

Factors Impacting Benefits of Participatory Forest Management in Upper Imenti Forest, Meru County, Kenya

Josephine Kamene Musyoki^{1*}, Lamech Felix Mogambi Ming'ate^{2*}, Joseph Muriithi², Mbuvi Tito Edward Musingo¹, Joram Kagombe¹

¹Kenya Forestry Research Institute, Nairobi, Kenya

²Department of Environmental Studies and Community Development, Kenyatta University, Nairobi, Kenya

Email: *jmusyoki@kefri.org, *josephinemusyoki2021@gmail.com, mingatefelix@gmail.com, mingate.felix@ku.ac.ke, muriithi.joseph@ku.ac.ke, mtembuvi@gmail.com, tmbuvi@kefri.org, mtembuvi@gmail.com, tmbuvi@kefri.org

How to cite this paper: Musyoki, J. K., Ming'ate, L. F. M., Muriithi, J., Musingo, M. T. E., & Kagombe, J. (2024). Factors Impacting Benefits of Participatory Forest Management in Upper Imenti Forest, Meru County, Kenya. *Open Journal of Forestry*, 14, 183-196.

<https://doi.org/10.4236/ojf.2024.143012>

Received: December 4, 2023

Accepted: May 19, 2024

Published: May 22, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

This study focused on identifying factors affecting the benefits of Participatory Forestry Management (PFM) income generating activities in Upper Imenti Forest and whether they are dependent on status of participation in forest management through membership of Community Forest Association (CFA) or not. Cross-sectional survey research design was applied for collecting quantitative data using a semi-structured questionnaire administered to 384 households stratified on the basis of PFM participation status. Qualitative data was collected through focused group discussions using a checklist and key informant interviews using an interview schedule. Using Statistical Package for Social Sciences version 25, Binomial regression with Wald Chi-square was analyzed to identify factors perceived to be significantly influencing benefits for PFM participants and Pearson Chi-square to compare factors perceived to be affecting PFM and non-PFM participants. CFA members' participation in PFM was significantly and positively affected by benefits of PFM income generating activities and forest products accessed in the forest. Benefits linked to Plantation Establishment for Livelihood Improvement System (PELIS) for CFA members were significantly reduced by enforcement of moratorium policy since February 2018, diseases and pests, poor PELIS guideline adherence and animal damage. Benefits related to state forest access for firewood by the CFA members were negatively influenced by the moratorium policy. Diseases and pests affected benefits associated with bee keeping significantly. Comparing factors under different PFM participation status, crop production was significantly affected by policy changes, pest and diseases, animal damage and PELIS guideline adherence for CFA members than for Non-CFA members. Policy changes also affected the CFA members significantly in firewood

collection and access to fodder in the state forest than the Non-CFA members. Hence, sustainable community participation in Upper Imenti Forest management requires: increasing PFM benefits, addressing factors reducing benefits and enhancing active participation of CFA members in PFM related decision-making processes.

Keywords

Participatory Forest Management, Community Forest Association, Sustainable Community Participation, Access to Forest Products, Moratorium Policy, Income Generating Activities

1. Introduction

Successful implementation of Participatory Forest Management (PFM) can only be secured if the benefits resulting from forest resources are accessed by the community members involved in its management (Mbeche et al., 2021). Effectiveness of PFM activities is derived from profits or benefits obtained locally contributing to poverty alleviation and enabling local forests' adjacent communities to overcome any emerging challenges while ensuring that the forest is managed in a sustainable manner (Kinyili, 2014). This requires involvement of the community members in PFM income generating activities or community forest enterprises (CFEs) that are affected by various factors depending on the nature of activity being undertaken (Ming'ate et al., 2014a, 2014b). For instance, in Brazil the benefits of community forest enterprises (CFEs) on timber sales were influenced by: decrease in number of associations/groups/stakeholders partaking the costs of extension services and other costs; type of species extracted; location of the enterprise; cost of equipment and value addition; marketing strategies; rate of processing and taxes paid among others (Humphries et al., 2012).

The main conditions that enhance benefits and sustainability of such forest-based enterprises included: rights to use the forest for commercial purposes, a highly cohesive and resilient social group and highly viable entrepreneurial skills (Macqueen, 2010). Forest enterprises providing forest products and or services may offer financial or non-financial value which act as an incentive to communities to participate actively in local management and protection of the forest resource (Hing & Riggs, 2021). It was similarly noted in Arabuko Sooke Forest in Kenya that if communities are denied such rights or incentives, they continue engaging in illegal activities hence denying the government possible source of revenue (Mbuvi et al., 2018). But, cohesive social institution offers better political influence; enhancing marketability of products and services and increasing the amount or scope of proceeds to stakeholders (Musyoki et al., 2022). Policy makers can also help through finding ways for easing governmental bureaucracies and providing assistance through social groups such as Community Forest Associations (Ming'ate, 2016). Furthermore, better entrepreneurial skills

increase the opportunities for higher benefits hence encouraging improved management of the forest resources (Macqueen, 2010).

