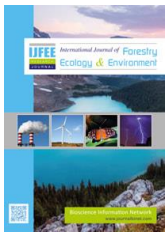
Published with Open Access at Journal BiNET
Vol. 07, Issue 01: 259-269
International Journal of Forestry, Ecology and Environment
Journal Home: https://www.journalbinet.com/ijfee-journal.html



Integrating traditional, indigenous and local knowledge in forest conservation in Embobut Forest, Kenya

Benjamin Mutuku Kinyili[1] and Ezekiel Ndunda[2]

[1]Kenya Forest Services, PO Box 2501-30100, Eldoret, Kenya
[2]Department of Environmental Science, Kenyatta University, PO Box 43844–00100, Nairobi, Kenya

✉ Corresponding author: bmkinyili@yahoo.com (Kinyili, BM)
Article received: 27.08.21; Revised: 25.06.23; First published online: 30 October, 2023.

ABSTRACT

The prospect for traditional, indigenous and local ecological knowledge in contributing to conservation and management of forests and forest resources is well documented. However, the concrete application of knowledge in fostering forest conservation is rarely practiced. It is hypothesized that when traditional, indigenous and local knowledge is integrated into forest conservation, there is likely to be a success through the integration of several stakeholders. To date, there are several social, economic and policy challenges impeding the application of the knowledge in the local context. This study explored how traditional, indigenous and local knowledge can be fostered to help in forest conservation of Embobut forest. The study focused on indigenous knowledge of forest adjacent communities and dwellers belonging to four groups who inhabit the Embobut forest: Sengwers, Marakwets, Pokots and Luhyas. The study used a combination of qualitative methods and ethnographic study approaches. Data were collected from the respondents through semi-structured questionnaires, interviews, focus group discussions and key informant interviews. The study found a need for community elders to be encouraged to pass the indigenous knowledge to the youth through initiation ceremonies, word of mouth and cultural day's celebrations. This indigenous knowledge needs to be documented and, published and integrated into forest management plans in the Embobut forest. Policy makers need to support patenting, copyrights, trade secrets and intellectual property rights of the essential indigenous knowledge with innovative ideas. For indigenous knowledge to be appreciated by younger generation, there is a need to revise and incorporate the content into the curriculum. They were additionally, integrating new scientific knowledge conspicuous with indigenous and traditional knowledge yielded a more remarkable outcome, fostering sustainable utilization and management of the local forest resources.

Key Words: *Indigenous knowledge, Local knowledge, Biodiversity conservation and Embobut forest*

Cite Article: Kinyili, B. M. and Ndunda, E. (2023). Integrating traditional, indigenous and local knowledge in forest conservation in Embobut Forest, Kenya. International Journal of Forestry, Ecology and Environment, 07(01), 259-269.
Crossref: https://doi.org/10.18801/ijfee.070123.28

I. Introduction

The current demography has permitted the Western worldview in practically every global sphere. Despite this global change, local communities continuously seek their rights, traditions and knowledge over generations (Cámara-Leret et al., 2019). Their problems occur due to living in two worlds: the indigenous and the non-indigenous ones, which are in continuous tension with each other. The problem is more dire given that native populations have suffered invasion and oppression for aeons, resulting in their knowledge being eclipsed by Western knowledge (Waters, 2018). This scenario renders the indigenous people vulnerable to natural or forest ecosystems (such as soil, water, land, forest, trees and wildlife) (Magni, 2017). As a result, the potential to develop knowledge that is beneficial for ecosystem conservation has been widely recognized, including in Article 8(j) of the United Nations Convention on Biological Diversity, which advocates for respect, preservation and application of knowledge and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity (Le Prestre, 2017). The knowledge, which is inherently rooted in their association with the environment and culture, forms the basis of traditional knowledge (Sultana et al., 2018).

The traditional knowledge, practices, and beliefs that espouse the cumulative body of knowledge about interrelationships living things have with each other and their environment have often been handed down across generations through cultural pathways (Fisher, 2019). The knowledge occurs in a geographically defined region, in societies engaged in natural resource use in a particular place. When the knowledge is limited to specific indigenous people, it forms indigenous knowledge (Waters, 2018). However, traditional knowledge can also be shared within a given location inhabited by indigenous people to form a community, which can also be determined as a shared locality. In such case the knowledge moves beyond the indigenous community to local knowledge (Sillitoe, 2019). Nevertheless, the distinction between indigenous and local is often used interchangeably but is the basis of traditional knowledge useful for forest management measures.

