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Sacred Groves Institutions, Rule Enforcement and Impact on Forest Condition: The case of Ramogi Hill Forest Reserve, Kenya.

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Abstract

Ramogi Hill is a small dry tropical forest covering an area of 283 ha. It is situated on the northeastern shores of Lake Victoria basin in Kenya, East Africa. It is considered a sacred forest and thus respected by communities living in the lake region. In the past, it was under local community management, but is now a gazetted Government forest reserve managed by the Forest Department (FD). The locals have used this forest for fuel wood, medicine, building construction and religious activities for many years.

Frequency and distribution of cut stumps, forest structure coupled with latent regeneration were used to assess the level of rule enforcement as applied in the sacred grove and other parts of the forest.

Data analyses indicate that, the species compositions and distributions are more or less similar across the zones. The sacred and settlement zones show similar forest structure as indicated by the diameter class distribution histograms. Composition of young seedlings was constant across all the forest zones. Latent regeneration potential as gleaned from species composition did not show significant variation between the zones. Data analysis further indicate that, the sample plots falling next to settlement and swampy zones had more cut stumps therefore worse forest condition compared to plots that fell closer to the sacred zone.

Taken together, condition of the forest can be described in the following order: ScZ>SwZ>SeZ which supports the argument that local institutions shape the condition and pattern of forest use.

Key words: Ramogi forest, sacred grove, forest structure cut stumps, regeneration, rule enforcement

Introduction

Forests support a wide variety of species and it is estimated that about 50 % of all woody plants, 40 % of mammals, 30 % of butterflies (Wass, 1995) and over 50 % of the Africas' terrestrial invertebrates are found in Kenyan forests. In addition, many of these forests contain indigenous plant species and sacred groves that are of cultural, religious and economic importance to the people.

Dense and increasing human populations now surround the remnants of once intact natural forests in Kenya. Both the lowland and mountain range forests are now under constant threat from human activities such as settlement and cultivation. In forests where both illegal and legal logging has been extensive, there has probably been a reduction in botanical diversity and many of them are now dominated by single species (Wass, 1995). The problems have been compounded by lack of reliable information to support policy decisions on management and conservation of natural forests, lack of measurable indicators of sustainably managed natural forests and assessment of the level of degradation (KEFRI, 1999). This has resulted in a situation whereby the level of licensing for logging, is based on demand and general impressions of local officers as opposed to the capacity of forests to sustain the off-take (Wass, 1995).

In the past, there have been political pronouncements on conservation of indigenous forests including the Presidential decree on total ban in logging of indigenous timber since mid 1980's, however, wanton destruction of forests continues unabated. Currently in most forest areas, the rate of logging is far much above planting resulting in degraded forests with large open areas. Other problems include commercial poaching of high value timber species for example *Ocotea usambarensis* (Camphor), *Juniperus procera* (Cedar) among others. Problems of encroachment are evident in some forest blocks where indigenous forests have been invaded, trees cut and food crops planted. In addition charcoal making is quite prominent in most of the forests.

The foresters and forest guards in most stations are not able to control these illegal activities due to lack of equipment and poor infrastructure.

Proper forest management is not possible without the biophysical assessment to determine the status of the resources. The results from the assessment can be used to determine the different resource use options. Biophysical assessment is therefore an important component of a series of activities to ensure the sustainable use of forest resources. The chain of activities are the policy statement, an inventory of the resources, management planning for orderly utilization of the resources, harvesting practices, the implementation of the management plan, and monitoring the impacts of the implemented plan in relation to the initial policy statement (Geldenhuys, 1991). This approach does not consider the inputs from the local forest users (local institutions).

To address these, the International Forestry Resources and Institutions (IFRI) research program provides scholars, policy makers, activists and local populations with a systematic set of findings about how people interact with forests resources at the community level. Information is collected about the demographic, economic, and cultural characteristics of communities dependent on forests, using rigorous forestry techniques to measure community impact on forests conditions. The data collected is stored in a database and can be used to generate information about forest conditions and the institutions that enhance sustainability. The social and biophysical information collected can be used to explain why some communities have institutions that sustainably use forest resources while others do not (Ostrom, 2002). Results obtained at local research centres are shared with government officials, local forest users, donors, practitioners, technicians and researchers from other institutions to improve policy making and technical oversight.

This paper present result of study that was carried out in one of the Kenyan Collaborating Research Centres' site, Ramogi hill forest. The main objective was to assess how local institutions shape the condition and pattern of forest use.

Study Area

Ramogi hill forest isolated from other mountain range forests such as Mount Kenya, the Shimba Hills, the Aberdares, the Taita Hills, the Mathews range (Fig.1) has received little scientific attention (Bagine, 1998).

