

**ANALYZING THE LEVEL OF IMPLEMENTATION OF KEREITA
PARTICIPATORY FOREST MANAGEMENT PLAN, ABERDARE
FOREST ECOSYSTEM, KIAMBU COUNTY KENYA**

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DECLARATION

Declaration by Candidate

This project report is my original work and has not been presented for a degree in any other University or any other award.

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Declaration by Supervisors

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DEDICATION

To my family, forest managers, and the Community Forest Associations (CFAs) in Kenya, who are critical to Participatory Forest Management and Governance in improving Forest Adjacent Communities livelihoods, upon whom the future of our forests depends.

ACKNOWLEDGMENT

In order to make this research a reality, I would like to take this opportunity to express my heartfelt gratitude to all organizations, institutions, groups, and individuals involved. The study was completed by the contributions of some well-known individuals to whom I am grateful. Thanks in particular, from the initial incoherent concepts and thoughts up to a concentrated and structured analysis to my University Supervisor Dr. Thuita Thenya for his guidance, critical appraisal, motivation, positive insights, and corrective advice. Special thanks to KENVO Staff for sharing information relevant to this study. I wish to acknowledge the assistance of the forester, Kereita Forest Mr. John Ouko. I also recognize the contributions of the Kereita CFA officials for their support in preparation, design, household interviews, Focus Group Discussions, and data collection. I deeply appreciate our user groups and stakeholders' generosity and engagement to provide much-needed information on the implementation of the PFM Plan. I also wish to thank Dr. Elizabeth Wambugu for her insight into management plans and tagging me along several field visits. Profound appreciation goes to Mr. George Morara Nyabero, Ms. Lauren Mokono, and Mr. Abednego Okwakau for their dedication and commitment as research assistants. I might not even be able to list all the individuals who made a contribution in one way or another to the success of this report, but I would like to thank you all, and may God abundantly bless you for your support.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADB:	African Development Bank
ARPIP:	Action Research into Poverty Impact of Participatory Forest Management
AWP:	Annual Work Plan
AWP & B:	Annual Work Plan and Budget
CAPs:	Community Action Plans
CBO:	Community Based Organizations
CDF:	Constituency Development Fund
CDTF:	Community Development Trust Fund
CEF:	Community Environmental Facility
CFA:	Community Forest Associations
CFC:	County Forest Coordinator
CFMA:	Community Forest Management Agreement
CPRC:	Chronic Poverty Research Centre
CSO:	Civil Society Organizations
CSR:	Corporate Social Responsibility
KEFRI:	Kenya Forestry Research Institute
KENDBIP:	Kenya National Domestic Biogas Programme
KENGEN:	Kenya Electricity Generating Company
KFMP:	Kenya Forestry Master Plan
KFS:	Kenya Forest Service
KIFCON:	Kenya Indigenous Forest Conservation Project
KIPPRA:	Kenya Institute of Public Policy Research and Analysis

KTDA:	Kenya Tea Development Agency
KWF:	Kenya Wetlands Forum
KWS:	Kenya Wildlife Service
Masl:	Meters above Sea Level
MENR:	Ministry of Environment and Natural Resources
MSMEs:	Micro and Small Medium-Sized Enterprises
NBEs:	Nature-Based Enterprises
NEMA:	National Environment Management Authority
NFTP:	Non-Forest Timber Products
NSAs:	Non-State Actors
NWTP:	Non-Wood Timber Products
NGO:	Non-Government Organizations
NRM:	Natural Resources Management
PAs:	Protected Areas
PELIS:	Plantation Establishment and Livelihood Improvement Scheme
PES:	Payment for Environmental Services
PFM:	Participatory Forest Management
PFMP:	Participatory Forest Management Plan
PRA:	Participatory Rural Appraisal
PRSP:	Poverty Reduction Strategy Paper
REDD:	Reduced Emissions through Deforestation and Degradation
SAs:	State Actors
SFM:	Sustainable Forest Management
SPSS:	Statistical Package for Social Sciences

UNCED: United Nations Conference on Environment and Development

UNESCO: United Nations Education, Scientific, and Cultural Organization.

UNFCCC: United Nations Framework Convention on Climate Change

WAP: Water Allocation Plan

WRA: Water Resource Authority

WRUAs: Water Resource Users Associations

WWF: World Wide Fund for Nature

ZFM: Zonal Forest Manager

ABSTRACT

The study's main objective was to analyze the implementation of the Kereita Forest Participatory Forest Management (PFM) Plan for 2010-2015. Specifically, the study aimed at documenting the implementation of planned activities in the participatory forest management plan. The study also aimed to identify collaborative activities between CFA, Kenya forest service, and other stakeholders in the study area and explore challenges and opportunities that were experienced during the implementation process. Drawing on a cross-sectional study design, the study collected data from a sample of 240 respondents who were all CFA members using semi-structured, questionnaires, focus group discussions, and key informant interviews. Data analysis was done using descriptive statistics mainly percentages and inferential statistics, specifically multiple regression analyses. The study results showed that 75.8% of the adjacent forest groups of Kereita were involved with PFM as registered CFA members, recruited from different CBOs in the villages. The study documented seven programs with activities which were to be implemented by various actors in collaboration with KFS and CFA. The study results show that the level of achievement differed for all activities. Some of the activities undertaken include drawing Community Action plans (CAPs), 82.5% had participated in the management and conservation of the Kereita covering 100 ha, KFS and KENVO established 50 Ha of plantation, zonation of 800ha for grazing. Others included water packaging plant completed in 2014, nature trails established covering 20km. On collaboration a committee established that assists in the implementation of plan, monitoring, and evaluation. 22% of the Kereita forest adjacent communities in the study area had been trained on Nature-Based Enterprises including mushroom and stinging nettle farming. The voluntary nature of the PFM and time limit constrained turn out for conservation and protection activities. The study also established that the major challenges in PFM implementation were the absence of specialized knowledge and information among the CFA members given that over 90% of the members did not have any formal skills. Other major challenges included poor governance, inadequate involvement of CFAs in major decision making, inadequate resources to carry out set tasks and voluntary work not being readily available to boost the members' income. The study concluded that there is room for more stakeholders to collaborate with the CFA in order to optimize the potential benefits of PFM. These can be in form of donors, investors and capacity building entities. The study findings on the challenges and opportunities have important implications for forest policy and practice in Kenya The study recommended for more resources to be allocated for the implementation of PFMPs in order for the planned activities to be achieved as well as harmonization of laws and regulations governing activities around the forest to reduce conflicts while implementing the plan activities.

CHAPTER ONE: INTRODUCTION

1.1. Introduction

The participatory forest management approach originated from South and Southeast Asia but has evolved to take various formats in different regions globally (Gachanja, 2013). Local participation is essential in forest management, which is in line with a global multilateral agreement like the Rio Declaration, Principle 10 of the Rio Declaration on Environment and Development (1991) states that “*Each individual shall have an opportunity to participate in the decision-making processes, facilitated by the widespread availability of information.*” This has been seen to be important, for example, in areas of high population where there are instances of conflicts resulting from pressure on resource use, communal ownership, and in smaller and more vulnerable protected areas. In such cases, forest protection without local participation is doomed to face serious challenges, including failure (Konuche, 2012). The participatory management of forests includes collaboration in mutually enforceable agreements whereby key stakeholders explicitly define the responsibilities, tasks, benefits, and authority in conserving scarce forest resources (Matiku, 2011). Besides, the best proof that the resource is handled in a sustainable manner is the usage of forest management plans. Participatory forest management brings together partners to a mutually beneficial arrangement that applies its planning in an increasingly deliberate process of moderating the unique challenges while addressing the forest management's short- and long-term targets. Forest management in different parts of the world is guided by participatory forest management plans developed for specific forests for a specified period (Mbugua, 2007).

Forestry management agencies have switched from governance control to participatory approaches in many countries, which enable a wide range of stakeholders to be involved. Kenya moved from command and oversight into a structured participatory approach from 2005, while Tanzania had an earlier launch of the same approach (Thenya et al., 2008). The PFM is an administration tool that mobilizes locals to work together to manage particular forest areas adjacent to the settlement to ensure the community's socio-economic improvement and minimize forest pressures. This includes sharing obligations and advantages as indicated by a well-characterized and commonly agreed set of standards and guidelines. The accepted standards and direction are arranged, executed, maintained, and observed by the community institutions (Ongugo *et al.*, 2009). Stakeholders involved in the participatory management approach must be

engaged in the formation of Community Forest Associations (CFAs), development, and execution of the Participatory Forest Management Plans (PFMP). In Kenya, one of the earliest sites was the Arabuko-Sokoke forest, where the formalization of PFM, led to improved community engagement in forest management and resolution of conflicts over forest resources. (Ongugo *et al.*, 2009. It has also addressed forest access, sustainable utilization of forest resources, livelihood issues, and increased biodiversity knowledge.

The fundamental goal of participatory forest management is to guarantee involvement in forest decision making. The laws and policies that allow collaborative management of natural resources and forestry management encourage the objective of PFM. The Kenya Forest Act, 2016, Tanzania Forest Act of 2016, and the Uganda Forest Policy of 2008 for the local area are all included in these laws and policies. In Kenya, the law requires Kenya Forest Service (KFS), as the state custodian of forests, to manage public forests. A forest management plan is a particular proclamation of objectives that the KFS has for community forest associations, trailed by a progression of activities that will occur to meet KFS strategic goals. The forest management plan is a "guide" to help the communities. In Kenya, by 2018 about 177 Forest management plans, including that of Kereita forest had been signed by Kenya Forest Service (KFS) to enable community involvement in forest conservation and management around the country. In addition, 77 Forest Management Agreements have also been signed. In 2010, the Kereita PFMP was the 6th in the country to be signed by KFS and the Kereita Community Forest Agreement was the first of its kind that Kiambu County signed in 2009 with the Kenya forest service (KFS, 2018). However, the implementation efforts of the Kereita PFMP have not been analyzed in a scholarly way, especially as related to success and failures.

1.2. Statement of the Problem

By 1908, gazetted forests in Kenya were exclusively managed by the colonial government under the forest department, while communities living near the forests assumed a fringe role. (Mbugua, 2007). This was because the then-existing forest law, Cap 385 of Kenya's Laws, did not provide for formal engagement of community involvement in the management of state forests. This contributed to the alienation of communities and disputes between resource managers and neighboring forest communities over access to and use of forest resources. Over time, these communities began to view themselves as adversaries of the forests instead of defenders and managers of this very vital natural resource that greatly supported their livelihoods (Mbugua, 2007). The adversarial view of communities negatively affected the successful implementation of forest management plans by the state. The development of the Kereita Participatory Forest Management Plan began in 2003 before enacting the Forest Act of 2005. It involved the collaboration of various stakeholders such as Kereita Forest and Wildlife Conservation Association (KFWCA) and Kijabe Environmental Volunteers (KENVO), Kenya forests working group (KFWG) with financial support from the Ford Foundation and the United Nations Development Programme (UNDP). The plan was then officially signed in 2010 by KFS for implementation (KFWG, 2013).

The Kereita Community Forest Management Agreement was signed in 2009. The main objective was co-participation in the conservation and management of the 4,722.6 ha of the Kereita Forest Reserve, within a period of 5 years. Other focus of the plan includes preserving the area from the illegal activities such as logging, poaching, uncoordinated collection of fuelwood and uncontrolled grazing, as well as the promotion of income generating activities (IGAs) based on forest resources. The significant challenges which were faced by the forest adjacent communities before the introduction of PFM include lack of defined structure and hierarchy at local, regional, and national levels. Despite these elaborate efforts towards sustainable management of Kereita Forest, it has not been possible to clearly state the level of success or failure as a result of implementation activities of the Kereita PFM. This study will carry out a critical analysis of Kereita PFMP implementation activities to document successes and failures while understanding what can be done better when implementing PFMPs around the country. The study findings will serve to inform Kereita Forest stakeholders on future PFM plan implementation

1.3. Research Questions

The study sought to analyze implementation of activities of the Kereita Forest Participatory Forest Management Plan for the period 2010-2015 based on the following questions:

- 1) What Kereita PFMP activities have been jointly implemented by Community Forest Associations and Kenya Forest Service in the management of the Kereita Forest Ecosystem?
- 2) What have been the successes and failures in the implementation of the Kereita Forest Participatory Forest Management Plan?
- 3) What challenges have been experienced during the CFA-KWS joint implementation of the Kereita PFMP?
- 4) Which opportunities exist for Community Forest Associations and Kenya Forest Service for better implementation of the Kereita PFMP?

1.4. Overall Objective of the Study

The general objective of this study was to analyze the implementation of the Kereita Forest Management Plan 2010-2015.

1.4.1. Specific Objectives of the Study

The specific objectives of the study were:

1. To document Kereita PFMP implementation activities jointly undertaken by Community Forest Associations and Kenya Forest Service during the period 2010-2015;
2. To analyze the level of collaboration between KFS and CFAs; in the preparation and implementation of the Kereita PFMP activities.
3. To Examine challenges experienced during the CFA and KFS implementation of the Kereita PFMP activities;
4. To examine opportunities for CFA and KFS collaboration for better implementation of the Kereita Participatory forest management plan.

1.5. Research Hypotheses

The study focused on the following hypotheses:

- H₀₁: Local structures have no significant effect on community participation in PFMP activities implementation for the Kereita forest.
- H₀₂: There is no significant collaboration between the CFAs and KFS in implementing the participatory management plan activities for the Kereita forest.

1.6. Justification of the Study

This study is critical because it examines the extent to which the implementation of Participatory Forest Management Plans influences the protection of forests and addresses poverty alleviation. Thus, this study's findings will aid in decision-making at all levels on improving the sustainability of Kereita Forest in Kiambu County. The study is also of great importance to the community for guidance on the appropriate application of the techniques, knowledge, and skills in a participative approach to enhance their forestry activities for better returns and utilization of forest resources. To coordinators of forestry activities, this study is crucial to point out the most relevant and sustainable strategy in PFMP implementation by communities in Kiambu County and other parts of the country. These findings are also invaluable to the Plantation Enterprise Division, Natural Forest Conservation Division, and the Enforcement and Compliance Division both of Kenya Forest Service by providing them with evidence of existing gaps and workable strategies on implementation of PFMP. This will enable KFS to put interventions in place, change strategies, and upscale the success from one place to another. To the Government, which is the primary agent behind the Participatory Forest Management in the country, the study will assist in refining PFM programs across the country depending on the specific needs and climatic conditions favorable in different parts of the country. Besides, scholars interested in further research on how community participation can be best implemented will also find the study an invaluable source of information.

1.7. Scope and Limitations of the Study

The study focused on the activities carried out in the implementation of Kereita Forest participatory forest management plan over five year period. This was done by interviewing both CFA and non-CFA members within the local community, while also talking to KFS staff.

1.8. Operational Definitions

Community: From a sociological viewpoint, the idea of community alludes to a group of individuals in a geographical area, shared interests and or traditions.

Community participation: Is the process by which communities are involved in decision making in matters affecting them such as development.

Forest resources management: Is the application of technical forestry principles to the operation of forestry property.

Participatory Forest Management: An framework to enter into mutually enforceable agreements between forest neighboring communities that specify their respective positions, obligations, benefits and powers for a particular forest resource's sustainable management.

1.9. Assumptions of the Study

The study considered that any respondents selected at random could know the implementation of participatory forest management in the PFM concerns in the communities near Kereita Forest. It was this hypothesis that the probability of anyone involved in the PFM activities was 0.5. In other words, an individual's probability to be or not to be a member of a specific user group was considered equal (that is 0.5).

CHAPTER TWO: LITERATURE REVIEW

2.1. Participatory Forest Management

A larger program for the transition of control and decision-making power from government to local communities is part of participatory forest management (Kainja, 2001). Most participatory forest management schemes have been introduced in tropics since the late 1970s. Implementing the participatory method of forestry management is seen as an important policy concept for sustainable forest management (Fomete & Vermaat, 2001; Adeleke 2006). Social forestry and community forestry have, in their initial concepts, been defined in a similar way to any situation that incorporates local people in a rural development forestry operation (FAO, 2001)). PFM provides a jointly enforcing agreement between key stakeholders to identify their respective functions, obligations, advantages and powers for managing limited forest resources (Springate Baginski, *et al*, (2003a). PFM is a strategy to forest management that includes the surrounding forest communities and other stakeholders in the forest management within the context that attributes to the community's living standards (KFS, 2007a). PFM is conducted through different interactive steps, and therefore is a process Gachanja (2007).

In the beginning of the 1980s, PFM was adopted internationally by Nepal, Mexico, India and Australia (Iversen, *et al.*, 2006). Sub-Saharan Africa had a unique past (Munyoli, 2007), which took place in the mid-1980s, accelerating following the United Nations Environment and Development Conference and the Earth Summit in Rio de Janeiro, Brazil, on 3-4 June 1992 (Kloaster, 2000). The growth of PFM and other collaborative natural-resource planning and development strategies was distinctive from the past (Munyoli, 2007). From 1995 to 2010, major PFM policy, regulatory, institutionalization and implementation activities had been driven within East Africa by major donors (World Bank, 2001). The adoption by donors such as World Bank and the International Monetary Fund of a neoliberal viewpoint and policies on PFM has been stepping up (FAO, 2008). In 1992, the Earth Summit described local communities as crucial for preserving forest ecosystems' preservation in their engagement in natural resource management (NRM) (Marshall *et al* , 2006 and OECD 2006).

In Kenya, initial steps were taken in the 1994 Kenya Forestry Master Plan (KFMP) (GOK, 1994) to incorporate the current management strategy. The standards include defining policy, legal and institutional changes that are vital to address new challenges in forests and enhance the sustainable management of forests in Kenya. These three sectors are crucial for the growth of PFM worldwide (Brockington, 2007). In 1997, with approval from the Ministry of Environment and Natural Resources (MENR), Dida in Arabuko-Sokoke Wildfish carried out a first PFM pilot initiative (ARPIP TEAM KENYA, 2008). This research pilot led to more PFM initiatives in Meru Upper Imenti, Loitokitok, Kakamega, Mt. Kenya and Aberdares (Thenya *et al* , 2008).

2.2. Stakeholders Activities and Participation in Forest Management –

Most countries worldwide are finding new ways to formally introduce societies into public land management (ARPIP TEAM KENYA 2009). Emerging strategies in each country represent different policies, former government-forest ties, resource management priorities and economic development needs. Some of the emerging fundamental approaches to group engagement in forest conservation are characterized in the following case studies.

2.2.1. PFM in Tanzania

Tanzania is feted as a leader in Africa concerning participatory forest management (PFM) policy and practice (Blomley, *et. al.*, 2008). The past decade's legal and policy reforms provide clear and strong incentives for the management and co-management of forest lands by community institutions. Furthermore, these legal changes have been supported by significant investments from government and development partners in the form of site-based projects, but more recently in the establishment of a national programme embedded in local and national government institutions. According to Blomley, *et al* , (2008), PFM in Tanzania is operational in over 3.6 million hectares of forestland (about 11% of the total forest area in the country) and over 1,800 villages (representing approximately 17% of all the villages). Furthermore, while PFM has delivered actively on its forest management objectives, its impact on livelihoods and village governance appears to have been mixed. The Kilwa District in Tanzania has been an example in which people have been helped in many projects including the REDD+ projects by a non-

governmental organization, the Mpingo Conservation and Development Initiative, which could help their communities by sending carbon offsets to the villages funded by PFM. There is an immediate need for more realistic evaluation of the effects of PFM at a variety of sites and conditions to direct potential delivery of government services (Blomley, et. al. 2008).

2.2.2. PFM in Ethiopia

The standard of living of Ethiopia's rural and urban citizens has strong relation with the forests that carry benefits like energy and building materials, grass, medicinal plants, spirituality, non-timber forest products, and wild food (Farm Africa/SOS Sahel, 2007). The PFM methodology uses traditional institutions to link forest-dependent communities to forest-based livelihoods to forest management. Forest user groups agree on management plans with the government who then hands over forest management to the groups. The extensive experience of FARM-Africa/SOS Sahel in PFM in Ethiopia shows that communities have the capacity and knowledge to participate in forest management if they obtain actual forest-derived benefits to improve their livelihood.