Forest-dwelling communities spend much of their time in forests observing, experiencing, experimenting, and tinkering for solutions that will enhance forest management (Bettinger et al., 2016). However, most of the work in forest management provides little anecdotal evidence for this traditional, indigenous and local knowledge, at least over the last 50 years. Several management tenets posit that stakeholders such as forest dwellers, practitioners, scientists, and managers should share knowledge to understand the natural environment and conservation tenets better. More recent literature provides insights into traditional, indigenous and local knowledge as a basis for forest conservation (Guerrero-Gatica et al., 2020; Tengö et al., 2021). Synthesis of this literature supports a conclusion that integrating traditional, indigenous and local knowledge is helpful in forest and forest resource conservation. But, integrating these knowledge bases, their use and preservation will not be accessible if the knowledge is not allowed to continue.

Crisis concerning depletion and unsustainable utilization of forests and forest resources is ubiquitous (Jhariya et al., 2019). A consensus spearheaded by the United Nations Conference on Environment and Development asserts that forest resource management needs to find ways beyond the traditional measure to achieve sustainable development (Bloomfield et al., 2018). Yet a key concern to sustainable forest management is exacerbated by uncertainty of indigenous knowledge reflecting generations of ethnic groups. Although there is slow recognition, there are numerous indigenous knowledge resource centres at the regional and local levels the world over that are involved in documenting contemporary indigenous knowledge (Sraku-Lartey et al., 2017). Despite some progress, recording this knowledge is still in its infancy and thus neglects valuable databases for humankind to learn how they interact with their changing environmental resources. For a long time, the African context has long been co-modified, ignored and maligned by western influence (Odok, 2019). African governments now build national databases of local knowledge, respect the knowledge made, guard the knowledge owners' rights, and improve the knowledge and organization base from community efforts (Ayaa and Waswa, 2016; Carson et al., 2018).

There have been attempts in Kenya to become acquainted with traditional, indigenous and local knowledge to help in understanding biodiversity conservation (Shiracko et al., 2016; Tian, 2017). However, a realistic appreciation of traditional, indigenous and local knowledge for identification, sustainable utilization and conservation of indigenous forest resources remains a neglected area of

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

research. The main objectives achieved during the study were to identify the tools and practical approaches for traditional, indigenous and local knowledge mapping and validation; integrate traditional, indigenous and local knowledge for policy and programming; mapping and conservation of endangered plant species using traditional, indigenous and local methods; identify traditional, indigenous and local knowledge; determine benefits derived from plants within the region; and determine ways of enhancing agroforestry as part of enhancing traditional, indigenous and local knowledge.

II. Materials and Methods

Study area

This study was conducted in Embobut Forest region (Latitude 0°58'-1°06'N and longitude 35°27'-35°33'E) with the larger Elgeyo Marakwet County from March to June 2018 (Figure 01). The region is the source of Rivers Embobut, Arror, as well as Moiben. Rainfall distribution is bimordal in April to May (long rain) and August to October (short rains) and ranges between 1100 and 1500 mm. The area has temperatures ranging from 21°C to 35°C. The soils are ferritic, fairly thick, free draining, and weakly acidic due to high proportion of iron and aluminium sesquioxide with quartz and kaolinite (Matthew, 2014). The inhabitant keeps livestock in pastoral environments and grows food crops such as maize, beans and vegetables.

Even though the Marakwet, Pokots, Luhyas, and Sengwer are among the forest's long-standing residents, the forest is being more and more encroached upon due to population development and a greater focus on grazing and cultivation. The result of this has been several contentious and forcible forest evictions. Regretfully, these have hampered efforts to negotiate a settlement with a focus on community-led conservation and protection and prevented the forest from regenerating.

