Journal of Environmental Science, Computer Science and Engineering & Technology

An International Peer Review E-3 Journal of Sciences and Technology

Available online at www.jecet.org

Section A: Environmental Science

Research Article

Trends for Application of Indigenous Knowledge in Natural Resource Management among Nandi People, Kenya

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Received: 29 June 2016**; Revised:** 08 July 2016**; Accepted:** 14 July 2016

Abstract: Indigenous knowledge has been widely reported by researchers and natural resource managers as a valuable contributor to natural resource management and biodiversity conservation. The influences of modernity throughout Africa and the developing world have seriously contributed to the negation of traditional indigenous knowledge in ongoing efforts to ensure sustainable management of natural resources. This study sought to investigate the changing trends in use and application of IK in NRM and establish environmental implications of changes in use and application of indigenous natural resource management. The study adopted a case study design. The target population were officers in charge of environmental management in the county, traditional specialists and household heads. A total of 385 household heads, thirteen traditional specialist and ten Nandi county natural resource management policy officers were selected through systematic, snowball and purposive sampling methods respectively. Quantitative data was collected using questionnaires while qualitative data was collected through key informant interviews and focus group discussions. Quantitative data was subjected to both descriptive and inferential analysis. Descriptive data were analysed in form of frequencies and percentages. For inferential statistics chi square was computed to test relationships between study variables while qualitative data was analysed thematically. The study established Significant changes in the use

and application of IK in NRM- (Chi-square=129, df=1 P<0.05 for land use), (Chi-square= 230.7 df=2, P<0.05 for water resources), (Chi-square=151.3, df=1 P<0.05 for forest cover) and (Chi-square=154.4, df=1 P<0.05 for wildlife). Modern approaches in NRM have taken precedence over traditional ecological knowledge resulting to significant negative environmental implications that ranged from: shrinking of water bodies, reduced vegetation cover and extinction of endemic species in Nandi forest. The study found out that IK and modern NRM are complimentary rather than incommensurable. These findings suggest the need to encourage community-based NRM at grass root levels, and incorporation of rural participatory NRM in Nandi county environmental management plans. This will enhance the integration of indigenous knowledge in modern natural resource management strategies.

Keywords: Conservation, Environmental degradation, Community strategies, Sustainability.

INTRODUCTION

Globally there is increasing relevance of indigenous knowledge as an invaluable and underused knowledge reservoir, which presents developing countries particularly Africa, with a powerful asset in environmental conservation [1-3]. The Rio Declaration, the Convention on Biological Diversity, the documents coming out of the World Summit on Sustainable Development, and a whole host of other international instruments and forums have emphasized the current (and future) relevance of IK. Institutions such as the World Intellectual Property Organization, the International Labor Organization (especially Convention 169), the Food and Agricultural Organization, the World Health Organization, UNESCO, UNEP, UNDP, the UN Commission on Human Rights, and a number of other international organizations have similarly given IK importance [4, 6].

The Convention on Biological Diversity (CBD) was the first to develop measures for use and protection of Traditional Knowledge related to the conservation of and sustainable use of biodiversity [7]. The Agreement on Trade Related Intellectual Property Rights (TRIPS) inserted Article 27.3 (b) which allows member states of World Trade Organization (WTO) to use sui-generis system. This permits countries to come up with specialized and appropriate forms of protection regimes, which can use local legislation to protect IK.