In Cameroon, Foundjem-Tita et al. (2018) noted that community forests could be managed as commercial enterprises. Factors affecting benefits were identified as: the nature of activities implemented, the capability of the community forest entrepreneurs to run the business themselves rather than delegating to others, and on the capacity of the members involved in the management of timber related enterprises to expand into non-wood forest products and other agronomic activities. Viable determinants of community forestry enterprises involves: the authenticity of the community forest form, the enterprise type the community concentrates on and the kind of support provided to the community forest. It has also been recommended that community enterprises related to community forests require support such as capital and training on elementary principles for successful enterprise development (Meinhold & Darr, 2019). Rana (2016) noted that in Nepal, there was a decline in abstraction of fuel wood with increase in physical distance to forests, increasing forest establishment in individual farm-lands, adoption of vegetable farming as a cash crop, increased accessibility of other sources of energy for cooking, rural-urban immigration of youths and male adults and alterations in distribution guidelines. Decline in fodder extraction from the forests was associated with increased farm forestry in private farms, reduced livestock numbers due to revolution of agricultural practices, and inadequate human resources owing to rural urban immigration.

This study was therefore designed to analyze factors that influence benefits gained from PFM income generating activities to CFA members in Upper Imenti Forest in Kenya. The aim was to provide recommendations that can help developing countries such as Kenya to enhance sustainable participation of CFA members in PFM implementation of income generating activities. Thus the paper research question was; what are the factors that influence the benefits of PFM income generating activities to CFA members adjacent to Upper Imenti Forest? It is hypothesized in this paper that there are no factors influencing the benefits of PFM income generating activities to the CFA members in Upper Imenti Forest.

2. Material and Methods

2.1. Study Area

The study was undertaken in Upper Imenti Forest which is estimated to have a total area of 10375.800 hectares and situated in Meru County in Eastern Conservancy of Kenya under Kenya Forest Service. The Forest Block terrain is 2500 meters above sea level and it is located on latitude 0° 3'0" and longitude 37° 31'59.98" (KFS, 2010). It is part of Mount Kenya Forest Ecosystem gazetted vide Legal notice Number 104 of 1938 under Forest Department (now Kenya Forest Service) for the purpose of forest and water conservation, utilization and development and it is rich in biodiversity and other resources (KFS, 2018). The

Upper Imenti Forest is managed under the Meru Central Forest Station in Ki-noru under the Meru County Ecosystem in collaboration with a Community Forest Association namely Meru Forest and Environmental Conservation and Protection Association (MEFECAP) and other stakeholders involved in implementation of Participatory Forest Management (KFS, 2010; KFS, 2019). The forest has been divided into 9 beats namely: Thege, Meru station, Nchoroiboro, Kibaranaki, Kithirune, Nkunga, Kithoka, Kithima and Kambakia (KFS, 2019) as shown in the map below (Figure 1).

