Local Uses and Conservation Status of On-Farm Tree Species in Budaka Sub-County Budaka District, Eastern Uganda

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ABSTRACT

This study focused on local uses and conservation of tree species in Budaka sub-county, Budaka district, Uganda, in light of the challenges for future management and conservation of trees. Tree species are sources of essential goods and services. They protect the soil from erosion, as well as maintain rates of evapo-transpiration and increase the soil's infiltration capacity. However, a number of human activities have led to destruction and general decrease of existing flora. Data were collected by ethno botanical survey to gather detailed information from the respondents. A total of two hundred and ninety (290) respondents were selected as sample for the study with the use of systematic sampling techniques. The research instruments used for data collected for the study were questionnaire and interview. Frequencies and percentages (%) were used to summarised the data. The conclusions from this study are that there was adequate availability of Senna siamea, Mangifera indica Artocarpus heterophyllus Albizia coriara Ficus natalensis and Makharmia lutea belonging to family Fabacea, Anarcadiacea, Moracea, Mimosacea and Bignoniacea which occur most frequently in the area as being used for many purposes such as used for medicine, timber, firewood, charcoal, fodder, fruit and as source of income. However, the preponderance of the people in the sub county engage in conservation practices for future use. The study therefore recommends that the government should enact laws governing the use of tree species in various villages. Community should be sensitized and educated about the utilization and conservation of tree species.

Key words: Trees species, local uses, conservation and Budaka Sub county, Uganda

Introduction

Trees are widely recognized as a source of goods and services. They protect the soil from erosion, maintain rates of evapo-transpiration and increase the soil's infiltration capacity (Brown, 2006). In addition to the physical contribution to the environment, trees also provide ecological, economic, social, religious and cultural benefits (Mainagwa, 2010). Among the benefit provided by trees were potentials and limitations for improving human welfare (Angelsen and Wunder, 2003). Tree species improve human welfare by a range of ecosystem

services through provision of resources including timber, nontimber forest products, climate regulation, soil formation as well as recreation. Tree species also supplement household income thus providing safety nets (Pattanayak and Sills, 2001). However, A number of human activities such as logging, bushfires and cultivation have led to destruction and general decrease of existing trees. Of the myriad causes of depletion of trees, include the increasing unsustainable utilization for instance provision of fuel wood and medicine which have been identified as one of the biggest threats to forest covers (Agarwala, 2006). Similarly, land degradation for agricultural production, especially under intensive agricultural practices, is believed to lead to loss of tree species biodiversity (Simon *et al.,* 2004). The loss of woody plants that supply products that are important for local subsistence or income generation can, therefore, leads to unprecedented challenges among individual who heavily relied on them for their livelihood. Loss of tree species does not only affect the rural community that directly depend on it, but also contribute to the current environmental challenges of greenhouse effects that leads to climate change that are faced by a world today (FAO, 2009).

 On a global level, 80% of the world's population is believed to rely to some extent on tree resources, as for most people living in Africa, tree species are indispensable to their daily existence with frequent use of wild woody plant species for food, medicine and firewood (Tabuti, 2012). In Uganda, tree species contribute significantly to the country's economy and account for 5.2% of Gross Domestic Product contributed in terms of income, taxes and employment for about 20,000 people (NFA, 2005). NFA, 2005 further emphasizes that about 90% of the Ugandan population depends on fuel wood as a primary source of energy. USAID, 2006 also reported that over one million people in Uganda earn their income from tree species through agro forestry, tourism and selling products like timber, charcoal, firewood, crafts and fruits. Trees also contribute to ecosystem services like watershed and ground water protection, erosion control, air purification, protection against desertification and land degradation, biodiversity conservation and avert effects of climate change through carbon sequestration (FAO, 2009). However, many tree species in Uganda have declined significantly by 20% and others threatened to extinction (FAO, 2009). According to the National Forestry policy of Uganda, Eastern region is among the regions that have been greatly affected by loss of tree species such as *Milicia excelsa* commonly known as Mvule by local people as a result of charcoal (NEMA, 2010). In Budaka sub-county, Budaka District of Eastern Uganda, tree cover on household farms and forests are deforested for timber, firewood as well as construction purposes (BLG, 2007). Despite the existence of the policies and legal frameworks such as the National Environmental Policy, National Land Act, National Forest Act, and National Environmental Management Act which are either directly or indirectly related to conservation and management of natural resources, the problem still exists (NFA, 2005). The continued loss and degradation of Uganda's biodiversity therefore, presents a serious challenge to livelihoods and economic growth. Following this challenge, there are needs for inventorization, identification tree species and their varying uses and knowledge of conservation status of the trees by rural communities in Budaka Sub-County. With the view to provide more conservation efforts and evenness to safeguard the flora (trees) in the study area.

