International Journal of Trend in Scientific Research and Development (IJTSRD)
International Open Access Journal
ISSN No: 2456 - 6470 | www.ijtsrd.com | Volume - 2 | Issue – 5

Impact of Environmental Conservation Status on Indigenous Medicinal Knowledge (IMK) Survival: Case of South Imenti in Meru County

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ABSTRACT
Survival of indigenous medicinal knowledge is threatened due to environmental degradation. The later is partly caused by loss of natural vegetation, land transformation and diminishing use of socio-cultural conservation measures. The study was conducted to investigate the relationship between the level of environmental conservation and the existing indigenous medicinal knowledge in Imenti South District of Meru County with the following objectives; 1. Assessment of the approaches and strategies used in conservation of Indigenous Medicinal Resources, 2. Assessment of the zonal environmental conservation status of the Indigenous medical knowledge, and 3. Establish a framework for identifying priority medicinal materials for immediate domestication and conservation. Data was collected from 453 respondents using questionnaires, interview schedules and field observations. Statistical Package for Social Sciences (SPSS) Version 17 was used for analysis. Acceptance of indigenous medicine (IM) and the consequential overharvesting of indigenous medicinal materials (IMMs) was found to be on the rise.On farm growing, preservation and conservational harvesting through community-based development programme were recommended to revitalize indigenous medicinal resources.

Keywords: *Environmental Conservation, Indigenous Medicinal Knowledge, Indigenous medicinal Resources, survival.*

1. INTRODUCTION
Human activities have shaped the world over the years. The world landscape and land cover have experienced indiscriminate destruction of forests and woodlands leading to destruction of biodiversity (Hamilton, 2008). Extinction of some organisms has been caused by human activities like overgrazing, improper management of agricultural land and general deforestation (Bisht *et al.*, 2006). Factors of environmental degradation are reducing the IMMs, whose need is increasing, thus, leading to extinction of some of the materials (Mworia, 2000 and Kareru *et al.*, 2007). Use of indigenous medeicinal knowledge (IMK) is largely localized, with only a little of existing IMMs processed into medicinal products for larger markets (Dery, *et al.,* 1999). Therefore, market surveys can easily miss some major aspects of IMK that exist in a community. Thus the study focused on both village and market (herbalists) level in South Imenti district of Meru County in Kenya.

2. MATERIALS AND METHODS
All possible Medicinal materials in Imenti South district were identified. Their local names (kimeru), scientific names, diseases cured/use, parts used and place of harvest were recorded. Interview schedules, questionnaires and observation check list were used to collect social data from respondents. The study area was categorized into three zones; the upper zone bordering Imenti forest with altitude of >1600M and rainfall of >1800mm/yr, the middle zone with altitude range of 1300 – 1600M and rainfall range of 1400 – 1800mm/yr and the lower zone bordering Tharaka district with altitude range of 1180 – 1300M and rainfall range of 900 – 1400mm/yr. The zones were delineated using physiognomic characteristics.

3. RESULTS AND DISCUSSION

3.1 Indigenous Medicinal Materials in Imenti South

Two hundred and sixty one indigenous medicinal materials were identified in terms of their local/ kimeru names, scientific names, diseases cured/use, parts used and place of harvest. Twenty materials were identified as non-plants. Leaves bark and roots were the commonly used part of plant IMM. 47.6% of the IMMs Use barks and roots thus causing drying up of the tree or shrub. The survival of 50% of IMM of plants in nature was threatened by drying up whenever harvested. To get animal products, animals were killed or fatally injured thus poaching from the wild was completely unsustainable. In such cases, domestication which allowed controlled harvesting was the only sustainable option. Only 1.1 % of materials mentioned whose respondents were not sure of the parts that were used. Most likely they had never used them, which was a significant indicator of some medicinal knowledge on the verge of disappearance.

3.2 Conservation measures used

Twenty percent of IMM was conserved on farm while over 60% of the materials were not under any conservation measure (Figure 3). The implication probably is that IMMs were not enjoying much conservation and their survival in the County habitats was bleak. Most of the harvesting of IMM was done on wild resources with no regard to conservation.

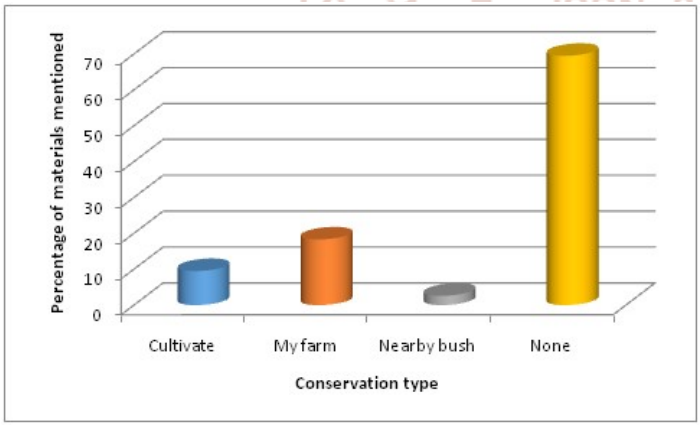

Figure 3.: Existing Forms of Conservation and Their Status

The lower zones of Imenti South district presented higher individual participation in conservation of IMMs than the upper zones. As a result of handling them more during conservation and domestication, they developed more individual knowledge. This means that the more a community interacts with their environmental resources, the more the knowledge they acquire. There was a direct relationship between conservation participation levels and the individual knowledge levels in zones (Figure 4 and 5).