2.3. Forest Management in Kenya

Forest beneficiaries are diverse: forest occupants, forest neighboring families, industrial producers and users of forest produce, nature lovers and eco tourists. The benefits are diverse. The key users are the local forest families who depend on all forest products and services throughout the year for their livelihood. Pastoralists only use some of these areas for dry grassing. The most common uses are those peripheral forest areas. Indigenous forests provide a wide variety of goods and services, not only for timber products but also for local consumers such as medicinal plants, honey, stomach grass, forage, wood fuel, charcoal and sand, saplings, seeds, cultural sites and food. Forests are used for science and social studies by local and foreign researchers. Even the forests play an important role in sequestration of carbon, soil and water conservation. (Waithaka & Mwathe, 2003).

2.3.1. Community Participation in Forest Protection in Kenya

The Forest Department (FD) was created in 1902 when the first Conservator of Forests, arrived. It was around the same time that the 'East Africa Forestry Regulations of 1902 were published. These regulations were expanded by the Forest Ordinance of 1911. The Ordinances included a section dealing with the appointment of Honorary Forest Officers. Those appointed were usually farmers with forestry interests living in areas remote from any forest station did a lot of valuable work (Thenya, *et al*, 2007). By 1908, major forest blocks in the county were declared forest areas. Work on surveying these large forest blocks was initiated but was unfortunately interrupted by the First World War. The decrees on forest guards' recruitment and service terms were issued between 1915 and 1916. This approach was purely military, which involved engagements for three years at a time and was armed with rifles. This marked the beginning of a command and control system that the Forest Department operated on for over 100 years.

The Forest Ordinance was revised between 1941 and 1954 following the Constitution's amendments that occurred in the Colony. The forestry duties were shifted from the Governor to the Legislative Council first and an official in 1954. In 1964, a new amendment to and implementing the Forest Act was made to the Forests Ordinance (chapter385). This Act provides for the establishment, control and regulation in Nairobi and unalienated government land by the Forestry Department (FD) of central forests and the forest areas (Thenya, *et al*, 2007). Since then, the legislation has received only minor amendments, mainly concerning rules made by the Ministers in charge of forests as provided in section 15 of the Act. These piecemeal changes were not able to accommodate new and emerging national and global forest-related challenges. This necessitated the start of a campaign for a review of forest legislation, which culminated in the Forest Act No.7 of 2005 (revised 2016) that enabled the provisions of the Act to apply to all forests and woodlots on state, local authority and private land, but with varying requirements applicable to the respective ownership categories (Thenya, *et al*, 2007).

"Post-independence interactions with local forestry programming at the community level are teaching in new modes of local governance designed to meet the needs of forest-dependent individuals" (Emerton, 2008). This is due to the enactment of the 2005 Forest Act, which

identifies community involvement in forest conservation (GOK, 2005). Several studies have been carried out on community engagement in forest management, the effect of PFM on household poverty and the cost of conserving and preserving the forest. After its implementation in 2010, the introduction of PFM under the Act has resulted in establishing 325 Community Forest Associations (CFAs) at national level. These CFAs have been made up of forest adjacent groups that collaborate with KFS to sustainably manage forest resources. Most CFA's reached KFS agreements on forestry management based on approved forest planning (Lowe & Ombai, 2013).

2.4. Participatory Forest Management in Kenya

Before 2005, management of forests in Kenya emphasized protection through command and control system with minimal participation of other stakeholders. Upon the realization that it was only by involving the communities that there can be sustainability in the management of the forests, Kenya embraced Participatory Forest Management (PFM) as an approach towards achieving sustainable forest management and a means of improving the livelihoods of the adjacent forest communities. The forest management system in Kenya has undergone several changes concerning PFM dating back to the Forests Act of 2005, which encourages implementing the participatory forest management approach. Thenya *et al.* (2006) have documented several piloting of PFM in Kenya from 1997 to 2008. Some of the forests where PFM has been implemented are herein highlighted.

2.4.1. Arabuko Sokoke forest

An impact analysis of PFM conducted by Matiku on the communities neighboring the forest in contrast with the impact on households located close to PFM areas to those located in non-PFM areas of the Kenya Arabuko-Sokoke Forest. The study included: PFM 's effect on local communities' household incomes in the Arabuko Sokoke Forest, shifts in household benefit distribution. The outcome was a variety of households reliant on the forest of Arabuko-Sokoke and PFMP was very good for society. Compared to the introduction of forest benefits in PFM areas the cost was higher, but forest costs in non-PFM areas and costs and benefits decreased at

a distance from the edge of forests. The study concluded that, while not cheap, the PFM is an instrument to help the adjoining local communities in the Arabuko-Sokoke forest (Matiku, 2009).

2.4.2. Eburu PFM

The research by Mutune aimed to investigate effect differences between members and non-members of a CFA in Sururu and Eburu Forests (2014). The results showed that implementation of PFMP has both positive and negative livelihood impacts. In both sites, CFA members had a higher total household, beekeeping, tree nursery and forest income relative to what they would have received if they had not participated in PFM. The conclusions made after this study showed that PFM could improve livelihood when adequately institutionalized during implementation. However, the gap is likely to widen between the poor and the non-poor households. Direct PFM benefits are at the participation level during implementation, but the poor's interests who are most dependent on forest resources are not well represented (Mutune, 2014).

2.5. Kereita forest governing structure

Kereita Integrated Community Forest Association (KICOFA): The KICOFA is the only official CFA currently present in Kereita. It was founded in 2009 to ease the conflicts between the three existing CFAs (KFWCA, KIFOMACO, and GWC) and implement the directives of the Forest Act 2005 which prescribed the existence of one CFA per forest station. As stated in the report from the joint CFA meeting held in 2009, the constitution was condoned by the 3 CFAs who convened to shape the so-called CFA 'Umbrella', by contributing financially and in terms of members. In the by-laws, it is written, that all of the members of the KICOFA must also be members of any of the three existing CFAs. The KICOFA was the one that signed the agreements with the KFS.

Kereita Forest and Wildlife Conservation Association (KFWCA): The KFWCA is among the oldest CBOs in Kereita. It was founded in 2000 (and registered in 2003) by community

members guided by the KFWG to sensitize the community on the new forest management approach that was at the time being discussed in Parliament (EMPAFORM, 2006). The association was initially formed by various stakeholders, including shamba system farmers, water harvesting groups, bee-keepers, and electrical fence groups (ibid.). According to the same source, KFWCA has been very active in the area through various projects to improve local livelihoods and forest conservation. Many of these projects have been conducted in partnership with international and regional organizations, like UNEP and KENVO. In 2009 the KFWCA entered the KICOFA, formally becoming a Forest User Group.

Kiriita Forest Management and Conservation Association (KIFOMACO) are among the 3 CFAs under KICOFA that was mainly focused on protecting the Kereita Forest cover.

Gatamaiyu Wildlife Conservation (GWC): its main focus was on the protection of the various wildlife inhabiting the Kereita Forest and was also among the three CFAs found under KICOFA

Kijabe Environmental Volunteers (KENVO): KENVO is an organization that started in 1996 with an aim of informing and educating local communities on the need for conservation and promoting environmentally-friendly activities. They operate in the Kijabe area of the southern slopes of the Aberdare Range. The main office is located adjacent to Kereita forest where, like in the whole Kikuyu Escarpment, they are trying to combat the forest's degradation. Some of the main activities of KENVO consist of tree nurseries, ecotourism, bee-keeping, or fish farming. However, they are also involved in other areas such as community workshops, mentoring local youth groups, and youth involvement in the Canada World youth international exchange program.

2.6. Gaps in Literature and Focus of the study

In 2005 the Participatory Forest Management Act was officially passed in Kenya following the paradigm change from command and control to 2005. While communities had been informally active in managing forests, they took the impetus to promote their participation by promulgating legislation on forests in 2005. Following this change in forestry products, the interest had been placed on forest products from traditional products such as firewood, grazing / foresters,

medicinal plants and water. It is notable that before the enactment of Forest Act 2005 now revised to Forest Conservation and Management Act 2016, community self-initiative towards forest protection and conservation had picked up in earnest in the late 1990s. At that time, there was no drive towards income generation but the emphasis was mainly conservation (Thenya *et al.*, 2017). Previous studies on Participatory Forest Management have focused on protecting, planting, and rehabilitating degraded areas with little emphasis on livelihoods. Most studies has focused on performance of CFA and PFM and not on implementation of plans (PFM conference 2014)

In a case study of the Karima Forest in Kenya carried out by KFS concerning the spread of powers in pre and post implementation of participatory forest management, the developed Community Forest Association (CFA) was not given significant powers; local authorities were left with all powers and advantages. Due to the limited power among the CFAs, it was evident that they were not entitled to carry out certain activities of PFM until communicated from the relevant authorities with the powers like the county government, Or Kenya forest service a gap that has not been systematically studied. This shows a gap in the lack of clear understanding of the forest management between the CFAs and their governing bodies during the PFMP implementation as well as how well these plans were implemented in addition to giving a clear understanding on reasons of the levels of achievement and failures. It was also reported that the CFA had inadequate representation and poor transparency for the forest communities. It also revealed a method of preparation with flaws in engagement and inclusion (Thygesen *et al.*, 2015).

2.7. Theoretical Framework

2.7.1. Power, Actors, and Accountability framework

Institutions are used to coordinate encounters and relationships between natural resources (forests) and people. Institutional structures are fundamental for understanding the various stakeholder interests' patterns in accessing and managing natural resources (Matiku, 2012). This affects implementation of PFM by identifying collaborations with the stakeholders who have same interest in natural resources (forests) management. Agrawal & Ribot's (1999) Power,

Actors, and Accountability framework applies in this study. This framework can be used to assess how decentralization functions in resource management. Allowing for an explanation of the dynamics in the decision-making processes related to the Kereita forest. The authors divided Power broadly into four hierarchies:

- i) *The power to create rules and modify old ones,*
- ii) *The power of decision making about how resources are allocated or used,*
- iii) *The power to implement and ensure compliance with the rule, and,*
- iv) *The power to adjudicate disputes.*

The actors are the stakeholders of the resource being managed and benefit from sharing. Accountability is relational, but it is the actors' responsibility for their action, and they are accountable to their constituents. So this framework will be used to analyze how the actors like KFS, CFAs, CBOs, Village leaders and the Community are exercising their powers and accountabilities in managing and benefiting from Kereita forest by comparing what is written in the Participatory Forest Management Plan and the data to be collected in the ground.

2.7.2. Access Theory

The theory of access identifies the community's right on the Kereita forest and what is their ability to access it because '*access right* is different from the *ability to access*' (Ribot & Peluso, 2009). As it is argued in the Theory of Access, it is essential to see the broader contexts when analyzing access to resources because; it is not only the policy environments that give the right of access but also the platform on the ground and the 'ability' of the community to exploit what is stated in the policy. By doing so, this framework will be used in power structure analysis around the management of the Kereita forest to examine who has access right and the enabling environment and 'ability' to participate in the management and get benefits out of the Kereita forest.

2.8. Conceptual Framework

The successful implementation of the Kereita PFMP was expected to bring about a new and better all-inclusive way of conserving and utilizing the forest to benefit both the government and the forest adjacent community. Introduction of PFM in Kereita forest was expected to result in high forest conservation and improve community livelihoods as well as better coordination of forest activities. The study had local structures and a forest ecosystem as the independent variables (as shown in figure 2.1) below.

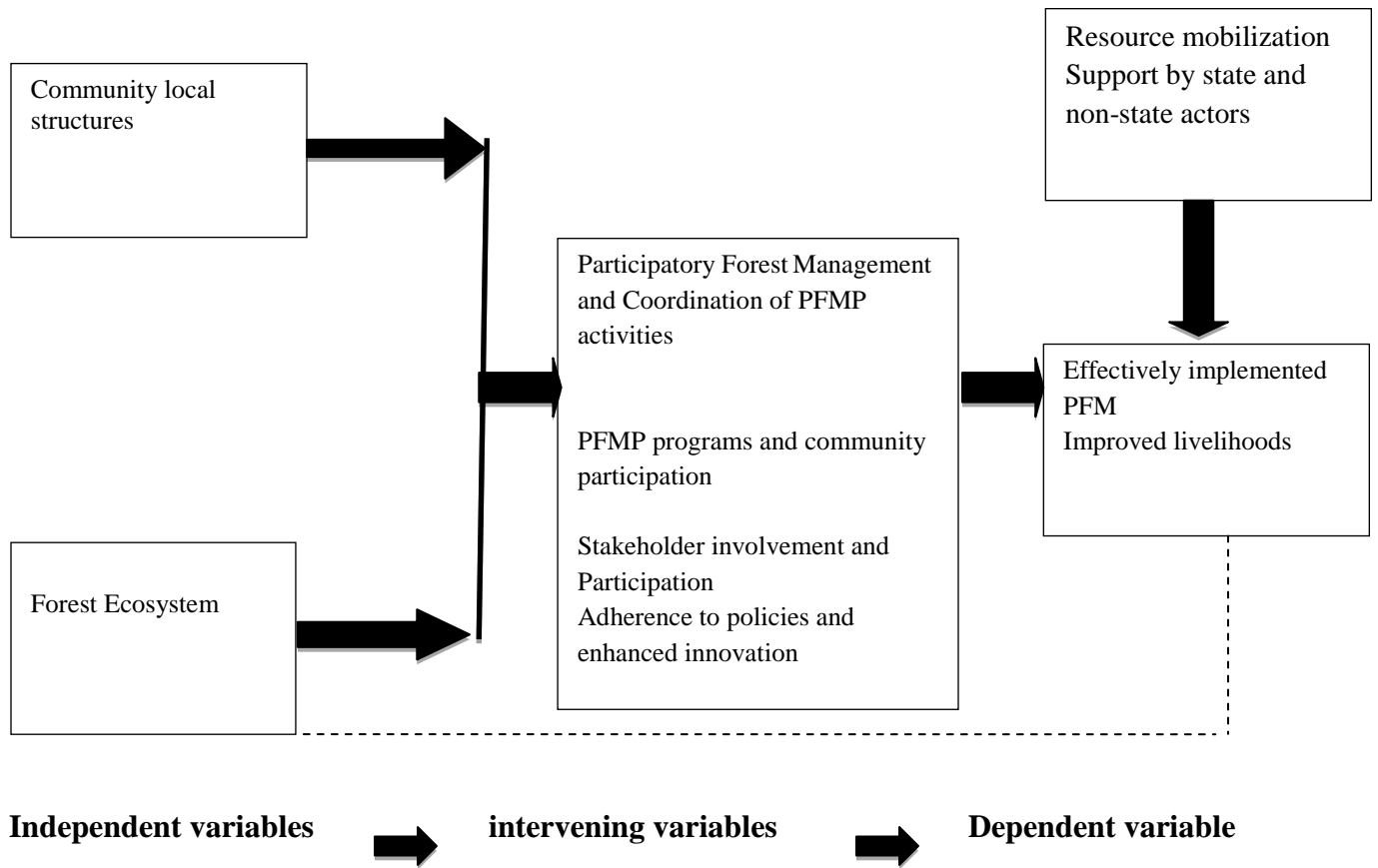


Figure 0.1: Conceptual Framework

The dependent variable was the activities implemented, which resulted in improved livelihoods of communities surrounding Kereita forest. However, the study further recognized four key factors that impact nearby communities' participation in forest management. The variables included coordination of PFMP activities, PFMP programs and community participation, stakeholder involvement and participation, adherence to policies and enhanced innovation. As

per Matiku et al. (2007), these four factors directly impacted any social group's participation in forest conservation and management such as decision-making processes. Regardless of this immediate connection between different aspects of PFM and people's livelihood in the surrounding communities, there are, however, other external components that may influence this relationship. These components were recognized as mediating variables. In the study, mediating variables were resource mobility by the government and support by both state and non-state actors in implementing PFM programme activities.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

The chapter defines the research's geographical area with precise reference to the size and position, the population under research, and physical and socio-economic characteristics. It also provides a summary of the process used to achieve the goals. It also focuses on managing the various forms of data collection, source data, and data collection methods.

3.2. The Study Area

3.2.1. Geographical Location and topography

Kereita Forest is in Lari sub-county, Kiambu County in Central Highland Conservancy. It lies within $1^{\circ} 03'$ and $1^{\circ} 09'$ South and $36^{\circ} 49'$ East. It occupies the east slopes of Aberdare's Escarpment, situated at 50 km to Nairobi's southwest. The forest has been scattered substantially to the south and remains are spread to its limits. The Kereita block neighbors Uplands and Kinale.

Kereita Forest covers an area of 4,722.6ha. The Kereita Forest Block is among the five forest stations in Kiambu County. The Kereita Forest Block is one of the five forest stations in Kiambu District. The others are Kinale, Uplands, Ragia, and Kamae. The Kereita Forest Block borders six administrative sub-locations: Gatamaiyu, Nyanduma, Kambaa, Magina, and Bathi. The forest is part of the larger Aberdares Ranges Ecosystem covering three counties the four countries of Kiambu, Nyeri, Murang'a and Nyandarua (Figure ---).

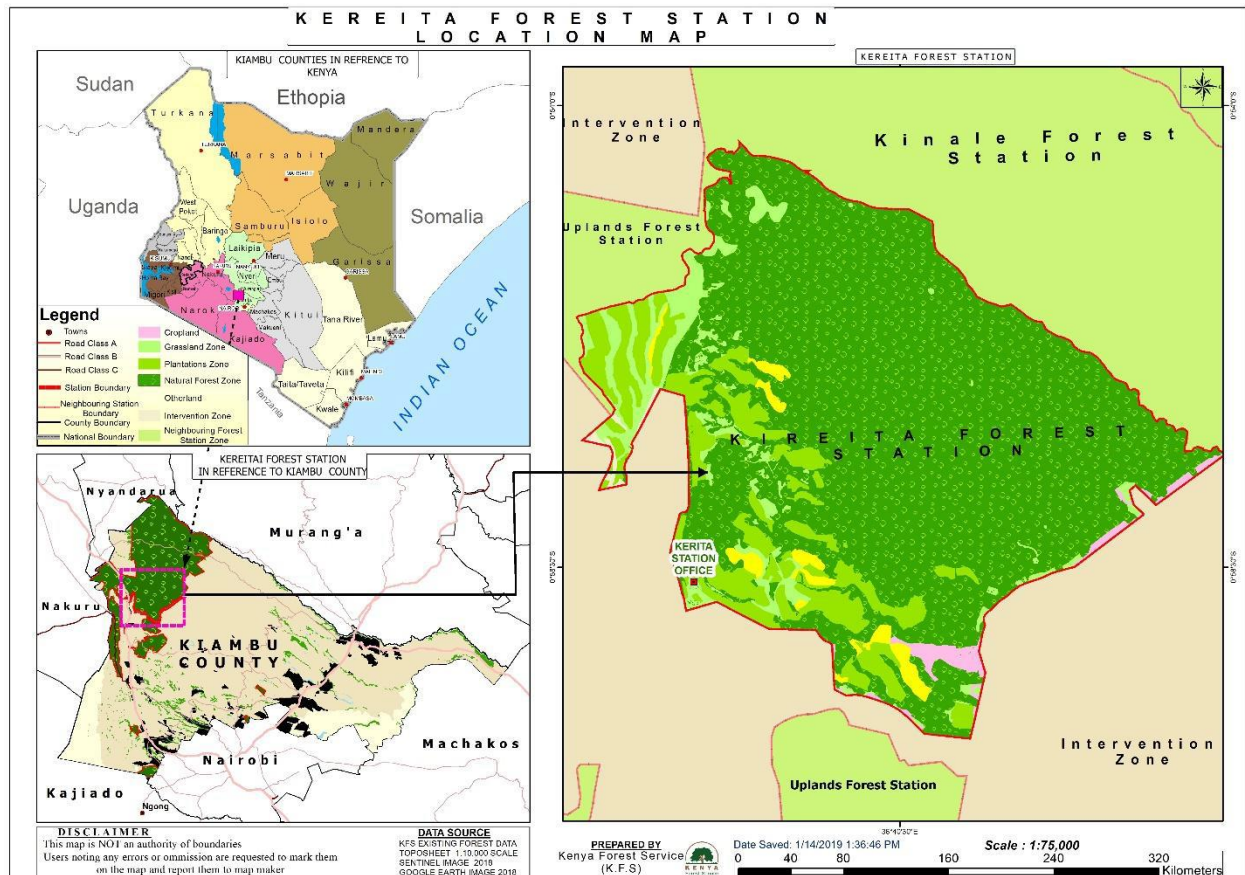


Figure 3.1: Location of Kereita forest in Kenya (KFS 2007)

3.2.2 Legal and Administrative Status

Kereita Forest is in Central Highland Conservancy, Lari Sub County, Kiambu County. The forest belongs to the Aberdare Forest Reserve to the Kikuyu escarpment forests. It was gazetted *vide* legal notice No.7 of 1943 with an objective of conservation. It has a total area of 4,722.6 ha. The forest comprises one forest block that is further divided into five beats for ease of management. It has two outposts whose role is to protect the forest and control human and livestock entry into the forest. Kereita Forest is managed by Kenya Forest Service (KFS) under Forest Manager who reports to the Ecosystems Conservator–Kiambu County; within the Central Highlands Conservancy. The Forest Manager is assisted by other KFS personnel.