MATERIALS AND METHODS

Study Area
The community generally are subsistence farmers belonging to Gwere ethnic group and the main language spoken is Lugwere. Other languages include Lusoga and Lunyole. The main cash crops are coffee and cotton. Fruit and vegetable growing is also common, with tomatoes, onions, carrot and cabbage (BLG, 2007).
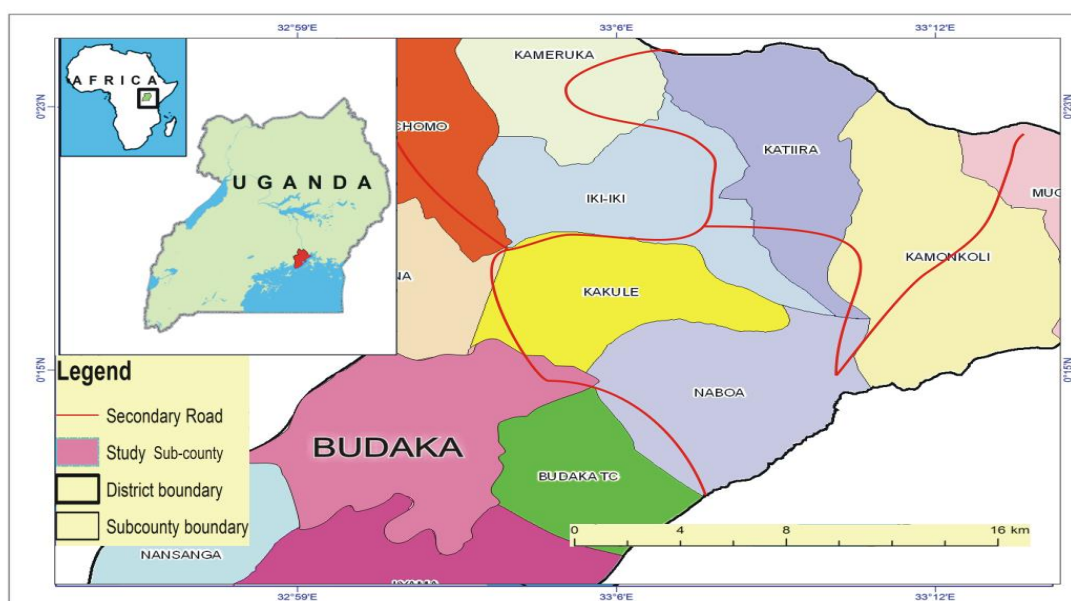
Location

Budaka Sub County is located in Budaka District, Eastern Uganda. The District is bordered by Pallisa District in the north, Mbale District in the east, Butaleja District in the south and Kibuku District in the west. Budaka Sub County is bordered by Nansanga and Lyama Sub Counties in the south, Budaka town council in the east, Kakule and Kaderuna Sub Counties in the north. The Sub County is approximately 36 kilometres from Mbale, the largest town in the sub-region; and approximately 212 kilometres from Kampala, the capital city of Uganda. The coordinates of Budaka Sub County are 01 01 00N, 33 56 42E (Latitude: 1.0150; Longitude: 33.9450) at an elevation of 1,220. metres above sea level and it's divided in to four parishes: Sapiri, Nampangala, Chaali and Gadumire parish.

