LOCAL COMMUNITY PERCEPTION ON BENEFITS AND CHALLENGES OF CONSERVING KIANGO'NDU FOREST IN THE EASTERN MOUNT KENYA FOREST BLOCK

Njeru, J.M.[1], Soi, B.C.[1] and Ngigi, W.M.[1]
[1]Department of Environmental and Resource Development, Chuka University, P. O. Box 109-60400, Chuka, Kenya
Correspondence: bsoi@chuka.ac.ke, jusmugendi@gmail.com

ABSTRACT
Forests are crucial to a country's health and development as they are important in providing environmental, economic and social benefits. Mount Kenya Forest in particular is a major water catchment area in Kenya. Unfortunately, communities living close to the forests carry out unsustainable extraction of forest products that puts the forest ecosystem under serious pressure. It is therefore necessary to understand the nature of interactions between the communities and forests and encourage support of the communities in the conservation and management of the forest. The main aim of this study was to determine the local community perception of the benefits and challenges of conserving the Kiango'ndu montane forest located in the Eastern Mount Kenya forest block. The study established the challenges that the communities face as a result of living close to the forest, their perceptions of the benefits they derive from the forest and their willingness to participate in conservation of the forest. The study was done through a qualitative ethnographic approach employing questionnaires, interviews and observations. The main target group was the forest communities bordering the forest. The study revealed that the local community enjoyed a diversity of economic, ecological, aesthetic and cultural benefits from the forest. However, they incurred losses caused by wild animals such as property and crop damage, loss of time spent chasing away wild animals, bodily injuries and even fear of wild animals. However, most of the respondents were willing to participate in conserving the forest. The study substantiates the need to resolve the human-wildlife conflicts as well as encourage initiatives geared towards enlightening local residents on updated forest/wildlife conservation practices and legal rights such as compensation of wildlife related losses.
Key words: Forest, Benefits, Community participation, Conservation

INTRODUCTION
Protection of threatened critical ecosystems such as the Mount Kenya Forest Reserve is the vision of conservationists at local, national and global levels. Mount Kenya is a World Heritage Site as well as a Biosphere Reserve under the UNESCO's Man and the Biosphere Programme (MAB). Like other forests, the forest is crucial to Kenya's health and development, as it is important in soil and water conservation, production of wood and non-wood products, carbon sequestration, conservation of biodiversity and social benefits. In fact, Mount Kenya Forest supports the largest and most ecologically diverse forests in the country (Kaburi and Medley, 2011) and has the highest priority for conservation (Kenya Wildlife Service [KWS] 2007; Woodley 2003; Emerton, 1999). Unfortunately, the forest reserve is under serious pressure from human activities such as illegal logging, cultivation, charcoal burning, overgrazing, encroachment, poaching, siltation, visitor impacts and increased human wildlife conflicts. These activities threaten the sustainability of the forest reserve.

Recent conservation initiatives have shown that success in conserving wildlife and their habitats depend on the attitude of local communities towards conservation (Fredrick, 2012; Okech, 2010; Esilaba *et al.*, 2007; Moses, 2005). This concept in which the local communities act as partners in conserving natural resources is based on the bottom-up approach. Several authors have argued that community participation is the key strategy to current biodiversity conservation and management whereby people are involved in deciding which direction and actions to take in managing natural resources in their areas (e.g. Chown, 2012; Berkes, 2004; Chambers, 1994). More recent models of community participation such as the People – Park Model (Oates, 1999; Stevens, 1997) and the Protected Areas Planning Framework (KWS, 2007) are aimed at ensuring that communities (and other stakeholders) and their resources are more effectively mobilized and empowered to participate in natural resource conservation by ensuring that their interests are taken care of. Based on these approaches a balance has to be struck between environmental protection and local community interests. Such a setup ensures harmonious co-existence between the communities and conservationist. In the light of this fact, it is imperative to understand factors which influence communities' attitude towards wildlife so as to enable wildlife and forest managers implement approaches that attract support of the community and the general public.

Furthermore, it is important to recognise that within the traditional African setup, communities and wildlife coexisted in an environment where human activities and human-wildlife conflicts had minimal adverse effects to the survival of wildlife and their habitats. In Kenya, this situation began to change from 1898 when the colonial government enacted the first Wildlife Legislation that was used to control indiscriminate hunting (Chongwa, 2012). This was the beginning of the alienation of communities from managing a resource that they lived with. The ultimate result of this was a drastic change of the local communities' attitude towards wildlife (Chongwa, 2012; Okech, 2010) mainly because they were evicted from their ancestral lands without any compensation and were denied access to resources that had been their inheritance for generations. One of the consequences of this is the seasonal and frequent human-wildlife conflicts around Kenya's protected areas which mainly stem from the problem of resource utilization within and around the protected areas (Okech, 2010; Esilaba *et al.* 2007). Such conflicts do not solve this problem, however, but adversely affect the biodiversity for example through retaliatory killings of elephants and lions.