Table 0.1: *Kereita Forest Blocks and Beats*

Kereita Forest	Block	Beats	Outposts
Kereita forest 4,722.6 Ha	Kereita	Station	Muri
		Muri	
		Bathi	
		Gatamayu	
		Nyanduma	Nyanduma

Source: KFS, 2013

3.2.2. Topography

The forest is situated in the Highland Region and makes the Aberdare area about 1800 meters above sea level. Many dissected ridges and valleys characterize the area. Geological evidence suggests that the present formation was strongly influenced by Mt. Kenya's volcanic activities. This led to many lava flows eroded in rich volcanic deposits over the years. The soils are very productive, well drained and brown in dark-rotten colour.

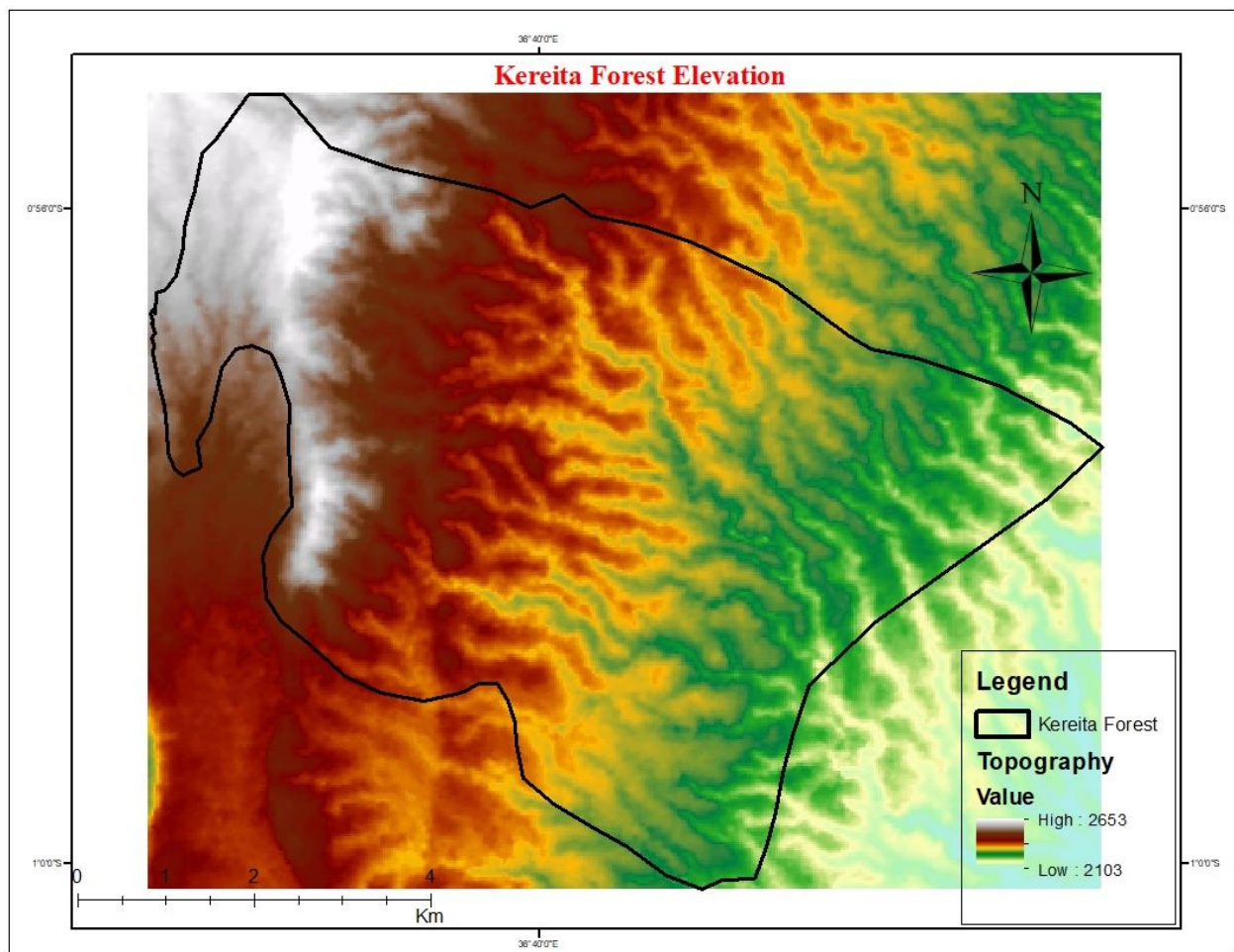


Figure 0.1: The Topography of Kereita forest (KFS 2011)

3.2.3. Climate

The relatively high altitude ranging from 1,500 and 2,550m.a.s.l plays a significant role in influencing the area's climatic conditions. The temperatures range from 20°C in March and April

dropping to 12°C in July/August. The area experiences two rainy seasons with heavy precipitation experienced in March up to May and June, accompanied by cold weather and short rains in October and November. The yearly precipitation shifts with heights, with higher zones getting as high as 2,500 mm and lower zones as low as 600 mm. p.a.

Table 0.2: Rainfall Figures for Kereita Forest Station and neighboring Kagwe Tea Factory (KFS, 2017)

	KEREITA FOREST STATION				KAGWE TEA FACTORY			
YEAR	2014		2015		2016		2017	
	RAINY DAYS	AMOUNT mm	RAINY DAYS	AMOUNT mm	RAINY DAYS	AMOUNT mm	RAINY DAYS	AMOUNT Mm
January	3	15.67	0	0	7	25.6	1	24
February	8	176.3	2	65.1	2	9.8	5	11.9
March	5	180.2	0	0	4	23.1	4	18
April	8	166.5	0	0	6	102.5	14	161.8
May	3	36.9	12	215	2	3.1	16	143.4
June	4	40.9	15	615	2	trace	2	23.4
July	2	25.3	11	215	1	trace	8	210
August	8	145.2	2	10	0	trace	11	38
September	5	113.2	3	45	0	0	8	27.5
October	5	75.8	5	87	3	6	15	231.6
November	12	231	15	336	**	**	18	168.2
December	5	95.6	12	178	***	***	5	23
TOTAL	68	1302.57	77	1766.1	27	168.1	107	1080.8

3.2.4. Geology and soils

The physiography of the northwestern part of Kiambu County where Lari Sub-County, is influenced by Nyandarua range. The soils of this area are moderate to highly fertile suitable for agriculture. On the mountain's soils with top humus soil and a medium to high fertility are low or leached and very acidic (pH 3.5-4.5). Soils on the hills are generally variably fertile and can only be found in the western part of the sub-county. Fertile upland soils occur in the west region (192 U, 198 U), others are of moderate to low fertility in the very eastern part of the sub-county.

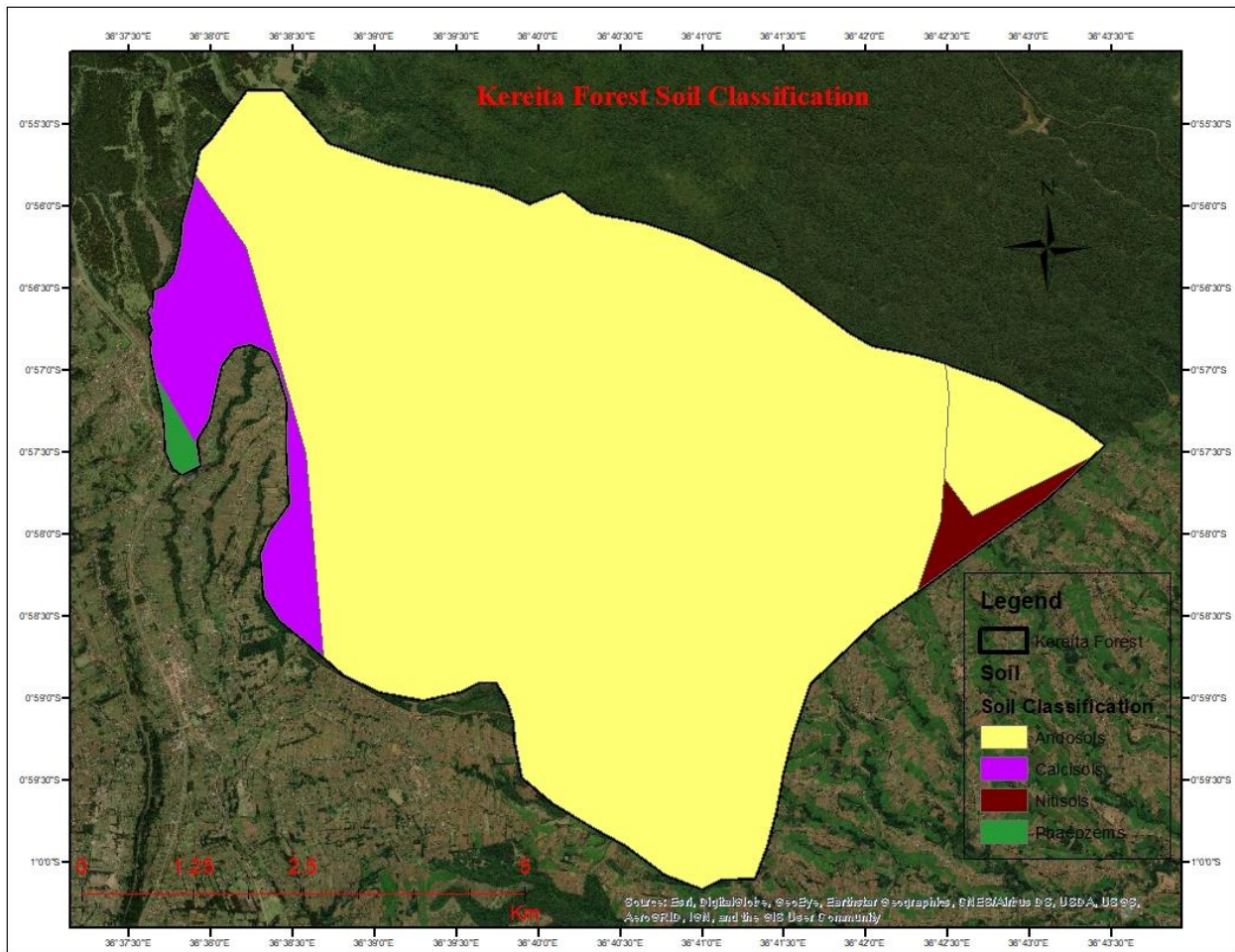


Figure 0.2: Soil classification of Kereita forest (according to FAO classification)

On the high-level uplands where the forest is located, amorphous volcanic rocks (primarily basalt) form the soils. They are well drained, very deep, reddish-brown with humic topsoil (andoluvic phaezems), very dark greyish-brown, friable and slightly flattened clay. Soil types on

pyroclastic rocks, with their humic surface (mollic andosols), is well drained, very deep, reddish-bright to dark-brown, very porous and smear, clay loam.

3.2.5. Drainage

The very high altitude topography has affected the current drainage pattern. The forest is the genesis majority of the streams and rivers that come from this region including Bathi, Githoito, Nduriri, Karatina, Wanjura, Gatamaiyu, Kiruiru, Komothai. The streams and rivers flow south-east joining the Athi River from Ruiru and Nairobi Rivers. The drainage system passes through inhabited farms with active farming capabilities.

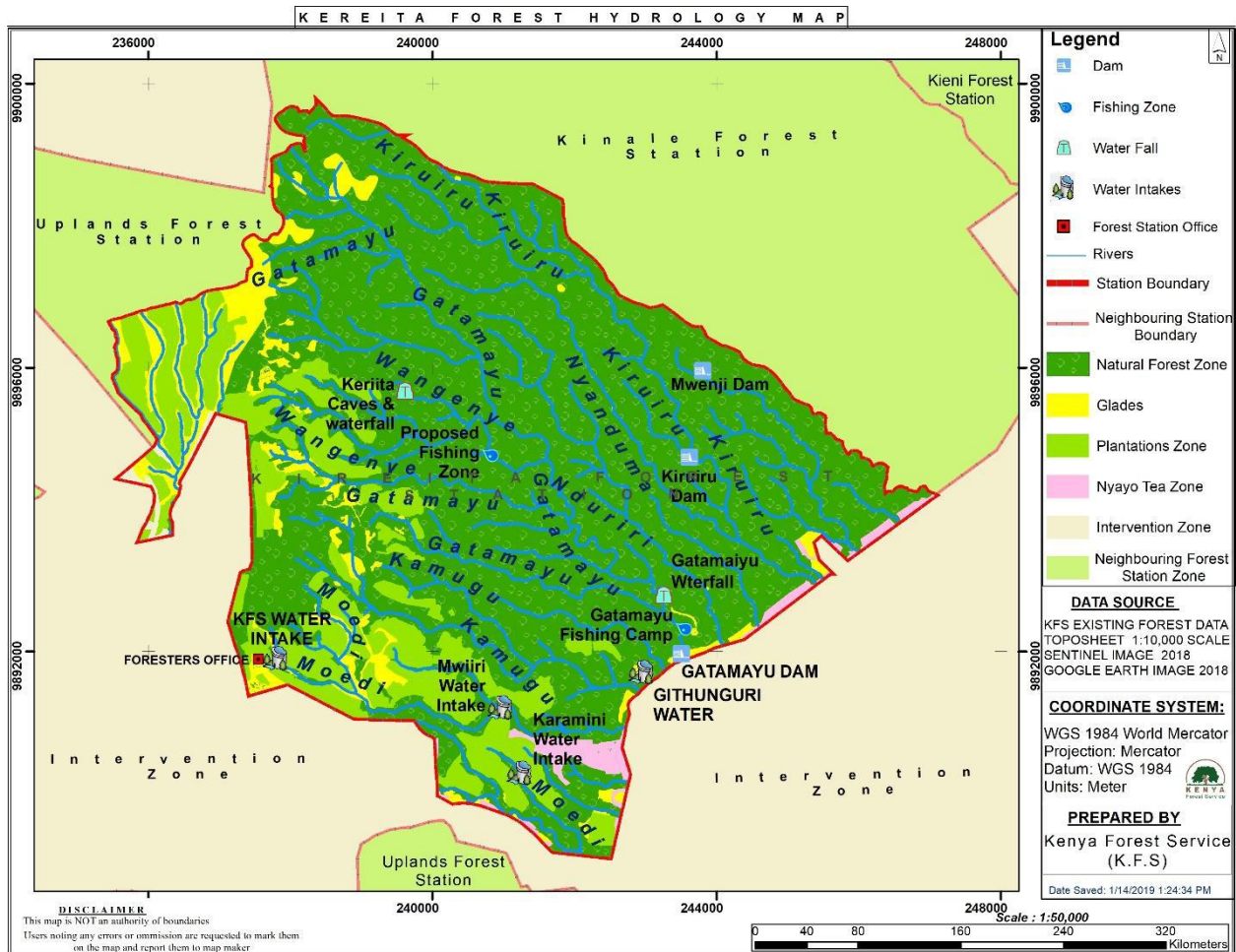


Figure 0.3 : Kereita Hydrology map

3.2.6. Land Use in the Area

The forest is globally, nationally, and locally significant. Locally, this forest's main products include firewood, fodder, water, and medicinal plants, among others. Nationwide it provides water to adjoining Ruiru and Githunguri; while globally, categorized among the Important Bird Areas (IBAs) and a source carbon dioxide for industrial use in East and Central Africa. The Kereita Forest Block has six sub-locations adjacent to it The forest is part of the Aberdare ranges with Kiambu covering less than 1%.

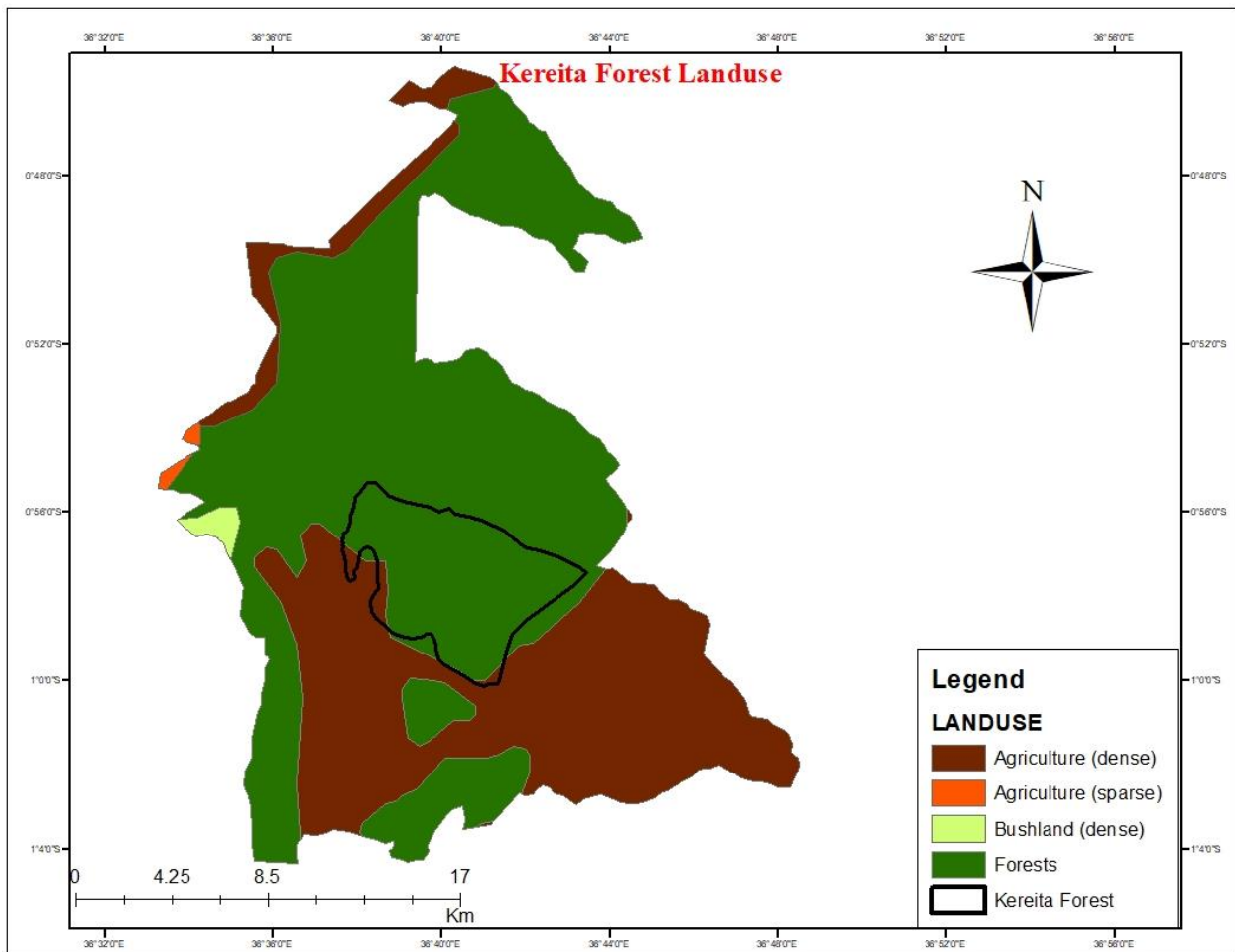


Figure 0.4: The land uses of Kereita forest

In 2004 grazing was banned in Aberdare ranges in Central Kenya (KFS, 2010). The inhabitants of Kereita have been very welcoming of wild animals living next to their land. In the previous years, however, farmers have seen wildlife as rivals for land, grass, water, and the deposits of livestock disease in the agricultural community. Owing to improvements in land use,

overgrazing, general environmental degradation and productivity have been increased in the margins of land, which have a negative effect on people. Poverty is a frequent phenomenon (Kenya County Fact Sheets, CRA, 2011).

