INSTITUTIONS, UTLISATION AND CONSERVATION OF INDIGENOUS WOODY PLANTS IN PADER INTERNALLY DISPLACED PERSONS' (IDP) CAMPS, NORTHERN UGANDA

BY

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DECLARATION

I, Epilla Rajab, hereby declare that although I may have drawn upon a range of sources cited in this work, the content contained in this dissertation is my own original work and has not been previously in its entirety or in part submitted for a degree in Makerere University or any other Institution of Higher Learning.

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DEDICATION

This dissertation is dedicated to my parents, Mr. and Mrs. Mamadi Etonga who laid humble foundation for my studies, and to my daughters Hasia and Safia.

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ACRONYMS

ACI	Acholi Cultural Institution
ANOVA	Analysis of Variance
AWF	African Wildlife Foundation
CARE	Cooperative American Relief Everywhere
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CITES	Convention on Trade in Endangered Species of Flora and Fauna
COVOL	Cooperative Office for Voluntary Organisations
DBH	Diameter at Breast Height
DRC	Democratic Republic of Congo
DSCD	Diameter Size Class Distribution
ENR	Environment and Natural Resources
GPS	Global Positioning System
ICRAF	International Centre for Research in Agro forestry
IDMC	Internal Displacement Monitoring Centre
IDPs	Internally Displaced Persons
IGA	Income Generating Activity
IUCN	International Union for Conservation of Nature
IWP	Indigenous Woody Plant
MEA	Multilateral Environmental Agreement
MLUHD	Ministry of Lands, Housing and Urban Development
MoFPED	Ministry of Finance, Planning and Economic Development
MUIENR	Makerere University Institute of Environment and Natural Resources
MUK	Makerere University Kampala
MWE	Ministry of Water and Environment
MWLE	Ministry of Water, Lands and Environment
NAADS	National Agricultural Advisory Services
NARO	National Agricultural and Research Organization
NEAP	National Environment Action Plan
NEMA	National Environmental Management Authority
NFA	National Forestry Authority
NGO	Non Governmental Organization
NPA	National Planning Authority

PDDP	Pader District Development Plan
PRA	Participatory Rapid Appraisal
PRDP	Peace, Recovery and Development Plan
RCD	Root Collar Diameter
SCD	Size Class Distribution
SPSS	Statistical Package for Social Sciences
UBOS	Uganda Bureau of Statistics
ULGA	Uganda Local Government Association
UN	United Nations
UN/OCHA	United Nations/ Office for Coordination of Humanitarian Affairs
UNEP	United Nations Environment Programme
UNHCR	United Nations High Commission for Refugees
UNPIDP	Uganda National Policy for Internally Displaced Persons
USAID	United States Agency for International Development
UWA	Uganda Wildlife Authority
UWS	Uganda Wildlife Society
WFP	World Food Programme
WRC	Women's Refugee Commission
WWF	World Wide Fund for Nature Conservation

ABSTRACT

An assessment of institutional and policy interventions for conservation of indigenous woody plants (IWPs) during armed conflicts was undertaken in and around internally displaced persons (IDP) camps in Pader district, Northern Uganda. The specific objectives of the study were to: assess utilization of and conservation strategies for indigenous woody plants in and around IDP camps; determine the diversity, dominance, abundance and density of indigenous woody plants commonly utilized in and around IDPs camps; analyze institutional interventions related to conservation of indigenous woody plants during and after armed conflict; and document policy and legal interventions related to conservation of indigenous woody plants in and around the IDP camps. The study involved a survey of 160 households in 4 IDP camps, 39 NGOs/CBOs, 9 government institutions and Acholi Cultural Institution. Focus group discussion, key informant interview, semi structured interviews and tree inventory techniques were used to collect data. Tree species diversity and dominance were calculated using Menhinick's and Shannon's indices and Berger-Parker dominance index respectively. Most of the respondents (91%) used indigenous woody plants for firewood. The socio-demographic factors such as sex, household size, educational level and age significantly influenced ($P \leq 0.05$) use of indigenous woody plants for firewood, medicine and fruits indicating high dependence of IDPs on tree resources. The most preferred species were *Vitellaria paradoxa, Lonchocarpus laxiflorus, Ziziphus abyssinica, Pseudocedrela kotschyi* and *Combretum collinum* for their various products. The highly rated conservation strategy was use of the cultural law and local bye-law. The diversity of IWPs was generally higher nearer IDP camps and decreased with distance from camp centre. The most preferred IWPs had low abundance and dominance indices in and around IDP camps indicating high human pressure exerted on them. The size class distribution generally showed a decreasing number of stems per hectare as tree size increased indicating human pressure on mature trees and a threat to future regeneration of some tree species. One way ANOVA showed significant difference ($P \leq 0.05$) in size class distribution in Lakoga and Patongo IDP camps as distance increased from camp centre hence, reflecting good conservation practice. The existing natural resources management policies and laws, the IDP Policy and NGO Policy in Uganda did not have specific provisions for optimal conservation of IWPs resources in woodland areas during resettlement of IDPs. Since there is high dependence on IWPs for firewood in and around IDP camps interventions such as training women on use of energy saving cooking stoves, promoting tree planting and community sensitization are recommended. Conservation efforts geared towards protecting the most preferred IWPs and other mature tree species need to be undertaken in Pader district. The existing national natural resources management policies and laws need to be amended to enhance conservation of IWPs in resettlement areas. The cultural law, bye-law and traditional conservation practices need to be strengthened to support conservation effort. There is need by government, through National Planning Authority to develop recovery, rehabilitation and long term reconstruction programmes with appropriate environmental action to conservation of indigenous trees in northern Uganda.

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CHAPTER ONE: INTRODUCTION

1.1 Background to the study

In sub Saharan Africa, many countries are at risk of or engaged in armed conflict. Armed conflicts in most cases result in enormous loss of human lives, biodiversity and natural resources upon which people depend (UNHCR, 2001). In Uganda, many wars have been fought to date since the major liberation war of 1979. These wars have displaced over seven million people into Internally Displaced Persons (IDPs) camps and consequent destruction of woody plants and environmental degradation (UNPIDP, 2004; Nampindo *et al.,* 2005). The most common problem associated with settling refugees is the imbalance between demand and the resource base of the settlement area. This is related to the emergency character of the movements which makes proper planning for new inhabitants before their settlement impossible (Shambaugh *et al.,* 2001). According to NEAP (1992), the construction and maintenance of shelter, especially during emergency circumstance heavily depend on use of indigenous woody plants. As noted by Hamilton (1984) and Turyahabwe (2006), woody plants resources in forests and woodlands in Uganda are currently under threat of degradation by human activities.

During and following armed conflicts, the internally displaced people and refugees become highly dependent on the use of woody plants for fuelwood, construction and other natural resources in areas they have moved to as they settle (Kalpers, 2001a). As noted by Pimm *et al*. (1988) and Simberloff and Abele (1984), armed conflict result into habitat destruction whereby, in extreme cases, certain plants and animal species may become locally threatened, or even extinct. When large numbers of displaced people are temporarily resettled, they often clear away vegetation for farming. Such clearance on a large scale may be unsustainable even in the short term (Ndyakira, 1995). According to Shambaugh *et al*. (2001) the situation may be worse once these people lack local knowledge of optimal resource management practices. Moreover, when displaced persons return to their homelands, they are often forced to rely heavily on woody plants resources until they can establish their livelihoods (Nampindo *et al.,* 2005).

Often, humanitarian organizations intervening in such a conflict crisis place immediate priority to saving lives and minimizing human suffering (Shambaugh *et al.*, 2001). This implies that

environmental concerns with respect to conservation of indigenous woody plants, and ecological systems which are susceptible to degradation by human activity remain a low priority (Kalpers, 2001b). According to Shambaugh *et al*. (2001) in the event of armed conflict or sudden crisis, local and environmental institutions in charge of protected areas, may also become undermined. The weakening of institutions during an emergency situation is not only potentially the serious threat to conservation, but also a disaster in waiting since the disaster can manifest itself over a very long period of time thereby affecting the sustainability of conservation actions. Moreover, the breakdown of law enforcement and even cultural taboos that usually play important roles in conservation are likely to become weakened in conflict situation (Tabuti *et al.*, 2009).

1.2 Statement of the problem

The over 20 years Lord Resistance Army (LRA) civil war in northern Uganda led to displacement of over 1.6 million people into IDP camps (UNPIDP, 2004; Nampindo *et al.*, 2005; IDMC, 2006). When large numbers of people are displaced either due to war or natural disaster and are temporarily resettled in IDP camps, they often utilize indigenous woody plants in the woodlands or forests for firewood, building materials and clear vegetation to open farmland. They also become more dependent on indigenous woody plants without due consideration for their conservation, thus leading to loss of many plants species (Shambaugh *et al.*, 2001). A study by Nampindo *et al*. (2005) and Achola (2007) revealed that natural vegetation in areas near IDP camps in northern Uganda had declined significantly. The situation is anticipated to have worsened in Pader district during the 21 years LRA insurgency which resulted into creation of many IDP camps in the Acholi sub- region.

Although indigenous woody plants have been traditionally preserved through retention in the farmland, the system used to work well before LRA civil war. In Pader district where the total number of IDPs in camps had been estimated to be 352,862 (UNHCR, 2008), there is lack of information on the influence of IDPs, institutional and policy interventions in the conservation of indigenous woody plants (IWPs). The current trend of woody plants species / vegetation loss in the forests and woodlands ecosystems if uncontrolled could easily result into loss of genetic diversity upon which productivity, ecosystem stability and long term survival depend (NEMA, 2004). This situation has heightened the need to document the values of these indigenous woody plants and the ecological consequences of their destruction during armed

conflict (Shambaugh *et al.,* 2001; McLaren *et al.,* 2005). Despite the existence of environmental laws and many humanitarian agencies support to IDPs during the 21 years LRA armed conflict in northern Uganda, their interventions in the conservation of IWPs in and around IDP camps have not been explicitly documented (Birikadde *et al.,* 2009). This study was therefore designed to assess the institutional and policy interventions in the conservation of IWPs during armed conflict in and around IDP camps.

1.3 Objectives of the study

1.3.1 Overall objective

The overall objective of the study was to evaluate the effectiveness of institutions and their interventions for the conservation of indigenous woody plant resources in and around Pader Internally Displaced Persons (IDP Camps, Northern Uganda.

1.3.2 Specific objectives

The specific objectives of the study were to:

1. Assess utilization of and conservation strategies for indigenous woody plants in and around IDP camps;
2. Determine the diversity, dominance, abundance and density of indigenous woody plants commonly utilized in and around IDPs camps;
3. Analyse institutions and their roles in the conservation of indigenous woody plants during and after armed conflict; and
4. Document policy and legal interventions related to conservation of indigenous woody plants in and around Pader IDP camps.

1.4 Research questions

The study was guided by the following specific research questions:

Objective 1

i. Which indigenous woody plants species are preferentially targeted by people in and around IDP camps?
ii. What are the uses of indigenous woody plants preferentially targeted in and around IDP camps?

iii. Which socio-demographic factors are likely to influence the utilisation and conservation of indigenous trees in and around IDP camps?
iv. What strategies have been put in place to regulate the use of the indigenous woody plants in and around IDP camps?
v. Which constraints are experienced by IDPs in the conservation of indigenous woody plants?

Objective 2

i. What are the different indigenous woody plants species in and around IDP camps?
ii. What are the frequencies of occurrence of different indigenous woody plants species in and around IDP camp?
iii. What is the density of indigenous woody plants species in and around IDP camp?

Objective 3

i. Which institutions are involved in the management and conservation of indigenous woody plants in and around IDP camps?
ii. What roles do these institutions play in the conservation of indigenous woody plants in and around IDP camps?

Objective 4

i. What local/traditional and national laws are in place for promoting conservation of indigenous woody plants considered of great values to people in and around IDP camps?

1.5 Justification

The dependency and unsustainable utilization of IWPs in and around camps by the IDPs for fuel wood and other immediate needs can lead to loss of woody plants species and other woodland resources on which livelihood is based. Considering the potential and actual benefits that the utilization and conservation of the IWPs can provide both to the local population and the nation, it was important to conduct an analysis of institutional and policy interventions in the conservation of IWPs commonly utilized in and around IDP camps during armed conflict. The study has provided signals of the pressure being exerted by community on the indigenous woody plants. The forest professionals and conservationists can thus use the information to advocate for increased funding to conservation of IWPs.

The study has also provided a basis for policy makers to formulate appropriate policies and strategies for conservation of woody plants during and after conflict situation. The academicians can also use the recommendations from the study to conduct further research on unknown importance of IWPs. The information provided by this study can also be used by both national and local government planners to create awareness among the local communities more especially on the conservation of indigenous woody plants resources.

CHAPTER TWO: LITERATURE REVIEW

2.1 Status of indigenous woody plants (IWPs) in Uganda

Uganda has a very rich biodiversity resulting from its biogeographical setting and varied altitudinal range (600 - 5,100 m) creating diverse physical features with an estimated 18,000 species of flora and fauna although the actual figure is unclear because some species are poorly known (NEMA, 2004). Forests and woodlands cover approximately 4.9 million hectares, and the vast majority of this is woodland (3.98 million hectares) while the remainder is tropical high forest and forest plantations (MWLE, 2001). Over time, a large proportion of the indigenous woody plants of Uganda have been modified by burning and other anthropogenic activities and as such, many vegetation types have been significantly reduced in quality and range (MWLE, 2003). The loss of indigenous woody plants is attributed to habitat conversion for agriculture due to increasing human population, bush fires, inappropriate sectoral policies and legislation and armed conflicts (NEMA, 2004). According to Pomeroy and Tushabe (2004) the woody biomass in all its forms continues to decline, together with all the biodiversity that depends upon trees.

2.1.1 Conservation status of indigenous woody plants in protected areas

Many important areas in Uganda are conserved under existing laws as protected areas which include areas like forest reserves, national parks and wildlife reserves that have been protected from human encroachment and are the ones that contain the bulk of indigenous woody plants species (Pomeroy *et al.*, 2002; NEMA, 2006). A report by MUIENR / USAID (2001) indicated that there are 54 indigenous woody plants species considered to be under threat with the majority occurring in protected areas. Species that are endangered include *Lobellia stuhlmunii* and *Alchemilla roccati* from Rwenzori National Park. Among the commercially exploited tree species are *Entandrophragma utile, Milicia excelsa* and *Prunus africana*, while the vulnerable ones include *Phoenix reclinata, Raphia farinera* and *Nauclea diderrichii*.

2.1.2 Conservation status of indigenous woody plants outside protected areas

Many rangelands and other areas of biological importance are found outside the borders of protected areas and conservation efforts for such woody plants are inadequate and largely ineffective. Moreover, lack of enforcement of laws at the district level is a barrier to IWPs conservation (MUIENR /USAID, 2001). According to MWLE (2001), the IWPs on private and

customary lands in Uganda are extensively being degraded due to rising demand for firewood, charcoal, agricultural land and other tree products. Besides, the present policies and legislation for the conservation of IWPs outside protected area system in Uganda being inadequate, the existing land tenure systems of mailo, leasehold and customary holdings also offer little incentive for management and conservation of IWPs (NEMA, 2004).

According to Tabuti (2006) the population of naturally growing woody plants valued for their contribution to human livelihood is threatened with extinction and most are at risks in human inhabited areas outside protected areas that are subjected to high population pressure and variety of land use demands. Giannecchini *et al.* (2007) noted that the natural woodlands in unprotected areas are rapidly being transformed for subsistence cultivation around growing human settlements rendering some indigenous woody plants species (sensitive to intensive harvesting) to decline in abundance while other species can respond through coppice re-growth.

2.1.3 Indigenous knowledge related to the management and conservation of IWPs

According to Barrow (1996), local people 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 stake-holders always have to know the availability of resources and the knowledge the indigenous people have about them (Jarvis *et al.*, 2000). 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 like *Vitalleria paradoxa* to the primary producers has directly led to the management decisions which promote regeneration and conservation of the species by local farmers. This is always done through the protection of young shea trees when clearing land for cultivation.

The management and conservation of indigenous tree species like *V.paradoxa* in Uganda can be classified into identification of desired qualities, propagation, tending, protection and ownership (Adokorach, 2010). Improvement of the tree species by the protection of productive individual trees on the farmland is based on the locally favoured criteria such as sweetness of fruit, harvestable yield, tree health and reduced competition with annual crops (Lovett and Haq, 2000; Maranz and Wiesman, 2004). According to Katende *et al.* (1995), application of

different management techniques allows tree growers to maximize the production from trees. He noted that some management strategies may also be applied in order to reduce negative side effects and that most common management practices include pollarding, coppicing and tending.

The practice of protecting and managing indigenous woody plants resources is an old one in Africa. As noted by Obua (2002), before deforestation became 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. Tending operations as a management technique employed by the local communities on shea trees are limited to the pruning heavily branched trees to reduce the effect of shade on agricultural crops (COVOL, 2006).

According to Obua (2002), shea and other valuable trees are always conserved and protected on-farm. Methods such as sparing trees during cultivation, weeding around the seedling/sapling/mature trees to prevent fire from burning it, practicing prescribed early burning to dispose of combustible biomass and enforcing local bye laws to forbid cutting of some valuable tree species are used. In addition local culture and beliefs also help to protect valuable indigenous trees from unnecessary cutting (Lovett and Wasser, 1999).

On the other hand, pollarding may be done in some instances by removing the whole top (crown) of the trees and top branches to reduce competition between the tree and the companion crop. The top of the tree is cut at about 3 meters from the base of the tree (Oluka *et al.,* 2000). Trees species on which pollarding is commonly done include *Persea americana* and *Mangifera indica.* The leaves from the pollarded trees can then be used as mulch and the branches as fuel wood.

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

Thinning is a process whereby some trees are cut down with the objective of reducing the number of trees in the 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.

2.1.4 The influence of socio-economic and demographic factors on tree distribution in woodlands

For many years, not much had been invested to explore the influence of socio-economic and demographic factors of households on woodlands (Pomeroy *et al.,* 2004). This observation may indicate poor management of woodland since conventional practices rely mainly on established facts to make decisions. According to Jashimuddin *et al.* (2006), the need for better understanding of the linkage between socio-economic characteristics and the conditions of woodland (owing to the role they play) has begun to gain consideration. For instance, it has been established that higher levels of preference of particular woody species with respect to others for particular use may impact negatively on the species as more individual of it may be harvested hence diminishing its density and distribution (Abbot, 1996; Obiri and Lawes, 2000).

Although there seems to be clear understanding of what the linkage between species preference and subsequent impacts on woodlands, other questions such as what drives people to choose one species for a particular use is unclear. According to Babanyara *et al.* (2010), household socio-demographic characteristics such as level of education, occupation, sex and household size have been found to determine the type of energy source a particular household is most likely to choose. For instance, in case of low household income and increased prices of alternative sources of energy (like kerosene, gas and electricity), households are more likely to opt for fuel wood that is cheaper to obtain in most cases. Eventually, and with increasing population level, more use pressure is envisaged in the woodlands (Fournier *et al.,* 2010).

2.2 Impacts of armed conflict on uses and conservation of woody plants resources

2.2.1 Impact of IDPs on vegetation cover

During armed conflict, the refugees and IDPs pose a great threat to the environment through deforestation (Lodhi *et al.,* 1998; Kalpers, 2001a). Due to limited or no access to alternative fuel and income sources, IDPs resort to unsustainable firewood collection practices like non-selective tree-felling and indiscriminate forest clearance in order to meet their fuelwood, shelter and economic needs without considering longer-term implications of these actions (Birikadde *et al.*,2009; Kalpers, 2001a). This is understood because IDPs' primary concern is welfare and security but not environmental protection. According to NEMA (2008), the

widespread conflict in West Nile, north and north eastern Uganda led to displacement of many people into IDP camps within the region. In areas with high population density such as IDP camps, unsustainable fuelwood harvesting is the main cause of deforestation and loss of tree species (NEMA, 2008). In such areas, the high human population density always overrides the potential of natural resources such as vegetation to regenerate resulting into their depletion.

Mubalama (1999) noted that armed conflict results into deforestation due to various reasons. For example, in 1999, the army in Democratic Republic of Congo (DRC) cleared areas around the roads leading to Virunga National Park to reduce the risk of ambush and to create access routes to the city of Goma. As a result, the local population took advantage of the strategic deforestation to cut trees in that region sometimes with the army's complicity (Kalpers, 2001a). Armed groups may also pursue deforestation for business purposes as noted during the refugee crisis of 1994-96 in eastern DRC, whereby the rebel groups not only encouraged but organized extensive woodcutting and set up large scale charcoal enterprise (Mubalama, 1999).

