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Attitudes of local communities toward biodiversity conservation in the Uluguru Rain Forests of the Eastern Arc Mountains of Tanzania

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ATTITUDES OF LOCAL COMMUNITIES TOWARD BIODIVERSITY CONSERVATION IN THE ULUGURU RAIN FORESTS OF THE EASTERN ARC MOUNTAINS OF TANZANIA

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ABSTRACT

The conservation of biodiversity in Tanzania is currently vested on local communities. This strategy is clearly stipulated in the National Forest Policy of 1998. The success of this strategy depends largely on local people's knowledge, perception and institutions that will facilitate local level engagement in conservation and utilization of natural resources. This study was conducted to assess the attitudes and perceptions of local people with regard to the management and conservation of a montane rain forest reserve of the Eastern Arc Mountains. Questionnaire survey was done in four villages adjacent to the Uluguru Forest Reserve, using a sampling intensity of 10%. About 81% of respondents proposed the forest to remain as a forest reserve and 19% proposed the forest be degazetted. The most common justification for the forest to remain as a forest reserve included its role as protection of water resources and support to their livelihood (73%). Regarding encroachment, 92% of respondents felt that encroachers are lawbreakers. About 50% believed that the forest belongs to them and over 70% agree to respect existing rules regarding the conservation of the reserve because they have free access to the forest and are allowed to collect firewood for domestic uses. With regard to forest deterioration 54% agreed the forest to have deteriorated compared to what it used to be. On the other hand, 54% make out fire as a management tool for land preparation. Over 81% would like to be involved in tree planting as well as patrolling the forest and majority of men and women participate equally in tree planting activities. Given the opportunities identified by this study collaboration with the local people could work adequately for sustainable management and conservation of the reserve. There is a need for strengthening on farm tree planting programs though joint ownership of tree nurseries with more emphasis on education and extension. Awareness creation on conservation of natural resources from grass root level especially through primary education is likely to be quite beneficial.

Key words: Conservation attitudes, local communities, biodiversity, Eastern Arc Mountains.

INTRODUCTION

Historically, people and their economic activities have been viewed as threats to the undisturbed functioning of natural ecosystems. In the classical approach to biodiversity conservation, people played no part and were excluded from protected areas, which were designed according to biological concepts and inventories. However, the evidence has been that the classical approach to biodiversity conservation has not been successful (Boyle *et al.,* 2000). The classical approach has therefore been replaced by several resource management approaches including Community Based Natural Resource Management (CBNRM). Such programs are starting to be developed in Tanzania and other developing countries. However, before they can be designed and become operational the relationship between protected areas and local people must be clearly understood (Newmark, 1990). Successful conservation measures therefore should address the interaction between local communities that live in the proximity of the forest resources. The stakeholders especially local communities are believed to play key role as determinants of biodiversity of protected areas such as forest resources, game reserves and others (Boyle *et al.,* 2000). Understanding how people depend on, interact with and utilize the biological resources and their local environment for survival and to reflect this understanding in future policies and management objectives is vital to successful protection of resources. The attitudes, perception and access of local communities as stakeholders in resource management and utilization have a great bearing on the successful management of resources.

The rain forests of Tanzania occupy small areas confined to isolated mountains, mainly the Eastern Arc Mountains. The Eastern Arc Mountains are recognized for their unique and diverse biota and hydrologically important forest vegetation (Lovett, 1988; Bruen, 1989; Hoffman, 1993). The mountains are one of the twenty-four top biodiversity hot spots in the world (TFCG, 1999, Munishi *et al.,* 2002). Their flora is much higher in richness by the number of endemic species than equivalent areas of forests outside them from the Horn of Africa to the Cape (Fjeldså *et al.,* 1998). However human related impacts are alarmingly intense and a threat to the existence of these resources. Such impacts include cultivation and grazing, general consequences of increasing population pressure, industrial forestry including plantations, small-scale logging (often illegal) and mineral exploitation. As a result genetic depletion of the forest resources is somewhat alarming (Bjondalein, 1992).