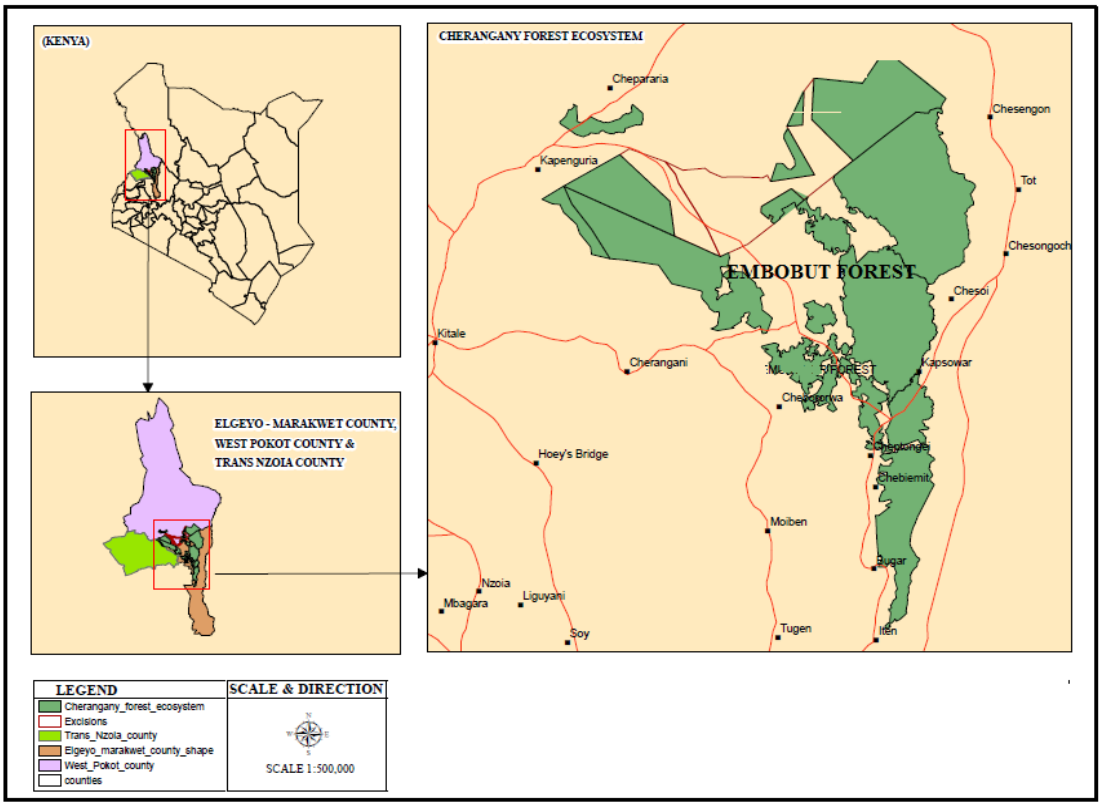


Figure 01. Map Elgeyo-Marakwet showing the location of the Embobute Forest

Research design

In order to gather data on traditional, indigenous, and local knowledge among the members of the indigenous community, the study used an exploratory survey approach. Given that the goals were to map and conserve rare and endangered plant species using traditional, indigenous, and local methods; identify traditional, indigenous, and local knowledge; and gather preliminary information on knowledge to aid in designing measures aimed at sustainable use, the design offered significant insight

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

into a given situation. It was pertinent to this investigation because, despite the fact that there are several native plants in the Embobut forest community, the field of traditional, indigenous knowledge has not been well examined (Kipkore et al., 2014).

Population, sample size and sampling

The target population were the inhabitants of Embobut forest in Elgeyo Marakwet County, which was obtained from published records as 26,772 (Kenya National Bureau of Statistics, 2010). It was estimated that 3,123 people (11.6%) accessed the forest (Rotich, 2019). The sample size was thus calculated using the formula:

$n = z^2(\frac{pq}{d^2})$ (Omona, 2013).

Where: n = sample size, z = the standard normal deviation, d = range of error (0.05), p = the proportion of individuals accessing the forest (11.6%), and q = individuals having no access to the forest = 1–p (88.4%). Hence; d = 0.05, p = 0.116, z = 1.96, q = 0.884.

Thus $n = 1.96^2(\frac{0.116*0.884}{0.05^2}) = 157$, Therefore, the sample size was 157 local community members.

The snowballing technique was used to sample elders, chiefs, leaders, and other community custodians of traditional knowledge. In snowball sampling, the respondents were recruited by other units to form part of the sample (Parker et al., 2019).

Instrumentation

An ethnographic research methodology was mixed with broadly qualitative methodologies in this study. Personal interviews, surveys, observations, targeted group discussions, and key informant analysis were the methods used to gather data. Through direct participant interactions, the data were gathered. Interviews with the local elders were undertaken. Since observation is thought to be the main technique in anthropological study, particularly for ethnographic studies, it was also carried out (Denzin, 2017). Participant observation aimed to detect conservation methods and measures used in the study area.

Piloting

Piloting was done in the study area to help understand the potential respondents' responses during the study. The initial visit took place in the first week of March 2018, which assisted the researcher in preparing the instruments and in training the research assistants on effective ways of administering the instruments. It was also essential to help iron out challenges regarding translation of questions and responses (from English to the local languages). The services of a translator were employed. Piloting was done, aiming at 40 respondents who did not participate in the study at a later date.

Validity and reliability of research instruments

Validity is the extent to which outcomes of the study represent the phenomenon under study. The validity of the instrument was thus tested through expert judgement, where they were delivered to research experts in indigenous knowledge for cross-checking and validation. Reliability of a test refers to the ability to consistently yield the same results under repeated measurements (Kumar, 2019). Reliability of the research instruments was done during the pilot through test-retest method and Cronbach Alpha coefficient computed (Taber, 2018).

