Human Activities Affecting Vegetation Characteristics in Chepalungu Forest Bomet County, Kenya

Ronoh Leonard Kiprotich

Abstract: **- Biodiversity values at ecosystem depend on how people use, manage and interact with the forest trees and trees outside the forest. Between 1990 and 2010 Kenya‟s forest cover significantly reduced by 6.5%. The aim of this study was to assess the effects of human activities on vegetation characteristics in Chepalungu Forest (CF).Primary data constituted responses from randomly sampled local community, the herbalist, cultivators and foresters interviewed. Their response rate was 96%, 100%, 100% and 60% respectively that were analyzed in SPSS. Obtaining firewood, grazing fodder, honey, herbs among others occurred very frequently in 88%, 83% 93% and 90% respectively. Cutting, trampling and browsing as disturbance on trees accounted for 73%, 15% and 12% respectively. 98%, 81%, 75% and 40% of the respondents considered charcoal making, grazing, and browsing and firewood collection to be very destructive human activities occurring in CF respectively. The forest has decreased in a margin of 9% between 1985 and 2010 in its area with 7% attributed to clear-cutting established using change detection technique. CF has a tree diversity of 0.6, 0.4 and 0.3 in the edge, core and middle zones respectively measured on Simpson Species Diversity Index. This data was collected using stratified random sampling with established square quadrats along line transects. The forest is managed by protecting and replanting trees which 91% and 76% of residents and forest officers considers inadequate. The local community feels alienated from the conservation as 89% are of the view that conservation management be done by the residents. Collaboration of all stake holders is preferred by 87% of the respondents and 95% proposed that fencing be done compared to 82% in favor of planting trees on farm among other viable conservation measures. Chi-square was conducted to test the significance of association. The forest has been over exploited by unregulated use. It is recommended that clear guidelines on the legal activities be developed by the forest department with public participation to regulate use of its resources. The forest department to develop inventory on what they are conserving to allow periodic audit that will guide conservation strategies.**

Key words: **Environment for Visualizing Images, Participatory Forest Management**

I. INTRODUCTION

Human activities such as grazing, wood collection, trampling and cultivation influence forest vegetation to the extent that forest ecosystems are degraded. When human makes use of any component of the ecosystem, they may bring about changes in other components. Delicate and informed management is required in order to take advantage of the multiple functions of a resource without damaging the ecosystem (Walter, 2004). This research assessed the effects of human activities on Chepalungu forest and suggested integrated perspective in conservation for sustainable development.

Forests play a significant role in the mitigation of climate change and improving the livelihood of people directly and indirectly across the world as source of food and water. illegal logging threatens 65% of forests which has devastated public forest around the globe, major disruptions usually set up chain of reaction within the ecosystem because they have been little understood and have not been predicted (Areole, 1991). Kenya‟s closed forest canopy is less than 2% as compared to 9% and 21% for the rest of Africa and the world respectively (Oeba, 2011). At independence, Kenya had 1.8 million hectares which is 3.5% of area of country. Kenya has been losing forest at a rate of approximately 1900 ha per year for the last 20 years (CBS, 2004).

Statement of the Problem

Rapid population increase exerts pressure on natural resources; census record in the study area indicates 723,813 persons in 2009, 782531 in 2012 and expected to reach 891,168 by 2017 of which 80% are youth active and likely to overstretch available resources in all respects. Human activities influence vegetation dynamics in Chepalungu Forest; wood logging, firewood collection, grazing and browsing, charcoal making, cultivation and bee

keeping are some of the human activities carried out in the forest. Vegetation exhibits continued change in canopy structure, species density abundance and dominance and species richness driven by the impact of unregulated human activities. Degradation of natural ecosystem is an environmental concern currently. Wetlands are being converted to farmland, cultivation along riverbanks, mountain top cultivation, deforestation to pave way for settlement, all lead to loss of such fragile habitats.