Although there exists numerous studies on the general distribution of plant species in the Eastern Arc Mountains, few studies have addressed the way the local communities perceive these resources or depend on, interact with and utilize the forest biological resources for survival. Approaches to address this should be the assessment of local attitudes toward the forests to determine what value they put on the forests and the use of information in future plans for integrated management and conservation of biological resources in these forests. This study aimed at understanding the attitudes and perceptions of local communities with regard to the conservation of biological diversity in the Ulugurus and the implication of this on the conservation of the forest resources.

METHODOLOGY

Site description

The Uluguru Mountains (7^o 2' - 7^o 16' and 38^o 0' - 38^o 12') are located in the central part of the Eastern Arc Mountains. The Uluguru bedrock is Precambrian metamorphic rock dominated by hornblende - pyroxine granulites with injections of granite, gneiss, and minor basic intrusions (Lovett, 1996; Kilahama, 2001). The climate is oceanic with bimodal rainfall, peaking in April and November. The annual rainfall is 2,900 - 4,000 mm on the eastern windward slopes and 1,200 - 3,000 mm on the western leeward slopes.

Data Collection

The study was carried out in two phases. Phase one involved reconnaissance survey, while the second phase was mainly based on questionnaire surveys checklists and participant observation. The second phase involved questionnaire survey as a main tool for data collection. A multi stage sampling procedure was employed. Four villages in the Mlimani ward were purposely selected on the basis of closeness to the Uluguru forest reserves and ease of communication. Interviews were done administered to randomly selected household members from the list of households in each village. About 10% of households from each village were picked randomly for interviews.

Data analysis

Data collected were analyzed by using both qualitative and quantitative methods. The statistical package for social science (SPSS) and Microsoft Excel® were used to analyze quantitative data, whereas content and structural functional analysis were used to analyze the qualitative data. The first step during quantitative analysis was the preparation of the variables to make them be in a form suitable for addressing the research questions and computer program used. Each question was analyzed to show the range of distribution of replies, the existence of any concentration or central tendency in those replies and the shape of distribution or the extent to which the replies were clustered around the central point. The components of verbal discussion were analyzed in detail with the help of content analysis method. In this way the recorded dialogue with respondents was broken down into smallest meaningful units of information or themes or tendencies.

RESULTS AND DISCUSSION

Attitudes toward Conservation

The results show that local people living adjacent to Uluguru Forest Reserve oppose the degazattement of the forest reserve. About 81 percent of the respondents proposed strongly that the forest reserves should remain as it is, as opposed to about 19 percent who had the view that

the forest be degazetted and handed over to local people to use it the way they like (Table 1). About 73 percent of the respondents whose views were for conservation of the forest gave reasons related to the importance of the forest to their livelihood and 27% believed that the forest should remain as it is as the government can better care for the resources than local communities. However, the recognition of the importance of the forest by the local people does not necessarily mean that local people will not continue to gather firewood, building poles and other forest products from the forest. Such recognition can be an opportunity for an entry point for conservation taking into consideration the people needs and how to supply their demand sustainably either from the forest or alternative ways.

Table 1. Responses by local communities

Response item	Response (%)		
	Yes	No	Not sure
Forest degazattement	19	81	NA
Forest deterioration	54	8	38
Involvement in conservation committee	81	19	NA
Visit by a natural resource officer	42	58	NA
Forest resource belong to local communities	50	50	NA

Status of the Forest

The study revealed that there are changes in the forest reserve due to deforestation caused by human activities for example encroachment to the forest resources and agricultural activities. About 54 percent of respondents viewed that the forest has deteriorated compared to what it was in the past, 8 percent did not realize any deterioration while 38 percent were not sure (Table 1). This shows that the majority of the residents around the forest are aware of changes occurring in that resource and are likely to take action to conserve it if given chance or are used as an entry point for conservation.

Participation in conservation activities

This study revealed that majority of local communities are willing to be involved in different activities that target the conservation of the natural forest because of their close proximity to this resource. Table 2 shows that more than 81 percent would like to be involved in conservation committees and only 19 percent of respondents are opposed to this. The respondents pointed out that their main expectations for being involved in conservation activities are to acquire forest products through tree planting (61.5%), fire prevention (11.5%), patrolling to stem out illegal activities (23.1) and educating others (3.8%). However, the study revealed that several factors hinder their involvement in such committees including lack of forest extension and education services (54.5), lack of good village governance (18.2%) and ignorance (27.3%).