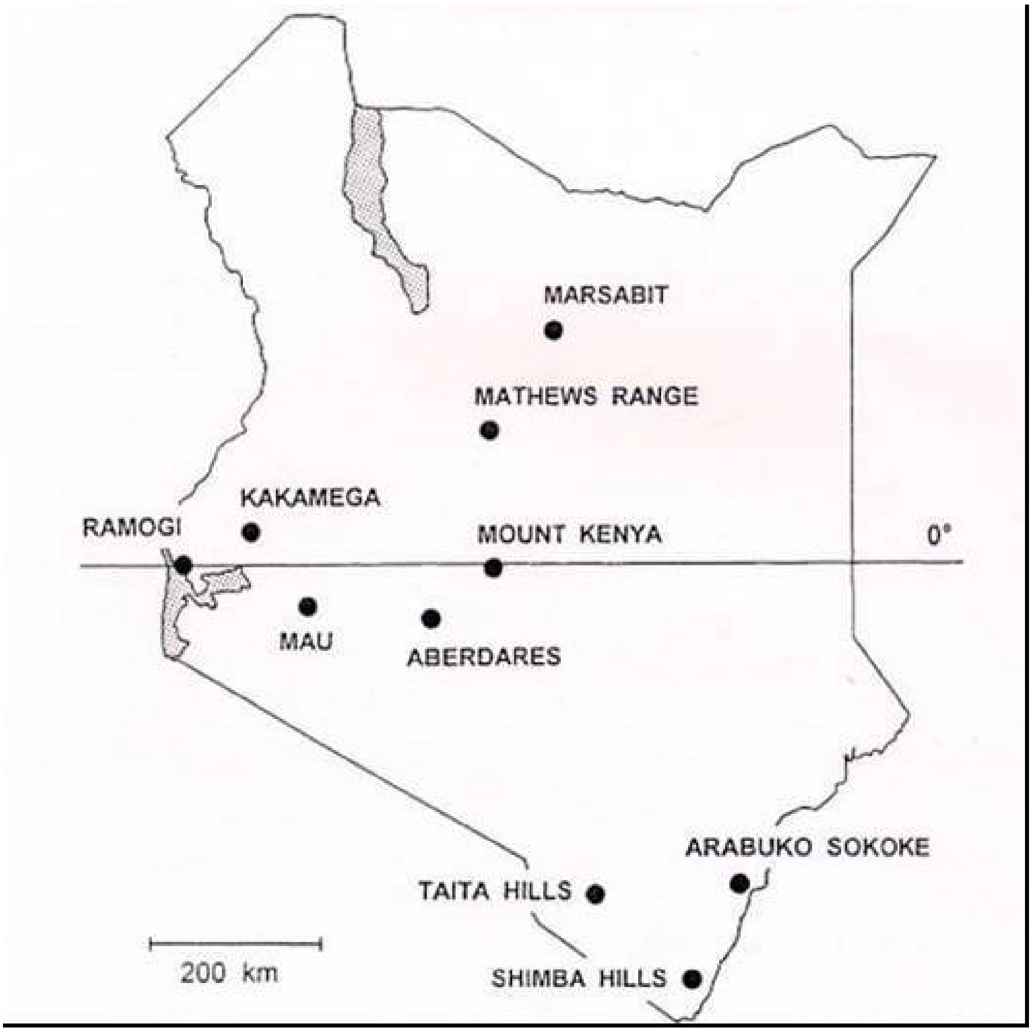


Fig. 1. Location of Montane and Lowland Forests in Kenya
Source: Bagine, R.K., (1998).

The forest is located in Yimbo location, Bondo, District, Nyanza province on the northeastern shores of Lake Victoria in western Kenya. It is located at latitude 00° 06´23´´S and longitude 034° 04´10´´E. The hill lies at an altitude of 1240 m a.s.l. and comprises two peaks namely Minyenjra (200 ha) and Nyaidi (83 ha).

It is surrounded by Lake Victoria and the associated Yala swamps in the west and North (Bagine, 1998). To the southwest it is bordered by Oraro, Usigu and Jusa settlements (Fig.2). Massive basement rocks, forming a mosaic of rock outcrops throughout the forest area, predominantly cover the hill. According to the geological evolution evidence given by Griffith (1993), the Lake Victoria region, which includes Ramogi Hill, is made up of highly deformed precambriam rocks. The soils are of low fertility on which crops like sorghum and maize are grown. Livestock kept are cattle, sheep, goats and poultry. The area receives an annual rainfall of <400 mm, with mean annual temperature of 27°c and contains small dry forest remnants of Lake Victoria basin vegetation.

Preliminary data obtained by Bagine (1998), shows that the flora and fauna are adapted to their environment and have survived over a long period of time. The biodiversity of the hill reflects relics of forest-dependent and generalist species that were probably more common in the Lake Victoria region during the post-interglacial period, but have now disappeared or are restricted and adapted to the remaining forest patches. The forest is in the eastern outpost of the Guineo-congolian block, but unlike other Lake Victoria basin forest fragments, e.g. Kakamega and Mau forests (Fig.1), it is the furthest on the western part of Kenya and is characterized by lowland dry forest (Bagine, 1998).
Rapid assessment of Ramogi hill biodiversity carried out in July 1993 and June 1994 recorded a total of twelve mammal species, four reptile species, three amphibian species and over 100 species of plants (Bagine, 1998). The forest is dominated by tree species such as, *Haplocoelum foliolosum, Teclea trichocarpus, Strychnos henningsii, Tarrena graviolens* and *Teclea simplicifolia* that are mainly exploited for charcoal making.

