INDIGENOUS TRADITIONAL KNOWLEDGE ON LANDSCAPES, BIODIVERSITY USE IN MT. ELGON FOREST ECOSYSTEM AND IMPLICATIONS FOR CONSERVATION

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ABSTRACT

The integrity of the forest ecosystem is shaped by communities' uses, traditional knowledge, and practices. Because community participation is critical in the management of conservation areas, it is essential that resource managers and policymakers understand local traditional knowledge, biodiversity use to inform appropriate interventions. This study was undertaken to document traditional indigenous knowledge on landscapes, biodiversity uses, and their impacts. It formed part of a wider study meant to develop forest restoration efforts to enhance the flow of ecosystems services and livelihoods of local communities in the Mt. Elgon forest ecosystem. The study used Participatory Rural Appraisal (PRA) techniques to capture traditional indigenous knowledge on landscapes, forest biodiversity uses, and their importance to local livelihoods. Types of landscapes and biodiversity uses were free listed and importance value assessed using the weighted ranking method. Twelve landscapes were identified as important to local people and their associated faunal and floral species. Fifteen plant and ten animal species were ranked in order of importance to local communities. These forest biodiversity resources provide human health, shelter, cultural and spiritual wellbeing, and cash income. This study has shown that forest biodiversity is important to the local livelihoods and local people have wealth of traditional knowledge on forest biodiversity, uses, and management practices. Although traditional knowledge is gradually declining because of socioeconomic and cultural change; it is imperative to integrate some of this knowledge in forest management.

Keywords: Traditional indigenous knowledge, Biodiversity, Livelihoods

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INTRODUCTION

Forest biodiversity underpins ecosystem functioning and the generation of benefits that support multiple dimensions of local livelihoods. The integrity of the forest ecosystem is shaped by communities' uses, traditional knowledge, and practices. Most conservation strategies seldom integrate local indigenous knowledge and aspirations of the local people and this has created friction between communities and resources managers (Berkes, 2004). There are opportunities for mitigating these conflicts by tapping into local indigenous knowledge particularly on uses and conservation (Biswas, 2003). The integration of indigenous knowledge is critical in ensuring community participation in resource management as articulated in the Kenya Constitution (Chapter 5 Article 69(1c) and Forest Conservation and Management Act 2016. The application of indigenous knowledge and values of biodiversity by local communities are increasingly being recognized globally as important ingredients for crafting viable biodiversity conservation strategies (Ellen, 1996; Biswas, 2003) This is because the integration of such indigenous knowledge into conservation programs facilitates knowledge sharing, trust-building and enables constructive engagement among stakeholders. It also instills shared vision, ownership, and responsibility towards the achievement of goals. Integration of indigenous knowledge and practices can build social capital (local support) goodwill, adoption, and promote and provide sustainable insurance against conflicts (Smith and Pretty, 2004). Furthermore, it may assist in achieving the dual goal of conservation and sustainable community development (Otieno and Analo, 2012. Studies have shown that local people are more knowledgeable than outsiders because of their long association with and use of biodiversity that are firmly ingrained in their local cultures and values (Rainforest Foundation, 2012; Kala, 2009; Smith and Pretty, 2004). The indigenous knowledge of the local people has remained largely ignored and

untapped in Kenya and therefore accumulated knowledge for biodiversity conservation is scanty. Mt. Elgon forest ecosystem is one of the critical Water Towers in Kenya. However, it is threatened by anthropogenic activities, yet it is a reservoir of flora and fauna diversity of immense potential. Past studies have indicated that local communities have encroached on about 10,000ha (Ochuoga, 2002). If the biodiversity of this ecosystem is not documented and integrated into conservation measures, the indigenous knowledge and potential value will be eroded. Because community participation is critical in the management of conservation areas, it is essential that resource managers and policymakers understand local traditional knowledge, biodiversity use to inform appropriate interventions. This study was undertaken to determine the important values of different landscapes to the local people, to identify biodiversity and ecosystem services critical for livelihoods, and to explore indigenous ecological knowledge (uses and management practices). The forest is an important regional resource that supports local economies through direct and indirect uses. Besides, the ecosystem provides biological, aesthetic, touristic, cultural, educational, employment, resource, and carbon sink values that are significant and could mitigate poverty and the likely negative effects of climate change. It is habitat to 37 "globally threatened" species (22 mammals, 2 insects, and 13 bird species) and is also home to 9 endemic animals. The alpine chat, long-crested eagle, Cape Robin-chat, and yellow-whiskered greenbul are among the 240 documented bird species. Sixty-seven reptiles and amphibians and 179 species of butterflies have also been documented in the Mt. Elgon region (Makenzie, 2016; Davenport, 1996; Larsen, 1991). The forest hosts many plant species such as Elgon teak, Indigenous bamboo, etc. making the area a priority for species conservation.

