

# THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES

## Influence of Economic Activities of the Host Community and Community-Based Ecotourism Forest Management Models on the Conservation of Masaai Mau Forest, Kenya

**Aloo, Charles Ochuka**

Ph.D. Candidate, Department of Ecotourism, Hotel & Institution Management,  
Maseno University, Kenya

**Kambona, O. Ouma**

Senior Lecturer, Department of Ecotourism, Hotel & Institution Management,  
Maseno University, Kenya

**Pius Odunga**

Senior Lecturer, Department of Business and Economics, Kirinyaga University, Kenya

### **Abstract:**

*There has been a decline in forest cover of about 5,000 hectares per annum in Kenya leading to an annual reduction in water availability of approximately 62 million m<sup>3</sup>, translating to an economic loss to the economy of over USD 19 million. During the last decade, the Mau Forest has lost 25 percent of its forest covers. It is however unknown whether this depletion is based on economic activities of the host communities like charcoal and timber production. Additionally, information with regard to the influence of forest management models comprising host communities on the conservation of Masaai Mau Forest is limited. The purpose of the study was to establish the influence of economic activities of host communities and forest management model on the conservation of Masaai Mau Forest in Kenya. Specific objectives were to establish: the influence of charcoal production, assess the influence of timber production, examine the influence of non-timber product (NTP) production, and to determine how forest management models influence conservation of the Masaai Mau Forest. Target population comprised of 15 Government agencies; 71 community-based tourism organizations (CBTOs); 847 hotels and restaurant service providers, and 29 tour and travels operators (N=962). Bartlett, Kotrlik and Higgins' (2001) formula was adopted to obtain a sample size of 384 stakeholders: six Government agencies; 28 CBTOs; 338 hotels and restaurant service providers; and 29 travel and tour operators. Structured questionnaires were administered on the sampled CBTOs and hotels and restaurant service providers; interviews were done with the government agencies, while Focus group discussions (FGDs) were conducted with 12 travel and tour operators in the area. Reliability coefficient of 0.859 was obtained for all the variables. Findings revealed that charcoal production ( $B=-.428, p=0.000$ ), timber production ( $B=-.601, p=0.000$ ), and production of NTP ( $B=1.188, p=0.000$ ) all have significant influence on forest conservation, with an overall influence of 79% ( $R^2 = 0.793$ ). There was also a positive association between conservation concerns of the Maasai Mau Forest and the preference for community based ecotourism model ( $0.169=V=0.280$ ) by the host community. It is recommended that charcoal production should be sufficiently controlled through income generating models involving the host communities.*

**Keywords:** Maasai Mau Forest; Conservation; Charcoal production; Timber production; production of NTP; Ecotourism; Management models; Host Community, Maasai Mau Community

### **1. Introduction**

Tropical forests are of primary importance to biodiversity conservation and climate change mitigation (Pimm et al, 2014). According to FAO (2017), forests are of immense importance in the survival and development of human beings, contributing to air purification, control of hydrological cycles, and provision of ecosystem goods as well as habitat for a great diversity of fauna. The organization (FAO, 2017) asserts that approximately 22% of the total income for rural communities in developing countries comes from forest products. Indeed Babulo et al (2009) revealed in a study conducted in Tigray, northern Ethiopia, that forest products are the second largest source of income for the local community after agriculture. The World Bank (2014) explains that an estimated 1.6 billion people across the globe are dependent on forests for sustenance. Thus, the host community (at times known as the Forest adjacent Communities – FACs) seems to be entirely dependent on the forests for economic gains hence the conservation of the same is a significant initiative towards the survival of this population.

Economic activities like logging for timber products and charcoal production among others have been shown to negate conservation efforts in natural forests, although impacts of forest management models to mitigate the menace seem to lack sufficient literature. However, the effects of economic activities directly associated with the host community or FACs tends not to have been focused upon in the wake of incessant and evident forest depletion across the globe. Evidently, between 2000 and 2010, 1.8Mha of forests (12.8% of all deforestation during that period) were lost due to commercial logging in Indonesia (Miteva, Loucks and Pattanayak, 2015). Wurster (2010) argues that unsustainable charcoal production activities could lead to reduced biodiversity as a result of deforestation and forest degradation. When forest cover is removed, wildlife is deprived of habitat and becomes more vulnerable to hunting. Carbon dioxide emissions represent up to one-third of total carbon dioxide emissions released because of human causes through economic activities in Vietnam (Agrawal, Nepstad and Chhatre, 2011; Sedano et al, 2016). Additionally, deforestation causes 15% of global greenhouse gas emissions in South Africa (Zulu and Richardson, 2012). Jones (2015) relates extensive use of child labor, severe physical injury, gender disparities in income and education, and environmentally unsustainable practices with the social and environmental impacts of charcoal production in Liberia. According to Ouko, Odhiambo and Boitt (2016), all charcoal consumed in Kenya and elsewhere in sub-Saharan Africa is made from local indigenous tree species.

