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Community Use and Product Valuation of Forest Resources in Maasai Mau, Kenya

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ABSTRACT

Forests play an important role in the livelihoods of local people in most developing countries. Local communities depend on forest resources for various products such as fuel wood, construction materials, medicine, and food. The Maasai Mau forest plays an important role in supporting the livelihood of people living around the forest. The forest has been degraded by habitation and uncontrolled exploitation of forest resources and services. Honey (36.9%), Medicine (35%) and firewood (26%) and water (30.9%) were all mainly sourced from the public forest Exploitation of forest resources should be undertaken in a sustainable manner to ensure posterity. To reduce dependency on the forest, alternative means of livelihood should be provided to reduce dependency on the forest. Rehabilitation efforts have been supported by local communities and other government agencies. Aerial seeding and tree planting are two methods that have been adopted to aid in Maasai Mau rehabilitation and restoration.

Keywords: Community use and product valuation of forest resources

INTRODUCTION

Many people of a great variety of cultures and land-use practices live in or around tropical forests. Although these people are all in some way dependent on forests, they have little else in common. In recent years, however, it has become much harder for forest-dependent people to use local forests and their products, owing to deforestation, logging, population pressure or legal initiatives such as the declaration of state forests, national parks or wildlife reserves. In many countries, plans to protect forest ecosystems have failed to address the needs and knowledge of local forest-dependent communities (Kumar, Singh & Kerr, 2015). According to Isager, Theilade & Thomsen (2001) participation by local people is essential to any conservation effort. In forest conservation, participation is often associated with community forestry, which refers to forest management or management by people living close to the forest. Legal, political and cultural settings for community forestry vary widely, and the term covers a wide range of experiences and practices. Community forestry is often associated with South and Southeast Asia, but it is also common in other regions.

Forests play an important role in the livelihoods of local people in most developing countries. Local communities depend on forest resources for various products such as fuel wood, construction materials, medicine, and food. An estimated 1.6billion people depend to varying degrees on forests for their livelihoods and about 60million forest dwellers are almost fully dependent on forests. Furthermore, 350million people who live adjacent to dense forests depend on them for subsistence and income (World, 2004). It is estimated that 20-25% of rural peoples' income is obtained from environmental resources in developing countries (Vedeld et al., 2007) and provide food reserve for use in periods of crisis or during seasonal food shortages (Langat, Maranga, Cheboiwo & Aboud, 2015). The ecological and economic significance of forest ecosystems in Kenya is widely acknowledged.

Statement of the Problem

In the last three decades, the East Mau forest area in Kenya has declined primarily due to anthropogenic activities. Central to the anthropogenic activities is the dependence of the people on forest products and services for livelihoods. These human perturbations threaten biodiversity and future ecosystems functions of this forest and thus livelihoods. The full values of the ecosystem benefits have not been adequately quantified, and their role in socioeconomic development has not been examined.

Most natural ecosystems services are not traded in the market and therefore often true values of forest ecosystems are obscured. Consequently, the total economic values of forest ecosystems are incomplete and undervalued (Langat, 2016). Such undervaluation has resulted in marginalization of forest ecosystems in budget allocations, land-use change decisions, leading to excisions and degradation.

Despite its importance as a resource for local livelihoods, there is hardly quantitative information on direct use values and the role of the forest to the household and the wider economy. Studies have found that the relationship between socio-economic and external factors on forest resource dependence are contestable and can vary between locations, product types, or specific forest (Langat, 2016). However, there are few studies in Kenya which have analyzed the role of socioeconomic and external factors on household dependence on forest

resources. To address the information gaps articulated above economic, Economic valuation of forest ecosystems services was undertaken in East Mau forest.

The main objectives of the study are:

1. Determine the level of community dependence on Maasai Mau forest
2. Determine socio economic factors influencing community dependence on Maasai Mau forest
3. Assess the perception of the community on the restoration of Maasai Mau forest
4. Determine the total Economic contribution of Maasai Mau forest to the community and other stakeholders.

Valuation of forest resources

Forest ecosystem goods and services, and the natural capital stocks that produce them, make significant direct and indirect contributions to national economies and human welfare. There have been many attempts to value these contributions. In the past two decades a good deal of progress has been achieved in developing valuation methods for forest ecosystem services and promoting their inclusion in national economic accounts.

The valuation of a natural resource or environmental service is usually based on the monetary value individuals place on it. The maximum amount of money an individual is willing to pay for obtaining a benefit or avoiding a loss in most situations reflects the preferences for such a benefit or loss. Preferences are based on the values he or she attaches to the goods or services in question. The maximum willingness to pay (WTP) can be considered therefore an expression of the individual's values. Analogously, the minimum Willingness to Accept (WTA) an amount of money as compensation for giving up a benefit or for receiving a loss reflects the value of such a benefit or loss. As an example, it might be of interest in estimating the aggregate WTP of people to maintain the environmental quality and amenity benefits of Mau Forest Complex. Alternatively we could estimate the WTA compensation where a development project might compromise these values, by changing the water flow upstream or damaging the forest.

MATERIALS AND METHODS

Study Site

This study was carried out among communities adjacent to the Maasai Mau Forest, Narok County. The Maasai Mau forest ecosystem forms the southern part of the Mau Forest Complex; Kenya's largest closed-canopy forest area which lies at approximately 0.0° to 0.91° South and 35.30° to 36.10° East in the South Rift region of the Rift Valley, Kenya at an altitude of 1,800 - 3,000m above sea level. The Maasai Mau forest is a Trust Land, managed by the Narok County. It covers 46,278 hectares; comprised exclusively of indigenous forest and is located in West Kenya, 17 kilometres northwest of Narok Town (Kipkoech et al., 2011). The Ecosystem is surrounded by thirteen administrative locations including Ol Posimoru, Olokurto, Naisoya, Nkareta, Ereteti, Ololulunga, Ol Shapani, Melelo, Enabelibel, Sogoo, Sagamia, Tendwet and Naituyupaki.

Research Design

The research design for this study was a descriptive survey. In view of this, the study adopted the field survey method to collect both quantitative and qualitative data. The field survey

implies the process of gaining insight into the general picture of a situation, without utilizing the entire population (King, 2004)

Data Analysis

Qualitative data generated from open-ended questions was analyzed in themes, content analysis and categories identifying similarities and differences that emerged. Qualitative analysis includes analysis of what some respondents said in the open ended questions. Quantitative data was scrutinized for completeness, accuracy and uniformity. Data from questionnaires were analyzed using descriptive statistics, and came out with frequencies and percentages using Statistical Package for Social Sciences (SPSS) - this is the reliable tool for quantitative data analysis.

RESULTS

Forest use and economic dependence

Time taken to walk to nearest forest

From data collected, the time taken by the respondents to walk to the forest averages to 40 minutes with the maximum time being 2hours 10 minutes and minimum time taken is a minute**.**

Table 1: Time taken to walk to nearest forest

Statistics	
Time taken to walk to the forest (minutes)	
N	69
Mean	40.93
Std. Deviation	32.292
Minimum	1
Maximum	130

Shortest distance from homestead to the forest

The shortest distance from the respondent's homestead to the nearest forest is at an average of 2 kilometers, with a maximum distance being 5 kilometers and the shortest distance being less than a kilometer.