3.2.7. Water utilization and easement in Kereita

The survey revealed that Kereita forest has several rivers and water projects that currently supply water to the communities adjacent to the forest, Towns, and shopping centers that are not too far from the forest (Table 3.5). These are categorized as large such as Bathi dam that serves about 150,000 people medium that help 200-1000 people and small that are individually owned that serve 6 to 20 people.

Table 0.3: *Water easement*

	Name of the water project	No. of people
1	Githunguri	300,000
2	Bathi Dam	150,000
3	Chiboni/Kambacha	200
4	Karamini Water Project	400
5	Karaya	400
6	Kirururu	800
7	Mbariki	600
8	Mbariki	500
9	Muiiri Githoito Water	800
10	Mwaritha Water Project	500
11	Mwenji	300
12	Nduriri Water Project	1000
13	Njoroge Benson (individual project)	20

Source:KFS, 2011

3.2.8. Description of Flora

Available information on vegetation is mainly in the forest reserve with scant details on the tree species found in the farmlands. Gatamaiyu ridge has a pure stand of indigenous trees while Bathi ridge is composed of a mixed forest of indigenous and exotic tree species. Some parts of the indigenous forest were hived off to create the Nyayo Tea Zones designated to serve as a buffer for protecting indigenous forests from encroachment. The tea buffer zones form a broken belt around the forest managed by the Nyayo Tea Zones Development Corporation still within the gazetted forest area as the area has not been degazetted. The forest has an area cover of 4,722.6ha that is categorized as follows:

Table 0.4: *Vegetation distribution*

Vegetation	Area (ha)
Indigenous Forest and glades	3,768.02
Forest Plantations	812.49
Bush Land	80.54
Bamboo	20.23
Grassland	40.42
Total	4722.6

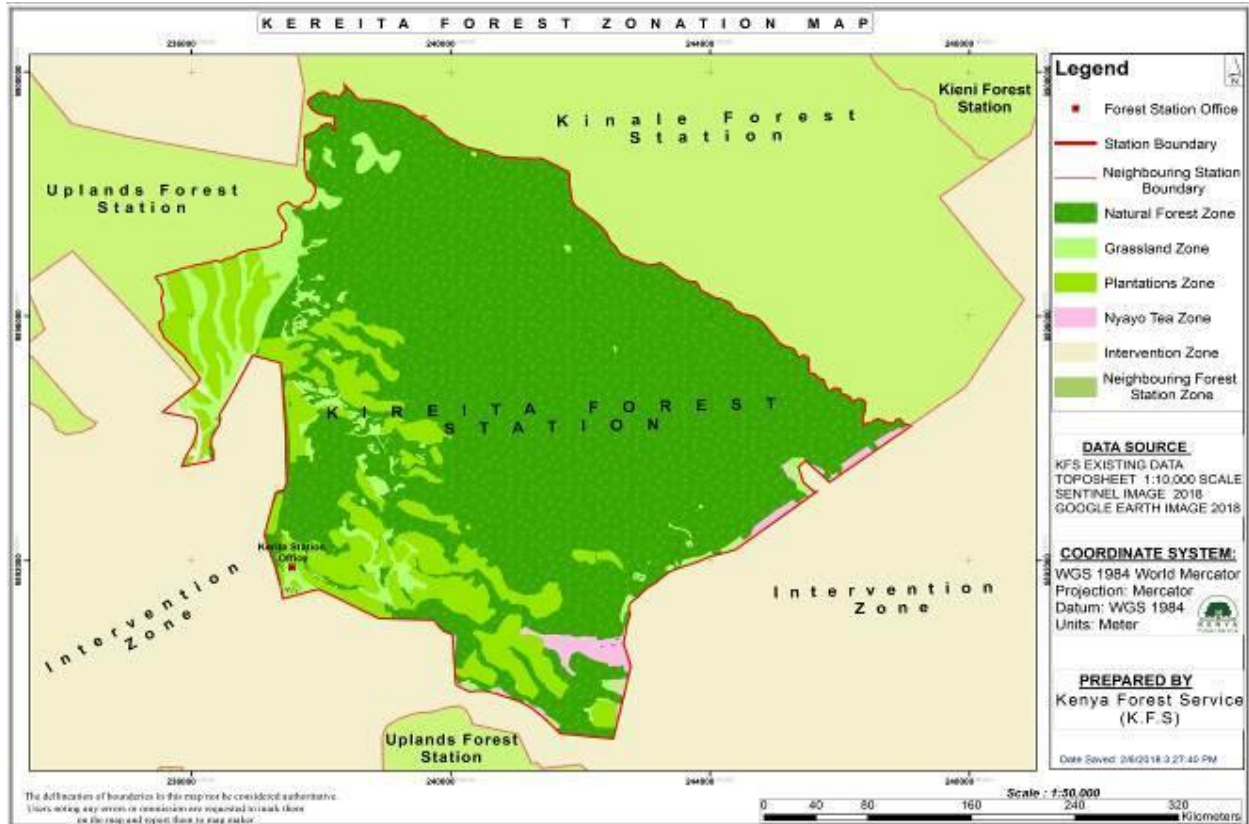


Figure 0.5: Kereita zonation map (KFS 2011)

The indigenous forest accounts for more than 75% of Kereita Forest and covers about 3,722ha with Bathi covering 800ha, Gatamaiyu 1,200 and Nyanduma 1,722ha. *Ocotea usambarensis* at one time dominated the forest. On the edges of the forest roads and in areas where illegal charcoal making was previously carried out the landscape is dominated by pioneer species such as *Croton macrostychus* and *Neubutonia macrocalyx*. Other common indigenous tree species found in include: *Podocarpus latifolius*, *Gracia volkensii*, *Prunus Africana*, *Macaranga kilimandscharica*, *Olea africana* and *Aningeria adolfi friedriccii*. Most plantations are in Kambaa and Bathi ridge. The current inventory depicts an area of 931.1 hectares occupied by farms. The species being grown in the plantations include the following:

Table 0.5: *Current plantation distribution*

Species	Area (Ha)
Cypress (<i>Cupressus lusitanica</i>)	686.3
Pines (<i>Pinus patula</i>)	144.9
Eucalyptus (<i>Eucalyptus saligna</i>)	72.9
Podo/Prunus	1.2
Araucaria	1.8
<i>Acacia mearnsii</i>	1.8
Mixed species	22.2
Total	931.1

The communities living near the forest, KICOFA members and saw millers carry out silvicultural operations such as pruning, thinning, weeding and taking care of planted trees through Plantation Establishment and Livelihood Improvement Scheme (PELIS). Besides, the Kereita Forest Station has a backlog of 135ha that requires to be planted with exotic softwood species. The Kereita Forest Manager and his rangers are responsible for supervising each operation to ensure that the work is done to the expected standards.

3.2.9. Description of the fauna

The Kereita Forest has been the home to African Elephants (*Loxodonta Africana*) which are often found in Kereita as they walk from Aberdare's main forest block. The Black Columbus Monkey (*Columbus polykomos*) Sykes's monkeys are also mammals present, small antelopes such as duiker, bush infant, pigs, carnivores Mongoose and Civets. In the past years, there have been isolated cases of leopard attacks on domestic animals. Kereita Forest is an Important Bird Area (IBA) of Kenya's Central Highlands with a rich avifauna. Kenya and Ornithology (NMK) recently researched some 138 bird species, 31 of which are forest experts and 20 rare throughout the forest. The NMK announced that there were about 138 forest species. A minimum of 39 of the 67 AHB species of Kenya occur. The forest houses Abbott's Starling (*Cinnyricinclus*

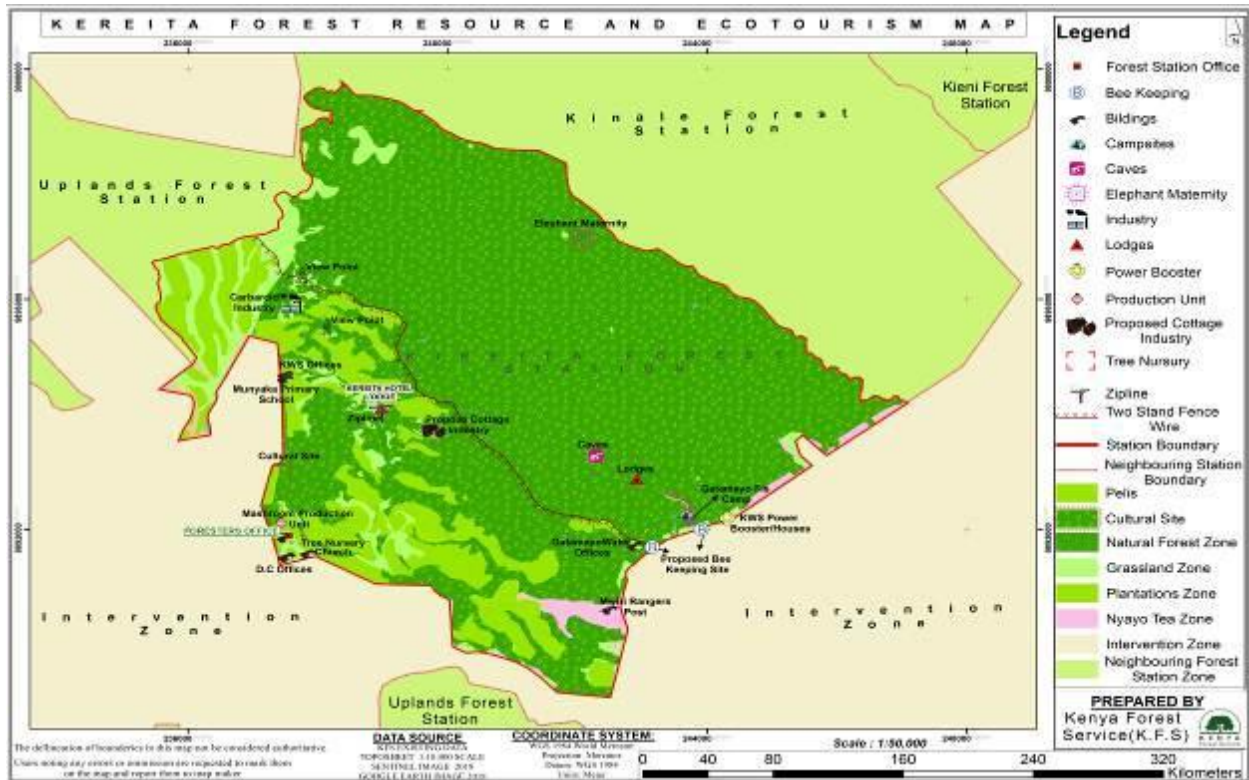
femoralis), which is internationally endangered and is almost the entire year recorded (Bennun & Njoroge 1999). There are also other species with restricted range such as Jackson francolin and Hunter's cisticola. Often known as "Taylor and Taylor," there are various regional species at risk such as African green ibis, Ayres hawk eagle, crowned hawk eagle, and Red-chested Owlet. The forest gives rise to three almost native butterfly species: *Charaxes nandina*, *Neptis kikuyuensis* and *Neptis katama*.

3.2.10. **Non-wood forest products**

Kereita forest has various non-wood forest products that include but are not restricted to honey, wax, herbal medicine, indigenous fruits, and roots. During the social-economic survey, it was found that the utilization of these products is not well established as only a few community members practice beekeeping using both modern and traditional hives, while a number of the elderly extract herbs for medicinal purposes.

3.2.11. **Ecotourism**

Its proximity to the Rift Valley circuit makes it an attractive area to tourists. Some of the nearby tourist attractions are; Aberdare National Park, Lake Naivasha, Hell's Gate National Park and Mt. Longonot National Park. The forest is easily accessible from the Nairobi–Nakuru road via a junction at Kimende Shopping Centre. Some of Kereita Forest sites and surrounding landscapes have ecotourism attractions which include the following that requires to be developed to attract local and international visitors; Waterfalls, caves, Gatamayu fishing camp, Kikuyu Cultural Centre, Bathi Dam, Mai ma Nyoni at Carbacid, Elephant maternity, and viewpoints.



Source: KFS, 2011

Figure 0.6 : Kereita Forest Resource and Ecotourism map

3.2.12. Forest infrastructure and equipment

Kereita forest is managed by a forest manager stationed at the Southern edge of the forest. The same compound houses KENVO Resource Centre, a Dispensary, KFS staff houses, water bottling plant, water pumps, and a Tree Nursery. Besides, the Sub County Commissioner offices Lari sub-county, Carbacid Company offices and plant, and Muniyaka School are within gazetted forest area. 56.2 Kilometres serve the forest in terms of the road network, which requires regular improvement. The Forest Manager has a serviceable four-wheel pick-up vehicle for conducting patrols to protect forest resources and a motorbike for extension services. Other developments within the forest include Carbacid occupying 23.7ha, Muniyaka School and Deputy County Commissioner's offices whose records on the area they occupy is not available.

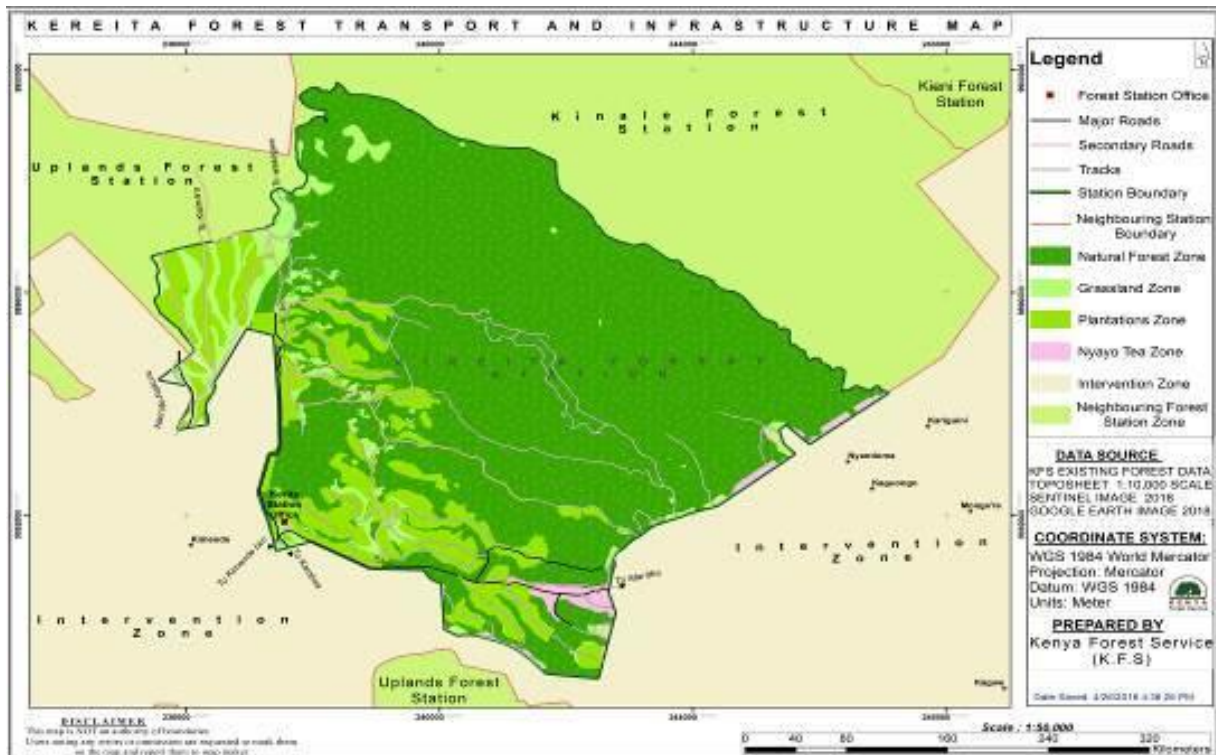


Figure 0.7: Kereita Forest transport and infrastructure map (KFS 2011)

3.2.13 History of the Area

Kereita forest has undergone various changes in management over the last seventy years. These historical changes in Kereita forest management are presented in table 3.2 .

Table 0.6: *Historical Profile of Kereita Forest*

Year	Event
1939	Members of the Kikuyus settled in the area around Kereita.
1942	Grazing was banned.
1935-1950	An increase in the number of schools in the area which were allocated land in the forest. The whole of Kimende was a forest.
1954	Villages were built and cultivation banned.
1956	Cultivation allowed.
1968	Grazing permitted but controlled.
1972	Great North Road done.
1988	Nyayo Tea Zones created; logging, grazing, and cultivation banned; forest schools and churches closed.
1993	Grazing permitted without control; the shamba system began
1995-2005	Many schools came; increase in several markets (Kirega was the only market); Non-governmental organizations (NGOs) related to forestry came up.
1999	Community and Kijabe Environmental Volunteers Organization (KENVO) started monitoring and conservation of forest.
2001	KENVO and United Nations Environment Programme (UNEP) started Ururu Project; Kenya Forests Working Group (KFWG) began civic education; Kereita Forest and Wildlife Conservation

Year	Event
	Association (KFWCA) founded.
2002	KFWCA registered with social services
2003	Shamba system and grazing banned.
2005	KFWCA registered with Registrar of Societies
2011	October 3rd community forest management agreement signed with Kenya Forest Service for five years.

Source: KFS, 2013

3.2.14. Population Characteristics

Kiambu County, nearby the northern fringe of Nairobi County is characterized by hilly topography and farmland. The county's population is 2,417,735 in total (KNBS, 2019), predominantly depending on agriculture and collecting forest products from the adjacent Kereita forest. The county can be described as having high population density of approximately 988 persons per squared kilometer. The County is 40% rural, 60% urban owing to Nairobi County's growth northward.

3.2.15. Human resources

The forest has one Forest Station Manager, one Assistant Station Manager, and 11 Forest Rangers. The current staffing status and the felt recruitment needs in the station are shown in the table below.

Table 0.7: *Current staffing status and immediate recruitment needs*

STAFF CADRE	CURRENT NO.	OPTIMUM NO	VARIANCE
Forest Station Manager	1	1	0
Assistant Forest Manager	1	2	1

Clerical Officer	0	1	1
Copy Typist	0	1	1
Driver	0	0	0
Rangers	11	20	9
Sergeant	0	0	0
Corporal	1	1	0
*Subordinate staff	2	26	24

Source: KFS Station Manager, 2017

NB **the current trend of KFS is to hire casuals on a need basis rather than employing support staff on a long-term basis.*

3.3. Sampling Design and Sampling Procedures

3.3.1. Study Design

The design entailed establishing the contribution of implementing PFMP activities in supporting communities' participation in the management of forest and their impact on their livelihoods. The descriptive survey design was crucial for the study, as it allowed the utilization of adjacent forest community living around and depending on the forest to explain what they perceived to be the contributions of PFM Plan activities in supporting participation of the community in the management of the forest and their accruing impacts on their livelihoods. These are based on how income-generating projects have affected forest management strategies and adjacent forest communities' livelihood improvement. The choice to consult with the forest neighboring community households was prompted by the fact that these are the people who are affected directly by any change in forest management on their livelihoods, which largely depend on forest resources. Thus, they had the most helpful information on issues connected to the study.

Data sources

This analysis used both the primary and secondary data collection methods to obtain information from the sampled population. The key data sources included the implementation of organized surveys, planned oral interviews and direct observations. However, secondary sources included the compilation of information from data or desk analysis that was already processed.

3.3.14. Target Population

The research concentrated on the Kereita Forest CFA, forest user groups, government officials, NGOs and CBOs as well as private investors with activities inside the study area. The study focused on the Kereita Forestry. The bureau of statistics in Kenya (2019) has established the Kenya Population & Housing Census document for 2019 as represented in Table 3.9. The number of people was in the five sub-locations.