This paper outlines the important role of forest biodiversity in local livelihoods and the need to incorporate indigenous knowledge in sustainable management and use of plant resources. Some of the important landscapes and biodiversity use (plant and animal) suggests ways of integrating indigenous knowledge in the conservation and restoration of degraded forested landscapes.

MATERIALS AND METHODS

Study sites

The study was conducted in the Mt. Elgon forest located in the northeastern part of Bungoma County, Western Kenya. This forest is one of the key water towers and is distinguished by rich biodiversity. The ecosystem lies between 0°52' and 01°25'N, and between 34°14' and 34°44'E (Figure. 1). It is an extensive transboundary resource between Kenya and Uganda covering 2,223 square kilometers, of which 1,078 square kilometers fall on the Kenyan side. The ecosystem covers an area of about 772,300 ha made up of 221,401ha of protected areas and 550,899 ha of farmlands and settlements of which 180,000 ha of the forest are in Kenya.

This study was undertaken using key informants and stakeholders adjacent to Kaberwa and Kaboywo forest blocks of Mt. Elgon forest ecosystem. The sites were selected based on preliminary assessment and discussions with key informants Kenya Forest Service (KFS) and Community Forest Association (CFA).

Data collection

Purposive sampling was used to select key informants. Twenty-two key informants (one key informant from each sampled village) were selected based on the following criteria: familiarity with the area and the local people, and having a broad and in-depth knowledge about his/her village, its households, and the forest issues in general and age (men and women > 50 years) and specialized resource users were targeted for the Focus Group Discussion. The selection of key informants was screened with the assistance of officers from KFS and local CFA and local opinion leaders. Local organizations such as CFAs, Community based organization (CBO), Water Resources Users Association (WRUA), and government agencies (KFS and Kenya Wildlife Services (KWS)) participated in the study. Indigenous knowledge on biodiversity was obtained through historical and ecological reconstruction of the past through storytelling. The Knowledgeable persons were allowed to narrate while encouraging others to contribute. All the landscapes, forest products and services, important plants (tree), and animals important for local livelihoods were free listed during the meetings. Pebble Distribution Method (PDM) was used to rate the importance of the above items using 50 bottle tops, where participants were asked to distribute amongst the various items of interest-based on the perceived important value at the community level. The participatory ranking exercise was led by one person from the community while researchers acted as facilitators. The outcome of participatory ranking was completed through consensus