Climate
The district has a sub-humid climate with a bimodal rainfall with first rains starting in early April-July while the second season starting in September- November. The total annual rainfall ranges between 1,130 mm and 1,720 mm, temperature ranges between 16.2 and 28.7 degrees Celsius and the relative humidity ranges between 52 per cent and 89 per cent (BLG, 2007).

Soil and vegetation
The soil type of the area includes ferralitic and hydromorphic and the Savannah grass is the most dominant vegetation type in the Sub County. In some parts of the Sub County, there is a mixture of forest remnant and incoming savannah trees, and a grass layer dominated by *Pennisetum perversion* (BLG, 2007).

Figure 1: Location of the Study Area in the Budaka Sub County, Uganda

Research Design

Ethnobotanical survey was used in this research to collect data on the different tree species, uses and conservation status.

Sample selection

Before the commencement of data collection, permission was obtained from the Chief District administrative officer (CAO), District Natural Resources Officer and the Sub County Chief by an introductory letter from the Dean Faculty of Science, Islamic University in Uganda. Budaka Sub County comprises of four parishes: Sapiri, Nampangala, Chaali and Gadumire. However, data for this study was collected from two parishes namely Sapiri and Nampangala; and specifically, from two villages of each parish that were randomly selected. The four villages from the two parishes were Nansekese, Sapiri, Nampangala and Nawango One research assistant and a Parish Chief from each of the two parishes were hired as lead persons to help in language interpretation during data collection. Ethical conduct was insured by following the principles contained in the Code of Ethics of the International Society of Ethnobiology (I.S.E, 2009).

Sampling Technique

The sampling technique employed for this research was systematic random sampling. Five households were selected at the start, skipping two households and then selecting the next five households in that order until the required number was reached, this is because the arrangements patterns of the households in the communities were clustered, therefore this minimized spatial effects

Data Collection procedure

A total of 290 respondents were selected in the study area. Data was collected through a survey employing Semi-structured questionnaire and interview. The questionnaire was designed using a check list of questions and were held with an individual selected from particular household targeting majorly the most mature individuals, to obtain information on aspects relating to the use of tree species and perception toward conservation strategies in their local areas. Group discussions were at times held with members of a particular households and this complemented on the interviews. All respondents were local residents identified through household number by systematic random sampling. The questions in the questionnaire were translated verbally into Lugwere by the lead persons hired. The respondents were asked to state their bio data, give information on various uses and conservation methods of the on-farm trees in their area.

Specimen collection and identification

Trees were initially identified by participants with their vernacular names; the entire tree species mention by the participants in the study were identified and recorded. The unidentified specimens were collected, pressed and taken to the taxonomist in Makerere University herbarium for proper identification and authentication where voucher specimens were deposited at the Herbarium. Similarly, the specimens were collected according to the standard practice, including leaves, flowers and fruits where possible (Gary, 1995).

Data analysis

The data collected in the study were checked for completeness and their responses in the questionnaire were assigned codes and labels and then analysed using descriptive statistics (frequencies and percentages) with the help of Statistical Package for Social Sciences (SPSS) version 22.0. Information obtained from the International Plant Index and **www.plantzafrica.org** was used to validate the documented species and to establish their families (IPNI, 2012).

RESULTS AND DISCUSSIONS

On Farm tree species Composition in Budaka Sub County

A total of 28 tree species belonging to 16 families were documented as being used by people in the four surveyed villages of Budaka Sub County (Table1). Family Moraceae had the highest number of tree species. This is a   family of tree species such as *Artocarpus heterophyllus, Ficus natalensis, Ficus platyphylla* and *Ficus sur.* The dominance of family Moraceae*,* was due to the high presence of *Artocarpus heterophyllus* that might be attributed to its several uses. The fruits of this tree can be consumed at household level, sold to generate income and its branches are cut and used for fire wood. This observation agrees with that of Semenya and Maroyi *et al.,* (2012). That each tree may have multiple uses rather than single use depending on the availability to the people as source of food, medicine and firewood. The family with the second highest number of trees was Ceasalpinniaceae followed by Meliaceae, Anarcadiaceae, Mimosaceae and Bignoniaceae; while the family with least number of trees was Annonaceae followed by Combretaceae and Pinnaceae. Family Annonaceae has tree species that have single uses such as producing edible fruits while Combretaceae and Pinnaceae have trees used for mainly timber production.