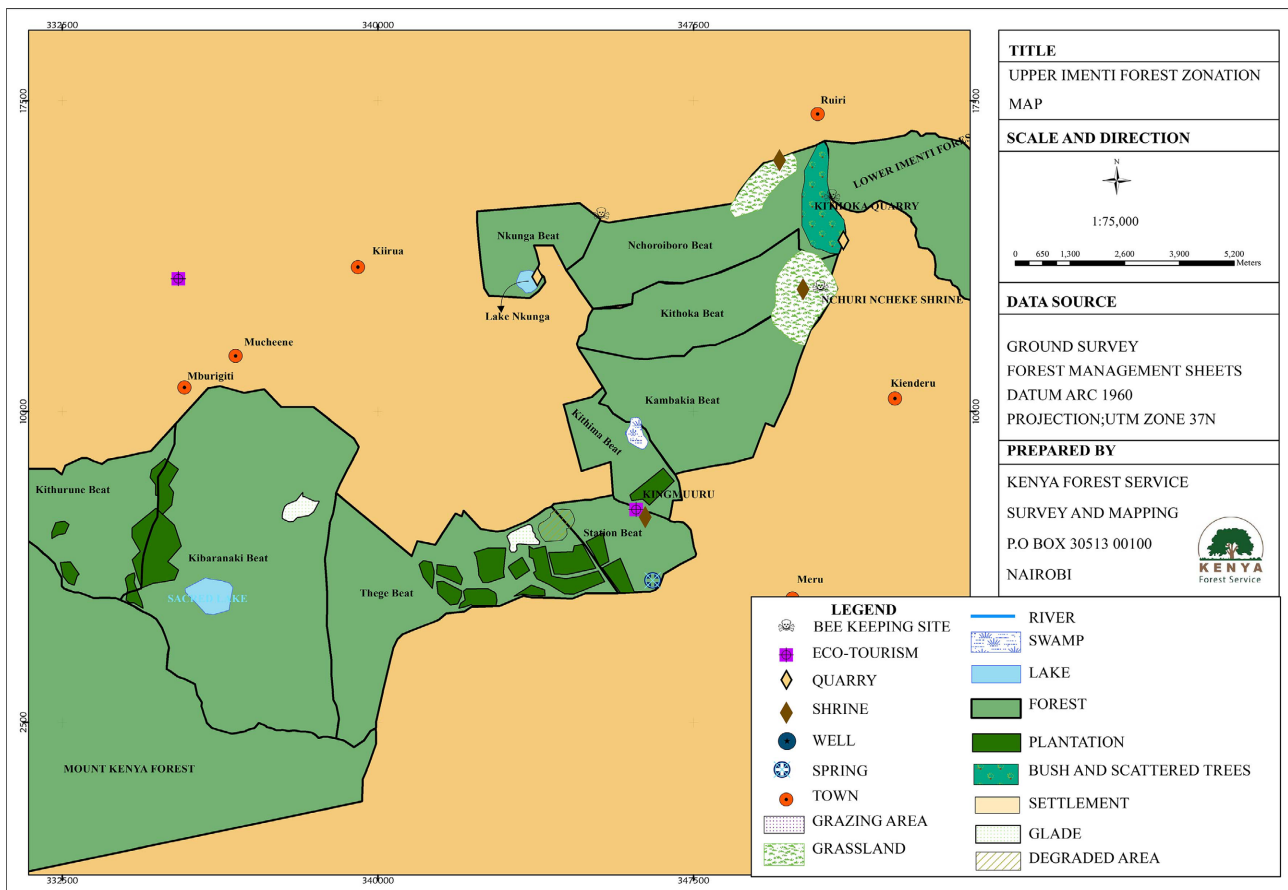


Figure 1. Location of Upper Imenti Forest and resources available (KFS, 2019).

2.2. Research Design and Sampling Procedure

This study adopted a cross-sectional survey research design which encompasses collection of information through interrogation or administration of a questionnaire to a selected group of people (Thomas, 2023). Both open and close ended semi structured questionnaires were used for the household survey making it possible to collect both qualitative and quantitative data respectively to enhance triangulation of the data sources while also ensuring complimentary cross validation (Creswell, 2014; Hesse-Biber, 2010). Simple random sampling was used to sample households from the community living adjacent to Upper Imenti Forest.

2.3. Sampling and Data Collection Procedures

Both primary and secondary data sets were collected in this study. Secondary data was obtained through on-line and physical relevant literature review. Primary data on factors affecting PFM related income generating activities was obtained through household interviews using semi-structured questionnaires. The Upper Imenti Forest is located within 3 Sub counties in Meru County (The County Government of Meru, 2018) with a total population of 121,097 households (Kenya National Bureau of Statistics, 2019). The formula by Cochran (1963) in Kothari (2004) was used to determine the study sample size: $n_0 = Z^2 pq \div e^2 = (1.96)^2(0.5)(0.5) \div (0.05)^2 = 385$. This was considered valid where n_0 is the sample size, $Z = 1.96$ (95% confidence level); $p = 50\%$ (sample proportion in the study population presumed to have the characteristic of interest) while $q = p - 1 = 0.50$; $e = 0.05$ (desired precision rate). The Upper Imenti Forest covered 3 Sub counties in Meru County which have a total population of 121,097 households (Kenya National Bureau of Statistics, 2019). Therefore with the given finite population, the sample size for the household survey was determined as 384 (that is, 192 CFA and 192 Non-CFA) households selected randomly in all the 9 forest beats.

2.4. Data Analysis

Quantitative data from semi-structured questionnaires was managed using MS Excel computer software that was imported into SPSS for analysis. Descriptive statistics was used to summarize and expound on the data, while inferential statistics was applied for drawing conclusions supported by the data (Grigorios et al., 2023). Binomial regression with Wald Chi-square was used to identify factors with significant influence on benefits gained by PFM participants from PFM income generating activities based on quantitative data collected. Pearson Chi-square was used to compare factors affecting benefits of different income generating activities for PFM and Non-PFM participants based on quantitative data collected. In-depth analysis was done for qualitative data recorded during the FGDs and it was used to keep up discussion of the results.

3. Results and Discussion

3.1. Participatory Forest Management Benefits Identified in Upper Imenti Forest

During the focused group discussions with CFA officials and the Forest User Groups' leaders, benefits gained by CFA members were linked to PFM activities/products related to Plantation Establishment and Livelihood Improvement Scheme (PELIS). PELIS Scheme is a system whereby Kenya Forest Service (KFS) allows forest adjacent community, through community forest associations the right to cultivate agricultural crops during the early stages of forest plantation establishment. The scheme is meant to improve economic gains of participating farmers while ensuring success of planted trees (Kenya Forestry Research

Institute, 2014). Firewood collection was also indicated to have an important source of income but during this study, collection had been stopped due to moratorium. There was a general consensus that PFM benefits influenced participation of CFA members in PFM implementation hence the need to address factors affecting the benefits negatively. It was further highlighted during the discussions that reduced participation of CFA members resulted into increased illegal activities in the forest and destruction of planted trees by elephants, an observation made by Ming'ate (2017) in Arabuko Sokoke Forest. The policy changes included a moratorium imposed in Kenya in February 2018 when there was rampant forest destruction by illegal loggers and it banned timber harvesting from all public forests and firewood collection from some of the forests.

