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Indigenous Systems of Forest Management and Beekeeping Practices: Case of Mzoghoti Village Forest Reserve, West Usambara Mountain, Tanzania

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Abstract A study to assess the application of indigenous systems of forest management and beekeeping practices was conducted at Mzoghoti Village Forest Reserve in West Usambara Mountain, Lushoto District, Tanzania. Data was done in three villages namely Makose, Kilanga and Mlesa. It involved household survey, key informant interviews and focus group discussion used to acquire data from village government leadership, forest officers, elders and local communities. A sample size of 90 households obtained through simple random sampling was used. The collected data were coded and grouped for analysis. Descriptive statistics were computed using the Statistical Packages for Social Sciences (SPSS) 11.0 for Windows. Results indicated that scaring technique (37%), conservation of sacred forests (32%) practice and traditional norms (31%) were the most existing indigenous systems of forest management practiced in Mzoghoti Village Forest Reserve. Beekeeping practices were based on the use of logs (90%) and barks hives (10%). *Ocotea usambarensis, Juniperus procera, Eucalyptus grandis, Grevillea robusta* and *Erythrina abyssinica w*ere the tree species preferred for hives making while *Albizia lebbeck, Acacia meansii, Grevillea robusta, Eucalyptus grandis,* and *Ficus thoningii* were preferred for hanging beehives. Honey and wax were the main bee products which were used for improving livelihoods of the people around the forest reserve. It was concluded that, indigenous systems of forest management and beekeeping practices are perceived, maintained and respected by communities around Mzoghoti Village Forest Reserve and need to be scaled up in other communities of Tanzania.

Keywords Indigenous systems, Forest management, Beekeeping practices

1. Introduction

Tanzania is endowed with large and valuable forest resources [1]. Forest goods and services have significant potential for the economic development of the country [1, 2]. Unfortunately the aggregate size of forest area continues decreasing due to deforestation. The rate of deforestation in Tanzania is estimated to be 372,871 hectares per annum which takes place in both protected and unprotected forests but mainly takes in the unprotected forests in General Land [3]. This is as a result of clearance for small scale and commercial agriculture, fuel wood, charcoal burning, building poles, logs export and uncontrolled fire [4]. Trees and shrubs in many forests have been burned and cut down and turned into ecosystems dominated by various grasses and herbs [5].

Forest loss and fragmentation are widely recognized as the two most important factors responsible for environmental degradation. The continuing forest loss is atelling measure of the imbalance between human needs, wants and nature's capacity [6]. The constantly changing forest management policies have not helped either to preserve biodiversity, or to develop forestry, instead forest ecosystems continued to be destroyed [7]. Modern forestry and beekeeping policy itself cannot lead to sustainable, productive forestry and conserve biodiversity unless it is combined with the indigenous management system of the local community and those systems should be strengthened [7]. Indigenous forest management systems and traditional beekeeping practices refer to knowledge and practices that have primarily originated locally and are performed by a community or society in a specific place for managing forest resources [8]. In addition, indigenous forest management reflects the management that has been organized by indigenous people through their traditional institutions for many years. Traditional institutions are socially embedded norms, behavior and procedures that shape how people act, in a given society [9]. This knowledge evolves and emerges continually over time according to people's perception and experience of their environment and is usually transmitted from generation to generation by word of mouth or by practice [10]. Indigenous forest management activities and traditional beekeeping practices may originate in specific

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areas in response to specific pressures, but this does not prevent them from adopting and transforming appropriate components of scientific forest management systems and modern beekeeping practices through interaction and shared experiences [11].

Some forms of indigenous systems continue to exist in some places despite a general belief that the nationalization of forests destroyed these systems [12]. The continuous survival of indigenous forest management systems in many locations despite the nationalization of forests was probably because of informal cooperation between communities and local officials that allowed successful forest conservation practices to continue against the national policy [7]. Indigenous knowledge plays an important role in local decision-making with regard to management of forest resources, which involves not only technical practices, but also social institutions that organize technical practices [9].