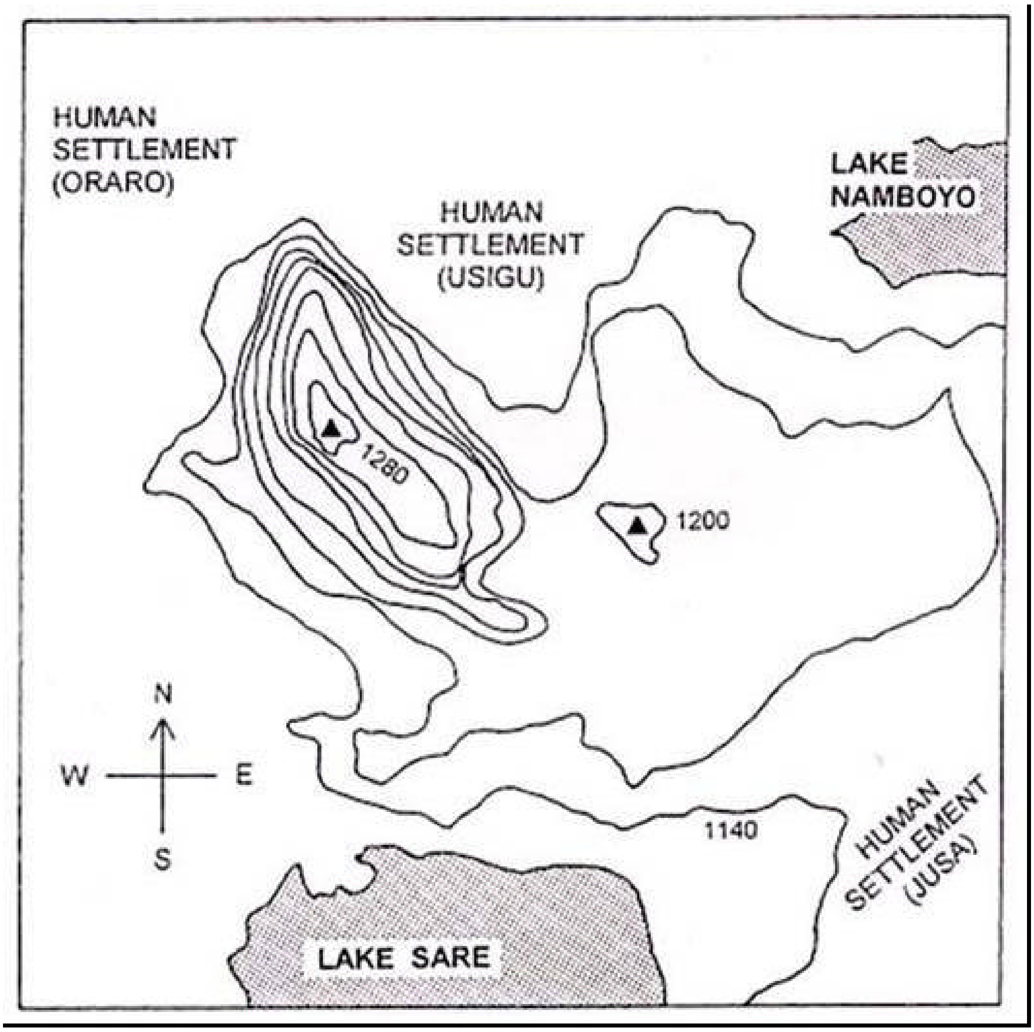


Fig. 2. Ramogi Hill Forest, the surrounding Lakes and Settlements
Source: Bagine, R.K., (1998).

Historical Background

The last decade has seen conservation efforts opened to more social approaches in integrating local control over natural resources and benefits to local communities. Culture and indigenous knowledge are playing an increasingly important role in conservation and resource management approaches. The Kaya forests at the Kenyan coast and Ramogi hill in western Kenya are good examples of sacred forests, where there are still strong cultural ties and institutions. For a long time the Kayas have been protected by the traditions of the indigenous communities who inhabited the forests.

The Kayas were fortified villages that were set up by the Mijikenda people from the early sixteenth century. These people used the Kayas as communal ceremonial areas, burial grounds and as places of prayer and collection of medicinal herbs.

In recent times, there has been an increasing disregard for these traditional institutions. They are being eroded because of the rising demand for land, fuel wood, construction and carving wood materials and hence putting pressure on these forests. Despite these, the rules are still observed by the local communities under the leadership of Kaya elders. The Elders of Kaya Rabai for example pound herbs collected from the forest in order to cleanse beacons that are used to mark the boundary of the forest. Kaya, Kinondo for example has an innermost sanctum where the community elders are buried and only married men are allowed, this is where sacrifices to ancestors are made and other traditional rituals performed. These traditional rules have conserved these forests for many years and preserved them as home to rare plant species. More than half of Kenya's rare plants occur in the coast, most of which are within Kayas (Nyamweru, 1996).

Communities living in the lake region have respect for Ramogi hill forest because of its historical significance. The hill is said to be the first place where the Luo community settled as they migrated from Sudan. It is the most important cultural site of the Luo and is largely considered to be holy. Ramogi was a famous Luo ancestor and leader. He had six wives and settled on the hill after migrating from Uganda. His homesteads were scattered all over the hill. To date, the community uses this forest for cultural, religious practices and a source of herbal medicine. There are also distinct parts of the forest preserved for religious worship. There is Asumbi rock popularly known as (*Agulu dhoge ariyo*) or "pot with two mouths" where Ramogi's family used to draw water. The water is said to have healing powers.
The Legion Maria sect church elders use it as a place for retreat and meditation. Many of the local and national politicians from this region pay visit to this forest to get blessing during election time. Since some of them are at policy and decisions making level, they can influence government actions on the conservation of this forest.

This study was undertaken to compare forest condition in areas adjacent to settlement (SeZ), swamp (SwZ) and Sacred zone (ScZ) zones to assess how local institutions have influenced the condition of this forest. The hypothesis of this study is that, forest conditions are superior when local institutions complement the rules of the central government

Research Methods

The biophysical forest assessment data was collected based on the International Forestry Resources and Institutions Research (IFRI) methodology (Ostrom, 2000). IFRI protocol involves systematic collection of biophysical data within a framework that is common across the IFRI network. Briefly, IFRI methodology requires that biophysical forest data be collected in three concentric plots of 10-, 3- and 1- m radius, allowing tree (defined as woody plants of at least 10 cm Diameter at Breast height (DBH)) data to be collected in the 10 m radius while saplings (woody plants of diameters between 2.5 and 10 m) data be collected in the 3 m radius plot. Data on all other plants and seedlings, including ground vegetation cover are collected in the 1 m radius (Ostrom, 2000). The biophysical sampling framework used depends on the conditions encountered within the site and may differ across networks. Detailed explanation of the sampling framework used is necessary so that this can be repeated during revisits and also to allow comparison between sites and across networks.

The forest was divided into three (strata) zones all between 20-500 m from the forest edge as follows: Adjacent to settlement (SeZ), Adjacent to swamp (SwZ) and Sacred zone (ScZ). The position of each plot was generated using random numbers and the last digits of the UTM Co-ordinates to locate the plots on the map. The plots were then located on the ground using a compass and pacing the distances between the plots. The position of each plot on the ground was recorded using a GPS. In total, 30 plots were randomly distributed in the whole forest, with 12, 10 and 8 plots falling in (SeZ), (ScZ) and (SwZ) respectively.

In the absence of quantitative data to determine the amount of wood harvested in forests, Vermeulen (1995) and Luoga (2002), used cut stumps to estimate the amount of wood harvested in the miombo woodlands in Mafungabusi state forest in Zimbabwe and Kitulanghalo forest reserve in Tanzania respectively. In both studies, the authors were able to estimate the amount of timber harvested in the two forests.

In this study, cut stumps were counted and their diameter at ground level (DGL) and height obtained from the 10 m radius plots. The cut stumps were identified mainly through the bark and coppices, as well as through consultations with a local botanist. Ages of the stumps were estimated based on qualitative characteristics such as level of decay, age of coppices and by consulting a local botanist. The ages were grouped in three categories namely: <1 year, 2 years and >3 years.

In addition, social data was obtained through participatory rural appraisal (PRA) process such as historical profiling and mapping, individual interviews, transects walks, triangulation and group discussions.

