



Influence of Settlement Activities on Sustainable Households' Livelihoods of the Inhabitants in Mount Elgon Forest, Bungoma County, Kenya

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Abstract: Mount Elgon Forest has declined primarily due to anthropogenic activities. The aim of this paper was to investigate the influence of settlement activities on sustainable household's livelihoods of inhabitants in Mount Elgon Forest, Bungoma County, Kenya. This study used cross-sectional research design and mixed methodology. The target population was 12842 household heads, 4 ward administrators, 12 chiefs, 1 Kenya Forest service personnel and 1 NEMA official. A sample of 373 household heads, 4 ward administrators, 12 chiefs, 1 Kenya Forest Service Personnel and 1 NEMA official took part in the study. Questionnaires, interview guides and Focus Group Discussions were used to collect data. Validity was determined by consulting supervisors while reliability was ascertained through piloting and use of Cronbach Alpha Coefficient. Quantitative data was analysed using frequencies, percentages, means, Standard deviation and Pearson Correlation analysis. Qualitative data was thematically classified and arranged before being reported in narrations and quotations. Analyzed data was presented using tables and figures. The study found a significant positive correlation between settlement activities and sustainable households' livelihoods ($r = .614; p = .000$). It was recommended that there was a need to devise ways of reducing population density and land fragmentation leading to reduced dependency on forest products. The findings of the study will be crucial to professional bodies and institutions such as Kenya Forest service, Kenya wildlife service and NEMA in relooking at the approaches that enhance livelihoods among forest users and thus come up with strategies for effective management of forests improving on sustainable livelihoods.

Keywords: Settlement, Activities, Sustainable, Livelihoods, Elgon

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1. Introduction

The influence of settlement activities on the sustainable livelihoods of forest-dependent communities is a complex and multi-dimensional issue that has received significant attention from scholars in recent years (Wani & Chandel, 2020). Settlement activities such as agriculture, logging, and mining can have both positive and negative impacts on the livelihoods of forest-dependent communities, depending on how they are managed and the extent to which they are sustainable

(Saliu, Adisa, Olukanni & Awolaye, 2021). One positive impact of settlement activities on forest-dependent communities is the creation of job opportunities, which can increase household incomes and provide greater access to goods and services. However, settlement activities can also lead to the destruction of forest resources, which are often crucial sources of livelihood for forest-dependent communities (Perera & Dissanayake, 2020). Recent research has highlighted the need for sustainable settlement practices that balance economic development with the

preservation of natural resources and the promotion of social equity (Salim & Ali, 2021). Some of the strategies that have been proposed to promote sustainable settlement activities include the use of community-based natural resource management systems, the implementation of sustainable agriculture practices, and the development of alternative livelihoods that are not dependent on forest resources.

Agricultural practices, such as the use of chemical fertilizers and pesticides, can have negative impacts on sustainable household livelihoods. The use of these chemicals can lead to soil degradation, water pollution, and health risks for farmers and consumers (Bai, Zhu, Zhang, Liu, Wang, Cao & Chen, 2021). On the other hand, sustainable agricultural practices such as organic farming, crop rotation, and agroforestry can enhance soil fertility, increase yields, and promote biodiversity (Soni, Gupta, Agarwal & Mishra, 2022). Energy consumption is another anthropogenic practice that has significant impacts on sustainable household livelihoods. The use of fossil fuels for heating, cooking, and transportation contributes to air pollution, greenhouse gas emissions, and climate change (Shu, Hu, Zhang, Schöpp, Tang, & Xie, 2022). The adoption of renewable energy sources such as solar, wind, and hydro can reduce dependence on fossil fuels, lower energy costs, and mitigate climate change (Holechek, Geli, Sawalhah & Valdez, 2022).

Forests are vital resources for sustaining human populations worldwide (Cheng *et al.*, 2019; FAO, 2020). In fact, more than 90% of the world's extremely poor depend on forests for food, energy, and other aspects of their livelihoods (FAO, 2020). Globally, forests contribute an average of 27% of household income in communities living within or in proximity to forests (Lawlor *et al.*, 2019), which are generally characterized by relatively high poverty rates (Castle *et al.*, 2021). Tree-based systems, such as agroforestry and tree cash crops, also provide a suite of products and services that contribute to poverty alleviation and the improvement of overall human well-being (Kuyah *et al.*, 2020; Miller *et al.*, 2020). Sustainable forest management, agroforestry, and other tree-based systems are therefore potentially significant contributors to achieving the first United Nations (UN) 2030 Sustainable Development Goal (SDG) to "end poverty in all its forms everywhere" as argued in a range of different contexts (Castle *et al.*, 2021).