Given this background, it is crucial to understand the conservation perspective of the communities living close to conservation areas if conservation and management programmes are to succeed. This is especially important because there is increasing recognition that biodiversity is ultimately lost or conserved at the local level. Besides, according to Meijaard *et al*. (2013), better understanding of local people's perceptions could help inform and shape political agendas with regard to land use, sustainability, people's rights, and result in more equitable land use decisions and other societal processes. In addition, perceptions about forest values could be considered proxies for the relative importance of forest ecosystem services, such as provision of timber and non-timber forest products, disease control, flood regulation, provision of energy and clean water, temperature control, and carbon sequestration (Raymond, 2009). Moreover, monitoring locals' concerns related to conservation and wildlife resources can provide a foundation for effective decision making that mitigates wildlife impacts (Moses, 2005).

The broad objective of this study was to find out the perceptions of the Kiang'ondu community on the costs and benefits of conservation of the Eastern Mount Kenya Forest reserve, so as to better understand mechanisms for integration of the community in forest and wildlife conservation. The specific objectives were to: (i) determine the prevalence and causes of human-wildlife conflicts in Kiang'ondu, (ii) determine the benefits the community derives from the forest and (iii) to find mechanisms of community participation in forest and wildlife conservation. Such information is crucial in suggesting strategies and methodologies for achieving sustainable participatory conservation of montane forests such as the Eastern Mount Kenya forests. This would also enable decision makers to better understand the conservation status of the community and adequately accommodate their aspirations during policy processes.

MATERIALS AND METHODS

Mount Kenya forest is the second largest in Africa after Mount Kilimanjaro of Tanzania. It is located at 00°10 S and 37°20 E, and lies between altitudes1600-5199 m above sea level. It is located on the eastern side of the Great Rift Valley and the northern slopes reach the equator. The study covered the Kiang'ondu forest located on the lower slopes of the eastern part of Mount Kenya Forest Reserve (Figure 1).

Generally, the climate of Mount Kenya is influenced by differences in altitude. Rainfall in the region including Kiango'ondu area is bimodal and averages about 1200 mm to 1800 mm with maximum rains falling during months of March to June and October to December. The driest months are January, February and September. The diurnal temperature range in January and February and may be as high as 20°C. The topography of the study area was characterized by foot ridges and hills but in other areas of Mount Kenya Forest there were plains and valleys with the majority of the valleys having rivers and streams or marsh. The Mount Kenya ecosystems especially where the Kiang'ondu forest block is located consist of pyroclastic rocks and volcanic ash originating from various secondary eruptions.

The forest is home to a wide diversity of flora and fauna. Some 882 plant species, subspecies and varieties belonging to 479 genera of 146 families have been identified in Mount Kenya forest; with 81 plant species being endemic (Woodley, 2003). Fauna includes: African elephant (*Loxodonta africana*), leopard (*Panthera pardus*), buffalo (*Syncerus caffer*), bongo (*Tragelaphus euryceros*) and the black fronted duiker (*Cephalophus nigrifrons hooki*). Several primates are also found in the forest, the most common being the black and white colobus (*Colobus guereza*), Sykes monkey (*Cercopithecus mitis*) and the olive baboon (*Papio anubis*), which is common on the forest margins where it is a nuisance to farmers from the nearby communities.

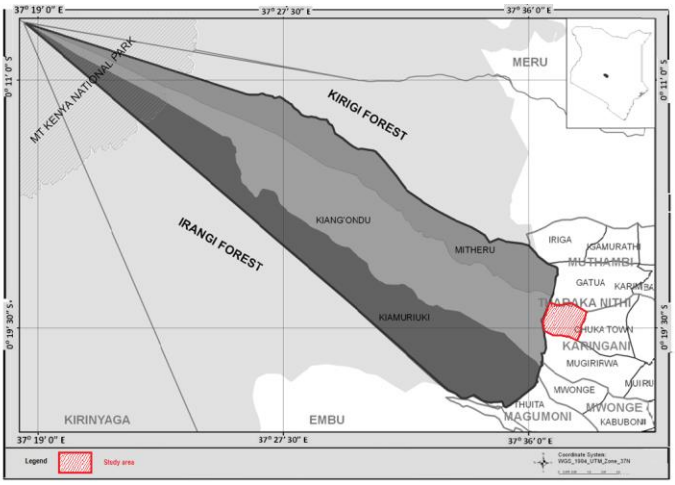

Figure 1: Map showing the location of the study area in the Kiang'ondu sub-County (Source: Modified after MKEEPA, 2015)

The environmental conditions in the area support subsistence crops such as sweet potatoes, maize, beans and potatoes as well as the commercial production of coffee, tea and other horticultural crops (Kaburi and Medley, 2011). Subsequently, these conditions support dense human settlements (600 people/km^2) that create a clear boundary between the rural agricultural landscape and closed forest (Ndegwa, 2005), including the buffer zone in Kiang'ondu subCounty (Kaburi and Medley, 2011). The study area has an approximate population of about 500 households living in villages that are contiguous to the forest buffer zone.