The need for an appropriate forest management model particularly in the wake of dilapidating economic activities cannot be gainsaid. However, several arguments supporting workable models have put forward without consensus. Kambona, Stadel and Okalo (2016) assert that any suitable forest management model must accommodate indigenous practices and beliefs to ensure enhance sufficient conservation. Indeed Ameha, Meilby and Feyisa (2016) revealed that participatory management through forest user groups (FUS) was more successful than government management in forestry conservation in Ethiopia. Moreover, Kimutai and Watanabe (2016) established that implementation of Participatory Forest Management (PFM) approach helped reduce Lembus Forest-cover decline in Kenya between 2002 and 2015). Similarly, Kinyili (2014) revealed that community participation in forest management resulted in increased tree nursery seedlings production, bee-keeping, eco-tourism, and fish farming in OI Bolossat forest. It is therefore evident that there exist various forest conservation models that, if appropriately employed, can result into adequate conservation. However, the employment and consequent success of such models in Masai Mau Forest remains unknown owing to incessant conflicts and deforestation witnessed in the area during the last few decades.

The Mau Forest is the largest in Eastern Africa encompasses seven forest blocks: Maasai Mau, Eastern Mau, Western Mau, Southern Mau, South West Mau and Transmara regions. It is the largest water tower in the region, being the main catchment area for 12 rivers draining into Lake Baringo, Lake Nakuru, Lake Turkana, Lake Natron and the Trans-boundary Lake Victoria (Olang and Kundu, 2010). The forest is drained by 12 rivers: Njoro, Molo, Nderit, Makalia, Naishi, Kerio, Mara, EwasoNyiro, Sondu, Nyando, Yala and Nzoia Rivers. There is physical evidence that the rivers draining from the forest have had significant decline in discharges, coupled by dwindling water quality owing to inept conservation of the Mau Forest. According to Owido, Chemelil, Nyawade and Obadha, (2003), the changing hydrological response of the area are as a result of the land use/land cover changes in the Mau. On the other hand, Siringi (2010) asserts that Mau forest complex has lost about 107,000 hectares, or 25 percent of its forest covers through: irregular and unplanned settlements, illegal logging and charcoal burning, change of land use from forest to unsustainable agriculture and change in ownership from public to private although these activities have never been associated with the host community.

In spite of the ongoing degradation of the Mau Forest, these natural habitats play a significant role in supporting the livelihoods of communities living adjacent to them in the developing countries (FAO, 2014). Furthermore, the forest sector contributes about Kenya Shillings 7 billion to the economy and employs over 50,000 people directly and another 300,000 indirectly (Republic of Kenya, 2018). Forest ecosystems also enhance landscape resilience to climate change and is a vital resource supporting the livelihoods of rural communities in Kenya (Kimutai and Watanabe, 2016). Studies have highlighted economic activities (Kambona et al, 2016; Mwangi et al, 2016; Ouko et al, 2016; Siringi, 2010; Tesot, 2014) as having significant bearing on forest conservation without linking such activities to the host communities. On the other hand, the Kenya Government introduced participatory Forest Management (PFM) through its Forest Department in the early 2000, to enable local communities to form and register Community Forest Associations (CFAs) (Kimutai and Watanabe, 2016). However, the effectiveness of host community formed CFAs as an intervention model for forest conservation is questionable going by the level of degradation witnessed in Mau Forest, with some researchers (Mutune and Lund, 2016) arguing that current forest governance approaches in Kenya appear not to support participation in practice. The need to investigate the influence of economic activities of host communities and management model on the conservation of the Maasai Mau Forest was therefore critical.