Data Analysis

Quantitative data were analyzed using Statistical Package for Social Science (SPSS) version 23.0. Data analysis was achieved through frequency distribution and percentage. Qualitative data were analyzed through synthesized text summaries.

III. Results and Discussion

Questionnaires return rate

During the study, a total of 157 questionnaires were distributed and 133 were returned, resulting in a return rate of 84.7%. The researcher only considered the duly filled questionnaires for analysis. A 50-

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

70% return rate has been declared adequate to validate any survey-based studies (Fosnacht et al., 2017). Hence, a response rate of 84.7%, taking cognizance of the nature of the study, is sufficient. High response may occur due to methods of distribution, where it has been established that if the researcher personally distributes and collects the questionnaires, high response rate may be elicited (Nulty, 2008).

Socio-economic characteristics of the respondents

The socio-economic profiles of the respondents are provided in Table 01. There was a gender disparity among respondents where male headed households were more dominant than females. The majority of the respondents were aged 26-35 years, followed by those aged over 18-25 years. The study also revealed differences in education levels of respondents, where the majority had secondary levels of education followed by primary levels of education. Most of the respondents were farmers.

Table 01. Socio-economic characteristics of the respondents (n = 133).

Variable	Response category	Frequency	Percent
Gender	Male	113	85.0
	Female	20	15.0
Age (years)	18-25	33	24.8
	26-35	64	48.1
	36-45	3	2.3
	45-55	13	9.8
	> 55	20	15.0
Level of education	None	5	3.8
	Primary	47	35.3
	Secondary	53	39.8
	Tertiary	28	21.1
Occupation	Farming	121	91.0
	Employed	8	6.0
	Business	4	3.0

Tools and practical approaches for traditional, indigenous and local knowledge mapping and validation

Approaches toward understanding the traditional, indigenous and local knowledge were determined by establishing the customary tools for understanding the forest, knowledge generation in the forest, and the protocol as well as hierarchies for protection of the forest. Information concerning the customary understanding of the forest in the region is shown in (Table 02).

Table 02. Customary understanding of the forest

Response category	Frequency	Percent
Shrine	54	40.6
Habitat	36	27.1
Ancestral land	29	21.8
Grazing land	8	6.0
Others	6	4.5
Total	133	100.0

Majority of the local community members understood the forest to constitute the shrines, habitats, and ancestral land. The use of forests as shrines among the Marakwets has been highlighted by some researchers (Rotich, 2019). Shrines connote the custody and ownership of local forests and everything within the forest, including local and traditional knowledge in many African societies where laws governing environment protection were formulated (Aniah and Yelfaanibe, 2016). The use of customary understanding of the forest as habitat in this study refers to land under settlement for grazing and hunting land or defined as the land under the jurisdiction of the community, which in traditional society was the forested area. Based on interviews and focused group discussion, we were informed that through the land or habitat under their custody, the elder would define the customs,

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

rules and regulations that govern the local community and the knowledge would then be kept by traditional rulers. Understanding forests as a shrine, a habitat for the people and as ancestral land is well recognized in many primitive African cultures that led to conservation and proper protection of these habitats as part of heritage from their ancestors (Matthew, 2019).

There were also attempts to determine who is responsible for traditional and local knowledge generation among the local community, especially forest (Table 03). The findings indicate that for generation and custody of local and indigenous knowledge, especially of the forest, the responsibility lies mainly on council of elders or a group of clan elders. Many African societies adopted clanism as their way of lives and in that hierarchy, the head was always an elder or a chief who had power and control of the traditional society and knowledge systems (Kipkorir and Welbourn, 2008). In an earlier study in the region, it was established that locals were the custodians of indigenous knowledge systems (Cheserek, 2005). Further interviews with the local community leaders indicated that the elders formulated traditional and indigenous knowledge and passed it to the local community members.

Table 03. Responsible person for traditional and local knowledge generation

Response category	Frequency	Percent
Council/clan of elders	98	73.7
God	18	13.5
Community members	17	12.8
Total	133	100.0

The study also determined ways of passage and sharing traditional knowledge of forests among generations (Table 04). The traditional ways of passing information concerning indigenous and local knowledge was through word of mouth, followed by folklore and during initiation, rite of passage and circumcision ceremonies. During interviews, it was clear that most of the general information about the forest was passed to the local community members through word of mouth and special servants called traditional communicators. However, when the information is perceived as secret, it was passed during circumcision. During focused group discussion, it was determined that to pass the same information from generation to generation, the community used folklore and in some instances, storytelling. In this case, the community identified women above the age of 60 as the ones to transmit the stories to younger generations. These traditional ways of communication of knowledge are well documented and rampant in many traditional societies in Africa where the use of Information and Communication Technology (ICT) was non-existence (Diamond, 2013).

