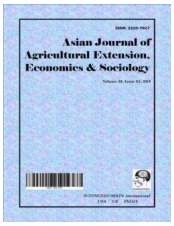

Asian Journal of Agricultural Extension, Economics & Sociology

28(2): 1-9, 2018; Article no.AJAEES.45032
ISSN: 2320-7027

The Role of Indigenous Knowledge on Use and Conservation of Wild Medicinal Food Plants in Loita Sub-county, Narok County

Peris M. Kariuki[1,2], Cecilia M. Onyango[3*], Catherine W. Lukhoba[4] and Jesse T. Njoka[1]

[1]Department of Land Resource and Agricultural Technology Management, Faculty of Agriculture, University of Nairobi, P.O.Box 29053 – 00625, Nairobi, Kenya.
[2]Kenya Resource Centre for Indigenous Knowledge (KENRIK), National Museums of Kenya (NMK), P.O.Box 40658 00100, Nairobi, Kenya.
[3]Department of Crop Production and Plant Protection, Faculty of Agriculture, University of Nairobi, P.O.Box 29053 – 00625, Nairobi, Kenya.
[4]School of Biological Sciences, University of Nairobi, P.O.Box 30197-00100, Nairobi, Kenya.

Authors' contributions

This work was carried out in collaboration between all authors. Author PMK designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors CMO, CWL and JTN reviewed the experimental design and all drafts of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2018/45032
Editor(s):
(1) Dr. Golubkina Nadezhda Alexandrovna, Agrochemical research center, All-Russian Institute of vegetable breeding and Seeds Production, Moscow Region, Russia.
Reviewers:
(1) Bogumil E. Brycki, Adam Mickiewicz University, Poland.
(2) Emmanuel Ifeanyi Obeagu, University Health Services, Michael Okpara University of Agriculture, Nigeria.
(3) Ogundeko, Timothy Olugbenga, College of Health Sciences, Bingham University, Nigeria.
(4) Mark K. Olanipekun, Ekiti State University, Nigeria.
Complete Peer review History: http://www.sciencedomain.org/review-history/27102

Original Research Article

Received 21 August 2018
Accepted 31 October 2018
Published 08 November 2018

ABSTRACT

Aims: To evaluate the role of indigenous knowledge in the use and conservation of wild medicinal food plants in Loita sub-county, Narok County.
Study Design: Stratified random sampling was used to select respondents.
Place and Duration of Study: The study was conducted in Loita sub-County of Narok County in Kenya for six months.

**Corresponding author: E-mail: ceciliam.onyango@gmail.com, cecilia.onyango@uonbi.ac.ke;*

Methodology: Data was collected through a household survey, key informant interviews and focused group discussions using a semi-structured questionnaire. For the household survey, 160 households were interviewed while 10 key informants consisting of traditional healers, village elders, spiritual leader and opinion leaders were used. The focus group discussions comprised of 15 participants (8 men and 7 women). The data collected was on habitat categorisation and use, knowledge sharing and traditional conservation methods for the species. The data were analysed using descriptive statistics to generate means, frequencies and percentages.

Results: Three habitat categories were identified; grasslands (*Olpurkel/Ongata*), bushland (*oloiparag)* and highland forests *(osupuko)* based on topography and dominant species. The forest habitat was ranked 1st as a source of water and wild medicinal food plants by both men and women and 4th (men) and 2nd (women) for dry season grazing. The grass and bushlands were considered best for grazing, cultural activities and wildlife by both genders. Additionally, the results indicated that the community named localities after dominant or unique species occurrence. The community has cultural zones with differentiated use, sacred species such as *Ficus thoningii (Oreteti) and Arundinaria alpina* (*Oltiyani*) and indigenous knowledge on sustainable use of the species.

Conclusion: The indigenous knowledge on habitat classification and different uses of wild plant species has contributed to the conservation of wild medicinal food plant species in Loita. The use of dominant plant species to give names to localities can be used to reconstruct environmental history even after species are depleted.

Keywords: Wild medicinal food plants; indigenous knowledge; conservation; Kenya.

