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Effects of Participatory Forest Management on the Livelihoods of Local Communities around Muguga Forest, Kiambu, Kenya

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Abstract- ***Participatory Forest Management has been widely promoted as a strategy to enhance forest conservation while improving the livelihoods of forest-adjacent communities. This study evaluates the effects of PFM on the livelihoods of local communities surrounding Muguga Forest in Kiambu County, Kenya. A mixed-methods approach was adopted, combining quantitative and qualitative data collected from members of the Muguga Ecosystem Research Community Forest Association (MERCFA) through questionnaires, key informant interviews, and focus group discussions. The findings indicate that PFM has contributed to livelihood improvement through income-generating activities such as tree nursery establishment, beekeeping, agroforestry, and controlled grazing. These activities have enhanced household income, promoted livelihood diversification and improved access to forest resources. However, the benefits remain modest and unevenly distributed due to constraints such as limited market access, inadequate financial support, weak institutional frameworks and low youth participation. The study concludes that while PFM positively influences livelihoods, its effectiveness is constrained by structural and governance challenges. Strengthening institutional support, enhancing market linkages and improving capacity building are critical to maximizing the livelihood benefits of PFM.***

Keywords: Participatory Forest Management, livelihoods, Muguga Ecosystem Research Community Forest Association community forestry, Muguga, Forest, income generation

I. INTRODUCTION

Participatory Forest Management represents a paradigm shift from centralized forest governance toward inclusive, community-based approaches that integrate conservation and socio-economic development. The approach recognizes that local communities living adjacent to forests depend significantly on forest resources for their livelihoods and are therefore critical stakeholders in sustainable forest management. Forests are also vital for ecological balance, biodiversity, and livelihoods in Africa. However, deforestation, land degradation, and unsustainable exploitation pose significant challenges to environmental sustainability and rural development (Blomley & Ramadhani, 2006). A strategic approach to forest governance and resource management, PFM involves governments, local people, and other stakeholders. The foundation of PFM is decentralization and community-based natural resource management principles, aiming to enhance local ownership, improve livelihoods, and ensure long-term forest ecosystem sustainability (FAO, 2025).

Forests that are managed by communities and Indigenous peoples, like those in Ixtlán de Juárez in Mexico, greatly reduce the frequency of wildfires and enhance biodiversity. After taking over from private concessions in 1982, these communities have embraced sustainable logging methods and have shown success in reducing poverty, creating jobs, and diversifying their economies through businesses like ecotourism and furniture manufacturing. With its roots in Indigenous traditions, the participatory management system guarantees that every member of the community has a say in decisions, fostering general social and environmental advantages (Farthing, 2024). Better livelihoods have resulted from the involvement of local communities in forest governance, which has been made possible in Nepal by community forestry programs and in India by Joint Forest Management (JFM). Saigal (2003), 18% of all state forests in India are covered by JFM, which encourages agreements between the Forest

Department and local communities to manage and conserve forest land together while sharing benefits and responsibilities.

In Kenya, PFM has been institutionalized through the Forest Conservation and Management Act 2016, which provides a framework for collaboration between the Kenya Forest Service and Community Forest Associations. Muguga Forest, located in Kiambu County, is an important ecological and socio-economic resource that supports surrounding communities. However, increasing population pressure, urban expansion, and land fragmentation have intensified dependence on forest resources, raising concerns about sustainability. The establishment of the Muguga Ecosystem Research Community Forest Association (MERCFA) has enabled local communities to participate in forest management while accessing livelihood opportunities. Despite the potential of PFM to improve livelihoods, its outcomes are often context-specific and influenced by institutional, economic and social factors. While existing studies suggest that PFM enhances income diversification and resource access, empirical evidence from peri-urban forests such as Muguga remains limited. This study therefore examines the extent to which PFM contributes to livelihood improvement, focusing on income generation, employment creation, resource access and livelihood diversification among local communities.