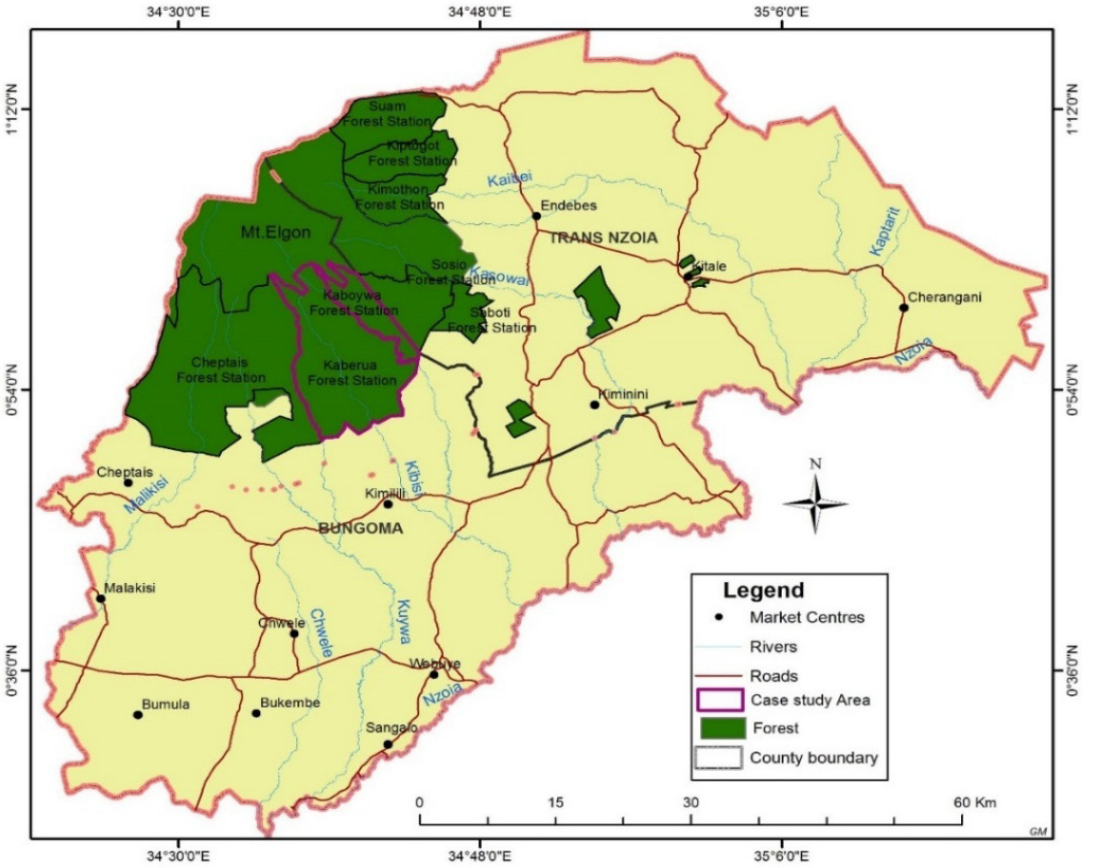

Figure 1. Mt. Elgon ecosystem selected case study forest blocks and forest adjacent villages

(Poffenberger *et al*., 1992; Hughes and Dumont, 2002; Sheil *et al*., 2002; Lynam *et al.*, 2006).

Data analysis

The data obtained from FGD were triangulated with secondary sources. The importance value was computed using the formula below as described by Lynam *et al.*, (2006).

Where I_v is the importance value

RESULTS AND DISCUSSIONS

Local knowledge on landscapes, characteristics, and their perceived importance

The local communities have developed local indigenous knowledge because of their long association which can be harnessed in developing sustainable use strategies of biodiversity resources. Local communities ranked the importance of different landscapes using the PDM method (Sheil *et al*., 2002; Lynam *et al*., 2006). The summary of the participatory ranking exercise is shown below in Table I.

TABLE I - LOCAL IMPORTANT VALUE OF DIFFERENT LANDSCAPE IN MT. ELGON AS PERCEIVED BY THE LOCAL COMMUNITY (PDM)

Name		**Perceived importance**	**Importance Weight**	**Relative Importance Value**
Common (English)	**Local (Saboat)**			
Hills	Legemosiek	Security site/watchtower, Training of athletes, Grazing ground, Rainfall attraction, Harvesting of natural herbs	4	0.08
Mountain	Tulondok	Source of rivers, Tourist attraction, Habitat for wildlife, Hunting sites, Herbal medicine source, Cultural sites	5	0.10
Flat plains	Ketowoosiek	Grazing, Resting places, Recreational site, cultivation, and human habitat	5	0.10
Wetlands	Saoset	Source of thatching grass, Source of water, Planting tuber crops, Source of small rivers, Sites for beekeeping, Cultural sites, Source of reeds for basketry	2	0.04
Rivers	Aonosiek	Source of water for domestic and anima use, Marking boundaries, Water for irrigation, Source of fish, Swimming, Pumice stone for scrubbing feet, Cultural sites (rites of passage)	5	0.10
Forest	Wooget	Source of firewood, medicinal herbs, Timber, Habitat for wild animals, Farming, Honey production, Tourism, Rain attraction, Source of seedlings, Grazing area, community security, Habitat for flora and fauna, Source of medicinal herbs, Cultural sites	12	0.22
Settlement	Rorokosiek	Boundary markings between residents and forests, Geo-referencing point, Administrative units, Livestock rearing, Establishment of schools and hospitals, Churches and mosques, Market centers	8	0.16
Caves	Kebonosiek	Salt lick, Security- Hiding places, Habitat for wild animals, Tourist attraction, Recreation, Source of water and minerals	3	0.06
Valleys	Ronkosta	Making roads, agricultural land, grazing, Decorative clay	2	0.04
Escarpments	Rengeriet	Marks boundaries between upper and lower zones, Medicinal herbs, Habitat for wildlife and plants, Tourist attraction (aesthetic), Waterfalls – Tapping area for water	3	0.04
Forest edge	Marmarta	Grazing, Demarcation of forest and settlement, Roads, Fireline	1	0.02
Total			50	1.00