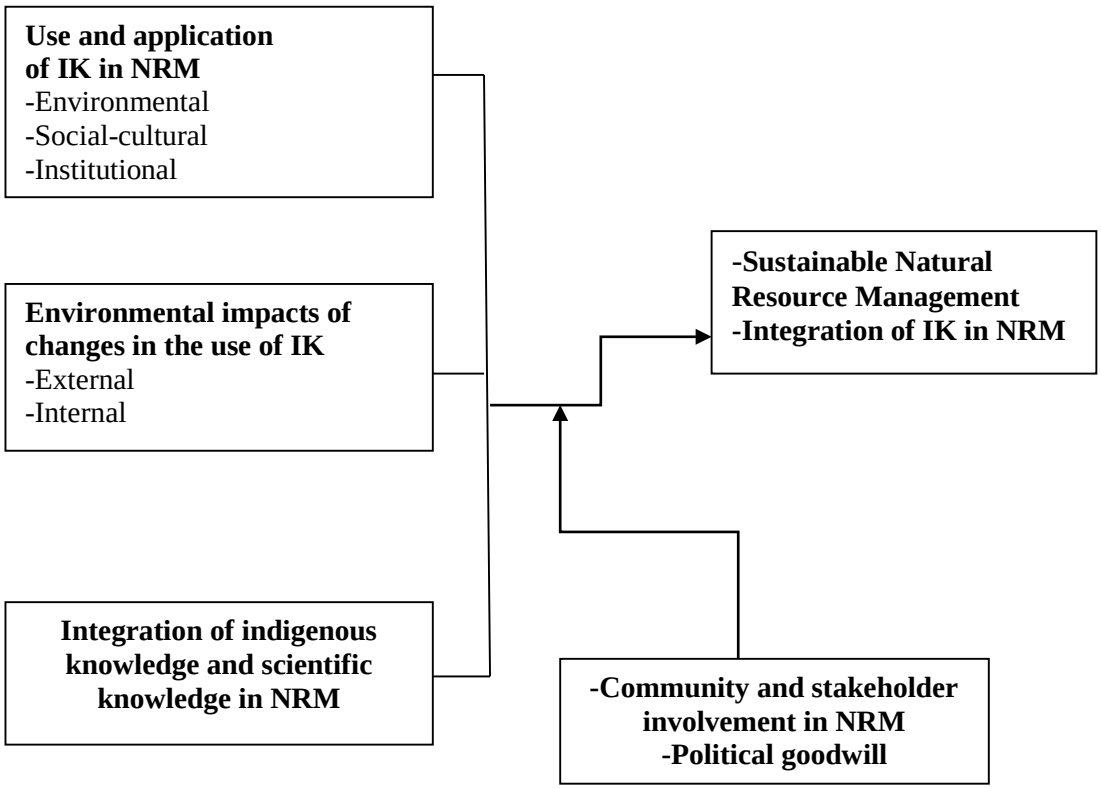
The World Intellectual Property Organization (WIPO) is working with organizations and indigenous and local communities in different nations to address the policy/legal issues on traditional knowledge protection through the Intergovernmental Committee on Intellectual Property, Genetic Resources, Traditional Knowledge and Folklore.

The African Regional Intellectual Property Organization (ARIPO) and Organization Africaine de la Propriete Intellectualle (OAPI), Traditional Knowledge and Traditional Cultural Expressions (TCE) aim at providing a legal framework to protect them and is formalized into a protocol for protection of Traditional Knowledge [8]. African states therefore have enough ground to come up with policies and legal frameworks on IK. The World Conference on Science, organized by UNESCO and the International Council for Science (ICSU), in its Declaration on Science and the Use of Scientific Knowledge, explicitly recognized the importance of Indigenous Knowledge and the need to respect and encourage its use for various forms of human endeavor [7]. The UN Declaration on Indigenous Peoples endorsed by the UN Human Rights Council in June 2006 recognized the contribution of indigenous knowledge to sustainable development and proper management of the environment [9].

The enactment of Environmental Management and Coordination Act (EMCA) 1999 provides an appropriate and legal framework for management of the environment. Policies emanating from EMCA include involvement of local communities and civil society in planning and management of environmental resources [10, 11]. Thus, recognises the important role played by indigenous knowledge in natural resource management. It is particularly instrumental to study the trends in IK application in NRM among the Nandi people in Kenya. The objectives of this study were to investigate the changing trends in use and application of IK in NRM and establish environmental implications of changes in use and application of indigenous natural resource management.

METHODS AND MATERIALS

The study was guided by Giddens Theory (1984) of time-space-distance that stipulates social relations of pre- modern societies are largely confined to a face to face interaction in a given locality. However, the advent of modernity undermines social interactions by fostering relations between absent others, internationally distant from any given situation of face to face interaction. It dis-embeds or lifts out social relations from local contexts of interaction and rearranges them across indefinite spans of time-space. According to Giddens changes often reflect or cause disruptions so that people's actions and their social systems become detached from the particular condition of ecosystems, in essence, people's perception of a relationship to elements in the ecosystem change. This can lead to over exploitation of resources and contribute to erosion of indigenous knowledge. This theory is useful in identifying the changes which have occurred over time in the use and application of indigenous ecological knowledge among the Nandi and their effects on the natural resources.