Table 2: Shortest distance from homestead to the forest

Shortest distance from homestead to the forest (Km)	
N	69
Mean	1.69
Std. Deviation	1.069
Minimum	0
Maximum	5

Sources of six key products

Six key products were identified as the most sought after by the locals, namely Firewood, Timber, Honey, Medicine, Animal fodder/ browse and Water. Honey, Medicine and water were mainly sourced from the public forest and the other three from own farms implying that public forest and own farms were the main sources of the products.

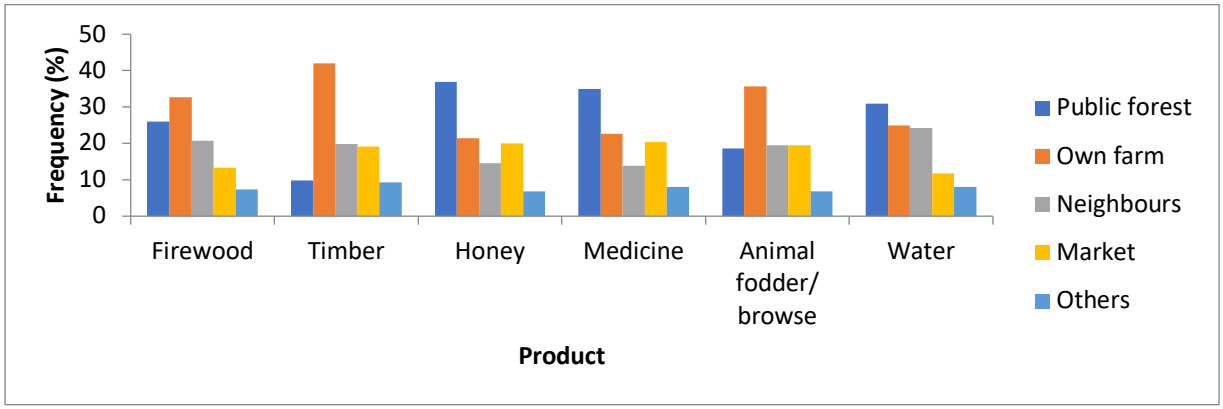


Figure 1: Sources of six key products

Importance of six key products

Importance of the six products according to the respondents was assessed and it was found that all six of high importance since they were to be ranked mostly as either more important or most important.

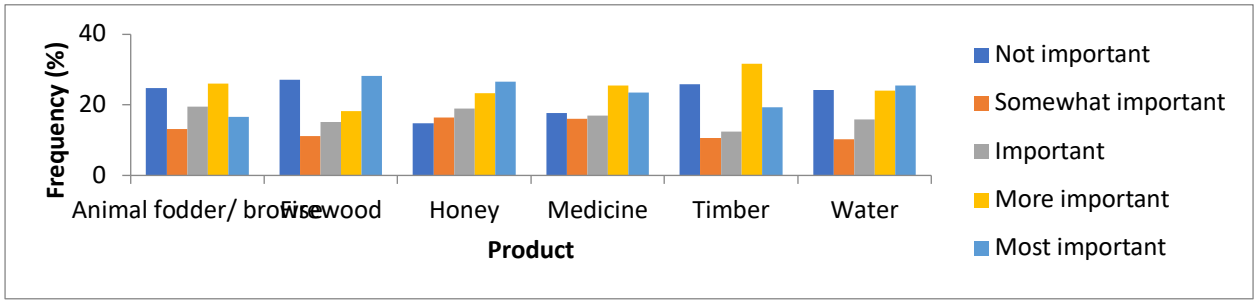


Figure 2: Importance of six key products

Forest products (Commodities)

Most the products were sourced from their own farms with the exception of honey (36.9%), Agricultural tools (yoke, tool handles etc.) (28.8%), mushrooms (35.5%), fibres (37.3%) and water (30.9%) which were majorly sourced from public forest.

Table 3: Forest products (Commodities)

Product	Source					N
	Public forest	Own farm	Neighbors	Market	Others	
Firewood	39(26%)	49(32.7%)	31(20.7%)	20(13.3%)	11(7.3%)	150
Timber	13(9.9%)	55(42%)	26(19.8%)	25(19.1%)	12(9.2%)	131
Charcoal	6(5.4%)	39(34.8%)	29(25.9%)	30(26.8%)	8(7.1%)	112
Honey	48(36.9%)	28(21.5%)	19(14.6%)	26(20%)	9(6.9%)	130
Medicine	48(35%)	31(22.6%)	19(13.9%)	28(20.4%)	11(8%)	137
Poles (fencing, building etc.)	10(10.1%)	31(31.3%)	26(26.3%)	20(20.2%)	12(12.1%)	99
Thatch grass	24(21.6%)	33(29.7%)	23(20.7%)	22(19.8%)	9(8.1%)	111
Fruits	20(15.9%)	46(36.5%)	25(19.8%)	25(19.8%)	10(7.9%)	126
Animal fodder/ browse	22(18.6%)	42(35.6%)	23(19.5%)	23(19.5%)	8(6.8%)	118
Agricultural tools (yoke, tool handles etc.)	36(28.8%)	26(20.8%)	20(16%)	31(24.8%)	12(9.6%)	125
Murram	6(6.6%)	21(23.1%)	22(24.2%)	26(28.6%)	16(17.6%)	91
Building stones	8(7.7%)	23(22.1%)	27(26%)	30(28.8%)	16(15.4%)	104
Mushrooms	38(35.5%)	30(28%)	19(17.8%)	11(10.3%)	9(8.4%)	107
Fibres	38(37.3%)	22(21.6%)	17(16.7%)	17(16.7%)	8(7.8%)	102
Meat	9(9.2%)	24(24.5%)	14(14.3%)	44(44.9%)	7(7.1%)	98
Water	42(30.9%)	34(25%)	33(24.3%)	16(11.8%)	11(8.1%)	136

Level of importance of the products

It can be noted from the table that most the products were more important or most important. Firewood (18.6%) and (30%), Timber (31.4%) and (20.3%), Charcoal (17.6%) and (16.8%), Honey (23.8%) and (27.9%), Medicine (25.8%) and (25.4%), Poles (fencing, building etc.) (22.8%) and (17.5%), Thatch grass (24%) and (21%), Fruits (24.2%) and (18.5%), Animal fodder/ browse (26.5%) and (16.9%), Agricultural tools (yoke, tool handles etc.) (24%) and (19.1%), Murram (20.6%) and (17.6%), Building stones (22.1%) and (16.3%), Mushrooms (23.8%) and (16.5%), Fibres (20.2%) and (17.9%), Meat (21.1%) and (13.9%) and Water (23.3%) and (27.8%).