1. INTRODUCTION

Indigenous and local communities depend on natural resources especially plants for their welfare and survival. To harvest various plant resources from wild or managed landscapes, local people used intuitive indigenous knowledge to guide them on what resources, where, when and how to collect and process products for use [1]. Indigenous knowledge (IK) on plant use is heavily influenced by the environment within which a community lives [2]. In the case of wild medicinal food plants, [3] observed that while sociolinguistic characteristics are an important factor in explaining the dietary diversity, the floristic makeup of a region contributes to the selection of species as wild vegetables. Indigenous knowledge on the use of wild plants can vary within the same ethnic group living at different eco-geographic regions. Thus traditional ecological knowledge is determined by specific ecological, historical, cultural and socio-economic context of the population [4,5]. Earlier work on wild medicinal food plants have mainly focused on ethnobotanical documentation, taxonomical, phytochemical and pharmacological analysis [6,7]. Despite previous attempts on documentation and conservation, there is concern over loss of Kenyan indigenous knowledge on wild medicinal food plants (WMFPs) and the biological resources [8]. The study was conducted to fill the gap in scientific knowledge on the role of indigenous knowledge in conservation and use of wild medicinal food plants in Loita sub-county, Narok County.

2. MATERIALS AND METHODS

2.1 Study Site

Loita sub-county is situated 320 km south of nairobi towards the Kenya-Tanzania border and covers an area of approximately 1718 km² in the great rift valley. This sub-county is located at an elevation of 2000-2600 meters above sea level. On the east it borders Nguruman escarpment which drops steeply 3000-5000 feet to the rift valley floor towards the Kajiado boundary. On the north are the Loita plains while on the west are the hills and valleys which lead to the Mara fly area. Towards the south-west is the Tanzania border which artificially cuts across the plateau a few miles from the topographical edge (Fig. 1). For this study the research was carried out in all the five locations of Loita sub-county namely Morijo, Entasekera, Olemesutye and Ilkerin administrative locations (Fig. 1).

2.2 Data Collection

Data was collected through household survey, key informant interviews and focused group discussions (FGDs) following martin [9] and cotton [10]. The interviews were conducted using a semi-structured questionnaire. The sampling frame for household survey was guided by the national sample survey and evaluation programme (NASSEP) which is based on the national population and housing census [11]. Stratified random sampling method was used to select respondents during this study whereby