Sampling Procedure

We used the qualitative research method using questionnaires with both closed-ended and open ended questions. The questions covered four broad categories: (1) socio-demographic profile of the respondents, (2) problems and conflicts with wildlife, (3) views towards benefits from conservation of Mount Kenya Forest Reserve and (4) views towards community participation in conservation of Mount Kenya Forest. Sampled households were in the range of ≤3km from the forest boundary. Community livelihoods in Kiango'ndu area are based on smallholder mixed crop and livestock production with households that form villages. To ensure effective coverage of the villages, we used systematic random sampling technique. We first obtained informed consent from the village elders. In every village, we marked the first household and then we used every third household as a sample. A questionnaire was given to the household head or in the absence of the household head, an adult family member of 18 or more years. A total of 150 questionnaires were distributed to households in the Kiango'ndu but usable questionnaires returned were 116, a 93% response rate.

Data was analysed using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics was used whereby the responses were summarised into frequencies and percentages. Open-ended questions were grouped into different categories based on similarity.

RESULTS

Socio-demographic profile of the respondents

Most of the respondents were male 53.4% and they comprised of persons aged 18 years and above with the majority (37.9%) being over 45 years old. As shown in Table 1, the highest proportions (75%) were famers and only 9.5% were illiterate. The respondents lived up to a distance of 3 kilometers from the forest boundary with the highest proportion (37.9%) residing about 1-2 km from the boundary. All the respondents were Christians by religion.

Prevalence of Human Wildlife Conflicts

Of the 116 respondents, 62.93% revealed that they were experiencing problems with wild animals in the Kiang'ondu forest. As shown in Figure 2, 37.07% of the respondents had no problem with wild animals. In relation to these findings, most of the respondents claimed that incidences of human-wildlife conflicts in the area occurred throughout the year but peaked during the months of June to August and November to January when food crops are in the farms.

Table 1: Demography of the respondents

Parameter		Frequency	Respondents (%)
Gender			
	Male	62	53.4
	Female	54	46.6
Age			
	18-25	7	6
	26-35	26	22.4
	36-45	39	33.6
	>45	44	37.9
Occupation			
	Farmer	87	75
	Teacher	9	7.8
	Others	20	17.2
Educational Level			
	None	11	9.5
	Primary	41	35.3
	Secondary	45	38.8
	Tertiary		
	College	12	10.3
	University	7	6
Distance From The Forest Boundary			
	0-1km	35	30.2
	1-2km	44	37.9
	2-3km	37	31.9
Religion			
	Christian	116	100

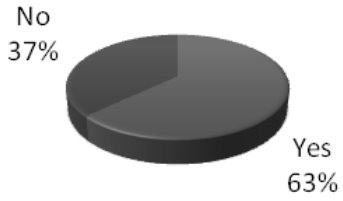

Figure 2: Proportion of respondents who had experienced conflict with wildlife

The informants revealed four main types of problems they experienced from wild animals in Kiang'ondu forest (Figure 3). Firstly and the most prevalent problem is crop raiding by wildlife, followed by fence damage, killing of domestic animals and cause of fear. It was also established that 37.07% of the respondents had no problem with the wildlife in Kiang'ondu forest.

Animal Species Causing Conflicts

Most of the respondents (32.76%) claimed that elephants were the major causes of human-wildlife conflicts in Kiang'ondu area. Monkeys, especially the vervet monkeys were also a major cause of conflict with 25% of the respondents supporting this view. As depicted by Figure 4, unidentified carnivores (which were most probably leopards) (9.48%), black and white colobus monkeys (7.76%) and rodents especially squirrels (2.59%) were also causing human wildlife conflicts in the area.

Methods Used to Resolve Conflicts

The majority of the respondents (43.97%) said that they dealt with problem caused by wild animals by scaring them away (Figure 5). This was mainly accomplished by making noises, shouting and drumming, throwing stones and sticks at the animals, lightning fires and using dogs as alarm. This was followed by scaring and reporting to the forest rangers. In addition, 14.66% of the respondents revealed that they resolved conflicts with the wild animals by killing them since they were not being compensated. In this regard, they claimed that the compensation process was *"difficult and so far nobody had been compensated for the losses."*

Benefits from Forest Conservation

Apparently, most of the respondents (40.52%) said that they enjoyed economic benefits from Mount Kenya conservation ventures. These benefits were in the form of employment and support through the community based organizations. They also benefited by collecting firewood, fodder and tapped water from the forest. Thirty seven percent of the informants said that they appreciated the ecological benefits such as climate moderation and conservation of water catchment area. Other benefits that the respondents enjoyed included socio-cultural, recreational, medicinal and aesthetic benefits as shown in table 2.