Forested landscapes are highly valued, followed by settlement areas, mountains, flat plains, and rivers which are rated important for livelihoods. The perceived importance of the forest is reflected in the importance of values attached to the forests as sources of products and services to the local community (Table I). This implies that forests are threatened and there is a need for effective management by determining which species are preferred locally and can therefore be successfully adopted into conservation plans. It is important also to understand the attitudes of the community towards tree conservation and their willingness to adopt agroforestry technologies aimed at establishing individual and community woodlots for fodder, fuelwood, timber, and other forest product needs. Failure to do this will lead to the loss of important traditional tree resources that will put the livelihoods of the local community at stake and increase poverty levels (Otieno and Analo, 2012).

Forest products and services from Mt. Elgon

Forest ecosystem is perceived by the local community as of primary importance as human settlement, source of posts, animal grazing, firewood, and water. The human settlement ranked high and this is a source of concern for the survival of the forest. The locals see the forest as reserve land to be occupied by the community and they believe the forest is rightfully theirs. It has therefore been subjected to various human pressures generated by human activities in agriculture, logging, and a host of other developmental projects. Needless to add, all these activities have led to a steady depletion of forest resources. Other studies have shown that the influence of anthropogenic activities on the natural forest has been profound particularly on the biodiversity of forest ecosystems (Whitmore and Sayer (1992). This, in turn, has negative effects that change the quality of stand, microclimate, nutrient cycling, and composition of forest species. The next important products from the forest after human settlement are the extractive use values (grazing, poles/posts, firewood, and water (Table II). The role of forest ecosystem in environmental quality and biodiversity conservation is recognized by the community and this could be a good entry point for introducing good conservation practices and sustainable use of Mt. Elgon. The people of Mt. Elgon are aware of the problems they face to provide for their families, to produce sufficient fuelwood for domestic use, together with the need to sustain biological diversity in combination with continuing provision of fodder (Mengich, 1994), fruits, dyes, tannins, gums, resins, and medicines (Cooper *et al.,* 1992). As the population increases, their troubles increase and they are forced to farm marginal land and clear the forest which is vulnerable to degradation and may result in poor crop yields and widespread poverty (Glover and Elsiddig, 2012; Barbier, 1999).

Knowledge about tree species and their associated ecological zones

According to local communities, there are two identifiable zones namely Mosoop (Upper zone, mountainous areas) and Soil (lower zones-lowlands). Local communities listed tree species associated with different ecological zones (Table III).

Biodiversity and their importance to livelihood in Mt. Elgon

Plant species important to livelihoods

Ten tree species were identified as important to the local people. Table IV shows the rankings of the species identified by the community. From the list, the exotic tree species (Eucalyptus and Cypress) are perceived to be very important and this is followed by indigenous tree species of *Croton macrostachyus, Olea Africana* and *Prunus Africana*. The importance of the exotics is due to their fast growth and multiple-use and market value (Glover, 2012). The indigenous species were also ranked due to their medicinal, cultural, and spiritual values. The number of ranked indigenous tree species was quite high indicating the potential use of the species for forest restoration and intensification of trees on farms. Local communities rely on indigenous trees for food, medicine, and income. These species also contribute to a cleaner environment as they sequester more carbon compared to exotics species. The collection, processing, and marketing of indigenous tree products represent a significant portion of rural household income particularly in areas where farming is marginal (Buyinza *et al*., 2015). Indigenous tree species are becoming scarce due to unsustainable land management practices and destructive harvesting methods. Harvesting products such as medicine from indigenous trees is often destructive and leads to wood deterioration due to insect damage and fungal infection (Chungu *et al*., 2007, Wyk and Prinsloo, 2018). Developing sustainable harvesting and processing methods will go a long way in ensuring the continued supply of valued products from indigenous tree species(Vermeulen 2009, Chungu *et al*., 2007, Wyk and Prinsloo, 2018).