Table 0.8: *Population Distribution by Number of Households and Administration Units for Kereita Forest Adjacent Community*

No.	Sub-Location	Population	No of households	CFA Members	Population Density per Sq. Km
1	Magina	4097	1143	235	2030
2	Bathi	3715	965	514	829
3	Nyanduma	3631	1078	600	587
4	Gatamaiyu	9557	3021	1200	595
5	Kambaa	2200	593	350	1050
	Total	23,200	6,800	2899	5091

Source: Kenya National Bureau of Statistics (KNBS) 2020 and Researcher, 2019

The survey was conducted strategically on the households of the communities that were adjacent the forest and belonged to a CFA member. This population was about 10% of the total households in the study area. The total number of households was 6,800 and therefore the sample size was determined from 680 households that were neighboring Kereita forest. In addition, the sample size was derived by using the formula suggested by Mugenda and Mugenda (2003). The

sample frame consisted of the entire households' resident in the five sub-locations. An appropriate sample was achieved using the formula below:

$$n = \frac{N}{1 + Ne^2}$$

Where: n = Sample size for the study area;
 N = Total number of households in the target area; and
 e = Desired margin of error (0.05).

$$n = \frac{680}{1 + 680 \times 0.0025}$$

$$n = \frac{680}{1 + 1.7}$$

$$n = \frac{680}{2.7}$$

$$n = 251 \text{ Households}$$

The sample size was derived through proportional allocation depending on the total number of CFA households in each sub-location. Sample size distribution is presented in the table below;

Table 0.9: *CFA Units Comprising the Kereita Forest Forest Sampled Respondents*

CFA Units in Kereita Forest the Study Area	Unit Members	Number of Respondents
Magina	235	21
Bathi	514	47
Nyanduma	600	55
Gatamaiyu	1200	100
Kambaa	350	28

Total	2899	251
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3.1. Sampling

The study was structured in a descriptive way. A descriptive survey designs the collection of data from population participants to assess population status in relation to one or more variables (Mugenda and Mugenda, 2003). Gall et al. (2009) note that the aim of descriptive research is to provide statistical information on various aspects of an existing phenomenon, in particular in terms of policy formulation and implementation. The choice of descriptive research design is focused on the fact that in this study the phenomenon of forest protection and management was already present.

Design consisted of the contribution to support forest management by the community and its impact on community livelihoods in the Kereita Forest. The design of a descriptive survey was suited to the research, as a contribution by incoming activities to promote community involvement in forest management and the impact it has upon community livelihoods was specifically explored by adjoining households from the forest community. They also informed forest management methods and the changes in livelihood of nearby forest communities in revenue generation projects. The fact that these are the people directly affected by any change in forest management, because of their primary reliance on forest resources, contributed to the preference of these community members in the study. They therefore had the most valuable knowledge regarding issues that were of importance to the study .

251 households were selected from eight units for this report. In general, the head of the household was interviewed. If the head wasn't available, a spouse or a child (above 18 years of age) was interviewed. All gender was included in the study for gender consideration.

3.2. Data collection

3.2.1. Pre-Test

Pre-test aimed at checking on the practicality of the study. This evaluation included checking the feasibility of the research targets and suitability of research devices to the study. The pre-assessment indicated that a few questions were ineffectively replied. Also, in some questions,

some respondents could not understand the questions. That is, the questions were poorly handled, and no meaningful information could be obtained. Therefore, the pre-test study assisted in erasing out errors and ensuring proper application of the research instruments.

3.2.2. Household Questionnaire

A household survey for collecting relevant socio-economic data was managed and successfully administered on 251 households, which were part of the communities adjacent to Kereita forest. The questionnaires were administered by both researcher with the help of research assistants and response received was noted in the respective spaces in the questionnaire. Enumerators were sourced locally because of language considerations and trained before administering the questionnaire. However, from all the 251 questionnaires administered, 11 of them were spoilt because of various reasons. Some of them were not filled properly or had numerous mistakes that could not be counted as valid responses. Therefore, 240 questionnaires that were properly filled and submitted were used in the study for analysis, results presentation, and also for the discussions and conclusions made.

3.2.3. Key Informant Interviews

Key informant interview, done with checklist and targeted the forester, CFA leaders and area administrative officers, relevant Government departmental heads, representatives of NGOs working in the area and private sector representatives who had activities inside the forest. An example of the private sector was a representative of Cabacid factory which deals with natural gas and the African lodges who are conducting eco-tourism activities in the area. These interviews were directed to accumulate expert opinions and knowledge data on the status and capability of different PFMP Activities inside and outside the forest, the management of the forest, protection, and livelihood elements. The key sources gave the obligations of different partners and other active actors in protecting, the management, and implementation of Kereita Forest PFMP. They featured conceivable and existing clashes and potential reasons for disputes in the implementation of the PFMP.

3.3. Data Analysis

Data analysis involved computation of both descriptive and inferential statistics. Descriptive statistics analysis was involved in calculation of means, variances, and coefficients of variation of the responses without giving detailed explanation of the values computed. Descriptive analysis therefore, gave general description of the collected responses. Common ways to describe a single variable was through proportions (percentages), frequency distribution tables, measures of central tendency and measures of dispersion. This was depicted in tables and/or graphs. In inferential procedures, interpretations of values obtained from descriptive procedures were given. Inferential statistics were therefore used to provide deeper understanding of descriptive statistics. Both quantitative and qualitative methods were used to perform descriptive and inferential procedures.

As one aspect of inferential procedures, regression analysis was performed to determine how the independent variables relate with the dependent variable. Here, Statistical Package for Social Sciences (SPSS) version 19 was used for correlation and regression analysis. Multiple regression equation obtained was of the form:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 \dots \dots \dots \beta_n x_n + e$$

Where,

y = dependent variable

x_i = independent variables

β_i = Coefficients to be estimated

All outputs of inferential procedures were summarized in a table.

3.4. Ethical Considerations

The purpose of the research fieldwork was to enhance the comprehension of the research process. Therefore the researcher often asked for information from people with no interest in the goal of the research during the study process. Those who chose not to participate for one reason or the other were respectfully allowed not to be involved. Among others, these were the major ethical consideration that the researchers observed. The researcher and her assistants carried the research permit at all times to reassure participants that the research was allowed by the relevant authority.

Engagement in all aspects of the study was voluntary, and manipulation or intimidation did not take place. During the research, the respondents were not compelled to give out information they did not want to. The team acknowledge that the respondents assist them and were encouraged to participate, knowing explicitly that they were not obliged to do so and that if they did not assist in the study, they would have no negative consequences.

3.4.14. Informed Consent

The study team made sure that the prospective respondents adequately understood what was required of them and also the consequences of such participation. The study included a sample data sheet and a selection of complementary information that could be used in the research. It was really critical that the details were clear enough that the specified participants understood the what was expected of them at all times. For example, we requested the respondents, who agreed to take part in the research, to complete the survey that was to take them about 15 minutes and submit them to an area we had designated for them.

3.4.15. Privacy and Confidentiality

The duration, the degree and contexts within which private information should be distributed or excluded from other people was at the liberty of each person freely to decide. The participants were assured of not sharing with others any private information, including interests, perceptions, opinions and documents, without their awareness or consent. Besides, the potential respondents and the study team deliberated all the goals, instruments and methods beforehand. There was, therefore, no threat to the issues of privacy and confidentiality.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1. Introduction

This chapter gives a detailed assessment of research findings and discussion. This study focused at analyzing the implementation of the activities of the Kereita Forest Management Plan 2010-2015, and assesses the level of collaboration between KFS and CFAs in implementing the Kereita PFMP activities and exploring the challenges and opportunities faced by the CFAs and KFS for increased participatory management of Kereita Forest Ecosystem.

4.2. Household characteristics

The interviews done on the households, the respondents were 52% male and 48% female. Most of the respondents were in the range of 46 and 55 years of age (figure 4.1).

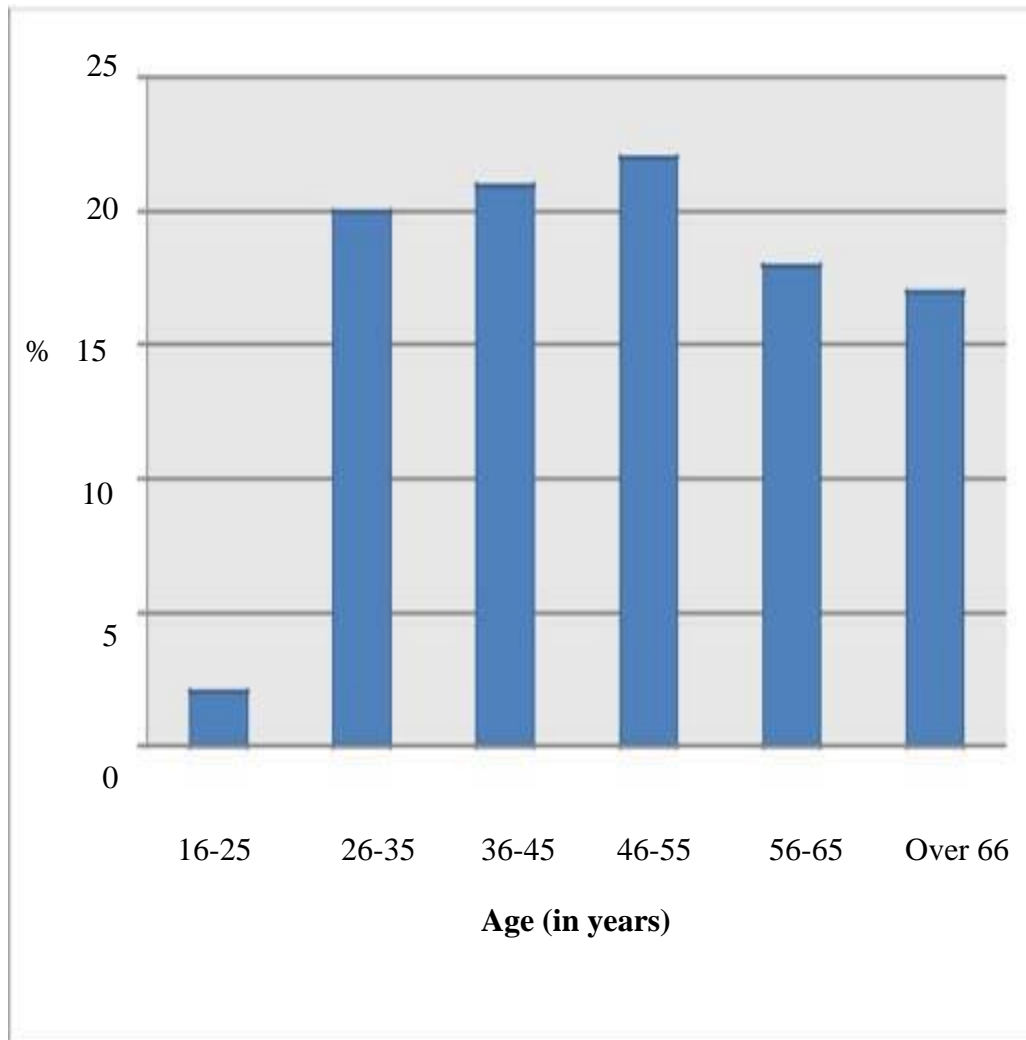


Figure 0.1: Age distribution of the respondents

In terms of religion affiliation, protestant accounted for 73% of respondents. On the other hand, the least representation was 1% which were Muslims (figure 4.2).

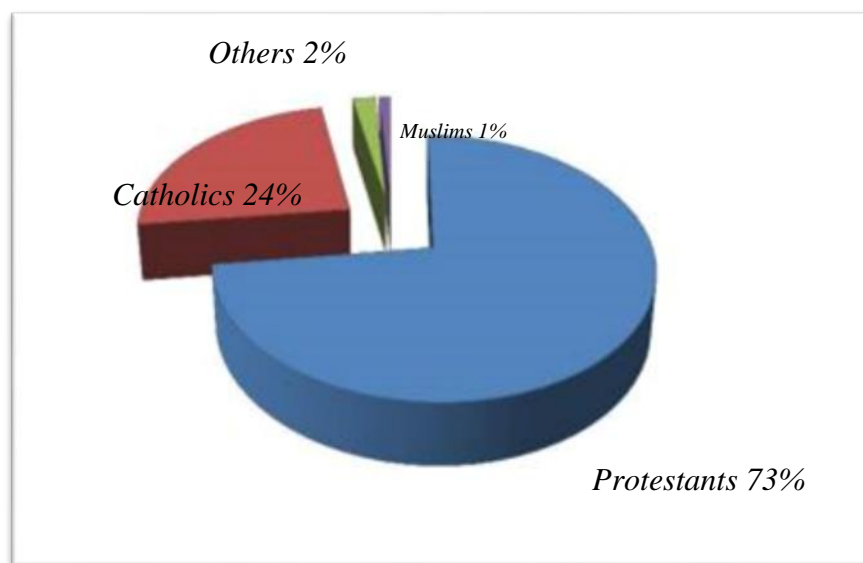


Figure 0.2: Religion of respondents

Literacy levels varied, but most household heads in the study area had a primary school level of education with a proportion of 53%. The levels of literacy were distributed, as in Table 4.1 below.

Table 0.1: Education level of respondents

Level of Education	No. of Respondents	Percent %
Primary	126	53
Secondary	86	36
Tertiary	28	11
Total	240	100

The occupations of the household heads in this study area were farmers, business, and casual workers. Most of the study area's household heads were farmers 85% with 10% and 5% being business and casuals, respectively, as shown in Table 4.2.

Table 0.2: *Occupation of the Head of Household*

Occupation of the head of household	No. of respondents	Percent %
Farmers	203	85
Business	24	10
Casual	13	5
Total	240	100

The study found out that the household sizes range from 2 to over 10. Because of the closeness of the household sizes, the smallest possible size intervals was 2. The largest household size was between 3 and 4 (accounted for 40%) while the smallest household sizes had 9-10 individuals (3%) and above ten individuals (3%). Frequencies of other household size categories were summarized, as shown in Table 4.3.

Table 0.3: Household Sizes

Household size	Frequency	Percent %
2	39	16
3 – 4	97	40
5 – 6	67	28
7 – 8	23	10
9–10	7	3
> 10	7	3
Total	240	100

4.2.1. Household Income per Month

The study identified the main income sources for individuals living in the study area as forestry and agricultural-related activities. Such activities specifically included farming, horticulture, and timber traders, poles, firewood, and milk. Table 4.4 gives the findings in this question.

Table 0.4: Household Income per Month

The income per month Ksh.	Frequency	Percent %
Less than 2,500	35	15
2,501- 5,000	52	22
5,001- 10,000	78	32
10,001 - 15,000	40	17
15,001-20,000	23	9
>20,001	12	5
Total	240	100

From Table 4.4, it came out clearly that the highest monthly income of the household was between Ksh. 5,001-10,000, 32%, while just 5% of all members earned more than Ksh 20,001 every month.

4.3. Activities undertaken by Community Forest Associations and Kenya Forest Service

4.3.1. Community Forest Associations (CFAs) and User Groups

To enhance and encourage good governance, Kereita CFA has an executive committee of five members, which is the highest decision making body, this is supported by a management committee of fifteen members comprising officials from the user groups who are leaders at grass root level, this ensures that all CFA members are represented in all decision making within the CFA as well as with all collaborations with KFS and other stakeholders. This is elaborated in Figure 4.3 below.

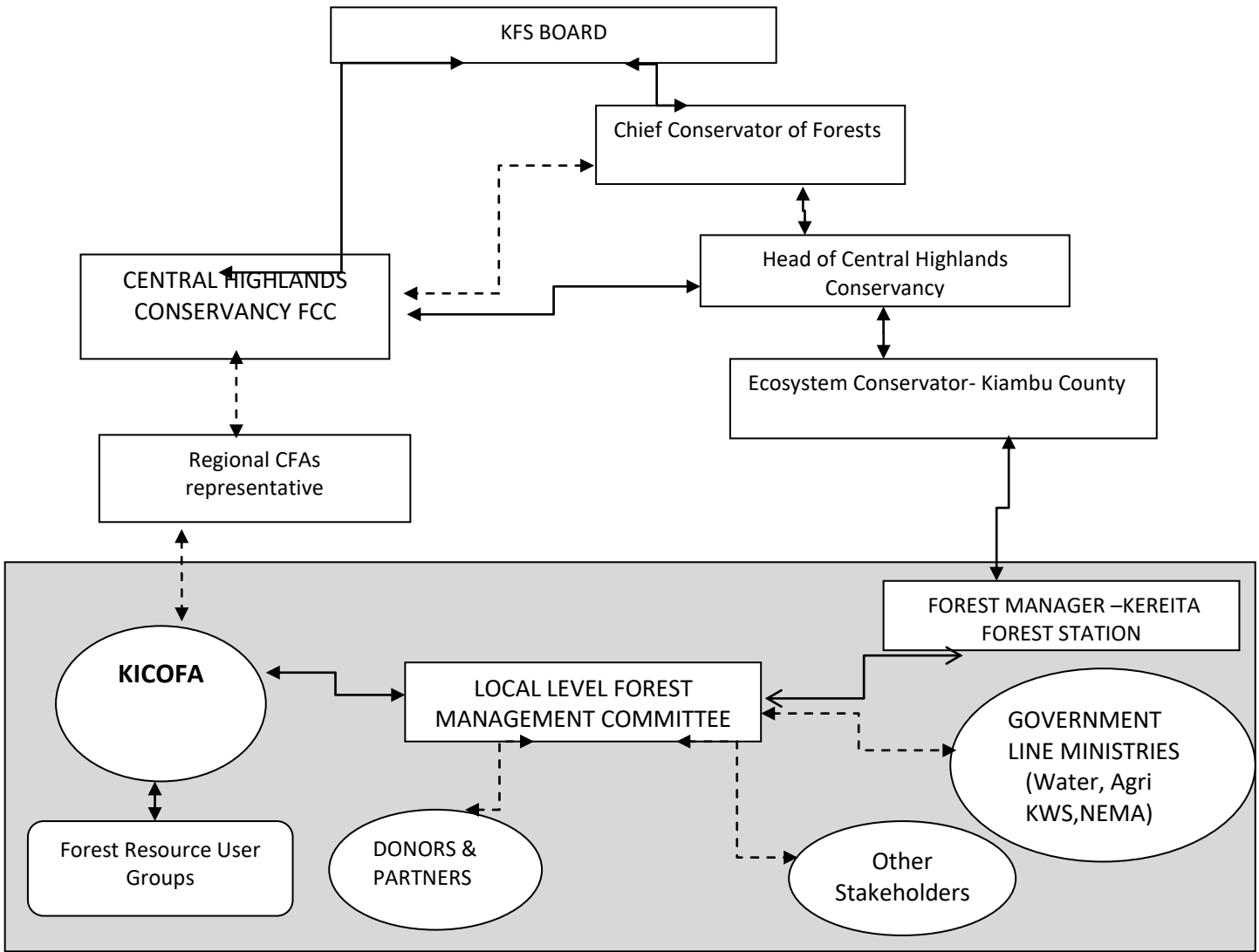


Figure 0.3: *Plan Implementation Structure*

Members of the Kereita CFA also belong to different specific forest user groups of their preference as indicated in Table 4.5 below.

Table 0.5: *User Group Registered Members in Kereita CFA*

User Groups Registered Under CFA	Respondents	Percent %
Cultivation PELIS	83	35
Grazing	61	25
Firewood collection	55	23
Grass cutting	16	7
Tree nursery seedlings production	14	6
Beekeeping & other NBEs	11	4
Total	240	100

The study findings established that 35% of the respondents are Plantation Establishment and Livelihoods Improvement Schemes (PELIS). Industrial forest plantations are cultivated through farming of food crops for at least three years before the tree canopy closes. This shamba farming system enhances food safety. Furthermore, as the main informants also clarified, this tailored cultivation increases the tree plant survival rate by 85%. The user groups for grazing and firewood collections were found to be between 25% and 23%.

4.3.2. Expanded Areas under Industrial Forest Plantations

Kereita Forest Station opened 989ha under Plantation Establishment and Livelihoods Improvement Scheme (PELIS), and 905.7ha were planted between 2007 and 2012. In these afforested areas, tree seedlings survival was impressive at 85%. The study found a consistently increasing trend on industrial forest plantation establishment and natural forest rehabilitation

with a total of 905.7ha and 185.9ha, respectively, as indicated in Figure 8. Expanded areas under industrial forest plantations that comprise entirely exotic tree species such as pines, cypress, blue gum, and *Grevillea robusta* are the primary source of timber for the construction industry, furniture workshops, plywood, pulpwood, and power transmission poles industries (KFS, 2016).