Source: Authors, 2016

Figure 1: Conceptual Framework

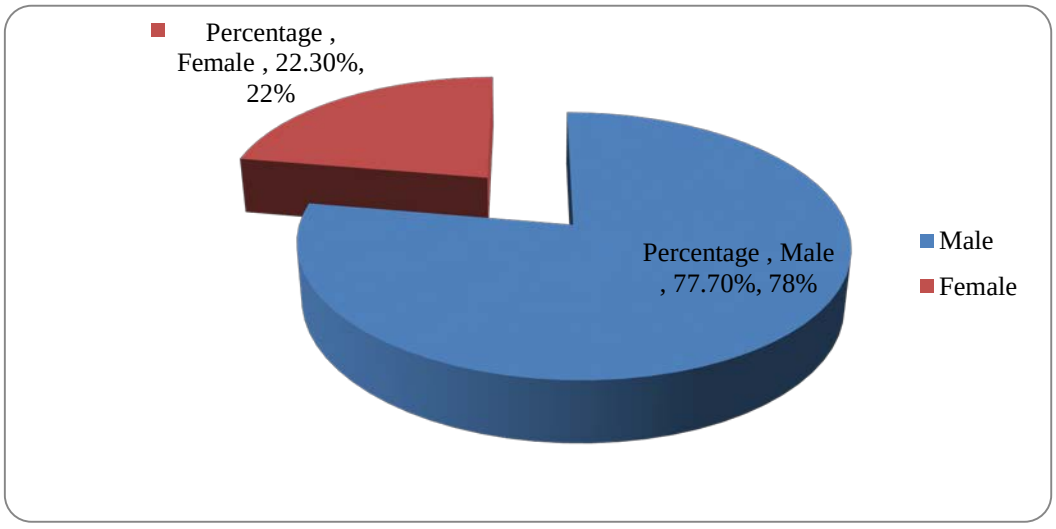
The study is conceptualized on the theoretical premise that man tries to adapt to the environment which he lives and derives his livelihood, he improves his knowledge skills and strategies to harness natural resources in a sustainable way. As shown in **Figure 1**, Indigenous knowledge is represented as emergent from man's daily interactions with the environment, observations and experiments (social, historical, cultural and bio-physical).

These interactions greatly shape and model the decisions made by people regarding exploitation of natural resources. That change may occur as a result of influence of factors from outside the ecosystem. As changes occur in time and space, indigenous knowledge also changes to adapt with the changing times. As IK becomes lifted from local context, it becomes less experiential and more factual influenced more by factors outside the ecosystem. This has repercussions (impacts) on the local ecosystem. Reflexivity enables local people to apply IK in new context thereby leading to sustainable use of natural resources in the community and hence environmental conservation.

The study adopted a case study design. The target population were officers in charge of environmental management in the county, traditional specialists and household heads. A total of 385 household heads, thirteen traditional specialist and ten Nandi county natural resource management policy officers were selected through systematic, snowball and purposive sampling methods respectively.

RESULTS AND DISCUSSIONS

Demographic Characteristics: There were a total of 408 respondents who participated in this study; 385 household heads, ten government officials in environment related ministries in the County and thirteen traditional specialists. The researcher established the general and demographic characteristics of these respondents (**Table-1.1; 1.2, 1.3** and **Figure 1.1, 1.2**).



Source: Authors 2016

Figure1.1: Proportion of household heads respondents by gender.

Majority (77.7%, n=299) of the respondents in this study were male whereas only 23% (n=86) were female. The results in **Table-1.2** shows 85.2% of all respondents in this study had formal education, 57.9%; had attained primary level education 16.4% secondary education whereas 9.9% had attained undergraduate education. Only 1% had masters' level education

Table-1.1: General characteristics of respondents.

Study site	Characteristics	Number of participants
Nandi Hills	**Gender**	
	Male	18
	Female	3
	Age:	
	Adult	
	Status in community	
	Community elders	3
	Traditional specialist	6
	Community member	7
	Government officer	5
Kapsabet	**Gender**	
	Male	17
	Female	7
	Age:	
	Adult	
	Status in community:	
	Community elder	4
	Traditional specialist	6
	Community member	10
	Government officer	4
Kipkaren	**Gender**	
	Male	8
	Female	1
	Age;	
	Adult	
	Status in community	
	Community leader	2
	Community member	6
	Government officer	1

Table-1.2: Proportion of Household Heads Respondents by Education Level.

Level of Education	Frequency	Percentage
No formal education	57	14.8%
Primary	223	57.9%
Secondary	63	16.4%
Undergraduate	38	9.9%
Masters	4	1.0%
Total	385	100%