In the last decade, forest-related income in household economies and rural development has received increasing attention from the international community. This is largely in recognition of the significant relationship between forest areas and poverty and the emerging knowledge that forests could have a far more significant role in meeting the Sustainable Development Goal's poverty alleviation targets (Sunderlin *et al.*,

2008). Hence, governments, international donors, and Non-Governmental Organizations (NGOs) are increasingly looking to the forestry sector for solutions to reduce poverty. Therefore, empirical knowledge about forest-related income in household economies and rural development is still needed in this regard. Considering that forest income helps reduce income inequality and contributes to households' food security, the success or failure to preserve and sustainably manage these forests will have significant consequences for millions of people dependent on them (Aung, Adam, Pretzsch & Peters, 2015).

In the last three decades, the Mount Elgon Forest reserve area in Kenya has declined primarily due to anthropogenic activities. Central to 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. In Mount Elgon there is encroachment, over exploitation and use beyond regulations on forest products such as collection of firewood and logging of indigenous trees with or without permit. While consumptive activities are not allowed by the KWS in the National Park, firewood and poles and timber are harvested in large amounts. Excision of forest products can weaken the species (Masayi, Omondi & Tsingalia, 2021). When harvesting legally, regulations describe the age, size and location of the product. In plantations, thinning activities are carried out to improve the product to be harvested. Excision often happens on the immature trees and hinders a successful reproduction. Charcoal burning, bee keeping, forest fires, and wildlife poaching is common as huge parts of the forest are not patrolled. Thus, the current study investigated the influence of settlement activities on sustainable household's livelihoods among the inhabitants living in the mount Elgon Forest Reserve, Bungoma County, Kenya.

2. Literature Review

A rising number of studies shows the value of forests as a source of income for many rural people in developing countries (Nguyen *et al.*, 2020). According to the Food and Agriculture Organization (FAO), forest extraction accounts for a major portion of one billion people's income (FAO, 2016). The process of extracting forest goods such as food, fuelwood, construction materials, and medicinal plants for consumption or sale is known as forest extraction (Ofoegbu, Chirwa, Francis & Babalola, 2017). International treaties, such as the United Nations Framework Convention on Climate Change (UNFCCC), the Sustainable Development Goals (SDGs), and the Bonn Challenge, in which world leaders agreed to reforest 350 million hectares of land by 2030, all recognize the importance of forests as a source of livelihood (Dave *et al.*, 2019).

Due to the high overlap of forested areas with poverty, a substantial body of literature has explored whether poorer households are more dependent on forest income than better-off ones (Dokken & Angelsen, 2015; Garekae *et al.*, 2017). While several studies have found that poorer households have higher relative forest incomes, varying results exist for absolute forest income (Dokken & Angelsen, 2015; Langat *et al.*, 2016). Angelsen *et al.*, (2014) reported that the amount of harvested forest products roughly increases with household wealth. Nielsen *et al.*, (2012) found that poor households harvest less forest products than better-off households, which have higher absolute forest and agricultural incomes, but rely less on forest products. In a recent review of evidence on the role of forests in poverty dynamics, Razafindratsima *et al.*, (2021) conclude that even though the dependence of the poor on forests for their livelihoods and well-being is widespread, the ability and capacities of the poor to use forest resources to lift themselves out of poverty remains limited.

Over 1.6 billion people in the world depend on forests for their livelihoods, including over 350 million who live in or near thick forests and depend on those resources for both income and survival (FAO, 2015). This is especially true for women and girls, who may depend on forests for up to half of their income and means of subsistence and who, as a result, need safe access rights to these resources (World Bank, 2016). Forest resources continue to be crucial for rural populations in developing nations in terms of services, goods, and earnings. They have shown economically disadvantaged households that they are capable of meeting their daily needs for things like energy, housing, healthcare, cash incomes, and jobs (Opperman *et al.*, 2018; Xu *et al.*, 2019; Dalu *et al.*, 2021). Common natural forest resources like wild spinach, fuelwood, charcoal, wooden utensils, grass for food, thatching materials, medicinal plants, edible fruits, building poles, bark, roots, tubers, leaves, flowers, seeds, resins, honey, and mushrooms are all classified as non-timber forest products (NTFPs) (Leaver & Cherry, 2020).