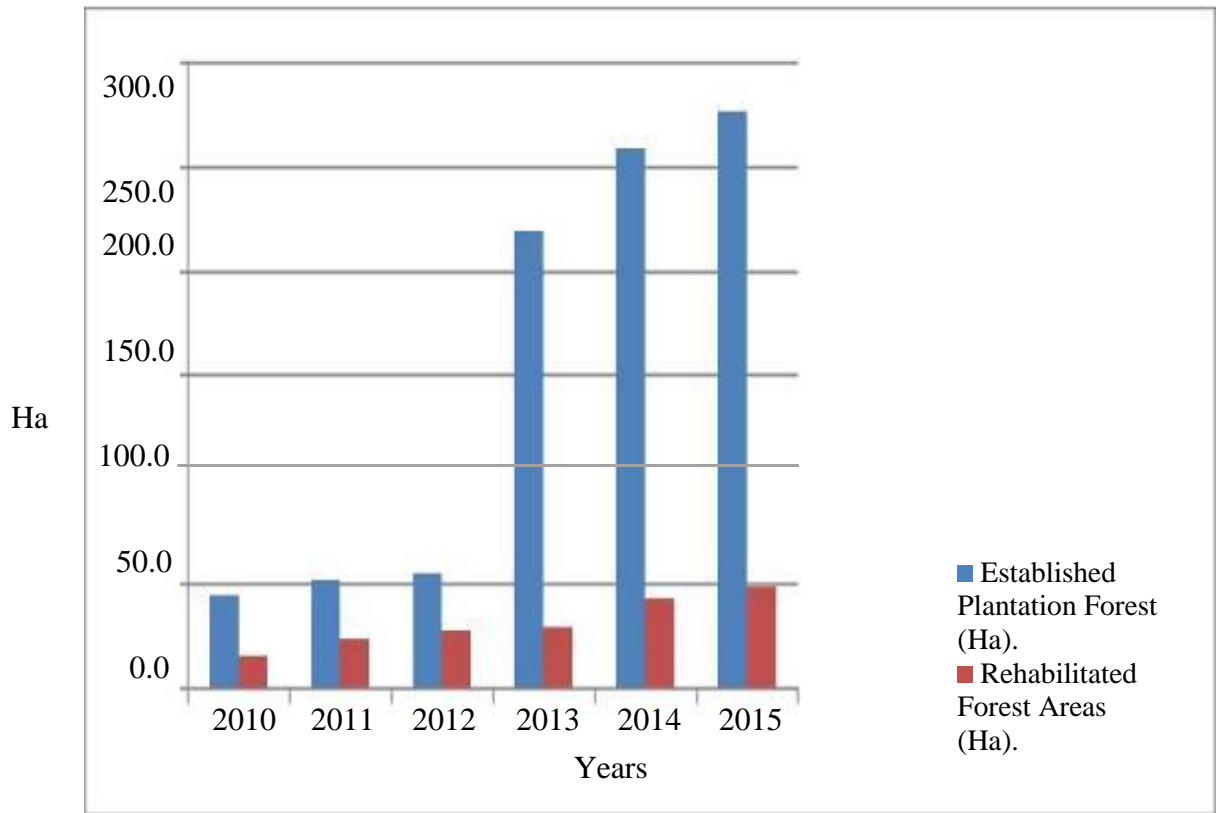


Figure 0.4: *Kereita Forest Planting of Trees between 2010-2015*

It was established that with community participation and cultivation under PELIS, the forest adjacent community enhanced industrial forest plantation establishment and food production hence improving their livelihoods and increase in forest cover. The trend concurs with Kagombe and Gitonga, 2005 report on plantation establishment in Kenya through the shamba system.

4.3.3. Community Action Plans

Community Action plans (CAPs) are the laid down protocols and action points that guide the implementation of the PFMP. It was established that Kereita CFA had drawn CAPs based on their PFMP whose development began in 2003 before enacting the Forest Act of 2005. It involved a collaboration of various stakeholders such as Kereita Forest and Wildlife Conservation Association (KFWCA) and Kijabe Environmental Volunteers (KENVO) Kenya forests working group (KFWG) with financial support from the Ford Foundation and the United

Nations Development Programme (UNDP). These are documents the communities use to draw their annual work plans and budget (AWP&B) to implement forest management, conservation, and protection with KFS and other stakeholders.

Development of community action plans (CAPs) was critical to implementing Kereita PFMP. A part from assessing the effectiveness of local structures in the management and conservation of Kereita forest from a broad perspective the CAPs give direction on how activities will be conducted in addition to giving timelines for the same. Most people in the adjacent communities reported to have participated in the management and conservation of Kereita forest, 82.5% having participated in the management and conservation of the kereita forest. This high participation rate was attributed to the fact that individuals are reaping many benefits from their participation in PFM. 97.9% of the respondents feel that the PFMP implementation process has benefited them as individuals with only 2.1% indicating that the process has been of any help.

Respondents also indicated what they thought was of most benefit in forest conservation with 29.5% citing climate stabilization as the biggest benefit derived from forest conservation. As seen on table 4.8, respondents differed in their ranking of these benefits.

Table 0.6: *Importance of Forest Conservation*

Importance of forest conservation	Respondents	Percent %
Climate change stabilization & rainfall influence	71	29.5
Forest Products	52	21.7
Future generation benefits	46	19.2
Non-Forest Timber Products (NFTP)	41	17.1
Biodiversity conservation	30	12.5
Total	240	100

As shown in Table 4.8, the micro-climate stabilization was considered the most valuable result of forest conservation with a frequency of 29.5%. This was attributed to reduced deforestation rate and use of alternative source of fuel. These later practices were observed to be consequences of community sensitization and education programs. On the other hand, the least considered importance of forest conservation was biodiversity conservation, which had a frequency of 12.5%.

The Kereita forest PFMP signed in 2010 to run until 2015 was the first PFM to be signed in Kiambu county and first for Kereita forest. The implementation process was therefore characterized by the usual teething problems of group dynamics and first time experiences. Some of the plan's achievements were the sensitization and training of CFA members on diverse issues including governance, election of the electric fence, and establishment of industrial plantation through PELIS among others. Table 4.9 presents the achievements and failures of the activities that were to be carried out during the plan period.

Table 0.7: Activities implementation status 2010 – 2015

Management Programme	Activity	Target and Lead agency	Achievement/ Remarks
Natural forest conservation and management	Rehabilitation of degraded areas	100 ha CFA, KFS and KENVO	Ongoing. 110 ha done during the plan period
	Establishment of industrial plantations	50 Ha by KFS and CFA	This is an ongoing activity, and 42 Ha through PELIS were planted during the plan period
	Wood fuel plantation development at Nyayo Tea Zone	No target was given. Nyayo Tea Zone to facilitate	Not done as there were no proper arrangement on how the plantations would be established
	Identification of grazing areas	Zonation of 800ha	Zonation of the forest areas for various uses by KFS in consultation with CFA and relevant stakeholders was completed
Water resources management	Mineral water Bottling	CFA and private investor – 1 plant	The plant started production in 2014. It has created employment opportunity to the youth within the project area and provided clean, safe water to an adjacent field and beyond

Management Programme	Activity	Target and Lead agency	Achievement/ Remarks
	Water abstraction	Seven by CFA, WRUA, KFS, and KWS	Fourteen water projects classified as significant that serve about 150,000 people medium that serve 200-1000 people and small that are individually owned that help 6 to 20 people. More projects to be built during the next plan
Wildlife and Ecotourism Management	Establishment of an eco-lodge	This was planned to be done by CFA and Private investors	The construction work by AFL is in progress. The first phase to be completed during the next Management plan period
	Regular outdoor events such as the marathon, zip line, etc	100 by CFA and private investor	This is ongoing and being organized by AFL in consultation with KFS & CFA. This includes camping and walks in nature trails.
	Marketing and promotion of tourist attraction sites	One by KFS and CFA, private investors	This is ongoing and being organized by AFL.
	Establishment of nature trails	Two by KFS, KWS, and CFA	This is has been done by AFL.2 nature trails established one 13km and another 7km
	Establishment of a	One by Private investor in	This has been completed. The community is benefiting from

Management Programme	Activity	Target and Lead agency	Achievement/ Remarks
	gift shop	consultation with KFS and CFA	employment opportunity, sale of farm produce, artifacts, and other items
	Construction of power line to AFL	Private investor in consultation with KFS and CFA	AFL was handling this. Wayleave was given and cleared. The power line not yet installed
	Development of campsites	Two by CFA and another by AFL	Not done due to lack of funds.
	Cultural tourism	One by CFA and private investor	Not done due to lack of funds
	Establishment of Tree House/canopy watchtower	1by CFA and the other by a private investor	Not done due to lack of funds
	Preservation of Scenic sites, e.g., caves, Elephant maternity, viewpoints, waterfalls, etc	Jointly to be done by CFA in collaboration with NMK	Not done due to lack of funds
Community Development	Income Generating Activities (GA), e.g., Beekeeping, Poultry, Fish farming, etc	CFA in collaboration with other communities living adjacent to the forest	Ongoing. Refining and packing of honey for sale being done at KENVO. No apiculture in the forest and unrefined honey is coming from the community adjacent to the forest for

Management Programme	Activity	Target and Lead agency	Achievement/ Remarks
			refining and packing.
	Farm forestry development	Several adjacent farms	Not done. However, farmers adjacent to the forest continue growing trees for domestic and commercial purposes
Human Resources Infrastructure and Equipment development	Upgrading of management road from Carbacid to AFL lodges	10 km by KFS and private investors	7Km Completed to motorable status. Done by AFL
	Construction of power line to AFL	KFS and private investor	KFS has given wayleave, and the same has been cleared. However, the power line has not been constructed.
	Construction of an electric fence by community	Rhino Ark, KWS KFS, and CFA	Construction of 15 Km of the electric fence was completed with financial support from CDTF mainly to keep the wild animals away from invading areas set aside for PELIS
Protection and Security	KFS and Community scouts' joint patrols	60 patrols by KFS and CFA	70 patrols were done during the period
Education and Research Development	Research and monitoring of biodiversity	KFS, NMK, KEFRI Colleges and Universities	Research being done by KU and Wangari Mathai Institute

Management Programme	Activity	Target and Lead agency	Achievement/ Remarks
	Establishment of a nature reserve (Gene Bank)	KFS and KEFRI, NMK	Due to inadequate capacity and finance, the activity did not take place
	Monitoring status of Fauna and Flora	KFS, KEFRI, and NMK.	Due to inadequate capacity and finance, the activity did not take place

4.3.4. Hypothesis Testing

H₀₁: Local structures have no significant effect on community participation in PFMP implementation for the Kereita forest.

H₀₂: There is no significance of the collaboration between the CFAs and KFS in implementing the participatory management plan for the Kereita forest.

To test the hypothesis about the effect of community participation and significance of collaboration in the implementation of the Kereita PFMP on the ecosystem, this study focused on activities performed by the CFA and KFS and the levels of collaboration while implementing the PFMP. Therefore, the effect of community participation in the implementation and significance of collaboration were tested based on;

- The current membership of the CFAs
- Whether an individual has ever participated in forest management and conservation activities under the PFMP.
- Whether an individual wish to take part in forest management and conservation activities.
- Whether an individual is aware of any joint effort between their CFA and the KFS.

The questions were “Yes-No” type, and responses in these questions were then used in testing the hypotheses. One sample T-test was used against a constant value of 120. The value 120 was used because the study assumed an equal probability of either saying “Yes” or “No” in any of the questions, and since the total number of respondents here were 240, the assumed likelihood implied that there is a presumed 120-120 distribution in the two response categories. The test was done at $\alpha=0.05$ significance level. When the procedure was run in SPSS, the output obtained was presented in Table 4.10.

Table 0.8: *One-Sample Test*

	Test Value = 120					
	T	Df	Sig. (2- tailed)	Mean Difference	95% confidence interval of the difference	
					Lower	Upper
The effect of community participation and significance of collaboration in the implementation	20.865	3	.000	70.500	59.75	81.25

The t-test output gives various statistics concerning the effectiveness of the implementation of the PFMP. For instance, the table provides a measure of the central tendency of the mean differences and the corresponding confidence interval. Also, the table gives the degrees of freedom of the test. Of great importance are, however, the t-value and the p-value (significance) columns, which determine whether we reject or accept the null hypothesis. The p-value is less than 0.05 ($p\text{-value} < 0.05$), and therefore, we reject the null hypothesis. This rejection implies that the effect of community participation and significance of collaboration in the implementation of the PFMP is more than 50%. This rejection of the null hypothesis suggests that the

implementation is effective, and that is why there is more membership in the CFAs, more people have participated in and are still willing to take part in forest management and conservation. Also, the effectiveness of the implementation was confirmed when the majority of the respondents admitted that they were aware of some form of collaboration existing between the CFA and KFS as well as other stakeholders

4.4 Collaboration between KFS and CFAs in PFMP Activities.

In the study, the forest management programs revolved around forest-based enterprises (FBEs). These were defined as actions that adjacent communities are involved in while carrying out PFMP implementation in the Kereita forest. FBEs aim at improving neighboring communities' livelihoods through the generation of income. However, FBEs often rely on natural resources as a source of their products. Consequently, FBEs are sometimes referred to as Nature-based Enterprises (NBEs). Since activities involved in FBEs lead to income generation, they are referred to as Income Generating Activities (IGAs), which focus on monetary gains to participants. Therefore, as far as participatory forest management is concerned, FBE, NBE, and IGA are used interchangeably. Nature-Based Enterprises (NBEs) and Income Generating Activities (IGAs) identified in Kereita forest included, but are not limited to, beekeeping, cultivation PELIS, grazing, fuelwood collection, grass cutting, stinging nettle, fish farming, sunflower growing, biogas, and energy-saving technologies. Other IGAs identified included spinning and weaving, beadworks and making of toothpicks. Therefore, in this objective, the study revolved around membership of various user groups, registration of such groups under CFA, other FBEs, the KFS, and other state and non-state actors collaborations in the implementation of the kereita PFMP.

In an assessment of levels of collaboration, it was found that there was a committee that assists the CFA in the implementation, monitoring, and evaluation of the community forest management agreement. The Forest Level Management Committee comprises of the Forest Station Manager, Kenya Wildlife Service Warden, representative of Provincial Administration, water officer, agricultural officer, livestock officer, and Kereita CFA management executive committee members. The committee was tasked with the work of effective implementation of PFM, which was constrained significantly by governance and organizational development challenges within

the CFA. Capacity building was critical for suitable governance structures and procedures to be followed.

4.3.4. CFA – User group Forest Management

Through self-regulation among CFA membership and user groups, it was encouraged to adopt good governance practices, external support to ensure compliance to governance systems and requirements such as upholding democratic processes and observing free and fair elections according to FAO, 2008 report on PFM which corresponds with the findings at Kereita forest. Kereita CFA members and User Groups pay specific fees for the services they obtain from the forest, such as grazing, firewood, grass, and cultivation of plots (KFS, 2011). They also control and regulate the number of people utilizing some of the resources to ensure there is no overexploitation. Sustainable management of forest resources aims at increasing revenue earning potential to the KFS and government through sound monitoring, control and surveillance, and a transparent process of licensing of forest products, goods, and services.

The first step involved identifying user groups or organizations that exist in Kereita forest adjacent communities. Among the active user groups in the nearby communities include cultivation in PELIS, grazing, firewood collection, tree nursery seedlings production, and grass cutting. The study went ahead to determine whether all existing user groups and organizations are registered under CFA. It was observed that all groups are. Table 4.11 below gives a summary of membership subscription registered under the CFA.

Table 0.9: Members Subscription to User Groups Registered Under CFA

Community Members Subscription to User Groups Registered Under CFA	Respondents	Percent %
Beekeeping	63	26.3
Eco-tourism/Camping	41	17.1
Fish Farming	55	22.9
Stinging nettle	21	8.7
Tree nursery seedlings production	25	10.4
Grass cutting	16	6.7
Energy-saving devices (Briquettes making)	19	7.9
Total	240	100

It can be seen from Table 4.11 that Beekeeping and Fish Farming are among the user groups that are actively registered under CFA with respective response frequency of 26.3% and 22.9%. On the other hand, Energy-saving devices and Stinging nettle groups are among the least actively registered user groups under CFA. As a form of encouraging participation in the user groups, community training and capacity building are often organized within the adjacent communities. Based on this, respondents were asked about Community Training and Capacity Building of Kereita CFA.

4.3.5. Community Training and Capacity Building of Kereita CFA

Kereita CFA members have been trained on various aspects of management and governance of different user groups by KFS. Specific training aspects included, among others, bookkeeping, beekeeping, and tree nursery establishment. The trainings which were carried out on different occasions during the implementation period aimed at improving their capacity in the

management of forest resources and improvement of their livelihoods. The first trainings to be carried out were mostly on group dynamics and governance to enable the CFA function as a team and also become transparent and accountable. Respondents who were administered with the questionnaire reported that they have been sensitized at least one time on forest management and conservation while the CFA officials reported to having been sensitized on governance. This according to the KFS was aimed at changing the perception of the community that the forest belonged to the government and to instill a sense of ownership in the community. This was done through collaboration with KFS staff, Community Development Trust Fund (CDTF), KENVO, agriculture, livestock, veterinary, water (WRMA) and environment (NEMA).

Technical extension and business services advice was provided to Kereita CFA members to promote Micro, and Small Medium-sized Enterprises (MSMEs) for new uses of forestry resources. The overall aim was to empower adjacent forest communities through environmentally and socially sustainable utilization of their forest natural resources. This goal concurs with findings by Benjamin and Wilshusen (2007). In this study, they reported that to spur economic development and improve living standards, capacity building, training, and technical services are critical for value addition. Community projects at Kereita were promoted to ensure economic benefits to the adjacent forest communities to encourage sustainable utilization of natural resources. They had developed and implemented a framework for community participation in policing and one that addresses the specific needs of vulnerable groups. These findings agreed with a report by ICIPE (2009) on Promotion of Nature-Based, Sustainable Businesses for Forest-adjacent Communities. The report stated that forests are about people and their basic needs are to be addressed first through nature-based enterprises.

The perspectives and adaptation steps of the population to climate change have changed positive and the attitude of people to the need to protect their environment and to increase food safety through self-initiatives and community initiatives. The greatest effort was to plant and shelter trees, to participate in the capacity building sessions, on the management of natural resources, and to adopt adequate technologies and methods of agriculture. Communities' willingness to respond to the implications of climate change mandated all players to help farmers

in their efforts to improve their livelihoods and food safety through technical, policy and financial interventions (FAO, 2008). Similar to the findings of the study by Conroy *et al.* (2002), this study found that Kereita CFA was undertaking agroforestry technologies“ training aimed at equipping community members with improved methods of farming. The techniques aimed explicitly at upgrading degraded soil and consequently increasing food crop production and livestock keeping. The community is trained on the importance of planting medicinal trees such as *Warbugia ugandensis*, *Prunus africana*, Neem and *Moringa oleifera*, and on how to use them to cure various diseases. Two types of training are done on-farm and nursery establishment. Training of Trainers (TOT) courses is done on CFA members who in turn train farmers and community members.

4.3.6. Farm Forestry Extension Service Provision

The study established that there was an intensive farm forestry extension service conducted by KFS staff in collaboration with other government officers from agriculture, livestock, water, youth, and gender. The services aimed at building the capacity of the adjacent forest communities through training and sensitization. On 16th June 2014, an open day was conducted for Kereita CFA members at Kimende. On this event, 1,236 cattle and 678 sheep were dewormed to improve on livestock and milk production. This was part of KFS Corporate Social Responsibility (CSR) to pay back to the community for proper management and protection of the forest. Extension services for the forestry industry play a crucial role in disseminating and linking farmers and other economic actors to expertise, technologies and forestry information. The extension service is among the essential entities needed to transform the forestry subsistence farming for fuel wood, poles, posts, and timber to modern business and commercial forestry venture. The transformations promote household income and consequently reduce poverty through the sale of forests products (KFS, 2009).

KFS has created a national forest extension network to provide forest extension services throughout the country via a network of more than 250 forest extension officers, where the main target is the promotion of tree farming in the farmlands and the drylands around Kereita forest. The main goal of forest extension is to avail forest goods and services to households in a manner that enhances access and household incomes while reducing pressure on the Kereita state forests.

4.3.7. Capacity building on tree growing as catalysts for economic growth

It was found that 22% of the Kereita forest adjacent communities in the study area had been trained on Nature-Based Enterprises (NBE) and income generating activities (IGA) over the five year period. This level was considered very low, and concerted efforts were required to scale up training to reach a broader scope of the community. Table 4.12 shows the number of respondents involved in IGAs training.