3.2. Factors Affecting Crop Production under Plantation Establishment Livelihood Improvement System (PELIS)

During this study, the CFA members emphasized that PELIS was a very important income generating activity that had been motivating majority of them to participate in PFM. The CFA members shared information on the various factors that influenced their benefits from crop production under PELIS (Table 1).

Using Binomial logistic regression for factors highlighted by the CFA members during the household interviews (Table 1), it was noted that the benefits for crop production under PELIS were significantly reduced by climate change (Wald $\chi^2 = 31.887$, $p = 0.000$), policy changes (Wald $\chi^2 = 70.537$, $p = 0.000$), diseases and pests (Wald $\chi^2 = 8.0240$, $p = 0.005$), poor guideline adherence by CFA members (Wald $\chi^2 = 5.863$, $p = 0.015$) and animal damage (Wald $\chi^2 = 5.964$, $p = 0.015$). Low market prices did not have a significant effect on benefits of crops under PELIS.

Table 1. Factors affecting crop production under PELIS for CFA members.

Factor	Frequency	% (N = 192)
Climate Change	115	59.9
Moratorium	134	69.8
Pest and Disease	75	39
Poor Guideline Adherence	37	19
Animal Damage	18	9
Low Market Price	8	4

Factors affecting crop production for both CFA and Non-CFA members were compared to identify which factors were more associated with status of participation in PFM in upper Imenti Forest (Figure 2).

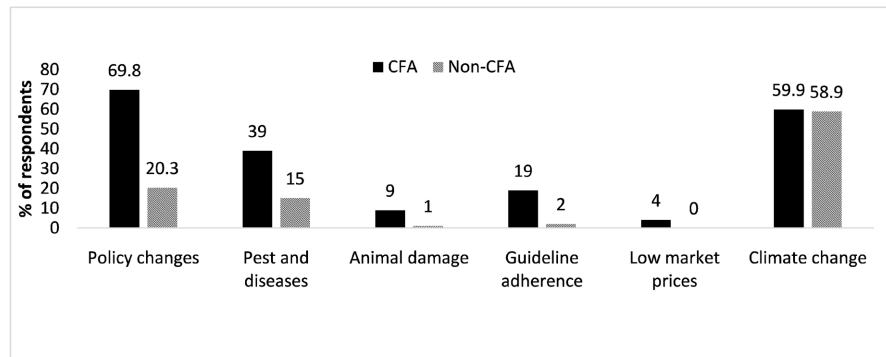


Figure 2. Factors affecting crop production benefits for CFA and Non-CFA members.

It was noted that policy changes in relation to clearing land for PELIS (Pearson $\chi^2 = 94.940$; $p = 0.000$), diseases and pests (Pearson $\chi^2 = 28.249$; $p = 0.000$), guideline adherence (Pearson $\chi^2 = 26.241$; $p = 0.000$), animal damage (Pearson $\chi^2 = 12.459$; $p = 0.000$) and low market prices (Pearson $\chi^2 = 7.130$, $p = 0.008$) were more significantly affecting the CFA members growing crops under PELIS in the forest than the non-CFA members growing crops in their farms. Climate change affected both CFA and Non-CFA members similarly hence there was no significant difference among both groups (Pearson $\chi^2 = 0.043$, $p = 0.835$).

The observations made in this study agrees with [Mwatika \(2013\)](#) who noted that some of the challenges affecting crop production under PELIS included wildlife damage, and issues related to lack of markets in Gathiuru Forest. He further observed that these challenges affected community livelihoods through reducing profit margins and reducing CFA members' morale in PFM participation. The study results also agree with [Achungo \(2015\)](#) who identified PELIS challenges as: destruction of crops by wild animals and livestock, pests and diseases as well as climate change.

During FGD, it was also highlighted that lack of opening up of land for PELIS was also affecting benefits gained by CFA members in Upper Imenti Forest. This was correspondingly observed in Gathiuru Forest in Nyeri ([Mwatika, 2013](#)), where limited forest land for cultivation reduced benefits of PELIS for 87% of the respondents and other factors including distance of PELIS plots from the village, higher costs of inputs and limited time allowed for crop production under PELIS had negative effect as well.