### *1.1. Statement of the Problem*

Participatory approaches which mobilize local capacity through the use of local initiatives such as customary laws in the management of natural resources like forests are vital in resolving conflicts arising from the need for sustainable forest conservation. There has however been a decline in forest cover of about 5,000 hectares per annum in Kenya leading to an annual reduction in water availability of approximately 62 million cubic metres, translating to an economic loss to the economy of over USD 19 million. During the last decade, the Mau Forest has lost 25 percent of its forest covers through: irregular and unplanned settlements, illegal logging and charcoal burning and change of land use from forest to unsustainable agriculture. In turn, this has led to disruption of water cycles, decline in some animal and indigenous tree species and livestock food stock leading to conflicts and tribal clashes in the area. Studies have shown that economic activities such as logging and charcoal production do influence conservation of forests. Literature has also revealed that various management models whose formulation includes the host communities adequately improve conservation of

forests. However, there is limited information with regard to how the aforementioned factors associated with the host community have influenced conservation of the Masaai Mau Forest.

### 1.2. Purpose and Objectives of the Study

#### 1.2.1. Purpose of the Study

The purpose of the study was to establish the influence of economic activities of the host community and forest management models on the conservation of Masaai Mau Forest.

#### 1.2.2. Objectives

- To establish how commercial charcoal production activities of host community affect the conservation of Masaai Mau Forest
- To assess the effect of timber harvesting employment activities of host community on the conservation of Masaai Mau Forest
- To explore the influence non-timber harvesting employment activities of host communities on the conservation of Masaai Mau Forest
- To determine the impact of established forest management models linked with the host community on the conservation of Masaai Mau Forest

### 1.3. Hypotheses

- H<sub>1</sub>: Commercial charcoal production activities of host community have no significant effect on the conservation of Masaai Mau Forest
- H<sub>2</sub>: There is no significant effect of timber harvesting employment activities of host community on the conservation of Masaai Mau Forest
- H<sub>3</sub>: There is no significant influence of non-timber harvesting employment activities of host communities on the conservation of Masaai Mau Forest
- H<sub>4</sub>: There is no significant impact of established forest management models linked with the host community on the conservation of Masaai Mau Forest

## 2. Theoretical and Literature Reviews

### 2.1. Theoretical Review

The study was guided by Value-Belief-Norm (VBN) theory espoused by Stern (1999) which provides an understanding of the human values that cause individual moral obligation to protect and conserve nature. VBN links individuals with community and observes that pro-environmental behaviour by individuals in community comes from moral obligations or personal norms embedded within a certain value orientation. Stern (1999) argues that pro-environmental behaviour manifesting in individuals is due to belief that when their valued ecosystem resources are threatened, then it is only their actions that can help restore them into their natural state. Thus the individuals experience an obligation as a matter of norm. The theory reveals a chain of influence on behaviour from people's value sets and beliefs to action. It is believed that individuals will be most likely to respond to environmental challenges when they are aware of the environmental threats and are convinced that the danger posed by the threats are great that they feel obliged to address the environmental problems.

Stern's VBN- theory, therefore, provides a suitable account for the social and environmental concerns of individuals in forest conservation or management models. The theory identifies community collectivism that accord with forest conservation models or principles. The interface between individual and collectivism, the theorists argue, provides a good foundation to community based management of natural resources and social relations. From an environmental point of view therefore, ecological consciousness or deep ecology can be understood to be the underpinning principle driving individuals into models such as forest participatory management and CBET as a tool for conservation in this study.

### 2. Literature Review

Influence of economic activities on conservation of natural forests has been focused in literature, although linkage with of such activities with the host communities who have lived in or adjacent to the forests has not been sufficiently made. Jones (2015) engaged six trained Liberian university students to assess social and environmental impact of charcoal production in Liberia in four Liberian counties using interviews of primary decision makers from governmental and non-profit agencies. The study established unsustainable practices as among the findings that highlight the social and environmental impacts of production. Sedano et al (2016) assessed the impact of charcoal production on forest degradation in Zimbabwe and found that forest degradation associated to charcoal production in the study area is largely independent from deforestation driven by agricultural expansion and that its impact on forest cover change is in the same order of magnitude as deforestation. Wurster (2010) employed local ecological knowledge, ecological surveys and remote sensing analysis to better understand questions related to how extraction for charcoal production and forest management affect Senegalese forests. Results confirmed that plots harvested for charcoal production are significantly different in forest structure and tree species composition than undisturbed sites. In Kenya, Tesot (2014) assessed the environmental implications of charcoal business in Narok South Sub County. The study found out that the charcoal enterprise activities as

currently practiced in Narok south sub county is unsustainable. The *Acacia xanthaphloea* trees, an important food stock for livestock among the host community, are vastly harvested for charcoal production making the community vulnerable to drought effects.