Participation in forest conservation and types of conservation activities involved

As indicated in Figure 6 below 68.10% of the respondents had ever participated in the conservation of Mount Kenya forest. Tree planting was the main type of forest conservation that the respondents were involved in. As shown in Figure 7, 38 (32.76%) of the respondents were planting trees though in their farms. It was observed that some respondents had tree nurseries from which they were getting seedlings for planting in their farms as well as for selling. It was also observed that 13.79% of the respondents were vigilant to ensure that wild animals did not cause conflicts with the local community and also collaborated with the security agents such the forest rangers to see that the locals were not carrying out illegal activities in the forest. In addition, other respondents cited that they had been involved in fire-fighting (11.21%), chasing away wild animals (12.07%) and creating public awareness about forest and wildlife conservation (10.34%). The remaining 19.83% could not identify any forest conservation activity they had been involved in.

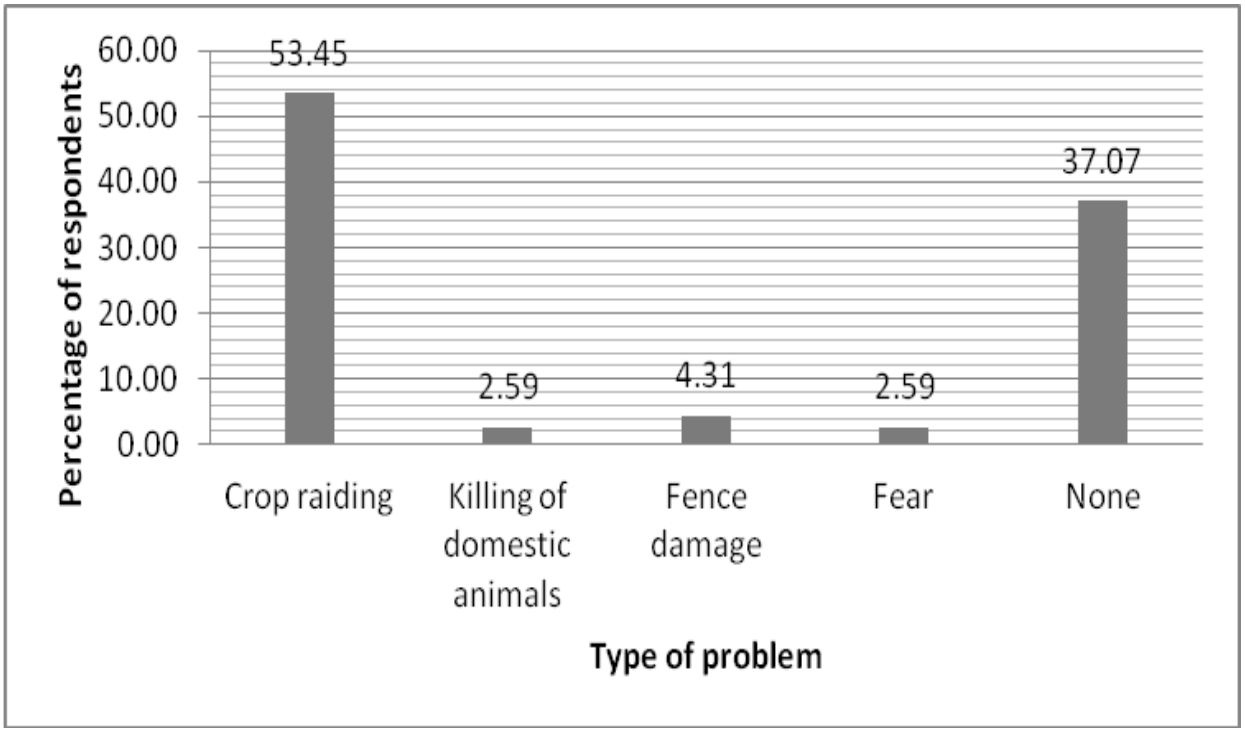

Figure 3: Types of conflicts experienced by respondents

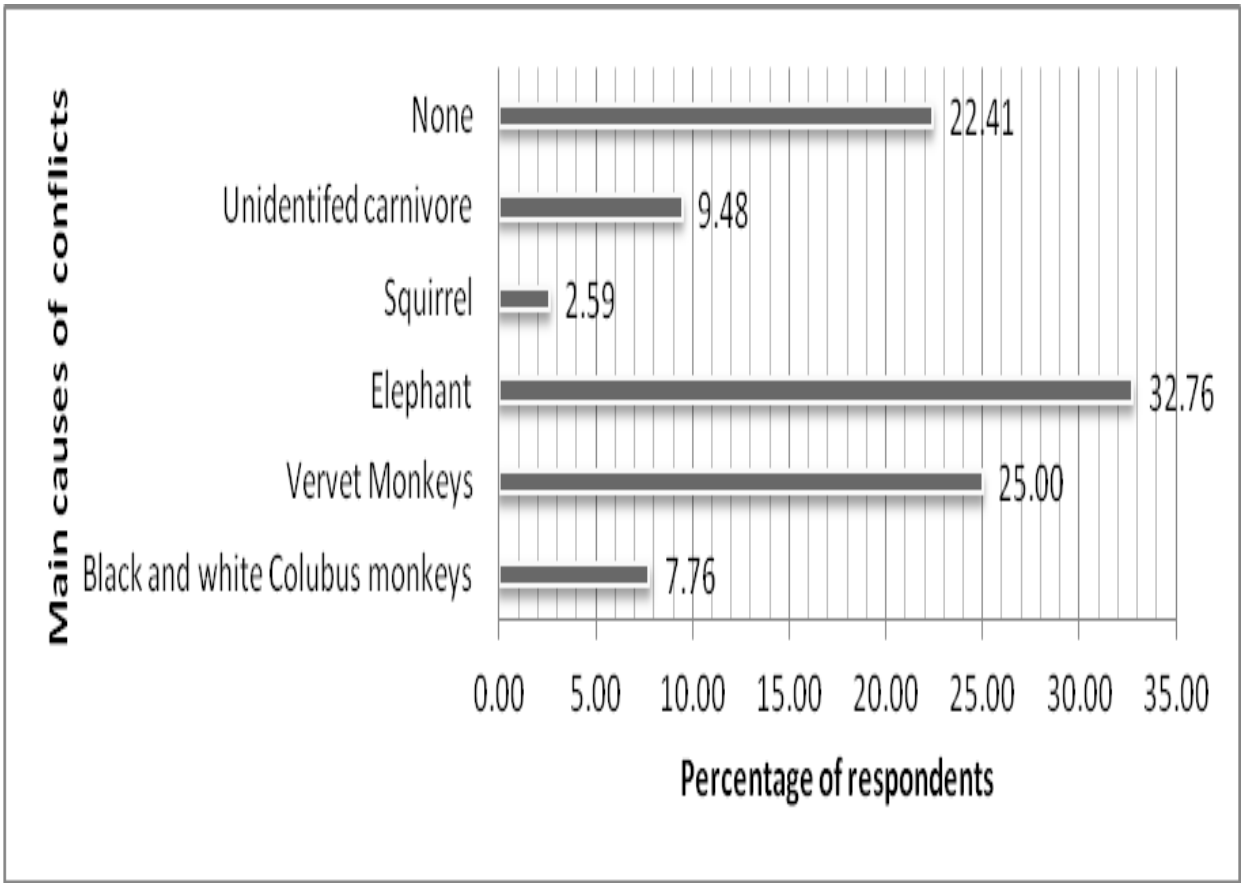