Table 4: Level of importance of the products

Product	Rank					N
	Not important	Somewhat important	Important	More important	Most important	
Firewood	67(25.5%)	29(11%)	39(14.8%)	49(18.6%)	79(30%)	263
Timber	65(24.9%)	27(10.3%)	34(13%)	82(31.4%)	53(20.3%)	261
Charcoal	73(27.9%)	48(18.3%)	51(19.5%)	46(17.6%)	44(16.8%)	262
Honey	35(13.2%)	43(16.2%)	50(18.9%)	63(23.8%)	74(27.9%)	265
Medicine	43(16.3%)	41(15.5%)	45(17%)	68(25.8%)	67(25.4%)	264
Poles (fencing, building etc.)	68(25.9%)	35(13.3%)	54(20.5%)	60(22.8%)	46(17.5%)	263
Thatch grass	60(22.9%)	40(15.3%)	44(16.8%)	63(24%)	55(21%)	262
Fruits	50(18.9%)	38(14.3%)	64(24.2%)	64(24.2%)	49(18.5%)	265
Animal fodder/ browse	64(24.6%)	33(12.7%)	50(19.2%)	69(26.5%)	44(16.9%)	260
Agricultural tools (yoke, tool handles etc.)	55(21%)	55(21%)	39(14.9%)	63(24%)	50(19.1%)	262
Murram	62(23.7%)	47(17.9%)	53(20.2%)	54(20.6%)	46(17.6%)	262
Building stones	73(27.8%)	47(17.9%)	42(16%)	58(22.1%)	43(16.3%)	263
Mushrooms	58(22.2%)	54(20.7%)	44(16.9%)	62(23.8%)	43(16.5%)	261
Fibres	70(26.7%)	41(15.6%)	51(19.5%)	53(20.2%)	47(17.9%)	262
Meat	75(28.2%)	47(17.7%)	51(19.2%)	56(21.1%)	37(13.9%)	266
Water	60(22.2%)	27(10%)	45(16.7%)	63(23.3%)	75(27.8%)	270

Level of importance of sources of the products

The findings indicate that the sources indicated in the table below are more important and most important. This is supported by the score of their higher percentages. The average percentage of the importance is (25%).

Table 5: Level of importance of sources of the products

Source	Rank					N
	Not important	Somewhat important	Important	More important	Most important	
Public forest	299(30.1%)	134(13.5%)	137(13.8%)	179(18%)	246(24.7%)	995
Own farm	125(14.5%)	112(13%)	120(13.9%)	220(25.5%)	287(33.2%)	864
Neighbors	173(20%)	137(15.9%)	196(22.7%)	224(26%)	133(15.4%)	863
Market	158(18.6%)	154(18.1%)	200(23.5%)	209(24.6%)	130(15.3%)	851
Others	223(35%)	115(18%)	103(16.1%)	141(22.1%)	56(8.8%)	638

Time spent for a trip

From the data collected the average time spent per trip by a respondent is 7minutes with the maximum time spend being an hour.

Table 6: Time spent for a trip

N	68
Mean	7.45
Std. Deviation	12.595
Minimum	0
Maximum	60

Number of trips per week

The average number of trips taken by a respondent per day are 3 with the maximum number of trips taken per day being 14 while the least number being 1 trip.

Table 7: Number of trips per week

N	68
Mean	2.47
Std. Deviation	2.048
Minimum	1
Maximum	14

Number of items collected per trip

From the data collected, it is evident that the average number of trips that the respondents' takes to the forest in a week are 5, with the maximum trips being 40 trips per weeks and the least could be 10 trips per week.

Table 8: Number of items collected per trip

N	60
Mean	4.74
Std. Deviation	7.334
Minimum	10
Maximum	40

Number of people collecting products from the forest

From the data collected, it is evident that children are the people who collect products from the forest.

Table 9: Number of people collecting products from the forest

Person	Average Number
Adults	1
Children	2
Grand Total	**2**

How much of forest products do you extract for home consumption and sale

The respondents stated that they extra much of the forest products for consumption and sale.

Table 10: How much of forest products do you extract for home consumption and sale

Quantity extracted for home consumption (Kgs)	
Mean	1891.2500
Std. Deviation	2431.55989
Minimum	0.00
Maximum	13000.00

Use of forest for spiritual purposes

Form the data collected, 66.7% of the respondents use the forest for spiritual and cultural purpose while 33.3% do not.

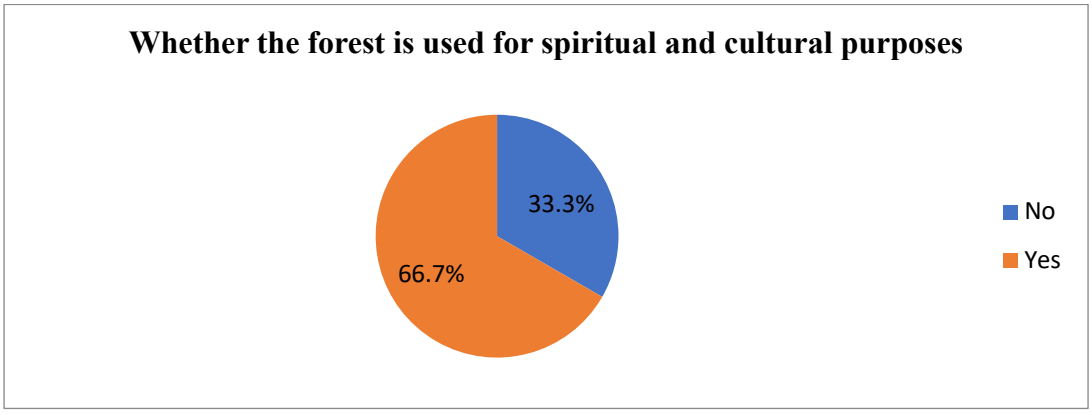


Figure 3: Use forest for cultural and spiritual purpose

Frequency of using the forest for spiritual and cultural purposes

It was noted that frequency of using the forest for spiritual purposes was once a year (84.6%) with a small number stating that it's done few times a year (11.5%).

Table 11: Frequency of using the forest for spiritual and cultural purposes

Frequency of using the forest for spiritual and cultural purposes	Frequency	Percentage
More than once a week	1	1.9
Once a week, 2 or 3 times a week	1	1.9
Few times a year	6	11.5
Once a year	44	84.6
Total	**52**	**100.0**

Majority of the respondents stated that they do not graze their animals in the forest (54.7%).

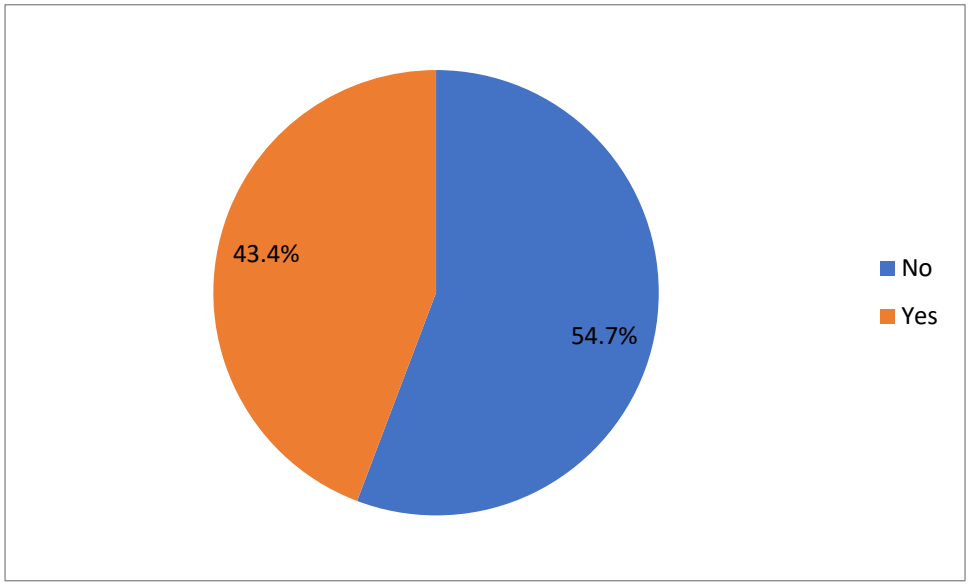


Figure 4: Domestic animals grazed inside the public forest

Type, number and period in months grazed inside the forest

For those who stated that they do graze their animals in the forest they were to own four different types of domestic animals, with goats being the most owned (average = 10) and donkeys being the least (average = 3). Besides number owned Donkey was found to be the most grazed animal (average = 9 months) and goats were the least grazed (8 = months).