Timber harvesting as an economic activity in the forests has also been focused, although the same seem not to have been linked with the activities of the host communities. Miteva, Loucks and Pattanayak (2015) used temporally and spatially explicit village-level data on environmental and socio-economic indicators in Kalimantan (Indonesia) to evaluate the performance of the forest service certified timber concessions compared to non-certified logging concessions. They found that between 2000 and 2008 forest service certification reduced aggregate deforestation by 5 percentage points and the incidence of air pollution by 31%. They also found that forest service certification reduced firewood dependence (by 33%), respiratory infections (by 32%) and malnutrition (by 1 person) on average. Similarly, Eshun, Potting and Leemans (2010) analysed the dominant environmental pressure of five major production lines in the timber industry in Ghana. The results showed that CO<sub>2</sub> emissions by the timber sector activities per year accounted for 745k tons per year and dominate overall greenhouse gases emissions in the timber sector (changes in carbons storage related to land use changes not included). Wood waste by the timber sector accounted for 0.8 million m<sup>3</sup> per year. The enormous wastage of wood contributes enormously to the rapid depletion of the country's timber resources. In another study, Ndangalasia, Bitariho and Dovie (2007) assessed the extraction of plant products from two montane forest ecosystems, Uzungwa Scarp Forest Reserve (USFR) and Bwindi Impenetrable National Park (BINP), East Africa. Findings revealed that the densities of eight commonly harvested tree species, most of which were used as building poles, were approximately 2.4–4.5 times lower in disturbed versus undisturbed habitats across all four sites in USFR. In BINP, the liana *Loeseneriella apocynoides* (Apocynaceae), is harvested for basketry weaving. Evidence suggested that the liana was harvested in both protected and unprotected areas of BINP: a negative impact on this species in an unprotected versus a protected area, with stem diameters larger than 1 cm significantly more abundant in the protected area. This study reveals that harvesting of NTFPs occurs even in these two protected forest areas, and that over-exploitation not only threatens species of high-demand, but could also alter forest structure and composition.

Similarly, Gatiso & Wossen (2015) examined the determinants of forest dependence and the role of community forest on income inequality in rural Ethiopia. Findings suggested that the probability of households' participation in low-return forest activities is determined by farm size, number of male members in the household and distance from the forest plot to the household's homestead. Further, wealthier households are less dependent on forest products for their livelihood. Forest products play a crucial role in reducing income inequality in the study area. Income inequality increases by 24% when forest income is included from the calculation of inequality measure. Kong'ani (2016) assessed the relationship between community livelihood options and climate change knowledge and practices among communities adjacent to the Maasai Mau forest, Narok County, Kenya. The main livelihood activities included crop production (85%) and livestock production (14%). There was found to be a high dependence on the forest resources (100%) although only 2% of the respondents ranked forest products as their major livelihood activity.

Models for conservation or management of forests have been suggested and tested by practitioners in conservation. However, models associated with host communities in the conservation or management of forests seems minimal in literature. Snyman (2014) assessed the impact of ecotourism employment on rural household incomes and overall social welfare in six southern African countries. Extensive socio-economic interview schedules were conducted in camps run by Wilderness Safaris in Botswana, Malawi, Namibia, South Africa, Zambia and Zimbabwe. The results show that rural households are relying heavily on the market economy, largely in the form of ecotourism, for support and highlight ecotourism employment's important role in local socio-economic development in remote, rural areas. Ameha, Meilby and Feyisa (2016) assessed the impacts of decentralized forest management on forest conditions in Ethiopian Montane forests. Findings show that altitude and slope were the topographical variables that had the strongest influence on species distribution. The overall densities of mature trees ha<sup>-1</sup> and four individual species were higher in forests under participatory management ( $p < 0.01$ ).

Kambona, Stadel and Okalo (2016) used focus group discussions and in-depth individual interviews to explore an account of the beliefs, practices and norms that have been used for conservation by the adjacent community of Kakamega Forest (Kenya) over the years. Results indicate that the local community applied various beliefs, practices and norms to regulate use of Kakamega Forest. However, the advent of forest management regimes has brought resource use restrictions which often neglect indigenous ecological knowledge. Kimutai and Watanabe (2016) examined the impacts of the participatory forest management (PFM) approach on the Lembus Forest-cover change in Kenya. Three Landsat satellite images (Landsat 5 TM acquired on 9 January 1985; Landsat 7 ETM+ acquired on 1 February 2002; and Landsat 8 OLI (Operational Land Imager) acquired on 1 March 2015) were used to analyse forest-cover change in the 1st period (1985–2002) and the 2nd period (2002–2015). The results of the land-cover change show a decrease in the percentage of forest-cover decline from 11.2%, registered in the 1st period, to 8.2% in the 2nd period. This led to the decrease of the annual rate of the forest-cover decline from 0.4 in the 1st period to 0.2 in the 2nd period. Similarly, Kinyili (2014) assessed the impacts of community participation on forest management and their effects on community livelihoods. The findings showed that participatory forest management in Ol Bolossat forest has significant impacts on the livelihoods of adjacent communities.