Table 04. Ways of passage of the traditional knowledge of forests among generations

Response category	**Frequency**	**Percent**
Circumcision/Initiation	31	23.3
Word of mouth	92	69.2
Folklores	80	60.1
Council of Elders	10	7.5
Traditional communicators	19	7.5
Total	133	100.0

The study determined the traditional threats posed to the forest (Table 05). Human activities were grazing, logging, firewood collection, and charcoal burning during the study. These activities are common in tropical regions of Sub-Saharan Africa. In Kenya, a settlement near forest land and wanton destruction by forest adjacent communities have been reported (Njue *et al.*, 2016; Muhati *et al.*, 2018), including in the study area (Rotich, 2019). Previous reports point to farming activities, livestock grazing, pastoralism, which threatened the conservation status of these forests (Larsen, 2015; Winkelhuijzen, 2017).

The study also determined whose responsibility it was to protect the forest in the traditional settings (Table 06). The respondents indicated that the responsibility lied squarely on the council of elder members.

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

Table 05. Traditional threats to Embobut forest

Response category	Frequency	Percent
Over grazing	34	25.6
Encroachment	62	46.6
Forest fires	19	14.3
Insecurity	3	2.3
Logging	15	11.3
Total	133	100.0

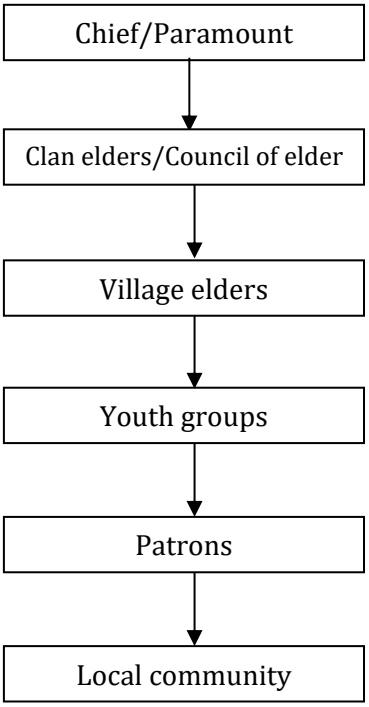
At the same time, the others believed that such responsibility was to be on the clan elders, during the interview. It was clear that protection of the forest, which was the habitat of the local community members, was the responsibility of all members of the community. But the custodian and enforcer of such laws was the council of elders and in years gone by, it was the chief. This agrees with several authors who indicate that much power and authority was bestowed among traditional rulers such as kings, council of elders, paramount chiefs, and elders under traditional chiefdoms in many African societies (Earle, 1987; Newbury, 2003).

Table 06. Who was responsible for protecting the forest in the traditional settings

Response category	Frequency	Percent
Council of elders member	89	66.9
Clan elders	41	30.8
Chiefs	3	2.3
Total	133	100.0

The hierarchy of traditional forest conservation was obtained after extensive interviews with elders and focused group discussions. The pictorial presentation of the hierarchy constructed is shown in (Figure 02). During the current clan elders who were custodians of the Indigenous Ecological Knowledge (IEK) in their communities, the residents were supposed to positively identify to help in the preservation of the traditional knowledge. However, in the past, the role was bestowed in chief or paramount chief and in some instances, there was a traditional king for the community. The duties of the chiefs were to ensure compliance in harvesting indigenous plant species. He was also mandated to prevent over-exploitation of the indigenous plant resources through several mechanisms applicable to the region.

Figure 02. Hierarchy of traditional forest conservation



Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

Mapping and conservation of endangered plant species

Structured interviews and focused group discussion provided three methods adopted by the community to preserve the indigenous rare/endangered plant. The interviews indicated that most of the elders were not aware of the endangered species as internationally described in the red list of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES). However, they had a traditional way of classifying endangered plant species, of which *Zanthoxyllum chalybeum, Lannea schimperi, Dobera glabra* and *Gardenia ternifolia* were considered the most endangered. The inability of the traditional leaders to understand the endangered plants has been reported (Kimmerer, 2002). Their limited biological range, slow growth, and excessive use were blamed for this. When asked about potential mitigating actions, those who were interviewed felt that smearing soils after debarking, gathering only dried wood for kindling, applying secrecy when harvesting medicinal plants, and harvesting sparingly were appropriate. Only coppicing—not cutting—is permitted when gathering wood for animals during the dry season. Signs marking the locations of uprooted trees are also required, and there are fines associated with felling certain plants that the community deems to be extremely valuable. Examples of these include *Vachelia tortilis* and *Balanites spp*., for which the elder council has imposed a goat fine upon conviction.