The underlying issues are that: unregulated human activities are detrimental to vegetation; illegal activities undermine conservation; insufficient community participation is a factor in sustainable conservation. Effective conservation measures are supposed to facilitate the self-sustenance of nature while maintaining complexity of any forest. Chepalungu Forest reserve faces challenge of transformation by human

disturbance forms and increased edge effects. It has poor potential for closed canopy growth. Illegal activities include forest clearing, tree poaching, setting on fire vegetation, charcoal making using traditional kilns and driving goats into the forest. Being a gazetted forest property of the government, the community has alienated itself from their resource allowing over exploitation. This situation should be managed to avoid total loss of natural habitat. Chepalungu Forest is at verge of extinction. In view of this problem, there was need to determine key factors in degradation and viable conservation strategies in protection, reforestation and restoration for optimal conservation.

Background of Human Activities

Virtually all rural dwellers in Kenya depend on fuel wood for energy and more than 90% of urban households use charcoal as a primary source of fuel for cooking. Based on a projected annual growth rate of 2.3%, Kenya‟s population is expected to increase from 35 million in 2007 to an estimated 60 million in 2030. By that time, the demand for wood fuel and charcoal could Human activities directly or indirectly influence vegetation characteristics at a point. Direct human activities include but are not limited to total clearing, cultivation, selective cutting and burning. Indirectly activities include livestock grazing and browsing, habitat modification, and pollution among others. These factors have been perceived by Ward (2009), Hugget (2004) and Graham (2002). Food requirement brings about livestock grazers and browsers with cattle, goats and sheep being overstocked. This phenomenon is advanced by Ogutu (1991). In East Africa, it resulted in wealth being measured in heads of cattle, which consequently leads to over grazing as described by (Huxley, 1931). This study assessed vegetation whose growth, regeneration and subsequently overall productivity has been hampered following human disturbance. Natural forests have been steadily declining as shown ;

Kenya: trends in natural forest Matiru (2010)

Year	Rate	Percent
1990–2000	-10.00	-0.29
2000–2005	-10.00	-0.3
2005–2010	-10.00	-0.3

Reach 23.5 million tons and 5.7 million tons respectively if per capita consumption remains at the present level. Assuming a conversion rate of 50% to produce charcoal, 11.4 million tons of biomass would be needed Wanyiri*et al* (2010).

Hence, to supply energy from both fuel wood and charcoal by 2030, 34.9 million tons of biomass would be required. Based on a conservative estimated yield of 10 tons per hectare, about 3.5 million hectares would have to be harvested annually which translates to 6% of forest cover.

Wood fuel is the energy source used by most of the world‟s population and is one of the most locally destructive sources of energy. There is global fuel wood crisis: Charcoal making is creating and expanding the circle of deforestation. Areole (1991) articulates that selective logging impacts on forest ecosystem by reducing the floristic diversity and structural complexity of the forest. Industrial round wood removal in Kenya total volume is 1,648,000 m^3 over-barks; this wastes 50% of the world‟s energy

II. RESEARCH METHODOLOGY AND DESIGN

Based on method of data analysis, Mugenda and Mugenda, (1999) descriptive research is a process of collecting data in order to test hypotheses or answer questions concerning the state of subject in the study and descriptive research determines and reports things the way they are. The advantages of using both qualitative and quantitative methods is that research had several objectives which others were better assessed by either method which supplements each other in that qualitative method provides for in-depth explanation while quantitative provides hard data needed to meet the required objective and to test hypotheses (Mugenda and Mugenda, 1999).

This study designed and used questionnaire to collect data from Bomet foresters regarding the conservation programmes, stakeholders involved, activities degrading the forest, challenges they face in line of duty, critical species they protect and proposal for conservation.

Interview schedule was used to acquire data from the local community in Chepalungu forest on the resources they obtain, the legal and illegal activities their views on conservation programmes and suggestion for sustainable use of Chepalungu forest resources. Observation schedules were applied to derive data on vegetation diversity and observed disturbance within the forest ecosystem.

This survey, a descriptive research study, concerned describing the characteristics of vegetation and diagnosing the frequencies of human activities occurrences and their association. Specific predictions were made with narration of facts concerning the activities and their impact on vegetation characteristics; floristic attributes and productivity. These constituted the primary data for this study. The researcher used samples to make statements about population on the basis of analysis. Coding data, statistical computation such as averages percentages were worked out.