Agriculture is the most prevalent human-environment interaction, affecting more natural resources than any other human activity (Barrios *et al.*, 2018). As the world's population rises, the agricultural industry is under growing pressure to produce more food (Tschora & Cherubini, 2020). In response to increased food demand, agriculture is being intensified, which can lead to soil quality degradation, and is being spread into forest environments (Jayathilake *et al.*, 2021). Deforestation as a result promotes biodiversity loss and the disruption of ecosystem functioning, exacerbating the vulnerability of ecological systems (Paiva *et al.*, 2020). Furthermore, rising temperatures, drought-related stress, and changes in precipitation patterns worsen this ecological sensitivity and jeopardize agricultural productivity (Wiebe, Robinson & Cattaneo, 2019). Producing food

for a growing population while combating climate change poses a significant issue for agriculture and necessitates the use of sustainable agricultural practices such as organic farming, sustainable intensification, agroecology, and nature-inclusive agriculture (Feleke *et al.*, 2021).

Because of their reliance on agriculture, developing countries are the most affected by food insecurity and poverty around the world. To improve the sector's contribution to poverty and extreme hunger alleviation, radical change in agricultural and food systems is required (Dobermann *et al.*, 2013). However, smallholder agriculture dominates agricultural production in developing regions around the world, and its contribution to future food supply is limited by climate variability, shrinking land sizes, poor adoption of agricultural technologies, and ineffective policies (Mugingenga *et al.*, 2016; Oluwatayo & Ojo, 2016). These obstacles result in low agricultural output, which leads to food-related issues and poverty. Smallholder farmers must adopt agricultural intensification strategies in order to overcome the difficulties of shrinking land sizes and climate change (Leigh *et al.*, 2014).

3. Methodology

The study was conducted among the inhabitants living in Mount Elgon national reserve, Bungoma County. The County lies between latitude 00 28' and latitude 10 30' North of the Equator, and longitude 34 20' East and 35 15' East of the Greenwich Meridian. The County covers an area of 3032.4 Km². It borders the republic of Uganda to the North west, Trans-Nzoia County to the North-East, Kakamega County to the East and South East, and Busia County to the West and South West. The forest lies approximately at coordinates 1.1615° N, 34.5405° E.

This study used cross-sectional research design and thus data was collected from the population at a single point in time as pointed out by Wang and Cheng (2020). Cross-sectional research design allows researchers to identify characteristics of their populations at a given time, analyze their evolution over time, and to establish some relationships between these features (Zangirolami-Raimundo, Echeimberg & Leone, 2018). In this study, the socio-demographic characteristics and anthropogenic activities that influence livelihoods were identified and in addition their relationship were established through the use of regression and Pearson Correlation Analysis. In addition, the study used mixed methodology (MM) where both quantitative and qualitative approaches of data collection and analysis were used. Mixed methods as a methodology, includes philosophical assumptions that provide directions for the collection and analysis of data from multiple sources in a single study (Dawadi, Shrestha & Giri, 2021).

This study was undertaken in three sub-counties bordering Mount Elgon National Reserve. These sub-counties included Cheptais, Kopsiro and Elgon. Cheptais, Kopsiro and Mount Elgon Sub-Counties have two wards each making a total of 6 wards. However, since the study was concerned with forests and livelihoods, four wards; Cheptais, Chepyuk, Kaptama and Elgon were used in the study. The two wards; Chesikaki (Cheptais) and Kapkateny (Kopsiro) were excluded since they do not touch the forest. According to Bungoma County Integrated Development, the three

sub-counties have a total population of 135792 inhabitants with 12842 Households. Thus, the target population for this study was 12842 household heads, 4 ward administrators, 12 chiefs, 1 Kenya Forest service personnel and 1 NEMA official. The Target population of households.