### 3. Methodology

#### 3.1. Research Design

The present study employed descriptive and explanatory survey designs. It is descriptive because data was collected through a detailed questionnaire which describes research questions, guided by hypotheses derived from adopted theories. On the other hand, the study was also explanatory since it sought to explain the relationship between livelihood practices, economic practices, socio-cultural activities and conservation of forest among host communities of Mau Forest (Creswell, 2009; Zikmund & Babin, 2010).

#### 3.2. The Study Area

The study area was Masaai Mau Forest. It is administratively located in Narok County and in the former Rift Valley of Kenya, as a trust land forest as per trustland Act Cap 288 and Local Government Act chapter 265 and wildlife conservation and management Act chapter 376. The forest covers 46,278 hectares and is located some 17 kilometers north of Narok Town, near the world famous Maasai Mara National Reserve. The forest is bordered by gazetted Forests of Olpusimoru in the north and Trans Mara forest on the Northwest. (Figure 1)

Masaai Mau is part of the larger Mau Forest Complex, Kenya's largest forest block and East Africa's largest single block of closed canopy indigenous forest. While most of the forest blocks in the Mau Forest Complex had been gazetted and managed by the Forest Department, the Maasai Mau Forest remains Trust Land, managed by the Narok County (Nkako et al., 2005).

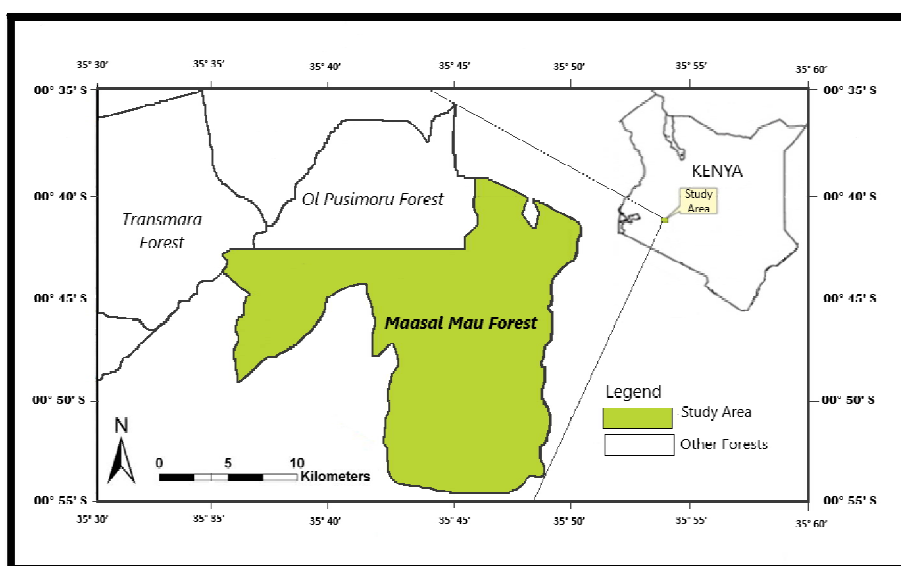


Figure 1: Administrative Map of the Maasai Mau Forest

#### 3.3. Target population and Sample Size

Target population comprised of 15 Government agencies; 71 community-based tourism organizations (CBTOs); 847 hotels and restaurant service providers, and 29 tour and travels operators (N=962). Bartlett, Kotrlík and Higgins' (2001) formula was adopted to calculate a sample size of 384 as follows:-

$$(a). \text{Sample size } n = \frac{Z^2(P\% * q\%)}{d^2}$$

Where;

N = Population size of = 962

n = Desired sample size of x

p% = Proportion of the representative sample size of respondents of the study area (0.5)

q% = Proportion of the sample size population that will not respond (0.5)

d<sup>2</sup> = Acceptable level of standard error (0.05)

Z = Selected confidence interval of 1.96 @ 95%

$$\text{The substituted values} = n = \frac{(1.96)^2(0.5) * (0.5)}{(0.05)^2} = 384$$

Therefore, the calculated sample size is equal to 384 which is (39.9) = 40% of 962. The 40% of the sample size above is within the 30% recommended sample size for credible scientific analysis and inferential research purposes (Zikmund, 2002). Multi-stage stratified random sampling technique was applied to divide the sample of 384 according to the proportion of sub-populations or sub groups (Kothari, 2004). The resultant strata included; Government agencies (N=15), Community-based tourism enterprise organizations (N=71), Hotel & restaurant Service providers (N=338) and Travel & Tour Operators (N=29) (Table 3.2). This was done to ensure that each element of the target population belongs to only one stratum and had equal chance of being selected.