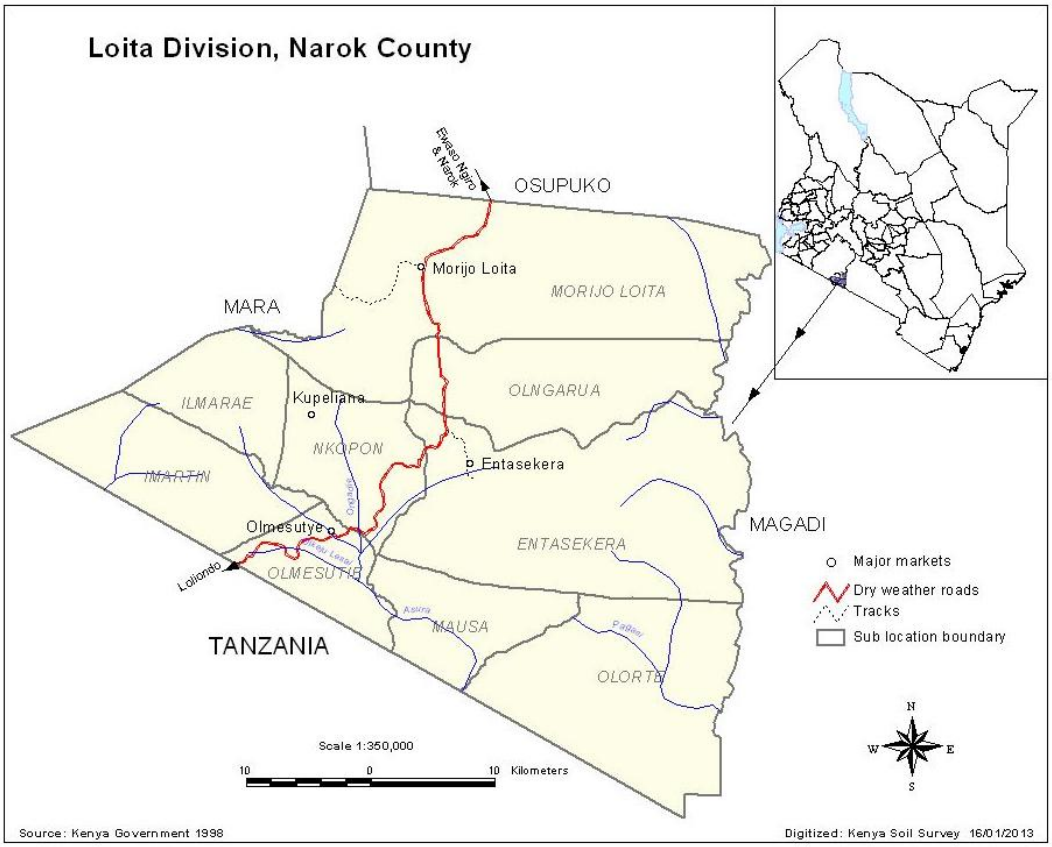

Fig. 1. Map showing administrative location of Loita sub-County Narok County (inset- map of Kenya)

area administrative units were used as the sampling unit alongside the NASSEP enumeration areas. The data collected was on habitat categorisation, use of the habitats, knowledge sharing on the uses and conservation methods for the species.

3. RESULTS AND DISCUSSION

3.1 Habitat Categorisation and Use amongst Loita Maasai

Three broad habitat categories were identified as grasslands (ol*purkel/Ongata*), bushland (*oloiparag)* and highland forests *(osupuko)* (Table 1). This classification was based on the respondents' views of vegetation cover and elevation.

Traditionally habitat classification in Loita was found to be on the basis of topography, dominant species and vegetation cover or a combination of these factors, for example, osupuko according to this community means highland forest while ongata means open grassland. Habitat categorisation in Loita by vegetation types, dominant species and vegetation cover is similar to conventional ecological classification [12]. This similarity between indigenous and conventional habitat classification offers an opportunity for these two knowledge systems to complement each other. This concurs with a study in Tanzania by Mapinduzi Al, et al. [13] who observed that indigenous systems of landscape assessments can be used to understand human effects on rangeland biodiversity alongside ecologists.

When the communities were interviewed by gender on the uses and importance of the different habitats, the forest habitat was ranked 1st by both men and women as a source of water and wild medicinal food plants and 4th (men) and 2nd for dry season grazing (Table 2). The grassland and bushland habitats were considered best for grazing, cultural activities and wildlife/tourism purposes by both men and women (Table 2).

Table 1. Landscape classification based on indigenous criteria

Local name(s)	Translation (English equivalent)	Description (elevation and vegetation)	Plant species found growing in the habitat
Osupuko	High land forests	Thick forest mostly found on higher elevations	Mainly high canopy trees *Warburgia ugandensis, Cassiporeua, Olea africana, Prunus africana*
Oloiparag	Bushland	Bushland/woodland or degraded grassland	*Acacia tortilis, Acacia zanthophloea, Combretum spp, Rhus natalensis spp, Carissa spinarum,*
Olpurkel/ Ongata	Wooded grassland	Acacia woodland	Dispersed acacias mainly grasses interspersed by *Acacia drepanolubium*
	Open grassland	Mainly grass vegetation	Open grassland with dispersed acacias on the valleys and hills

Table 2. The use and importance of the various habitats segregated by gender (men and women)

Use of habitat	Habitat ranking for the different uses					
	Forest		Bushland		Grassland	
	Men	Women	Men	Women	Men	Women
Water	1	1	8	8	3	8
Dry season grazing	4	2	10	10	10	9
Cultural activities	8	9	9	9	2	1
Normal grazing	10	6	2	1	1	2
Food	1	1	4	6	5	4
Medicine	1	1	6	2	8	7
Wildlife/Tourism	5	8	1	4	6	10

Note: Rank of 1 = most important habitat for the use; rank of 10 = least important habitat for the use

Gender ranking disparities on use and value of the habitats may be attributed to the extent of exposure to a habitat. For instance, women normally interact more with the grassland during grazing and collection of food plants while the men are in charge livestock during the dry season taking them into the forest in search of food (*Personal communication with the local elder*). In Uganda, [14] reported that knowledge of wild edible plants species was influenced by both age and gender while overall knowledge held was directly related to responsibilities performed by individuals in the community. For example, [15] reported increased knowledge amongst women than men and children about wild leafy vegetables due to their association with household chores.