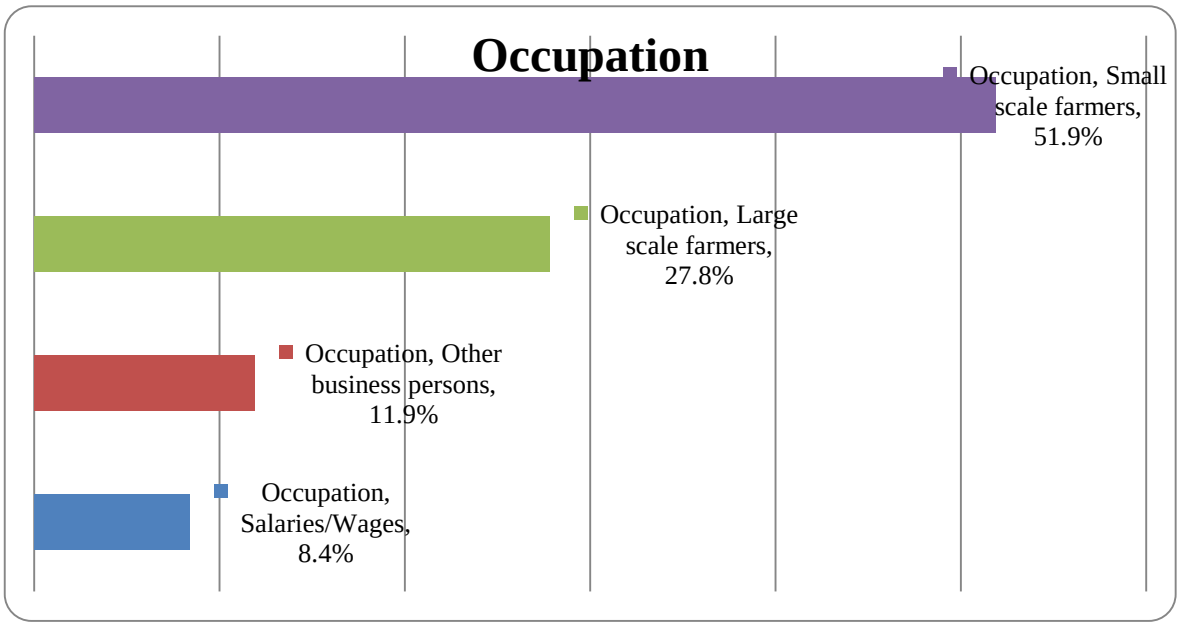
Source: Authors 2016

Table-1.3: Cross tabulations of education level and gender of respondents.

Education level	Gender		Chi-square
	Male	Female	
Never attended	54.8%	45.2%	10.203 df=4 P=0.037
Primary school	63.8%	36.2%	
Secondary school	72.2%	27.8%	
Tertiary	75.4%	24.6%	
University	52.6%	47.4%	
Total	66.3%	33.7%	

The above Chi-square results (P=0.037) indicate the independence between gender and education. These results implied that the level of education attained did not depend on what gender the respondent was. The study established the occupation of household heads in order to assess the extent to which families dependent on natural resources for livelihoods. Majority of respondents (51.9%; n=200) are small scale subsistence farmers while 27.8% (n=107) are large scale farmers.

Those who earn salary from formal employment are 8.3% (n=32) while 11.9% (n=46) are in business. Report from focus group discussion revealed self-employed respondents engaged in agricultural related business activities such as selling livestock, middlemen and mechanics repairing farm machinery. Those in formal employment are primary school teachers who supplemented their income by engaging in farm activities (see **Figure 1.2**)



Source: Authors 2016

Figure 1.2: Proportion of household heads respondents by occupation.

The Chi-square results (P=0.475) (**Table-1.4**) indicate the dependence between gender and occupation. Results imply that occupation status of respondents is linked to their gender. Majority of those respondents with salary were likely to be male.

Table-1.4: Cross tabulation of occupation and Gender.

Occupation	Gender		Chi-square
	Male	Female	
Unemployed	62.0%	38.0%	2.503 df=3 P=0.475
Self employed	69.5%	30.5%	
Formal/salaried	72.0%	28.0%	
Farmer	62.9%	37.1%	
Total	65.8%	34.2%	

Results shows age is an important factor in establishing use and application of indigenous knowledge in Nandi community. Findings indicate 29.4% (n=113) were aged between 21-24 years. Additionally 28.3% (109) were aged 41-50 years. Furthermore 19.1% (N=79) were aged 51-60. While 23.2% (n=89) were 60 years and above. Cross tabulation of gender and age is shown in **Table-1.5**.

Table-1.5: Cross tabulation of age and gender.

Age	Gender		Chi-square
	Male	Female	
21-40	51.4%	48.6%	18.097 df= 3 P<0.05
41-50	66.7%	33.3%	
51-60	76.1%	23.9%	
>60	76.7%	23.3%	
Total	66.3%	33.7%	

Residence of respondents: Residential status of the respondents was examined from two angles: the type of residence and period of residence. Findings show majority 84.6% (n= 326) are resident in various divisions by birth and minority 15.4% (n=59) are immigrations. Majority 62.6% (n=241), of respondents have lived in the study are for more than 20 years. Those who have lived for 11-20 years were 15.7% (60), while those who have lived in the study are for ten years and below are 22.7% (n=84 (see **Table-1.6**.).