2.2.2 Armed conflict and local communities' perception on conservation

In times of an acute crisis, local populations tend to focus on their survival and typically increase the pressure on natural resources, including those that fall within protected areas hence little focus on conservation of these resources (Birikadde *et al.*, 2009; Kalpers, 2001a). At times, the existence of a protected or forested area may become a refuge or corridor for various armed groups in times of armed conflict. When this happens, the adjacent human populations find themselves seated in the front row of a theater of potential violence and greatly exposed to possible attack. Their precarious situation may spark certain hostility toward such protected areas and can lead to wide scale clearance of vegetation for security reasons with negative ecological consequences on IWPs abundance and diversity (Nampindo *et al.*, 2005; Kalpers, 2001a).

However, when an inhabited region is under threat from military activities, a natural habitat may also become a refuge for local populations. For example, during the Rwandan genocide thousands of people took refuge in the Virunga Mountains while extremist militias scoured the north western portion of the country (Plumptre *et al.*, 2001). In this instance, the Volcanoes National Park filled a clearly positive function for local populations which may positively influence community's perception towards conservation.

2.2.3 Impacts of IDPs on indigenous woody plants diversity and abundance

Typically, communities in the IDP camps adjacent to the woodland use several forest products to meet their every day livelihood needs for fuel, shelter, food and medicine in times of hardship (Shackleton and Shackleton, 2003; Birikadde *et al.*, 2009). According to Mudekwe (2007), the type of indigenous woody plants used and the degree of use may vary depending on human population densities, personal and cultural preferences and household income level. The preference of use of IWPs in respect to size, species could have an ecological effect on the woody plants abundance, population of targeted species and species richness (Peters, 1996; Timmermans, 2000; Mudekwe, 2007).

A report by Shambaugh *et al*. (2001) indicates that over harvesting of indigenous woody plants can easily endanger the ecology of the woodland ecosystem, yet little is still known of the undiscovered values of these indigenous woody plants and the ecological consequences of their destruction during armed conflict. This destruction of woody plants if uncontrolled may jeopardize the woodland biodiversity and threaten the sustainability of livelihoods.

2.2.4 Methods and indicators commonly used in woodland management

Species diversity, relative abundance and density are among the parameters that have been used by scientists to study the status and regeneration of woody plants resources for a long time and form the key parameters in vegetation analysis (Kent & Cocker, 1996; Millet & Troung, 2011). According to Gimariet-Carpentier *et al.* (1998), the magnitude of these parameters provides a reflection of the status of the resources in the study area with regards to the variables under consideration. For example, a bigger density value implies the species have more ground coverage while low density may be an indication of sparsely distributed plant species. Similarly, a high index of diversity (H') implies that the sample plot has many different species while a low diversity index could imply a lower level of diversity in the study area (Millet & Troung, 2011). Though intense human disturbance reduces species diversity, a study by Connell (1978) noted that intermediate levels of human disturbance can promote higher diversity as a consequence of continually changing conditions.

The population structure is the expression of frequency distribution of various sized trees in woodland (Peters, 1996). It is generated from a plot of number of trees against predetermined size- classes. Diameter at breast height is the most commonly used size variable in the analysis of population structure although of recent, use of tree height is becoming frequent (Brown &

Bredenkamp, 2004; Rasingam *et al.,* 2009). According to Abbot (1996), the stem diameter-size distributions of different communities and of species across different communities usually provide useful information to interpret the dynamics of the communities and the species.

A report by Lykke (1998) indicated that size class distribution (SCD) graphs are generated from a plot of number of individuals of a particular species in each class. Interpretation of the nature of regeneration in a given scenario is made in comparison with the normal "inverse – J" distribution curve. Flat size class distributions indicate lack of regeneration and declining populations that may be as a result of rapid growth rate in small size classes and high survival rate overall (Mwavu, 2007). Species with rapid growth rates in small size classes would have relatively flat SCDs in comparison to species with slow growth provided that other parameters are similar (Poorter *et al.,* 1996). The nature of the SCD slope also provide a wide set of deductions concerning regeneration status of a given tree species. According to Mwavu and Witkowski (2009), negative SCD slope is an indication of good regeneration. A distribution slope of zero implies equal numbers of regenerating and mature trees, while a positive slope may imply many adult individuals with fewer individuals under the rejuvenation category.

The characteristic inverse J-shaped size class structure is indicative of stable and expanding populations (Millet & Truong, 2011). A higher abundance of individuals in smaller size classes than the larger size classes and an almost constant reduction in the number of trees from one size class to the next, leading to an inverse J-shaped size class distribution is regarded as an indicator of adequate regeneration and population maintenance (Condit *et al.,* 1999). Ideally, this is the type of structure that one strives to maintain in a natural populations of woody plants communities.

2.2.5 Positive impact of human displacement on IWPs density

The effect of armed conflict on the environment is not necessarily always negative as in certain cases, warfare has had positive impacts. Nampindo *et al.* (2005) noted that satellite images in the study conducted by Wildlife Conservation Strategy showed that woodlands in West Nile region increased by 12-23 %, while protected areas increased by 20-39%. Specifically, vegetation cover was estimated to have increased by 23% in Yumbe, 20% in Moyo, 19% in Pader and 19% in Kitgum where there was a large belt of increased woody cover as a result of armed conflict and in areas where LRA had been most active. On the contrary, the north east of the country had experienced an increased loss of wood cover where Nakapiripirit was

estimated to have lost about 36% of its original tree cover, and about 19% in Lira , 16% in Moroto (Nampindo *et al.*, 2005) (Table 1).

Table 1: Woody cover change (1985-2002) by district in northern Uganda

District	Total woody area (Ha)	Net change in woody cover (Ha)	% change in woody cover
Nakapiripirit	132,462	-47,488	-36
Lira	419,298	-80,192	-19
Moroto	753,112	-116,789	-16
Katakwi	220,655	-19,553	-9
Kotido	1,317,434	-97,722	-7
Apac	309,673	-22,552	-7
Gulu	1,205,387	173,905	14
Kitgum	1,021,285	189,032	19
Pader	641,108	122,665	19

Source: Nampindo *et al*. (2005).

The trend indicates that the districts affected by the conflicts had experienced regeneration of natural vegetation and woody plants diversity but this did not translate into the entire region. The study further revealed that in the Lango sub region and north eastern region there was shortage of fuel wood, charcoal and building poles. The same report indicated that much as there was increase in biomass in Acholi sub region, the regenerated woodlands had been targeted as the main livelihood source by supplying firewood and charcoal to other regions of the country as people moved to their original homes (Nampindo *et al.*, 2005). This situation can reverse the positive trend gained in the last two decades and the most probable solution would be to institute mechanism for sustainable management of tree resources both on-farms and in woodlands.

McNeely (2000) noted that some parts of the Ziama region in Guinea, which encompasses a major biosphere reserve, underwent spontaneous reforestation due to a series of wars that affected the region between 1870 and 1910. In those conflicts, ethnic warfare, followed by fighting against the French colonial armies, led to out-migration and economic decline, thus allowing the forests to recolonise abandoned fields.

2.3 Impact of armed conflict on natural resources conservation and management

2.3.1 Disruption of government operations

During and after conflict, governments generally focus on meeting immediate human needs – food shortages, shelter, disease, weakened health care systems, safety for citizens and

displaced persons, fragmented social networks, destruction of people's livelihoods and refugees who must be returned to their own homeland. All these take precedence over environmental concerns (Shambaugh *et al*., 2001). The Lord's Resistance Army rebellion in northern Uganda from 1986 – 2006 displaced over 1.7 million people into Internally Displaced Persons' (IDP) camps where the immediate government priority was provision of security, food supplies and medical care to the internally displaced persons (IDMC, 2006).

As noted by Squire (2001); UWA (1997) and Werikhe *et al*. (1997), war often leads to breakdown of law and order, leaving protected areas and species vulnerable to exploitation. For example, during Sierra Leone's civil war in the 1990s, regional forestry officers, foresters, rangers and guards went unpaid for long periods, while there was illegal mining and logging. This resulted in massive deforestation in the forest reserves. Even after conflict, well-informed environmental decisions were unlikely in the face of economic collapse, the need to rebuild infrastructure and disruption of commerce at the local and national levels (Kalpers 2001a).

2.3.2 Impact of armed conflict on the activities of institutions involved in conservation

In the event of armed conflict or sudden crisis, the institutions responsible for environmental protection and conservation are faced with an enormous array of disastrous consequences. Loss of human life, equipment and infrastructure, financial resources and security are all factors that contribute to a further weakening of government agencies and ministries. As noted by Shambaugh *et al*. (2001), post-crisis rehabilitation programmes rarely focus on environmental concerns, and because biodiversity conservation is almost never a priority for donors attempting to bolster a country afflicted by war, in many places these lingering after effects are almost guaranteed in these institutions. This type of impact particularly well underscores the need to strengthen the operational capacities of such institutions.

Armed conflicts may also lead to "brain drain", when nationals with higher education in environmental fields flee the country and do not return. This can leave relatively few well educated people in the environmental sector, weakening the institutional effort in post conflict attempts at reconstruction and conservation (Plumptre *et al.*, 2001). According to Kalpers (2001b) the destruction of conservation facilities also contributes to a general weakening of the institutions, as well as vastly impeding caretaking and surveillance programme.

The most negative impact observed in any armed conflict is the toll of casualties among the civilians as a result of human rights violations and assassinations. This usually happens when armed units range across the countryside, often attacking innocent civilians - locals, refugees, displaced persons and the field agents responsible for conservation (Shambaugh *et al.,* 2001). According to IDMC (2006), the 21 year old LRA war in northern Uganda resulted in over 1.7 million people being displaced and tens of thousands estimated to have been killed. NEMA (2006) noted that lack of conservation staff in a war situation can worsen the rate of degradation of woody plants by internally displaced persons.

2.4 Conservation interventions by relevant institutions during armed conflict

2.4.1 Roles of NGOs, government and donors

The NGOs normally play a role of advocacy, active interventions in conservation activities and can be highly effective at raising international awareness about the misuse of natural resources, influencing public opinion and informing policy makers (Shambaugh *et al.,* 2001). Many NGOs are active in Uganda at the national, district and local levels. As noted by MUIENR/USAID (2001), a number of NGOs active in conservation of biodiversity in Uganda are Nature Uganda, Ecotrust, Uganda Wildlife Society (UWS), African Wildlife Foundation (AWF), CARE, World Wildlife Fund (WWF) and World Conservation Union (IUCN). Despite their presence they have normally restricted their operations in areas free of insecurity or disaster, hence undermining conservation of natural resources in conflict areas.

Uganda has instituted a governance framework for conservation of natural resources. The Act of Parliament, 1995 created National Environment Management Authority as the principal institution in Uganda responsible for the environmental matters with the mandate to coordinate, monitor and supervise all activities in the field of environment (NEMA, 2004). It relates horizontally with different sectoral agencies like National Forestry Authority and Uganda Wildlife Authority.

According to NEMA (2004) and MUIENR/USAID (2001), the important feature of reforms in natural resources conservation and environmental management has been the decentralization of functions to lower local governments. The restructuring system in the Public Service Commission in Uganda created the department of natural resources to include forestry, lands, environment and wetlands sectors at the district level. However, the structure still needs

improvement as it does not bring all biodiversity institutions under one umbrella as recommended in the National Environment Management Policy of 1994, following meager allocation of financial resources (NEMA, 2004).

The funding support from donors to mitigate impacts of armed conflict on the environment is important during and immediately after armed conflict (Shambaugh *et al.,* 2001). Donors play a major role in biodiversity and natural resources conservation efforts in Uganda and many include environmental activities within their programmes (NEMA, 2004; MUIENR/USAID, 2001). However, the current focus of the government of Uganda on poverty alleviation has downplayed the importance of environmental sector conservation of indigenous woody plants.

As donor agencies increasingly respond to the government programme such as Poverty Eradication Action Plan (PEAP), they are also beginning to downplay natural resources conservation efforts (MUIENR/USAID, 2001). Since the primary funding for most environmental agencies and conservation-based NGOs largely comes from donors, any setbacks to continued donor support would be devastating to the natural environment and associated conservation of indigenous woody plants species in Uganda, which is the basis of livelihood for most Ugandans (NEMA, 2004).

2.4.2 Traditional laws for the conservation of natural resources

Uganda's traditional system of natural resources conservation and environmental governance is not very well studied and documented (NEMA, 2008). The system however, relies on a network of traditions and customs that regulate the use of natural resources and empowers elders to arbitrate in situations of dispute (NEMA, 2008; Obua, 2002). The traditional system of natural resources conservation involves unwritten, informal but systematic taboos, rituals, rules and includes sacred totems, grooves and prohibited behaviors that together aim at ensuring stewardship of various environmental resources. For example, in many cultures of the Banyoro, Acholi, Baganda, Akarimojong a tree is planted to mark the birth of the child and in the same cultures, the system of sacred totems ensures that people do not harm or eat, but protect and conserve certain animals and plant species (NEMA, 2008). The traditional systems are localized and participatory decision making is vested to the respective levels of society including households.

NEMA (2008) notes that previously traditional governance systems were adequate to maintain a functional balance in most ecological systems but new interests, natural hazards resulting in massive human displacement, population growth, wars and developmental pressures now surpass the capacity of traditional governance system to conserve natural resources. There is therefore an increasing need for official conventions, policies, laws and institutions and modern system of environmental governance.

2.5 Policy and legal interventions for the conservation of IWPs during armed conflict

2.5.1 National policy and legal interventions in Uganda

The function of environmental governance is to provide a comprehensive, coherent, effective and efficient framework for the protection and sustainable use of natural resources which include identification of problems, provision of information on the problem and formulation of policy advice and guidance and integration of environmental policies in the broader policy framework (Perrez, 2001; Roch and Perrez, 2005). In Uganda, the need to conserve biodiversity has been articulated in the Constitution of the Republic of Uganda 1995, the National Environment Act Cap. 153, the Land Act Cap. 227, Local Government Act Cap. 243, the National Environment Management Policy 1994, the National Forestry Policy 2001, the National Biodiversity Strategy and Action Plan and sectoral laws and policies (UNEP, 2009; NEMA, 2004).

In addition, a number of agencies and non- governmental organizations are working on various coordination, research and implementation aspects of these laws and policies (MUIENR/USAID, 2001). Despite the large scale donor support in conservation of biodiversity there are gaps in the conservation laws in relation to conservation of indigenous woody plants (MUIENR/USAID, 2001). The Poverty Eradication Action Plan highlights links between natural resources degradation and increasing poverty to lack of clear policy and institutional coordination on conservation actions, inappropriate economic policy and calls for political focus on natural resources conservation (MoFPED, 2000).

2.5.2 Post – conflict conservation policy reforms

The post-war period may offer opportunities for policy reforms that can have large impacts on natural resources conservation and sustainable rural livelihood. There is often a window of

opportunity for countries to up- date old or inappropriate policies and laws which may include natural resources conservation as well as other sectors which may impact directly or indirectly on the environment (UNEP, 2003; Shambaugh *et al.*, 2001). According to NEMA (2004), Uganda has made significant progress in the area of developing the necessary instruments, tools, institutions and processes for environmental management and planning since National Resistance Movement government came to power in 1986. In 1991 the National Environment Action Plan (NEAP) was instituted. The NEAP process advocated for a new institutional structure for environmental management observing that the Department of Environment Protection which existed by then could not handle the functions and roles envisaged.

The National Environment Management Authority (NEMA) was created through an Act of Parliament in 1995. An important feature of reforms of environmental management has been through the decentralization process, where districts and lower local governments are responsible for the management of environment in their respective area of jurisdictions (NEMA, 2004). As reported by Hatton *et al.* (2001) the Mozambican government showed much greater openness to natural resources conservation after the war, and incorporated this into revised land and natural resources policy and legislation.

2.5.3 Role of international conventions in promoting conservation of natural resources

Multilateral environmental agreements (MEAs) are the main instruments of international natural resources conservation and environmental governance. According to NEMA (2008) Uganda is a signatory to a number of international conventions on biodiversity conservation including the Convention on Biological Diversity (CBD), 1992; African Convention on the Conservation of Nature and Natural Resources, 1968; Convention for protection of World Cultural and Natural Heritage, 1972 and Convention on Trade in Endangered Species of Flora and Fauna (CITES), 1973. Brautigam (1995) notes that CITES protects certain endangered species of wild flora and fauna by limiting and regulating trade in such species and the convention has a potentially important role to play in the present conservation context because, if applied to the letter, it could reduce the temptation for certain rebel forces to harvest indigenous woody plants as a way to finance weapons, purchases and military activities.

Uganda has responded to above international treaties by Ratification of Treaties Act Cap. 204, Uganda National Policy for Internally Displaced Persons, 2004 (NEMA, 2008). Uganda has

also developed a set of robust non-compliance regulations that are now being enforced for instance; conservation of *Prunus africana* which is believed to be a cure for cancer is probably a direct reflection on the effectiveness of the Conventions (NEMA, 2008). According to MUIENR/USAID (2001) the national legislation must be modified to give such international treaties a binding force in Ugandan law. WRI (2003) noted that the effective implementation of various international conventions presents a number of challenges including slow negotiation and ratification, hence dire consequences on conservation of some plant and animal species.

A report by Shambaugh *et al.* (2001) indicates that although most of the international environmental treaties are in principle applicable during both times of peace and armed conflict, regrettably it seems to be widely accepted implicitly among the states parties that this body of law is operative only in times and places of peace. In this regard it seems more than wanted to note that all sovereign states must, in parallel with submitting to any treaty, enact domestic legislation and associated administrative mechanisms that will ensure fulfillment of the accepted obligations.

CHAPTER THREE: STUDY AREA AND METHODS

3.1 The study area

3.1.1 Location of study sites

The study was conducted in Pader District in Northern Uganda between June-October, 2009. By the period of this study the district had been affected by the LRA armed conflict and Karimojong cattle rustlers for a period of up to 21 years. Pader District is located between longitude $32^0 30'$ and $33^0 32'$ East and latitude $2^0 00'$ and $4^0 00'$ North. It covers total area of 6,917 Km^2 (PDDP, 2007; UBOS, 2007). The district is bordered by the districts of Kitgum in the North, Abim and Kotido in the East, Gulu in the West, Apac in the South West and Lira in the South (Figure 1).

3.1.2 Climate

Pader District has one dry and two wet seasons. The wet seasons extend from April to November with highest rainfall peaks in April and August. The dry season is from December to March. The total annual rainfall is 1,330 mm and the average monthly maximum temperature is 29^oC and minimum temperature is $17\ ^oC$ (PDDP, 2007; UBOS, 2007).

3.1.3 Flora and fauna

The vegetation of the district is predominantly dry savannah type comprising mainly of *Hyperrhania, Combretum, Terminalia, Acacia species* and *Vitellaria paradoxa.* The north eastern part of the district has mountain forests and shrubs. Isolated riverine forest type vegetation is found along Agago and Aswa rivers dominated by wetland plants (Eggeling and Dale, 1951). The notable palatable species for grazing animals include *Panicum maximum, Hyperrhania* and *Pennisetum species.* The district originally had considerable population of wild life animals such as *Loxodonta africana, Synecrus caffer, Kobus kob thomasi, Sylvicapra grimmia, Struthio camelus* and *Numida meleagris*. However, the entire large games have disappeared as a result of human influence (PDDP, 2007; UBOS, 2007).