Results
Forest structure

Fig. 3 (a) Tree DBH Distribution

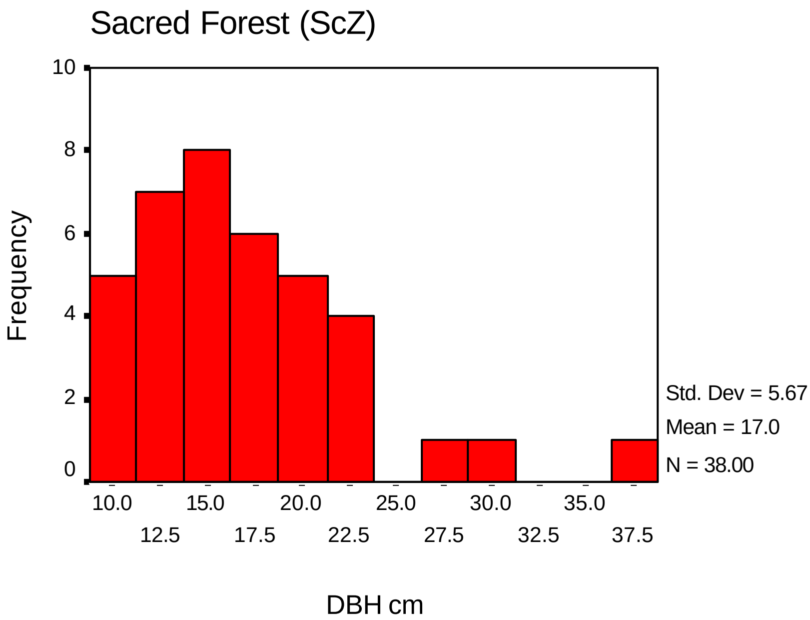


Fig. 3 (b) Tree DBH Distribution

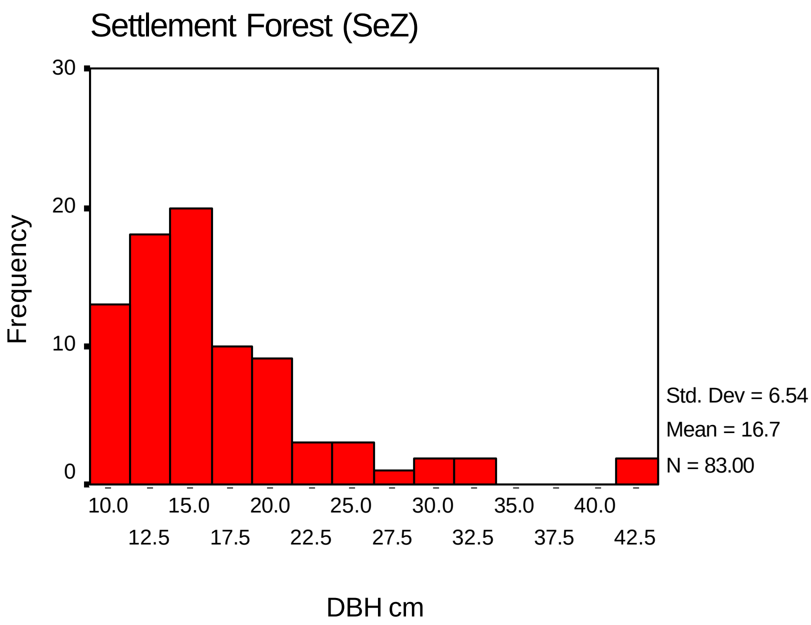
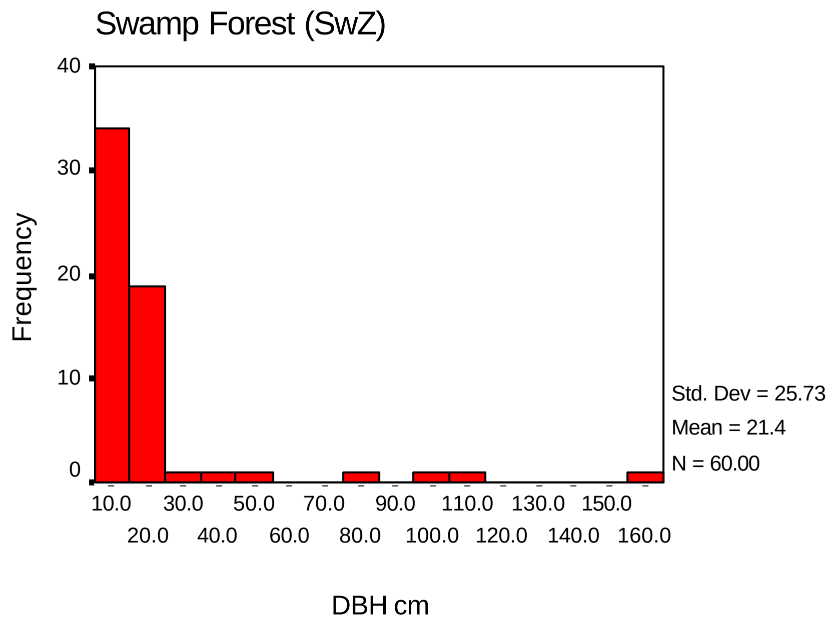


Fig. 3 (c) Tree DBH Distribution



Figs.3 [a, b, c]. Tree DBH Class Distribution in Sacred, Swamp and Settlement zones

Table 1. Species diversity in saplings and regeneration populations

Forest type	**Tree Saplings No.**	**Regenerates No.**	**Common species**
ScZ	15	18	10
SwZ	16	15	12
SeZ	25	23	15

Table 2. Tree species with the DBH>10 classes in various zones

Sacred forest	**Adjacent to Swamp**	**Adjacent to settlement**
Ekerbergia rueppeliana	*Acacia xanthophlea*	*Haplocoelum foliolosum*
Haplocoelum foliolosum	*Croton dichogamus*	*Synadenium grantii*
Teclea trichocarpus	*Drypetes gerrandii*	*Lannea shweinfurthii*
Drypetes gerrandii	*Cassipourea malosana*	*Euphorbia candelabrum*
Ochna ovata	*Grewia trichorcarpus*	*Acacia brevispica*
Euphorbia candelabrum	*Haplocoelu m foliolosum*	*Drypetes gerrardii*
Lannea shweinfurthii	*Pyrostria phyllanthodea*	*Brachylaena huillensis*
Obetia pinnatififida	*Obetia pinnatifida*	*Strychnos henningsii*
Paveta crassipes	*Paveta crassipes*	*Obetia pinnatifida*
Pittosporum viridiflora	*Pittosporum viridiflora*	*Eucalyptus camaldulensis*

Synadenium grantii *Pyrostria phyllanthodea* *Milicia excelsa*	*Synadenium grantii* *Tarrena graveolens* *Teclea trichocarpus*	*Paveta crassipes* *Combretum molle* *Lannea sp.* *Euphobia turicali* Unknown *A*