Natural Resource Extension and Education

It was revealed that there is inadequate forest education and extension in the villages surrounding Uluguru Forest Reserves. Majority of respondents (58%) indicated to have seen no forest/wildlife officer visiting their villages, while 42% of the respondents agreed to have been visited/seen an officer from the natural resource office. Reasons given for the visit were to emphasize on tree planting around the forest reserve and controlling wild fires. The possible reason for forest/wildlife officers not visiting the villagers may be due to lack of funds to cater for education and extension costs such as transport and material costs, though insufficient number of staff may also be a contributing factor.

Problems/conflicts related to management of the resources

Conflicts ensue when resources become scarce and that the more unequal the distribution of scarce resources in the system the greater will be the conflicts of interest between dominant and subordinate segments in a particular system (Mvena *et al.,* 2000). Conflict does not imply outright violence. It may include tension, hostility, competition and disagreement over goals and value. In this study an attempt was made to identify conflicts/problems facing local communities around the Uluguru forest reserve

specifically whether they feel the forest to be their property and conflicts with wildlife.

About 50 percent of the respondents felt that the forest reserve belongs to them as they have free access to the forest. The other 50 percent felt that the resource belongs to the government. This may indicate a certain level of conflict regarding the owner of the resource and may have a great bearing on move for collaborative/joint forest management approaches in this area.

Other problems that may entail conflicts are associated with wild animals especially blue monkeys (C*ercopithecus mitis),* black and white Colobus monkeys (*Colobus guereza*), bush pig (*Potamochoerus porcus*), bush babies *(Galago uluguruensis)*, Duickers (*Cephalopus monticola*) and birds. This is a case of these animals from the forest damaging agricultural crops around the forest. About 50 percent of respondents admitted to have problems caused by wild animals while 50 percent do not have problems with wild animals. The extent of the problems depends greatly on how close a farm is to the reserve. Sometimes those who have encroached into the forest (with farms inside the forest) will also complain about wildlife damage complicating this type of conflict and its possible solution. Measures to avert the problem taken include trapping (18.3%), shooting /killing (8.4%) and scaring away the animals (23.3%). It was revealed that fire is a major problem with regard to natural resource conservation in the area. About 61 percent of respondents admitted fire to be a problem in the conservation of the Ulugurus, agreeing that fire causes habitat destruction. On the other hand 39 percent of respondents didn't see fire to be a problem. Over 54 percent of the people use fire as a traditional tool for agricultural activities especially for land preparation, and on the other hand about 16 percent of fire problems were accounted for by social conflicts and intentional burning (pyromaniacs) (30 %) (Table 2).

Table 2: Response as to the reasons for burning

Reasons	**Percentage (%)**
Land preparation	54
Social conflicts	16
Intentional burning	30

Benefits from the forest

This study identified that all of the respondents have had realized both tangible and intangible benefits from the forest reserve. These benefits vary from firewood (61.5%), rainfall (11.5%), medicine (7.7 %), tool handles (3.8%), rituals (7.7 %) and poles for house construction (7.7 %) (Figure 1)

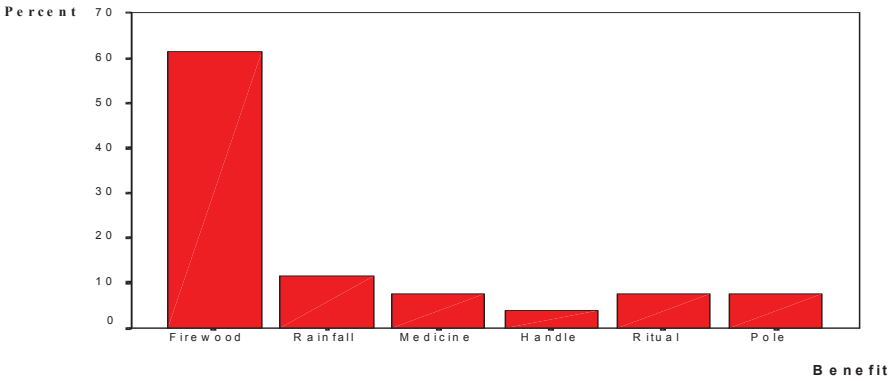

Figure 1: Percentage response on benefits from the acquisition of the Uluguru Forest Reserves by adjacent local communities