The study revealed that the Maasai community in Loita named localities/sites after dominant or unique species occurrence in an area (Table 3). For example, local names of two locations *Morijo (*plant species *-olmorijoi)* and *Olorte (*Plant species-*Olorte)* are derived from *Ackonthera schimperii and Faurea saligna* dominant tree species growing in these localities.

Since place names remain even after species are depleted they can be used to reconstruct environmental history. This information once documented can be used to guide restoration of habitats based on local people's knowledge. In some instances to restore degraded areas, indigenous knowledge may be the only available source of information [16]. Indigenous knowledge is important in adaptive management, however, it may be inconsistent [16]. This inconsistency is a result of the shifting baseline syndrome [17]. Addressing perceptiveness of environmental change is important because the way in which individuals detect and respond to ecological change shapes how information feeds back into the socio-ecological system and this feedback affects peoples livelihoods and resource governance systems as they adapt to new circumstances [18]. A good example is the idea of building synergies between science and local and indigenous knowledge in the initial work

program for the United Nations (UN) organ on the Intergovernmental Platform on Biodiversity and cosystem Services (IPBES) in which the indigenous and local knowledge taskforce seeks to ensure the integration of indigenous and local knowledge with science [19].

3.2 Indigenous Knowledge (IK) Transmission and Use in Loita Division

The study also revealed that IK amongst Loita Maasai was passed on throughout life along vertical and horizontal social structures differentiated by gender and age within the community (Fig. 2). Fifty percent of the respondents acquired the knowledge on use and conservation of wild medicinal food plants (WMFPs) from their elders (both male and female) while 26% acquired through apprenticeship from expert practitioners, 16% acquired this knowledge during moran-hood and meat camps and 11% learnt from their peers (Fig. 3).

It is the responsibility of senior elders to pass on indigenous knowledge to warriors and junior elders throughout life. Indigenous knowledge (IK) was passed on during cultural activities and ceremonies. During ceremonies, there was shared learning for age groups and inculcation of IK within and between age groups.

Transmission of IK in Loita was similar to other reported studies in Kenya [20] and Tanzania [21] and among the Achi Mayans in Guatemala [4]. Indigenous knowledge on WMFPs was well entrenched in the lifestyle and livelihoods of the communities thus ensuring continuity.

The study found out that environmental interactions and routine activities dictated by gender roles, age group and family explained the differentiation in knowledge amongst the Loita Masai members. Moreover, there were people with unique knowledge due to specialisation and they included herders, traditional health practitioners and honey harvesters.

Indigenous practices that enhance wild medicinal food plants conservation amongst Loita Maasai.

From the study findings, the Loita Maasai have classified their landscapes into several cultural zones (Table 1), each having culturally differentiated use and this has supported conservation of large tracks of indigenous vegetation within the division. One notable example of traditional conservation of important WMFP was having cultural sites in areas of abundant occurrence of the species. Among the Loita maasai, Loita forest was such a site that encompasses several shrines (*Oltukai, Oloitoktok, Oltiyani* and *Emugurrolkine).* These sites were conserved and revered, only used during cultural ceremonies or special prayers under the protection of the cultural/spiritual leader the *Oloibon*. The highest point in Loita forest is a sacred site named by the species Oltiyani (*Arundinaria alpina)*.

The other way of species conservation was having sacred/cultural species such as *Ficus thoningii (Oreteti)* which according to the

Table 3. Names of localities in Loita and their corresponding plant names

Local place name	Area	Species local species name	Species botanical name
Olorte	Location	Olorte	*Faurea saligna*
Morijo	Location	Olmorijoi	*Ackonthera schimperii*
Olkiloriti	Village	*Olkiloriti*	*Acacia nilotica*
Nkosesiai	Village	*Olosesiai*	*Osyris lanceolate*
lng'arwa	Village	Olngarwa	*Pennisetum sp*
Olpopong	Village	Olopoponi	*Eurphorbia candelabrum*
Esentu	Village	Osentu	*Tarconarthus sp*
Oltarkwai	Village	Oltarakwai	*Juniperus procera*
Iltararani	Village	Oltarara	*Acacia abysinica*
Olirien/nkoriento	Village	*Oloirien*	*Olea europaea ssp africana*
Oloorgisoyia	Village	Oloorgisoyia	*Vigna friesiorum*
Enuraelerai	Village	EmuruaElai	*Acacia xanthoploea*
Iltumaro	Village	Oltumaro	*Cussonia spicata*
Nkamuriak	Village	*Olamuriaki*	*Carissa edulis*
Oltiyani	Sacred site	Oltiyani	*Arudinaria alpine*