TABLE II - IMPORTANT AND RELATIVE IMPORTANT VALUES OF FOREST PRODUCTS AND SERVICES AS PERCEIVED BY THE LOCAL COMMUNITY IN MT. ELGON

Type of use	**Products/services**	**Importance weight**	**Relative Important Value**
Consumptive	Human settlement	6.00	0.12
Consumptive	Grazing	5.00	0.10
Consumptive	Poles/ Posts	5.00	0.10
Consumptive	Firewood	4.00	0.08
Consumptive	Water	4.00	0.08
Consumptive	Medicine (human and livestock)	3.00	0.06
Consumptive	Charcoal	2.00	0.04
Consumptive	Employment	2.00	0.04
Consumptive	Honey	2.00	0.04
Consumptive	Timber	2.00	0.04
Consumptive	Vegetables/mushrooms/bamboo shoots	2.00	0.04
Consumptive	Cultivated foods	1.00	0.02
Consumptive	Source of tree seedlings	1.00	0.02
		39	**0.78**
Non-consumptive	Environmental quality	3.00	0.06
Non-consumptive	Habitat for wild animals	3.00	0.06
Non-consumptive	Cultural sites/ spiritual	2.00	0.04
Non-consumptive	Aesthetic value/ Scenery	1.00	0.02
Non-consumptive	Education and research	1.00	0.02
Non-consumptive	Recreation (Ecotourism)	1.00	0.02
		11	**0.22**
	Total	**50.00**	**1.00**

TABLE III - DISTRIBUTION OF TREE SPECIES AS REPORTED BY LOCAL COMMUNITIES IN MT. ELGON

Ecozone (Kooret)	**Tree species**		
Common name	**Local name (Sabout)**	**Common name**	**Botanical name**
Upper Zone (Mosoop)	Pegerondiet	Elgon Olive	*Olea capensis*
	Saptet	East African yellow wood	*Podocarpus latifolia*
	Keterwet	African pencil cedar	*Juniperus procera*
	Armootit	Red stinkwood	*Prunus africana*
	Cheptuiyet	Abyssinian diospyros	*Diospyros abissinica*
	Luliondet	Conker berry, bush plum	*Carissa spinarum*
	Masitetet	East African Olive	*Olea capensis*
	Koroshwandet	Wild olive, brown olive	*Olea europea ssp africana*
	Kibumatet	Ekerbergia	*Ekerbegia capensis*
	Simatweet		*Ficus thoningii*
Lower zone (Soi)	Tungurwet	Governors plum	*Flocourticia indica*
	Chebitet	Red Thorn	*Acacia lahai*
	Saonet	Elaeodendron	*Elaedendaron buchananii*
	Mushyembut	Peacock flower	*Albizia gummifera*

TABLE IV - IMPORTANCE VALUES OF TREE SPECIES AS PERCEIVED BY LOCAL COMMUNITIES IN MT. ELGON

Local name	**Common names**	**Botanical name**	**Local uses**	**Importance Value**	**Relative Importance Value**
Mtimbao	*Blue gum*	*Eucalyptus spp*	Timber, poles, posts, agricultural tools	10	0.20
Cheparuus	Mexican cypress	*Cuppressus lusitanica*	Timber, medicine, shade, ornamental, windbreak	6	0.12
Tobosweet	Broad-leaved croton	*Croton macrostyachyus*	Firewood, charcoal, timber, medicine, bee forage ceremonial, ceremonial	6	0.12
Pergeriondet	Elgon Olive	*Olea capensis*	Firewood, timber, posts, medicine, shade, ornamental	5	0.10
Armootit	Red stinkwood	*Prunusafricana*	Timber, firewood, construction, medicine (human and livestock)bee forage, ornamental, shade	4	0.08
Tungururuet	Governors plum	*Flocourticiaindica*	Firewood, charcoal poles , tools, fruits nuts medicine, bee forage, mulch, soil conservation, live fence	4	0.08
Sananteet	Murkhamia	*Markhamia leutea*	Timber, Firewood, artifacts, poles, medicine, bee forage, shade, ornamental, soil conservation, windbreak	3	0.06
Tegandet	Mountain bamboo	*Yushania alpina*	Fencing, construction, vegetables, Quivers, arrows, containers, walking stick, ceremonial	3	0.06
Katarweet	African pencil cedar	*Juniperus procera*	Firewood, charcoal, timber, poles, posts, medicine, tools, beehives, bee forage, ceremonial, ornamental	2	0.04
Septeet	East African yellow wood	*Podocarpus latifolia*	Firewood, timber, posts, medicine, shade, ornamental,	1	0.02
Others		Various		6	0.12
Total				**50**	**1.00**