Table-1.6: Residence of respondents.

Residence		
Residence by	*Frequency*	*Percent*
Birth	326	84.6
Immigrant	59	15.4
Total	385	100
Period of residence	*Frequency*	*Percent*
Less than a year	7	1.9
1 to 5 years	25	6.4
6 to 10 years	52	14.4
11 to 20 years	60	15.7
More than 20 years	241	62.6
Total	385	100

Natural resources traditionally conserved: Key informants were interviewed and traditional resource person (TRS) and focused group discussions stated the following (Box 1.1)

Box 1.1: Case study response.

> "This generation has tremendously changed, in the past; we used to regard our resources as sacred. Land for forests and water bodies were never tampered with. We used forests for religious purposes; prayer and offerings...you could not destroy such resources. Destruction was traditionally condemned. Today, you just see young people carelessly destroying the environment." (Personal communication, TRS).
>
> "We had cultural beliefs and taboos which guided us on how to live and care for our natural resources." (personal communication, FGD)
>
> "Children learned our way of life through stories and songs narrated to them by grandparents "(personal communication, FGD)

Indigenous knowledge and land use systems: The study sought to establish various land uses that have been in existence in Nandi region during three main phases: pre-colonial (before 1895); colonial (1895-1963); and post-colonial (1963 to date), and how indigenous knowledge has influenced these land uses. Views on land uses were sought from respondents and findings established that indigenous knowledge played a significant role in land uses during the pre-colonial and colonial times.

Various reasons were given by respondents for land conservation among the Nandi per-colonial period. Majority 87.1% indicated that land was conserved for grazing, 84.1% reported that land was conserved for food, while 80% indicated conservation of land for settlement and 63.6% indicated prestige and wealth. A proportion of 70.6%(272) comprised of respondents aged over 40 years indicated the main land uses during these periods was hunting, gathering, livestock keeping,

Responses from FGDs are as follows: We didn't plant crops in one place for many years... we cultivated one place then moved to a new place after two or three years; Land was only cultivated for 3-4 years and then a new area for cultivation was identified this ensured that the soil was not over exploited; Slopes and hilly areas were only cultivated for one year. In such areas trenches were dug round the field and in some instances ridges were built by piling logs and branches of trees across the field to control soil erosion. Responses from the participants indicated that land in Nandi community was assigned various uses that did not degrade the natural ecosystem.

Traditionally, agro forestry was practiced where crops are grown in the wilderness with natural vegetation using traditional artefacts that did not destroy the environment. The difference between traditional and modern agro forestry is that the latter introduced invasive plant species which destroy indigenous crops. Their main agricultural activity is keeping livestock and cultivating crops. The respondents grow maize, and beans for subsistence; tea as a cash crop for cash generation. Respondents reported their main land use during post-colonial period has been crop production, mixed cropping, mono cropping, agro forestry and animal husbandry.

Indigenous knowledge and forest conservation in Nandi County: The study established key reasons why forests were conserved in the past. This information was sought from three categories of respondents. There were 66.6% (n=256) respondents who indicated the key traditional reason attached to conservation of forests in Nandi was preservation of cultural sites, 61.4% (n=236) indicated religious

attributes as a key reason while 47.2% (n=182) indicated shelter for wildlife. Some indicated the key reason as provision of fuel wood 49.6% (n=191); medicinal reasons 97.8% (n=377); rainfall attraction 98.3% (378); protection of water catchment areas 98.0% (n=377) and provision of construction materials, 84% (n=323). Note that these are multiple responses by respondents. Results reveal majority (87.2%) of respondents reported that forest are categorised as hunting grounds. Another 81.3% indicated that forests are categorised as ritual sites, while 57.4% indicated that forests are categorised as graveyards, only 14.6% indicated other forms of categorisation. This study sought to establish the indigenous reasons behind conservation of specific tree species and plant species. Information collected from focus group discussions showed in **Table-1.7**.

Table 1.7: Indigenous reasons for conservation of tree/plant species among the Nandi.