Traditional, indigenous and local knowledge and preservation of forest resources

According to the interviews and focused group discussion, there are strict harvesting protocols to conserve useful plants. Tree species with more dependency at times of need attracted additional conservation methods involving cultural practices from the local community members (Sajem *et al.*, 2008). The conservation methods in the study area were limited to specific harvesting methods, avoiding some species harvesting as well as fines for cutting down some trees such as *Balanites aegyptiaca, Ficus* spp*. Yurshania alpinia,* and *Vachellia tortilis*.

According to our observations, a number of steps were taken during the study to protect the native plant species. First, it was forbidden for strangers to gather certain tree species, and it was also frowned upon to hit fruits with a stick. All that was available to cut for lumber and poles was a mature, straight stem. Furthermore, gathering wood for fire was limited to dead wood alone. There is no gathering of live species for fuel. Mature trees were trimmed of their leaves so that the goats could not directly browse the trees. The village headsman, sub-chief, area chief, and a few chosen youngsters tended the indigenous flora. The young people dissuaded people in the neighbourhood from felling trees carelessly for whatever reason.

Benefits derived from plants within the region

Plant use among the local community members was determined (Table 07). There were diverse uses of the plant species. The Marakwet sub-ethnic group are traditionally forest dwellers and therefore, there are several plant uses associated with them (Kipkore et al., 2014). The local community members identified only five traditional/indigenous uses of the plant species that they could remember in the region. The plant parts that were used were bark, bulb canopy, fruits, leaves, sticks, thorns, and flowers.

Table 07. Plant use among the local community members

Response category	Frequency	Percent
Protecting homes	110	82.7
Beekeeping	7	5.3
Medicinal use	3	2.3
Food	1	0.8
Not sure	12	9.0
Rope	11	7
Timber	7	5
Total	133	100.0

The study also determined from the interviews with the elders that the local community members were usually encouraged to plant wild plants in homesteads. This is presumed to encourage traditional agroforestry at the homesteads. However, there is no strong evidence that agroforestry

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

was widely practised in the past. Preservation and retaining of indigenous trees were left in the cultivated farms for windbreak, shading, hanging bee hives and soil erosion control in steep areas. In order to preserve plants in the homesteads, the local community members were encouraged to protect the trees from livestock grazing. This was done mainly through proper nesting of the tree species away from the livestock.

IV. Conclusion

The Marakwets living in Embobut forest areas have used their local knowledge of forest and watershed management and conservation to protect the environment from degradation in a dry and harsh region. However, this knowledge system faces threats from poor communication between elders and youth, insecurity and politics of cattle rustling, and displacement of people. To preserve this knowledge, the elders should teach the youth during cultural events and ceremonies. This knowledge should also be recorded and published to be part of the forest management plans in Embobut forest and other dry lands in the region. Moreover, the authorities should support the rights and innovations of the local knowledge holders. To make the youth value this knowledge more, the education curriculum should include both local and scientific knowledge. Furthermore, the study has shown that combining local and scientific knowledge can improve the sustainable use and management of forest resources.

References

[1]. Aniah, P. and Yelfaanibe, A. (2016). Learning from the past: the role of sacred groves and shrines in environmental management in the Bongo District of Ghana. Environmental Earth Sciences, 75(10), 916-924. https://doi.org/10.1007/s12665-016-5706-2

[2]. Ayaa, D. D. and Waswa, F. (2016). Role of indigenous knowledge systems in the conservation of the bio-physical environment among the Teso community in Busia County-Kenya. African Journal of Environmental Science and Technology, 10(12), 467-475. https://doi.org/10.5897/AJEST2016.2182

[3]. Bettinger, P., Boston, K., Siry, J. P. and Grebner, D. L. (2016). Forest management and planning. Academic press.

[4]. Bloomfield, G., Bucht, K., Martínez-Hernández, J. C., Ramírez-Soto, A. F., Sheseña-Hernández, I., Lucio-Palacio, C. R. and Ruelas Inzunza, E. (2018). Capacity building to advance the United Nations sustainable development goals: An overview of tools and approaches related to sustainable land management. Journal of Sustainable Forestry, 37(2), 157-177. https://doi.org/10.1080/10549811.2017.1359097

[5]. Cámara-Leret, R., Fortuna, M. A. and Bascompte, J. (2019). Indigenous knowledge networks in the face of global change. Proceedings of the National Academy of Sciences, 116(20), 9913-9918. https://doi.org/10.1073/pnas.1821843116

[6]. Carson, S. L., Kentatchime, F., Nana, E. D., Njabo, K. Y., Cole, B. L. and Godwin, H. A. (2018). Indigenous peoples' concerns about loss of forest knowledge: implications for forest management. Conservation and Society, 16(4), 431-440. https://doi.org/10.4103/cs.cs_17_105

[7]. Cheserek, G. (2005). Indigenous knowledge in water and watershed management:'Marakwet'conservation strategies and techniques. FWU Water Resources Publications, 3, 25-33.