Tourism Stakeholders	Target Population	Sample Size
Government agencies	(N= 15) X 0.4	6
Community-Based Tourism Organizations	(N= 71) X 0.4	28
Hotels and Restaurants service providers	(N=847) X 0.4	338
Travel and Tour Operators	(N=29) X 0.4	12
Total	962	384

Table 1: Sample Distribution of Ecotourism Stakeholders

### 3.4. Data Collection Instruments

The study combined both quantitative and qualitative techniques of data collection. Quantitative data was generated through questionnaires while qualitative data was obtained through interviews with government agencies as well as focus group discussion (FGD) with travel and tour operators. To ensure instrument validity, designed instruments were counter checked by the researcher's supervisors and peers in order to improve the contents of the instruments and to ensure their content validity. Additionally, the principle of triangulation was employed. Three different research instruments were used in this study: questionnaires, interview guide, and FGD guide. The results from the three instruments were thereafter corroborated.

The pre-testing was also done to improve on the content of the questions and to estimate on the time required in undertaking the exercise. The pilot testing of the questionnaire was done on 34 members of hotels and restaurant providers and another two members of community based tourism organizations) selected through purposive random sampling technique from the study area; thereafter issues arising from the questionnaire were clarified. Internal consistency of the instrument was determined via test/re-test reliability coefficient. Test/re-test method involves administering the same test on the same individuals at two different times (Kumar, 2005). Reliability coefficient of 0.849 was obtained for all the variables.

### 3.5. Data Analysis

This study collected and analyzed both qualitative and quantitative data. Descriptive statistics was used to analyse quantitative data, while Thematic Analysis was used on qualitative data. These variables were tested from a general multiple regression equation of the form:

$$Y_i = a_i + b_1X_{i1} + b_2X_{i2} + b_3X_{i3} + e$$

## 4. Findings and Discussions

### 4.1. Distribution of Respondents and Response Rate

The tourism stakeholders' upon whom questionnaires were administered include 28 community based tourism organizations as well as 338 hotels and restaurant service providers. The researcher was able to administer the questionnaires to a total of 358 out of 366 respondents, thus attaining coverage of 98%. The survey questionnaire coverage rate is presented in Table 2.

Tourism Stakeholders	Sample Size	Sample Size Covered	Percent
Community-Based Tourism Organizations	28	26	93
Hotels and Restaurants service providers	338	332	98
Total	366	358	98

Table 2: Questionnaire Coverage

Table 2 illustrates that out of the sampled 28 community based tourism organizations, the study was able to administer the questionnaire on 26 respondents, representing 93% coverage rate. Similarly, out of the 338 hotels and restaurants service providers sampled in the study, the study managed to administer the questionnaire upon 332 respondents, representing 98% coverage rate. This was much above 50% that is recommended by Mugenda and Mugenda (2003). This implies that the data collection process was well covered and thus the sample response is adequate for analysis.

Additionally, all the six (6) Key Informants (KIs) were interviewed, representing 100% coverage of interviewees. To ensure confidentiality, the key informants were given the following codes: KI<sub>1</sub>, KI<sub>2</sub>, KI<sub>3</sub>, KI<sub>4</sub>, KI<sub>5</sub> and KI<sub>6</sub>. Equally, the researcher was able to conduct eight FGDs involving an average of 10 discussants from 12 travels and tour operators from the area. The FGDs were coded as FGD 1, FGD 2, FGD 3, FGD 4, FGD 5, FGD 6, FGD 7, and FGD 8.

The demographic characteristics of the sampled respondents covered gender and age of respondents. Table 3 presents the distribution of respondents by gender.

#### 4.2. Gender of Respondents

Gender	Frequency (f)	Percentage (%)
Male	248	69.3
Female	110	30.7
Total	358	100.0

Table 3: Gender of Respondents

Table 3 illustrates that majority (69.3%) of the sampled members of the community based tourism organizations and hotels and restaurant service providers are males while 30.7% are females. This implies that these stakeholder groups in Masaai Mau are dominated by male persons.