Tree/Plant Species	**Indigenous Reason for conservation**
Simatwet (Fig)	-Sacred tree -Herbal medicine -Sacrifices offered under this tree
Emdit (olive/olea chrysophylla)	-Medicinal value - Makes symbolic sticks for elders -Preserving milk -Provide shade for elders to discuss community issues
Tendwet (prunus africanium)	- Medicinal value - Makes women ceremonial sticks
Lamaiywet (ximenia americana)	-Water catchment preservation -Fruits are edible
Kagarweet (erithrina toonentosa)	-Healing properties -Seeds used to make decorative beads for women
Sosiot (palm) arecaceae	-Sacred and used for religious purposes -Used for construction of initiates huts -Used to clean guards for storing milk -Used to make brooms
Kikuskoit	-Used to make arrow extensions -Used for making beer drinking straws since it is hollow inside
Tumeiyot (Khat) Catha edulis	-The leaves are chewed for pleasure

Source: Authors 2016

The respondents indicated the penetration of Christianity in the community tremendously side lined the use and application of indigenous knowledge in resource conservation. One of the traditional specialists (TRS) observed as follows:

"...we now worship in church and as a result of Christianity, very few families among the Nandi practice traditional initiation rites...with the introduction of modern medicines, herbal medicines have lost popularity and hence the indiscriminate cutting of trees in the natural forests." These sentiments imply the use and application of indigenous knowledge in resource conservation has changed over time. These changes have negative impact on resource conservation among the Nandi.

Factors contributing to forest depletion in colonial and post-colonial periods: Results reveal that various factors have contributed to the shrinking of forest cover in Nandi County; 86.8% (n=308)

indicate forests are cleared for settlements, while 85.4% (n=303) indicated forest are depleted due to population growth. Furthermore, 82.8% (n=293) indicated forests are cleared for fuel wood provision, 72.4% (257) indicated forest are cleared for urbanization while 62.5 (n=222) reported laxity in law enforcement as a factor contributing to forest depletion (see **Table-1.8**).

Table-1.8: Factors contributing to forest depletion.

Factor	Frequency	Percentage
Population growth	303	85.4
Human settlement	308	86.8
Fuel wood	293	82.8
Laxity in law enforcement	222	62.5
Urbanization	257	72.4

Source: Authors 2016

The respondents reported prime forest land was alienated by colonial government to white settlers and much of forest land was in private ownership. The Africans were displaced from their lands and colonial forest department claimed it without considering the rights of local inhabitants and imposed strict regulation on use of products by forest adjacent communities. African communities resisted these regulations and hence encroachment and misuse of forest resources was introduced. Forest policy is a legacy from colonial administration which does not recognize traditional systems, local knowledge and traditional rights. This has made it difficult to enforce the act due to resentment of government officers by local people.

Indigenous knowledge and wildlife conservation in Nandi County: The study established key reasons why wildlife was conserved in the past by the Nandi people. Majority of the respondents (98.5%, n=379) indicated provision of food as the main indigenous reason for wildlife conservation. Other reasons identified are aesthetic purposes 27.0% (n=103), totem provision 24.6% (n=95), hides and skins 52.1% (n=201) and religious purposes 52.8% (n=203). A significant proportion (97.8%) of household heads' indicated the Nandi community lived in harmony with wild animals and that wild animals were not killed haphazardly. These respondents indicated that in order to protect animals, each clan had a sacred animal (totem) and the clan protected the animal. The killing of sacred animals was forbidden and any breach of this was dealt with severely. They reported in focus discussions that the offender was either put to death or driven out of his/her clan and his cattle confiscated. These findings agree with those of Ipara [12].

Traditional specialists indicated during the focus discussions that if for any reason the community members wanted to kill a lion for its skin, the *talai* clan elders would be approached and asked for permission to kill the animal. The traditional specialists emphasized that this helped in wildlife conservation. Some of the traditional specialist retorted as follows:

"...many of our wild animals have been killed because this generation no longer observes indigenous customs attached to exploitation of natural resources...they (the current generation) are mainly driven by greed..." (Personal communication, TRS) "….our wildlife is our cultural heritage, yet through over hunting, timber harvesting, bush fires, and use of toxic chemicals large number of animals, reptiles, and birds have been lost (personal communication, TRS). Our tradition of totemism is not idol worship...it was intended to moderate and save our wildlife (Personal communication, TRS) "...we cannot throw away our totemism just like that because it has been one of the major traditional conservation tools which has helped conserve many wildlife species (personal communication, FGD).

The traditional specialists indicated that the hyena for instance, was highly protected and feared among the Nandi since it was considered a living mausoleum of the dead. **Table-1.9** provides a list of clans among the Nandi and their respective animal totems.

Table-1.9: Clans and their totems in Nandi community.