[8]. Denzin, N. K. (2017). The research act: A theoretical introduction to sociological methods. Routledge. https://doi.org/10.4324/9781315134543

[9]. Diamond, J. M. (2013). The world until yesterday: What can we learn from traditional societies? Penguin.

[10]. Earle, T. K. (1987). Chiefdoms in archaeological and ethnohistorical perspective. Annual Review of Anthropology, 16(1), 279-308. https://doi.org/10.1146/annurev.an.16.100187.001431

[11]. Fisher, W. (2019). Why Is Traditional Knowledge Different from All Other Intellectual Property. Washburn LJ. 58, 365.

[12]. Fosnacht, K., Sarraf, S., Howe, E. and Peck, L. K. (2017). How important are high response rates for college surveys? The Review of Higher Education, 40(2), 245-265. https://doi.org/10.1353/rhe.2017.0003

[13]. Guerrero-Gatica, M., Mujica, M. I., Barceló, M., Vio-Garay, M. F., Gelcich, S. and Armesto, J. J. (2020). Traditional and Local Knowledge in Chile: Review of Experiences and Insights for Management and Sustainability. Sustainability, 12(5), 1767. https://doi.org/10.3390/su12051767

[14]. Jhariya, M. K., Banerjee, A., Meena, R. S. and Yadav, D. K. (2019). Agriculture, Forestry and Environmental Sustainability: A Way Forward, *Sustainable Agriculture, Forest and Environmental Management*. Springer. pp. 1-29. https://doi.org/10.1007/978-981-13-6830-1_1

[15]. Kenya National Bureau of Statistics. (2010). Population census results of Kenya by the year 2009. Government Printers: Nairobi, Kenya. http://www.afdevinfo.com/htmlreports/org/org_33469.html.