Important tree species and their sources

The local community listed important tree species and sources in their environment (Table V). Most exotic species are cultivated (planted) and indigenous tree species (Elgon teak, Cedar, and bamboo and Podos are mostly obtained from indigenous forests. The only species collected from wild sources and not cultivated is *Juniperus procera* and it implies that the species may need special attention in terms of protection and domestication. The other indigenous species have been domesticated in this area; the interventions could focus on promoting farm intensification of tree species growing to ease pressure from wild sources (natural forest).

Plant species have many functions and uses by the local community and below is the list of medicinal plants of importance to the local people. The list identified by the community as important as medicinal plants was also reported by Okelo *et al*., (2010) and Jeruto *et al*., (2008) (Table VI).

TABLE V - SOURCES OF PRIORITY TREE SPECIES FOR PRODUCTS IN MT. ELGON

Tree species name			**Where sourced (Score) (RIW)**			
Local (Sabout)	**Common name**	**Botanical**	**Wild from forest**	**Cultivated**	**Bought**	**Total**
Mtimbao	Blue gum	*Eucalyptus spp*		0.6	0.4	1.0
Cheparuus	Mexican Cypress	*Cuppressus lusitanica*		0.4	0.6	1.0
Pergeriondet	Elgon Olive	*Olea capensis*	0.8	0.2		1.0
Tobosweet	Broad-leaved croton	*Croton macrostachyus*	0.3	0.7		1.0
Sananteet	Murkhamia	*Markhamia lutea*	0.1	0.9		1.0
Katarweet	African pencil cedar	*Juniperus procera*	1.0			1.0
Armootit	Red stinkwood	*Prunus africana*	0.5	0.5		1.0
Tegandeet	Mountain bamboo	*Yushania alpina*	0.8	0.2		1.0
Tungururuet	Governors plum	*Flocourticia indica*	0.2	0.8		1.0
Septeet	East African yellow wood	*Podocarpus latifolia*	0.9	0.1		1.0

TABLE VII - PRIORITY MEDICINAL PLANTS, DISEASES CURES, LEVEL OF EXTRACTION AND POTENTIAL FOR FUTURE USE IN MT. ELGON

Local name	Botanical name	Diseases	Parts harvested	Impact on sustainability			Remarks
				Extent of collection	Present stock	Future potential	
Pegeriondet	*Olea capensis*	Sexually transmitted diseases, Prostate	Bark, Roots, Leaves	Very high	Very low	Very low	High demand for timber medicinal and charcoal
Kibumetet	*Bersama abbysnica*	Diarrhea, Back ache	Bark, Roots, Leaves	Very low	Very low	Very low	
Arumwatit	*Prunus africana*	Bloody diarrhea, HIV, Prostate, sex stimulant	Bark, Roots, Leaves	Very high	Moderate	Very low	
Keterwet	*Juniperus procera*	Wounds, breathing difficulty	Roots, fruits	Very low	Very low	Very low	The species is threatened by extractions for poles
Toboswet	*Croton macrostachyus*	Cattle, Malaria, Fever, Diarrhea, Fresh wounds, Snake bites	Leaves, Buds	Very low	Very low	Very low	Makes very good charcoal
Cheptuiyet	*Diospyros abbyssinica*	Fluke worms, De-worming	Roots	Very low	Very low	Very low	Rare and to extinct
Tongotuet	*Ilex mitis*	Fertility disorders, Urinal tract, Appendicitis	Bark, Roots	Low	Low	Very low	Treats multiple ailments and produces quality charcoal
Sokwondet	*Warbugia ugandensis*	Pneumonia, Colds, Headaches, Cattle, Chicken	Bark, Roots, Leaves	Very low	Very low	Very low	Highly valued for medicine
Kamyadet	*Acacia lahai*	Tooth ache, Cow diarrhea, Chest pains	Bark	Very low	Low	Very low	Good for construction, very durable in service
Mugengeret	*Cordia abyssinnica*	Stomach cramps after delivery	Bark	Very low	Very low	Very low	It has light wood
Kwiriondet	*Teclea simplifolia*	STIs, Deworming cattle, Backache, Blood cleansing	Roots, Leaves, Bark	Very low	Very low	Moderate	Used as walking sticks and agricultural tools