Beekeeping in Tanzania plays a major role in socio-economic development and environmental conservation. Beekeeping is advocated to improve human welfare by alleviating poverty through increasing household income; it is a source of food and nutritional security, low materials for various industries, medicine and enhancing environmental resilience [6]. Beekeeping also plays a major role in improving biodiversity and increasing crop production through pollination to both cultivated and wild plants [13]. It is estimated that beekeeping generates about 1.2 million USD annually for the economy from sales of honey and beeswax [14]. It is an important income generating activity with high potential for improving incomes, especially for communities living close to forests and woodlands. For many years the practice has been very common in various parts of Lushoto district. Due to high population growth and increase pressure of human activities around forest reserves including Mzoghoti, this study was therefore conducted to assess the indigenous systems of forest management and beekeeping practices and their implication in management of Mzoghoti Village Forest Reserve in West Usambara Mountain.

2. Material and Methods

Study area description

Lushoto District is located between 04° 22' S - 05° 08' S, and 38° 05' E - 38° 38'E within West Usambara Mountains, a part of the Eastern Arc Mountains with an area of 3,500 km^2 [15]. The district has an elevation ranging from 900 to 2250 m.a.s.l. The climate is characterized by a short rainy season during November-December and a longer one during March-May with annual rainfall ranging from 600 to 1,200 mm per annum. The minimum and maximum temperatures are 13°C and 27°C, respectively. The area had total population of 492,441 people where the main ethnic groups are Shambaa, Pare, and Mbugu [16]. The Shambaa is the predominant tribe (78% of the population) followed by the Pare (16%) while Mbugu is the minority (5%) [17]. Other small groups are also found in this area accounting for only 1% of the population. People's livelihood depends on subsistence farming. The food crops grown are maize, beans, wheat, Irish potatoes, yams, bananas, and cassava. The study was based on Makose, Mlesa and Kilanga villages around Mzoghoti Village Forest Reserve (MVFR).

Sampling design and data collection

Mixed sampling techniques were used. In the first stage, a purposive sampling technique was employed in selecting three villages (Kilanga, Mlesa and Makose) out of 17 villages surrounding MVFR. The selection was based on proximity to the forest. In the second stage, random selection of household within each of the three identified villages was done. A total of 30 household individuals from each village irrespective of village population size were selected. Data were collected using Participatory assessment and household survey. Household survey was conducted using structured questionnaire to complement the qualitative information from participatory assessment. A total of 90 households were randomly selected from three villages. Questionnaires were used to collect data related to; indigenous systems of forest management, existing indigenous systems, beekeeping practices (honey production, honey collection seasons and harvesting techniques) and the potential uses of beekeeping in the study area. Participatory assessment include focus group discussion (FGD) and Key informant interview. FGDs aimed at capturing information on indigenous systems of forest management and beekeeping practices and the potentials of beekeeping to livelihoods. FGDs comprised of 10 people in each village, aged above 40 years with gender consideration. The key informants were drawn from village government leaders, forest officers, and elderly people in the respective villages. The tools aimed at capturing information on indigenous systems of forest management and beekeeping practices.

Data Analysis

Content method and Statistical Package for Social Science (SPSS) were used to analyse qualitative and quantitative data respectively. Qualitative information's collected through verbal discussion and open ended questionnaires were broken down into smaller meaningful themes and analysed to bring statistical meaning. This helped in ascertaining attitude of the respondents. According to Kajembe [18] this technique can be used to explain the way social system and the manner in which they relate to the physical environment.

Prior to data analysis using SPSS, coding was first done to summarize information based on formulated ecosystem service variables. Descriptive statistics were computed using the Statistical Packages for Social Sciences (SPSS) 11.0 for Windows [19].

3. Results and Discussion

Characteristics of Respondents

Respondents characteristics assessed include age, sex and

education level (Table). This type of information is important in determining the application of indigenous forest management systems and traditional beekeeping practices on household livelihood.

Table 1. Distribution of respondents by sex, age class and education level

Parameters	% Respondents
Sex	
Males	62
Females	38
Age class	
31-40	7
41-50	17
51-60	23
>60	53
Education level	
Primary	77
Secondary	2
Informal	21

The study findings revealed that, about 62% of the respondents were males and 38% females. The implication is that, majority of the household in the study area were male-headed which is a typical characteristics of traditional African societies. In this scenario, sensitiveness on indigenous forest management systems and traditional beekeeping practices was mostly dominated by male possibly due to male-headed, having awareness on forest and beekeeping practices aspect. These results are similar to those reported by Lema [20] where the proportion of male headed households (73%) was higher compared to their female counterparts in Morogoro Rural District. This is in line with reports of Bogale [21] who noted beekeeping as the man's job in Ethiopia.