Cut Stumps

Table 3: Cut Stumps Tree Species List

Sez / Species	ScZ / Species	SwZ / Species
Haplocoelum foliolosum *Ochna Ovata* *Tarenna graveolens* *Teclea trichocarpus* *Euclea divinorum* *Acacia brevispica* *Acacia xanthophloea* *Harrisonia abyssinica*	*Tarenna graveolens* *Vangueria madagascariensis* *Haplocoelum foliolosum* *Teclea trichocarpus* *Ochna Ovata* *Euclea divinorum*	*Euclea divinorum*

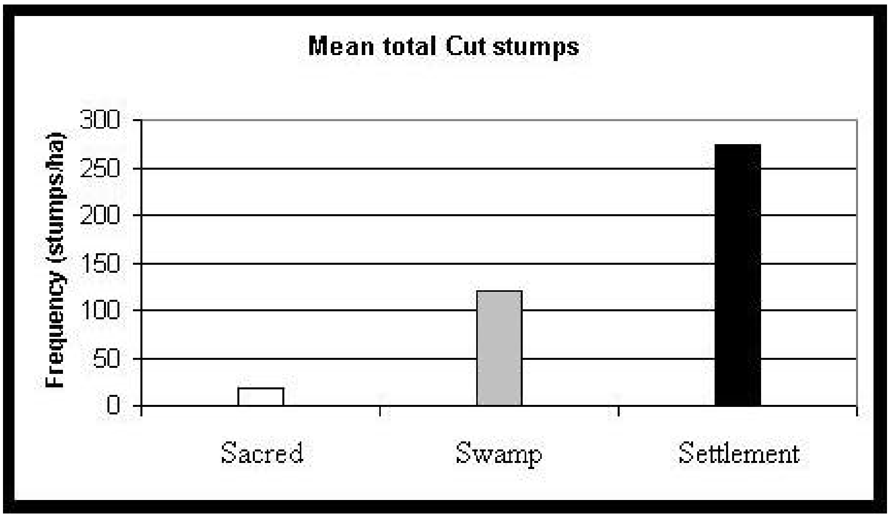


Fig. 4. Frequency of Cut Stumps within different zones

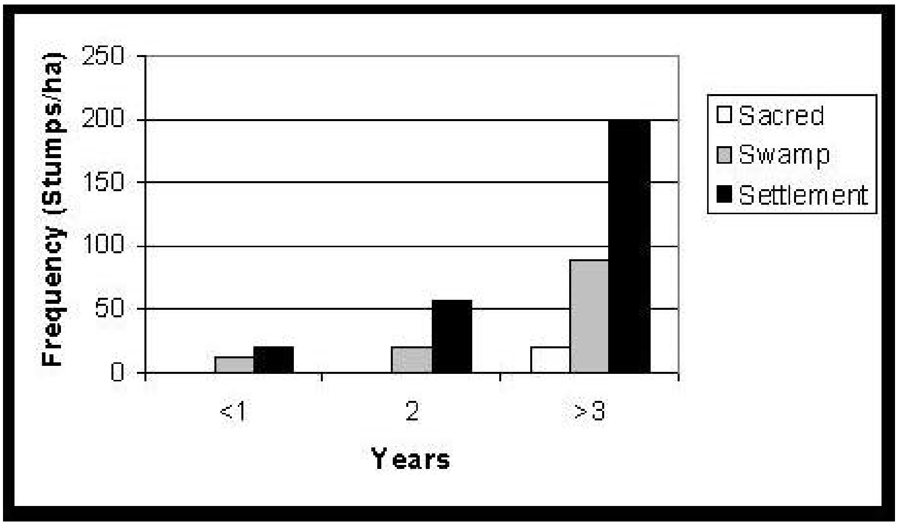


Fig.5: Age Distribution of Cut Stumps

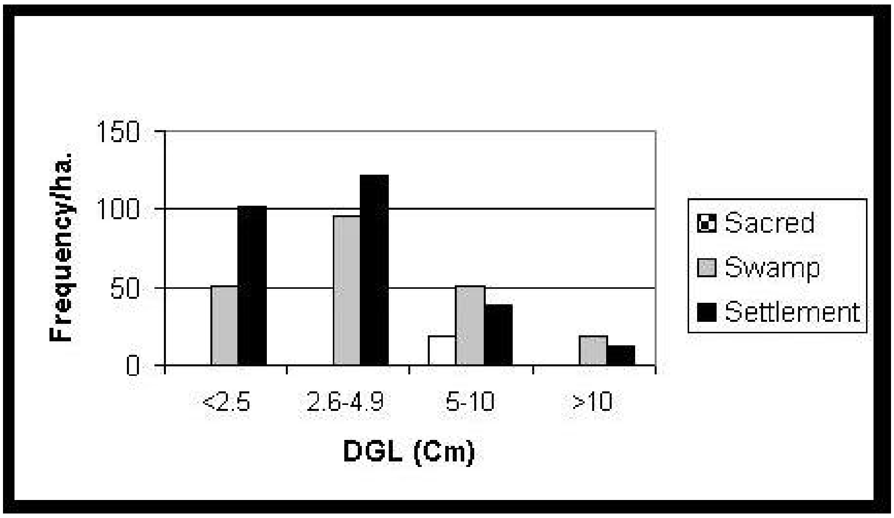


Fig. 6: The diameter at ground level (DGL) class distribution of cut stumps.