#### 4.3. Age bracket of Respondents

The sampled stakeholders were asked to indicate their age in years using the guidelines given as: Less than 19 years, between 20-29 years between 30-39 years, between 40-49 years and over 50 years. The responses by age were presented as shown in Table 4.

Years	Frequency	Percent
20 - 25	45	12.6
26 - 30	89	24.9
31 - 35	81	22.7
36 - 40	67	18.7
41 - 45	31	8.7
46 - 50	25	7.0
51 - 55	15	4.2
Above 56	5	1.4
Total	358	100.0

Table 4: Age Distribution of the Respondents  
N= 358; Source: Field Data

Table 4 indicates that most (24.9%) of the sampled respondents upon whom questionnaires were administered were between 26 and 30 years of age, while those of 31 to 35 were 22.7%; 18.7% were between 36 and 40. Equally, 12.6% of the sampled respondents were of between 20 and 25 years of age; 8.7% were between 41 and 45 years old; 7% were between 46 and 50 years old; 4.2% were of between 51 and 55 years old, and the remaining 1.4% of the sampled respondents were above 56 years of age. These findings tend to imply the two stakeholder groups in Masaai Mau are of relatively younger age. This points at the urge with which community based tourism is regarded as a source of income to young people.

#### 4.3. Influence of Economic Activities of Host Community and Management Model on Conservation of Forests

##### 4.3.1. Descriptive Statistics

A descriptive analysis was first done to establish the extent to which the sampled respondents view economic activities with regard to their contribution towards conservation of Masaai Mau Forest. Table 5 presents the results of the descriptive analysis.

	N	Minimum	Maximum	Mean	Std. Deviation
Conservation of Masaai Mau Forest	358	1.00	5.00	2.14	1.09
Charcoal Production	358	1.00	5.00	1.96	0.91
Timber Production	358	1.00	5.00	3.00	0.9
Production of NTP	358	1.00	5.00	3.53	0.19
Forest Management Model	358	1.00	5.00	4.07	0.82
Valid N (list wise)	358				

Table 5: Descriptive Analyses of Economic Activities and Forest Conservation  
Source: Survey (2019)

Table 5 indicates that the sampled respondents indicated that conservation of Masaai Mau has been achieved to a small extent (M=2.14; SD=1.09). Similarly, the respondents indicated that economic activities related to charcoal production has influenced conservation of Masaai Mau to a small extent (M=1.96; SD=0.91). However, the sampled respondents indicated that timber production has influenced conservation of Masaai Mau forest neither to a large extent nor to a small extent (M=3.01; SD=0.9). The respondents also indicated that production of non-timber products have influenced conservation of Masaai Mau Forest to a large extent ((M=3.53; SD=1.19). Finally, that forest management models put in place comprising host communities have influenced conservation of Masaai Mau Forest to a large extent

( $M=4.07$ ;  $SD=0.82$ ). These findings tend to suggest that while charcoal and timber production have not helped in the conservation of the forest, production of non-timber products as well as forest management models involving the host communities have remained influential.

#### 4.3.2. Testing Research Hypotheses

The following hypotheses were tested:

- $H_1$ : Commercial charcoal production activities of host community have no significant effect on the conservation of Masaai Mau Forest
- $H_2$ : There is no significant effect of timber harvesting employment activities of host community on the conservation of Masaai Mau Forest
- $H_3$ : There is no significant influence of non-timber harvesting employment activities of host communities on the conservation of Masaai Mau Forest
- Hypotheses one to three ( $H_1 - H_3$ ) were analysed via multiple regressions analysis. The fourth hypothesis ( $H_4$ ) was analysed via inferential statistical test using Chi-Square to analyze the local communities' conservation concerns and the likelihood of adopting community based model for conservation of the forest.

To determine the nature and direction of the relationship that exists between economic activities (charcoal production, timber production, NTP) and conservation of Masaai Mau Forest, the study proceeded to conduct stepwise multiple regression analysis. Table 6 presents results of the model of prediction using linear regression.