Majority (53%) of the respondents were more than 60 years old. Presence of good number of old age people is a good indicator of existence of indigenous forest management systems and traditional beekeeping practices that can be transferred from generation to generation. Similar findings was reported by Bogale [21] in Ethiopia that traditional beekeeping practices are mainly undertaken by older people indicating the need of documentation of indigenous knowledge that may be transferred to the new generation. The majority of respondents (77%) had acquired a minimum primary education. This implies that majority of the respondents were at least knowledgeable regarding both indigenous forest management system and traditional beekeeping. Bogale [21] reported that traditional beekeeping practices are based on informal opportunities and an individual's level of formal education does not matter as most of the beekeepers in this study are uneducated older people. This is in line with Gichora [22] who noted the insignificant role of level of education in the traditional beekeeping in Baringo District, Kenya. Very few (2%) of respondents had got a chance to receive secondary school education.

Indigenous systems of forest management and their potential application

Findings revealed that scaring techniques (37%), conservation of sacred forests (32%), and traditional norms (31%) (Figure 1) were the main indigenous systems of forest management existing in the studied forest. Similar results were reported by Risiro *et al.* [23] that sacred places, taboos and totems are traditional practices used to conserve natural resources in Zimbabwe. Ylhäisi [24] reported that sacred forests have a high level of endemism and a rich biodiversity. Based on FGDs the presence of elders in the study area has an influence in the existence of the traditional systems of forest management. According to Long and Zhou [7] the continuous survival of indigenous forest management systems in many locations despite the nationalization of forests was probably because of informal cooperation between communities and local officials that allowed successful forest management practices to continue against the national policy. Forest Act of 2002 allows elders to protect traditional protected forests and sacred forests using by-laws. Moreover, many young people are ignorant about their traditional systems [24]. However, the existence of these forests has been threatened recently due to human activities. Similarly, Ylhäisi [24], Mwihomeke *et al.* [25] reported that the intact forests (sacred forests) in Zigua are in danger of disappearing in the near future due to human activities.

Findings from FGD revealed that, traditional norms were applied through offering of domestic animal such as cow, sheep or goat and was sanctioned to a person found making any destruction to the forest. The observation shows that the major destruction caused in the forest were encroachment for agriculture which is mainly associated with an increase in population around the area. Previously, chiefs and elders initiated norms with the aim of conserving sacred forests. Those found against those norms were punished by compensation depending on the nature of destruction. A similar result was reported by Feyera and Demel [26] that any member of the community who did not obey norms and the regulation of the sacred forest (*Shenecha*) were punished accordingly. In some African societies, local leaders were instituting management practices including issuing permission for trees to be cut for specific purposes [27]. It is also important to ensure recognition of indigenous systems including customary tenure that contribute to the sustainable use of resources [28].

Scaring techniques were used by traditional elders in the management of MVFR, in a way that anyone who fails to be involved in management of the forest was punished through being excluded from any social organizations, lack of support from the community during illness or death. Feyera and Demel [26] also reported that the scaring techniques are collective traditional management system of the Oromo people in regulating the forest use types over time and space.

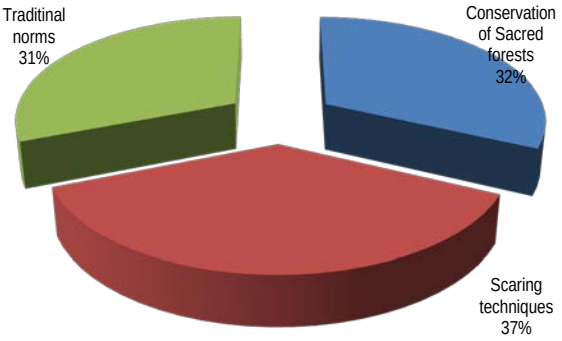

Figure 1. Indigenous system of forest management at Mzoghoti forest

Traditional Beekeeping Practices in West Usambara Mountain

Traditional beekeepers

In the study area, 19% of respondents around Mzoghoti forest reserve own beehives (Table 2). Hence, are regarded as traditional beekeepers. Result show that about fewer households engage themselves in beekeeping. The reason behind were lack of materials for making bee hives (50%). The rest of responses are as shown in Table 2. Moreover, 98% of those who practice bee keeping own traditional beehives while 2% own modern ones (Table 2). The findings from this study also indicated that all beekeepers were male. A similar situation is reported by Bogale [21] Feyera and Demel [26], that beekeeping as man's job in Ethiopia.