The sample size for this study was based on Krejcie and Morgan (1970) sample size determination formula. The formula is given as:

$$n = \frac{X^2 * N * P(1 - P)}{(ME^2 * (N - 1)) + (X^2 * P * (1 - P))}$$

Where

n=Sample size
 X^2 =Chi Square for the specified confidence level at 1 degree of freedom= (3.841) from tables
 N=Population size
 P=Population proportion (.50 in the table)
 ME=Desired margin of error (expressed as a proportion=0.05)
 $= 3.841 \times 12842 \times 0.5 (1-0.5) / 0.05 \times 0.05 (12842-1) + 3.841 \times 0.5 (1-0.5)$
 $= 12331.5305 / 33.06275$
 $= 373$ households

Using the formula, a total of 373 household heads were used in the study. In addition, 4 ward administrators, 12 chiefs, 1 Kenya Forest Service Personnel and 1 NEMA official participated in the study and were selected purposively to take part in the study giving a sample size of 391 respondents.

The study purposely sampled four wards namely Cheptais (Cheptais Sub-County), Chepyuk (Kopsiro Sub-County), Kaptama and Elgon (Mount Elgon Sub-County). The sampling of these wards was based on the fact that they border Mount Elgon Forest Reserve and thus the inhabitants of these sub-counties depend on forest resources for their livelihoods. In order to ensure that representative samples were derived from each ward, a multi-stage-cum-stratified random sampling procedure was utilised in choosing the household heads for the research. In the study, simple random sampling strategy was used in selecting the first household in each ward followed by systematic random sampling where every 5th household was selected. The household heads present at the time of the study were issued with a questionnaire. This process guaranteed that all the members of a particular population were accorded similar probabilities of being involved in the study population. In addition, purposive sampling was used to select 4 ward administrators, 12 chiefs, 1 Kenya Forest Service Personnel and 1 NEMA official to participate in the study.

The current used both quantitative and qualitative forms of collecting data and thus questionnaires, interview schedules and focus group discussions were used making this research a mixed methods approach. Construct

validity was determined by testing the hypothesis on the relationship between deforestation activities and livelihoods. Face validity was assessed by getting students undertaking PhD in the department of development studies to test-run the instrument to see if the questions appeared to be relevant, clear and unambiguous while content validity was ascertained by designing questionnaires, interview schedules and FGDs guides that adequately addressed the construct or area under investigation. In addition, research experts who had content in the area under investigation were consulted and their comments used to improve the questions in the questionnaire, interview schedules and FGD guide. In determining the reliability of the research instruments, the researcher pilot tested the instruments in the nearby trans-Nzoia county which shares similar characteristics as the study area. Thereafter Cronbach Alpha Coefficient was calculated. In this study, a Cronbach Alpha of .8232 was obtained indicating that all variables in the study were reliable. For interviews, the researcher ensured that data collected did not have any minor errors and at the same time all the research themes were captured during the instrument preparation, the process of interviews/focus Group Discussions and during the analysis stage.

The quantitative data from the questionnaire were first subjected to preliminary processing through validation, coding and tabulation in readiness for analysis with the help of the statistical package for social science (SPSS) computer package (Version 26). Frequencies, percentages, mean and Standard deviation were used to analyze quantitative data. Pearson Correlation analysis was employed to determine the relationship that exists

between the independent and dependent variable. Qualitative data from interview schedules and FGDs were thematically classified and arranged before they were reported in narrations and quotations as per the research objectives. In addition, the quantitative analysis was supplemented by qualitative descriptions to explore and expand on the quantitative finding in order to provide in-depth explanations of the findings and validation.

The researcher observed all the rules and regulations in carrying out research in Kenya. Before undertaking fieldwork. Privacy, confidentiality and openness in data collection was ensured throughout the study. The major ethical issues of concern were informed consent from the participants so as to remove job insecurity, privacy and confidentiality on information supplied, anonymity to safeguard the identity of the respondents and the researcher's sensitivity to human dignity (Suri, 2020). The researcher further sought consent from the respondents before participating in the study. In terms of

trustworthiness, respondents were asked to be open and honest when answering the questions. The identity of the respondents was not revealed in this research, and the respondents were assured that data obtained from them was purely going to be used for academic purposes only.