II. LITERATURE REVIEW

Forest management plays a crucial role in shaping the livelihoods of forest-adjacent communities, particularly in developing countries where forests serve as a critical source of food, fuelwood, medicine, and income. According to Wunder et al., (2014), sustainable forest management practices can enhance local livelihoods by maintaining ecosystem services while also providing opportunities for income through NTFPs, ecotourism, and agroforestry. PFM models, such as those practiced in Kenya, Tanzania, and Nepal, are designed to create a balance between conservation and community benefit. By involving communities in forest governance through institutions like CFAs, these models aim to increase access to forest resources, improve transparency in decision-making, and promote equitable benefit-sharing.

PFM aims to harmonize conservation efforts with economic direct benefits to forest-adjacent communities. Research by Jackson et al. (2024) suggests that PFM contributes to income generation, employment opportunities, and enhanced access to forest resources. Communities involved in PFM as stipulated in SDG 17, states that an action by one group affects other groups or has an impact on other groups, partnerships are therefore necessary in the achievement of sustainable goals in natural resources such as forests, activities including agroforestry, ecotourism, and the sustainable harvesting of non-timber forest products are common among CFAs. (United Nations Development Programme, 2024). This therefore shows how action from surrounding communities has an impact on the health and growth of forests. By engaging adjacent communities, CFA creates a responsible community that equally benefits and is responsible for the said benefits of forests. Communities are more likely to embrace sustainable practices that preserve forests while reaping the benefits of the resources they oversee when they are given more authority and included in decision-making procedures. Furthermore, PFM programs that recognize and utilize traditional knowledge systems frequently result in conservation tactics that are more flexible and suitable. Thus, communities involved in forest management not only help conserve biodiversity but also reap financial rewards, which enhances livelihoods and fosters a stronger commitment to sustainability over the long run. PFM builds a cooperative atmosphere that supports conservation initiatives and encourages resilience to environmental challenges by acknowledging the value of local knowledge and encouraging collaborations between communities and government organizations.

A study done by Ochola et al. (2021) found that households participating in PFM reported increased household incomes due to regulated access to forest products like honey, medicinal plants, and fuelwood. PFM in Muguga Forest has created income opportunities through eco-tourism, beekeeping, and sustainable extraction of non-timber forest products while also providing employment in conservation

activities. Additionally, training programs have improved agricultural productivity and environmental awareness. However, strict forest regulations have limited access to resources, affecting traditional land use and subsistence activities. Challenges such as inadequate financial support, weak policy enforcement, and inequitable benefit-sharing continued to undermine PFM's effectiveness. Strengthening community participation and ensuring equitable access to forest resources can enhance the sustainability of PFM in Muguga Forest (Gachanja & Wahome, 2022).

Households typically experience higher income levels, better food security, and increased resilience to environmental shocks when community rights to access and manage forests are clearly defined and supported by law, according to studies by Angelsen et al. (2014) and Lund et al. (2018). On the other hand, communities may experience limited access, resource conflicts, and fewer options for a living when forest management is done poorly or top-down. For instance, although CFAs have increased participation in Kenya, Mutune and Lund (2016) note that funding, capacity, and unclear land tenure frequently hinder the full realization of livelihood benefits. Furthermore, vulnerable groups may be marginalized by elite capture and gender exclusion, which compromises the intended equity goals of participatory approaches.

According to a FAO (2020) report, forest management may not result in appreciable gains in household well-being in the absence of integrated support, such as technical training, market access, and income source diversification. Community attempts to obtain consistent benefits from forests are also made more difficult by the way that climate change is changing forest ecosystems and resource availability. Consequently, there is a growing recommendation for adaptive forest management strategies that incorporate climate-smart agriculture, payment for ecosystem services, and strengthened community institutions (Chomba et al., 2015). According to this literature, forest management needs to be inclusive, legally supported, environmentally sustainable, and connected to larger rural development plans in order to effectively support local livelihoods.

CFAs frequently encounter obstacles that prevent them from realizing their full potential, despite their promise. According to Humphrey et al. (2014), these include a lack of funding, poor technical training, and regular disputes with government officials regarding roles, duties, and benefit distribution. According to the FAO (2020), the existence of clear land tenure agreements and strong legal frameworks that acknowledge and defend community rights are also essential for the success of CFAs. Participatory forest management initiatives run the risk of becoming symbolic rather than transformative in the absence of such structural support, highlighting the necessity of continuous policy reforms and institutional capacity building.