Table 1: Tree Species, their Abundance and Density per Hectare in the study area.

Botanical name	Family name	Local name	Abundance	Utilization category
Ablizia coriaria Welw.ex Olive	Mimosaceae	Musita	29	Medicine
Albizia zygia (DC) Macbr	Mimosaceae	Mulongo	4	Firewood
Aleurites moluccanus L	Euphorbiaceae	Kabakanjagala	5	Medicine
Annona muricata L	Annonaceae	Musaferi	2	Food/fruit
Artocarpus heterophyllus Lam	Moraceae	Fene	35	Fruits
Azadirachta indica A. Juss	Meliaceae	Azadirachta	4	Timber
Citrus sinensis (L) Osbeck	Rutaceae	Muchungwa	17	Fruits
Combretum collinum Fresen	Combretaceae	Mukoola	5	Medicine
Entandophragma angolense Welw	Meliaceae	Mukusu	16	Timber
Eucalyptus grandis W. Hill	Myrtaceae	Kalitunsi	18	Timber
Ficus natalensis Hochts	Moraceae	Mugaire	29	Firewood
Ficus platyphylla Delile	Moraceae	Mukooko	11	Firewood
Ficus sur Forssk	Moraceae	Mukoonyo	25	Firewood
Greveria robusta A. cunn	Proteaceae	Guluveria	10	
Grewia mollis (Hochst ex A. Rich)	Tiliaceae	Mukooma	5	Medicine
Jatropha curcas L	Euphorbiaceae	Kiroowa	5	Medicine
Khaya anthoteca Welw C.DC.	Meliaceae	Mahogany	1	Timber
Mangifera indica L	Anacardiaceae	Muyembe	48	Fruits
Makharmia lutea (Benth)	Bignoniaceae	Musambya	33	Firewood
Melia azaderach L	Meliaceae	Lira	28	Timber
Milicia excels (Welw) C.C. Berg	Moraceae	Mvule	37	Charcoal
Persia americana Mill.	Lauraceae	Ovacado	28	Fruits
Piliostigma thoningi Schum	Fabaceae	Kiraama	4	Medicine
Pinus patula Schiede	Pinnaceae	Pine	9	Medicine

Psidium guajava L.	Myrtaceae	Mupera	7	Fruits
Senna siamea Lam	Ceasalpinniaceae	Mugasiya	44	Firewood
Tamarindus indica L.	Ceasalpinniaceae	Mukooge	8	Medicine
Terminallia glaucuscense Hochts	Combretaceae	Terminallia	7	Timber

Source: Survey (2020).