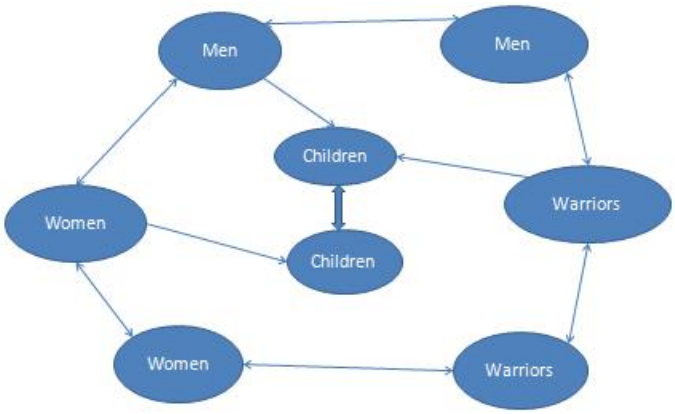

Fig. 2. Indigenous knowledge (IK) transmission amongst Loita Maasai

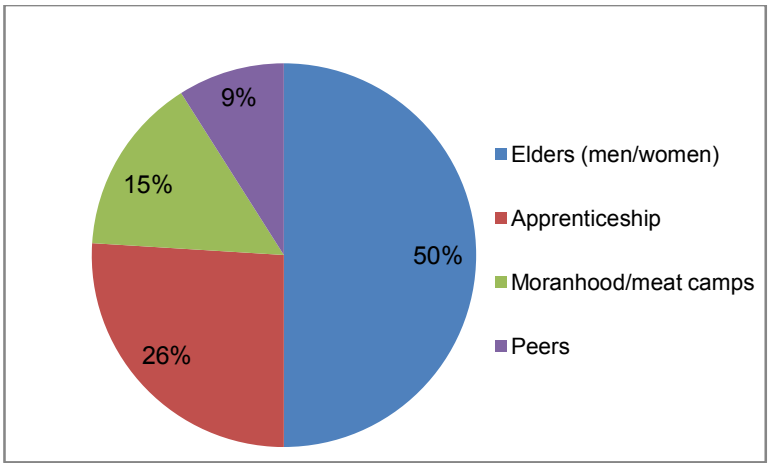

Fig. 3. Indigenous knowledge (IK) acquisition from different sources amongst Loita Maasai

community was a taboo to cut and *Arundinaria alpina* (*Oltiyani*) which was believed that felling it would result in a drought. Community members were discouraged from using species of cultural significance such as *Oloirien* (*Olea europaea* spp *africana)*, *Olgigal* (*Teclea simplicifolia*) and *Osinoni* (*Lippia javanica*) for ordinary purposes such as fencing and firewood. While *olmedungi* (*do not cut*); mainly in an area of strict preservation such as those on top of the hills with high species diversity for extraction of plant materials and products was prohibited.

Sacred sites and controlled use of certain species has resulted in conservation of wild species in Loita; cultural sites including *Oltiyani* and *Oltukai* and hilltops such as *ole megili* and *ole medungi* are areas of strict preservation where no extraction was allowed. Sites that have cultural significance were revered and protected traditionally by the community and are islands for biodiversity conservation as the case of Loita forest. This agrees with findings on cultural sites in Coast, Central, Western and Northern Kenya, [22] noted that though some cultural sites in Kenya had been degraded or destroyed, others continue to be preserved retaining religious importance and indigenous governance while acquiring other roles as biodiversity conservation sites. In Obalanga Sub-County in Uganda, [14] reported that the conservation of some species such as *Tamarindus indica* and *Vittelaria paradoxa* was supported by community by-laws and ancestral land tenure systems.

In addition, it was noted that the Loita Maasai practised sustainable harvesting of wild plant resources and a number of ways were highlighted as being used to promote sustainable use such as harvesting some stems from a multi-branched tree and partial bark removal to allow continuity of life of the harvested plant (Table 4).