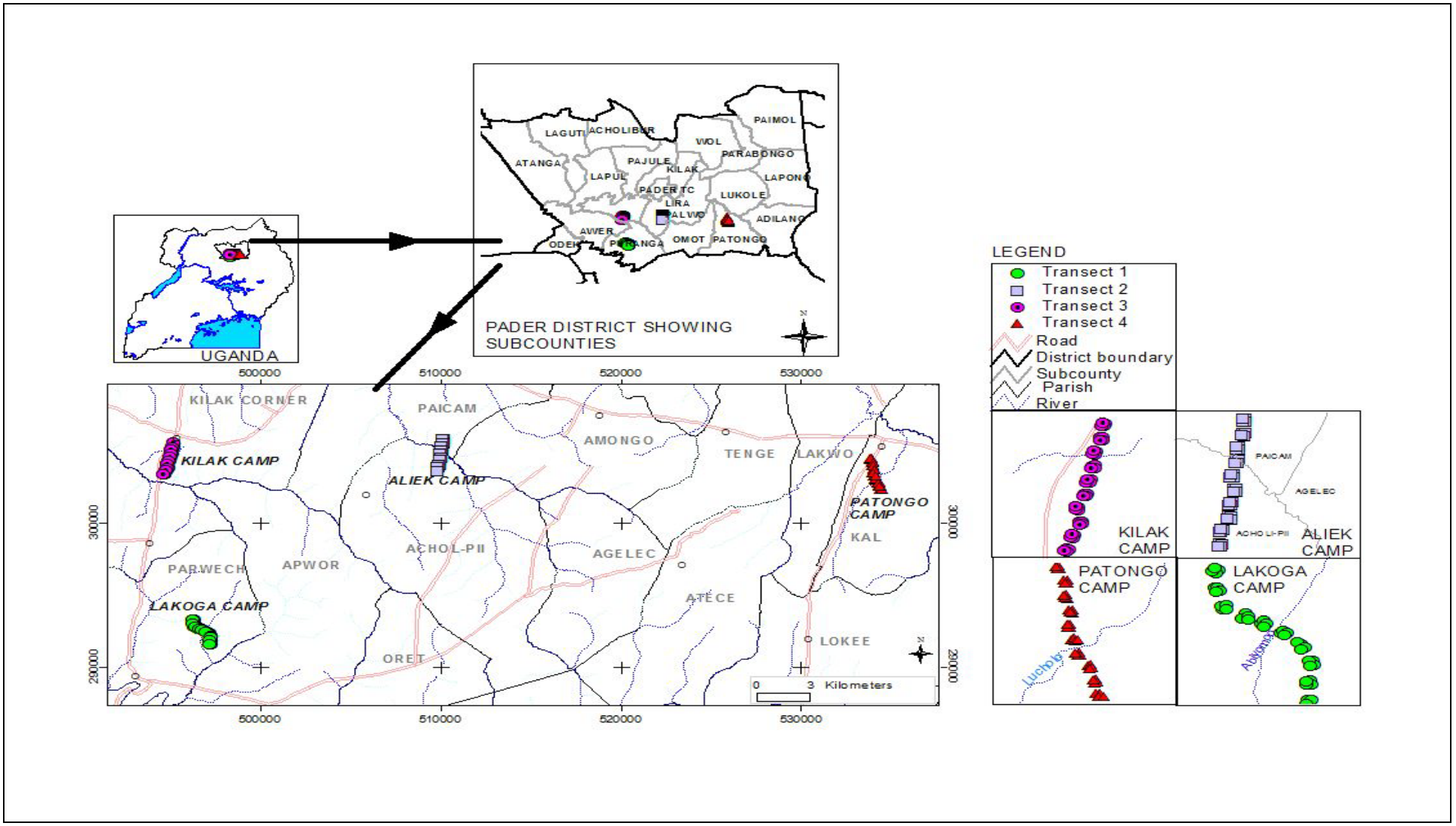


Figure.1: Map of Uganda showing Pader District and study sites

3.1.4 Topography and Soils

The topography of the district is characterized by low plains and rolling hills along the river, rising to a series of hills and peaks in the eastern and north eastern parts of the district with some inselbergs in the sub-counties of Adilang, Paimol, Lapono, Lukole and Parabongo. The district lies at an altitude of 1,150 m above sea level. Further west of the district, the land falls as the relief becomes gentler towards Gulu District (UBOS, 2007).

The soils are of undifferentiated gneises and in the north granulite facies rocks consisting of Acryic Ferrasols, Gleysols, Leptosols and Vertisols (NEMA, 2009). The reddish brown layer of clay loam soil covers about 90 % of the cultivable land. This soil is very suitable for rain fed agriculture. The rocky soils account for 3 % and black clay soils account for 97 % of the soil mass in the sub region. The district has well drained sandy loam soils and vulnerable to soil erosion (PDDP, 2007; UBOS, 2007).

3.1.5 Drainage

Pader District has two rivers Aswa and Agago and several streams which drain North West through Gulu district into River Nile. The wetlands cover an area of 37.2 Km^2 (0.54 % of Pader land area). The rivers and streams are seasonal and dry off in dry season. The main source of drinking water is underground water (PDDP, 2007).

3.1.6 Population and socio-economic activities

According to UBOS (2007) the population of Pader was 327,284, with annual population growth rate of 2.6 % compared to the national population growth rate of 3.3 %. The majority of the people are involved in both subsistence and cash crop farming. The main food crops grown include groundnuts, simsim, cassava, sorghum, millet, sweet potatoes, finger millet, cowpeas, beans and vegetables while the traditional cash crops are cotton and tobacco.

The nontraditional cash crops grown include simsim and rice (PDDP, 2007). The labour for cultivation is provided by the family and traditional communal labour provided by the local population on rotational basis. Agricultural productivity is constrained by erratic weather conditions, limited supply and high cost of agricultural inputs (PDDP, 2007).

3.2 Methods

3.2.1 Research design

The study was designed to assess the impacts of IDPs, institutional and policy interventions in the utilization and conservation of IWPs in and around IDP camps during and after the armed conflict. It involved both household surveys and tree inventory in the woodlands in and around IDP camps. Semi structured interviews were used to obtain information from household heads in the IDP camps. Inventory of indigenous woody plants was conducted to assess the density, dominance and species richness in and around IDP camps. Review of relevant literature, consultation with stakeholders, observations and photography were also conducted. In this study, indigenous woody plants were taken as vascular plants with perennial stems above ground and covered by a layer of thickened bark, and the stems support continued vegetative growth above ground from one year to the next (Stearn, 1966).

3.2.2 Sampling procedure and transect establishment

a) Sampling procedure

Sampling was carried out in four IDP camps: Lakoga, Alyek, Kilak and Patongo, in Pader district (Table 2).

Table 2: Study IDP camps in Pader district

Name of IDP camp	County	Sub County	Parish	Village	GPS coordinates (centre points)		IDP Population size *
					Northing	Easting	
Lakoga	Aruu	Puranga	Lakoga	Lakoga	0239.297	03258.078	2,860
Alyek	Agago	Lira Palwo	Alyek	Alyek	0245.993	03305.487	2,422
Kilak	Aruu	Kilak	Kilak	Kilak	0245.841	03257.398	17,462
Patongo	Agago	Patongo	Patongo	Oliga	0245.898	03318.653	48,798

* *Source:* World Food Programme food distribution list in Pader (September, 2005 - May, 2006)

The sites selected were those affected by LRA armed conflict since 1986. These camps hosted a large number of Internally Displaced Persons (IDPs) whose activities were expected to have negatively impacted on indigenous woody plants. Pader district has 2 Counties, 2 Town Councils, 17 sub counties (PDDP, 2007). From each County, two Sub Counties were randomly selected making a total of 4 sub-counties (representing 23% of sub counties). Each Sub County had on average 3 IDP camps. In each of the selected Sub County, one camp constituting 33% of the IDP camps was randomly selected for study. According to

Hetherington (1975), 20% sample of a population is a minimum size that can be taken to be representative.

b) Transect establishment and plot lay out

A transect of approximately 2 km long, marked with tapes and stakes was established in each of the selected IDP camp to allow enough plant capture (McLaren *et al.,* 2005). Establishment of the transect started from 100 m off the last household in the camp to avoid edge effect. The transect alignment of North – South was maintained in all the subsequent sites. On each transect, 10 rectangular plots each of 50 m x 40 m were established alternating at intervals of 200 m along the transect line.

As presented in Table 3, each sample plot was stratified as follows: 50 m x 40 m for mature trees (dbh > 10 cm); two sub plots each measuring 25 m x 20 m for saplings and poles (dbh > 2 - ≤ 10 cm) and five smaller sub plots each measuring 10 m x 10 m for seedlings (≤ 2 cm rcd) as per Kent and Coker (1996) and Okullo (2004).

Table 3: Size class categories

Plot size	Size class of IWPs	Tree category	Number of plots sampled	Measured:	
				Diameter	Height
10 m x 10 m	≤2 cm	Seedlings	200	rcd	Yes
25 m x 20 m	> 2 – ≤10 cm	Saplings / poles	80	dbh	-
50 m x 40 m	>10 cm	Mature trees	40	dbh	-

Adopted from Kent and Coker (1996)

On each plot measuring 50 m x 40 m the corners were randomized and two sub-plots each measuring 25 m x 20 m were laid at those corners. Following this design, 320 plots were studied. The resulting general design is shown in Figure 2.

3.2.3 Field instruments

A linear tape measure was used for plot and transect lay out and for measuring ground distance along transects and between plots. Pangas were used for slashing transect lines, nylon ropes and ribbons for demarcation of plot boundaries. GPS was used for taking plot coordinates and for aligning the direction of movement along transects in addition to generating the location of

the IDP camps. Diameters at breast height (1.3 m) of mature trees were measured using diameter tapes. For saplings / poles, dbh were measured using caliphers.

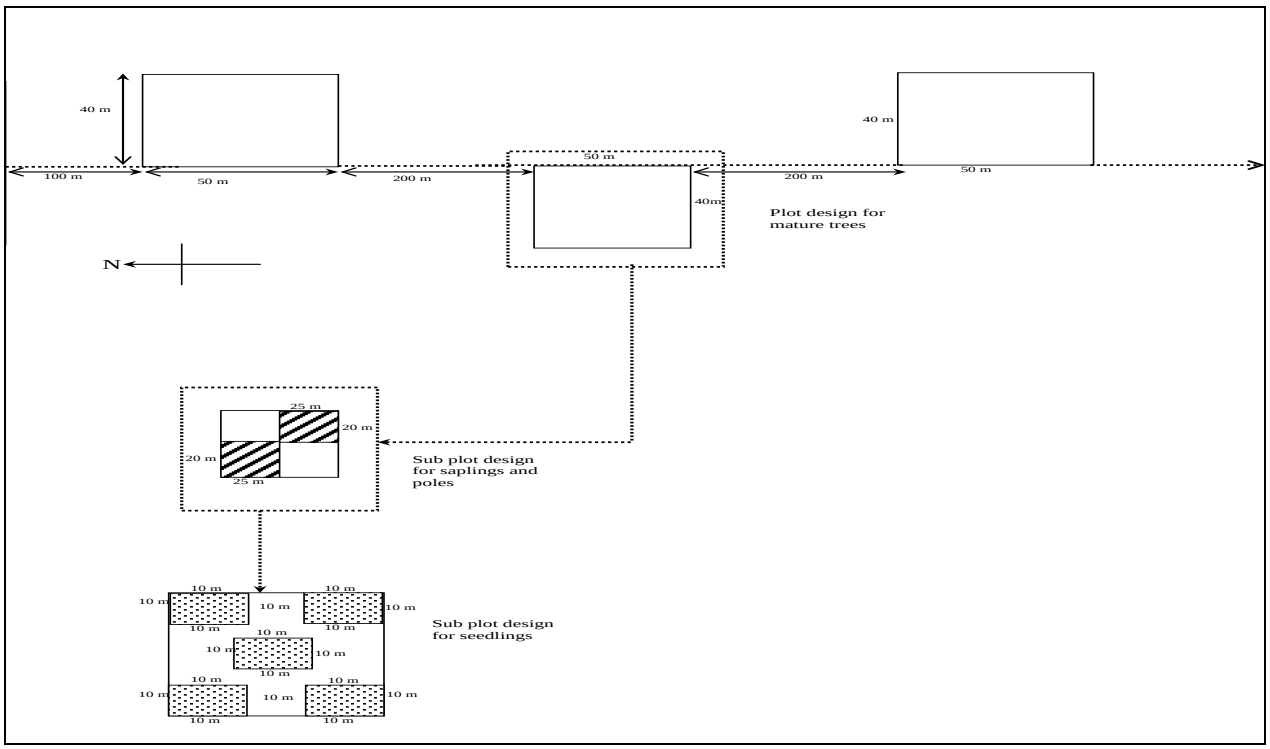


Figure 2: Transect and plot layout design for sampling indigenous woody plants in and around IDP camps in Pader district

The root collar diameters (rcd) of seedlings were measured immediately above root collar using vernier calipher, and the height was measured using 3 metre hardened tape measure. For coppices, each stem was measured separately and the rcd averaged to obtain an estimate diameter for the main rootstock (McLaren *et al.*, 2005; Mudekwe, 2007). Tree inventory data sheets were used for recording measurements in each plot size description.

3.2.4 Data collection

a) Focus group discussion

Focus group discussions using a questionnaire guide were held with elders of men and women groups, youth as well as Acholi cultural leaders to elicit information on uses and conservation strategies of IWPs. Preference ranking was used to rank indigenous woody plants considered valuable by IDP community in and around IDP camps. Each individual respondent in the focus

group was then asked to name 10 IWP species considered of importance by community and rank them in order of preference (Okia *et al.,* 2008).

The highest priority species out of 10 was assigned 10 points and the lowest ranked was assigned 1 point. The points for each species were summed across all the respondents. Ranking was based on majority head counts for indigenous woody plants preferentially used by IDPs in and around IDP camp. The species were then prioritized according to total points scored (Agea *et al.,* 2007).

b) Key informant interview

An interview guide was used to conduct an in-depth interviews with key informants such as the technical people from the line Ministry of Water and Environment (MWE), Ministry of Disaster Preparedness, Ministry of Internal Affairs, NEMA, NFA, NGO Forum, NGOs, CBOs and Acholi Cultural Institution (ACI) leaders to validate their awareness of and the availability of natural resources conservation policies and legal interventions during armed conflict.

Key informant interviews were also held with council members of Production and Environment Committees in Pader district local government and four selected sub counties, Forestry Officer and Environment Officer to identify institutions and their interventions related to conservation of IWPs in the area. The District and Sub County committees were selected because they are the key institutions involved in policy making, planning, financing of and ensuring proper governance of environment and natural resources as mandated by Local Government Act Cap. 243, National Forestry and Tree Planting Act, 2003 and National Environment Act Cap. 153 (Turyahabwe, 2006; NEMA, 2008).

c) Semi structured Interviews

Semi structured interviews using questionnaire were used to obtain information from the household heads in each of the 40 sampled households per study IDP camp. The questionnaire was designed to collect information on the socio-demographic characteristics of the household, uses and conservation strategies of IWPs in and around IDP camps. Open ended questions were especially used to solicit more detailed information on cultural practices and challenges relating to conservation of IWPs.

To avoid bias in selecting household members for the study area (the sampled IDP camps), simple random sampling technique was used. A list of household names was obtained from the camp leader and household numbers written on pieces of paper and thrown into a box. Using a lottery technique (Mugenda, 2003; Kothari, 1990), 40 names in each camp were randomly withdrawn from the box without replacement. These were the households where questionnaires were administered. In total 160 respondents were interviewed in the four sampled IDP camps.

d) Tree inventory and Identification

Tree inventory was carried out in sampled plots along the established transect in each camp. Trees were identified and counted in 80 established plots in each IDP camp to determine density, dominance and species diversity. Measurement of diameter at breast height (dbh) and root collar diameter (rcd) was done in each plot and recorded in tree inventory data sheet by diameter size-classes to determine stand composition structure (Turyahabwe and Tweheyo, 2010; Okullo, 2004; Mihai *et al.*, 2004; Eilu, *et al.*, 2003). In the sampled plots GPS positions were also measured in order to locate the study site on the map. The first five plots of 50 m x 40 m along each transect were referred to as near the camp and the last five as far away from the centre of IDP camp (Table 3).

The indigenous woody plants encountered in the study plots were recorded in the data sheet by local names. For indigenous woody plants that could not be identified in the field, specimens were collected, labeled, tightly preserved using plant presses and taken to Makerere University herbarium for identification. Tree identification followed nomenclature in Hamilton (1991); Katende *et al.* (1995); Eggeling and Dale (1951). This enabled establishment of names of each encountered tree species in sampled plot.

e) Secondary sources

Further information was sought from internet and Makerere University main library. The policy instruments relating to natural resources conservation reviewed were The Constitution of the Republic of Uganda (1995), Forestry Policy (2001) and National Environment Management Policy (1994). The other policies related to management of IDPs were IDP Policy (2004) and NGO Policy (2009). The available legal instruments reviewed were National Environment Act (Cap 153), Local Government Act (Cap 243), National Forestry and Tree Planting Act (2003), Land Act (Cap 227) and NGO Act (2006), cultural laws and bye laws in Pader district. These policies and laws were reviewed in relation to conservation of indigenous

woody plants in times of armed conflict because they are legal basis for enforcement and compliance (Turyahabwe, 2006; NEMA, 2004).

Other relevant documents from the district, NGO Forum were reviewed to collect information on interventions being implemented by both NGOs/CBOs and cultural institutions during the armed conflict. NGOs were consulted and / or their documents reviewed because they are mandated to support local governments in the refugee resettlement programme. A part from having close collaboration with local communities, these institutions can also influence conservation efforts (Shambaugh *et al.,* 2001; Birikadde *et al.,* 2009).

3.2.5 Data analysis

The data from questionnaires were sorted, coded and the entered in Statistical Package for the Social Science (SPSS) computer software to generate descriptive statistics like percentages and histograms (Okullo, 2004). The scores given by respondents in the PRA for preferred species were ranked and priority list generated using MS Excel computer programme. Responses from open ended question were sorted and summarized to generate additional information on institutional interventions during and post conflict situation.

The data from semi-structured questionnaire administered to key institutions involved in policy formulation and implementation were analyzed in order to make proper recommendations for the management and conservation of indigenous tree resources during times of armed conflict and or/ natural disasters.

Logistic regression was run in STATA in order to test the relationship between socio-demographic characteristics and utilization of IWPs. The dependent variable was use of IWPs while sex, age, occupation, marital status and education level were the independent variables.

A dummy variable as a proxy for the dependant variable having value of 1 was assigned a 'yes' response and a value of 2 was assigned to a 'no' response (Koutsoyiannis, 1977).

According to Koutsoyiannis (1977), extensive application of dummy variables has been used in the study of relationships between pure economic variables and socio-economic factors.
The model is presented as follows:-

Prob (event) = $\frac{e^z}{1+e^z}$ = ……..……..……..(i)

Where:

P(event) = Probability of an event occurring

e = The base of natural logarithms, approximately 2.718

z = The linear combination of socio-demographic factors (earlier identified as gender, age, marital status, number of dependants, education level, occupation and conservation strategies)

$= B_0 + B_1X_1 + B_2X_2 + \ldots\ldots + B_pX_p$ ……(ii)

Where:

X = The value of the variable

B = Corresponding coefficients

B_0 = Coefficient of the constant

Prob (event) = B_0 + B_1Gender + B_2Age + B_3Marital status + B_4No. of dependants + B_5Education + B_6Occupation……..…….. ……...……(iii)

The probability of an event not occurring is estimated as,

Prob (no event) = 1 - Prob (event)……..……...……..… (iv)

It is assumed that the probability that a respondent will use a particular IWP product and / or conserve IWPs is determined by the above socio-demographic factors. The probability level at which independent variables significantly affected the dependant variables was 5% (Turyahabwe, 1997).

The Berger-Parker dominance index (*d*) was used to determine indigenous woody plants species dominance using the formula:

$d = Dmax/N$

Where:

d = Berger-Parker dominance,

Dmax = Abundance of the most dominant species,

N = Total number of individuals of all the species inventoried (Magurran, 2004).

Diversity of IWPs was computed using Shannon-Weiner diversity index (H') represented by:

$H' = -\sum pi \ln pi$

Where:

H' = Shannon's diversity index,

pi = The proportion of individuals / abundance of the species expressed as a proportion of the total sample (ni/N),

ln = The natural logarithm of pi (Magurran, 2004).

The stand density of mature trees, saplings and seedlings as the number of stems per hectare was calculated by counting the number and dividing it by total area of plot respectively.

Stand density was computed as $D = S / A$

Where :

D = number of stems per hectare,

S = the number of stems , and

A = the total area sampled (Turyahabwe, 2006).

The values of stand density were calculated for the size classes in each IDP camp. The total number of IWPs enumerated in the sample plots were used to show stand density, abundance and presented in graphs (Turyahabwe, 2006).

The stem diameter size-class distributions (DSCD) of the IWPs species were calculated and the proportion of each size class determined. The DSCD were analysed using the method proposed by Condit *et al.* (1998) and Lykke (1998) and used by Obiri *et al.* (2004), McLaren *et al.* (2005), and Mwavu & Witkowski (2009).