Figure 4: Main species of wildlife responsible for conflicts with the local community

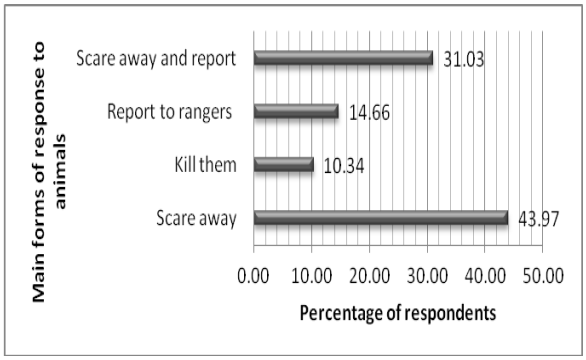

Figure 5: Main ways of responding to the problem wild animals used by the community

Table 2: Benefits received by the community from conservation of Mount Kenya forest

Form of benefits	Frequency	Percentage
Economic benefit	47	40.52
Ecological	43	37.07
Cultural	11	9.48
Recreational	7	6.03
Medicinal benefits	5	4.31
Aesthetic value	3	2.59
Total	116	100.00

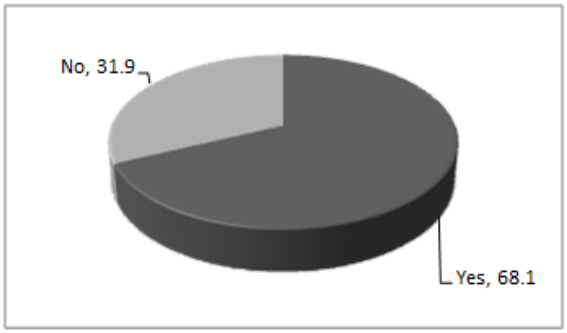

Figure 6: Respondents' participation in the conservation of the Mount Kenya forest

Challenges Facing Forest Conservation Activities

The community faced a number of challenges in participating in the conservation of Mount Kenya forest. Most of them (26.72%) felt that financial constraint was the major problem that they were facing. In addition, 15.52% claimed that they did not have enough time to participate in forest conservation activities and 12.07% said that they lacked motivation to participate in the activities. As shown in Figure 8, others cited lack of forest/wildlife conservation knowledge (11.21%), lack of technical skills (7.76%) and lack of any community based organization in the area that they could join (6.90%).