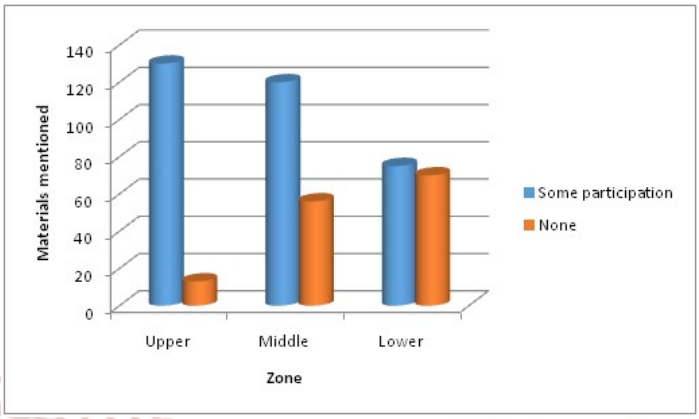

Figure 4: Individual conservation participation per zone

There is more IMK survival in lower zone where people participate more in conservation of their indigenous knowledge. A community that participates in conservation of their IMMs ends up retaining higher knowledge of the same.

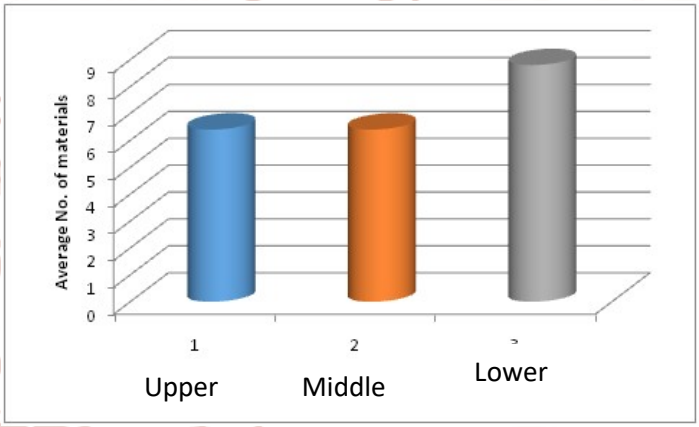

Figure 5: Average Number of materials known per person per zone

The triangular-bark conservational harvesting method was successfully used in medicinal tree species including *Mwiria* (*Prunus africana), Mururuku (Terminalia brownii)* and *Mutuati(Trichilia emetica),*(figure 2).The triangular wound take shorter time to heal.

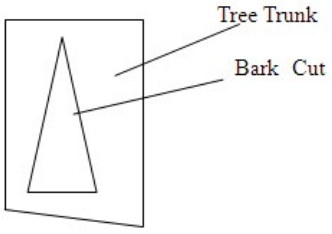

Figure 2: Conservation harvesting bark cut

3.3 Relationship between Environmental Status and IMK

Assessment of individual conservation participation per zone showed that in the upper zone; only 8.2% of the respondents were conserving some materials, 31.6% in the middle zone and a high of 51.5% participated in the lower zone. The hypothesis test was done using SPSS version 17 chi square test. The hypothesis had stated that, "The survival of indigenous medicinal knowledge of Imenti-South district was not dependent on the ecological status of the environment". It was rejected, proving the alternative to be true at $p<0.05$.

Table 3.1: Hypothesis test
Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	63.013[a]	2	.000
Likelihood Ratio	68.950	2	.000
Linear-by-Linear Association	62.722	1	.000
N of Valid Cases	453		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 40.83.

Therefore, the survival of indigenous medicinal knowledge is dependent on the conservation status of the environment.

3.4 The topmost three known IMMs by respondent frequency

The most known and used medicinal materials were *Mutongu*(*Solanum incanum*), *Muukura(Mondi whitei)*, *Mururuku(Terminalia brownii)* and *Mwarubaine (Azadirachta indica)* respectivelyas shown in appendix 2. There was a tie in the last two materials thus four IMMs were identified. With this high frequency, the four plants have a high likelihood of having important medicinal substances and also vulnerable to overharvesting. Kareru, *et al*. (2007) had done research on *Mururuku (Terminalia brownii)* which revealed that the bark sap had an active antibacterial substance.