The CFA members emphasized during FGDs that government moratorium affected PELIS in Upper Imenti Forest because new forest areas could not be cleared for PELIS. This was equally noted by [Kagombe et al. \(2020\)](#) that in areas with mature trees and partially harvested areas which could not be fully harvested due to the moratorium, KFS lost prospects for establishing new plantations. [Agevi et al. \(2016\)](#) noted that PELIS implementation in Malava forest of Western Kenya for enhancement of community livelihoods was challenged by: unscrupulousness in allocation of plots, destruction of crops by livestock being grazed illegally and destruction by wildlife, stealing of crops, restrictions on means of transport for harvests from inside the forest, poor status of the roads,

and encroachment to unauthorized areas and internal conflicts.

3.3. Factors Affecting Firewood Benefits to CFA Members

Firewood collection was considered as one of the PFM benefits but its benefits to CFA members had been affected by the moratorium. Binomial regression revealed that the moratorium (policy matter) was significantly affecting firewood benefits (Wald $\chi^2 = 18.995$, $p = 0.000$) more than human-wildlife conflict for CFA members.

Comparing both CFA and Non-CFA members, it was noted that only CFA members indicated effect of climate change on firewood benefits while human wild life conflicts were solely a challenge to CFA members most of who depended on the forest for firewood sources before the moratorium (Figure 3). This could be attributed to the fact that most of the Non-CFA members used to depend on their own established wood lot whose growth is dependent on climatic conditions such as rain.

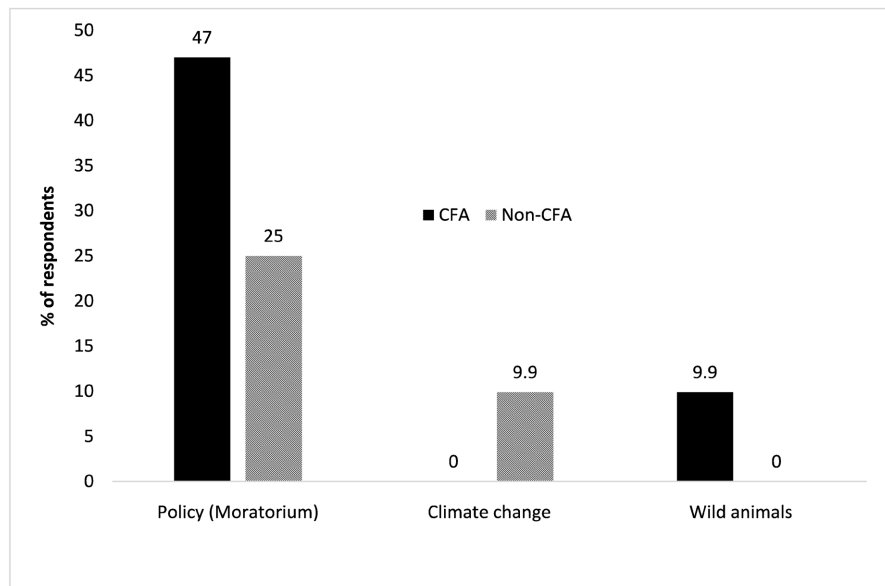


Figure 3. Factors affecting firewood benefits for CFA and Non-CFA members.

A comparative analysis of the factors among CFA and Non-CFA members indicated that moratorium as a policy matter significantly affected CFA members more significantly than Non-CFA members (Pearson $\chi^2 = 18.995$, $p = 0.000$) through their hindered access to the forest for firewood collection. However, wild animals and climate change were not a very significant factor for both groups (Pearson $\chi^2 = 1.003$, $p = 0.317$).

The CFA officials emphasized that the government moratorium effected as from February 2018 had resulted into reduced forest access by CFA members for firewood collection. This affected the CFA members' livelihoods since some were depending on fuel wood sales in the market to raise revenue for their family needs. This observation agrees with the results of study by Nyaboke (2019) and

Kagombe et al. (2020) in which the moratorium was noted to have adversely affected the livelihoods of the forest dependent communities and other stakeholders. They further noted that firewood wood cost in the market had gone up thus resulting in high cost of living for forest adjacent communities depending on firewood as their major energy source.

3.4. Factors Affecting Benefits for Grazers

The grazers' user group indicated that during the research period, grazing had been stopped by Kenya Wildlife Service due to degradation and poaching of wildlife in some beats including; Kambakia, Nkunga and some parts of Kithoka beat. Such policies that do not involve the community members in decision-making put the PFM participants away from the forest thus encouraging illegal activities such as poaching and fire outbreaks in the forest. The involvement of CFA members in protection of such beats has declined resulting in encroachment by non-PFM participant members of the community and outsiders.

3.5. Factors Affecting Bee Keeping as a PFM Benefit

Bee keeping is one of the PFM beneficial activities which have been recently started by CFA members in collaboration with other stakeholders in Upper Imenti Forest. For bee keepers, diseases and pests were noted to be the main factors that were negatively affecting its benefits significantly (Wald $\chi^2 = 4.820$, $p = 0.028$) by hindering habitation of the hives by bees. Climate change, low sales, stealing and lack of equipment had no significant effect on bee keeping benefits.