4. Results and Discussion

The aim of this paper was to determine the influence of settlement activities at mount Elgon Forest reserve area on sustainable livelihoods of the inhabitants in the reserve. To achieve this objective, the study participants were requested to indicate their level of agreement/disagreement on statements which covered the influence of settlement activities on sustainable livelihoods. The participants rated their response on a five-point Likert scale questions as; on a scale of 1-5, as Strongly Disagree (SD=1) Disagree (D=2) Neutral (N=3) Agree (A=4) and Strongly Agree (SA=5). Their responses were tabulated and the results are presented in Table 1.

Table 1: Responses on Influence of settlement Activities on sustainable livelihoods

Statement	SD		D		N		A		SA	
	F	%	F	%	F	%	F	%	F	%
Due to settlements, construction of houses has led to forest clearance leading to reduced rainfalls in the area	26	7.5	28	8.1	4	1.2	195	56.4	93	26.9
Due to the extreme weather conditions, agricultural productivity is poor, pushing vulnerable farmers to exploit limited natural resources from the forest	46	13.3	41	11.8	9	2.6	110	31.8	140	40.5
Due to shrinking land sizes the government allows limited farming in the forest area reducing food insecurity	54	15.6	52	15.0	2	.6	123	35.5	115	33.2
Increased population density has put pressure on the forest resources	48	13.9	40	11.6	8	2.3	108	31.2	142	41.0
Livestock farmers are allowed to graze their animals within the forest	43	12.4	30	8.7	3	.9	134	38.7	136	39.3
Agricultural intensification in our area has reduced the demand on forest resources while increasing agricultural productivity	102	29.5	92	26.6	15	4.3	67	19.4	70	20.2

Source: Field Data, 2022

Table 1 shows that 195 (56.45) study participants agreed with the assertion that due to settlements, construction of houses had led to forest clearance leading to reduced rainfalls in the area, 93 (26.9%) respondents were strongly in agreement with the statement, 28 (8.1%)

study participants were in disagreement with the statement and 26 (7.5%) were strongly in disagreement with the assertion while only 4 (1.2%) were neutral on the statement. The study found out that 83.3% of the inhabitants of mount Elgon acknowledged that due to

settlements in the area where inhabitants had constructed houses had led to forest clearance leading to reduced rainfalls in the area. This shows that the inhabitants depend on the forest for construction materials which in effect leads to deforestation. It is widely acknowledged that clearance of forest lands could lead to climate change which affects the livelihoods of the inhabitants. Thus, in the study area, clearance of forests for settlements could be a factor contributing to climate variability and variations in rainfall amounts and patterns which affects crop productivity. According to Panday *et al.*, (2015), deforestation can significantly lead to climatic variability and lead to warmer future climate forecasts with a higher likelihood of fires and droughts. The World Conservation Organization also states that by protecting forests and planting more trees, the effects of climate change can be lessened since forests retain carbon and the new trees will absorb CO₂ from the atmosphere. Similar to this, Kristjanson *et al.*, (2019) emphasize that by failing in our efforts to stop deforestation, we are also failing to take advantage of a crucial chance to slow down the effects of climate change. Similar to this, Silva *et al.*, (2020) claim that forests regulate the climate and that failure to take measures to stop the destruction of natural vegetation accelerates deforestation, leading to significant swings in temperature and rainfall over time.

Similarly, 140 (40.5%) respondents were strongly in agreement with the statement that due to the extreme weather conditions, agricultural productivity is poor, pushing vulnerable farmers to exploit limited natural resources from the forest, 110 (31.8%) respondents agreed with the assertion, 46 (13.3%) respondents were strongly in disagreement with the assertion and 41 (11.8%) respondents disagreed while 9 (2.6%) study participants were neutral. From the responses, it can be deduced that 72.3% of the study participants reported that agricultural productivity has been poor in the study area owing to extreme weather conditions. This has pushed vulnerable farmers to exploit limited natural resources from the forest. The exploitation of natural resources in unsustainable ways lead to depletion of these resources. The weather variability pattern in the study area has made the inhabitants over-depend on the forest resources for their livelihoods thus endangering the existence of these resources and their livelihoods. According to Gebrehiwot and van der Veen (2013), adverse climate change has a negative impact on agricultural productivity. Gebrehiwot and van der Veen (2013), also revealed that the issue of food availability is exacerbated by a decrease in per capita food production due to negative yield growth elasticity and an increase in food prices due to climate variability. Studies from the past have shown how forests and the areas around them have generally experienced decreases in precipitation and rises in temperature throughout time (Boon & Ahenkan, 2011). These modifications have a significant negative impact on the ecosystem's general health,

decreasing the availability of crops, fuelwood, medicinal plants, and other non-timber forest products (NTFPs). This will eventually put further strain on the livelihoods of the majority of impoverished, forest-dependent people. As forest plant species become extinct as a result of changing climatic patterns, biodiversity is lost, further destabilizing the environment and altering community livelihoods in the impacted areas (Dube *et al.*, 2016).