Clan	**Totem**
Kipasio	Sun/mole
Kipaa	Snake/Columbus monkey
Tungo	Hyena
Kamwaike	Partridge
Kiptopke	Monkey
Moi	Crested crane/Buffalo
Sokom	Hawk
Kipsirgoi	Warthog
Toiyoi	Solider ant/Rain
Talai	Lion
Kipkokos	Lizard
Kipkenda	Bee/Frog
Kipamwi	Duiker
Kipkoitiim	Elephant/Chameleon
Chemur	Wild cat

Source: Authors 2016

Traditional specialists indicated that there are beliefs attached to killing of wild animals in Nandi community. One traditional specialist narrated a story as follows:

"...a woman once killed a frog and later gave birth to a baby with frog like features (short and rough skinned)...when a person killed an animal, he/she had to ask the animal for forgiveness". This is unlike today where young people just kill wild animals with impunity. Again poor cultivation methods, deforestation, charcoal burning, overgrazing are other factors causing severe wildlife habitat degradation." (Personal communication, FGD).

Indigenous knowledge and water conservation in Nandi County: Results indicate the Nandi people conserved water for varied reasons. Findings in **Table-1.10** show majority (97.8% n=354) of the respondents indicate water is conserved for domestic use; 87.3% (316) reported that it is conserved for cultural practices; 74% (n=268) indicate for salt licks while 76% (n=275) report for religious rituals.

Table-1.10: Reasons for conserving water resources (multiple response)

Variable	**Frequency (%)**
Reason for conserving water source	
Domestic use	354 (97.8)
Salt licks for animals	268 (74)
Cultural practices	316 (87.3)
Religious rituals	275 (76)

Source: Authors 2016

Respondents indicated in varying degrees the events and activities that traditionally were carried out in water sources. A majority of 87.5% (n=357) reported water resources was traditionally used for initiation ceremonies; 84.0% (n=348) as sacred places, for cleansing ceremonies are 78.9% (322) while 68.9% (n=281) provided clay for pottery and smearing houses. We observed regulations for ensuring watering points are not misused. The elders regulated the access and use of watering points and different villages were allocated particular days they could use. This reduced congestion and misuse of water resource. Traditional specialists' responses indicated indigenous knowledge was key in the use of water resources. This is because water was used sustainably, paying attention to changing seasons. More attention is paid to the use of water during dry seasons to ensure and manage scarcity.

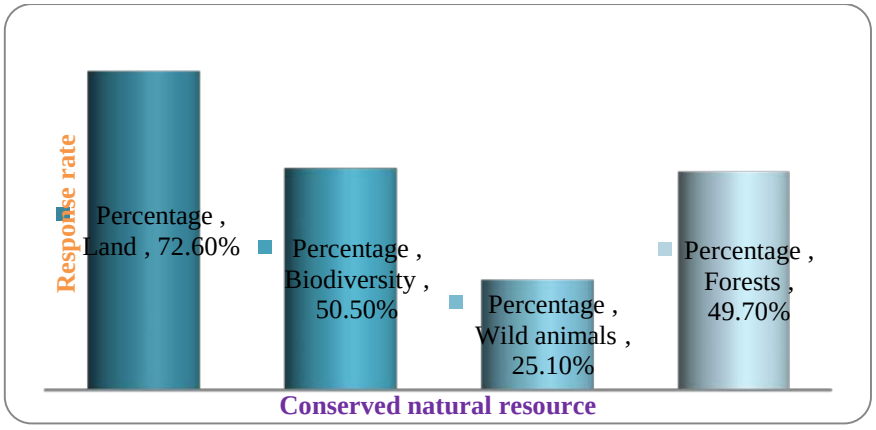
Traditional specialists reported thus;

"...we could not allow any careless use of water resources especially during dry seasons... this was meant to ensure that water was available for everyone during that season. There were clear signs of dry seasons like disappearance of crested crane birds and shading leaves of some trees species. Rivers are regarded sacred places, and many religious rituals are held there. We belief ancestral sprits resided in rivers." The *Talai* clan are questioned when there was delay in rainfall because it was believed they could stop rain. In case of prolonged drought a ritual was performed by women to ask God for rain. Women would gather together, proceed to the river singing songs imploring God to give them rain. They carried with them cooking sticks and pots and at the river women chanted prayers and threw the cooking sticks and pots to the river as a sign of offering to the rain god. Upon returning home it was believed that rain would fall immediately and indeed it did (personal communication, FGD).

The respondents who were drawn from household heads indicated there has been tremendous change in the use and application of indigenous knowledge in conservation of water resources One respondents stated thus: "...things have really changed in this generation, the young people have thrown away our treasure (indigenous knowledge) that was significant in water conservation. Today water flows wastefully, pipes are burst, and water is wasted in irrigation, in factories and many uses. What pains me is the use of water is careless!" An elderly respondent retorted: "...at this rate, I wonder if my grandchild will ever have sufficient water. This generation should ask us how we used to conserve water resources..." (Personal communication, FGD). Traditional specialist Stated; "...in the past, we knew when we were about to experience drought or when there was an impending danger just by observing the behaviour of different bird species. Today trouble strikes and people are not aware, they have neglected traditional knowledge on environmental resources..." (Personal communication, TRS).