Table 12: Type, number and period in months grazed inside the forest

Animal	Statistic	Number owned	Number of months in a year
Cattle	Mean	6.57	8.9
	Std. Deviation	4.198	3.897
	Minimum	1	2
	Maximum	16	12
Sheep	Mean	6.71	8.08
	Std. Deviation	5.06	4.055
	Minimum	2	2
	Maximum	20	12
Goats	Mean	10.09	7.67
	Std. Deviation	12.153	4
	Minimum	3	2
	Maximum	45	12
Donkeys	Mean	2.5	9.27
	Std. Deviation	3.032	3.927
	Minimum	1	2
	Maximum	12	12

Month and reason for usage of the forest

The respondents stated that they mainly utilized the forest during the months of January (n=45) and December (n=16) and the major reasons were due to cultural purposes in December (81.3%) and during dry season/ drought in January (86.7%).

Table 13: Month and reason for usage of the forest

Month the forest is used most	**Reason [n (%)]**				**N**
	Due to cultural purposes	**Dry season/drought**	**Floods/rainy season**	**Honey harvesting season**	
January	6(13.3%)	39(86.7%)	0 (0.0%)	0 (0.0%)	45
February	0 (0.0%)	3(100%)	0 (0.0%)	0 (0.0%)	3
March	0 (0.0%)	2(100%)	0 (0.0%)	0 (0.0%)	2
April	1(25%)	1(25%)	1(25%)	1(25%)	4
July	0 (0.0%)	0 (0.0%)	2(100%)	0 (0.0%)	2
August	1(25%)	1(25%)	1(25%)	1(25%)	4
September	0 (0.0%)	1(100%)	0 (0.0%)	0 (0.0%)	1
November	0 (0.0%)	0 (0.0%)	0 (0.0%)	3(100%)	3
December	13(81.3%)	1(6.3%)	0 (0.0%)	2(12.5%)	16

Family members employed by KFS or forest product industry

Majority of the respondents stated that their family members are not employed by KFS and that they don't depend on the forest product industry (61.8%). Of the 38.2% who acknowledged that they have family members employed either in the forest industry or Kenya Forest Service the Maximum number stated was 16 people with a mean of 2 people.

Table 14: Number employed by KFS or forest product industry

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Number of household members employed	29	0	16	2	2.964

Forest products and services obtained from the forest

On average the amount time per trip made by locals to obtain forest products ranged from 2 hours to 5 hours, with the number of trips ranging from 2 to 16. The amount per trip was most costly for those going to collect honey at Kshs 3213 with timber being the least costly at Kshs. 121. The highest number of persons involved in collection was 10 for fibres the highest amount obtained for usage at home was Kshs. 3200 for charcoal same as that for sale at Kshs. 5700.

Table 15: Mean of Forest products and services obtained from the forest

Product	**Average of Time/ trip (hrs.)**	**Average of Trips/ week**	**Average of Amount/ trip**	**Average of Number involved**	**Average of Amount/ month (Home)**	**Average of Amount/ month (Sale)**
Agricultural tools (yoke, tool handles etc.)	3	2	384	1	848	830
Animal fodder/ browse	2	4	668	1	645	450
Building stones	2	1	817	1	650	433
Charcoal	5	2	656	2	3200	5700
Fibres	3	16	227	10	333	664
Firewood	3	2	171	2	1449	4305
Fruits	3	2	341	1	617	703
Honey	3	2	3213	1	3264	1718
Meat	3	2	550	2	250	550
Medicine	2	1	308	1	454	436
Murram	3	1	500	1	200	433
Mushrooms	2	2	238	1	222	263
Poles (fencing, building etc.)	3	1	310	1	1150	450
Thatch grass	3	2	438	1	2040	2100
Timber	4	3	119	2	1600	840
Water	4	7	121	2	333	0

Earnings from employment in forest product industry

The highest amount of earnings from forest product industry by household members was Ksh. 14000 with an average of Kshs. 4678.39.

Table 16: Earnings from employment in forest product industry

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Earnings for members of the household from employment in forest product industry (Kshs.)	23	0	14000	4678.39	3114.125

Source of water and whether it's from the forest

There were three sources of water mentioned namely stream/ river, borehole/ well and spring with stream/river being the most commonly used source (40.6%). It was for note that the overall source of the water irrespective of point of collection was the forest (73.8%) **Error! R eference source not found.**

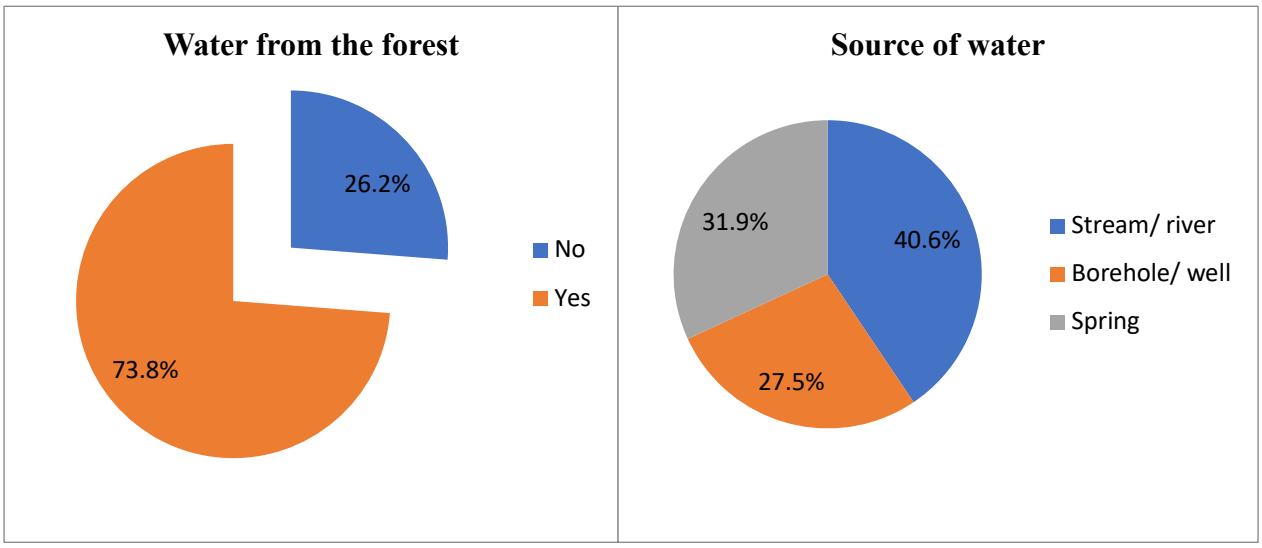


Figure 8: Source of water and whether it's from the forest

Distance between water source and homestead

The average amount of time spent collecting water from available source was noted to be 21.94 minutes with person who walks farthest spending 120 minutes with the one who walks the shortest distance spending a minute. Table 17. The number of jerry cans collected varied from 2 to 120 with a mean of 29.