3.5 Zonal conservation status

The survival of indigenous medicinal resources was dependent on the conservation status of the environment. The lower zone with more bush parcels recorded more IMRs. This is because fallow lands and forests were found to be main sources of IMMs and knowledge of the community. The average size of most fallow lands was identified from the following categories: N/A, <1 hectare, 1-5 hectares, and 5-10 hectares and >10 hectares. N/A represented respondents who did not give any bush parcels thus asking them about the size was not applicable. In the upper zone, the land size of the bushes was mainly >10 hectares (84.9%). This was because it was the Imenti forest or *Nthunguuru* forests which were large. The middle zone report showed that 63.7% of the respondents estimated the bush land sizes to be <1 hectare (table 1).In the lower zone, there was increasing number of respondents with parcels of different sizes. 33.8% of the respondents identified parcels of <1 hectares, 14.7% , 1-5 hectares and the rest were of different size. The 3.7% that cited >10 hectares referred to *Kijege* hill and *Kiringa* forest as well as some large tracts of private land in *Nkachie,Kithakanaro* and *Mitunguu* which are being cleared fast for irrigation agricultural expansion. The middle and lower zones, and more so in the lower zone, there were a wide variety of bushes of all sizes which provided for higher amounts of indigenous medicinal materials.

Table 1: Bush Sizes

Zone		Land size in hectares					Total
		0(N/A)	1(<1)	2(1-5)	3(5-10)	4(>10)	
Upper	Freq.	.7%	13.0%	.7%	.7%	84.9%	100.0%
Middle	Freq.	7.6%	63.7%	9.9%	7.6%	11.1%	100.0%
Lower	Freq.	43.4%	33.8%	14.7%	4.4%	3.7%	100.0%
Total	Freq.	16.1%	45.0%	8.4%	4.4%	26.0%	100.0%

3.6 Impact of Environmental Status on Knowledge survival

The number of forests increased with decrease on zonal altitude which also increased number of IMMs (Increased IMMs biodiversity). The middle zone had the highest variety of IMMs. This was favored by the fact that more people participated in the conservation. Also, the ecological niche may have favoured some additional IMMs endemic in both lower and upper zones. However more individual knowledge had

survived in lower zone where individuals had higher conservation participation. Zones with higher medicinal knowledge provided higher market for the same resulting to higher number of practitioners (herbalists). The lower zone had the highest number of herbalists: table 2, followed by the upper zone while the middle had the least. The lower zone was consistent in its high IMK in that it had 13.2% of the respondents in the zone being herbalists. It had the highest conservation, highest knowledge and good market. This was even higher than the upper zone near Imenti forest (great IMMs reservoir) because their higher knowledge created market. They visited Imenti forest for IM even more than the immediate neighbors.

The areas with higher environmental conservation parameter values presented higher number of known IMMs, which were sought by higher number of herbalists. This ensured high participation in conservation for individual use and market, as well as bequeaths the treasure to the future generation.

Table 3: Average number of materials in zones

Zones	Number of respondents	Number of material mentioned	Average Number of IMMs per person
1(upper zone)	146	940	6.4
2(middle zone)	171	1096	6.4
3(Lower zone)	136	1194	8.8
Total	453	3230	7.1

Zones with higher environmental conservation had higher number of villagers who could identify and harvest their IMMs. 60.3%Villagers of upper zone and 81.6% of lower zone villagers used their IM. The middle zone had higher variety but lower use, lower conservation participation and lowest knowledge. IMK is therefore not dependent on the goodness of the ecological niche but the interactive activities with the existing IMMs. The IM was found to have four consequent benefits; reduced the cost of mitigating ill-health, enhanced knowledge of their IMMs, instilled the instinct for their conservation and transfer of knowledge to the future generation.

Table 3.3: The main forest harvesters per zone

		(N/A)	(Villagers)	(Village herbalists)	(Hawkers)	(non-villagers)	Total
Upper	Freq.	.0%	32.2%	28.1%	3.4%	32.2%	100.0%
Middle	Freq.	1.2%	91.8%	2.9%	2.9%	1.2%	100.0%
Lower	Freq.	9.6%	65.4%	16.2%	2.9%	5.9%	100.0%
Total	Freq.	3.3%	65.3%	15.0%	2.4%	13.9%	100.0%

IMMs conservation programme needs to target all zones to achieve sustainable supply of IM in pace with increasing demand, while easing achievement of Sustainable development goals as well as Kenya vision 2030. Targeting forests alone would leave out IMMs that are endemic innon-forest lower zones. Forest reserves in the middle zone and lower zone should be given equal protection effort as gazette forest.

4. CONCLUSIONS AND RECOMMENDATIONS

Socio-cultural conservation measures like totems, myths, superstitions and taboos had traditionally influenced the conservation of IMRs for long. They have been eroded from the culture thus alternative conservation mechanisms are required. Legislations and their supervisory mechanisms were in place but it was established that they were inadequate and unappreciated in enhancing survival of IMRs in the community.

Adoption of the integrated community-based conservation strategies is proposed. A community-based development programme intended to revitalize indigenous medicinal resources should emphasise on farming, preservation and conservational harvesting of the materials for their multipurpose use which include medicine provision.

Domestication-for-conservation mechanism in the human settlement areas should be put into place so as to reduce harvesting from the wild. It would also save resources which are endemic in the lowlands.

There is need for a chemical analysis into the IMMs to realize their full potential. It will also reveal whether there are some toxic elements in them.

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