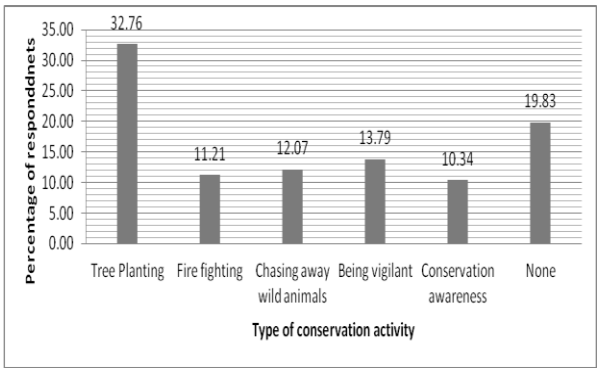

Figure 7: Types of forest conservation activities community had participated in

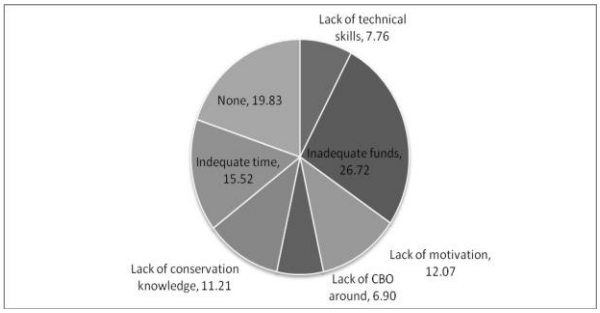

Figure 8: Challenges facing community participation in forest conservation

DISCUSSION

Prevalence of Human Wildlife Conflicts

The main goal of gauging peoples' attitudes towards environmental conservation is to create an understanding of the beliefs, interests and rules that influence environmentalism or pro-environmental action (Fernandez-Manzanal *et al.*, 2007). The forces that shape a community's attitudes and perspectives applied to environmental conservation including wildlife and forests tend to be based on attributes such as gender, age and level of education, occupation and the nature of interactions with the resources (Agrawal and Gupta, 2005). The communities living around Mount Kenya exhibit this heterogeneity but the degree to which these attributes influence their perspectives towards conservation of the montane forest was not assessed in this study.

We found that the community was experiencing problems with wild animals in Kiang'ondu Forest, and this was linked to the observation that the majority of the respondents were farmers who reside at a distance of less than 3 kilometers from the forest boundary. In such a setup the potential for human wildlife conflicts is high. Our findings on human-wildlife conflicts in the Eastern Mount Kenya forest concur with other research findings on the topic. For example Bett (2005), conducted a socio-ecological

survey on the role of the community in the conservation of Mount Kenya Biosphere Reserve and found out that human-wildlife conflict was a major problem facing communities around the forest reserve. This scenario is not unique to the Mount Kenya conservation area, but instead, it represents one of the greatest threats facing forests and wildlife conservation in Kenya (Fredrick, 2012; Okech, 2010; Esilaba *et al*., 2007; Moses, 2005) with negative consequences for both humans and wildlife. The origin of such human-wildlife conflicts has been attributed to the establishment of parks and reserves as wildlife protected areas without full involvement and support of local communities, and again the communities settled next to the protected areas (Ngene and Omondi, 2009) where human activities especially agriculture take place on the boundaries of the protected areas.

Based on the findings from this study, most of the conflicts stem from crop raiding by elephants. Elephants are known to cause severe damage to crops within the affected areas. They can destroy entire fields of crops (Naughton-Treves, 1998). A study by Ngene and Omondi (2009) on the costs of living with elephants in areas adjacent to Marsabit National Park and Reserve showed that farmers were losing crops running into millions of dollars. Though not ascertained by the current study, it can be hypothesized that crop raiding has severe socio-economic cost to the Kiang'ondu community. It is important to note that although crop raiding is perhaps the most common form of human-elephant conflict (Sitati *et al*., 2003), elephants can also be quite damaging to local economies through destruction of food stores, water installations, fences, barriers and occasionally have been known to injure or kill people (Kangwana, 1995). In addition, vervet and colobus monkeys were also reported to be causing conflicts with the community. This finding was in consent with Bett (2005) who observed that a number of primate species including baboons were a major cause of human-wildlife conflicts around the Mount Kenya Biosphere Reserve. Though the species of carnivores reported to have killed livestock in the area could not be ascertained, leopards are the top predators that roam the eastern parts of the Mount Kenya Forest Reserve and in addition to mongoose, are likely to be responsible for the losses. Such losses could have adverse effect on the livelihood of the community members who basically depend on farming. This unfortunately leads to conflicts between local communities and wildlife conservationists even though wild animals raid crops or kill livestock simply to survive (Kaswamila *et al.*, 2007). With reduction of natural habitats steadily on the rise and agricultural activities close to the wildlife areas on the increase, it is obvious that wildlife is forced to encounter humans with increasing frequency.

This study established that the community uses a variety of strategies to respond to the problems caused by the wild animals. Fences such as the electric fence can be very effective for deterring wildlife from crops and livestock. The ongoing project by Rhino Ark, Kenya Wildlife Services and Kenya Forest Services to encircle the whole of Mount Kenya forest reserve with an electric fence is meant to realize benefits for the wildlife and the local communities. However, such a fence has high installation and maintenance cost, is ineffective for keeping out small animals that can go under the wires or dig under the fence, and it may cause negative ecological impacts such as habitat fragmentation or blocking traditional wildlife migratory routes (Hayward and Kerley, 2009). A combination of deterrents for crop raiding like use of bees to scare aware elephants (King *et al.*, 2011) and compensation for wildlife damages may help solve some of the human-wildlife conflicts in Kiang'ondu area.