The local people have free access to the forest and are allowed to collect firewood from the forest. Miller *et al.,* (1995) reported that local people in Kasungu National Park in Malawi are given the right to harvest tree caterpillar and to establish beehives in the National Park. However 96.2 percent of respondents agreed that they are not allowed to cut trees from the forest for sale. Despite this restriction illegal cutting and trade of Msambwa (*Chrysophyhllum gorungosanum)*, and Msambwa mweusi (*Afrosersalisia* sp.) for tool handles was reported.

More than 61.5% of local people depend on firewood from the forest as a source of energy for cooking, lighting and heating. About 11.5 percent of people collect firewood only once per week, 65.4 percent twice, 19.2 percent thrice and 3.8 percent four times per week. The implications of the number of days per week people collect firewood from the forest have effects on the rate of deforestation. The reasons for this variation of number of days per week people collect firewood from the forest could be the size of their families, distances from their households to the forest and the efficiency in utilizing firewood.

Tree planting as a way of sustaining Uluguru Mountains Forest Reserves

Tree planting is done under the agro-forestry programme supported by Uluguru Biodiversity Conservation Project and other conservation initiatives. The main objective of these programmes is to enhance people's capacity to get alternative sources of forest products. It was observed that more than 70 percent of respondents have had an opportunity to participate in tree planting. The number of trees planted varied from 1 – 10 trees (30.8%), 11 – 20 trees (38.5%) and 21 – 30 trees (5.3%). About 30 percent of respondents have not participated in tree planting efforts due to lack of tree seedlings and awareness. People need to be educated on how to establish village environment committees (VEC) so as to create awareness among people. According to Katani (1999), education creates awareness, positive attitudes, values and motivation for better natural resources management among the people. Kajembe and Luoga (1996) asserts it further that there is no development without education.

Factors influencing tree planting

Any effort to conserve the valuable biodiversity in the Uluguru Mountains need to consider and predict factors that directly or indirectly influences people perception and therefore commitment to conservation. A number of socio-economic factors were observed to influence participation in tree planting and other forms of conservation. Age, gender and education are among the major factors revealed to influence participation in conservation activities in the Uluguru. A multiple regression model was developed to determine the relationship between these factors and tree planting. Age and education had a significant influence on participation in tree planting on the other hand sex (gender) had no significant influence. This implies

that both men and women participate equally in conservation activities. This is likely an important factor to consider when planning conservation activities.

Table 4: The relationship between factors and tree planting exercise

Xi	**Yi** $R^2 = 0.67$		
	B	Beta (b*)	Sig. t
Age	1.709	0.845	0.008 *
Sex	-5.319	-0.093	0.205 NS
Education	8.563	0.196	0.022

Key:
Xi = All independent variable
Yi = Number of planted trees (Dependent variable)
R^2 = Coefficient of determination (0.67)
* = Significant at 0.05 level (90 to 95 Probability level)
NS = non significant
b* = Beta weight

Table 5, shows that the sampled population constituted both males and female who accounted for 46 % and 54 % respectively. The majority of the sampled population was married couples accounting for more than (58%). Others were single (23%), separated (8%), divorced (7%) and widowed (4%).

Table 5: Sex classification and marital status of the sample population

Alternative	**Attribute**	**Percentage (%)**
Sex	Male	46
	Female	54
Marital status	Single	23
	Married	58
	Divorced	7
	Widowed	4
	Separated	8

Age and participation in tree planting

About 32 percent of the population were below 30 years, while 53 percent fall between 30 – 45 years of age and about 15 percent were above 45 years. The study revealed that age is significantly correlated with the number of trees planted with middle age people planting more tree than younger or old ages. Middle age group may be planting trees than younger people or older people possibly because they own relatively larger portions of residential areas, which are mostly used for tree planting. It was learnt from the sampled population that people 30 years and above are more involved in farming and thus may have more opportunities to plant trees. Older people above 45 years however may not be so energetic to participate much in such activities despite owning relatively ample land amenable to tree planting.