For the analysis, stem diameter size-classes were defined so that they accommodate more individuals with increasing size (Lykke, 1998). This balances the samples across diameter size classes, because the number of individuals generally declines with increasing diameter stem size (Condit *et al.,* 1998). In this regard, the inventory data were tallied into the following stem diameter size-classes 0 - ≤5, 5-14, 15-24, 25-44, 45-64 and 65+ cm (Lykke, 1998; Mwavu & Witkowski, 2009). The diameter class- sizes for IWPs was analyzed using MS Excel following Brower *et al.* (1997).

One way Analysis of Variance (ANOVA) ($p = 0.05$) was used to show whether there was a variation in size classes and diversity with respect to distance from the camps (Boffa, 1999; Okullo, 2004; Turyahbwe *et al.*, 2008).

CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics of the respondents

More than half of the respondents were females. The age of respondents ranged between 15 and 40 years with about 37% of them being over 40 years. Over 70% of the respondents were married and 48% had an average of five dependants in a household. About 48% of the respondents had attained primary education and 88% reported farming as their main occupation. Other economic activities that the respondents were engaged in included charcoal/firewood selling, stone quarrying, carpentry and brick making (Table 4).

Table 4: Socio- demographic profiles of the respondents for IDP camps in Pader district (N=160)

Variable	% of respondents
Sex	
Male	44.4
Female	55.6
Age	
Below 20 years	14.4
20-40	48.7
40+	36.9
Marital status	
Married	75.0
Never married	07.5
Divorced	02.5
Widowed	15.0
Number of dependants	
None	06.2
1-5	47.6
6-10	41.2
10+	05.0
Education level	
None	28.8
Primary	48.1
Secondary	21.2
Tertiary	01.9
Major occupation	
Farmer	88.1
Trader/Business	04.4
Formal employment	03.8
Others (sand quarry, charcoal dealer, firewood dealer)	03.7

4.2 Utilisation and conservation strategies of indigenous woody plant species in and around IDP camps in Pader district

4.2.1 Utilisation and preferences of IWPs in and around IDP camps

A total of 35 woody plants species were mentioned by respondents from the 4 IDP camps as commonly used IWPs (Table 5). *Vitellaria paradoxa* was mostly used for oil followed by charcoal as mentioned by 91% and 44% of the respondents respectively. Other species commonly utilised for charcoal were *Combretum molle*, *Piliostigma thonningii, Terminalia macroptera* and *Combretum collinum* reported by 85%, 81%, 70% and 63% of the respondents respectively.

The most utilized species for fruits were *Oxytenanthera abyssinica*, *Saba comorensis, Tamarindus indica, Vitex doniana* and *Carissa edulis* as mentioned by 100%, 100%, 86%, 42% and 40% of the respondents respectively. The most commonly used species for timber were *Syzygium guineense*, *Tetrapleura tetraptera*, *Ficus ovata* and *Manilkara schwinfurthii* (Table 5). The major uses of the indigenous woody plants were for firewood and building poles reported by about 91% and 76% of the respondents respectively (Table 6).

The ten most preferred IWPs in and around IDP camps were *Vitellaria paradoxa*, *Lonchocarpus laxiflorus*, *Ziziphus abyssinica*, *Pseudocedrela kotschyi*, *Combretum collinum*, *Khaya grandifoliola, Grewia mollis*, *Tamarindus indica, Afzelia africana* and *Flueggea virosa* for their various uses. *Vitellaria paradoxa* was ranked top most across the four IDP camps (Table 7).

4.2.2 Conservation strategies for indigenous woody plants in and around IDP camps

About 76% of the respondents reported that they conserve indigenous woody plants through implementing cultural laws. Other strategies used in conservation of woody plants included spot weeding of indigenous trees, retention of indigenous trees in the field when opening up farmland and fire risks reduction by early burning of woodland (Table 8).

Table 5: Commonly utilized indigenous trees in and around IDP camps, Pader district (N=160)

Scientific name	Local name	Uses										
		Tim	Fw	Ch	Med	Fr	Oil	Cul	Env	Bp	Cr	Bee
Vitellaria paradoxa C.F. Gaernt	Yaa	4	2	44	3	24	91	1	2	-	-	-
Terminalia macroptera	Opok	2	12	70	4	-	-	-	-	7	2	-
Combretum collinum	Oduku	-	44	63	7	-	-	11	1	4	-	-
Piliostigma thonningii	Ogali	-	25	81	13	-	-	-	-	-	-	-
Combretum molle	Ooro	-	15	85	-	-	-	-	-	-	-	-
Tamarindus indica	Cwa	-	14	14	29	86	-	43	-	-	-	-
Combretum schumanii	Anwanga	-	14	86	-	-	-	-	-	-	-	-
Albizia grandibracteata	Owak	-	-	100	-	-	-	-	-	-	-	-
Prosopis africana	Kijing	14	-	71	14	-	-	-	-	-	-	-
Acacia seyal	Oryang	-	-	100	-	-	-	-	-	-	-	-
Ziziphus abyssinica	Olango	-	-	100	-	-	-	-	-	-	-	-
Grewia mollis	Pobo	-	38	31	6	6	-	6	-	-	-	-
Oxytenanthera abyssinica	Koo	-	-	-	-	100	-	-	-	-	-	-
Pseudocedrela kotschyi	Oput	42	-	12	9	-	-	12	-	-	24	-
Ficus ovata	Ebule	100	-	-	-	-	-	-	-	-	-	-
Carissa edulis	Acuga	-	-	-	40	40	-	20	-	-	-	-
Vitex doniana	Oywelo	31	4	4	15	42	-	-	4	-	-	-
Bredelia scleroneura	Larwece	-	67	33	-	-	-	-	-	-	-	-
Afzelia africana	Beyo	79	7	-	-	-	-	7	7	-	-	-
Lonchocarpus laxiflorus	Olwedo	-	11	7	4	-	-	74	-	4	-	-
Maytenus senegalensis (Lam.) Ex.	Akakado	-	25	50	-	-	-	-	-	25	-	-
Khaya grandifoliola	Tido	69	3	2	21	-	-	2	2	-	2	-
Stereospermun kunthianum	Opolok	3	33	14	5	-	-	-	3	-	-	5
Ziziphus abyssinica	Okango	-	67	-	-	-	-	33	-	-	-	-
Annona senegalensis	Ovolo	20	20	-	20	40	-	-	-	-	-	-
Sclerocarya birrea	Olimu	-	33	-	33	33	-	-	-	-	-	-
Flueggea virosa. Voigt.	Oree	-	-	-	-	-	-	50	-	50	-	-
Albizia coriaria	Latoligo	-	-	100	-	-	-	-	-	-	-	-
Tetrapleura tetraptera	Itek	100	-	-	-	-	-	-	-	-	-	-
Saba comorensis (Boj.) Pichon	Kwomo	-	-	-	-	100	-	-	-	-	-	-
Teclea nobilis	Acaco	50	50	-	-	-	-	-	-	-	-	-
Lophira alata	Oteng	-	-	100	-	-	-	-	-	-	-	-
Manilkara schwinfurthii. J.H.Hemsl.	Ikula	100	-	-	-	-	-	-	-	-	-	-
Syzygium guineense	Kano	100	-	-	-	-	-	-	-	-	-	-

Tim=Timber; Fw= Firewood; Ch= Charcoal; Med= Medicine; Fr= Fruit; Oil= Oil; Cul= Cultural,Env=Environmental value, Bp=building poles; Cr=Crafts, Bee=Bee keeping. Numbers in the columns are % of responses.

Table 6: The major uses of indigenous woody plants in IDP camps (N=160)

Uses	% of respondents
Firewood	91.2
Building poles	76.2
Charcoal	63.8
Food/Fruits	61.9
Oil	59.4
Medicine	47.5
Environmental values	27.5
Cultural practices (re-concilliation, sacrifices and child birth)	20.6

Table 7: Most preferred indigenous woody plants in and around IDP camps, Pader district

Local name	Scientific name	Scoring by IDP camp (10 points)				Total Score	Mean +S.E	Rank
		Lakoga	Alyek	Kilak	Patongo			
Yaa	*Vitellaria paradoxa* C.F Gaertn.	10	10	10	10	40	10.0±0.0	1
Olwedo	*Lonchocarpus laxiflorus* Guill&Perr	9	9	9	8	35	8.8±0.3	2
Okango	*Ziziphus abyssinica*	7	4	7	9	27	6.8±1.0	3
Oput	*Pseudocedrela kotschyi* Schweinf.	8	5	3	7	23	5.8±1.1	4
Oduku	*Combretum collinum* Fresen	3	7	2	3	15	3.8±1.1	5
Tido	*Khaya grandifoliola*C. DC.	5	1	8	0	14	3.5±1.9	6
Pobo	*Grewia mollis*Juss	0	8	0	6	14	3.5±2.1	7
Cwa	*Tamarindus indica*L.	6	0	5	0	11	2.8±1.6	8
Beyo	*Afzelia Africana* Persoon	4	0	6	0	10	2.5±1.5	9
Oree	*Flueggea virosa* Voigt.	0	6	0	0	6	1.5±1.5	10

Table 8: Strategies for conserving indigenous woody plants in and around IDP camps (N=160)

Strategies	% of respondents
Use of cultural laws (e.g. protection of preferred tree species, fines)	75.6
Spot weeding of indigenous trees	11.2
Retention of trees in farmland	10.6
Fire risks reduction by early burning of grass	07.5
Tree planting	06.2

a. Reasons for conservation of indigenous woody plants in and around IDP camps

About 72% of the respondents reported that they conserved IWPs in and around IDP camps as sources of products such as timber, firewood, fruits and medicine. Other reasons for conserving indigenous trees were for environmental protection, cultural values and income generation (Table 9).

Table 9: The reasons for conserving IWPs in and around IDP camps in Pader district (N=160)

Reason(s)	% of respondents
Source of multiple products (timber, firewood, fruits, medicine)	71.9
Environmental values (soil conservation, rainfall formation, wind brake)	66.2
Cultural values	10.6
Income generation	09.4

b. Challenges to conservation of indigenous tree species in and around IDP camps

The main challenges to conservation of IWPs were lack of tree seedlings, lack of field extension services and inadequate individual land reported by 64%, 48% and 40% of the respondents respectively (Table 10). The reported measures instituted to overcome these challenges were community sensitization, provision of tree seedlings and provision of income generating activities (Table 10).

Table 10: Challenges to conservation of indigenous woody plants in and around IDP camps in Pader District (N=160)

Challenges	% of respondents
Lack of tree seedlings	64.0
Lack of field extension services and technical support	48.0
Inadequate individual land	40.0
Lack of knowledge on economic values of indigenous trees	27.0
Longer rotation period of trees	17.0
Cultural factors	05.0
Preference of crops to trees	02.0
Measures to overcome challenges	
Community sensitization	80.0
Provision of tree seedlings and tree planting	41.0
Provision of income generating activities (e.g. apiary, poultry keeping and carpentry)	18.0
Enforcement of environmental laws /bye laws on tree planting	13.0

4.2.3 Influence of socio-demographic characteristics of respondents on utilization of indigenous woody plants in and around the IDP camps

Household size, sex and educational level of the respondents significantly influenced ($P \leq 0.05$) use of indigenous woody plants for firewood within IDPs. Educational level and age of the respondents also significantly influenced ($P \leq 0.05$) the use of IWPs fo r medicine and fruits respectively (Table 11).

4.3 Abundance, dominance, diversity and density of indigenous woody plants in and around IDP camps, Pader district

4.3.1 Abundance of saplings of IWPs in and around IDP camps

The most abundant IWP species in the saplings (dbh > 2 – ≤10cm) were *Terminalia macroptera, Annona senegalensis*, *Combretum collinum* and *Grewia mollis*. Overall, *Terminalia macroptera* was the most abundant (Figure 3a). Nearer to the IDP camps (0-1 km), the most abundant species were *Annona senegalensis* (19 saplings Ha^{-1}*)*, *Combretum collinum* (18 saplings Ha^{-1}), *Bredelia scleroneura* (16 saplings Ha^{-1}), *Terminalia macroptera* (13 saplings Ha^{-1}), *Vitex doniana* (13 saplings Ha^{-1}) and the least abundant species was *Khaya senegalensis* (1 sapling Ha^{-1}).

Table 11: Logistic regression analysis for the influence of socio-demographic factors of respondents on the use of indigenous woody plants in and around the IDP camps, Pader district

Independent Variable	Dependent variable (use)					
	Value	**Yes**	**No**	**Odds Ratio**	**p>|Z|**	**95% C.I**
					Firewood	
Sex	Male	61	10	1.000		
	Female	85	4	3.483	0.042*	1.044 - 11.627
Household size	None	7	3	1.000		
	1-5	69	7	4.224	0.070^{ns}	0.888 – 20.104
	6-10	63	3	9.000	0.016*	1.517 – 53.404
	10+	7	1	3.000	0.388ns	0.248 – 36.325
Education level	None	44	1	1.000		
	Primary	72	5	0.655	0.621^{ns}	0.121 – 3.520
	Secondary and above	30	7	0.195	0.050*	0.038 – 1.003
					Medicine	
Household size	None	3	7	1.000		
	1-5	34	42	1.889	0.382^{ns}	0.454 – 7.862
	6-10	33	33	2.333	0.247^{ns}	0.555 – 9.809
	10+	6	2	7.000	0.069^{ns}	0.861 – 56.895
Education level	None	29	17	1.000		
	Primary	33	44	0.440	0.032*	0.208 – 0.931
	Secondary and above	14	23	0.357	0.024*	0.146 – 0.873
					Fruits	
Age group	10 -18	1	5	1.000		
	19 - 30	33	21	7.857	0.068^{ns}	0.857 – 72.027
	31- 40	32	9	17.778	0.013*	1.835 – 172.216
	40+	33	26	6.346	0.101^{ns}	0.698 – 57.715

*significant (P≤0.05), ns= not significant (P>0.05)

Further away (>1-2 km) from the centre of the IDP camp, the most abundant tree species were *Terminalia macroptera* (31 saplings Ha^{-1}), *Annona senegalensis* (27 saplings Ha^{-1}), *Combretum collinum* (24 saplings Ha^{-1}), *Grewia mollis* (18 saplings Ha^{-1}) with *Vitellaria paradoxa* (1 sapling Ha^{-1}) being the least abundant (Figure 3a).

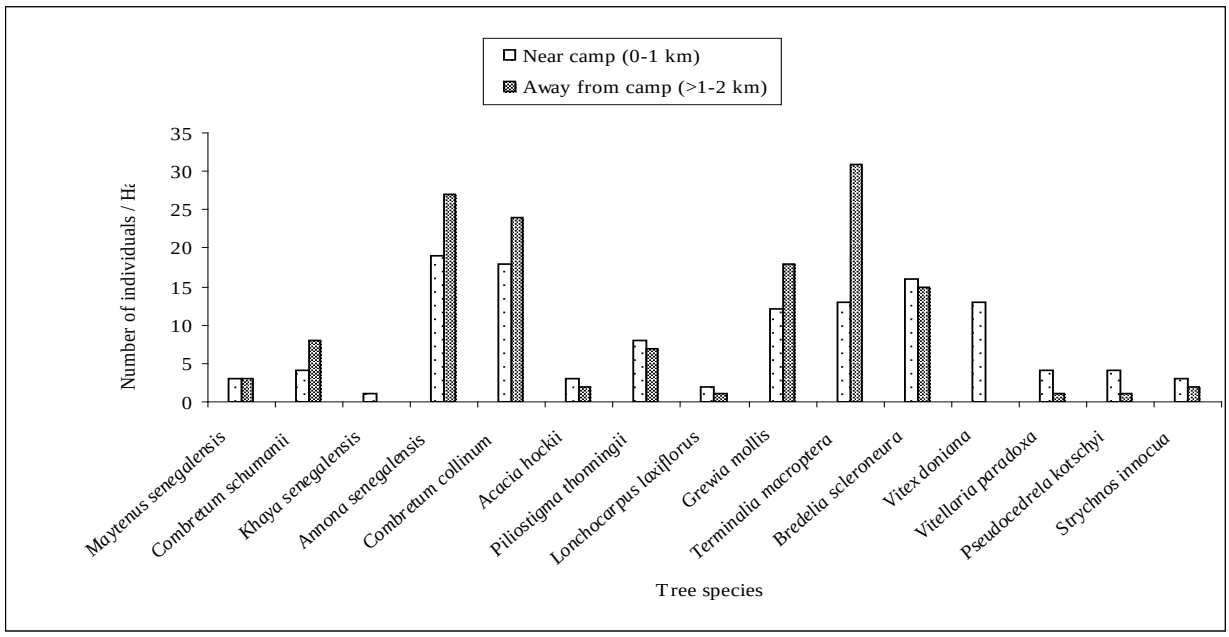


Figure 3a: Abundance of saplings (dbh > 2 ≤ 10 cm) in and around IDP camps in Pader district

4.3.2 Abundance of mature IWPs in and around IDP camps

The most abundant species in the mature tree size class (dbh > 10cm) near the camps (0-1 km) were *V. paradoxa* (3 trees Ha^{-1}), *Terminalia macroptera* (2 trees Ha^{-1}) and *Piliostigma thonningii* (2 trees Ha^{-1}). After one kilometer from the camp centre the most abundant trees were *Vitellaria paradoxa* (6 trees Ha^{-1}), *Terminalia macroptera* (5 trees Ha^{-1}), *Grewia mollis* and *Combretum collinum* (2 trees Ha^{-1}) respectively (Figure 3b).

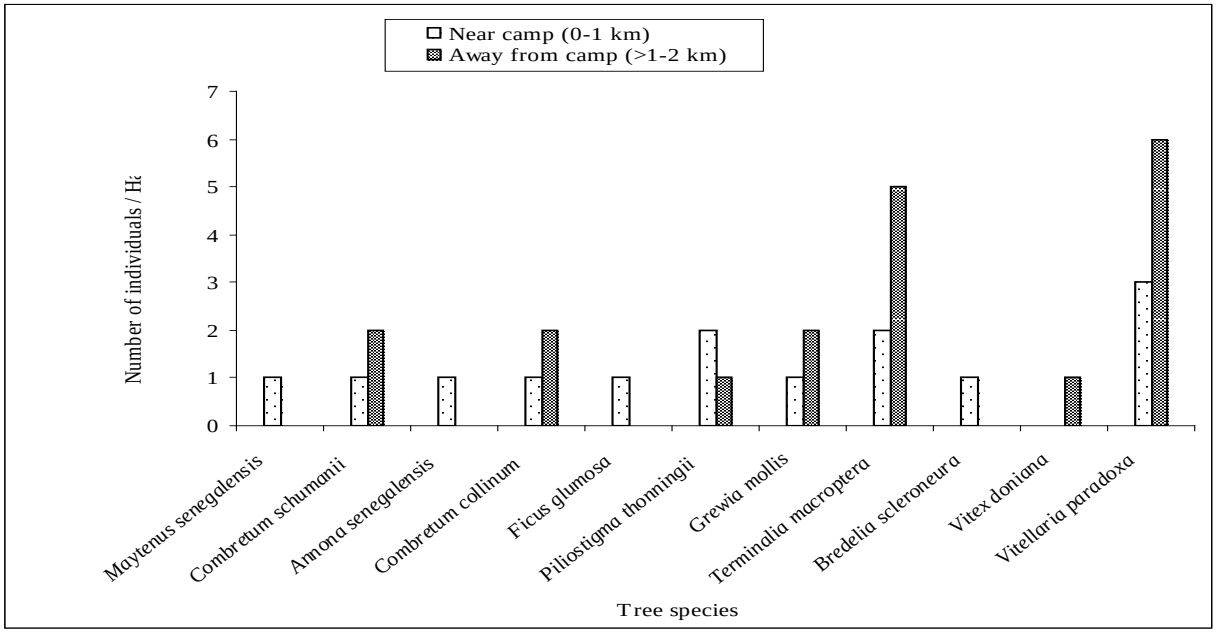


Figure 3b: Abundance of mature trees (dbh > 10 cm) in and around IDP camps in Pader district

4.3.3 Dominance of IWPs in and around IDP camps

The most dominant IWP species nearer (0-1 km) and away (>1-2 km) from the IDP camps were *Terminalia macroptera* (*d*= 0.113), *Vitex doniana* (*d*= 0.128), *Annona senegalensis* (*d*= 0.269) and *Combretum collinum* (*d*= 0.500) in Alyek, Kilak, Lakoga and Patongo, respectively. After a distance of one kilometre from the IDP camp, the dominant IWP species changed only in Kilak and Patongo to *Grewia mollis* and *Combretum schumanii* with *d*= 0.206 and *d*=0.913 respectively (Figure 4).