Benefits from Forest Conservation

Our informants showed a great appreciation of benefits received from conservation of Mount Kenya forest especially economic benefits. It was noted that the Mount Kenya forest reserve and people's farmlands are integrated places and numerous benefits are expected to get to individuals in the area. Of critical important are the Non Timber Forest Product (NTFP) that comprise benefits such as increased access to forest products such as fuel wood, herbal medicine, honey, tree seedlings and fodder. For the communities that live near the forested areas such as the Kiang'ondu community, NTFPs provide a source of complementary cash income, or a safety net when agricultural yields are low (Angelsen and Wunder, 2003). However, extraction of NTFP may be sustainable or non-sustainable (Pearce, 2001), and is important to establish which is the case. Howe *et al*. (2012) also underscores the importance of understanding the trade-offs and synergies between the use forest resources to provide economic benefits and conservation. Kaburi and Medley (2011) observed that the forest is a major source of fuel wood to the Kiang'ondu community and highlighted the way in which diverse fuel wood resources can be supported through extraction and enrichment practices and development opportunities for fuel wood sustainability in mountain environments. The essential point is that these benefits can constitute a substantial fraction of household incomes to

communities that live near forests. Moreover, even if such values fail to compete with alternative land uses, serious local poverty issues can arise if the benefits of the competing land use do not accrue to those who lose the forest products in question (Pearce, 2001).

The finding that the community recognizes that the forest provides them with ecological benefits is critical in encouraging their support in conserving the forest. The respondents associated the forest with ecological benefits such as climate moderation and provision of water. The high response rate indicates that the ecological benefits the community derives from the forest influence their valuation of forest conservation. This observation accords with a case study in Taita Hills by Himberg *et al.* (2009) on the benefits and constraints of participation in forest management in Kenya. However, according to Meijaard *et al.* (2013), in-depth studies are needed to determine whether people's perceptions about forest services are based on experience or external factors such as media that link deforestation with floods, erosion, and landslides.

Other benefits that the community enjoyed included socio-cultural, recreational, medicinal and aesthetic benefits. This appreciation could give the community the impetus to participate in conservation of the Mount Kenya forests against the frustrations they get after incurring losses from the human-wildlife conflicts.

Community Participation in Forest Conservation

Results revealed that the greatest majority of the respondents in this study had participated in forest conservation activities. In Kenya, participation in forest conservation is open to all households (RoK, 2014; RoK, 2005). However, the community sampled was heterogeneous in terms of levels of gender, age, education, occupation, social status and according to Agrawal and Gupta (2005) such attributes could make some people not participate in forest conservation even when they were willing to. Most of the respondents had participated in activities such as tree planting, fire-fighting, creating conservation awareness and forest protection. This trend needs to be encouraged by initiating and strengthening community forestry associations and introduction of sound benefit-sharing arrangements. It is also important to note that challenges such as financial constraints, lack of time, motivation, technical, forest/wildlife conservation knowledge and lack of community based organization in the area need to be addressed in order to deepen community participation in conserving Mount Kenya Forest Reserve.

CONCLUSIONS

Our study showed that the local community enjoys a diversity of economic, ecological, aesthetic and cultural benefits from the forest. However, they incur losses such as property and crop damage, loss of time spent chasing away wild animals, bodily injuries and even fear of wild animals which were perpetuating human-wildlife conflicts. Among these, crop raiding was the most significant type of conflict and was mainly associated with elephants and monkeys. Unfortunately, the community was finding it difficult to follow up compensation for the losses; a situation that could be precipitating negative attitude towards wildlife/forest conservation in the area. This substantiates the need to address the causes of the conflicts in addition to enlightening the community on compensation guidelines. Despite the many constraints and challenges enumerated, the afore mentioned benefits of conservation of the forest block was found to be a great driving force for the willingness of the community to participate in conserving the forest and its wildlife.

REFERENCES

Angelsen, A. and Wunder, S. 2003. Exploring the forest–poverty link: key concepts, issues and research implications (No. CIFOR Occasional Paper no. 40, pp. viii-58p). CIFOR, Bogor, Indonesia.

Agrawal, A. and Gupta, K. 2005. Decentralization and participation: the governance of common pool re-sources in Nepal's Terai. *World Development* 33: 7, 1101–1114.

Bett, A. 2005. Role of community in the conservation of Mount. Kenya Biosphere Reserve. *Kenya Wildlife Service, Kenya*.

Berkes, F. 2004. Rethinking community - based conservation. Conservation biology, 18(3), 621-630.

Chambers, R. 1994. The Origins and Practice of Participatory Rural Appraisal. World Development, 22(7), 953-969.

Chongwa, N.B. 2012. The History and Evolution of National Parks in Kenya. *The George Wright Forum.* 29(1) 39–42.