Table 0.10: *Training on Nature-Based Enterprises (NBEs)*

NBE / IGAs training	Frequency	Percent %
Trained on Nature-Based Enterprises	53	22
Not Trained on Nature-Based Enterprises	187	78
Total	240	100

4.3.8. Alternative Livelihoods Initiatives

Apart from training and capacity building organized within the communities, some initiatives are actively promoted within the adjacent neighborhoods. Some of these initiatives include beekeeping, sale of non-wood products, and production of seedlings among others. This study found that beekeeping had been introduced as modern alternative nature-friendly investment at Kereita forest by various donors. Green Zones Development Support Project (GZDSP) has supported Kereita CFA beekeeping user group with training for thirty members, provision of beehives and bee suit for use in harvesting honey. Donors have helped Kereita CFA with Langstroth beehives, capture box, centrifugal machine for honey processing, bee kit (complete with one bee suit, hive tool, gumboots, torch, bee brush, and bag). Community Development Trust Fund (CDTF) supported Kereita CFA with certified tree seeds from Kenya Forestry Research Institute (KEFRI) seed centre and polythene tubes to raise both indigenous and exotic seedlings to plant in the forest areas and farmland as well as for sale. These initiatives have spurred economic, social and environment development of the region through the improved sale of quality honey and provision of forest products like poles, firewood, and timber.

4.3.9. Eco-Tourism Development in Kereita Forest Areas

The study established the significant Nature-Based Enterprises (NBE) are tree nursery seedlings production followed by bee-keeping, Eco-tourism, and fish farming, and sunflower farming and stinging nettle combined as shown in Table 4.13.

Table 0.11: *Respondents Engaged in Different NBE Activities*

Nature Based Enterprise (NBE)/ IGAs	Respondents	Percent %
Tree nursery seedlings production	97	40
Bee-keeping	45	19
Eco-tourism	34	14
Fish farming	33	14
Sunflower & Stinging nettle	31	13
Total	240	100

Kereita CFA main eco-tourism activities carried out include bird watching in the indigenous natural forest along the nature trails, picnic camping at the Lodge developed to take advantage of tourists' circuit, fishing, visit historical sites and high-altitude athletics training. Other physical features found in the forest include quarries and clay soil areas. However, limitation on the number of natural features in Kereita forest and the presence of large degraded areas without vegetation renders the forest not so suitable for ecotourism activities (NAREDA, 2009). The finding concurred with the documented tourist attraction sites of historical and cultural significance, caves, and dense indigenous forests with serenity environment, spectacular views, and waterfalls attractive to visitors. It is worth noting here that the PFMP had proposed that the CFA would develop a lodge and camping site, this was however not undertaken because of lack of resources. The African lodges went ahead and established the business as a private investor with the understanding that they will work with both the KFS and the CFA on diverse issues.

4.3.10. Existing Income Generating Activities (IGAs) in Kereita Forest

The study found that population increase and rural-urban migration has created a very high demand for fuelwood and charcoal requiring the CFA to promote the use of alternative energy, biogas, solar application, and energy-saving stoves. These demands have created employment to the youth through briquettes making and installation of Jiko Kisasa“ for energy-saving devices as IGAs. The study area experiences severe frosts affecting agricultural productivity hence through agroforestry technologies, the losses are reduced by planting trees (GoK, 2002). The communities have embraced bee-keeping for honey production reaping benefits from the markets. Herbal plants are being promoted to provide alternative use of Non-Timber Wood Products (NTWP) especially stinging nettle, Moringa, indigenous vegetables, and sunflower. It was established that fish farming was not doing well at Kereita forest and so there was minimal fishing in this area despite their introduction through the department of fisheries in Kiambu County as part of the PFMP implementation stakeholder. Respondents suggested that the Department of Fisheries should construct three shallow-water retention dams in Kereita area. Such retention dams would support private sector driven fingerlings supply chain, improve rural-based fish feed development program, and employ fisheries extension officers. They also procured pond line materials for the area and established a mini processing plant and cold storage facilities to serve the area. These processing plants serve as centers for aquaculture products branding, valuation, and marketing at the local level in addition to conducting training for the members. With this in mind, the department of Fisheries Development was expected to play its full role in enhancing food security, creating employment, and championing for healthy living for the people (WRMA, 2011). Kenya Commercial Bank (KCB) held their community tree planting day at Kereita forest, and over 3,000 tree seedlings were planted in degraded sites. Greening Kenya Foundation (GKF), a Non-Governmental Organization, planted 2,000 seedlings for watershed protection.

4.3.11. Nature-Based Enterprises (NBE) in Operation at Kereita Forest

a) Stinging Nettle *Urtica massaica* (Thabai)

Driven by increasing demand for medicinal value, natural health products such as vegetables have been on the rise in the study area. Kereita CFAs have positioned themselves for a slice of the multi-billion-shilling trade-in Stinging nettle-based products. Kenyans are known to be

consumers of this plant, and Kereita CFA can be a crucial producer of stinging nettle which they benefit marginally. Stinging nettle is a herb with stinging hairs which grows wildly and in plenty in kereita forest. . The Kereita Stinging nettle user group has about 40 acres under stinging nettle in the Kereita forest. The idea is to encourage village-based groups to start cottage industries that can produce stinging nettle-based products which can compete effectively with others on supermarket shelves. The plant has opposite toothed leaves and greenish flower used as a vegetable, very rich in minerals, vitamins, and medicinal value. It is beneficial in the treatment of various complaints, including joint pains, skin roughness, blood sugar, high blood pressure, and problems of diuretic (Gachathi, 2007). Stinging nettle trade has not been well coordinated. It has involved harvesting, transportation, and sale of raw materials by intermediaries at market centers.

However, the realization that the plant is a resource which could help the CFA fight poverty has seen communities in Kereita forest where it thrives, make serious efforts to domesticate it. Several years down the line, community groups are now moving to value addition to tap the real potential of the plant. The study findings further indicate that group representatives of the community that are involved in the cultivation of the plant need to be given an intensive course on various stinging nettle-based products and processing methods such as drying, packaging, and marketing using simple techniques at home. According to KEFRI, 2010, the move towards value addition creates employment in rural areas and therefore reduces poverty. If each stinging nettle group embarks on the process, they would be able to reap benefits from the plant. The other step will involve linking the groups to the market after their products are approved by the Kenya Bureau of Standards (KEBS). Adding value to stinging nettle has also captured the attention of research institutions such as Jomo Kenyatta University of Agriculture and Technology (JKUAT) (Codling and Rutto, 2012).

From the respondents, it was suggested that the Institute of Biotechnology had to carry out a study on how the plant could be used to create wealth. It was also reported that the then area Member of Parliament (MP), was approached to support the community group with some funds from Constituency Development Fund (CDF) for training, packaging materials, tools, and

equipment. To learn more about the plant, the group representatives intended to visit Dundori CFA in Nakuru who are benefiting from growing, harvesting, packaging, and marketing of stinging nettle. However, JKUAT has not yet come up with an entire value chain for the production, marketing, and environmental conservation of the stinging nettle.

Stinging Nettle Site: Stinging nettle is a weed that grows naturally in the forests. This prickly herb likes moisture and shade. It can be used as both food and medicine. The nettle is harvested before flowering. Once it flowers, the plant is not safe to consume as food or as medicine since it can be irritating and may inflame the urinary tract (Gachathi, 2007).

Medicinal Purposes: Stinging nettle has a supporting impact on our immune system, spleens, cardiovascular system, urinary, nervous system, respiratory system, digestive, and endocrinal systems. It nourishes the whole of body and spiritually nourishes us by increasing receptiveness to the normal flow of our spirit. In severe menstrual bleeding, the nettle is useful too. It adds to the supply of missing iron and helps to prevent bleeding. Nettle promotes uric acid removal and therefore is beneficial with gouty arthritis. In certain cases, it can be used as a diuretic. Nettle is best used to treat chronic disorders and muscle relaxation over the long term (Gachathi, 2007).

A Food: It is possible to consume both the roots and leafy aerial parts. The rich minerals of Nettle make it an outstanding addition to our diet. Powder, calcium , magnesium , iron and silicon acid rich in nettles. A high mineral content may lead to the ability of nettle tea to lower the incidence and appearance of leg cramps, menstrual cramps and healthy bones. The high content of minerals also helps anemic and undernourished people (Gachathi, 2007).

Processing: In Kereita forest, stinging nettle leaves are dried in locally made solar drier where they are turned often to prevent browning and maintain the nutrients. They are then crushed using hands into powder form, which is then weighed and packed different sizes and dispatched to the market.

b) Mushroom Farming

Mushroom farming was part of the activities that were implemented. A few farmers ventured into mushroom farming and was considered a viable alternative if the market would be made available and also if value addition can be done. Mushroom farming is good for business and are highly nutritious foods that take a minimum of 28 days to grow and harvest. Mushroom farming does not need rain or extensive land to cultivate. It only needs stuffing organic waste bagasse from sugarcane factories, dried banana leaves, crushed maize cobs, wheat stalks, and stocks leftover in farmers' fields then place in culture. They are harvested every four days for three months. Mushrooms are highly perishable commodities which are sold fresh or dried for the local markets. They have a short shelf life and so require drying and processing them into a powder that is added to foods stuff or made into soup.

c) Moringa Tree (*Moringa oriffera*) Based Products

Moringa is a tree of all seasons according to the community members, the leaves, pods, and the flowers are rich in protein, iron and a host of micro-nutrients and amino acids that are consumed as vegetables. The bark and roots have medicinal properties and are used for a variety of ailments and infections. All green matter from the Moringa tree is cut into small pieces and left on the farm to enrich the soil. In the study area, its seeds are used to produce high-quality oil, much favored by the cosmetic industry for its stability (Gachathi, 2007). Moringa tree planting at Kereita forest is focused on the rehabilitation of the environment and women empowerment through the production, processing, and marketing of Moringa based products. The communities and user groups can sink shallow wells to support the tree seedlings production. Although moringa tree planting remains the main focus, the groups are planting other indigenous trees like *Prunus africana*, *Cordia abbyssinica*, *Juniperous procera*, *Olea africana*. Fruit trees species tree tomato and passion, are grown for sale at Kimende and Lari towns and the local community. Moringa tree takes less than two months to start producing leaves, and it has abundant foliage that can be harvested for vegetables every three weeks. The main challenge found in the study area was on its production, funding, and training of farmers and communities and establishment of nurseries to be used as demonstration centers, production of tree seedlings and as collection

centers to be put up where farmers can take their fresh leaves for sale. Value addition and processing of Moringa leaves into powder can be used to make a beverage or additives to food.

d) Energy Oriented Nature-Based Enterprises

These include promoting the use of alternative energy, biogas, solar application, wind power, and energy-saving stove.

Improved Cooking Stoves and Energy Saving Stoves

Energy-efficient wood fuel stoves are promoted within the study area. The enhanced stoves (jikos) are designed to reduce fuelwood consumption when used correctly. The stoves are made from long-lasting materials, with high-quality artistry and well insulated to minimize heat losses. These qualities reduce the load for women who used to spend a lot of time fetching firewood, cook more with less fuelwood, and the stoves last longer and reduce fire accidents among women, children, and men in kitchens. The women on firewood collection user group were fetching at least five head loads per week and have reduced to two in a week, providing more time to attend to household chores. Awareness creation, training, and installation of 100 jiko liners were done by GZDSP in June 2011. Market linkages to jiko liners producers were done to the CFA members who were able to procure additional 730 jiko coatings for installation to their members. Training of CFA members, artisans, and entrepreneurs in the fabrication and marketing of quality improved jikos were done to improve on absorption rate, which was 29% on energy saving devices technology transfer.

Biogas

Biogas was found to be used as an alternative source of affordable fuel to reduce the demand for wood fuel at the household level. KFS, livestock department and CFA user group, were promoting the use of cow dung to generate cooking gas to reduce harvesting of trees and increase the forest and tree cover at Kereita. The farmers were encouraged to keep quality dairy animals as a source of dung to produce biogas, manure bio-slurry to increase food crop yields and improved soil fertility. Six members of grazing cut and carry grass cutters user group received technical support and installed biogas plants at affordable rates costing about Ksh. 50,000.00 to

build a medium-sized facility of 8m³ through Kenya National Domestic Biogas Program (KENDBIP) in July, 2009 (Ngigi, 2009). The cost included piping from the digester to the house. The projects objective was to improve the livelihood and quality of life of rural households in Kenya and contain the biomass loss through the exploitation of market and non-market benefits of domestic biogas. Six farmers benefited from the Kereita CFA, and dairy farmers neighboring Kereita forest were ready to install more biogas plants. The CFA was requesting the government to subsidize the cost of cooking gas and fund such programs to contain deforestation and boost forest cover.

e) Commercial Tree Growing.

It was found that investment in private farm forestry had become a profitable venture in the study area with over 90% of respondents having woodlot on their farms due to increased demand for wood products that have outstripped supply. The region comprises three groups of industries that consume firewood, which inspire farmers to invest in commercial forestry. These are tea processing plants belonging to the Kenya Tea Development Authority (KTDA), transmission stations and wood fuel processing industries. The majority of farmers in the area of study invest in commercial farm forestry because they believe it is more valuable in the long term. Increase in trade-in tree products in terms of volume and value in the study area is caused by rising prices for wood products. Kereita CFA members are promoting farm forestry for conservation, timber, poles, firewood, and carbon credit trade for financial gain.

f) Briquette Production from Charcoal Dust

In the processing of charcoal, distribution, retail and wholesale stands, some charcoals end up as dust. It has been estimated that 10-15% of the coal is used as a waste (Njenga et al., 2013). The dust may be compacted into briquettes, as a fuel substitute or as an alternative to heat or heating wood and charcoal. The use of briquettes as a fuel substitute uses the waste product and decreases pressure on the capital of the forestry industry. Charcoal briquettes production in Kenya is well documented: approximately 82% of the country's producers use manual presses, 25% use electricity and 10% use other tools (Njenga *et al.*, 2013). At Kereita forest, it was found

that the CFA had acquired manual briquette machine and capacity building was conducted by Kenya Forestry Research Institute (KEFRI) to address the demand for charcoal and reduce forest tree cutting. The user groups underwent training in briquettes production, packaging, and marketing. The briquettes are used at homes, food kiosks, and hotels, institutions such as schools, chicken incubators, and bakeries even though 15% of the populations using briquettes was considered to be very low when compared to its potential. The findings collaborate the survey report by Energy for Sustainable Development Africa on National Charcoal Survey, 2005.

4.4. Challenges and Opportunities in the Implementation of PFMP

Poverty of neighboring forest communities was found to be the root cause of forest destruction in the study region. Poverty and insufficient conservation of forests was the cause for the overuse of "free" forestry resources (fuelwood, pole timber, medicinal plants) and other illegal activities, such as timber, firewood and game meat. High poverty often limits the ability of forest adjacent communities to take forest conservation positively as it appears to be competing with their immediate needs. Consequently, sustainable IGAs became the standard feature of forest conservation projects in the developing world for local communities (ACCORD, 2009). In addition to this overall view of poverty as the root cause of forest degradation, the study identified specific challenges under this objective which hindered the effectiveness of PFM. Also, under this objective, opportunities existing in Kereita Forest management and conservation were studied.

4.4.4. Challenges in PFM and Conservation

The challenges the communities face while implementing PFM are the voluntary nature of PFM, time limit constraints, technical knowledge, poor management, distance, and strict rules. It was found out that the work is voluntary, time limit restraint, lack of technical expertise and information, poor management, long distances, strict rules and inadequate land as indicated in Table 4.14.

Table 0.12: *Challenges in PFM and Conservation*

Challenges in PFM and Conservation	Respondents	Percent %
Voluntary work	88	37
Time limit constrain	38	16
Lack of technical knowledge & information	32	13
Poor management	30	12
Long distances	26	11
Strict rules	14	6
Lack of enough land	12	5
Total	240	100

The study found that people can go the extra mile to make the environment better if well sensitized. This is because despite the voluntary nature of the PFM and time limit constrain their turn out for conservation and protection activities like planting and firefighting was exceptionally good. In spite of the work being voluntary, the communities turned up and participated in raising of seedlings, planting, and protection. Despite the challenge of time constraints, most of the community members are always available to carry out conservation activities according to the set rules and regulations. The gap in lack of technical knowledge and information to the communities can be filled by the KFS staff that interacts with the forest adjacent farmers.

It was established that when the required services are easily accessible, long-distance is no hindrance to participation in PFM at Kereita forest by communities. Farm sizes in the

surrounding communities are small hence high demand for forest PELIS plots for cultivation. The CFA has set strict rules which have to be adhered to by the members for proper coordination and functional management of the forest activities. Additionally, it was reported that future demands for food, energy, and water at Kereita were a significant challenge in the adjacent communities. This required willingness of communities to think beyond traditional forestry, to win the battle on sustainable forest management and conservation.

4.4.4.1. **Climate Change Effects at Kereita Forest**

The Kereita CFA community accepted that there are changes in climate-related factors affecting their livelihoods. 97% of the respondents gave a positive response to the question of whether climate-related factors affected their livelihoods. Respondents reported experiencing a difference in the weather patterns, which they said affected the production and output of their farms, creating a deficit in their income.

Reasons given by the communities at Kereita forest for the changes affecting livelihoods are climate change and drought. Other reasons included lack of NBE/IGAs, lack of alternatives to livelihoods, poor forest management, and lack of technical knowledge and capacity. Responses to these reasons are as shown in Table 4.19.

Table 0.13: *Forest related factors affecting the livelihood- challenges section*

Reason for changes affecting the livelihood	Respondents	Percent %
Climate change & Drought	89	37
Lack of NBE/ IGAs	66	28
Lack of alternatives livelihoods	32	13
Poor forest management	28	12
Lack of technical knowledge & capacity	25	10
Total	240	100

In this finding, climate change is emerging as the most significant environmental and developmental challenges of the twenty-first century as it exerts multiple stresses on the biophysical, social, and institutional environment. This result has been recognized by the international community and GOK and reported in many conventions as outlined in (Maharjan *et al.*, 2009). It is now directly linked to recurrent droughts experienced in the country, intense rainfall and floods, the spread of pests and vector-borne diseases, increased competition for resources, the collapse of financial institutions, human and animal migration and biodiversity losses. Food security is at risk in arid and semi-arid and other fragile ecosystems (Government of Kenya, 2010).

4.4.4.2. **Water Supply and Catchments Area Conservation**

Water security in the area is threatened by the high and unregulated abstraction of the waters from the feeder rivers and an increase in human and livestock population in the study area. The Kereita forest communities are contributing to the conservation of the riverine through established Water Resource Users Associations (WRUAs). Similarly, the area is plagued by high levels of pollution from poor pesticide use, disposal, and inadequate garbage disposal in the settlement areas. The catchment faces the threat of poor land-use practices by the farmers. This increases soil erosion and siltation into the rivers and subsequently contributed to the falling water levels (EAWLS. 2008).

4.4.5. **Kereita CFA Specific Challenges**

To be fully involved in Nature-Based Enterprises (NBE), the communities faced several challenges such as lack of capital (money), water to establish tree nurseries, inadequate training and capacity building, and faulty production materials. Other problems include poor projects management and scarce land to carry out the activities, as shown in Table 4.15, which summarizes these challenges and their intensities.

Table 0.14: *NBE Challenges and Constraints Faced By Group Members*

NBE/IGAs challenges & Constraints	Respondents	Percent %
Inadequate training	57	24
Lack of financial resources	53	22
Management/governance	30	12
Materials for the enterprises	28	12
Water	27	11
Contribution of labor	24	10
Lack of sites	21	9
Total	240	100

Inadequate capacity building and training on Nature-Based Enterprises (NBE) for the forest community groups was a big challenge. Lack of capital to start some of the NBEs was also a significant challenge. Management and governance issues were also cited as challenges with a general feeling that the people chosen as officials sometimes sided with the forest department instead of fighting for them. Lack of production materials was also among the challenges facing the adjacent forest communities. However, as a solution to the labor crisis, the communities were ready to provide labor, time, and energy if some sites and support of materials are availed to carry out NBE activities.

Inadequate access to the market for the product that the community is producing for various reasons like not being certified by the Kenya Bureau of Standards, not meeting set standards, making the products ineligible to be sold to the broader market was also cited as another big challenge for the community. Lack of transparency and accountability in book-keeping, records by CFA official or user groups or both of them, and quantity harvested and sold product has affected the group dynamics. Another related challenge identified was the inability of the CFA groups to Sustain large orders by major supermarket outlets also poses another challenge given that the groups are using simple domestic tools to make their products.