Table 17: Distance between water source and homestead

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Distance of the source of water (minutes)	69	1	120	21.94	21.517

Table 18: Number of jerry cans per day

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Number of 20 jerry cans used per day	70	2	120	29.39	32.635

Type of purification for drinking water and the quality of water collected from the forest

The quality of water collected from the forest was stated to be mainly good (55.9%), with a small percentage of the respondents stating that it was fair. No purification method was noted to be mostly used (41.4%).

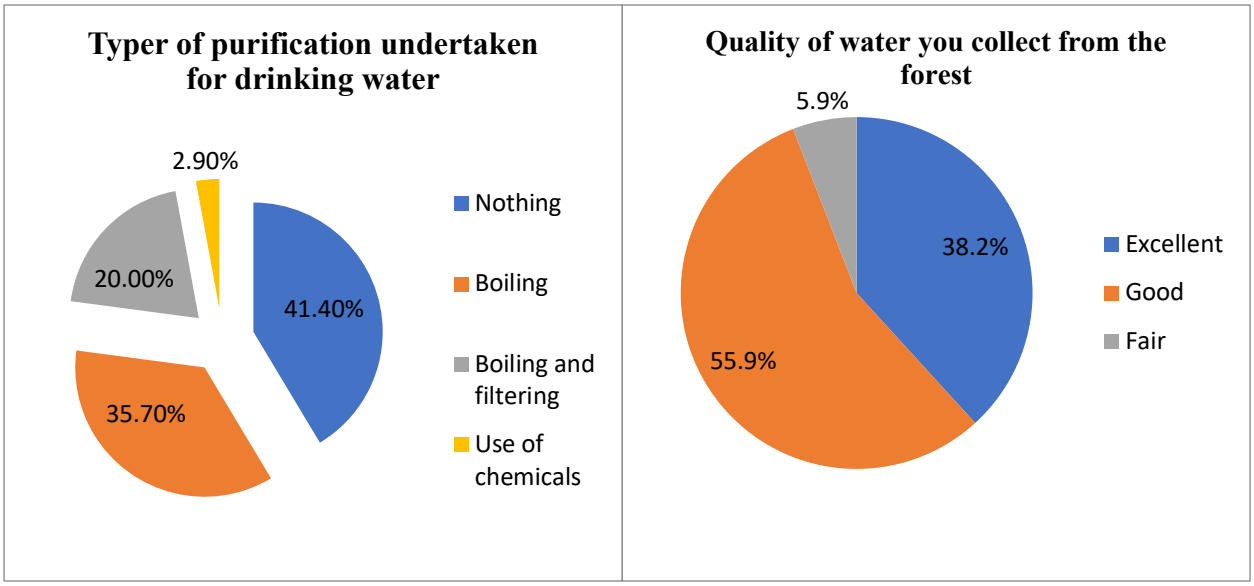


Figure 5: Type of purification for drinking water and the quality of water collected from the forest

Number residents with problem with crop raiding animals from the forest

Majority of the respondents stated that they have no problems with raiding animals from the forest (79.2%). **Figure 6** with the cost of damage ranging from Kshs. 4000 to Kshs. 8000 with an average of Kshs. 6000.

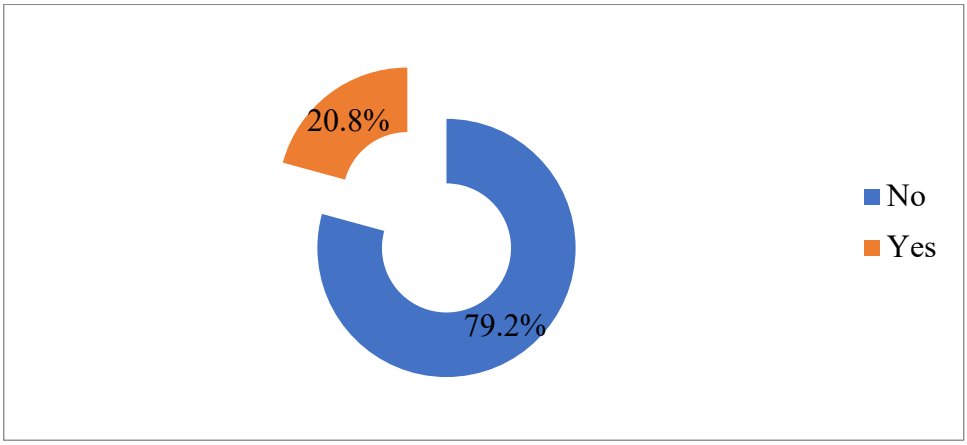


Figure 6: Number residents with problem with crop raiding animals from the forest

Cost of damage caused

The cost of damages done by the wildlife animals is at a minimum of 4000 and a maximum of 8000. This very high according the residents.

Table 19: Cost of damage caused

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Cost of damage	10	4000.00	8000.00	6000.00	2108.19

Attitude/ perception on the status/ management of Maasai Mau forest

The findings indicate that 61.5% of the respondents argued that Environmental and biodiversity conservation is the most perceived of the management of the Maasai Mau forest with provision of raw materials for industry/ locals being the least with 4.6%.

Table 20: Perceptions on the management of maasai mau forest

Purpose	Frequency	Percent
Environmental and biodiversity conservation	40	61.5
Creating more employment opportunities	11	16.9
Tourism	4	6.2
Provide raw materials for industry/ locals	3	4.6
I don't know	7	10.8
Total	**65**	**100**

Importance of the forest to family members

The finds indicate that the forest products are the most important to the family memebrs in different aspects including Economic (income), Subsistence (Domestic uses), Cultural/ Spiritual/ Worship and Future use values

Table 21: Importance of the forest to family members

Services/ values	Level of importance [n, (%)]					N
	Least important	Somewhat important	Important	More important	Most important	
Economic (income)	20(29%)	3(4.3%)	17(24.6%)	11(15.9%)	18(26.1%)	69
Subsistence (Domestic uses)	8(11.4%)	5(7.1%)	5(7.1%)	22(31.4%)	30(42.9%)	70
Cultural/ Spiritual/ Worship	24(34.8%)	9(13%)	14(20.3%)	8(11.6%)	14(20.3%)	69
Future use values	20(29%)	11(15.9%)	6(8.7%)	12(17.4%)	20(29%)	69

Rating of the management of Maasai Mau forest

The findings shows that the forest is not well conserved and its somehow well conserved. It lies in between.

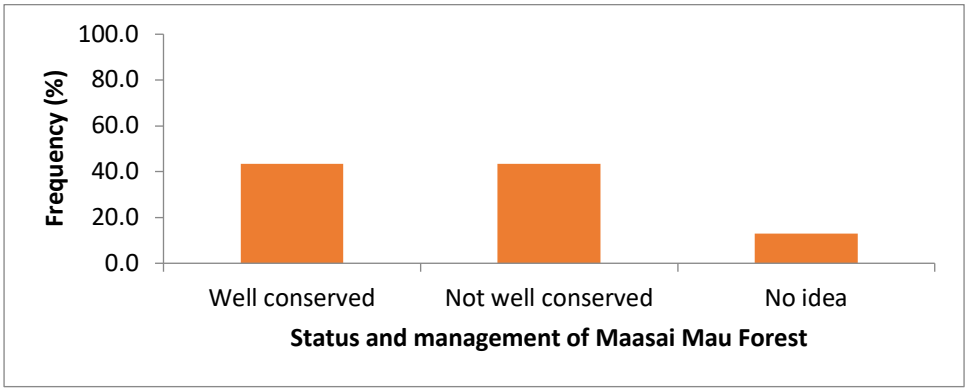


Figure 7: Rating of the management of Maasai Mau forest

Species of trees/plants/animals that may have disappeared over the years

The findings indicate that Species of trees/plants/animals that may have disappeared over the years which is supported with 81.80% of the respondents.