III. METHODOLOGY

3.1 Study Area

The study was conducted in and around Muguga Forest, located in Kiambu County, Kenya. Muguga Forest lies approximately 25 kilometers northwest of Nairobi and forms part of the larger Central Highlands Forest ecosystem. The forest is ecologically significant, hosting a variety of indigenous and exotic tree species and serving as a critical site for forestry research under the Kenya Forestry Research Institute (KEFRI). It also plays an important role in environmental conservation by supporting biodiversity, regulating microclimate conditions, and contributing to water catchment functions within the region.

The surrounding area is characterized by a mix of rural and peri-urban settlements, with increasing population pressure due to its proximity to Nairobi. Land fragmentation and urban expansion have reduced farm sizes, compelling households to adopt diverse livelihood strategies. The local communities primarily depend on small-scale agriculture, including crop farming and livestock keeping, supplemented by forest-based activities such as firewood collection, grazing, and non-timber forest product utilization. The presence of the MERCFA provides a formal structure through which community members participate in forest management under PFM framework.

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3.2 Research Design

The study adopted a mixed-methods research design, integrating both quantitative and qualitative approaches to provide a comprehensive assessment of the effects of Participatory Forest Management on local livelihoods. The quantitative component was based on a descriptive survey design, which enabled the systematic collection of data from a defined population to assess patterns of participation, income generation and access to forest resources. This approach facilitated the generation of measurable and comparable data across all respondents.

The qualitative component complemented the survey by providing in-depth insights into community experiences, perceptions and attitudes toward PFM. This was particularly important in understanding complex issues such as benefit-sharing, institutional challenges and social dynamics that cannot be fully captured through quantitative methods alone. The integration of the two approaches enhanced the robustness of the study by allowing for triangulation and cross-validation of findings improving the reliability and validity of the results.

3.3 Data Collection

Primary data for the study were collected from members of the Muguga Ecosystem Research Community Forest Association who are directly involved in participatory forest management activities. Structured questionnaires were administered to selected registered respondents to gather quantitative data on household characteristics, participation in PFM activities, income sources and access to forest resources. The questionnaires included both closed-ended and a few open-ended questions to allow for standardized responses while also capturing additional insights. key informant interviews were also conducted with representatives from key institutions involved in forest management, including KFS, KEFRI and local administrative leaders like chiefs and church leaders. Lastly, focus group discussions were also carried out with community members to obtain qualitative data on collective experiences, challenges and perceptions regarding PFM. These discussions facilitated interaction among participants, enabling the exploration of shared views and differences in experiences across groups.

3.4 Data Analysis

Quantitative data obtained from the questionnaires were coded and entered into statistical software for analysis. Descriptive statistics such as frequencies, percentages, measures of central tendency among others were used to summarize the data and identify patterns among respondents and their views on PFMs contribution to their livelihoods.

Qualitative data obtained from interviews and focus group discussions were analyzed using thematic analysis. This process involved organizing the data into meaningful categories based on recurring themes related to the study objective, such as income generation and challenges associated with PFM. The data were then carefully reviewed, coded and interpreted to draw connections between community experiences and the broader objective of the study. This integration of quantitative and qualitative findings allowed for a comprehensive interpretation of the results, providing both statistical evidence and contextual explanations.

IV. RESULTS AND DISCUSSION

The largest group of 18 respondents reported earning an average monthly income of Ksh.5,000, followed by smaller groups of 4–5 respondents each earning Ksh.6,000–11,000. 2 respondents reported higher incomes of Ksh.36,000, Ksh.60,000 (5 respondents), and Ksh.120,000 (1 respondent). The median monthly income is Ksh.6,000, while the average household expenditure stands at Ksh.8,500, suggesting that many households spend more than they earn.

The researcher further sought to find out which of the PFM activities studied was the most profitable and life-sustaining and how this impacted the respondents' livelihoods.