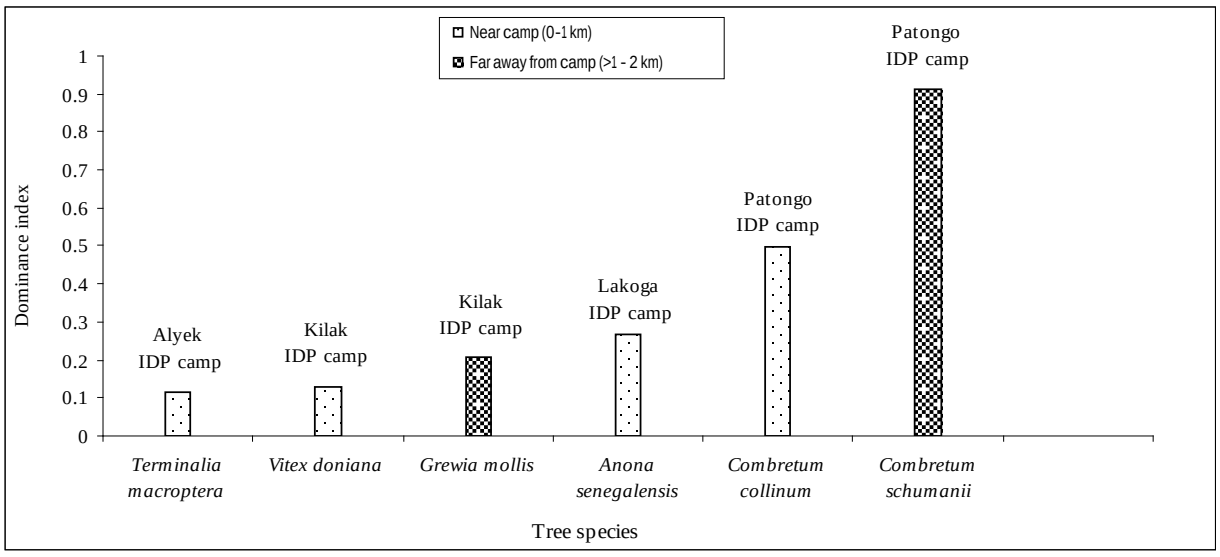


Figure 4: Dominance of IWPs in and around various IDP camps, Pader district

4.3.4 Diversity of IWPs in and around IDP camps

Diversity of indigenous woody plants was generally higher near IDP camps (0-1 km) than in far away plots (1-2 km) from camp centre, except in Patongo. The highest indigenous woody plant diversity (H'= 3.09) was in Alyek while the least (H'=1.693) was in Patongo IDP camps. Analyses of the far away plots (>1-2 km) of each transect indicated indigenous woody plants diversity to be decreasing from Kilak, Lakoga, Alyek to Patongo IDP camps (Table 12).

Table 12: Shannon - Weiner species diversity indices and variation in diversity of IWP with distance from the camp

IDP camp	Shannon's Diversity Index (H')= -∑(pi*lnpi)		F-Value	P-Value	Significance at 5%
	Near camp (0-1 km)	Far away from camp (>1-2 km)			
Alyek	3.09	2.45	3.23	0.08	ns
Kilak	2.97	2.70	3.89	0.05	*
Lakoga	2.63	2.51	0.33	0.57	ns
Patongo	1.69	2.33	1.70	0.21	ns

* significant (P≤ 0.05); ns = not significant (P> 0.05)

One way ANOVA showed that there was a significant difference (($F_{1, 1173}$; p = 0.05) in the diversity of IWPs with increase in distance from the camp centre only in Kilak IDP camp (Table 12; Appendix IX a).

4.3.5 Size class distribution and density of IWPs in and around IDP camps

The composition of tree population generally showed a decreasing number of stems / ha as the tree size increased. In all the 4 IDP camps, the small size classes (dbh≤2 cm - ≤ 5 cm) had the highest number of stems / ha (Figure 5). The density of seedlings and saplings (dbh≤2 cm - ≤ 5 cm) was generally lower nearer IDP camps and higher in plots far away from IDP camp (Figure 5). The individual tree stems in all the 4 IDP camps studied occurred in smaller size classes (dbh ≤2 cm - ≤ 14 cm) while larger size trees (dbh > 65 cm) had the least stems/ha in all the 4 IDP camps studied except in Lakoga and Patongo. There was, however, a sharp decline in the number of trees from saplings / pole size class to mature tree size class (Figure 6 a-d). The size class distribution of all the tree species (dbh≤2 cm - > 10 cm) in all the 4 IDP camps are summarized in Figures 5 and 6 (a-d).

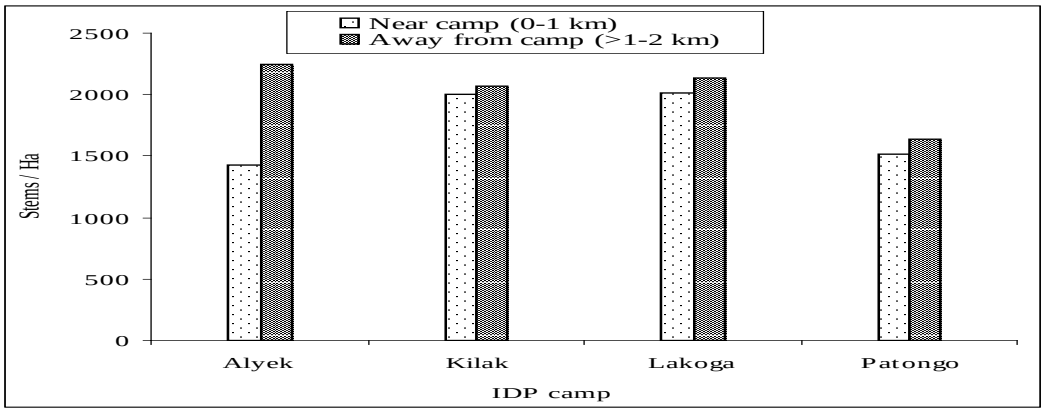
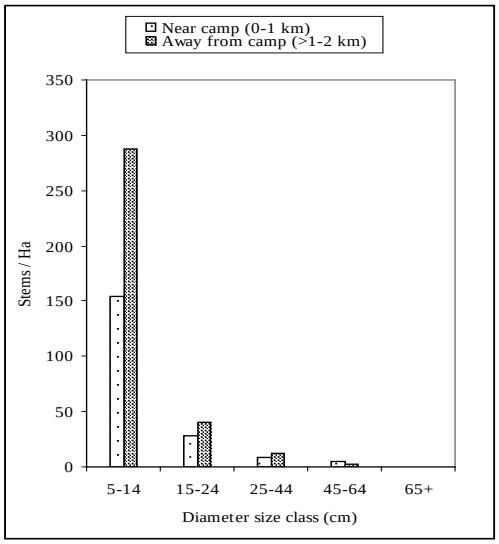
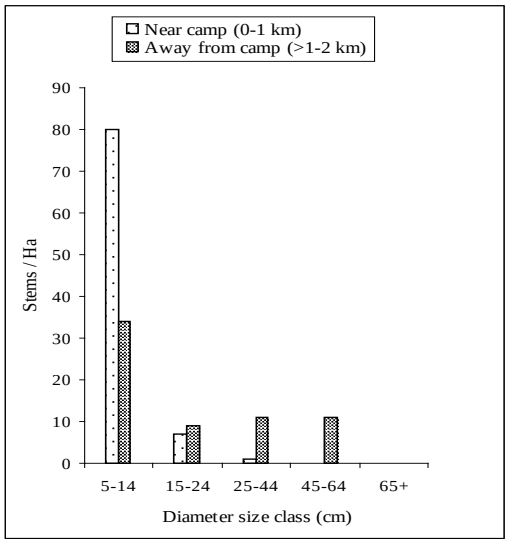


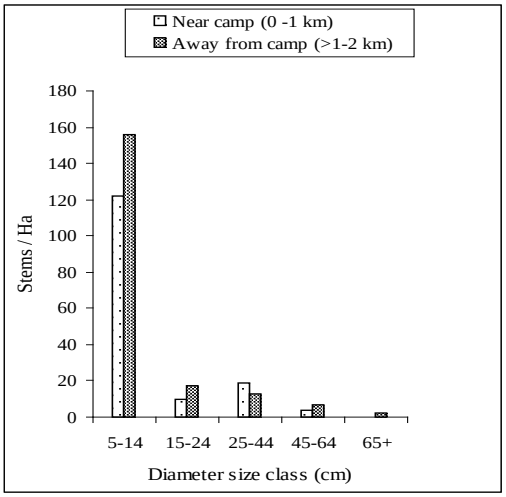
Figure 5: Size class (≤ 5cm) distribution and density of IWPs near and away from camp



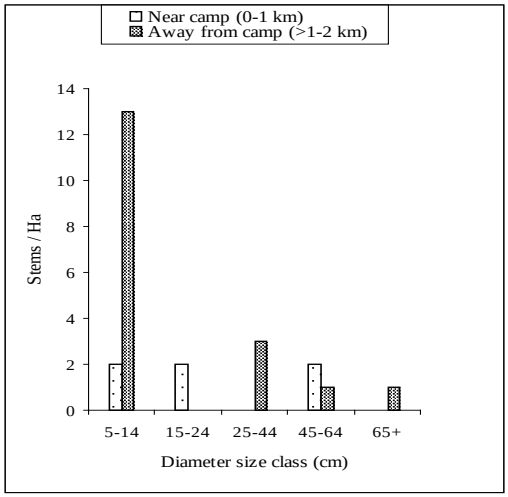
a) Alyek IDP camp



b) Kilak IDP camp



c) Lakoga IDP camp



d) Patongo IDP camp

Figure 6 (a-d): Size class distribution (≥5cm) of IWPs near and far way from IDP camps

One way ANOVA (Appendix IX b) showed that there was significant difference ($P \leq 0.05$) in size class distribution with distance from the IDP camp centre in Lakoga ($F_{1, 374}$; $p = 0.01$) and Patongo ($F_{1, 142}$; $p = 0.03$).

4.4 Institutions and their interventions to conserve indigenous woody plants during armed conflict in Pader district

4.4.1 Documentation of institutions with interests in environmental conservation

There were 39 institutions documented to have intervened during and in post conflict period, implementing various activities. The reported areas of interventions by institutions during and in post conflict periods were supply of non food items, food relief, education and medical care (Table 13). The main players in environmental conservation were World Food Programme (WFP) and Friends of Orphans (Table 13).

Table 13: Institutions with their interventions during and in post conflict period in Pader district

Category of intervention	Institution(s) involved	% of institutions involved
Supply of non food items (NFIs)	Save the Children, CARITAS, World Vision, WORUDET, ZOA, URCS, AVSI, COOPI, IOM, CARE, War Child Holland, War Child Canada, ASB Return Monitoring, FH, Mercy Corps, CESVI	41.0
Supply of food relief	WFP, World Vision, CARITAS, AVSI, CARITAS, URCS, Save the Children, War Child UK, Concern, CARE	25.0
Education	Save the Children, War Child Canada, Friends of Orphans, AVSI, CCF Pader, War Child Holland, ASB, OVC Network Patongo, War Child UK	23.0
Conflict resolution	ARLPI, WORUDET, HIDO, WOSO, YSA, HAP, LICHI	17.9
Medicare	WHO, Medical Teams, AMREF, PSI(PACE), MedAir, ASB Sanitation	15.4
Agriculture/ Food security	AUPWAE, AT-Uganda, WFP, World Vision, FH	12.8
Water and Sanitation	Concern, ASB Spring, Mercy Corps, COOPI	10.2
Environmental conservation	WFP, Friends of Orphans	05.3
Income Generating Activities(IGAs)	BRAC, CCF Pader	05.3

4.4.2 Activities implemented by NGOs to community in and around IDP camps

The main activities implemented by NGOs at the community level in IDP camps during armed conflicts were supply of food relief, water and sanitation construction and supply of non food items reported by 68%, 32% and 17% of the respondents respectively (Table 14). The major activities by NGOs in the post conflict period were resettlement of IDPs and agriculture (food security) reported by 66% and 58% of the respondents respectively (Table 14).

The major challenges faced by humanitarian agencies during their interventions in IDP camps were duplication of activities among NGOs, poor road network and poor data management on IDPs reported by 66%, 64%, and 43% of the respondents respectively (Table 14). Other reported challenges were neglect of duties among local leaders, high level of poverty and poor reporting by partners.

Table 14: Institutional community activities during and in post conflict periods, Pader district (N=160)

Interventions	**% of respondents**
During armed conflict	
Supply of food relief	67.5
Water and sanitation	31.9
Supply of NFIs	16.9
Education	12.5
Medicare	11.2
Agriculture (Food security)	04.4
Conflict resolution	03.8
Environmental conservation	03.8
During post conflict period	
Resettlement of IDPs	66.2
Agriculture (Food security)	58.1
IGAs	11.9
Tree planting	03.1
Environmental education	01.9
Challenges faced by NGOs in their interventions	
Duplication of activities	66.2
Poor road network	63.8
Poor data management on IDPs in camps	43.1
Nepotism by local leaders	38.8

The income generating activities implemented in the post conflict period were livestock restocking and fruit tree planting reported by 67% and 30% of the respondents respectively (Table 15).

Table 15: Income generating activities implemented by NGOs during post conflict period in Pader district (N=160)

Income generating activities	% of respondents
Livestock restocking	66.9
Fruit tree planting	30.0
Vocational training	11.9
Bee keeping	08.1
Bakeries	05.0
Fish farming	03.1

4.5 Policy and legal interventions related to conservation of indigenous woody plants in and around the IDP camps

4.5.1 Policy issues on IWPs

The respondents' perception on existence of environment policies and laws, IDP policy and NGO policy and their effectiveness to conserve IWPs in resettlement camps was sought. In spite of the existence of environmental policies, laws, ordinances and bye-laws to conserve environment and natural resources, about 85% of respondents were aware of the existence of the national conservation laws while 87.5% said it was ineffective in conservation of environment and natural resources (Table 16).

The main reason for lack of effectiveness of conservation policies and laws was weak enforcement of available laws as reported by about 71% of the respondents (Table 16). The strategies recommended for strengthening of conservation laws were community sensitization and effective enforcement of available ENR laws on conservation of natural resources reported by 66% and 28% of the respondents respectively (Table 16).

At the community level the main actors reported in the formulation of cultural laws and bye-laws on conservation of indigenous woody plants were cultural leaders, opinion leaders and local community reported by 53%, 32% and 19% of the respondents respectively (Table 16). The main actors in the policy formulation at the national level were Ministries of Water and Environment, Relief and Disaster Preparedness, and Internal Affairs.

Table 16: Respondents' opinion on environment and natural resources conservation policies and laws (N=160)

Opinion	% of respondents
Community awareness on existence of environmental conservation policy and laws	
Yes	85.0
Not aware	15.0
Are national conservation policies and laws effective?	
No	87.5
Yes	06.9
Not sure	05.6
Reasons for ineffectiveness of national conservation policies and laws	
Weak enforcement of available laws	71.2
Lack of knowledge about the policy / law	28.8
Lack of stakeholder consultation in policy formulation	10.6
Main actors in formulation of cultural laws	
Cultural leaders	52.5
Opinion leaders	31.9
Local community	19.4
Councilors	10.6
Constraints faced by local government in implementing policies and laws for conservation of IWPs	
Lack of community sensitization	55.6
Poverty	32.5
Inadequate environment field staff	13.1
Poor community attitude on conservation	06.2
Recommendation on ENR conservation policy /laws	
Community sensitization on ENR policies and laws	66.2
Effective enforcement of available ENR laws and cultural laws	27.5
Legitimization of cultural laws on ENR conservation	20.0
Translation of available ENR laws into local language	08.1
Involvement of stakeholders in ENR policy and law formulation	04.4

CHAPTER FIVE: DISCUSSION

5.1 Utilization and conservation strategies for indigenous woody plants in and around IDP camps

5.1.1 Most preferred and utilized indigenous woody plants in and around IDP camps

The finding shows *Vitellaria paradoxa* as the most preferred and highly valued indigenous woody plant species in all the 4 IDP camps. This is partly due to its shea butter, commonly used by local community. Other tree species such as *Combretum collinum, Khaya grandifoliola* were preferred for their peculiar characteristics such as high heat content for fuelwood and good quality for timber. This finding is supported by Okullo *et al.* (2010), who reported that *Vitalleria paradoxa* was the most preferred indigenous tree for its nuts/seeds processed into shea oil that constitutes an important source of fat.

A study by Yikii *et al.* (2006) also noted *Combretum collinum* as the most preferred tree species for fuelwood by tobacco farmers in West Nile due to its low combustion rate and high heat content. The consequence of high preference of a particular indigenous tree species with respect to others is that there may be a reduction in the abundance and availability of the highly sought after species as revealed by result of this study. As noted by Redford (1992) continuous harvesting of preferred indigenous trees in woodlands may lead to the highly sought species failing to sustain the increasing harvesting pressure, leading to loss of such tree species.

5.1.2 The conservation strategies for indigenous woody plants in and around IDP camps

The most common and effective strategies of conserving indigenous trees in the study area were cultural ban on tree felling, local bye-laws, spot weeding of indigenous trees and retention of trees on farmland. This could partly be due to fear of taboos and fines associated with some culturally revered indigenous trees. The communities could have also been familiar with the indigenous conservation knowledge in protecting ecological integrity of the woodland. These strategies have also been reported by Obua (2002) who pointed out that shea and other valuable indigenous trees on farm are conserved through sparing during cultivation and weeding around the seedling / tree to prevent fire from burning it.

A study by Tabuti *et al.* (2009) noted that community members in eastern Uganda are also actively involved in conserving those tree resources with economic value on-farms through field retention during cultivation and spot weeding around seedlings/saplings. The finding is

further supported by FAO (2002) that species retention is the most common strategy for conserving on-farm tree species. In Pader district, farmers do not cut all trees at the time of land clearing for agricultural production. They usually retain highly valued indigenous trees such as *Vitellaria paradoxa* in the crop fields (Plate 1). There is good potential in conserving indigenous trees through applying these strategies.

Plate 1: Traditional conservation practice of field retention of IWPs (*V. paradoxa*) in crop field, Kilak Sub-County, Pader district

Even if highly valued for its various products, *Vitellaria paradoxa* is rarely planted by farmers. The findings revealed that *V. paradoxa* and other preferred indigenous trees were conserved by community by allowing them to naturally regenerate through coppicing and seedlings. However, Gary (2004) noted that recent increase in the knowledge on value of *Vitellaria paradoxa* and demands for its products, have increased the need to conserve and utilize the shea resources in a sustainable and economically beneficial manner. Although the input of farmers' knowledge in selecting priority IWP species, domesticating them and evaluating their

market values is still limited (Kadzere *et al.*, 1998), farmers' willingness to integrate indigenous trees on-farm is usually based on farmers' preferences such as fast growth, less shading to crops and quick adaptability to particular agro-ecological zones (ICRAF, 2003). The implication of this is that the conservation of IWPs is given less attention thereby leading to loss of commonly harvested tree species (NEMA, 2001).

According to Obua (2002), local beliefs and culture can help to protect indigenous woody plants from unnecessary cutting. For example, taboos and bye laws that forbid cutting of trees have played a great role in determining which tree species to conserve in northern Uganda. For instance, *Lonchocarpus laxiflorus* conserved as a key IWP for cultural practice is reportedly used by elders to dispel bad omen and bring good blessing in homes. Shea butter oil is also customarily used 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 culturally revered trees.

For example, a fine of a goat or a cow would normally be charged and paid to the owner whose shea tree has been cut (Obua, 2002). In certain cases, the decision to conserve or plant a certain tree species has also been dictated by the myths and beliefs of the community about such species (NEMA, 2008). Hence, use of cultural laws and enforcement of local bye-laws alongside national conservation laws (Lovett and Wasser, 1999) has played significant role in promoting conservation of highly preferred indigenous tree species.

As reported by Madrama (2006) the needs and interest of the local population should be taken into consideration as a strategy in conservation of IWPs and the protection of indigenous trees resources should be based on defined actions for sustainable woodland management including indicators for monitoring and follow up. This is so because where products from IWPs can be substituted by cultivated crops or items purchased from the market, farmers may be less motivated to conserve woodlands (Boffa, 1999). A case in point is the substitution of shea trees with crops such as sunflower and groundnuts for their oils favoured by some groups for their preferred taste, less variable annual yields and relative ease of processing.