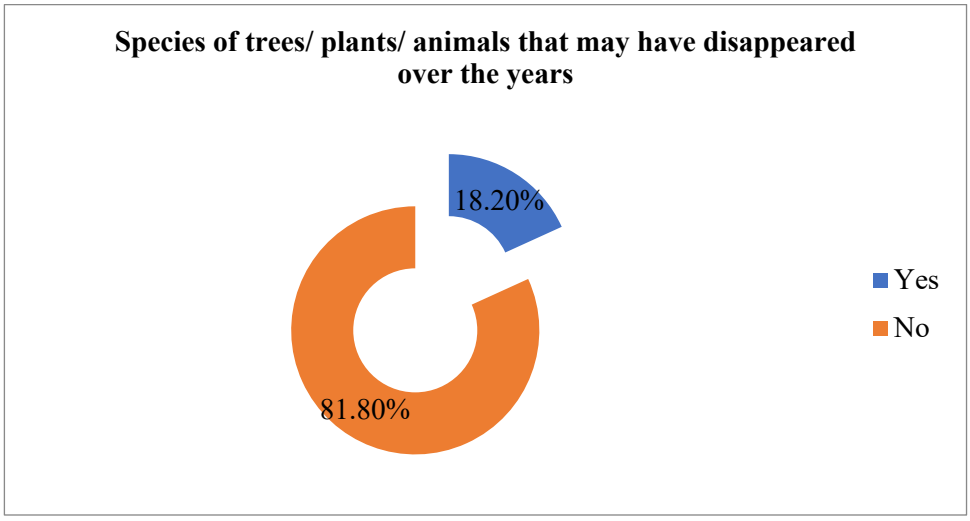


Figure 8: Species of trees/plants/animals that may have disappeared over the years

Support for the project

Most of the respondents agreed that they Support the project of the forest onservation

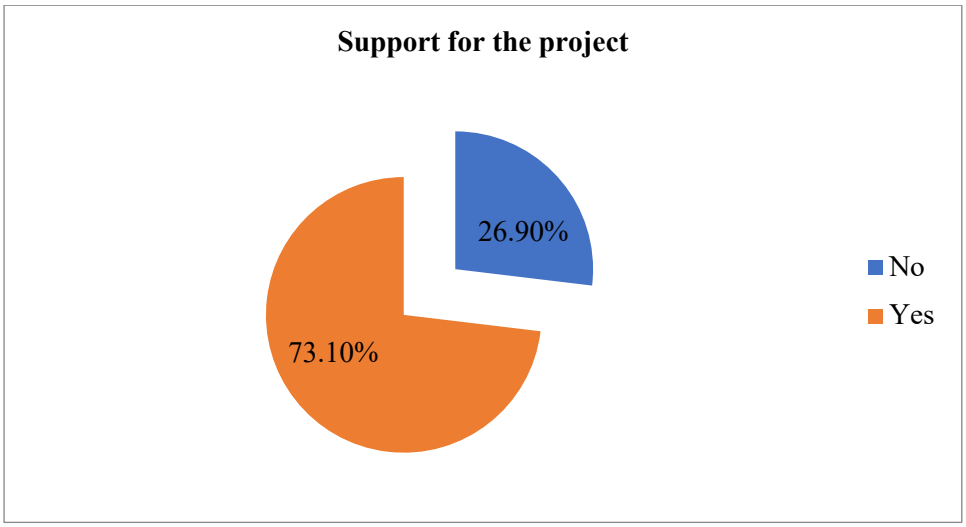


Figure 9: Support for the project

Reasons for not contributing to the project

For those who does not support the project, indicated they don't do it because of Lack of compensation to the evictees by the government with the highest percentage of 73.1%. others do not support due Due to nepotism, Political issues, Tribal issues, Believe of ownership rights and Violation of human rights in the process

Table 22: Reasons for not contributing to the project

Reasons for not contributing to the project	Frequency	Percentage
Lack of compensation to the evictees by the government	19	73.1
Due to nepotism	1	3.8
Political issues	1	3.8
Tribal issues	1	3.8
Believe of ownership rights	2	7.7
Violation of human rights in the process	2	7.7
Total	**26**	**100.0**

Ethnic groups

Most of the ethnic group of people who live aroud the forest are the kipsgis (91.4%) followed by the ogiek (5.7%) then the gusii with (2.9%).

Table 23: Ethnic groups

Ethnic group	Frequency	Percent
Kipsigis	64	91.4
Ogiek	4	5.7
Gusii	2	2.9
Total	70	100.0

Land usage

The findings indicate that the land is used in different ways including Natural forest/ woodland, Planted forest (woodlot), Food crops (maize, potatoes etc.), Cash crops (pyrethrum, wheat, tea), Pasture land and Wetlands/ marshy/ rocky areas

Table 24: Land usage

Land use	Statistic	Size (acres)	Proportion of total land size
Natural forest/ woodland	N	10	
	Mean	1.10	
	Std. Deviation	.316	
	Minimum	1	
	Maximum	2	
Planted forest (woodlot)	N	37	6
	Mean	1.32	22.17
	Std. Deviation	.699	9.174
	Minimum	1	13
	Maximum	3	40
Food crops (maize, potatoes etc.)	N	59	7
	Mean	2.33	31.80
	Std. Deviation	1.785	11.545
	Minimum	1	20
	Maximum	10	50
Cash crops (pyrethrum, wheat, tea)	N	20	
	Mean	1.50	
	Std. Deviation	.761	
	Minimum	1	
	Maximum	3	
Pasture land	N	57	6
	Mean	1.97	30.67
	Std. Deviation	1.972	14.514
	Minimum	1	7
	Maximum	9	50
Wetlands/ marshy/ rocky areas	N	19	4
	Mean	1.37	15.75
	Std. Deviation	.742	6.131
	Minimum	1	7
	Maximum	3	20

Permanent Occupation

The findings indicate that the respondents have different forms of permanent occupations namely Farming, Business, Livestock keeping, Teacher, Poultry keeping, Household chores, Bee keeping, Doctor and Casual labourer with 55, 18.9, 8.1, 4.5, 4.5, 3.6 and 3.6 of percentages respectively.

Table 25: Permanent Occupation

Permanent occupation	Frequency	Percentage
Farming	61	55
Business	21	18.9
Livestock keeping	9	8.1
Teacher	5	4.5
Poultry keeping	5	4.5
Household chores	4	3.6
Bee keeping	4	3.6
Doctor	1	0.9
Casual labourer	1	0.9
Total	**111**	**100**

Livestock type

Most the residents are farmers of Cattle, Sheep, Goats, Donkeys, and Chicken/ Ducks/ Geese.