Other factors mentioned by CFA members during discussions included inadequate participation of the CFA members in PFM related decision making especially on cutting and selling of timber trees by KFS. Gichuki (2018) and Mbuvi and Kungu (2019) similarly noted that the government of Kenya had maintained higher level of control over PFM and generally all forest management procedures depicting power imbalance between the CFAs and the government in Kerita and Kakamega forests which has resulted in to conflicts affecting community livelihoods.

Bugembe (2016) similarly noted that one of the challenges facing Community Based Natural Resource Management (CBNRM) in Southern and Eastern Africa was failure to adequately transfer powers of decision-making and obligations to the local community members. The state had a lot of power compared to others thus challenging the relationship among the stakeholders and affecting CBNRM implementation. It was also indicated that illegal activities by non-CFA members contributed to degradation of the forest and destruction of trees planted under PELIS hence causing KFS to stop CFA members from accessing some of the affected forest beats.

The CFA members indicated that they were not adequately empowered to enforce any forest protection rules and regulations despite there being well laid down forest protection regulations. For instance, they could not arrest people

accessing the forest illegally and this had strained the relationship with KFS and the KWS staff in charge of managing the forest.

Concerning pest and disease challenges faced in crop production and bee keeping under PFM, capacity-building with a mutual vision of the enterprise is necessary. Provision of accessible suitable technical support is therefore required to enhance successful implementation of such enterprises as recommended by [Molnar and others \(2007\)](#).

3.6. Hypothesis Testing

The study objective Null Hypothesis (H_0) that there were no factors influencing the benefits of PFM income generating activities to the PFM (CFA) members in Upper Imenti Forest was rejected. This is because the study identified various factors that were significantly affecting benefits from different PFM income generating activities in Upper Imenti Forest.

Benefits from PELIS were negatively influenced by climate change (Wald $\chi^2 = 31.887$, $p = 0.000$), policy changes (Wald $\chi^2 = 70.537$, $p = 0.000$), diseases and pests (Wald $\chi^2 = 8.0240$, $p = 0.005$), poor guideline adherence by CFA members (Wald $\chi^2 = 5.863$, $p = 0.015$) and animal damage (Wald $\chi^2 = 5.964$, $p = 0.015$). Benefits related to firewood collection and grazing in the forest by PFM members was negatively affected by moratorium policy issues (Wald $\chi^2 = 18.572$, $p = 0.000$). Bee keeping benefits were negatively influenced by diseases and pests (Wald $\chi^2 = 4.820$, $p = 0.028$).

4. Conclusion and Recommendations

This study concluded that benefits from PFM activities undertaken by the CFA members were negatively affected by several factors that need to be addressed. Policy changes were a major factor influencing benefits associated with PELIS and firewood collection. Diseases and pests among other factors were also affecting benefits of PELIS, bee keeping and livestock production. It was therefore concluded that PFM related income generating activities have a great potential of improving the livelihoods of Upper Imenti Forest adjacent community members involved in its management if these factors among other emerging issues could be addressed.

From the conclusion, it is recommended that technical support be provided by government agencies such as Kenya Forest Service and Agricultural Department to address the factors reducing benefits accruing from the IGAs undertaken by PFM participants in the forest. The government should also endeavour to involve CFA members in decision making on policies affecting PFM to enhance acceptance and ownership of such policies and adherence thus making enforcement quite easy. Efforts should also be made to improve PFM implementation and benefits in order to encourage higher participation of all community members including the youth.

More so, financial support in implementing the approved Participatory Forest Management Plans (PFMPs) which relate to some of the income generating ac-

tivities such as PELIS. This will enhance sustainability of community participation in forest conservation by ensuring that CFAs do not become dormant after withdrawal of support from donors and NGOs. Government allocation of funds such as for seedling production for plantation establishment and rehabilitation of degraded natural forests can help to reduce costs of forest conservation for the CFA members. Capacity building on forest conservation activities as well as on management of PFM related IGAs for increased benefits to CFA members should form part of the annual government plan in order to ensure improved forest cover and forest condition while also encouraging sustainable participation of community members in PFM implementation.

Author Contributions

MJK conceptualized the research idea and developed the proposal, undertook data collection and paper writing. MF and MJ reviewed all the work, edited and approved the study as supervisors in Kenyatta University. MM and JK edited the work as my supervisors at work. All authors read, edited and contributed to the manuscript.

Funding

This study was funded by the Government of Kenya through Socioeconomic, Policy and Governance thematic area at Kenya Forestry Research Institute.

Acknowledgements

We appreciate the support accorded to us from the Department of Environmental Studies and Community Development of Kenyatta University, the Director, Kenya Forestry Research Institute through the Socio-economic, Policy and Governance Thematic Area, the Meru County Ecosystem Conservator of Forests under Kenya Forest Service (Mr. Njoroge), members of Meru Forest and Environmental Conservation and Protection Association and other community members living adjacent to Upper Imenti Forest in Meru County, Kenya.