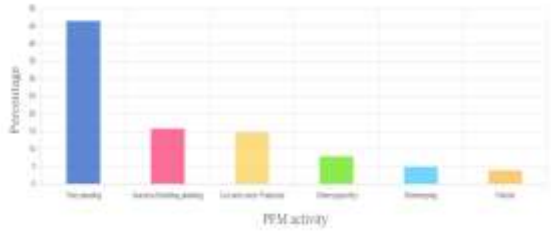

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Figure 4.1: Most profitable PFM activity (n=84)

The data in Figure 4.1 above revealed that among the PFM activities, tree planting is considered the most profitable, with 46.53 percent respondents identifying it as the top income-generating activity. This was followed by nursery seedling planting with 15.84 percent respondents and cut and carry/pastures with 14.85 percent. Other activities like beekeeping and patrols were less frequently mentioned, with 4.95 percent and 3.96 percent of the respondents supporting them, respectively, while unspecified activities such as animal keeping, like goats, accounted for 7.92 percent.

Plate 4.1: PELIS system establishment in cooperation with CFA

As for the effect of PFM on livelihoods, 89.11 percent of the participants positively identified these activities as having had an impact on their livelihood. PFM has led to various livelihood improvements, with food-related benefits being the most dominant. They reported improved food security, food supply, or increased food availability through farming, grazing, and access to forest products like maize, beans, potatoes, and fodder. firewood collection contributed both to household energy needs and income generation as shown on plate 4.2 below, showing some of the private woodlots. Income generation through activities such as farming, tree planting, milk production, selling seedlings, and table banking was also reported as a product of the CFA membership. Other notable impacts included training and capacity building, e.g., in fruit farming and tree nursery management, socialization, community bonding, and access to a clean or relaxed environment for mental well-being. Programs like PELIS as shown plate 4.1 above, were frequently credited for enabling farming in harvested areas and improving access to fodder.

Plate 4.2: Products of a woodlot establishment

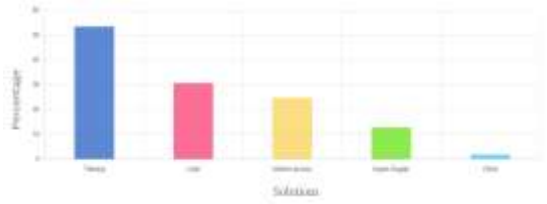

Figure 4.2: Proposed solutions to increase income from PFM activities (n=75)

Furthermore, the surveyed members were asked to suggest some of the possible solutions that would further improve the capacity of PFM to improve their livelihoods. They highlighted the need for training as the most significant factor as shown on figure 4.2. This was followed by the need for better access to land and markets, which are essential for improving productivity and ensuring products reach buyers. Additionally, access to necessary inputs such as seeds, tools, and equipment was mentioned as a way to boost income.

The results presented above present a summary of how PFM has influenced the livelihoods of CFA members revealed through data analysis. These findings further suggest that the narrow financial margin points to limited savings and low investment capacity, forcing some households to draw significantly on forest resources for fuelwood, grazing and charcoal production despite Kiambu County being among Kenya's wealthier regions with an average monthly income of Ksh.23,899, income

inequality remains pronounced, with rural households, especially casual laborers, earning as little as Ksh.4,000 monthly (Njeru, 2021).

More findings from household survey data revealed that the benefits from joining MERCFA are both direct and indirect. Members accessed food security through the PELIS, which allowed intercropping of food crops with young trees. Households also benefited from cut-and-carry fodder to sustain livestock, including goats and pigs distributed by the CFA with government under programs where the first offspring were returned to the group, while subsequent ones remained with the family with some of the goat breeds shown on plate 4.3.

Plate 4.3: Goats distributed to surveyed members for milk production

This system enabled households to build livestock assets without direct purchase. Families also secured fuelwood and timber for domestic use, reducing household expenditure. The CFA in collaboration with NGOs introduced energy saving Jikos that used less firewood and charcoal to reduce the pressure on forests as shown on plate 4.4 below. In addition, seedling production through community and individual nurseries provided small but consistent income, while niche activities like beekeeping and eco-tourism offered supplementary earnings.