5.1.3 Influence of socio-demographic factors on use and conservation of IWPs in and around IDP camps

Socio-demographic characteristics are of great importance in monitoring abundance and population structure of IWPs. The finding reveals sex, household size, education level and age

to affect use and conservation of indigenous woody plants in and around IDP camps. In particular sex, household size and educational level were the main socio-demographic factors affecting use of IWPs for firewood. Studies by Obua *et al*. (2010) and Agea *et al.* (2010b) have also shown some of these socio-demographic factors to have significant influence on people's attitude and perception towards use of indigenous tree resources.

In the study IDP camps, the major use of IWPs was for fuel wood. This could have been due to lack of alternative source of fuel for cooking. As reported by WRC (2012), the collection, supply and use of firewood and alternative energies in homesteads and humanitarian settings have been associated with women and young girls. Since the women in IDP camps were normally supplied with rations of beans, soya, rice and posho, the fuel wood for cooking would be harvested by women from nearby vegetation. Such harvesting would be in addition to the demands of the original residents of such area. This study revealed women had a significant influence on the use of IWPs for fuelwood in and around IDP camps in Pader district. The implication of this is that the consumption of trees in form of firewood would be increased thereby making overexploitation of IWPs to result in loss of biodiversity, especially rarity of commonly harvested species (NEMA, 2001).

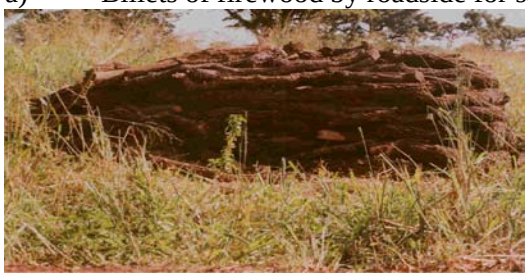
As insecurity had forced most respondents to live in IDP camps, the majority had attained only primary education which could probably be a pointer to high level of secondary school dropout and poverty. The displacement of the community into IDP camps for about 20 years in the study area left many school drop outs without any trained skills. They thus ended up having high dependency on hand outs (from humanitarian organizations) and low regards for conservation activities. The lack of education and the resulting economic hopelessness felt by many young people in conflict-affected areas became a hidden crisis that could not make them appreciate environmental conservation values (Shambaugh *et al.*, 2001).

This, coupled with peasantry as the main occupation, poses a major threat to conservation. According to Vanwing and Hens (2010), most people who attain formal education have got higher chances of becoming environmentally aware and can make decisions that enhance sustainability of woodlands. In essence, the educated parents are more likely to influence the perceptions of their children on issues about sound environmental management. This makes the children more sensitive and responsible with regards to conservation of natural resources and management of the environment.

In the case of the study area where the number of respondents with no formal education is high, the chances of positively influencing the young generation with better environmental management knowledge may also be low. The end result would imply having the generation with low regard for conservation and management of natural resources. However, in the study area, even the highly educated respondents had a significant influence on use of IWPs for firewood. This could be due to heavy dependence by IDPs on IWPs as the only source of fuel for cooking in a camp situation.

The major occupation of the respondents in the IDP camps was farming. Various theories regarding the influence of household's level of occupation and income have been advanced. For example, Mudekwe (2005) argued that the occupation of households and their sources of income are closely linked to the nature of the energy used. In the case of the study area where most of the population is involved in subsistence farming for livelihood support, many trees can be lost as more land is cleared for farming. A study by Twine (2005) also noted farming and related land use demand led to overexploitation of indigenous woody plants. Low income levels also imply heavy reliance on wood as the main source of energy and income that subsequently leads to degradation of the forests (MEMD, 2006) (Plate 2a-c).

a) Billets of firewood by roadside for sale by IDPs in Lakoga IDP camp



b) Pile of *V. paradoxa* for charcoal production by IDPs in Kilak IDP camp

c) Bags of charcoal at roadside for sale by IDPs in Kilak IDP camp

Plate 2: Impacts of IDPs on use of indigenous woody plants in and around IDP camps, Pader district

However, where households have access to formal employment, often such people can afford alternative sources of energy such as electricity, solar and gas as well as meet their livelihood needs from salaries (Mudekwe, 2005; MEMD, 2006), hence reducing overdependence on woodlands.

The high household size in the IDP camps whereby the respondents (91%) directly depended on firewood as the main energy for cooking could make a significant contribution to overexploitation of woodland resources for wood products and more demand of land for cultivation (UBOS, 2008). This may be another factor that further affects the status of fuelwood species in and around IDP camps. Eventually, this leads to the deforestation and / or degradation of the woodlands hence diminishing its capacity to provide fuelwood and other services to future generations.

In a related study, Vanwing and Hens (2010) reported that family size is positively associated with environmental degradation. This finding is also supported by Agea *et al.* (2010a) who reported a strong positive correlation ($R^2 = 0.919$) between household size and the volume of firewood consumed per day, implying that where household sizes are high like in the study area, the demand for fuelwood and other woodland resources may be high. In this study a large household size was found to have a significant influence on use of IWPs for firewood.

In the study area, the majority of the respondents (49%) were adults. This adult population had the responsibility of harvesting IWPs for firewood, building poles, timber, fruits and medicine which could most likely lead to overexploitation of IWPs in and around IDP camps. The result of this study found the adults (31-40 years) had a significant influence on the use of indigenous trees for fruits. However, this adult population appreciates the multiple values of IWPs as revealed by 72% of the respondents and in addition has land ownership rights (Okia *et al.*, 2008) hence; there are higher prospects of promoting conservation projects.

5.1.4 Challenges faced by IDPs in conservation of IWPs in and around IDP camps

Although the benefits of trees in the overall agricultural system is a great factor in determining whether woodland trees are maintained and planted, the findings show lack of tree seedlings, field extension staff, knowledge on economic values of IWPs and longer juvenile period of

indigenous trees as the main challenges faced by respondents in the conservation of indigenous trees in and around IDP camps. This is probably attributed to low prioritization of environmental and conservation concerns by government. As noted by Shambaugh *et al.* (2001), the situation is not helped by the intervention of NGOs during disaster situations as most of them engage in emergency relief activities to IDPs. Studies by Okia *et al.* (2008) also noted long juvenile phases, shortage of tree seedlings, pests and diseases, lack of land, civil unrest and inadequate conservation skills as the major challenges in the conservation of indigenous fruit trees in northern Uganda. Faced with such difficult conditions, many local communities have no ability to conserve natural resources and the environment, often leading to unsustainable exploitation of indigenous woody plants on which livelihoods depend.

The longer juvenile period of some IWPs such as *Vitellaria paradoxa*, *Vitex doniana* and *Terminalia macroptera* usually creates disincentives for their domestication on-farm. *Vitalleria paradoxa* has been reported to begin producing fruit at the age of 20 years (Ruyssen, 1957), making most farmers to undermine its conservation. Apart from shea trees, other multipurpose indigenous trees such as *Terminalia macroptera*, *Combretum collinum, Pseudocedrela kotschyi* and *Tamarindus indica* also have longer juvenile periods. However, these tree resources are of considerable social and cultural significance (Boffa, 1999). According to Tabuti *et al.* (2003), indigenous tree species that can be used for firewood, herbal medicine, timber and traditional construction materials are always spared, hence strengthening the case for their conservation.

Although this might be true, people living in IDP camps had been left with no other option but to entirely depend on the indigenous trees for survival. Thus, despite having a lot of knowledge on the indigenous tree species products, the local community still collects most of these from the wild. This is because people still have the notion that it is cheaper to harvest woody plant products from the wild than grow them on farms (FAO, 2002). This dependency has posed a great threat to conservation of indigenous trees in and around IDP camps.

Even if the National Agricultural Advisory Services (NAADS) programme in Uganda was designed to guide farmers in developing environmentally sound farming, on-farm tree planting and maintaining field types that best satisfy their socio-economic needs (Eilu *et al.*, 2003), tends to focus mainly on exotic fruit trees such as grafted mangoes and oranges with little and / or no attention to conservation of indigenous woody plants.

5.2 The abundance, diversity and density of indigenous tree species in and around IDP camps

5.2.1 Abundance of most preferred indigenous trees

In the study area, the abundance of mature preferred indigenous woody plants such as *V. paradoxa, Combretum collinum and Grewia mollis* were generally lower nearer the IDP camps and meagerly increased as one moved away from the camp centre. This could be an indicator of human pressure exerted on these tree species due to preferences related to various uses by large number of local community in the IDP camps and cutting of trees around camps for security reasons resulting to rarity of such species (Yikii *et al.,* 2006). The higher abundance of mature indigenous trees in plots far away from camp centre could be attributed to fear by IDPs of rebel attacks and land mines hence limiting harvesting of trees in such far away plots. A study by COVOL (2006) also shows low abundance of most preferred IWPs such as shea trees near IDP camps as a result of highly organized cutting for charcoal production for sale to urban areas. According to Grainger (1993), human population increase resulting from either resettlement or inherent growth, can lead to over exploitation of the tree resources in the immediate vicinity as a result of need for charcoal, building materials and land for settlement thus reducing indigenous tree abundance.

A report by NEMA (2001) also indicates that biodiversity conservation on land used for settlement and agricultural purposes faces great challenges whereby rapid population growth, unplanned settlement and fragmentation destroy fragile habitats and reduce woody species abundance. Although the respondents had good reasons for protecting such indigenous trees their efforts were constrained by effects of the two-decade LRA war (Masters, 2002).

5.2.2 The indigenous tree species diversity in and around IDP camps

Conserving biodiversity where people live is a major challenge, especially where there is increased population pressure on woody plants resources (McNeely, 2000). The finding shows that tree species diversity in and around the IDP camps generally decreased with distance from the camp centre outwards. One of the factors that could explain this scenario is the high level of human disturbance in and around IDP camps for over 20 years. According to intermediate disturbance hypothesis, diversity can be highest when disturbance is either too frequent or too rare (Connell, 1978). This implies that species diversity is dependent on the degree of disturbance on an ecosystem.

According to Obiri and Lawes (2004), the extent of variation in species diversity is also dependent on the intensity and duration of disturbance. The long duration of disturbance by IDPs in areas near the camps (0-1 km) could have exposed such areas to varying conditions (light, moisture, heat and soil conditions) that increased species diversity as opposed to sites far away (>1-2 km) from camp centre. It can therefore be deduced from the study that because sites near IDP camps (0-1 km) were exposed to varying levels of disturbance, this probably created conducive environment for species diversity to increase than in far away plots.

The high tree species diversity registered in plots far away from camp centre (>1-2 km) in Kilak IDP camp may be linked to form of land use. Studies by Kelly *et al.* (2004b), Okullo and Waithum (2007) have shown fallow fields to be more species diverse than fields under constant cropping system. The fear of rebel attacks and land mines, made far off areas less degraded, thus contributing to the high diversity of indigenous tree species in distant plots (>1-2 km).

While the assessment of the diversity of indigenous trees is vital for their conservation, the study noted that consideration of the local people's knowledge on use of different tree species is not adequately taken into account, thus jeopardizing conservation of woodland plant resources. To be able to conserve biodiversity in a given area, there is need to understand how tree species diversity is impacted by different factors (McNeely, 2000). In the current study, the tree species composition and diversity status in and around IDP camps demand for a shift in biodiversity conservation from a protectionist form of preservation towards one of sustainable utilization (Rehema *et al.,* 2005).

5.2.3 Density and size class distribution of IWPs in and around IDP camps

All the studied species showed a relatively gradual decline in the number of individuals in each diameter size-class with increasing size-classes. This is an indication that these woodland tree species are presently experiencing a substantial regeneration and recruitment (West *et al.,* 2000), that can replace the lost mature individuals. The finding showed no significant difference ($P > 0.05$) in diameter size class of indigenous trees as distance increased from IDP camp centre except in Lakoga and Patongo IDP camps. This could be attributed to overexploitation of larger diameter size classes in and around the IDP camps during the over two-decade LRA insurgency.

However, there was a significant difference ($P \leq 0.05$) in diameter size class as distance increased from camp centre in Patongo and Lakoga IDP camps. This could be due to deliberate retention of some mature woody species that are well known for their multiple products such as oil, timber, medicine and cultural practices in the crop fields in and around IDP camps (Okullo *et al.,* 2004). This shows good practice for conservation of indigenous trees.

The loss of large diameter mature trees as a result of anthropogenic disturbances (such as harvesting of trees for fuelwood, building materials, charcoal production and clearing land for cultivation) in and around IDP camps could have changed the size class distributions of most indigenous woody plants in the area. Although many savanna woody plants may resprout vigorously after cutting (McLaren & McDonald, 2003; Luoga *et al.,* 2004), the lack of individuals in the size-classes ≥ 45 cm DBH is further evidence of increased loss of the more mature seed producing trees. The loss could have negatively affected the species persistence and regeneration potential, thereby threatening ecosystem functions / services, and consequently, human well-beings.

Other studies by Shackleton (1993) and Dublin (1995) reveal that low number of individuals in the bigger size classes may be attributed to the common economic activities of charcoal and brick burning that require big sizes of fuelwood. The argument fits well with findings from this study where for most of the tree species, there were missing individuals from size classes greater than 64 cm (DBH). It is also probable, from observations that that subsistence uses as well as commercial exploitation of indigenous trees have had impacts on population structure of the commonly harvested indigenous trees. For instance, during the study, big trunks of trees were commonly observed stacked along road sides for sales to urban centers (Plate 2a). Such incidences could also be responsible for the missing individuals in the bigger size classes. It therefore, becomes imperative to further study the likely impact of such activities for long term conservation of woodlands especially if the mother trees for seed production are overexploited.

5.3 Institutions and their interventions in the conservation of indigenous woody plants in and around IDP camps during armed conflict

The study revealed very few NGOs (5%) were involved in activities that are related to conservation of indigenous woody plants in and around IDP camps. More so, the only conservation–based organization (CARE) was executing non-conservation activities such as

emergency relief supplies. The major interventions by NGOs during and after armed conflicts were supply of food relief, water and sanitation, resettlement of IDPs and food security. These could be attributed to low priority to conservation issues by NGOs during and / or after the disaster (Shambaugh *et al.*, 2001; UN, 2009).

Though there were interventions in environmental conservation in terms of awareness and tree planting activities by some NGOs such as World Food Programme and Friends of Orphans, little focus was given to establishment of tree nurseries which are the engines for tree planting to restore degraded vegetation. Even then, most NGOs/CBOs that intervened during the armed conflict ended their operations immediately after end of the war with no post-war plans to rehabilitate the IDP camp areas. Lack of tree nursery skills among the IDPs during camp situation would greatly undermine tree planting activity and conservation effort even after camp life. This situation has negative implication on conservation of woody plants on which livelihoods depend.

The reported challenges faced by humanitarian agencies in their interventions were duplication of activities among NGOs/CBOs and poor road network which tampered the operations of humanitarian agencies during and after armed conflict. A study by Shambaugh *et al*. (2001) reveals duplication of activities to be common amongst NGOs during IDP resettlement. This could be attributed to many international donors' bilateral funding agreements with NGOs, directing them to undertake specific emergency humanitarian programmes, greatly undermining ability of NGOs to prioritize conservation programmes. The bad roads could be due to rebel insecurity which rendered rehabilitation by government difficult, thereby limiting outreach activities to some remote IDP camps. The implication of this is that conservation efforts and monitoring could not easily be extended to such areas, leading to massive depletion of tree resources by IDPs and making commercial trade in charcoal and firewood to go on unchecked (Duffield *et al.*, 2002).

5.4 National policies and laws in conservation of IWPs in and around IDP camps

5.4.1 Environmental and natural resources conservation policies and laws

By the time of this study, most institutions in Uganda did not have provisions in their policies and or / laws specifically addressing conservation of indigenous woody plants in and around IDP camps during armed conflict or disaster occurrence. However, the Constitution of Uganda, 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 resources and any land to be reserved for ecological and tourism purposes for the common good of all citizens. This provision reflects the contents of National Objective XIII(of the Constitution) that requires the state to protect natural resources including forests, wetlands, water, minerals, oil, fauna and flora on behalf of the people of Uganda. Despite this provision in the national constitution, there is little commitment by central and local governments to apply the relevant conservation policies and laws to operationalise this provision of the Constitution to conserve important natural resources on which livelihoods depend. This could be the probable cause of uncontrolled overexploitation of indigenous woody plants in resettlement areas leading to loss of some tree species.

Even if Local Government Act Cap 243 empowers the local government councils at both district and sub-county to make appropriate ordinances and bye laws that can reinforce available national laws in the management of environment and natural resources under their jurisdiction (Turyahabwe, 2006), it is clear from this study that the local government levels that are legally mandated to formulate and plan the implementation of natural resources management policies do not have any appropriate environmental and natural resources management ordinances, bye-laws and environment action plans. This could be due to functional limitations in terms of funding and inadequate manpower.

A study by Adokorach (2010) noted that what the majority of the respondents referred to as bye-laws are unwritten societal norms and taboos that when abided by would act as conservation measures for many highly valued indigenous trees and woody plants. The local government governing body (Uganda Local Government Association)-ULGA which is an advocacy body for local governments was notably playing little role in advocating for increased funding and human resource support in order to fully operationalise the Local Government Act in sector of environment and natural resources management. This could undermine the efforts of local governments to conserve woody plants and natural resources placed under their jurisdiction.

The Forestry Policy and the National Forestry and Tree Planting Act, 2003 places the management of the central forest reserves under management of National Forest Authority and

the local forest reserves and woodlands under District Forestry Services. A key constraint in the current forestry policy and law is that all farmlands with trees in them are included in the national forest domain falling under state control (McLain, 1992). Thus the restrictions intended to protect forest trees are inappropriately applied to trees on private lands and fallows. For example, farmers are required to obtain permits for cutting trees on their farmland. This could create disincentives as it restricts them from carrying out traditional conservation practices or basic management activities such as removal of old trees and pruning which are crucial to optimizing their land use systems and discourages them from conserving the IWPs (Boffa, 1999). In the end they become reluctant to conserve trees and may choose to eliminate them as they regenerate. A study by Turyahabwe (2006) noted that forest policies and laws were not translated adequately into operational tactics, strategies and programmes at the local and national levels.

Despite reforms in the Ugandan forest sector, new institutions created are not yet in position to effectively enforce forest rules and regulations on forest resource use, particularly private forests and woodlands. These weaknesses in the forestry policies and laws weaken efforts to conserve trees in private lands and resettlement areas. Although the National Environment Management Policy and the National Environment Act Cap.153 provides for sustainable management of the environment in Uganda, they have not been made use of in the management and conservation of woodland resources in resettlement and development areas. For instance, even if under sections 19-23 of the National Environment Act Cap.153 the need to carry out Environmental Impact Assessment (EIA) for activities and developments in the natural resource area of concern has been stressed, its implementation has been very difficult in the woodlands and government resettlement areas. Besides, lack of proper Environmental Impact Assessment usually has serious ecological consequence on the indigenous trees in and around IDP resettlement areas.

The Acholi Cultural Institution survived during the armed conflict and has been very useful in conserving Acholi cultural values including conservation of some indigenous woody plants culturally revered. Although it does not have a written cultural policy and law the Acholi Cultural Institution had societal norms that were highly rated in conservation of indigenous trees in the study area. A study by Obua (2002) also noted cultural norms to be effective in conservation of indigenous trees. This could be due to fear of myths, taboos and fines

surrounding such culturally revered indigenous trees. This provides an opportunity to influence people's willingness to conserve indigenous woody plants resources.

Lack of harmony in the conservation policies and laws was noted during the study. For instance, the National Forestry and Tree Planting Act, 2003 does not provide for conservation and management of tree resources in the wildlife reserves, national parks and woodlands. This could be attributed to the lack of sectoral coordination in designing structure, policy and legal framework to address management of natural resources. A report by NEMA (2004) noted lack of coordination in most sectoral policies and laws. This has the implication of reducing the effective conservation of indigenous trees resources during disaster situations (UNHCR, 2001). Furthermore, it could also not allow local authority and community decision-making bodies to have the information, infrastructure, financial resources, or human capacity to conserve natural resources located in such areas.

5.4.2 The actors in the formulation of natural resources conservation laws

The study revealed clan leaders, local communities, local councilors and opinion leaders as the key actors involved in the formulation of the cultural norms and bye-laws. The involvement of the actors could be due to need of eliciting their opinion on the local situation and to influence acceptability and effectiveness of such cultural norms and bye-law. Such involvement could have resulted in the wide application and acceptability of such local laws in the conservation of indigenous trees in the study area. Such approach also provides a good opportunity for formulation of national policies, laws and ordinances relevant to the conservation of natural resources at the grass root. This is expected to result in the proper implementation of the conservation of IWPs in the study area.