Table 4. Ways used to promote sustainable use/conservation of wild medicinal food plants among the Loita Maasai

	Ways to promote sustainable use/conservation
1	Harvesting only what is needed
2	Cutting only one stem from multi-stemmed tree or clump
3	Cutting the branches instead of the main stem
4	Cutting tree stems at least 1½ - 2 m above ground to allow re-sprouting from the stems (i.e. Locally referred to as "allowing continuity of life"
5	Harvesting only a portion of stem or bark at a time and after de-barking, the wound is covered with soil or cow dung to avoid desiccation
6	For roots and tubers, one should only remove a few and return the soil so as not to expose the roots
7	For firewood purposes, dead or fallen wood was the first option followed by cutting branches. Felling trees were not encouraged

Traditional conservation practices that involve sustainable harvesting procedures and setting aside some areas for preservation are passed down through beliefs and taboos. They are deeply ingrained in belief systems and influence behaviour in private and public with threats of social repercussions if not observed. Besides, traditional Loita Maasai lifestyle put little demand on the environment, for example, in the construction of their houses known as *Enkaji e modiei*, small diameter stems (withies and fitos) were used while tree crowns/branches were used to make livestock enclosures (kraals).

Similar practices are reported in traditional communities in West Usambara Mountains in Tanzania [23] and among the South Africa collectors who harvest only a few lateral roots from each plant covering remaining roots to help the survival of the plant [24]. These observations are also in line with those obtained in [25] who reported traditional methods of sustainable collection and domestication of WMFPs among the Hehe of Tanzania.

The Loita Maasai are careful not to harvest plant products (roots or bark) causing the death of a plant as they believe it would lead to the death of the person responsible. A similar belief was reported in South Africa by Tshisikhawe MP et al. [24] where Venda traditional healers emphasised the need to preserve plants for the herbal medicine to be effective. Traditional beliefs and taboos were effective in modifying the behaviour of community members unlike in modern times where harvesters can deplete resources without care of sustainability. This is fueled by market demand which is driven by sales and profits at the expense of sustainability.

4. CONCLUSION

Seasonal use of the grassland, bushland and forest habitats allowed regeneration of wild plant resources. In addition, the traditional livelihood put low demands on the environmental resources while indigenous conservation practices contributed to the preservation of the Loita landscape. This shows that conservation was effectively ingrained in the life of this community. This was enabled by low demand from a small population, the poor technology used in exploitation and limited access to markets. The current study found revealed that indigenous knowledge on the use and conservation of wild medicinal food plants could play a key role in guiding biodiversity conservation. This information once documented can be used to guide restoration of habitats.

ACKNOWLEDGEMENTS

The authors acknowledge financial support through "Research for Development" grant received from the Centre for Sustainable Dry Land Ecosystems and Societies (CSDES) University of Nairobi. The support by the Loita Community is also acknowledged

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Barirega A, Tabuti JRS, Van Damme P, Agea JB, Muwanika V. Potential for commercialization and value chain improvement of wild food and medicinal