Change Statistics									
Model	R	R Square	Adjusted R Square	Std Error of the Estimate	R Square Change	F Change	df 1	df 2	Sig F Change
1	.891 <sup>a</sup>	.794	.792	.60088	.794	36.083	3	354	.000

Table 6: Model of Prediction Using Linear Regression  
a Predictors: (Constant), Charcoal Production, Timber Production, NTP Production

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.218	.166		7.337	.000
	Charcoal Production	-.428	.102	-.164	-4.1960	.000
	Timber Production	.601	.048	.811	12.774	.000
	Production of NTP	1.188	.093	.816	12.521	.000

Table 7

a. Dependent Variable: Conservation of Masaai Mau

Findings from the model in Table 6 present the actual influence of the coefficients of the independent variable (economic activities) on the dependent variable (conservation of Masaai Mau Forest) among the host communities of Masaai Mau. The unstandardised beta for charcoal production is  $-.428$ . This implies that charcoal production among the host communities contributes  $-0.428$  unit change in conservation of Masaai Mau. Similarly, the unstandardised beta for timber production among the host communities is  $1.188$ . This implies that timber production among the host community can contribute  $0.601$  unit change in conservation of the forest. Equally, the unstandardised beta for production of NTP is  $1.188$ . This also implies that production of NTP among the host communities can contribute  $1.188$  unit changes in forest conservation of the Mau Forest.

The regression equation  $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \epsilon$ , with the constant ( $\beta_0$ ) being  $1.218$ , the coefficient can be plugged into the formula to predict conservation of the Masaai Mau Forest as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \epsilon,$$

$$Y = 2.023 + (-.428) X_1 + (.601) X_2 + (1.188) X_3 + \epsilon$$

The regression model in the table shows that  $R^2 = 0.79$  in the model summary (Table 6), the coefficient of determination (predictor indicator) reveals that 1 unit change in economic activities of the host communities under this study results in 79% change in the conservation of the Masaai Mau Forest. The stability of this result is reflected by the minimum adjustment in the adjusted  $R^2$  value of  $0.79$ ; only showing a decrease of  $0.002$ . Hence, economic activities of the host community explain 79% of conservation of the forest, with a significant model fitting ( $F=36.083$ ;  $p<0.000$ ). This implies that 21% of conservation of Masaai Mau Forest is attributed to other factors outside this study.

Interviews and FGDs done by the researcher also revealed that there are elaborate procedures for ensuring that tourism is enhanced for the purposes of job creation and income earning to discourage charcoal burning by members of the host communities. In one interview, it emerged that:

The Government ensures that every financial year, the tourism Ministry receives adequate funds for promoting tourist destinations including rural sites (KI).

This finding tends to suggest that deliberate steps have continuously been taken by the government to ensure that local tourist sites are promoted for the purposes of attracting more guests. During one FGD, it was deduced that:



The national government often collaborate with the County Government to ensure that the income earned through ecotourism is ploughed back to benefit the host residents. Additionally, the local authorities have continued to purchase capital assets from the proceeds of local tourism and these have resulted in job creation and more income to host families (FGD).

These findings suggest that proceeds of tourism based models such as Community Based Ecotourism (CBET) activities can be used to enhance asset base for the economic benefits of host community.

- H<sub>4</sub>: There is no significant impact of established forest management models linked with the host community on the conservation of Masaai Mau Forest

The stated hypothesis was subjected to inferential statistical test using Chi-Square to analyze the host communities' conservation concerns and the likelihood of adopting CBET model. The indicators were listed as the row values while the local community's preferences for CBET approach were used as the column values. The outcome of the analysis is reported in Table 8.

Variables	X <sup>2</sup>	Df	V	P
Community based ecotourism is a better alternative for ecosystem management	104.683	16	.262	.000
Community based ecosystem is a better alternative for enhancing water resource quality	109.818	16	.268	.000
Community based ecotourism opens up income sources for improved economic well being of host community members	118.470	16	.280	.000
Community based ecotourism opens up conservation projects and investment opportunities	57.844	16	.195	.000
Community based ecotourism enhances lifestyle improvement and conflict resolution abilities	43.289	16	.169	.000

*Table 8: Chi Squire Test for CBET Model*  
*X<sup>2</sup>= Chi-Square value; df= Degrees of Freedom; V= Cramers' V*  
*P= Probability significance Computed using  $\alpha=0.05$*

Table 8 illustrates that the conservation concerns of the Masaai Mau Forest community and their preference for community based ecotourism model had a positive association. This is determined by looking at the Cramers' V column, which is a measure of association. Even though the association between the variables is as low as (0.169=V=0.280), it reflects a positive outcome which infers a positive association between conservation concerns of the community and their preference for community based ecotourism model. All the variables also yielded probability significance values less than the critical value of 0.05 (i.e. P=0.000). This implies that the respondents' conservation concerns and their preference for the CBET model are statistically significant. The P value of 0.000 also implies that these findings could be generalized to the population from which the sample was drawn. This therefore meant that the null hypothesis had to be rejected and the alternative that CBET is a viable model for conservation among host community of Masaai Mau Forest, Kenya, accepted.

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