Natural regeneration

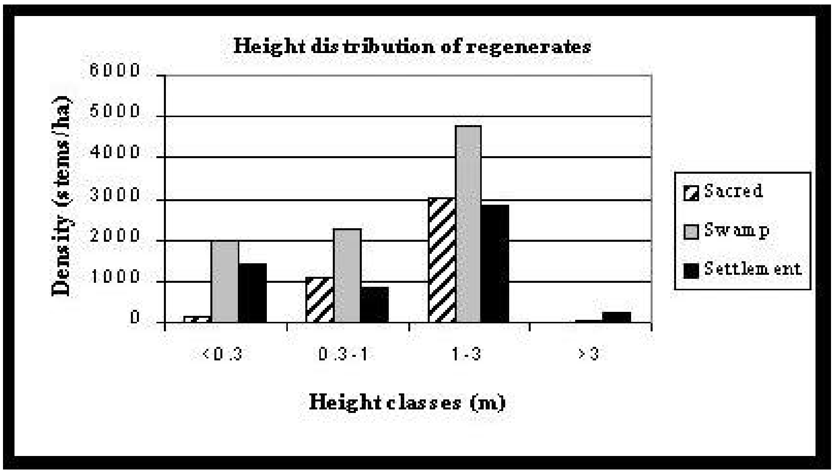


Fig.7. Height distribution of naturally regenerated seedlings

Discussion

Ramogi hill forest is surrounded in by Usigu, Oraro and Jusa settlements. From the top of the hill (Fig. 2), one has an excellent view of Lake Victoria across to Uganda, the reason why it was chosen for settlement enable the residents spot the enemies from far (Mhando, 2003). There are about eleven clans living around the hill comprising of about 602 households[1] having 3071 individuals. Most of them rely on subsistence agriculture for their livelihood. The crops grown are maize, sorghum and cassava. Most of the households keep cattle, sheep and goats that are grazed in the forest. Fishing industry is one important activity in the area. Fuel wood from the forest is used in smoking and frying fish. The tree species commonly used for smoking is *Rhus natalensis*, which they claim adds flavour to the fish. It is interesting to note that in all the 30-forest sample plots, none had this tree species. The fishing industry faces marketing and storage problems and does not provide the expected benefits. Non-adoption of modern farming technologies and low annual rainfall hamper commercial agricultural production, although the area has great potential for cotton production. This leaves the forest as the alternative livelihood support.

Four major forest products used by the adjacent community are firewood, medicinal plants, poles and posts for building and game meat. Most residents from these settlements depend on the forest for both domestic and commercial requirements. For example with exception of one or two households, all the other households living within 1-5 km exclusively use fuelwood for cooking. An estimated 90 % of the fuel wood used is obtained from the forest and the rest from private farms. This has a direct impact on the forest condition.

Forest Structure

From trends exhibited in Figs. 3, tree diameter distribution in all zones assumes a less than distinct inverse J-distribution curve normally associated with an undisturbed natural forest. (Lamprecht, 1990). Instead diameter distribution histogram shows higher densities in the smaller size classes dipping progressively towards larger diameters. This

[1] Household defined as man wives and children who are not married.

pattern implies that the forest structure is indicative of more intense use and the trees with large diameter size classes seem to have been harvested as indicated by the presence of cut stumps.

This is supported by the presence of cut stumps in all the zones. Between the three zones, SwZ has fewer representations of trees in all the diameter size classes. However, the settlement zone had patches of *Eucalyptus camaldulensis* plantations that could have effect on the diameter class of trees in this zone. This suggests that settlement zone and swamp forests are more intensively used than the sacred forest.

When comparing the tree species diversity, SeZ zone had 14 tree species while SwZ and ScZ both had 12 species each. The settlement zone had *Eucalyptus camaldulensis* and *Eurphorbia candelabrum* (sacred tree) that explains the no of trees in this zone. The species diversity of the early developmental stages of trees (Seedlings) was represented as follows: SeZ = 23, SwZ = 15 and ScZ = 18 (Tables 1and 2). The higher number of seedlings noted in the SeZ could have been through the influence of more utilization and therefore more open canopy which may in turn have encouraged the growth of pioneer species and other opportunistic species that are not shade tolerant.
Interestingly, the total inventory when saplings and seedlings are taken into account in all the zones give 36 tree species, yet only one third recorded in all the zones implying that the trees have been harvested and/or are continuously being harvested before attaining large DBH size classes.

Cut Stumps
Most of the tree species harvested across all the three zones are similar (Table 3). Most of these tree species are used in building houses and for fuelwood (Bentjee, 1994, Noad and Birnie, 1992 Dale and Greenway, 1961). *Euclea divinorum, Harrisonia abyssinica* and *Vangueria madagascariensis* were not encountered in the plots in all the three categories namely, seedlings, saplings and trees. Both *E. divinorum* and *V. madagascariensis* roots are extracted for herbal medicine. The two species are also used for firewood and this may cause reduction in their population.
Cut stumps can be useful tools in forest verification of the responses of the users particularly in forests where withies, poles, posts and timber are harvested.

Vermeulen (1995) using cut stumps was able to explain why some residents in Mafungabusi state forest in Zimbabwe choose to harvest in different categories of tenure. Results from his study indicated that, more harvesting took place in the state forest compared to the community forest. In the case of Ramogi hill, less harvesting took place within the sacred zone as the community perceived this to be their forest and perhaps could explain why there was more harvesting in the other zones (Fig.4) perceived by the community as government forest.

In this study, we found out that Ramogi hill forest has always held a central; position within social and cultural life, inspiring respect through a great number of taboos and norms. The sacred groves, where the remains of royal ancestors lie, are the sources of many medicinal plants and have therefore been zealously protected for centuries. Within the sacred groves for example, no iron tool or axe is allowed and only mature trees are cut on the periphery of the grove for building houses but with permission from the elders. Women are not allowed to collect fire wood within the groves, no non-member is allowed entry when ceremonies are taking place, beehives are not allowed in the groves, before cutting any tree, one has to pray and request for permission and blessing from the ancestors, any artifacts left behind by the ancestors like grinding stones are kept in their original places and no one is allowed to move them, when there is no ritual taking place in the in the grove, any one can pass through the grove, grazing is allowed only during dry season on the precincts of the grove.

Results from this study indicates that in addition to government-enforced rules, the recognition of indigenous rights to forest resources management and utilization can lead to successful management practices as demonstrated by less impact within the sacred zone. The results underscores the strength of the local institutions associated with the sacred forest in that, people tend to abide by the rules the elders prescribe.

Like in other forests in Kenya, the most serious threat to this forest is the demand for forest resources that can be used to meet the subsistence and commercial needs of the local communities (Wass, 1995). Mostly the youth extract fuel wood from the forest for sale in the nearby Usenge town for fish smoking.

The FD has rules for extraction of certain forest products in the whole forest area; the locals disregard this since there are only two forest guards to patrol the whole forest area. Access by local people to the forest is sanctioned through permits for example, thatching grass may be collected and cattle grazed upon payment of a monthly fee. Dead wood, which is the main source of fuel, is collected upon payment of Kshs 35, however cutting live wood or even carrying an axe is prohibited. Despite this, most harvesting goes unchecked in the forest areas adjacent to swamp and settlement. However because of the sacred nature of the forest, the adjacent communities have their values, norms, rules set by the elders, mentioned previously that regulate the extraction of forest products in some sections of the forest perceived as sacred groves. This seems to be the main reason why the forest is still standing despite the immense pressure. In other words, the hypothesis of this study that forest conditions are superior when local institutions complement the rules of the central government. It is not the performance of either, but it is the complentarity of the two rules systems that determine the effectiveness at the local level.