Utilization of On Farm Trees in Budaka Sub County

Various uses of on farm trees were reported by respondents during the study. Some of these uses included provision of firewood (33.5%), timber (14.2%), charcoal (11.4%), edible fruits (10.7%) and Poles (9.8%) in the decreasing order of percentages (figure 4.2). These products were used in households for subsistence or being sold to earn cash income. Some other uses that were less frequently mentioned included fodder, (4.0%) medicine (7.5%) and others (7.5%). This finding agreed with that Tabuti (2012), that tree species in Uganda were frequently used for food, medicine firewood, charcoal, timber and poles than all other uses.
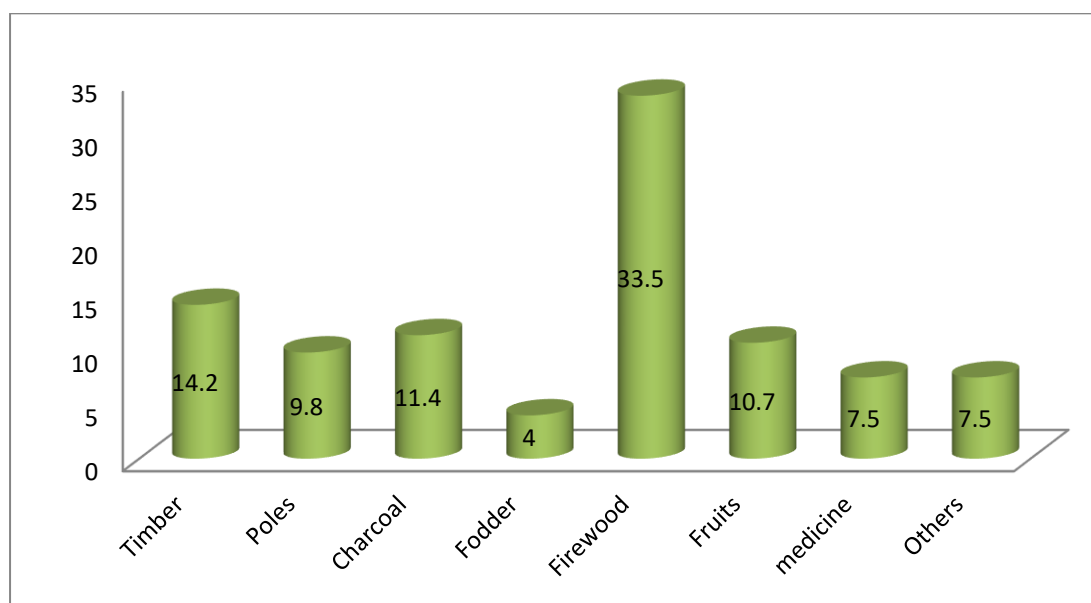

Figure 2 Ethno Uses of Tree Species

The findings also revealed that various tree species are used for various purposes by the people of Budaka for example, *Tamarindus indica, Artocarpus heterophyllus and Mangifera indica* were reported to be used for providing firewood, charcoal, timber poles medicine food and shade while *Milicia excelsa, Senna siamea Makharmia lutea and Eucalyptus grandis* were said to be used for providing firewood, charcoal, timber windbreaks, poles and shade. Generally, the majority of the tree species were multi-used depending on their availability to the people. These findings agree with those of Semenya (2012); Shanley and Luz (2003). who also found that, single tree species had multiple uses in Limpopo Province, South Africa and Eastern Amazonia, Brazil respectively. It was however also established that there are some tree species

that are becoming rare, these were mostly those that are used for providing timber and includes the following *Maeopsis eminii, Khaya anthoteca* and *Piliostigma reticulatum*

Availability of On-Farm Tree Resources in Budaka Sub County

Results in Table 2 show that 88.9% of respondents agreed that there is reduction in tree species resources; while 11.1% were of the opinion that there is no reduction. From the respondents, the causes of this reduction are many some of which included: high population growth which has resulted in the over utilisation of the tree resources, cutting down of trees due to shortage of land for cultivation and bush burning. These findings agree with those of Smith, *et al.,* (1996) who reported that availability of certain important tree species in northern Tanzania decreased due to high utilization pressure as a result of charcoal, timber and fire wood.

Similarly, results in Table 2 further show that 22.5% of the respondents agreed that it is easy to obtain tree species resources; while 77.7% were of the opinion that it is not easy to obtain them. This might be because of the scarcity of the tree as indicated in Table 2 The majority of the people (62.1%) obtain or harvest the on-farm plant resources from a distance of about one kilometre while few of them (0.8%) get resources beyond 3 kilometres.