Indigenous knowledge and land conservation in Nandi County: The land tenure system in Nandi in pre-colonial period was community based hence each community had its own area of occupation. Some areas were shared by entire community especially grazing land. The entire community benefit from entitlements over those common areas like; salt leeks and water points. Majority of respondents (88.82%; n=361) indicated that communal land tenure system was an effective tool in enhancing natural resource conservation in Nandi. Respondents indicated this was because communal land tenure system had a system of controls and checks that ensured each member of the community acted responsibly towards the protection and preservation of natural resources.

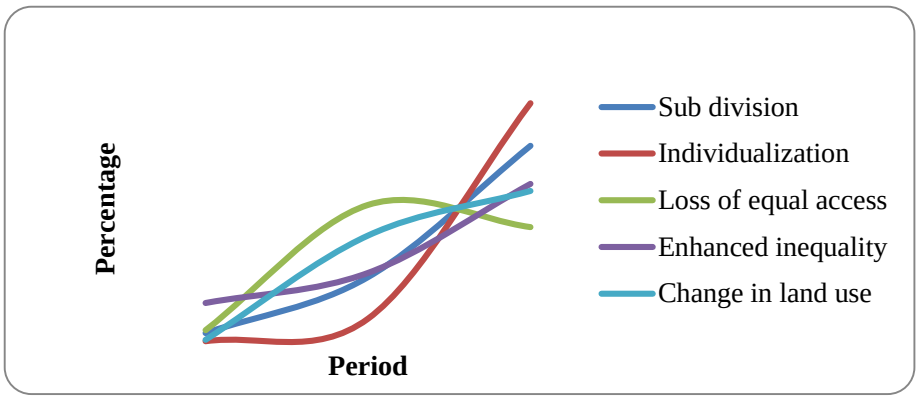
The study sought to find out reasons for preference of communal land tenure over other land ownership systems. Although the participants indicated the main reason for communal land ownership was to ensure effective natural resource conservation; household heads and traditional specialists have varied responses on which resources this ownership system intended to conserve. A majority of 72.6% (n=289) reported communal land ownership helped in facilitating conservation of land resource, 50.5% (n=201) of biodiversity, 25.1% (n=100) of wild animals, and 49.7% (n=198) of forests. (Refer **Figure 1.3**.).



Source: Authors 2016

Figure 1.3: Reasons for the predominant communal land ownership system.

The study established there have been remarkable changes in land tenure systems from pre-colonial, colonial and post-colonial periods. Majority of respondents 97% (n=377) reported there has been changes in land tenure, land ownership and land use activities. Majority (88.95) reported changes are individualization of land ownership; and 73.2 reported sub-division of land. Some 59.21% indicated sub-division of land enhanced inequality, 56.55% reported changes in land use, while 43.21% indicated loss of equal access to land (see **Figure 1.4**).



Source: Authors 2016

Figure 1.4: Changes in land tenure systems.

CONCLUSION

The study findings have shown the use and application of indigenous knowledge among the Nandi has changed significantly during the three phases of pre-colonial, colonial and post-colonial periods. The changes have been significant in the conservation of water resources; land use and land tenure; protection of forests and wild animals. The modern approaches to natural resource management have taken precedence over the indigenous natural resource management. As a result significant environmental impacts have been observable due to neglect of use and application of indigenous knowledge in natural resource conservation. The study further established that IK and modern NRM strategies are complementary rather than fundamentally incommensurable. Differences between them, can be resolved through collective natural resource management approaches that integrate IK.

RECOMMENDATIONS

In order to conserve and integrate indigenous knowledge in NRM among the Nandi people, there is need to create awareness among the youth and professionals on the benefits of using IK in NRM. Awareness creation can be achieved through promotion of cultural events within the county and to show case cultural aspects of the Nandi nationally and internationally. These include: rites of passage, folk media, rituals, proverbs, taboos, totems and songs. Annual cultural events could be organized at the county level through the ministry of culture, where different sub-communities are encouraged to show case their IK and NRM interaction.

There is need for to documentation of Nandi people indigenous knowledge in natural resource management to be used by current and future generations. These include: written, audio and video recording of the community's knowledge on the utilization of natural resources in local language and translated into English for wider readership. The study further recommends the creation of a community knowledge center where all information about the Nandi culture and in particular natural resources management is stored and can be made available for public knowledge. This should include establishing an inventory of indigenous plants, trees, birds and animal species in the County. The county government could assist to create partnerships between the community and researchers to identify other unique knowledge available among the Nandi on biodiversity preservation and weather control.

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