Conflicts of Interest

The authors have declared that there is no conflict of interest related to this work.

References

- Achungo, T. O. (2015). *The Influence of Plantation of Plantation Establishment and Livelihood Improvement Scheme on Forestry Cover: A Case Study of Uasin Gishu County, Kenya*. Ph.D. Thesis, University of Nairobi Repository.
<http://erepository.uonbi.ac.ke/bitstream/handle/11295/92856/achungo>
- Agevi, H., Mwendwa, K. A., Koros, H., Mulinya, C., Kawawa, R. C., Kimutai, D. K., Wabusya, M., & Khanyufu, M. J. S. (2016). PELIS Forestry Programme as a Strategy for Increasing Forest Cover and Improving Community Livelihoods: Case of Malava Forest, Western Kenya. *American Journal of Agriculture and Forestry*, 4, 128-135.

<https://doi.org/10.11648/j.ajaf.20160405.13>

- Bugembe, B. N. (2016). *Natural Resource Governance Framework Challenges and Opportunities in Eastern and Southern Africa. A Regional Scoping Synthesis of the Critical Natural Resource Governance Issues*. International Union for Conservation of Nature. Commission on Environmental Economic and Social Policy.
https://www.iucn.org/sites/default/files/2022-07/africa_5nrgf.pdf
- Cochran, W. G. (1963). *Sampling Technique* (2nd ed.). John Wiley and Sons Inc.
- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed.). SAGE Publications.
<https://www.researchgate.net/publication/332246566>
- Foundjem-Tita, D. L. A., Duguma, S. S., & Piabuo, S. M. (2018). Viability of Community Forests as Social Enterprises: A Cameroon Case Study. *Ecology and Society*, 23, 50.
<https://doi.org/10.5751/ES-10651-230450>
- Gichuki, L. (2018). *Impacts of Participatory Forest Management on Community Livelihood: Case Study of Kereita Forest Kenya*. Master's Thesis, Victoria University of Wellington.
- Grigorios K., Miguel, S., Dowling, M., Fernández-Ortega, P., Colomer-Lahiguera, S., Bağçivan, G., Pape, E., Drury, D., Semple, C., Karin, B., Dieperink, K. B., & Papadopoulou, C. (2023). An Overview of the Fundamentals of Data Management, Analysis, and Interpretation in Quantitative Research. *Seminars in Oncology Nursing*, 39, Article ID: 151398. <https://doi.org/10.1016/j.soncn.2023.151398>
- Hesse-Biber, S. N. (2010). Mixed Method Research: Merging Theory with Practice. *The Canadian Journal of Program Evaluation*, 27, 123-125.
<https://www.utpjournals.press/doi/pdf/10.3138/cjpe.027.007>
- Hing, S., & Riggs, R. (2021). Re-Thinking Benefits of Community Protected Areas in Mondulkiri, Cambodia. *Trees, Forests and People*, 6, Article ID: 100128.
<https://doi.org/10.1016/j.tfp.2021.100128>
- Humphries, S., Holmes, P. T., Kainer, K., Koury, G. G. C., Cruz, E., & Rocha, M. R. (2012). Are Community-Based Forest Enterprises in the Tropics Financially Viable? Case Studies from the Brazilian Amazon. *Ecological Economics*, 77, 62-73.
<https://www.elsevier.com/>
<https://doi.org/10.1016/j.ecolecon.2011.10.018>
- Kagombe, J., Kiprop, J., Langat, D., Cheboiwo J., Wekesa, L., Ongugo, P., Mbuvi M. T., & Leley, N. (2020). *Technical Report on Socio-Economic Impact of Forest Harvesting*. Nairobi, Kenya.
- Kenya Forest Service (2010). *Mt. Kenya Forest Reserve Management Plan*. Nairobi, Kenya.
- Kenya Forest Service (2019). *Upper Imenti Participatory Forest Management Plan 2019-2023*. Kenya.
- Kenya Forest Service (KFS) (2018). *Status of Gazette Forests in Kenya*. Nairobi, Kenya.
- Kenya Forestry Research Institute (2014). *Contribution of PELIS in Increasing Tree Cover and Community Livelihoods in Kenya*. Nairobi, Kenya.
- Kenya National Bureau of Statistics (2019). *Population and Housing Census of Kenya, 2019*. Nairobi, Kenya.
<https://www.knbs.or.ke/2019-kenya-population-and-housing-census-results/>
- Kinyili, B. M. (2014). *Impacts of Participatory Forest Management approach in Ol Bolosat Forest, Nyandarua County, Kenya*. Master's Thesis, Kenyatta University.
<https://www.semanticscholar.org/paper/Impacts-of-participatory-forest-management-approach-Kinyili/4f78d405257eded55c0274cfe9a30b05fb23554a>