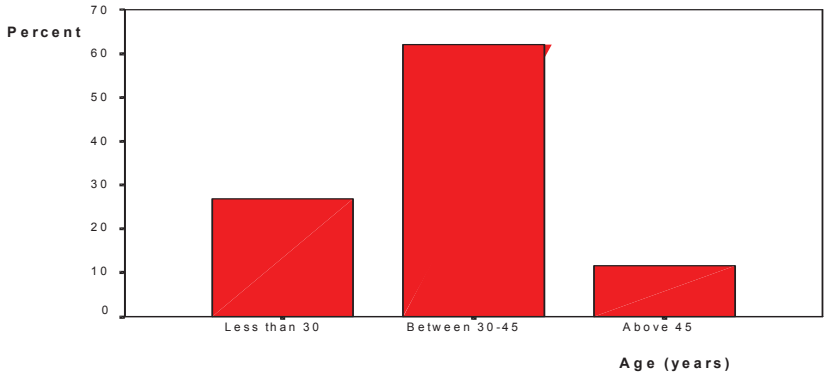

Figure 2 Participation and response towards in tree planting with respect to age among Communities adjacent to Uluguru Forest Reserves

Gender involvement in conservation activities

It was observed that there was no significant relationship between sex and the number of trees planted (Table 4) This means that both males and females participate equally in tree planting activities though females seems to plant more trees than males (Figure 2). Astolfi (1995) reported that women have developed a thorough knowledge of plant growth, maturation and reproduction through their daily occupations as food gatherers. These higher achievements in tree planting by women may indicate that women are more touched by the scarcity of forest products especially firewood, as they are the ones responsible for firewood collection.

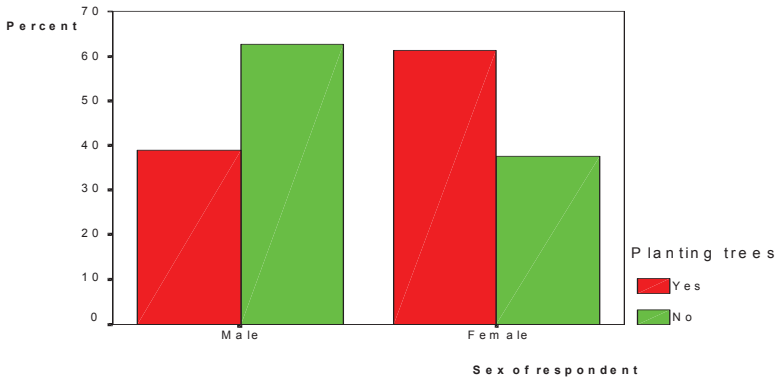

Figure 3: The percentage response on tree planting by gender in villages adjacent to Uluguru Forest Reserves

Effect of the level of education on tree planting

The study revealed that 46.2 percent of respondents in the sampled population have primary education, whereas about 15.4 percent attended adult education and about 30.8 percent secondary education. About 7.7 percent of the sample population did not receive any formal education. With reference to Table 4 the number of trees planted is significantly correlated with education level. This means that farmers with more education tend to plant more trees than those who are less educated. This implies that education has a direct influence towards people participation in conservation activities. According to Katani (1999), education creates awareness, positive attitudes, values and motivation for better natural resources management among the people. Kajembe and Luoga (1996) asserts it further that there is no development without education. This might also entail a need for environmental education and extension to boost conservation awareness among the communities in the Ulugurus.

Knowledge on rules and regulations governing Uluguru Forest Reserve

Joint natural resource management in the Ulugurus is mediated by rules and regulations, which in this study are referred to as institutions. Institutions governing joint action in this study are externally and internally sponsored institutions. Internally sponsored institutions encountered were mainly traditional institutions. Externally sponsored institutions in this study are rules set by the Ministry of Natural Resources and Tourism and those agreed between villagers through their representatives in the Morogoro Catchment Forest officials and the Uluguru Biodiversity Conservation Project. Joint agreement on rules and regulations between forest officials and local communities is an indication that the community rights are respected. The survival of joint management of natural resources depends very much on the respect of the rights of communities as joint managers. Recognition of the rights of local communities to organize and define their local institutions for natural resource management is a fundamental policy principle that enhances Co-management strategies. The success for local level