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

[16]. Kimmerer, R. W. (2002). Weaving traditional ecological knowledge into biological education: a call to action. BioScience, 52(5), 432-438. https://doi.org/10.1641/0006-3568(2002)052[0432:WTEKIB]2.0.CO;2
[17]. Kipkore, W., Wanjohi, B., Rono, H. and Kigen, G. (2014). A study of the medicinal plants used by the Marakwet Community in Kenya. Journal of ethnobiology and ethnomedicine, 10(1), 24. https://doi.org/10.1186/1746-4269-10-24
[18]. Kipkorir, B. E. and Welbourn, F. B. (2008). The Marakwet of Kenya: A preliminary study. East African Publishers.
[19]. Kumar, R. (2019). Research methodology: A step-by-step guide for beginners. Sage Publications Limited.
[20]. Larsen, S. (2015). Threatened forest, threatened culture: a case study of subjectivities, nature and resistance in Embobut Forest. Master Thesis Series in Environmental Studies and Sustainability Science.
[21]. Le Prestre, P. G. (2017). Governing global biodiversity: The evolution and implementation of the convention on biological diversity. Routledge. https://doi.org/10.4324/9781315253930
[22]. Magni, G. (2017). Indigenous knowledge and implications for the sustainable development agenda. European Journal of Education, 52(4), 437-447. https://doi.org/10.1111/ejed.12238
[23]. Matthew, D. (2014). Geoarchaeological assessment of the area around Tot, Marakwet. Cambridge University Press. University of Cambridge.
[24]. Matthew, M. (2019). Faith Borders, Healing Territories & Interconnective Frontier? Wellness & Its Ecumenical Construct in African Shrines, Christian Prayerhouses & Hospitals. Numen, 22(1), 240-260. https://doi.org/10.34019/2236-6296.2019.v22.29619
[25]. Muhati, G. L., Olago, D. and Olaka, L. (2018). Participatory scenario development process in addressing potential impacts of anthropogenic activities on the ecosystem services of Mt. Marsabit forest, Kenya. Global ecology and conservation, 14, e00402. https://doi.org/10.1016/j.gecco.2018.e00402
[26]. Newbury, C. W. (2003). Patrons, clients, and empire: Chieftaincy and over-rule in Asia, Africa, and the Pacific. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199257812.001.0001
[27]. Njue, N., Koech, E., Hitimana, J. and Sirmah, P. (2016). Influence of land use activities on riparian vegetation, soil and water quality: An indicator of biodiversity loss, South West Mau Forest, Kenya. Open Journal of Forestry, 6(05), 373. https://doi.org/10.4236/ojf.2016.65030
[28]. Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: what can be done? Assessment & evaluation in higher education, 33(3), 301-314. https://doi.org/10.1080/02602930701293231
[29]. Odok, G. E. (2019). Commodification of forestlands and assault on indigenous knowledge within forest-dependent communities of Cross River State, Nigeria. Transactions of the Royal Society of South Africa. 74(2), 126-131. https://doi.org/10.1080/0035919X.2019.1600069
[30]. Omona, J. (2013). Sampling in qualitative research: Improving the quality of research outcomes in higher education. Makerere Journal of Higher Education, 4(2), 169–185. https://doi.org/10.4314/majohe.v4i2.4
[31]. Parker, C., Scott, S. and Geddes, A. (2019). Snowball sampling. SAGE research methods foundations.
[32]. Rotich, B. (2019). Forest conservation and utilization in Embobut, Cherangani hills, Kenya. International Journal of Natural Resource Ecology and Management, 4(1), 7-13. https://doi.org/10.11648/j.ijnrem.20190401.12
[33]. Sajem, A. L., Rout, J. and Nath, M. (2008). Traditional tribal knowledge and status of some rare and endemic medicinal plants of North Cachar Hills district of Assam, Northeast India. Ethnobotanical Leaflets, 2008(1), 31.
[34]. Shiracko, N., Owuor, B. O., Gakuubi, M. M. and Wanzala, W. (2016). A survey of ethnobotany of the AbaWanga people in Kakamega county, western province of Kenya.
[35]. Sillitoe, P. (2019). Investigating local knowledge: New directions, new approaches. Routledge. https://doi.org/10.4324/9780429199387
[36]. Sraku-Lartey, M., Acquah, S. B., Samar, S. B. and Djagbletey, G. D. (2017). Digitization of indigenous knowledge on forest foods and medicines. IFLA journal, 43(2), 187-197. https://doi.org/10.1177/0340035216681326
[37]. Sultana, R., Muhammad, N. and Zakaria, A. (2018). Role of indigenous knowledge in sustainable development. International Journal of Development Research, 8(2), 18902-18906.
[38]. Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education, 48(6), 1273-1296. https://doi.org/10.1007/s11165-016-9602-2
[39]. Tengö, M., Austin, B. J., Danielsen, F. and Fernández-Llamazares, Á. (2021). Creating synergies between citizen science and Indigenous and local knowledge. BioScience, 71(5), 503-518. https://doi.org/10.1093/biosci/biab023
[40]. Tian, X. (2017). Ethnobotanical knowledge acquisition during daily chores: the firewood collection of pastoral Maasai girls in Southern Kenya. Journal of Ethnobiology and Ethnomedicine, 13(1), 2. https://doi.org/10.1186/s13002-016-0131-x

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper

[41]. Waters, M. W. (2018). Indigenous Knowledge Production: Navigating Humanity Within a Western World. Routledge.
[42]. Winkelhuijzen, R. (2017). page: A makeshift house in Kapkok glade, inside Embobut forest. Picture by author. development. 23(7), 1073-1084.

HOW TO CITE THIS ARTICLE?

MLA
Kinyili, B. M. et al. "Integrating traditional, indigenous and local knowledge in forest conservation in Embobut Forest, Kenya". International Journal of Forestry, Ecology and Environment 07(01) (2023): 259-269.

APA
Kinyili, B. M. and Ndunda, E. (2023). Integrating traditional, indigenous and local knowledge in forest conservation in Embobut Forest, Kenya. *International Journal of Forestry, Ecology and Environment*, 07(01), 259-269.

Chicago
Kinyili, B. M. and Ndunda, E. "Integrating traditional, indigenous and local knowledge in forest conservation in Embobut Forest, Kenya". International Journal of Forestry, Ecology and Environment 07(01) (2023): 259-269.

Harvard
Kinyili, B. M. and Ndunda, E. 2023. Integrating traditional, indigenous and local knowledge in forest conservation in Embobut Forest, Kenya. International Journal of Forestry, Ecology and Environment, 07(01), pp. 259-269.

Vancouver
Kinyili, BM and Ndunda, E. Integrating traditional, indigenous and local knowledge in forest conservation in Embobut Forest, Kenya. International Journal of Forestry, Ecology and Environment. 2023 October, 07(01): 259-269.

Published with open access at journalbinet.com.
EISSN: 2708-5430, © 2023 The Authors, Research paper