Rain-fed agricultural and livestock systems will bear the burden of climate extremes as rural livelihoods become more fragile, increasing the vulnerability of forest-dependent populations, who make up a sizable part of impoverished rural farmers (Ofoegbu *et al.*, 2016). Reduced agricultural yields specifically jeopardize food security and worsen the health of vulnerable populations like the elderly, women, and children (Altieri & Nicholls, 2017). Additionally, while the practice of grazing animals inside of forests is common among communities that are close to forests, biodiversity loss results in insufficient pastures, which increases the psychological strain on livestock farmers and forces them to look for alternative sources of animal feed.

Further, 123 (35.5%) respondents agreed with the statement that due to shrinking land sizes the government allows limited farming in the forest area reducing food insecurity, 115 (33.2%) respondents strongly agreed with the statement, 54 (15.6%) study participants were strongly in disagreement with the statement and 52 (15.0%) respondents disagreed while 2 (.6%) respondents were neutral. The study thus found out that 68.7% of the sampled respondents indicated that the government allows limited farming in the forest thus cushioning farmers against food insecurity. This could be one way of regenerating the lost forest area where farmers are allowed to plant crops and trees. People are heavily dependent on community woods for their livelihoods since forestry, agriculture, and animal husbandry are intertwined with the agricultural system (Walelign & Jiao, 2017). This supports people's involvement and active participation in forest management even more.

In addition, 142 (41.0%) study participants were strongly in agreement with the assertion that increased population density had put pressure on the forest resources, 108 (31.2%) respondents agreed with the statement, 48 (13.9%) were in disagreement and 40 (11.6%) disagreed while 8 (2.3%) were neutral. From the responses, it can be acknowledged that about 72.2% of the study participants believed that increased population density in mount Elgon region has put pressure on the existing forest resources. This was found to be consistent with the findings of Chamberlain, Small, and Baumflek, (2019) and Ngalim, and Edgar, (2022) who found in their studies that numerous plant species that generate NTFPs are rapidly vanishing owing to overexploitation,

unsustainable usage, and increasing population pressure on forest resources, especially in tropical regions, as a result of the indiscriminate harvesting of timber.

Similarly, 136 (39.3%) study participants strongly agreed with the statement that livestock farmers were allowed to graze their animals within the forest, 134 (38.7%) respondents agreed with the assertion, 43 (12.4%) study participants strongly disagreed and 30 (8.7%) respondents disagreed while 3 (.9%) were neutral on the assertion. The study findings suggested that 8.0% of the study participants reported that livestock farmers were allowed to graze their animals within mount Elgon forest. This implies that the inhabitants were getting animal pasture from the forest and this was attributed to population density which has made the existing lands to be sub-divided into parcels which cannot sustain livestock farming. Thus, allowing farmers to graze their animals within the forest is one way of enhancing livelihood sustainability in the study area. Livestock productivity according to Mekasha, (2014) directly affects the poverty status of households. This therefore shows that allowing livestock farmers to graze their animals in forest land is one way of eliminating poverty at household level. Singh, Bhutia, Bhutia and Babu, (2022) in their study found that farmers around the Himalayas were obtaining animal feeds from the forest affecting species biodiversity in the forested lands.

Moreover, 102 (29.5%) respondents strongly disagreed with the statement that agricultural intensification in mount Elgon area had reduced the demand on forest resources while increasing agricultural productivity, 92 (26.6%) respondents disagreed with the assertion, 70

(20.2%) study participants strongly agreed with the statement and 67 (19.4%) respondents were in agreement with the statement while 15 (4.3%) respondents were neutral on the statement. The responses points out that 57.1% of study participants believed that agricultural intensification had not reduced demand for forest resources. This implies that most of the inhabitants in mount Elgon region depend heavily on forest resources for their livelihoods. This is consistent with the findings of Saalu, Oriaso and Gyampoh, (2020) who found in their study that most of the people living within the proximity of Kakamega forest depend on forest products and services for their daily income and well-being. This was also found to be consistent with the findings of Shukla, Dhyani, Pujari, Mishra and Verma, (2022) who acknowledged in their study that cropland expansion and intensification are the primary approaches for increasing agricultural productivity in response to increased biomass demand, but they are also major drivers of biodiversity loss.