Table 2. Reasons for not practicing beekeeping and types of bee hives

Beehives	Respondent %
Owning beehives	19
Not practicing beekeeping	81
Reasons	
Lack of materials for beehives	50
Lack of knowledge about beekeeping	13
Lack of bee flora	12
No interest in beekeeping	12
Uncertain in beekeeping practices	13
Types of bee hives	
Modern beehives	2
Traditional beehives	98

Traditional beekeeping practices

The study showed that 90% of the respondents use log hives and 10% use bark hives (Figure 2). This is in line with reports by Mwakatobe and Mlingwa [13], Lalila and Machangu [29] who noted that, over 95% of all hives used by smallholder beekeepers in Tanzania are traditional logs and bark hives. Log and bark hives are locally considered to be the available hives in the study area. Tree species preferred for hives making include *Schrebera alata, Juniperus procera, Ocotea usambarensis, Eucalyptus grandis, Grevillea robusta* and *Erythrina abyssinica.* Tree species preferred for hanging beehives include *Pirus calleryana* (Pea fruit trees), *Albizia spp, Acacia meansii, Grevillea robusta Eucalyptus grandis,* and *Ficus thoningii.* Durability, ample availability of tree species and indigenous knowledge of hives making are the major reasons for these preferences.

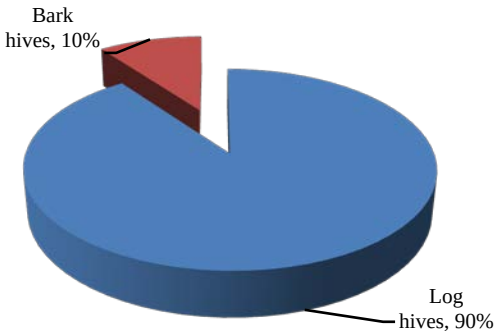

Figure 2. Traditional beekeeping practices

Honey production

Baiting hives, hive placement and management practices

The use of baiting hives to catch swarm is part of the traditional beekeeping practices in the study site. New bee hives are smeared inside and outside aromatic plant leaves, sheep fat, honey and bee wax. According to Bogale [21] most of the beekeepers in the central Ethiopia had got their bee colonies by trapping swarms using baiting hives. Setting hives at the correct position is the most important consideration for traditional beekeeping practices. Hives must be in a quiet area that is been kept far away from roads and sidewalks. Hive entrances should face appropriate direction.

Weeding around the tree where hives are placed is one of the important management practices for beekeepers in the study area. As reported during FGD, most of beekeepers provide water to beehives during dry seasons. It was reported that, in very hot weather, bees use a large amount of water to maintain temperature and humidity in hives, and in absence of such water, they travel far distance to find water. It was noted that, bees are supplemented by flour during absence of flowers to serve as pollen in the study site. Similarly, Feyera and Demel [26] observed that, during dearth period when there is little honeybee forage, beekeepers provided supplementary feeds. Besides, majority of the beekeepers gave solution of either sugar or honey to the bees by putting either grass or stone in the solution a container in order to avoid the damage during feeding [21].

Management of major pests and predators of honey bees reported were rapping the corrugated iron sheet on stands of hive to prevent honey badger from climbing. In addition, bunch of thorny branches is tied on hive stands; therefore, it is not comfortable for the animal to climb. Bogale [21] reported similar results and also added those honey badgers are protected by metals and strings around the entrance of the apiary site through hanging the predator.

Honey collection seasons

The result indicates that majority of respondents (90%) observed to have two honey collection seasons at the end of flowering season (Figure 3). Similar observations were

reported by Bogale [21] in Ethiopia and Chinh *et al.* [30] in Vietnam, the first harvest can take place 20-30 days after the hive is occupied. The second harvest can be carried out about 30 days later.