Table 26: Livestock type

Livestock type	Statistic	Number
Cattle	N	67
	Mean	7.90
	Std. Deviation	6.876
	Minimum	1
	Maximum	30
Sheep	N	46
	Mean	9.50
	Std. Deviation	8.479
	Minimum	1
	Maximum	40
Goats	N	45
	Mean	10.64
	Std. Deviation	11.068
	Minimum	1
	Maximum	50
Donkeys	N	43
	Mean	2.49
	Std. Deviation	3.261
	Minimum	1
	Maximum	20
Chicken/ Ducks/ Geese	N	48
	Mean	25.00
	Std. Deviation	23.963
	Minimum	2
	Maximum	120

Income sources

The result shows that the respondents income sources are Farming (annual crops), Livestock sales, Livestock products (milk, wool, hides, skins etc.), Remittances, Pension, Income from residential/ commercial buildings, Income from business and Income from sale of forest products.

Table 27: Income Sources

Income source	Statistic	Gross income in 2018/ 2019 (Kshs.)
Farming (annual crops)	N	63
	Mean	55777.78
	Std. Deviation	50615.389
	Minimum	3000
	Maximum	200000
Livestock sales	N	52
	Mean	38307.69
	Std. Deviation	32189.109
	Minimum	0
	Maximum	180000
Livestock products (milk, wool, hides, skins etc.)	N	61
	Mean	17959.02
	Std. Deviation	25196.371
	Minimum	300
	Maximum	150000
Remittances	N	44
	Mean	14245.45
	Std. Deviation	25846.618
	Minimum	600
	Maximum	120000
Pension	N	4
	Mean	76500.00
	Std. Deviation	149000.000
	Minimum	2000
	Maximum	300000
Income from residential/ commercial buildings	N	2
	Mean	35000.00
	Std. Deviation	21213.203
	Minimum	20000
	Maximum	50000
Income from business	N	13
	Mean	44384.62
	Std. Deviation	32030.034
	Minimum	2000

	Maximum	100000
Income from sale of forest products	N	12
	Mean	6500.00
	Std. Deviation	4231.913
	Minimum	1000
	Maximum	15000

Financial and social assets

Whether they have had an account with financial/ credit institutions in the last 5 years

The findings indicate that the majority of the respondents (60.3%)have had an account with financial/ credit institutions in the last 5 years.

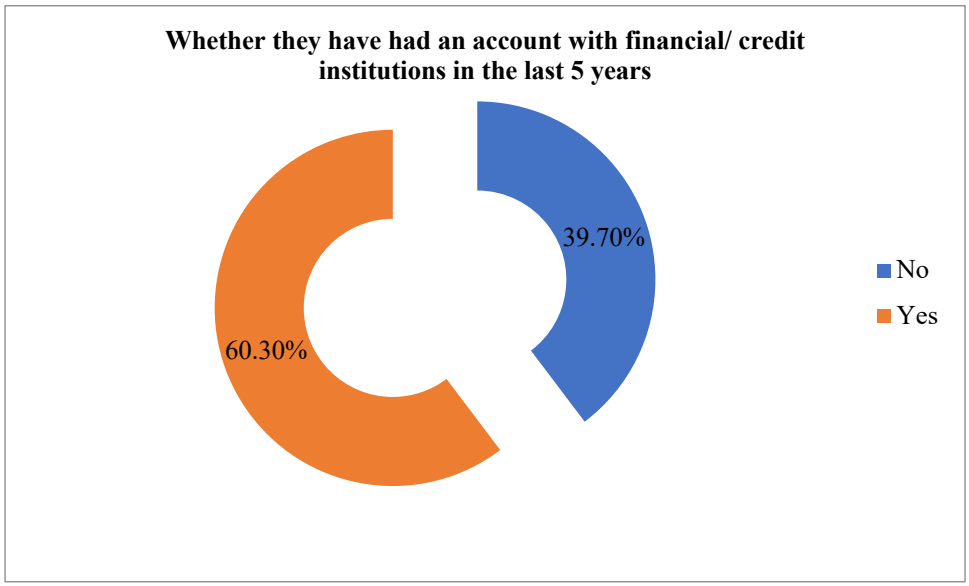


Figure 10: Whether they have had an account with financial/ credit institutions in the last 5 years

Savings in Account

The majority of the respondents have savings in accounts with a maximum of 400,000 shillings.

Table 28: Savings in Account

Statistics	
Savings in account	
N	32
Mean	29418.75
Std. Deviation	72384.464
Minimum	0
Maximum	400000

Member of an environmental conservation group

The majority of the respondents 52.9% are member of an environmental conservation group

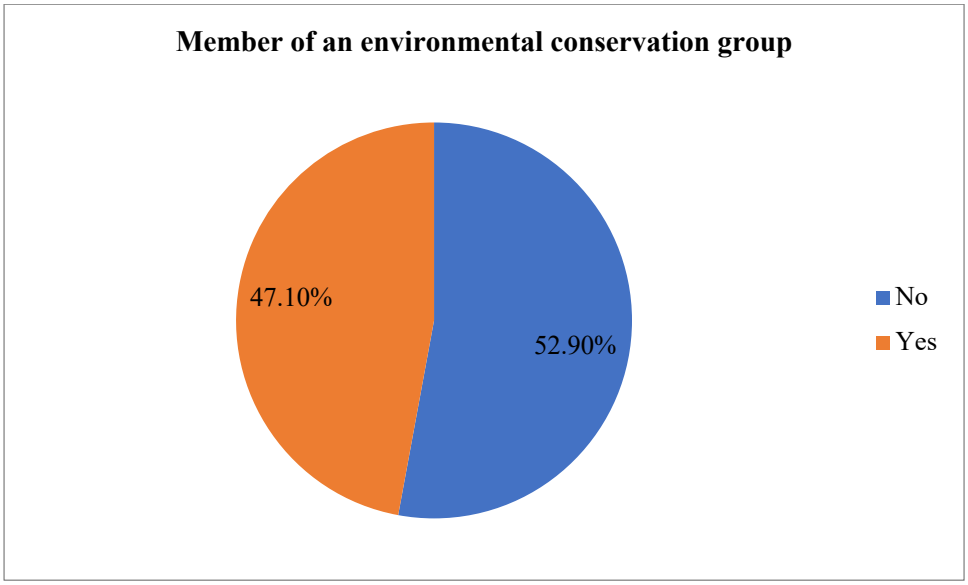


Figure 11: Member of an environmental conservation group

Crisis and unexpected expenditures

Self-sufficiency in food throughout the year

The findings indicate that 73.1% noted that there is Self-sufficiency in food throughout the year