Although consultative approach has been used in the formulation of National Land Policy (MLHUD, 2009), most of the natural resources management policies and laws, NGO Policy and IDP Policy, 2004 were formulated without country wide local consultations and have no provisions for emerging issues like conservation of natural resources in refugee resettlement areas during armed conflict or disaster occurrence. According to Shambaugh *et al*. (2001), this lack of participatory approach by stakeholders in formulation of natural resources management laws usually leads to formulation of policies/laws which may be difficult to implement thereby increasing degradation of natural resources by the local community.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based on the results from this study the following conclusions have been made:

i. There was a high dependence on IWPs for firewood and building poles in and around IDP camps by respondents, implying more demand on the tree resources. The number of people with no or little education is high. This may imply high dependence on woodlands as the main source of livelihood for a long time, with low regards for environmental conservation. The cultural law and on-farm retention of IWPs in the field when clearing land for cultivation were the most effective strategies for conservation of indigenous woody plants. There is a good conservation potential in these strategies.

ii. The resettlement of IDPs into camps created varying effects on indigenous trees in and around IDP camps in the study area. Tree abundance and density were reduced in areas near the camps. There were generally few trees in≥ 45 cm dbh indicating overexploitation of most preferred mature indigenous trees. This may pose a challenge in their natural regeneration in the future. The diversity of IWPs was high near camps and generally decreased with distance from the camp centers.

iii. The interventions by NGOs during and after the armed conflict had no significant focus on conservation of indigenous woody plants and environment in and around IDP camp as most interventions focused on emergency relief activities. This had a serious bearing on the degradation of natural resources and the environment in and around resettlement areas.

iv. The existing natural resources conservation policies and laws, NGO and IDP policies have no provisions for conservation of woody plants and environmental management in and around IDP camps during war or disaster situation. Though national conservation laws were available they were ineffective in conservation of natural resources.

6.2 Recommendations

The following recommendations are made:

i. There is need to increase natural resources conservation education and campaigns through mobilizing and sensitizing the local community about the value of indigenous woody plants resources and need to conserve them in their farmland. Women should be trained on use of energy saving cooking stoves.

ii. There is need for further inventory of IWPs in their respective agro-ecological zones in Uganda to assess their unknown values than the current nature of studies which are for academic purpose. This could be achieved through research by NARO in their respective zonal centres.

iii. In order to preserve the current tree species composition and diversity and reverse decline in mature tree population in and around IDP camps, there is a need for a shift in biodiversity conservation from a protectionist form of preservation towards one of sustainable utilization that emphasizes community participation in conservation management.

iv. The line Ministry of Internal Affairs need to review the NGO Policy and Act to provide for humanitarian agencies to deliberately include in their interventions the natural resources conservation and environmental management in and around IDP camps. There is need to undertake an EIA in a resettlement area and recommended mitigation measures need to be implemented by the stakeholders involved during and after camp life.

v. There is need to amend the national conservation policies and laws to address the need for conservation of IWPs in resettlement areas. The cultural systems and by laws for conservation which are currently undocumented but are found to be effective in conservation of natural resources during this study should be formalized and mainstreamed into the modern system of environmental governance.

vi. Future research needs to address on-farm production of forest species especially for firewood, agro-forestry, medicine and substitutes for forest products in order to decrease demand for wild woody plants resources.

vii. The government need to increase funding and personnel in natural resources management in the lower local governments to ensure effective service delivery like other sectors of health and agriculture. Also, the government, through National Planning Authority (NPA) should develop recovery, rehabilitation and long term reconstruction programmes with appropriate environmental action to conservation of indigenous trees in northern Uganda.

REFERENCES

Abbot, J.I.O. (1996). Rural subsistence and protected areas: community use of the Miombo woodlands of Lake Malawi National Park. A Ph.D Thesis, University College,University of London,UK.

Achola, I.O. (2007). *The impact of internally displaced persons and their settlements on the environment:* A case study of a peri-urban camp (Unyama) and a rural camp (Pabo), Gulu district. Northern Uganda. Dissertation for MSc.ENR. Makerere University. Kampala.

Adokorach, J. (2010). *The influence of internally displaced people on spatial distribution and conservation of indigenous tree resources in the shea parkland of Northern Uganda. MSc (ENR) Dissertation.* Makerere University, Kampala. pp 43-64.

Agea, J. G.; Kirwangwa, D., Waiswa, D. & Okia, C.A. (2010a). Household Firewood Consumption and its Dynamics in Kalisizo Sub County, Central Uganda. *Ethnobotanical Leaflets,* **14**: 841-855.

Agea, J. G.; Obua, J., Waiswa, D., Okia, C.A & Okullo, J.B.L. (2010b). Farmers' Attitudes Towards On-Farm Cultivation of Indigenous Fruit Trees in Adwari Sub-County, Lira District, Uganda. *Ethnobotanical Leaflets,* **14**: 366-380, 2010.

Agea, J. G.; Obua, J.; Kaboggoza, J. R. S. & Waiswa, D. (2007). Diversity of indigenous fruit trees in the traditional cotton-millet farming system: the case of Adwari subcounty, Lira district, Uganda. *Afr. J. Ecol.*, **45**, *supp 3***:** 39-43.

Alexander,I. (1998).*The effects of tillage and cover crops on some chemical properties of an oxisol and summer crop yields in south western Parana, Brazil*, **31**:1239-1246.

Babanyara, Y.Y. & Saleh, U.F. (2010). Urbanization and the Choice of Fuelwood as a Source of Energy in Nigeria. *Human Ecology,* **31:**19-26.

Barrow, E.G.C. (1996). *The dry lands of Africa, local participation in tree management*. Initiatives Publishers Ltd, Nairobi.

Birikadde, G.K., Matinga, M., Clancy, J. (2009). *Fuel security and supply dynamics in Internally Displaced Persons' camps of Northern Uganda.* Jn.Humanitarian Assistance. Feinstein International Centre.pp1-3.

Boffa, J. M. (1999). Agroforestry parklands in Sub-Saharan Africa. *FAO Conservation Guide, Rome,* **34***:* 1-230.

Bräutigam, A. (1995). "*Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES*)," **5**:46-51.

Brower, J.E., Zar, J.H., and Von Ende, C.N. (1997). *Field and laboratories methods for general ecology.* USA: The McGraw-Hill Companies, Inc.

Brown, L.R. and Bredenkamp, G.J. (2004). The use of structural species size class in the description of the woody vegetation of a nature reserve. *African Journal of Ecology,* **42**: 252-269.

Condit, R., Sukumar, R., Foster, R.B. Hubbel, S.P., Loo De Lao, S., Leigh, E.G., and Manokaran, N (1999). Assessing forest diversity from small plots: Calibration using species individual curves from 50 ha plots. pp 247-68. In: Dallmeier, F. & Comisky, J.A. (Eds.).

Condit, R., R. Sukumar, S.P. Hubbel and R.B. Foster, (1998). *Predicting population trends from size distributions:* A direct test in a tropical tree community, **152**: 495-509.

Connell, J. H. (1978). *Diversity in tropical rain forests and coral reefs.* Science 199:1302-10.

COVOL, Uganda. (2006). *The shea project. www.covol.org/shea/indes.html. Accessed on 12/12/2009*.

D'Agnes, L., Heather, D., Schwartz, J.B., Amarillo, L., & Castro, J. (2010). Integrated management of coastal resources and human health yields added value: a comparative study in Palawan. *Journal of Environmental Conservation,* **37**: 398-409.

De Saint-Sauveur, A. (1999). The shea project: An economic assessment.Montpellier: PROPAGE, 61pp.

Dublin, H.T. (1995). Vegetation dynamics in the Serengeti-Mara ecosystem: the role of elephants, fire and other factors. pp. 71-90. In: Sinclair, A.R. & Arcese,P.(Eds), *Serengeti II: Dynamics, management and conservation of an ecosystem*. Chicago University Press, Chicago.

Duffield,M.,Macrae,J., and Curtis,D. (2002). *Disaster: Politics and humanitarian aid*. Vol 25,Issue 4 pp 269-274.

Eggeling, W.J. and Dale, I.R. (1951). *The indigenous trees of Uganda Protectorate.* Government Printer, Entebbe.

Eilu, G., Obua, J., Tumuhairwe, J. K. & Nkwine, C. (2003). Traditional farming and plant species diversity in agricultural landscapes of south-western Uganda. *Agriculture, Ecosystems and Environment,* **99**: 125–134.

FAO. (2002). Trees Outside Forests: Towards Better Awareness. FAO. Rome.

Fournier, M. & Demurger, S. (2010). Poverty and firewood consumption: A case study of rural households in Northern China. University of Lyon 2, F-69007, Lyon, France.

Gary, J.M. (2004). Etnobotany, a methods manual. pp 30, 228-238.

Giannecchini, M., Twine,W., Vogel. (2007). *Land-cover change and human environment interactions in a rural cultural landscape in South Africa,* **173**: 26-42.

Gimaret-Carpentier, C., Raphaël Pélissier, R., Jean-Pierre,P. & Houllier, F. (1998). Sampling Strategies for the Assessment of Tree Species Diversity. *Vegetation Science,* **9:** 161-172.

Grainger, A. (1993). *Practical forester, controlling tropical deforestation,* Earthscan. Publications, London. pp 310.

Hamilton, A.C.(1991). *A Field Guides to Ugandan Trees*. Kampala: Makerere University Press.

Hamilton, A.C. (1984). *Deforestation in Uganda*. Oxford University Press. Nairobi.

Hatton, J., M. Couto,, and J. Oglethorpe. (2001). *Biodiversity and War: A Case Study from Mozambique.* Washington, DC, USA: Biodiversity Support Program.

Hetherington, J.C. (1975). Samples? What shape? How large? How many? – Scotish Forestry, 29(4).

ICRAF (2003). *Farmer-driven strategy in rebuilding valuable tree diversity on farms.* ICRAF, Nairobi.

IDMC. (2006). Internal Displacement Monitoring Committee Report for IDPs in Northern Uganda. Kampala, Uganda. pp. 11-18.

Jarvis, D.I.,Riberio,S., Silva,M.L. Ventura,D and Ibeiro,S. (2000). A Training guide for In Situ Conservation on-farm.IPGRI. Kampala.

Jashimuddin, M., Masum, K.M. & salam,M.A. (2006). Preference and consumption pattern of biomass fuel in some disregarded villages of Bangladesh. *Biomass and Bioenergy*, 30:446-451.

Kadzere, I., Chilanga, T. G., Ramadhani, T., Lungu, S., Malembo, L., Rukuni, D., Simwaza, P. P.,

Rarieya, M. & Maghembe, J. A. (1998). Choice of indigenous fruit trees in Southern Africa: summary of case studies in Malawi, Tanzania, Zambia and Zimbabwe. In: Maghembe, J. A., Simons, A. J., Kwesiga, F. and Rarieya, M. (eds) *Choice of indigenous fruit trees in Southern Africa: Priority setting with farmers in Malawi, Tanzania, Zambia and Zimbabwe*. ICRAF, Nairobi, pp. 1-15.

Kalpers,J. (2001a). *Volcanoes under Siege: Impact of a Decade of Armed Conflict in the Virungas*. Washington, DC, USA: Biodiversity Support Program. pp.1-8.

Kalpers,J. (2001b). *Overview of Armed Conflict and Biodiversity in Sub Saharan Africa: Impacts, Mechanisms and Responses.* Biodiversity Support Program Washington, DC.

Katende, A.B., Birnie,A. and Tengnas, B. (1995). *Useful trees and shrubs for Uganda:identification,propagation and management for agricultural and pastoral communities.* Nairobi: Regional Soil Conservation Unit,RSCU/Sida.

Kelly, B. A., Hardy, O. J, Bouvet, J. M. & Picard, N. (2004b). *Size class distribution and spatial pattern of Vitellaria paradoxa in relation to farmers' practices in Mali*, **60**: 3-11.

Kent, M. and Coker, P. (1996). *Vegetation Description and Analysis. A practical Approach.* John Wiley and Sons Ltd.

Kothari C.R.(1990). *Research Methodology: Methods & Techniques,* 2nd Edition. K.K Gupta for New Age International (P) Ltd Publishers.

Koutsoyiannis, A. (1977). *Theory of econometrics.* 2nd Edition, Macmillan, Hong Kong.

Lodhi, M.A., Echavarria, F.R., and Keithley, C. (1998). "*Using remote sensing data to monitor land cover changes near Afghan refugee camps in Northern Pakistan.*

Lovett, J.C and Wasser,S.K. (1999). Forest conservation in the East Usambara Mountains, Tanzania. *IUCN, Journal of Tropical Ecology,* **15**: 689-694.

Lovett, P.N. and Haq, N. (2000). *Evidence of anthropic selection of the shea nut tree* (*V.paradoxa*). Agro forestry systems 48: 293-304. In: Maranz, S. and Wiesman,Z. (2003) *Evidence for indigenous selection and distribution of shea tree, V.paradoxa, and its potential significance to prevailing parkland savanna tree patterns in sub-Saharan Africa north of the Equator.* Institute for agriculture and applied biology, Ben Gurion University, Be'er Sheva, Israel.

Luoga, E.J., Witkowski, E.T.F. & Balkwill, K. (2004). Regeneration by coppicing (resprouting) of Miombo (African Savanna) trees in relation to land- use. *Forest Ecology and Management*, **189**: 23-35.

Lykke,A.M. (1998). *Assessment of species composition change in savannah vegetation by means of woody plants size class distribution and local information*, **7**: 1261-1275.

Madrama,F.(2006). Population structure, utilization and conservation of *Balanites aegyptica* in Moyo Sub county, Moyo District. Dissertation.

Magurran, A.E. (2004). *Measuring Biological Diversity*. London: Blackwell Publishing**.**

Maranz, S., Kpikpi, W., Weisman, Z., Sauveur, A. D. & Chapagain, B. (2004). *Nutritional values and indigenous preferences for shea fruits* (*Vitellaria paradoxa* CF Gaertn.) *in African groforestry parklands,* **58**: 588-600.

Masters, E.T. (2002). The shea resource: Overview of research and development across Africa. In: International workshop on processing and marketing of shea products in Africa- proceedings, Dakar, Senegal.pp 13-19.

McLain, R. (1992). Recommendations for a new Malian forest code: observations from the Land Tenure Centre's study of land and tree tenure in Mali's Fifth Region. Madison, Wisconsin, USA, land Tenure Centre.

McLaren, K.P. & McDonald, M.A. (2003). Coppice regrowth in a disturbed tropical dry limestone forest in Jamaica. *Forest Ecology and Management*, **180**: 99-111.

McLaren K.P., McDonald M.A., Hall J.B., and Healey J.R. (2005). Predicting species response to disturbance from size class distributions of adults and saplings in a Jamaican tropical dry forest. *Plant Ecology*, **181**: 69-84.

McNeely, J. A. (2000). *War and Biodiversity: An assessment of impacts.* In *The environmental consequences of war.* Austin, J., and Bruch,C.E., eds. Cambridge, UK. Cambridge University Press.

MEMD. (2006). *Renewable Energy Policy for Uganda.* Ministry of Energy and Mineral Development (MEMD), Kampala, Uganda.

Michelle, D., Spencer, F.G. (2003). *The environmental consequences of the war Iraq:* a Green party press office briefing.

Mihai, C., Skeffington, M.S., Giller, P., Smith, C., Gormally, M. and O'Donovan, G. (2004). Vegetation diversity and stand structure in streamside forests in the south of Ireland. *Journal on Forest Ecology and Management,* **202**: 39-57.

Millet, J., & Truong, L.H. (2011). Assessment of the diversity and distribution of the threatened tree species in a logged forest in Vietnam. *Tropical Conservation Science,* **4**: 82-96.

MLHUD. (2009). *National Land Policy*. Working Draft 4.

MoFPED. (2000). *Revised Vol. I of Poverty Eradication Action Plan(PEAP).* Final Draft 2000. Kampala , Uganda.

Mubalama, L. (1999). *A View from Eastern Democratic Republic of Congo."* In: *Fighting in the Forest. Biodiversity Conservation amidst Violent Conflict.* Naughton-Treves, L. (ed.). Conservation Development Forum.

Mudekwe, J. (2007). *Impact of subsistence use of forest products and the dynamics of harvested woody species populations in a protected forest reserve in Western Zimbabwe.* Dissertation presented for the degree of Ph.D in Forestry, University of Stellenbosch.Norway. pp 71-119.

Mudekwe, J. (2005). *Demography and dynamics of commonly harvested woody species in a protected indigenous forest in Zimbabwe.* Unpublished report. Department of Forest

Resources and Wildlife Management, National University of Science and Technology, Bulawayo.

Mugenda, M.O. and Mugenda, A.G. (2003). Research Methods. Quantitative and Qualitative Approaches. ACTS Publishers, Nairobi, Kenya. pp.44-45.

MUIENR/ USAID. (2001). *Environmental threats and opportunities assessment for Uganda.* Biodiversity assessment.. Task order under the biodiversity and sustainable forestry. Makerere University, Kampala. pp 4-83.

Mwavu, E.N. & Witkowski, T.F. (2009). Population structure and regeneration of multiple-use tree species in semi-decidous African tropical rain forest: Implications for primate conservation. *Forest Ecology and Management*, **258**: 840-849.

Mwavu, E.N. (2007). Human impact, plant communities, diversity and regeneration in Budongo Forest Reserve, North–Western Uganda. A Ph.D Thesis, University of the Witwatersrand, Johannesburg, South Africa.

MWLE. (2003). *Land Sector Strategic Plan (2001-11).*Ministry of Water, Lands and Environment, Kampala.

MWLE. (2001). *The Uganda Forestry Policy*. Kampala, Uganda.

Nampindo, S., Picton, G.P, Plumptre, A. (2005). *The impact of conflict in northern Uganda on the environment and natural resources management.* USAID and WCS, Kampala.pp 2-40.

Ndyakira, A. (1995). *Refugee factor on environment*. The New Vision 17th January, 1995, p.4.

NEAP (National Environment Action Plan). (1992). Ministry of Natural Resources, Uganda. Kampala. pp 1-36.

NEMA. (2009). Uganda: Atlas of our changing environment. Kampala. pp.22 - 47.

NEMA. (2008). National State of Environment Report for Uganda. pp. 60-128.

NEMA.(2006). National State of Environment Report for Uganda, 2006 / 2007. Pp 70-159.

NEMA. (2004). National State of Environment Report for Uganda, 2004 / 2005. pp 77-162.

NEMA .(2002). State of the Environment Report for Uganda 2002.

NEMA.(2001). State of the Environment Report for Uganda. National Environment Management Authority, Ministry of Water Lands and Environment. Uganda, Kampala, 153 pp.

Obiri, J.A.F. & Lawes, M.J. (2004). Chance versus determinism in canopy gap regeneration in coastal scarp forest in South Africa. *Vegetation Science*, **15**: 539-547.

Obiri, J.A.F. & Lawes, M.J. (2000). The sustainable use of timber and non timber products: A case study from Umzimvubu District, Pondoland, S.Africa. In: Seydack, A.H.W., Vermeulen, W.J. & Vermeulen,C. (Eds.). *Towards Sustainable Management Based on Scientific Understanding of Natural Forests and Woodlands.* Proceedings of a Natural Forest and Savannah Woodlands Symposium II, 5-9 September 1999, DWAF, Knysna.

Obua, J., Agea, J.G. & Ogwal, J.J. (2010). Status of forests in Uganda. *African Journal of Ecology*, **48**: 853 -859.

Obua, J. (2002). *Conservation of shea parklands through local resource management, International Workshop on processing and Marketing of shea products in Africa, proceedings*, CCF Technical paper No. 21.

Obua, J., and Muhanguzi, G.(1998). *Farmer's knowledge of indigenous tree cultivation around Bwindi Impenetrable Forest National Park, Uganda*.

OCHA/UNHCR. (2004). *IDP Return Survey of official camps in Liberia.*

Okia, C. A. (2010). *Balanites aegyptiaca*: A resource for improving nutrition and income of dryland communities in Uganda. Phd thesis, University of Wales, Bangor, United Kingdom. 310 pp

Okia, C. A., Opolot, V. I., Katumba, B. M. Esegu, J. F. & Okiror, P. (2008). *Use and conservation of indigenous fruit tree diversity for improved livelihoods in Eastern Africa.* Uganda Country Report, Kampala.