4.1 Relationship between Settlement Activities and Sustainable Households' Livelihoods

The hypothesis of this study stated that:

H₀₁: There is no significant relationship between settlement activities and sustainable household's livelihoods of the inhabitants living in mount Elgon Forest.

This hypothesis was also tested using Pearson Correlation analysis and the results are presented in Table 2.

Table 2: The Correlation Coefficient between Settlement Activities and Sustainable Households' Livelihoods

	Sustainable Households' Livelihoods	
Settlement activities	Pearson Correlation	.614**
	Sig. (2-tailed)	.000
	N	346

** Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows that there was a significant positive correlation between settlement activities and sustainable households' livelihoods among the inhabitants living in the mount Elgon forest ($r = .614; p = .000$). This means that at 95% confidence level the r value for settlement activities was .614 showing a positive correlation with sustainable households' livelihoods among the inhabitants living in the mount Elgon forest. However, the r value was positive implying a positive correlation which means that increases in settlement activities in the area lead to enhanced livelihoods. Thus, the null hypothesis which stated that there is no significant relationship between settlement activities and sustainable household livelihoods of the inhabitants

living in mount Elgon Forest was rejected and the alternate accepted.

In this study interviews and focus group discussions were held in the study area to determine the influence of settlement activities on sustainable livelihoods among the inhabitants living in mount Elgon forest. Interviews conducted showed that there was increased population density in the study area leading to land fragmentation which has affected food production negatively. It also emerged that due to increased population density, there is high dependency on forest resources which also has affected the forest structure and ecosystem. This over-dependency leads to over-exploitation of these forest

products making them unsustainable for future generations.

4.2 Qualitative Data on Influence of settlements on sustainable livelihoods

Interviews and FGDs were conducted to obtain qualitative information on the influence of settlements on sustainable livelihoods among the inhabitants around Mount Elgon forest reserve. The study found out that due to influx of a large number of people in the area, there has been land fragmentation in the area and overdependency on forest products due to poverty in the area. The land fragmentation factor had led to food insecurity and reduced forest cover. One of the key informants had this to say:

During the past ten years this place was so fertile that we used to plant our crops without any use of fertilizers but currently due to land fragmentation, soils in the area have been exhausted since each family plants year in year out in the same place. Soil fertility has been depleted so much to an extent that we have to use fertilizers during planting (65-Year-old inhabitant of Kapsokwony).

In addition, one of the inhabitants had this to say:

We actually depend on the forest for our food supply and also for non-timber products such as medicine, honey, vegetables and fruits. The overdependency on the forest has actually been occasioned by population explosion leading to high rate of settlement in the area. For our survival we have to depend on the forest or migrate to other regions where farms are still large (46-year-old Lady from Kaptama).

This is in line with the findings of Nath and Inoue, (2009) who found out that jhum community in Bangladesh could not ensure their food security year round, so, for survival they adopted several alternative livelihood strategies such as extraction and sale of timber and non-timber forest products (NTFPs), including young bamboo shoots, wild edible fruits, mushrooms, cane, and wild vegetables from nearby primary and secondary forests, supplying labour to timber traders, and seasonal migration to other areas for agricultural work.

5. Conclusion and Recommendations

5.1 Conclusion

Based on the findings of the study, it was concluded that there was a significant positive correlation between settlement activities and sustainable households' livelihoods among the inhabitants living along the Mount Elgon forest ($r = .614; p = .000$). This means that at 95% confidence level the r value for settlement activities was .614 showing a positive correlation with sustainable households' livelihoods among the inhabitants living along the Mount Elgon forest.

5.2 Recommendations

The paper recommended that there is need to devise ways of reducing population density and land fragmentation in the study area since these have made most of the inhabitants to be wholly dependent on forest products for their survival.

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