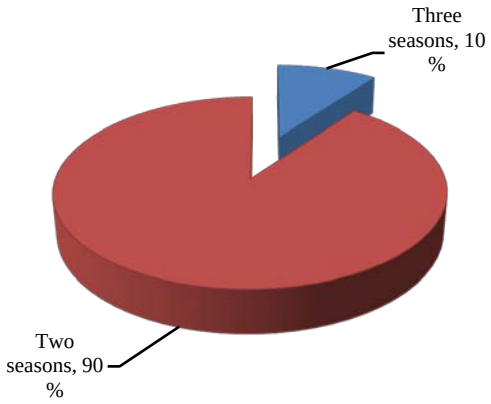

Figure 3. Honey collection seasons

The average annual honey collection varies with season normally depending on amount of beehives and weather conditions. Most of the respondents' hives can yield 1 to10 litres of honey from one beehive where few can yield 11 to 20 litres of honey. Traditionally, honey harvesting is done at night, when bees are less active.

Harvesting techniques

The study findings from focus group discussion indicated that, during harvesting, bees are driven off the hive using smoke of dry leaves of a selected trees and/or mushroom plant which causes them to be less active. According to Knoxfield and Wangaratta [31] smoke stimulates bees to gorge honey or nectar, temporarily disrupting the defensive behavior of the colony and making the bees easier to handle. The results further showed that 36% of the respondents used smoke, 16% use fire and 48% use mushroom plant. However, harvesting is done at least by two people, tree climber and the second honey receiver.

Potentials of beekeeping to livelihood

The values of beekeeping practices to users' lies on the way are used to maintain rural livelihood. However, honey was used as food (25%), medicine (60%) and sources of income generation (15%) (Figure 4). Just like what was observed from the study area, MALE [32] observed that, the most important use of honey in Zanzibar is medicinal. The results revealed that, honey was used to cure people suffering from stomach ulcers, burns, fire wounds and for children suffering blood shortages. Honey Scientific Report [33] also observed that, honey is used to treat stomach ulcers, burns, and surgical wounds. Also is used as carbohydrate source in oral rehydration therapy. Regarding honey customers in the study site, the study revealed that, traditional healers (58%) and communities (42%) were the main customers (Figure 5). The income generated from beekeeping activities used to cater for social services such as education and health.

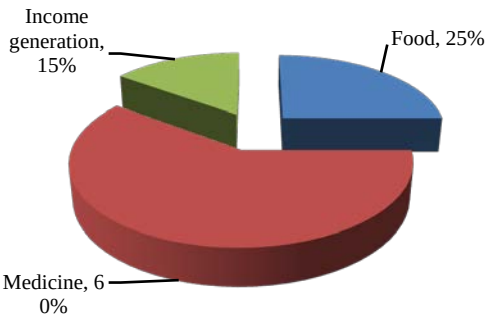

Figure 4. Potentials of beekeeping to livelihood

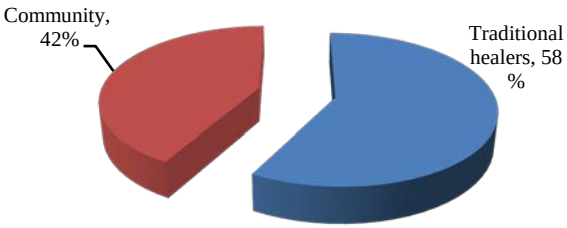

Figure 5. Main honey customers

4. Conclusions

In this particular study, the main indigenous systems of forest management identified were scaring techniques, conservation of sacred forests and traditional norms. The study revealed significant role of the identified indigenous systems of forest management. The dominant traditional beekeeping practices in the study area were made from log and barks. The use of baiting hives, proper hive placement and hive management are part of traditional beekeeping practices identified. Traditional harvesting techniques such as the use of smoke of dry leaves of a selected trees and/or mushroom plant were also identified.

Most of the honey collected was used as medicine, food and sources of income generation. Most of the bees' products are available seasonally and many people lack proper knowledge on how to harvest without hurting bees and improve quality of honey. In this respect there is a need of training the communities on proper harvesting methods to ensure sustainability of the products and improved market value. The indigenous systems of forest management and beekeeping practices are perceived, maintained and respected by communities around MVFR and there is a need to consider both traditional and conventional forest resource management techniques in Tanzania.

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