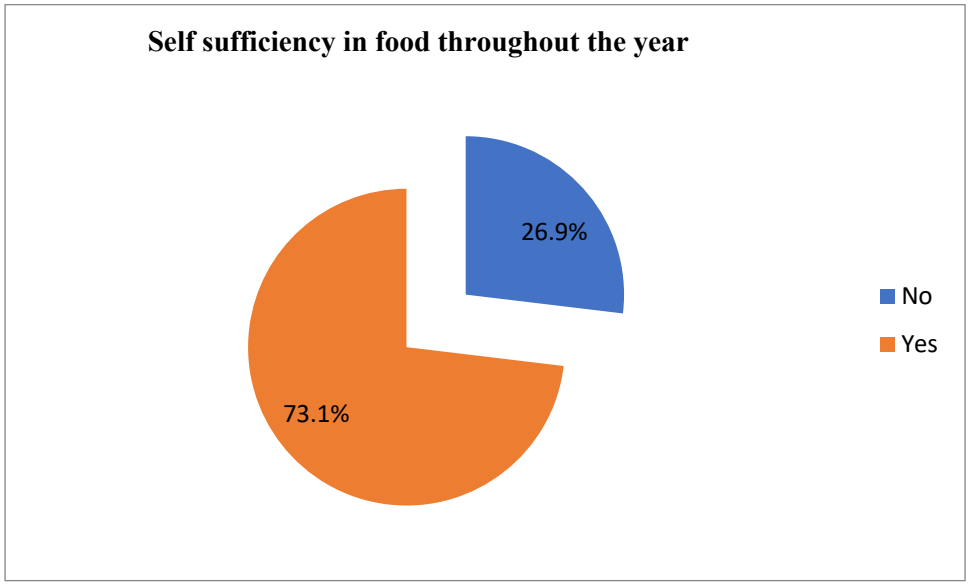


Figure 12: Self-sufficiency in food throughout the year

Whether household have faced any major crisis in the last 5 years

54% of the respondents agreed that there households have faced major crisis in the last 5 years

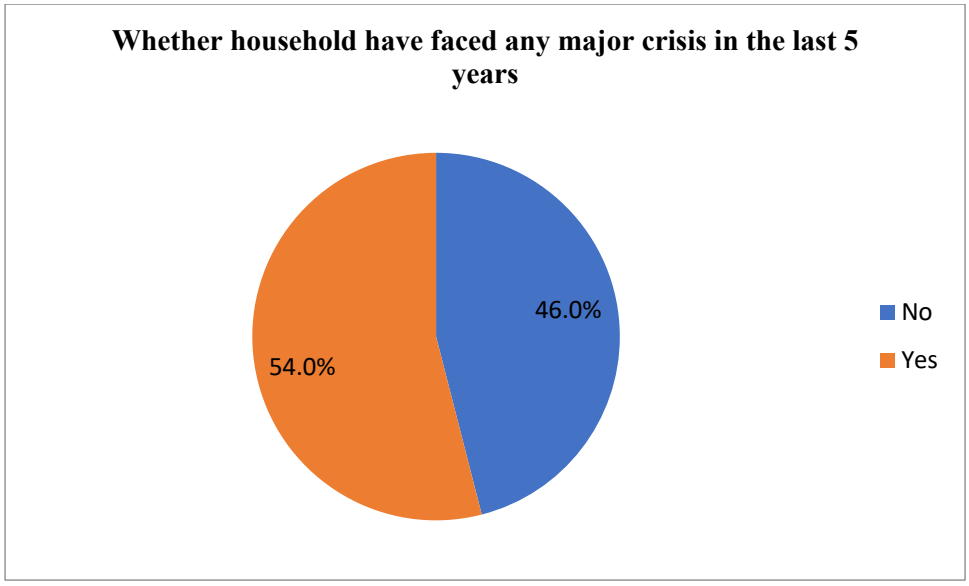
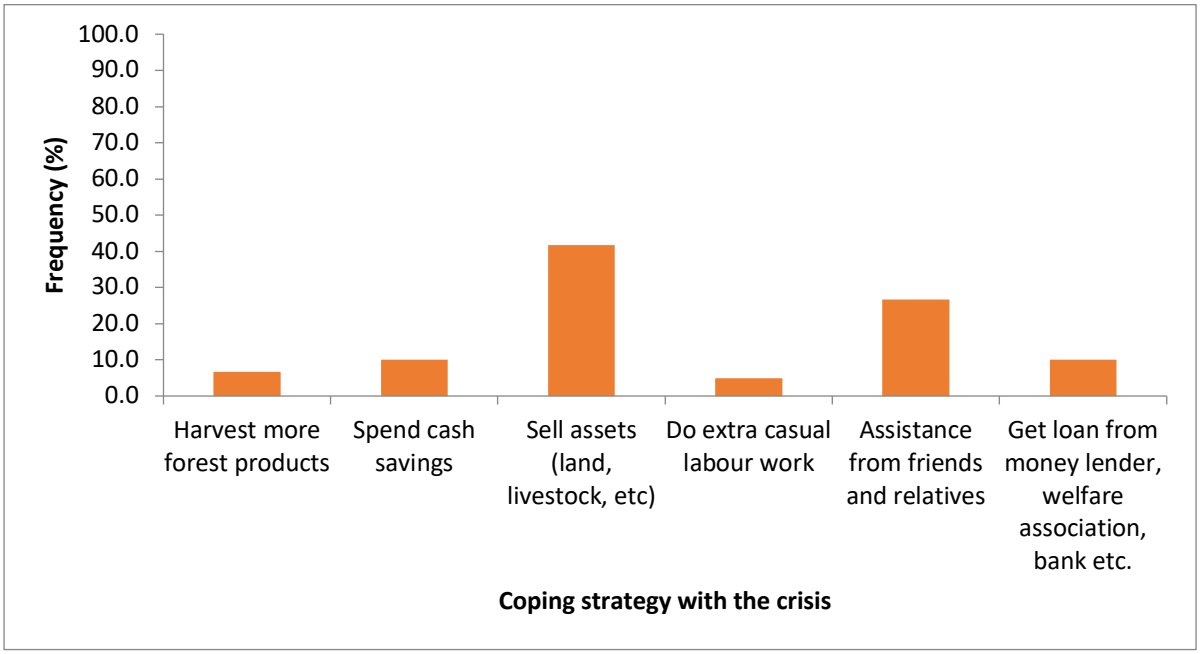


Figure 13: Whether household have faced any major crisis in the last 5 years

Coping strategy with the crisis

The respondents indicated that there are different ways of coping strategy with the crisis which includes; Harvest more forest products, spend cash savings, sell assets (land, livestock etc), do extra casual labour work, or get loan from money lender welfare association bank etc.

Figure 14: Coping strategy with the crisis



Ownership of Movable assets

Earnings for members of the household from employment in forest product industry (Kshs.)

The respondents indicated that they own different things (Bicycle, Car/ truck, Cassette/ CD/ VHS/ VCD/ DVD/ Player, Cell phone/ Phone, Chainsaw, Furniture, Motorcycle, Plough, Radio, Solar panel, Stove for cooking (gas or electric only), Tractor, TV, Water pump/ Money maker, and Wooden cart or wheelbarrow) of different values with a minimum of 1750 and a maximum of 40000

Table 29: Earnings for members of the household from employment in forest product industry (Kshs.)

Asset	Average of Units owned	Average of Respondent valuation (resale value of all units)	Average of Computed value
Bicycle	1.0	4100.0	5500.0
Car/ truck	1.0	525000.0	
Cassette/ CD/ VHS/ VCD/ DVD/ Player	4.4	2400.0	
Cell phone/ Phone	1.5	4636.3	6337.5
Chainsaw	1.0	20000.0	
Furniture	6.1	11140.7	16000.0
Motorcycle	1.1	94857.1	40000.0
Plough	1.1	5235.3	5000.0
Radio	1.1	3425.9	2600.0
Solar panel	1.4	9815.8	10833.3
Stove for cooking (gas or electric only)	1.1	5181.8	
Tractor	1.0	1520000.0	
TV	1.0	10400.0	11500.0
Water pump/ Money maker	2.0	3286.7	
Wooden cart or wheelbarrow	1.0	3080.0	1750.0
Grand Total	**2.1**	**30712.1**	**8643.2**

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