Animal species and their importance to the livelihood

The local community listed 10 important animal species and their importance to livelihoods (Table VII). Elephants, buffalo were ranked as the most important due to its food and nutritional values. Leopard is regarded by the local people for its fur and claws which is believed to confer fierceness and used for traditional rites of passage. Humans have used animals and their products since time immemorial. Animals are used for different purposes including; food, medicines, and religious cultural practices. Some studies have shown that the use of the surrounding fauna resources occurs mainly among populations within disadvantaged socioeconomic conditions. The extreme needs experienced by these communities often lead to the hunting of wild fauna for food purposes (Soares *et al*., 2014).

CONCLUSION AND RECOMMENDATIONS

This study has shown that forest resources (biodiversity) are important to the livelihoods of the people for provisioning services such as shelter (Timber, posts), energy (firewood and charcoal), health (human and livestock), and cash income. The local communities have had a long association with the forest biodiversity and have local knowledge in the use and management of biodiversity. Results from the study have shown that plants and animals are very critical in the livelihoods of the local people and management plans should integrate the local knowledge and the needs of the local communities. The extractive use of resources has had some negative impacts on biodiversity and any proposed interventions should take cognizant of the socioeconomic dependence of the local people. There are some notable tree species

Table 7. Importance values of animal species to local livelihoods as perceived by the community in Mt. Elgon

Species name			**Importance weight**	**Relative Importance Value**
Local (Sabout)	**Common**	**Scientific**		
Belionteet	Elephant	*Loxodonta africana*	10.00	0.20
Soyeet	African Bufallo	*Syncerus caffer*	8.00	0.16
Meliito	Leopard	*Panthera pardus*	5.00	0.10
Boineet	Water buck	*Kobus ellipsiprymnus*	4.00	0.08
Pranguut	Hare	*Lepus timidus*	4.00	0.08
Monkosieet	C. monkey	*Colobus guereza*	4.00	0.08
Saramaitaa	Gazelle	*Gazella gazella*	3.00	0.06
Ngemweet	Dikdik	*Madoqua kirkii*	2.00	0.04
Suboltit	Monkey	*Cercopithecus hamlyni*	2.00	0.04
Kibyongeet	Olive Baboon	*Papio anubis*	1.00	0.02
	Others		7.00	0.14
	Total		**50.00**	**1.00**

that the communities have identified as threatened such as Elgon teak (Mt. Elgon), Indigenous bamboo (*Yushania alpina*), *Prunus Africana*, *Podocarpus latifolia,* and *Nuxia congesta.* It notable that the decline in biodiversity is driven by population pressure, unemployment, poverty, unemployment, technological know-how, corruption, market integration (expansion of markets for forest products), agricultural expansion, and infrastructure development. This study has shown the important role of forest biodiversity to local livelihoods and therefore there is an urgent need to incorporate indigenous knowledge in sustainable management and use of plant resources. The use of forest biodiversity is currently not guided by the nexus between the needs of the people and the biophysical needs of the biological resources. Concerted action must be undertaken involving all stakeholders and taking into consideration the local realities and knowledge.

ACKNOWLEDGMENTS

We are grateful to Director KEFRI for the logistical support and EU- Water Towers Project for the financial support. We appreciate the local community of Mt. Elgon, Kapsokwony district for sharing with us their indigenous knowledge.

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