Okullo, J. B. L. (2004). *Vitalaria paradoxa in Uganda: Population structures and reproductive characteristics.* PhD Thesis, School of Agricultural and Forest Sciences, University of Wales, Bangor. 303pp.

Okullo, J. B. L. & Waithum, G. (2007). Diversity and conservation of on-farm woody plants by field types in Parombo Sub County, Nebbi District, north-western Uganda. *African Journal of Ecology* , **45** (s3): 59–66.

Okullo, J. B. L., Hall, J. B. & Obua, J. (2004). *Leafing, flowering and fruiting of Vitellaria paradoxa subsp. nilotica in Savanna parklands in Uganda.* Agroforestry Systems, **60**: 77-91.

Okullo, J. B. L., Omujal, F., Agea, J. G., Vuzi, P. C., Namutebi, A., Okello, J. B. A. & Nyanzi, S. A. (2010). *Physico-chemical characteristics of shea butter (Vitellaria paradoxa C.F. Gaertn.) oil from the shea districts of Uganda.* AJFAND, 10(1). January, 2010.

Okullo, P. (2004). *The population structure and utilization of Zanthoxylum chalybeum and Sarcocephalus latifolius along the shores of Victoria Nile in Apach district, Northern Uganda*.pp 1-38.

Oluka, A., Esegu, F., Kaudia, A. (2000). Agroforestry Handbook for the Banana-Coffee Zone of Uganda, Technical Handbook No. 21. The RELMA / SIDA, ICRAF.

PDDP. (2007). *Three Year District Development Plan (2007/08 – 2009/10).* pp 1-23.

Perrez, F. (2001). *Country report: Switzerland's International Environmental Policy in 2001*. Yearbook of International Environmental Law 12: pp. 451-459.

Peters, C.M.(1996). *Observations on the sustainable exploitation of non – timber forest products*. An ecologist's perspective. *In*: M.Ruiz Perez and J.E.M. Arnold. Current issues in non-timber forest products research. *Proceedings of the workshop 'Research on NTFP'*. Hot Springs, Zimbabwe 28 August – 2 September 1995.pp 68-73.

Pimm, S.L., Jones, H.L., and Diamond, J.M. (1988). "*On the risk of extinction*", **132**(6):757 – 785.

Plumptre, A.J., Masozera, M.,Vedder, A. (2001). *The Impact of Civil War on the Conservation of Protected Areas in Rwanda*. Washington, DC, USA: Biodiversity Support Program.

Pomeroy,D., Tushabe, H. (2004). *The state of Uganda's Biodiversity, 2004.* Makerere University Institute of Environment and Natural Resources/ National Biodiversity Data Bank. With assistance from DANIDA- ENRECA.

Pomeroy, D., Tushabe, H., Mwima, P., Kasoma, P. (2002). *Uganda ecosystem and protected area characteristic.* A contribution to the strategic criteria for rural investments in productivity (SCRIP) programme of the USAID Uganda Mission. Makerere University, Kampala. pp 21-39.

Poorter, L., Bongers, F., van Rompaey, R.S.A.R. & de Klerk, M. (1996). Regeneration of canopy tree species at sites in West African moist forest. *Forest Ecology and Management,* **84**: 61-70.

Rasingam, L., and Parathasarathy, N. (2009). Tree species diversity and population structure across major forest formations and disturbance categories in Little Andaman Island, India. *Tropical Ecology,* **50**: 89-102.

Redford, K.H. (1992). The empty forest. *Bioscience* 42: 412-422.

Rehema, W.,Anke,F.,Hans,P.H., Riku,V.,Young,J. and Adamescu,M.(2005). *Conflict management, participation, social learning and attitudes in biodiversity conservation, global change and ecosystems,* WPR42005-03, http.www.alter-net.info. 23/11/2010.

Roch, P., Perrez, F. (2005). *International Environmental Governance: The Strive Towards a Comprehensive, Coherent, Effective and Efficient International Environmental Regime,* **16**: 1-25.

Ruyssen, B. (1957). *Le karité au Soudan: Première et deuxième parties,* **12**: 143- 172.

Schreckenberg, K. (1999). Products of a managed landscape: non-timber forest products in the parklands of the Bassila region, Benin . *Global Ecology and Biogeography,* **8**: (3-4): 279–289.

Shackleton, C.M, Shackleton, S.E. (2003). *Value of non timber forest products and rural safety nets in South Africa*. Paper presented at The International Conference on Rural Livelihoods, Forests and Bio diversity, 19-23 May 2003, Bonn, Germany.

Shackleton, C.M. (1993). Demography and dynamics of the dominant woody species in a communal and protected area of the eastern Transvaal Lowveld. *South African Journal of Botany,* **59** (6): 569-574.

Shambaugh,J., J.Oglethorpe, and Ham,R. (2001). *The Trampled Grass. Mitigating the impacts of armed conflict on the environment.* Biodiversity Support Programme .Washington, DC. 3pp.

Simberloff, D. and Abele, L.G. (1984)."*Conservation and Obfuscation: Subdivision of Reserves",* **42***:*401.

Squire, C. (2001). *Sierra Leone's Biodiversity and the Civil War*. Washington, DC, USA: Biodiversity Support Programme.pp 4-29.

Stearn, William T. (1966). *"Botanical Latin"*. Nelson Publishers,London, UK.

Tabuti, J. R. S., Ticktin, T., Arinaitwe, M. Z. & Muwanika, V. B. (2009). Community attitudes and preferences towards woody species: implications for conservation in Nawaikoke, Uganda. *Oryx*, **43**(3): 393–402.

Tabuti, J.R.S. (2006). *The uses, local perceptions and ecological status of 16 wood species of Gadumire Sub County, Uganda.* Biodiversity and Conservation Journal **16**: 1901-1915.

Tabuti, J.R.S., Dhillion, S.S. and Lye, K.A. (2003). Firewood use in Bulamogi County, Uganda. Species selection, harvesting and consumption patterns. *Biomass and Bioenergy,* **25**: 581-596.

Timmermans, H. (2000). *Reconciling conservation and rural development: social and ecological dynamics of forest resource harvesting in the Cwebe Nature Reserve*. *In*: Seydack, A.H.W., Vermeulen, W.J. and Vermeulen, C.(Eds). Towards sustainable management based on scientific understanding of natural forests and woodlands. Proceedings of a natural forests and savannah woodlands symposium II Knysna, South Africa, 5-9 September, 1999. pp. 332-341.

Turyahabwe,N., Tweheyo, M. (2010). *Does forest tenure influence forest vegetation characteristics? A comparative analysis of private, local and central government forest reserves in central Uganda,* **12**(4): 320-324.

Turyhabwe, N., Geldenhuys, C.J., Watts, S., Tweheyo, M. (2008). *Linking forest tenure and anthropogenic factors with institutions and the effectiveness of management in Mpigi forests, Central Uganda,* **70**(3): 255-267.

Turyhabwe, N. (2006). *Local capacity to manage forestry resources under a decentralized system of governance: the case of Uganda*. PhD. Thesis, University of Stellenbosch. Norway. pp156-169.

Turyahabwe, N. (1997). *Attitudes of local communities towards forest management practices in Uganda: An analytical study of Budongo Forest Reserve.* A thesesis for MSc.in Forestry. Makerere University. Kampala. Pp 31-75.

Twine, W.C. (2005). *Socio-economic transitions influence on vegetation change in the communal rangelands of the South African lowveld,* **22**:93-99.

UBOS. (2008). *Statistical Abstract 2008. Uganda Bureau of Statistics*. Kampala, Uganda.

UBOS. (2007). *Population and Housing Census Analytical Report for Pader District Local Government*. pp 1-10

UN. (2009). *Trends and impacts in conflict settings: the socio-economic impact of conflict-driven displacement* in the ESCWA Region. Issue No.1.

UNEP. (2009). *Protecting the environment during armed conflict:* An analysis of international law.

UNEP. (2003). *Afghanistan: Post-Conflict Environmental Assessment.* Geneva, Switzerland.

UNHCR. (2008). *Summary of IDPs in Pader district.* UNHCR survey report. Pader Office. pp 3

UNHCR.(2001). *Armed conflict and the environment.* (Various http://www.unhcr.org/cgi-bin/texis/vtx/home: 16/5/2009 at 4.20pm).

UNPIDP. (2004). *Uganda National Policy for Internally Displaced Persons.* Office of the Prime Minister. Kampala.pp;pp1-39.

UWA. (1997). *"When War Breaks Out"*, **1**:1-2.

Vanwing, T. & Hens, L. (2010). Perception, Environmental Degradation and Family Size Preference: a Context of Developing Countries. *Sustainable Development,* Vol.3 No.4. ISSN 1913-9063.

Werikhe, S., Mushenzi Lusenge, N., and Bijimana, J. (1997). *"The Impact of War on Protected Areas in Central Africa". Case Study of the Virunga Vocanoes Region,*

delivered at the International Conference on Transboundary Protected Areas as a Vehicle for International Cooperation, Cape Town, S.Africa, September 16-18.

West, A.G., Midgley, J.J. & Bond, W.J. (2000). Regeneration failure and the potential importance of human disturbance in a subtropical forest. *Applied Vegetation Science*, **3**: 223-232.

WRC. (2012). Women's Refugee Commision: Cooking fuel saves lives: A holistic approach to cooking in humanitarian setting. http://womensrefugeecommission.org/programs/firewood. Accessed on 30.10.2012 at 7.35 p.m

WRI (Water Resources Atlas). (2003). Watersheds of the World-global_Maps. World Resources Institute. www.waterandnature.org/eatlas/. Accessed on 24th February, 2010 at 10.34a.m.

Yikii, F., Agea, J.G. & Kaboggoza, J.R.S. (2006). *Eucalyptus* versus indigenous trees: what do tobacco farmers prefer in North-Western Uganda? *Makerere University Research Journal*, **1**(2):171-177.

APPENDICES

Appendix I

QUESTIONNAIRE ON PRA ASSESSMENT ON RANKING AND DOCUMENTATION OF INDIGENOUS WOODY PLANTS PREFERRENTAILLY TARGETED BY IDPs IN AND AROUND IDP CAMPS

1. Are there indigenous woody plants commonly targeted by IDPs in and around the camps?	Yes	No

2. If yes, what are the 10 indigenous woody plants commonly used by the IDPs in and around the IDP camps?

No.	Local name	Scientific name	Rank of importance	Reasons for preference / use(s)

Appendix II

QUESTIONNAIRE ON USES AND CONSERVATION STRATEGIES FOR INDIGENOUS WOODY PLANTS BY IDPs IN AND AROUND CAMPS (INTERVIEW WITH HOUSEHOLD REPRESENTATIVE)

A. Location

1.County	2. Sub County	3.Parish	4.Village	5.Name of IDP camp

B. Household / respondent characteristics

6.Sex	M	F

7. Age (Years)	10-18	19-30	31-40	>40

8.Marital status	Married	Single	Divorced	Widowed

9. No. of dependants	None	1-5	6-10	>10

10. Education level	None	Primary	Secondary	Tertiary	University

11. Occupation	Farming	Trade	Formal employment	Informal employment

12. What are the main uses of indigenous woody plants in the IDP camps?

Firewood	Building poles	Charcoal	Medicinal	Food/Fruits	Cultural practices	Oil	Others (specify)

13. Which form of fuel do you use for cooking?

Firewood	Charcoal	Paraffin	Others (specify)

14. What form of cooking stove do you use?

Open 3 - stones	Energy saving stove	Paraffin stove

15. Are there potential markets for any of these indigenous woody plants products?	Yes	No

16. If yes,

Tree species		
Scientific name	Local name	Use(s)

17. Are there community / traditional control strategies in place to conserve indigenous woody plants in IDP camps?	Yes	No

18. If yes, what are they?.....

19. Is there an IDP camp administration committee to coordinate environmental concerns in the camps	Yes	No
20 .Do you know about any national law / bye law to conserve indigenous woody plants?	Yes	No

21. If yes, name them……

22. If yes, is it being implemented?	Yes	No

23. As you clear land to grow crops do you leave some trees?	Yes	No

24.If yes, give reasons	Cultural	Economic	Timber	Firewood	Fruits	Medicinal	Effect on crops	Others (specify)

25. Would you like to plant some trees	Yes	No

26. Give reasons for your answer……

27. Do you feel there is need to conserve these indigenous trees?	Yes	No

28. Give reasons……

29. What challenges do you face in the conservation of indigenous woody plants?

i. Lack of land	ii.Lack of tree seedlings	iii. Preference of crops to trees	iv.Lack of field extension services& techniques	v.Lack of knowledge of economic value	vi.Longer production period	vii.Cultural factors

30. Any comment……

Appendix III

QUESTIONNAIRE ON INSTITUTIONAL INTERVENTIONS IN CONSERVATION OF INDIGENOUS WOODY PLANTS DURING ARMED CONFLICT

Key informant interview
NGOs / CBOs

1. Name of NGO / CBO……
2. ……..…….(Optional)

2. Scope of operation	One County	District wide

3. Nature of intervention (Tick where appropriate)

	Nature of NGO intervention									
	i	ii	iii	iv	v	vi	vii	viii	ix	x
	Environmental conservation	Food relief	Medical care	Supply of NFIs	Education	Water & sanitation	Food Security (Agric)	IGAs	Conflict resolution	Others (specify)

4. Does the organization have environmental programme in respect to conservation of woody plants in and around IDP camps during armed conflict?	Yes	No

	Nature of activities					
5. If yes, what are the activities? (Tick)	Environmental education	Tree planting &Tree nursery practices	Promoting Use of energy saving stove	Support policy,ordinances,bye laws formulation & enforcement	Promoting Cultural / traditional Institutions; individuals in domestication of certain indigenous tree used by people	Sustainable agricultural practices

6. Do the humanitarian organizations have any interference from the NGO Forum,Central / Local Government in their operations?	Yes	No

7. If yes, briefly state……

8. Does the organization have any environmental conservation programme for post conflict resettlement of IDPs and rehabilitation of IDP camps?	Yes	No

9. If yes, briefly state…….

10 .Does the organization offer income generating activities to the IDPs?	Yes	No

11. Give reasons for your answer……..……..……..

12. If number 10 is yes, state form of economic support ……..……..……..

13. Any comment…….

Appendix IV

QUESTIONNAIRE ON POLICY AND LEGAL INTERVENTIONS IN CONSERVATION OF INDIGENOUS WOODY PLANTS DURING ARMED CONFLICT

PRA and key informant interview

Local Gov't (Sub County)	Local Gov't (District)	Cultural institution	NGO Forum	NEMA	NFA	Ministry

(A). National Environment Management Authority (NEMA) / National Forestry Authority (NFA)

1. Do the current national environmental and natural resources policies, laws and regulations have provisions for conservation of indigenous woody plants during armed conflict?	Yes	No

1. If yes, state them……

B. Ministry of Disaster Preparedness / NGO Forum

3. Does the National IDP Policy provide for indigenous woody plants conservation in the NGO interventions in IDP camps during a disaster situation?	Yes	No

4. Does the National NGO Policy provide for indigenous woody plants conservation in the NGO interventions in IDP camps during a disaster situation?	Yes	No

C. Local Government (District)/ Sub County)

5. Does the district local government have any ordinance / bye law for conservation of ecologically valuable indigenous woody plants in private land and protected areas?	Yes	No

6. Are there traditional / cultural laws in place for the conservation of indigenous woody plants considered of great values to the local community?	Yes	No

7. If yes, who are the main actors in the formulation of these policies, ordinance/bye law, cultural laws.....

8. Are these policies, laws, regulations, ordinances/bye laws effective?	Yes	No

9. If no, what are reasons for their ineffectiveness…….

10. Is there a District Disaster Coordination Committee / District Technical Planning Committee to handle IDPs cases?	Yes	No

11. If yes, is conservation of woody plants and environmental issues in and around IDP camps discussed in the agenda and what conservation actions are put in place……..……

12. Does the District have District State of Environment Report (DSOER) ?	Yes	No

13. Does the District have District Environment Action Plan?	Yes	No

14. Are the local environment committees in the sub county, parish and village levels involved in environmental conservation issues in and around IDP camps?	Yes	No

15. If no, reasons……..……

16. What constraints are faced by natural resources department in the local government in the conservation of woody plants and environmental management?.....

17. Any comment……..…….

Appendix V

IWPs SPECIES INVENTORY DATA SHEET FOR MATURE TREES, PADER DISTRICT

1.Site location	Near IDP camp (≤ 1 km)	Outside IDP camp (>1 Km)
Tick		

2.Name of enumerator	3.Date

4.IDP camp	5.Village	6.Parish	7.Sub County	8.County

9.Transect No.	10.Plot No: (50 m x 40 m)	11. Plot corner: (GPS clockwise)			
		1	2	3	4

Indigenous woody plants species (>10 cm)			Dbh (cm)	Plot description
S/No	Local name	Scientific name		

Appendix VI

IWPs REGENERATION ASSESSMENT DATA SHEET FOR SAPPLINGS/POLES , PADER DISTRICT

Transect No.	Plot (50m x 40m)	Sub plot (25mx20m) No.	Sub plot corners (GPS clockwise)			
			1	2	3	4

Indigenous woody plants species ($> 2 \leq 10$ cm)			Dbh (cm)	Plot description
S/No	Local name	Scientific name		

Appendix VII

IWPs REGENERATION ASSESSMENT DATA SHEET FOR SEEDLINGS, PADER DISTRICT

Transect No.	Plot (50m x 40m)	Sub plot (10m x 10m) No.	Sub plot corners (GPS clockwise)			
			1	2	3	4

Indigenous woody plants species (≤2 cm)			Height (cm)	Root collar diameter (cm)	Plot description
S/No	Local name	Scientific name			

Appendix VIII

QUESTIONNAIRE ON ASSESSMENT OF NGO INTERVENTIONS IN AND AROUND IDP CAMPS (INTERVIEW WITH HOUSEHOLD REPRESENTATIVE)

SECTION 1: LOCATION

County……..Sub County……..

Parish……Village…….……..……..

IDP camp……..

SECTION 2: SOCIO-DEMOGRAPHIC CHARACTERISTICS

Sex…….Age……..……. Marital status……

1. Were there interventions by NGOs to IDPs during and after armed conflict? Yes…….. No……..……

2.What are the main areas of interventions by NGOs during the armed conflict ?.....

3. What are the main areas of interventions by NGOs after the armed conflict ?...…….……..……

4. Are there NGOs advocating for / implementing any conservation policy / law in and around IDP camp? Yes….. No……

5. Do you think the national conservation policies / laws are effective in conservation of indigenous trees ? Yes….. No…….

6. If no, why…….……..……

7. Who are the stakeholders involved in the formulation of cultural / bye-laws in the conservation of indigenous trees?.....

8. What challenges do you think would hinder promoting conservation of indigenous trees ?.....

9. What recommendation would you suggest to overcome above……..……

10.What are the income generating activities provided by NGOs? ……..…….……..

11. What do you consider to be the major challenges faced by NGOs during their interventions?.....

12. What were the NGO interventions in IDP camps during the armed conflict?.....

13. What were the NGO interventions in IDP camps after the armed conflict?.....

14. What challenges were face by the NGOs / institutions during their interventions in the IDP camps?.....

15. Any comment…….……..……

Appendix IX

a) ANALYSIS OF VARIANCE (ANOVA) RESULTS FOR DIVERSITY OF IWPS WITH DISTANCE FROM CENTRE OUTWARDS

ANOVA (Kilak IDP camp)

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1173.28	1.00	1173.28	3.89	0.05*	4.006872822
Within Groups	17484.72	58.00	301.46			
Total	18658.00	59.00				

* significant (P≤ 0.05); ns = not significant (P >0.05)

b) ANALYSIS OF VARIANCE (ANOVA) RESULTS FOR SIZE CLASS OF IWPS WITH DISTANCE FROM CAMP CENTRE OUTWARDS

ANOVA (Lakoga IDP camp)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	374.3206732	1	374.3206732	6.203889546	0.01 *	3.8485887
Within Groups	78799.40407	1306	60.33645028			
Total	79173.72474	1307				

* significant (P≤ 0.05); ns = not significant (P >0.05)

ANOVA (Patongo IDP camp)

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	142.18712	1	142.1871	4.751236	0.03 *	3.85254
Within Groups	25168.055	841	29.92634			
Total	25310.242	842				

* significant (P≤ 0.05); ns = not significant (P >0.05)