In both the settlement and swamp areas, harvesting was active in all the three age class categories meaning harvesting has been going on. Harvesting of the third age-class (>3 years) was observed in all areas. (Fig.5). Less harvesting took place in the sacred areas as shown by stumps of age three and above and during the last 2 years prior to our study, no harvesting took place in the sacred zone.
The diameter of stumps indicates that more trees of 2.5 cm but less than 5.0 cm are harvested most frequently around the settlement and swamp areas compared to sacred areas (Fig.6). The trees in these diameter classes are mainly used for firewood. What might this mean for the forest is that the practice encourage the growth of mature trees however, if all of the small trees are cut, then the forest could be in jeopardy later on. The

question of whether this type of use is sustainable and beneficial for the forest comes into play here. The management implication is therefore zoning the forest and encouraging rotational harvesting in areas that are not degraded.

Regeneration

Lamprecht (1989) in his study of regeneration in many tropical forests found out that, although latent regeneration was found more or less everywhere in the forest, floristically it only partially corresponded to the composition of mature forest stand and was usually less diverse. He went further to explain that apart from light conditions, a number of abiotic and biotic factors also play an important role in the regeneration process. The overall situation in each case is decisive for its success or failure. In his conclusion, he pointed out that abundance of seedlings was by no means an indicator of the definitive establishment of young seedlings; it was frequently ephemeral more or less completely fading after a short time, whereby light deficiency could probably be one of the main causes of decline.

In this study, overall there is latent regeneration in all the three zones (Table 1). Considering the distribution of mature trees in the SeZ zone and the relatively high level of gap creating disturbance, the SeZ zone would be expected to have a high density of regeneration representing a narrow range of species, but this is not the case (Tables 1 and 2). Instead, this zone has population density of regenerates in most size classes, but with a range of species comparable with that of the sacred and swamp zones (Fig.7).

This unexpected wide range of species representation in the regeneration stages in the SeZ zone may be as a result of open canopy that can encourage the regeneration of pioneer and opportunistic species that are not shade tolerant (Lamprecht, 1989). From the foregoing, it appears that the forest structure and extent of latent regeneration may not be reliable indicators of the extent use in this forest. Looking at direct use in the form of cut stumps, along with regeneration provides a better picture of the intensity of forest use for subsistence.

Density of regenerates was higher in SwZ across all size classes (Fig.7). Densities of regenerates were, however, comparable in sacred and settlement except in the smallest size class. Very few cut stumps were evident in sacred forest areas. Taken together, condition of the forest can be described in the following order: ScZ>SwZ>SeZ which supports the argument that local institutions shape the condition and pattern of forest use. This implies that, to reduce further degradation, strengthening community involvement in forestry management and use of their indigenous knowledge and recognition of their sacred groves institutional arrangements is important. People will defend forest if they feel they have a stake in them. Responses therefore must recognize the complexity of the problem; gun-totting forest rangers will not be able to solve the problem unless the demands for illegally harvested forest products are satisfied (Dudley and Stolton, 2000).

Among the more important independent variables that affect the level and type of consumptive utilization of forests in many settings are the security of tenure that local residents possess related to forests and the level of rule enforcement related to the use of forest resources (Banana et al. 2000). He goes further to explain that these variables are important because individuals who lack secure rights to forest resources are strongly tempted to use up these resources before they are lost to the harvesting efforts of others. If rules regulating access and use of forest resources are not adequately enforced, the *de facto* condition becomes one of open access rather than secure tenure. Although the Forest Department has security of tenure over the whole forest, the users of the sacred sites have access rights and therefore monitor illegal activities. From the cut stumps results, it evident that there is a boundary of sacred forest that marks a switch in tenure which means a difference in the extent of policing and the range of penalties for tree cutting. The local people are not deterred by the risk of arrest and therefore harvest in the area they perceive as state forest.

Absence of formal and secure tenure by the locals notwithstanding, the better forest condition in the sacred zone may be as a result of 'informal' recognition by the Forest Department of the rights of the locals to use the forest for religious rites and other traditional activities, thus there are informal rules that restrict consumptive harvesting of forest resources. In this case local institutions are complementing the efforts of FD. Individuals may ignore central government rules that contradict their daily patterns of resource use (Banana et al, 2000). This is supported by the study, since all the non-sacred groves of the forest are heavily used despite the formal government rules regulating the use.

Schweik (2000) demonstrates in his study, that physical variables alone do not account for differences in the forest condition or in the availability of certain valuable tree species. He argues that subtle institutional factors do help account for better forest condition or the availability of these trees, for example cultural practices. In Ramogi hill forest, *Milicia excelsa* is a sacred tree that nobody is allowed to cut despite its valuable timber. The presence of these trees with dbh of over 100 cm underscores the strength of sacred rules. Local elders traditionally instituted rules and regulations to protect the groves from destructive use, relying heavily on taboos and other social sanctions rather than active policing.

With the changes in the management and society, the local communities are no longer socially cohesive as before and the hold of traditional institutions has weakened particularly in the face of economic and developmental forces. Increasing disregard for cultural values by the youth is also envisaged to be a major threat to the future of the sacred groves (Nyamweru, 1996). This study found out that most of the fuel wood for sale is harvested by the youth.

Ramogi hill forest was gazetted in the early 1970's as a natural forest reserve[2] to protect the unique flora and fauna associated with this forest type. In the past, it was under local community and county council management. During the gazettement, the sacred groves institutions were not recognised by the state. The forest is under the protection of state laws, but these laws carry weak sanctions or penalties, which are also not enforced

[2] These are legally owned by the government and are forests that have been surveyed, demarcated on the ground and declared as forest reserves. They are managed directly by the Forest Department (FD) on behalf of the state.

because forest department have only two guards who are ill equipped to patrol the forest area. This creation of state institutions to appropriate forestland leaves the sacred groves in various tenure arrangements with the central government as the main stakeholder and the county council and community as passive stakeholders. This raises the question of access to the groves by community members and security of tenure. I argue that, community based forest management linked with traditional values and practices therefore represent an important means to realise the goals of conservation, especially when modern forest management mechanisms and traditional norms complement each another. The best results are achieved when central government rules are congruent with the objectives of the local institutions.