- Kothari, C. R. (2004). *Research Methodology. Methods and Techniques* (2nd ed.). New International (P) Publishers Limited.
- Macqueen, D. (2010). *Building Profitable and Sustainable Community Forest Enterprises: Enabling Conditions*. International Institute for Environment and Development (IIED).
- Mbeche, R., Ateka, J., Herrmann, R., & Grote, U. (2021). Understanding Forest Users' Participation in Participatory Forest Management (PFM): Insights from Mt. Elgon Forest Ecosystem, Kenya. *Forest Policy and Economics*, 129, Article ID: 102507. <https://www.sciencedirect.com/science/article/pii/S1389934121001131>
<https://doi.org/10.1016/j.forpol.2021.102507>
- Mbuvi M. T. E., & Kungu, J. B. (2019) Institutional Factors Influencing Decentralized Forest Governance: Policy Makers' Perspectives and Future Trends. *Environmental Policy and Law*, 49, 264-276. <https://doi.org/10.3233/EPL-190173>
- Mbuvi, M., Ndalilo, L., & Hussein, A. (2018) Applying Sustainability and Ethics in Forest Management and Community Livelihoods: A Case Study from Arabuko Sokoke Forest, Kenya. *Open Journal of Forestry*, 8, 532-552. <https://doi.org/10.4236/ojf.2018.84033>
- Meinhold, K., & Darr, D. (2019). The Processing of Non-Timber Forest Products through Small and Medium Enterprises—A Review of Enabling and Constraining Factors. *Forests*, 10, Article 1026. <https://doi.org/10.3390/f10111026>
- Ming'ate, F. L. M. (2016). A Framework for Linking Forestry Co-Management Institutional Arrangements with Their Associated Livelihood Outcomes. *Progress in Development Studies*, 16, 329-347. <https://doi.org/10.1177/1464993416657210>
- Ming'ate, F. L. M., Rennie, H. G., & Memon, A. (2014a). Potential for Co-Management Approaches to Strengthen Livelihoods of Forest Dependent Communities: A Kenyan case. *Land Use Policy*, 41, 304-312. <https://doi.org/10.1016/j.landusepol.2014.06.008>
- Ming'ate, F. L. M., Rennie, H. G., & Memon, A. (2014b). NGOs Come and Go But Business Continues: Lessons from Co-Management Institutional Arrangements for Governance of the Arabuko-Sokoke Forest Reserve in Kenya. *International Journal of Sustainable Development & World Ecology*, 21, 526-531. <https://doi.org/10.1080/13504509.2014.968237>
- Ming'ate, M, F. L. (2017). An Evaluation of the Implementation of the Arabuko-Sokoke Forest Reserve Co-management Approach in Kenya. *East African Agricultural and Forestry Journal*, 82, 227-235 <https://doi.org/10.1080/00128325.2018.1436842>
- Molnar, A., Liddle, M., Bracer, C., Khare, A., White, A., & Bull, J. (2007). *Community Based Forest Enterprises. Their Status and Potential in Tropical Countries. International Tropical Timber Organisation Technical Series No. 28, ITTO, Yokohama, Japan.* https://www.researchgate.net/publication/228868465_Community-based_forest_enterprises_in_tropical_forest_countries_status_and_potential
- Musyoki, J. K., Ming'ate, F. L. M., & Muriithi, J. K. (2022). Factors Determining Household Membership to Community Forest Association for Participation in Management of Upper Imenti Forest, Meru County, Kenya. *Open Access Library Journal*, 9, 1-18.
- Mwatika, N. M. (2013). *The Influence of Plantation Establishment Livelihood Improvement Scheme on Livelihood of Forest Adjacent Communities. A Case Study of Gathuru Forest in Nyeri County*. Ph.D. Thesis, University of Nairobi.
- Nyaboke, J. K. (2019). *An Assessment of the Adequacy of the Moratorium on Logging as a Sustainable Forest Management Tool. A Case Study of Eastern Mau Forest Reserve area*. Ph.D. Thesis, University of Nairobi. <http://erepository.uonbi.ac.ke/handle/11295/2/browse?type=subject&value=logging>
- Rana E. (2016). *REDD+ and Ecosystem Services Trade-Offs and Synergies in Community Forests of Central Himalaya, Nepal*. Ph.D. Thesis, Charles Sturt University.

Thomas, L. (2023). *Cross-Sectional Study: Definition, Uses & Examples*.
<https://www.scribbr.com/methodology/cross-sectional-study/>

Acronyms and Abbreviations

CFA	Community Forest Association
FAO	Food and Agriculture Organization
FMA	Forest Management Agreement
IGAs	Income Generating Activities
IUCN	International Union for Conservation of Nature
KES	Kenya Shillings
KFS	Kenya Forest Service
KFWG	Kenya Forest Working Group
KWS	Kenya Wildlife Service
MEFECAP	Meru Forest and Environmental Conservation and Protection Association
MENR	Ministry of Environment and Natural Resources
NGO	Non-Governmental Organization
PFM	Participatory Forest Management
PFMP	Participatory Forest Management Plan
RoK	Republic of Kenya
UG	User Group