Members of Chepalungu local community respond duringinterview

Study variables and methods

	Objective	Variables	Methods	Data analysis
1	To examine the	Human activities	Interview schedule,	SPSS
	effects of	- Encroachment	Questionnaires.	Mean, total,
	Human	-cultivation	Landsat-5,1985-	percentage,
	activities on	-Disturbance	2010	ENVI
	Vegetation	Forms	Observation-	Chi-square
	Characteristics		checklist, plates	

III. FINDINGS

Human Activities Affecting Vegetation in Chepalungu Forest

The study assessed human activities affecting vegetation in Chepalungu Forest. The community living near the forest was asked to state which resources they derived from the forest, how much importance they attached to those resources, whether they paid any levies for them and also whether they got any permission to use the resources and from whom.

The study established that the community considered herbs, honey, firewood and grazing to be the most important resources from the forest whereas charcoal, thatching grass and soil were the least important. The study revealed that water and game were the least utilized resources from the forest. All of these human activities are potentially degrading to the forest (Ogutu, 1991) if conservation measures are not taken, the forest will deteriorate with consequences such as loss of species (Hambler, 2004). The study found that community members sought consent from forest officers before obtaining some but not all the resources they derived from the forest. Forest officers were mostly consulted for firewood, grazing, poles and thatching grass. These were also the resources for which most people paid levies. Honey, charcoal, herbs and seedlings were the resources most people obtained without permission and fewer people paid for. Village elders and chiefs were very rarely consulted over matters of forest utilization. This finding suggests that the community considers itself entitled to some resources such as herbs and honey so they do not seek permission even from the forest officers to get them.

The study investigated the frequency with which the community members engaged in activities that were deemed to be degrading to the forest, whether they considered those activities to be legal or illegal and how they rated the destructiveness of these activities to the forest. The findings revealed that the community engaged in all the activities with grazing, collection of firewood and beekeeping as the three activities most frequently engaged in compared to charcoal making and cultivation. Forest officers reported firewood collection and grazing as the two most common degrading activities they encountered in their work.

Women carrying firewood from Chepalungu forest during interview

Cultivation is one of the activities with great potential to degrade the forest. The study particularly investigated the impact of cultivation on Chepalungu Forest. It emerged that cultivation was not as prevalent as other activities such as grazing and beekeeping. In addition, the study found that most of the farmers used hoes or ox ploughs to prepare land as opposed to burning or harrowing which are more destructive modes of land preparation. The farmers‟ activities were found to be supervised hence they adhered to the guidelines for the Shamba system. These findings lead to the conclusion that cultivation was not an important factor in the degradation of Chepalungu Forest.

On the question on whether activities were legal or illegal, the study found that charcoal making, logging and browsing were the activities most people considered to be illegal whereas beekeeping, collecting herbs, trampling and grazing were the activities most people considered to be legal. The community members rated charcoal burning, logging and browsing to be the most destructive activities and beekeeping, collecting herbs and trampling to be the least destructive. Care should be taken when extracting any part of the tree to allow for regeneration especially for herbalist using rare species. Constant abrasion by moving livestock affects plant growth and amount to degradation. The community should be informed of this fact and reduce the livestock numbers to minimize this situation. Bees are important in reproduction in flowering plant. These insect forms important part of forest ecosystem and should be encouraged for ecosystem and the economic aspect of resource management. To reduce demands for firewood, fuel saving jikos should be made available to the community including the alternative technology in biogas production and general good practice in the use of trees

Cattle trampling on vegetation in the Chepalungu forest

This study recommends enforcement of regulation on cutting and collection of firewood by forest department and all stake holders. Develop and stick to guidelines on annual allowable cut on firewood collection. The forest ACT of 2005 does not allow browser, its implementation has failed in CF. Impose strict penalties and limit grazers that trample on vegetation. Beekeeping should be promoted in Chepalungu Forest. All stake holders to encourage on farm forest with fuel efficient jikos for households and alternative fodder for livestock especially priority on 5 km radius round the forest in order to reduce their depending on forest for firewood as source of energy for households and to make a buffer zone around chepalungu forest which will reduce edge effects.

IV. RECOMMENDATIONS FOR FURTHER RESEARCH

According to the findings of the study and gaps identified, the study recommends that other studies should replicate on:

1. Ways of involving the public in forest conservation, participatory forest management for sustainable forest use.
2. Restoration opportunities for degraded forests.

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