plants for livelihood enhancement in Uganda. Current Research Journal of Biological Sciences. 2012;4(2):108-116.
2. Thomas E, Vandbroek I, Van Damme P, Goetghbeur P, Douterlgne D, Sanca S, Arrazola S. What works in the field? a comparison of different interview methods. In ethnobotany with special reference to the uses of photographs. Economic Botany. 2007;61(4):376-384.
3. Achigan–Dako EG, Danjkou SN, Assogba-Komlan F, Ambrose- Oji B, Adan-Ahancheche A, Paskini MW. Diversity and geographical consumption patterns of traditional vegetables in sociolinguistic communities in Benin: Implications for domestication and utilization. Economic Botany. 2011;2:129-145.
4. Turreira-García N, Theilade I, Meilby H, Sørensen M. Wild edible plant knowledge, distribution and transmission: A case study of the Achí Mayans of Guatemala. Journal of Ethnobiology and Ethnomedicine. 2015;11:52.
DOI: 10.1186/S13002-015-0024-4
5. Idohou R, Fandohan B, Salako VK, Kassa B, Gbèdomon RC, Yédomonhan H, Kakaï RCG, Assogbadjo AE. Biodiversity conservation in home gardens: Traditional knowledge, use patterns and implications for management. International Journal of Biodiversity Science, Ecosystem Services & Management. 2014;10(2):89-100.
6. Rukangira E. Medicinal plants and traditional medicine in Africa: Constraints and challenges. Sustainable Development International.1998;179-184.
7. Schmelzer GH, Gurib-Fakim A. (Ed.S). Plant Resources of Tropical Africa 11(1) Medicinal Plant 1. Prota foundation, wageningen, netherlands / backhuys. Publishers, Leiden Netherlands /CTA. Wageningen Netherlands. 2008;15-20.
8. Kigen K, Ronoh HK, Yenesew A, Mbugua PM, Patel NB. Current trends of traditional medicine practice in Kenya. A review. African Journal of Pharmacology and Therapeutics. 2013;2(1):32-37.
9. Martin GJ. Ethnobotany: A methods manual. New York: Chapman & Hall. 1995; 268.
10. Cotton CM. Traditional botanical knowledge. In Ethnobotany: Principles and applications. John Wiley & Sons, Chichester. 1996;59-89.
11. Mugenda AG. Social science research; theory and principles. Arts Press. 2008; 59-126.
12. Legilisho-Kiyiapi J. Preliminary biodiversity assessment of loita forest. Technical Report No. 3. Nairobi: IUCN-EARO; 1999.
13. Mapinduzi AI, Oba G, Weladji RB, Colman JE. Use of indigenous ecological knowledge of the Maasai pastoralists for assessing rangeland biodiversity in Tanzania. African Journal of Ecology. 2004;41:239-336.
14. Ojelel S, Kakudidi EK. Wild edible plant species utilized by a subsistence farming community in Obalanga Sub-County, Amuria District, Uganda. Journal of Ethnobiology and Ethnomedicine. 2015; 11:7-12.
15. Thongam B, Konsam S, Handique ER. Assessment of wild leafy vegetables traditionally consumed by the ethnic communities of Manipur, Northeast India. Journal of Ethnobiology and Ethnomedicine. 2016;12:9.
DOI: 10.1186/S13002-016-0080-4
16. Babai D, Molna'r Z. Multidimensionality and scale in landscapeethno ecological partitioning of a mountanous landscape (Gymes, Eatern Carpathians, Romania). Journal of Ethnobiology and Ethnomedicine. 2013;9:11.
DOI: 10.1186/1746-4269-9-11
17. Fernandez-Liamazares A, Luz AC, Cabeza M, Reyes-Garcia V. Rapid ecosystems changes and challenges. The Adaptive Capacity of Local Environmental Knowledge. Global Environmental Change. 2015;31:272-284.
18. Aswani S, Lauer M. Indigenous people detection of rapid ecological change. Conservation Biology. 2014;28(3):820-828.
19. Thaman R, Lyver P, Mpande R, Perez E, Cariño J, Takeuchi K. The contribution of indigenous and local knowledge systems to IPBES: Building synergies with science. IPBES Expert Meeting Report. UNESCO/UNU. Paris, UNESCO. 2013; 49.
20. Gakuubi MM, Wanzala W. A survey of plants and plant products traditionally used in livestock health management in Buuri District, Meru County, Kenya. Journal of Ethnobiology and Ethnomedicine. 2012; 8:1-19.
21. Kaya HO. Indigenous knowledge of wild-food resources among children in

Tanzania. Journal of Human Ecology. 2014;48(1):1-8.
22. Nyamweru C. Natural cultural sites of Kenya changing contexts and changing meanings. Journal of East African Studies. 2012;6(2):270-302.
23. Msuya TS, Kideghesho R. The role of traditional management practices in enhancing sustainable use and conservation of medicinal plants in West Usambara Mountains, Tanzania. Tropical Conservation Science. 2009;2(1):88-105.
24. Tshisikhawe MP, Van Rooyen MW, Bhat RB. An evaluation of the extent and threats of bark harvesting of medicinal plant species in the Venda Region, Limpopo Province, South Africa. International Journal of Experimental Botany. 2012;81: 89-100.
25. Shangali CF, Zilihuna LJE, Mwangingo PLP. Use of Medicinal plants in the eastern arc mountains with special reference to the Hehe Ethnic Group in Udzungwa Mountains Tanzania. Journal of East African Natural History. 2008;97(2):225-254.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/27102