management depends critically on the recognition and legitimization of community initiatives. It is important to note that management rules and regulations need to be known by all stakeholders in order to avoid unintended violation. Response on the knowledge of the rules and regulations are presented in Table 6. The responses show that about 76 percent of the respondents in the sampled populations are aware of the rules and about 24 percent are not aware of the rules governing joint action in the management and conservation of Uluguru Forest Reserves. This group represents the proposition of the community that probably does not participate in joint natural resource management and possibly has negative attitude towards the conservation of the Uluguru Forest Reserves. This study revealed that in some cases rules are not followed. Cases of illegal entry for commercial timber and firewood collection are still common.

Table 6. Response on the knowledge of rules and regulations

Rules and regulations	**Percentage**
Restriction on collection of dead wood only	36
Restriction on starting fire in and around the forest	32
Plant trees before cutting a tree	8
Undecided (not sure)	24

About 92.3 percent of respondents viewed encroachers as lawbreakers and they cause about 88.5 percent of habitat destruction while 7.7 percent of respondents viewed encroachers as breaking no laws. Those viewing encroachers break no laws had various reasons. The most common was that they are looking for their human needs. Clarifying on this, Ostrom (1996) had this to say, "appropriators who violate operational rules should be subjected to graduated sanctions depending on the seriousness and context of the offense". Kajembe and Kessy (1999) argues further that a person who is a rule follower but who is in dire need of the resource and therefore cheats can be treated more leniently compared to an offender who shows little allegiance to the rule structure of the institutions. In this study penalties for illegal entry ranges from verbal warning (fines) to jails for both village government and central government, as shown in Table 7.

Table 7. Response as to the actions to be taken by village and central government against lawbreakers in communities adjacent to Uluguru Forest Reserves

Action	**Village government (%)**	**Central government (%)**
Educated	46.2	61.5
Fined	42.3	7.7
Jailed	11.5	30.8

It can be seen from Table 7 that most of respondents suggested that law breakers are to be educated by the village government 46.2% and 61.5% by the central government through provision of forest extension and education services. This serves to enhance cohesion between the community and the offenders. If the penalties are too harsh then the community itself will not enforce them or violators will serve their relationship with the community organization (Ascher, 1995).

Internally sponsored institution which are essentially traditional are important in natural resources management and play a greater role in regulating access and utilization of various natural resources in a given society. Traditional institutions, which originate from local cultures, have roots in the past and reflect knowledge and experience of the local people. Identification of these institutions can serve as a point of entry in the search for local level and broad based approaches. They include norms, rituals and customs governing protection of resources. In this study rituals account for about 8 % as a regulator of access and utilization of forest reserve **.** Ritual uses of forests and trees tend in most cases to be disregarded in classical forest literature (Kajembe, 1994), but indigenous knowledge accompanying this rituals use of forests and trees if studied carefully can be valuable for biodiversity conservation.

CONCLUSION AND RECOMMENDATIONS

- The study demonstrated that local people could work and provide the means for sustainable

management and conservation of biological resources.

- Given more opportunities, education and training to the local communities can be powerful incentive to protection and management of natural resources. The sustainable conservation approach proposed in this study emphasizes the need for a realistic interaction between the local communities and natural resources managers and staff.
- There is a need to put more emphasis on education and extension services so as to enable local communities to establish their own conservation committees.
- Participation of both men and women in tree planting and their role in conserving the forest as illustrated in this study provides the evidence that many differences between men and women are socially constructed and can be changed to impact positively on biodiversity conservation.
- Traditional institutions in the Ulugurus have much to offer to contemporary policy makers searching for bottom-up approach to resource management.
- The promotion of biodiversity awareness and education at all levels as part of the national efforts to sensitize and promote conservation and sustainable natural resources utilization behavior is important. Furthermore, experiences and knowledge of local environment possessed by local communities is a useful input and some efforts should be made to design some site based integrated conservation and management activities.
- The local people should be provided with alternative sources of energy outside the forest as their continued dependence on firewood from the reserve will likely impact negatively on forest resources. Rural electrification at low costs may be a long term mitigation measure.

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