Chown, S.L. 2012. Trait-based approaches to conservation physiology: forecasting environmental change risks from the bottom up. Phil. Trans. R. Soc. B, 367(1596), 1615-1627.

Emerton, L. 1999. Mount Kenya Forest: Economics of Community conservation. Evaluating Eden Discussion Paper No. 4.

Esilaba, M.O., Maara, N.T. and Tangus, J.K. 2007. Impact of human-wildlife conflict resolution on wildlife conservation and socioeconomic welfare of pastoral communities: a case study of

Samburu pastoralists, Samburu District, Kenya. *Eastern Africa Social Science Research Review*, *23*(2), 41-54.

Fernández-Manzanal, R., Rodríguez - Barreiro, L. and Carrasquer, J. 2007. Evaluation of environmental attitudes: Analysis and results of a scale applied to university students. *Science Education*, 91(6), 988-1009.

Fredrick, O. 2012. Options to stem human – wildlife conflicts. Swara. July-Sept 8-9.

Hayward, M.W., and Kerley, G.I. 2009. Fencing for conservation: Restriction of evolutionary potential or a riposte to threatening processes? *Biological Conservation*, *142* (1), 1-13.

Himberg, N., Omoro, L., Pellikka, P. and Luukkanen, O. 2009. The benefits and constraints of participation in forest management. The case of Taita Hills, Kenya. Fennia 187: 1, pp. 61–76.

Howe, C., Suich, H., Vira, B., and Mace, G.M. 2014. Creating win-wins from trade-offs? Ecosystem services for human well-being: a meta-analysis of ecosystem service trade-offs and synergies in the real world. Global Environmental Change, 28, 263-275.

Kaburi, S.M., and Medley, K.E. 2011. Community Perspectives on Fuelwood Resources in East Africa: Enrichment and Extraction Along the Eastern Slopes of Mount Kenya. *Mountain Research and Development*, *31*(4), 315-324.

Kangwana, K.F. 1995. Human-elephant conflict: the challenge ahead. Pachyderm. Vol. 19. pp. 11-14.

Kaswamila, A., Russell S. and McGibbon, M. 2007. Impacts of wildlife on household food security and income in northeastern Tanzania. *Human Dimensions of Wildlife*. Vol. 12. pp. 391-404.

Kenya Wildlife Service (KWS). 2007. Protected Areas Planning Framework: The Planning Manual. 2nd Edition, Nairobi, Kenya.

Meijaard, E., Abram, N.K., Wells, J.A., Pellier, A.S., Ancrenaz, M., Gaveau, D.L., Runting, R.K. and Mengersen, K. 2013. People's perceptions about the importance of forests on Borneo. *PLoS One*, *8* (9), p.e73008.

MKEEPA. 2015. The Mount Kenya East Environmental Conservation Association Management Plan (2015-2019): Chuka Participatory Forest Management Plan

Moses, M.O. 2005 Land Use Changes and Human–Wildlife Conflicts in the Amboseli Area, Kenya.*Human Dimensions of Wildlife*, 10:1, 19-28.

Naughton-Treves, L. 1998. Predicting patterns of crop damage by wildlife around Kibale National Park, Uganda. Conservation biology, 12(1), 156-168.

Ndegwa, L.M. 2005. Monitoring the Status of Mt. Kenya Forest using Multitemporal Landsat Data [MA thesis]. Oxford, OH: Miami University.

Ngene, S. M. and Omondi, P.O. 2009. The costs of living with elephants in the areas adjacent to Marsabit National Park and Reserve. *Pachyderm*, (45), 77-87.

Oates, J.F. 1999. Myth and Reality in the Rain Forest. How Conservation Strategies Are Failing In West Africa. Berkeley, CA, USA: university of California press.

Okech, R.N. 2010. Wildlife-community conflicts in conservation areas in Kenya. *African Journal on Conflict Resolution*, *10*(2). 65-80

Pearce, D.W. 2001. The economic value of forest ecosystems. Ecosystem health, 7(4), 284-296.

Raymond, C.M., Bryan, B.A., MacDonald, D.H., Cast, A., Strathearn, S., Grandgirard, A. and Kalivas, T. 2009. Mapping community values for natural capital and ecosystem services. *Ecological economics*, *68*(5), pp.1301-1315.

RoK. 2014 Forest Policy. Ministry of Environment, Water and Natural Resources. Nairobi, Kenya

RoK. 2005. The Forest Act, Kenya Gazette Supplement, No. 7 of 2005. Nairobi, Kenya.

Sitati, N.W., Walpole, M. J., and Leader-Williams, N. 2005. Factors affecting susceptibility of farms to crop raiding by African elephants: using a predictive model to mitigate conflict. *Journal of Applied Ecology*. Vol. 42. pp. 1175-1182.

Stevens, S. 1997. The Legacy of Yellowstone. Conservation through Cultural Survival: Indigenous People and Protected Areas. Island press. Washington DC, USA.

Woodley, B. 2003. Mount Kenya National Park: Challenges in Protection and Management.