In forest areas where the community are involved in the assessment of forest condition, simple methods like counting cut stumps are easily understood. In Nepal for example, the forest user groups are required by state law to carry out an inventory and draw a management plan of their forest before the lease license can be renewed. Most of the user groups are unable to carry out inventory and therefore cannot renew their licenses (Birendra, Pers. Comm.). This is worrying and may require training of some members of the user group in forest inventory techniques incorporating simple techniques like using cut stumps. This paper further illustrates that such techniques have the advantage of being easily understood and performed by local people. This is not always the case with conventional forest assessment methods, which may be both costly and complicated to carry out. Cut stumps have a potential for use in time series analysis on the use of forest resources, particularly in a forest reserved for conservation purposes.

Conclusion

Traditional beliefs and practices handed over time are still observed with total studiousness by the local people in Ramogi and have been used to protect the forest. The sacred groves are protected, conserved and maintained through a combination of taboos, prohibitions, beliefs and restrictions. In almost all cases, burning, tree cutting and fuel wood gathering are prohibited in groves. There are graduated sanctions against those who contravene the taboos, and in some instances the culprits must perform certain rituals.

The establishment and preservation of sacred groves in Ramogi forest is based on informal regulations and practices founded on traditional worship. For many years the people have observed unwritten guidelines that restrict human interference with the groves. The people observe regulations banning harvesting of trees from the groves except for medicinal purposes from the groves. These activities have become absorbed into their lives and they derive great satisfaction from observing the guidelines.

Ramogi hill forest community therefore has an important role to play in its management and conservation. Conservation measures that are bound to succeed must recognise the role played by this people. The complementary nature of the institutions for forest protection/governance/conservation in this case FD and local institutions, I suggest a joint management type of regime that incorporates both the state and local institutions. Other stakeholders, for example the fishing folk's role in both conservation and utilization of the forest products in the industry must also be recognised.

There are opportunities for the development of eco-tourism in this area and this may provide the locals with additional alternative income thus reducing pressure on the forest.

It is interesting to note that sacred forests are not entirely a thing of the past and therefore, further research on the sacred groves institutions and tenure arrangements in this forest is required to help in the planning the conservation of this forest. Future research should focus on the study of the history of the previous land use in this forest since there is evidence of previous settlements within the forest, the ecology of the some tree species in terms of shade tolerance, coppicing ability, palatability to livestock and how this affects their regeneration, ethno botany of other species considered sacred or suitable for fish smoking, assessment of the spatial distribution of cut stumps to be able to give an indication of intensity of forest use and proximity to settlement, how tenure shift was received by the community, for example were there conflicts and how were the conflicts resolved and how the conflicts impacted on the forest condition. This will help strengthen the authors' arguments.

REFERENCES

Bagine, R. 1998. Biodiversity in Ramogi Hill, Kenya, and its evolutionary significance. African Journal of Ecology 36 (3), 251 – 263.

Bagine, R.K., Njoroge, J.M., Ogutu, W. and Ruthiri, J.M. 1994. Ramogi Hill Forest: Invertebrate Biodiversity Survey, Unpublished Report.

Banana, Abwoli., and William Gombya-Ssembajjjwe. 2000. "Successful Forest Management: The Importance of Security of Tenure and Rule Enforcement in Ugandan Forests." In people and Forests: Communities, Institutions and Governance, ed. Clark C. Gibson, Margaret A. McKean and Elinor Ostrom, 87-98, Cambridge, MA: MIT Press.

Beentje, H.,1990. Kenya Trees, Shrubs and Lianas. National Museums of Kenya. Nairobi, Kenya.

Birendra, K., 2003. Personal Communication

Dale, I.R. and Greeway, P.J. (1961). Kenya Trees and Shrubs. Buchanan Estates Limited. Nairobi.

Dudley, N. And Stolton, S. (Eds) (2000). The Law of the Jungle. Arbor vitae. IUCN/WWF Forest conservation Newsletter 15.

Geldenhuys, C.J. (1991). Inventory of indigenous forest and woodland in Southern Africa. Paper presented at the 13th meeting of the SARCCUS standing committee for forestry held in Kuysna, RSA, on 24th October 1990.

Griffiths, C.J. 1993. The Geological Evolution of East Africa. In: Biogeography and Ecology of the Rain Forests of Eastern Africa (Eds J.C.Lovett and S.K. Wasser). Cambridge University Press, Cambridge.

Ostrom, E., 1998. IFRI Field Manual Version 10.5. 2002. International Forestry Resources and Institutions Research Program Indiana University. Worskshop in Political Theory and Policy Analysis.

Kenya Forestry Research Institute (KEFRI), 1999. KEFRI Strategic Plan 1999-2004.

Lampretcht, H. 1990. Silviculture in the tropics. Tropical forest ecosystems and their tree species-Possibilities and methods for their long term utilization, GTZ,Gmbh, Eschborn [Translated by John Brose] Ross;TZ-GES.

Luoga, E. J., Witkowsky, E.T.F., Balkwill, K., 2001. Harvested and standing wood stocks in protected and communal miombo woodlands of eastern Tanzania. Forest Ecology and Management J. Vol. 164, Issues 1-3, Elservier Science B.V.

Mhando, J.2003. Ramogi Hill-The dispersal point of the Luo. The secrets of Traditional sacred sites. In Indigenous Knowledge Newsletter, Vol. II issue 1.

Noad, T. and Birnie, A. (1992). Trees of Kenya. 3rd edition. T.C. Noad and and A. Birnie. Nairobi.

Nyamweru, C., 1996. Sacred Groves Threatened by Development. The Kaya Forests of Kenya. Cultural Survival Quarterly, 19-21.

Schweik, M. Charles. 2000. “Optimal Foraging, Institutions, and Forest Change: A Case from Nepal.” In people and Forests: Communities, Institutions and Governance, ed. Clark C. Gibson, Margaret A. McKean and Elinor Ostrom, 87-98, Cambridge, MA: MIT Press.

Vermeulen, S.J.,1996. Cutting trees by local residents in a communal and an adjacent forest in Zimbabwe. Forest Ecology and Management J. Vol. 81,101-111, Elservier Science B.V.

Wass, P. 1995. Kenya’s Indigenous Forests, Status, Management and Conservation. XII and pp. 205. IUCN, Gland, Switzerland.