The FDG results indicate that PFM has contributed positively to the livelihoods of local communities. Surveyed respondents noted increased opportunities in tree nurseries, seedling sales, beekeeping, honey production, butterfly farming, eco-tourism, poultry, dairy goats, and energy-saving jikos. Communities have benefited socially through improved income levels, reduced poverty, better school attendance by children, and stronger social networks. PFM participation has diversified household income streams and enhanced access to training and development support. However, challenges such as resource limitations, low community motivation, and insufficient partner engagement may slow the full realization of livelihood benefits.

Plate 4.4: Selling of firewood from woodlots established under participatory forest management.

These patterns identified reflects and agrees with findings in broader Kenyan research, such as Mutune and Lund (2016), in a comparative study of 286 households across Kenya, indicated that members of the CFA had greater total and forest-derived incomes than those not in the CFA, but noted that these gains were largely linked to donor-supported activities and access to markets rather than direct extraction of forest products. They further observed that while PFM enhances livelihoods, governance remains dominated by the KFS, as echoed by the KEFRI assistant director in my interview, emphasizing that CFAs are yet to reap benefits due to the non-existent written down guidelines on the benefit sharing between CFAs, KFS, and adjacent communities who are entitled to benefits, whether they were members or not, limiting community decision-making power.

Our findings further agree with research by Matiku et al. (2011) who demonstrated that households in PFM zones enjoyed positive net livelihood benefits compared to those in non-PFM zones, where forest costs often outweighed benefits. They further showed that the magnitude of benefits declined with distance from the forest and that gendered differences shaped access to resources, with women more involved in

firewood collection and men dominating activities such as beekeeping.

Kabasa too agreed and indicated that PFM does enhance local livelihoods by improving food security, providing income through activities such as agroforestry, seedling production, and non-timber forest products, and strengthening community cohesion (2017). However, the gains are described as modest and unevenly distributed, with households closer to forests or with better access to resources benefiting more than others. The study emphasized that these livelihood benefits are often limited by weak markets, poor value chains, governance challenges, and dependence on external institutional support. Which further supported our findings on livelihood improvement suggestions that would improve PFM capacity to strengthen livelihoods.

Overall, the findings indicate that in Muguga, PFM has contributed positively to household welfare by enhancing food security, creating income streams, and strengthening social cohesion. However, these benefits remain modest, unevenly shared, and economically fragile. Without enhanced institutional backing, improved training, stronger market linkages, and fair benefit-sharing mechanisms, PFM will continue to play only a limited role in poverty reduction.

V. CONCLUSION

The study found that PFM has contributed significantly to improving the livelihoods of local communities around Muguga Forest. Through the framework of MERCFA, members have engaged in several income-generating and subsistence activities that directly benefit their households. Key among these tree planting of forest establishment either in the forest or within the woodlots which leads to the sale of timber and firewood although within the period of study few trees were harvested and sold showing that it is a long term investment while tree nursery establishment, where farmers raise and sell seedlings to both conservation projects and private buyers ranked as the most rewarding despite the challenges in marketing among others, and beekeeping, which provides a steady source of income through honey production. The cut-and-carry pasture system has allowed livestock farmers to sustainably harvest grass for fodder without degrading forest ecosystems, while some community members benefit from controlled firewood collection, which reduce household energy costs and supplement incomes. Ecotourism ranked as the least and newly introduced PFM activity which has the potential to attract the youth and give them a chance to participate in PFM if the right motivation is offered.
In addition, PFM initiatives have opened up opportunities for employment and capacity building, as community members participate in forest patrols, reforestation programs, and maintenance works organized in partnership with the KFS and other conservation agencies. These engagements have not only enhanced local economic resilience but also promoted environmental awareness and a sense of stewardship among community members. However, the study also found that these benefits are unevenly distributed, with more active or better-connected members gaining higher returns. Challenges including limited access to markets, unstable prices for forest products, insufficient technical skills, and delays in payments have constrained the overall economic benefits. Nevertheless, PFM has fostered social cohesion, enhanced livelihoods, and promoted collective responsibility for forest conservation and the sustainable use of resources in Muguga Forest.

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