Table 2: Changes in Availability of Tree Resources

Item	Frequency	Percentage
Are these tree species reducing		
Yes	225	88.9%
No	28	11.1%
Is it easy to obtain tree species resources		
Yes	57	22.5%
No	196	77.5%
Distance covered to harvest tree species		
Below 1 kilometer	157	62.1%
2- 3 kilometers	90	35.6%
3- 4 kilometers	2	0.8%

Source: Survey (2020)

Harvesting of the Tree Resources in Budaka Sub County

Various parts of the trees were reported to be used (Table 3) as follows; Branches (33.2%) were the most common tree parts that were reported to be used by the people in Budaka Sub County; followed by stem (28.4%), fruits (20.9%), leaves (9.8%) and roots (5.1%). Branches and stems were the most used parts because these are the parts that are used for providing firewood and timber. Fruits were also reported to be the commonly used part of the plant because they are always collected for food and for commercial purposes. Leaves and roots were the least mentioned parts of the trees that were utilized mainly for providing fodder and medicine. These findings agreed with those of Ojelel and Kakudidi (2015) who reported that many parts of trees are used by the community in Obalanga Sub County.

The study also found out that people in Budaka Sub County use various types of tools for harvesting tree resources which include; power /fuel saw (33.2%), axe (23.7%), hand saw

(17.4%), knife (13.4%) and others (9.5%). Power/ fuel saw and axe were the most frequently mentioned tools used and these methods of harvesting are rather destructive since they involve the removal of whole stem or trunk and hence this threatens most of the on-farm tree species. These findings agreed with those of smith *et al.,* (1996) who reported that some of the harvesting methods such as the use of fuel saw and axe affects some tree species as far conservation is concerned. It can lead to extinction of some of the on-farm tree species.

The study further found out that the majority of the people (48.6%) frequently harvest trees on their farm once in a week, (24.5%), once in a month, (8.7%) once year and others (15.8%). The dominance of weekly harvesting of the tree resources will impose utilization pressures that decrease the availability of important tree species. These findings agreed with those of smith *et al.,* (1996) who reported that frequent use of tree species result in the decrease availability of tree species in Tanzania as a result of timber, firewood and charcoal.

Table 3: Harvesting of Tree Resources

Item	Frequency	Percentage
What parts of the tree do you use		
Stems	72	28.4%
Branches	84	33.2%
Leaves	25	9.8%
Fruits	53	20.9%
Roots	13	5.1%
What do you use to harvest tree resources		
Hand saw	44	17.4%
Axe	60	23.7%
Power/ fuel saw	84	33.2%
Knife	24	13.4%
Others	34	9.5%
How often do you harvest the tree resources		
Once a week	123	48.6%
Once a month	62	24.5%
Once a year	22	8.7%
Others	40	15.8%

Source: Survey (2020).

Conservation and Management of On-Farm Tree Species

Table 4 reveals that 86.9% of the respondents are involved in the conservation and management of tree species in Budaka Sub County while 95.3% reported that these acts is beneficial to their livelihood. The findings further reveal that the majority of the people (76.4%) conserve and manage their on-farm trees by planting while others do so by practicing controlled use of the tree resources (15.4%); using good harvesting methods that encourage regeneration for example coppicing (4.3%) and use of cultural practices (1.5%). However the study found out that there was also involvement of the local government on conservation and management of tree through educating people (57.7%), training forest personnel (26.8%) and selling of seedling (15.0%) to the local community These findings are in agreement with Yrjola (2002) who reported that controlled grazing, planting of trees on farmlands, community sensitization and sustainable harvesting by restricting harvesters are good measures for conservation and management of tree species.

Table 4 Conservation and management of Tree Species

Item	Frequency	Percentage
Involvement in the conservation and management of trees		
Yes	220	86.9%
No	33	13.0%
Whether conservation and management of trees is beneficial		
Yes	248	95.3%
No	12	4.7%
Conservation and management strategies used		
Planting	193	76.2%
Controlled use	39	15.4%
Use of good harvesting method e.g. coppicing	11	4.3%
Cultural practices	04	1.5%
Others	06	2.3%
Involvement of local government in conservation and management of tree species		
Educating people	146	57.7%
Training forest personnel	68	26.8%
Selling seedling to people	38	15.0%

Source: Survey (2020).

Conclusion

The study concluded that on-farm tree species still play an important role in the surveyed villages of Budaka Subcounty. Furthermore, for sustainable utilization and long-term conservation of plants in these areas the government should enact laws governing their uses and assist communities in the management of their plant resources in the area.

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