4.4.6. Policy Challenges

The study established some inconsistent directives which negatively affected the smooth working of the Kereita CFA. In October 2010, the grazing of livestock in the forest was suspended until the CFA and KFS had to draw grazing plans, conduct livestock carrying capacity assessment and maintain grazing registers. The directive came from the NEMA, which was concerned with overgrazing in the forest areas and degradation of natural resources. At Kereita forest, there are over-mature plantations that cannot be harvested due to the ban on timber harvesting, which was effected in the year 2000 and imposed from time to time, affecting silvicultural activities up to date. The ban has affected forest plantation and management practices (KFS, 2011). The ban on timber harvesting in state forest plantations since the year 2000 has resulted in deterioration of mature forest plantations through biological deaths, windfalls, heart rot, and fires. This has led to a significant loss in value and increased management costs (Kagombe and Gitonga, 2005). To meet industrial wood demand, Kenya spends more than Ksh. Thirty-two billion annually on importation of timber and transmission poles that can be supplied locally from industrial forest plantations, thus saving the foreign exchange (KFS, 2011).

4.5. Opportunities in the Implementation of PFMP in Kereita Forest

Economic, environmental, and community needs have to be integrated for sustainable development. Sustainable forest management is all about conducting meaningful discussions with all stakeholders and appreciating multiple-use approaches at all levels, and putting in place appropriate forest policies and laws (FAO, 2001). Sustainable forest management rests on a foundation of fundamental building blocks on formulating policies and legislations which drive the forest sector by defining the relationship between national and county governments in the forest sector. Reframing opinions between commercial forestry and environmental stewardship is also an aspect of sustainable forest management. Making a decision based on interdisciplinary science and ensuring public participation and ownership of the management processes was also found to be crucial in forest management and conservation. It was found that the level of public

participation in Kereita forest adjacent communities was 75.8%. This participation had been integrated with all forest management and conservation aspects. Farm forestry was being carried out well and taken as a commercial venture. On the other hand, agroforestry systems were being practiced to improve food productivity and livestock rearing. Interaction of KFS, CFA, and User groups for smooth running and management of the forest was found to be a crucial aspect of addressing challenges experienced in PFM implementation. The institutions were well defined and minimal conflict experienced at Kereita forest between the grazers and PELIS cultivation groups. Previously, the conflict between these two groups arose because the opening of PELIS plots for cultivation reduced the grazing areas, and sometimes unattended cattle strayed in the cultivated fields and destroyed food crops. To address most of the conflicts, the user groups followed and implemented the management plans for PELIS cultivation and grazing plans according to the zoned areas of the forest for each activity.

In the study area, forests are, in summary, the main resources. Opportunities come through Plantation Establishment and Livelihoods Improvement Scheme (PELIS) projects and livestock farming, among others. By formulating and implementing proper policies, the plans were highly favored, noting that there was the availability of grazing land in the forest. Water was also a significant resource from the forest, which is the catchment area feeding several streams and tributaries.

4.5.4. PFMP Success in the Conservation of Kereita Forest

There are several strengths and opportunities identified while implementing the PFMP. The communities appreciated mainly the devolved government, which embraces community participation and empowers the communities to take part in natural resources management. Achievements of the identified strengths and opportunities in the implementation of PFM are assigned to certain factors, which are summarized in Table 4.16 below.

Table 0.15: *NBE Strengths and Opportunities faced by group members*

NBE strength & opportunities faced	Respondents	Percent %
Community Participation	84	35
Community Empowerment	70	29
Sensitization and awareness creation	51	21
Bylaws and rules enforcement	35	15
Total	240	100

There were improvements and acceptance of NBE by Kereita forest adjacent communities through participation and empowerment to improve their livelihood. These are great opportunities and strengths where communities can take the lead in shaping their destiny. Using community sensitization, awareness creation, rule of laws, and enforcement of regulations, the user groups had made strides in protection, conservation, and management of the Kereita forest.

4.5.5. Opportunities through collaboration with Development Partners in Kereita Forest PFMP implementation

It was established that in the Kereita forest, there are several development partners carrying out activities to improve forest management and conservation and the overall community livelihoods, which provide the opportunity for promotion of PFM. Community Development Trust Fund (CDTF) through the European Union (EU), Government of Denmark (DANIDA), International Development Cooperation, the Government of Kenya (GoK), and communities supported the development of PFM processes and writing of PFMP for Kereita forest from 2010 to 2015. The CDTF Community Environmental Facility (CEF) assisted rehabilitation of tree nursery with water pump, tanks, tools, and equipment at Gathanje to boost seedlings production for both exotic and indigenous tree species for industrial forest plantation and rehabilitation of

degraded sites. In 2015, the CDTF supported training and uniform for twenty community scouts among the youth at Kereita to improve on forest protection and employment creation. Green Zones Development Support Project (GZDSP), through a partnership between African Development Bank (ADB), the GoK, and communities, promote biodiversity conservation, contribute to poverty reduction, and improve rural livelihoods and incomes of communities living adjacent to the forest. The aim of this collaborated effort is the improvement of forest cover for water conservation. At Kereita forest GZDSP supported natural forest rehabilitation of degraded sites, participatory natural forest management, restoration of community watersheds, promotion of woodlot establishment, and agroforestry development on-farm forestry services (KFS, 2011).

The International Union for Conservation of Nature (IUCN), Netherlands Ecosystem Grant Program, through the East African Wild Life Society (EAWLS) and Kenya Wetlands Forum (KWF) supported Nyakariang^a Unit of Kereita CFAs with Langstroth beehives, bee capture box, centrifugal machine for honey processing, bee kit (complete with one bee suit, hive tool, gumboots, torch, bee brush, and bag) for support of NBE/IGAs in enhancing livelihoods and nature conservation (EAWLS, 2011). Kiambu County Government supported the Kereita CFAs with the rehabilitation of degraded areas with indigenous tree seedlings. Participatory Forest Management program, through the involvement of Community participation and implementation, has contributed to the conservation of Kereita Forest Station.

Table 0.16: Importance of Forest Conservation

Importance of forest conservation	Respondents	Percent %
Climate change stabilization & rainfall influence	71	29
Forest Products	52	22
Future generation benefits	46	19
Non-Forest Timber Products (NFTP)	41	17
Biodiversity conservation	30	13
Total	240	100

The importance of forest conservation was demonstrated by the community's appreciation of climate stabilization and rainfall influence through tree planting to mitigate the adverse effects of frostbite by practicing agroforestry technologies. These agroforestry technologies include alley tree planting, contour tree planting, windbreaks, shelterbelts, scattered trees in farmland, and woodlots. The provision of timber and non-timber forest products is a driving force towards forest and biodiversity conservation for future generations and prosperity. There has been a considerable improvement in forest management and conservation through community participation and PFM through tree planting and community involvement in management and governance.

Communities are working with vigor and enthusiasm in tree planting and thus guaranteeing tree survival because of being involved in planning, implementation, and management of forest affairs. They conduct policing and enforce forest rules and regulations through User Groups Compliance to Forest Act 2016. There are great benefits in public participation and devolved governance of natural resources management through PFM. There is the future of the forests, which are renewable resources, through the involvement of stakeholders and communities to control and regulate extraction, zonation of specific areas for specific activities, and sustainable utilization of forest resources. KFS has partnerships with the Government of Finland, Rhino Ark,

Africa Development Bank, World Bank, and the Japanese Government for extension of sustainable forest management and institutional support (KFS, 2011).

4.5.6. Opportunity for increased benefits Derived from PFM

According to study findings, the best way of making improved benefits from the Kereita PFM area and the forest to be more beneficial was by carrying out natural forest rehabilitation of degraded areas. These efforts would increase forest goods and services in terms of volumes, quality, and quantity of water and river flow. Cultivation was through PELIS in industrial forest plantation areas for timber, fuelwood, poles, and crop production to address food security. Conservation of the remaining forest was to improve climate change and biodiversity conservation. Benefit and cost-sharing were done through corporate social responsibility support to infrastructure, roads, bridges, cattle dips, and schools. Employment and wealth creation was through casual labor and community scouts for protection. Controlled grazing was done in the zoned grazing areas where cut and carry of grass were advocated for increased milk production. Ways to make the forest more beneficial were summarized, as shown in Table 4.18 below.

Table 0.17: *Ways of Making Forest More Beneficial*

Ways of making the forest more beneficial	Respondents	Percent %
Rehabilitation	124	52
Cultivation PELIS	48	20
Conserved forest	44	18
Employment creation	13	5
Benefit and cost-sharing	7	3
Controlled grazing	4	2
Total	240	100

It is established without any doubt that the leading agency for PFM is Kenya Forest Service (KFS). For the planting of timber, infrastructure roads, homes, offices, personnel, and nursery for

seedling plants, KFS has numerous investments in the plantation farming of forests. By cultivation, grassland, firewood development, and water projects, CFA members derive major advantages. The classes of forest users include different groups of shared interest for agriculture, firewood, grass, beekeeping, and grass cutters. CFA Management Executive Committee, which adopts the strategy for conservation and protection for managerial decisions, consultations, and community engagement.

4.5.7. Carbon Trade

Carbon trade can be made from any project; planting of trees, road construction, house design as long as it can be quantified that the project has cut down on greenhouse emissions or contributes to carbon capture. This information needs to be disseminated to the communities as part of their capacity building in order for them to tap into carbon trading. Carbon trading was part of the outcome of the Kyoto Protocol of 1997 brokered under the United Nations Framework Convention on Climate Change (UNFCCC). The Kereita CFA can learn from projects that are already earning carbon credit. An example being Power generating company, KENGEN which is the pioneer in carbon trading through World Bank support and has already earned \$ 225,000 from the Olkaria II geothermal expansion project paid in June 2011. (KFS, 2011).

4.5.8. Payment for Environmental Services (PES)

Payment for environmental services (PES) is a viable watershed service system that provides landowners and communities sustainable protection of natural resources and improved livelihoods. The Kereita CFA was very keen to practice it, considering the promising results of PES pilot projects elsewhere. Water quality was improved with farmers in the objective tributaries and a positive improvement in the clarity of the water was registered (WRMA 2011). Environmental Services Payment (ESP) is a market-based method for the retribution by landowners of services. It is based on the premise to transform land use by land owners who provide ecosystem services that they have decided. The recipients pay for this service financially. This link requires negotiated contractual agreements between ecosystem administrators and ecosystem recipients, making PES a unique mechanism for benefit sharing. These landowners transform their land use by foregoing some income for agreed environmental

service for good quality water (WRMA, 2011). PES methodology involves, pilot sites selection, initial hydrology studies to identify degraded hot spots. Community awareness and knowledge are raised on-farm, in the form of grassroots meetings and seminars, on the land, in field daytime, at public conferences (barazas), in order to increase the Community and all stakeholders' knowledge and participation. Hot point farming selection, parameters are based on knowledge of the PES principle and respective target areas for selection of hot random farms. The identified pilot hot spot farms are mapped.

Provision of conservation materials includes agroforestry trees and grass for conservation purposes. Assessment and monitoring using gauges are installed in several rivers. On farm supervision and instruction on good farming practices, with increased on-farm supervision on all farms, to ensure the correct methods are practiced (WRMA 2011b). Improved livelihoods with Napier, the cock's foot and the protection of Elmba Rhodes grass have improved forestry supply and increased production of milk. In addition, there is an extra income for fruit trees and improved potato plantation products. Soil and water management have reduced steeply soil erosion and drainage of surface water in the systems implemented in the farms. Farming of suitable trees on-farm has strengthened the fertility of soil (EAWLS 2011). The covering of the forest would increase since the project focuses on planting trees on the farm and along the riparian areas apart from the Napier grass. In the PES pilot areas this increased tree cover, with a expected rise in wood and non-wood products in future (WRMA, 2011b).

CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1. Summary

Results from this study show that the accomplishments in the activities conducted in the PFMP include active CFA involvement and participation in different user groups and the formulation of effective governance frameworks. It is also clearly evident that the PFMP activities were not all accomplished during the planned period for various reasons as explained in the results of objective one. In collaboration between the CFA, the KFS and other stakeholders, several activities were achieved. FBEs, PELIS stood out to be suitable and successful in forest conservation, management, protection and utilization of Kereita forest. Among the NBEs recognized included cultivation of Stinging Nettle and mushroom. Enhanced community involvement in the conservation and management of the forest of Kereita was seen as opportunities.

Benefits derived from PFMP, PELIS system was found to be suitable and successful in plantation establishment because it ensures higher survival and low-cost establishment of industrial plantation forests. These benefits can be enhanced and strengthened by giving farmers access to agricultural extension services, credit facilities for buying inputs and proper product marketing platforms, and by introducing them to many alternative forest resources uses and adding value. All these advantages increase incomes and food protection. Furthermore, the study findings highlighted an increase in community engagement in PFM in terms of education, training, empowerment of CFA officials and members, user groups and farmers. This has contributed to better forest management and conservation and the services involved. As a result, the general integrity and livelihoods of the local communities have improved dramatically. Furthermore, Kereita Forest houses many significant cultural sites, recreational, traditional, religious, spiritual and sacred sites that can be used to support communities adjacent to the forest and provide alternatives. The capacity is thus to be implemented by various nature-based organizations to boost the wellbeing of the community and to generate income while at the same time easing the burden on forestry overreliance.

Discoveries revealed major positive relationships between the overall support of neighboring populations and the PFMP, community engagement, local community systems, PFM businesses, PFMP collaboration and forest management and conservation policies. Different opportunities

included community strengthening in diverse areas, expanded sensitization and creation of awareness. Challenges experienced while executing PFMP included inadequate resources to implement PFM, poor management of PFMP due to formulation of inappropriate policies and incompetence as well as inadequate technical knowledge.

5.2. Conclusions

The study results clearly indicate the need for communities to create, produce and market for Non-Wood Forest Products (NWFP) and to provide adequate economic motivations for promoting potential nature-based enterprise growth, processing technologies and marketing. Kereita CFA community members has become more successful in forest management on emerging issues relating to diverse group dynamics that improve governance, openness and accountability on participatory management of natural resources. Economic benefits for forest adjacent communities need to be ensured by adding value and promoting a sustainable use of natural resources. Forest adjacent communities need to understand the existing local structures and how they relate with the existing policies governing forest management to ensure success of the PFMP implementation.. Dissemination of cost and benefit from NBE forest enterprises between KFS on one side and the neighboring communities, on the other hand, should be reviewed because it is critical for the successful implementation of PFM. There is room for more players to collaborate with the CFA in order to optimize the potential benefits of PFM. These can be in form of donors, investors and capacity building entities. The KFS needs to relook at new ways of increasing resources for CFAs in order to be able to honor their obligations in the forest management agreements. There also needs to be more practical learning experiences for example exchange visits with other working CFAs in order to learn from best practices.

5.3. Recommendations

- There is need for harmonization of laws governing forest management in order to minimize conflict while implementing PFMP activities
- The community needs training and capacity building on development, processing technologies, Value addition and marketing for the Non-Wood Forest Products (NWFP).
- There is need for sufficient economic incentives to promote potential nature-based enterprises to increase the number of CFA members engaging in the same. This can be in form of startup capital, storage facilities and training
- Training Kereita CFA community members on group dynamics that improve governance, transparency, and accountability on participatory natural resources management will aid them to become more successful in forest management.
- There is a need to ensure economic benefits to the forest adjacent communities through value addition chain and encourage sustainable utilization of natural resources
- Some of the communities also need to be empowered to be able to recognize and identify challenges and opportunities to PFM implementation in addition to being taught negotiation skills to be able to engage potential partners
- Capacity building on existing policies and laws governing natural resource management is also recommended
- There is room for more players to collaborate with the CFA in order to optimize the potential benefits of PFM. These can be in form of donors, investors and capacity building entities. The KFS needs to relook at new ways of increasing resources for CFAs in order to be able to honor their obligations in the forest management agreements.
- There also needs for more practical learning experiences for example exchange visits with other working CFAs in order to learn from best practices.

5.4. Recommendation for Further Research

During the study duration, some areas for further research emerged. The study could be extended to assessing the cost-benefit analysis of the impacts of PELIS system in Participatory Forest

Management. That is, to determine the financial contribution of PELIS system in improving the socio-economic welfare of the local communities. Comparative studies on the implementation of PFMPs in other forests could also enrich knowledge on effective PFM.

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APPENDICES

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ANALYZING THE LEVEL OF IMPLEMENTATION OF KEREITA PARTICIPATORY FOREST MANAGEMENT PLAN, ABERDARE FOREST ECOSYSTEM, KIAMBU COUNTY KENYA By Anne Theuri



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ANALYZING THE LEVELS OF IMPLEMENTATION OF KEREITA PARTICIPATORY FOREST MANAGEMENT PLAN, ABERDARE FOREST ECOSYSTEM, KIAMBU COUNTY.

Respondent Questionnaire

Anne Theuri

University of Nairobi,
Department of Geography and Environmental Studies

Dear Respondent,

RE: REQUEST TO FILL QUESTIONNAIRE

The above subject refers.

Chapter 2 I am a University of Nairobi student undertaking a Master of Arts degree in Environmental Planning and Management. As part of the requirement for the course, I am carrying out a study on *Analyzing the Impacts of Implementation of Kereita Participatory Forest Management Plan, Aberdare Forest Ecosystem, Kiambu County*. I believe the study will help in improving forest cover which will ultimately ensure maximum benefits to the forest adjacent communities and to the general society at large.

Despite your busy schedule, I request for your opinions and suggestions in response to questions contained in the questionnaire. These will be of great value and importance to the completion of this study. Kindly note that the information provided will be treated with a lot of confidentiality and will only be used for the purposes of this study.

Yours sincerely,

ANNE THEURI-C50/8750/2003

Consent: Please initial all boxes

1. I confirm that I have had the opportunity to ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected.
3. I understand that relevant sections of data collected during the study, may be looked at by individuals from University of Nairobi, from regulatory authorities or from the Kenya Forest Service, where it is relevant to my taking part in this research study. I give permission for these individuals/Institutions to have access to my records.
4. I agree to take part in the above study.

Name of Participant

Date

Signature

Please answer these questions as honestly as possible. Write your responses in the spaces provided. Please don't write your name on the questionnaire. Tick where applicable.

Location:	Name of Interviewer:	Questionnaire # :
	Date :	
	Starting Time:	Finishing Time:
	Name of Respondent:	

SECTION ONE: BASIC HOUSEHOLD INFORMATION

HH member	Type of HH	Gender	Marital status	Age	Level of Education	Occupation

1.1. How are the different roles divided within the household? (farming, collection, diverse occupations, duties, rights etc.). Specify

- Father:.....
- Mother:.....
- Children.
- Elders:.....

1.2. Which year did your family settle here?.....

1.3. Where did you live before?.....

1.4. Why did you move to this area?

.....

1.5 Thinking back to before Community Forest Associations (CFAs) were established, how would you rate the quality of the forest area at that time?

1) Very poor 2) poor 3) good 4) very good 5) excellent

Specify reasons

.....

.....

.....

.....

.....

1.6 Did this location have any prior experience with community management of any forest areas? **YES/NO**; If yes, specify:

.....

.....

.....

SECTION TWO: KEREITA FOREST ECOSYSTEM MANAGEMENT ACTIVITIES BY COMMUNITY FOREST ASSOCIATIONS AND KENYA FOREST SERVICE.

2.1 Are you aware of any CFAs members who participate in management of Kereita Forest Ecosystem? *Yes or No*

If Yes, which ones

.....

2.2 Are you a member of Kereita CFA?

If Yes, then indicate your group

Name of group	Role	Year formed	No. of members	Gender	When joined

2.3 In your CFA, what is the duration of the term of office for the Executive Committee?

.....

2.4 How regularly do you hold meetings in a year?

.....

2.5 What activities do the CFAs undertake in the forest management? Please list them

Activity	When	Where undertaken	By Which CFA

2.6 Who decides what activities to be undertaken?

.....

 2.7 Which resources are required by your CFA to undertake these activities?

Activity	Resources Required	Provided by

2.8 Since you joined the CFA, please list any trainings undertaken or workshops attended?

Trainings/Workshops	When	By Who

SECTION THREE: COLLABORATION BETWEEN COMMUNITY FOREST ASSOCIATIONS AND KENYA FOREST SERVICE IN PREPARATION AND IMPLEMENTATION OF WORK PLANS.

3.1 As a member of a CFA are you aware of the Kereita Participatory Forest Management Plan 2010-2015?

3.2 Are you aware of the existence of an agreement between your CFA and KFS and if yes when was it signed?

.....
.....
3.3 Are there any work plans developed for the implementation of the forest management plan?

Yes/No

If Yes, by who?.....

3.4 Are they annual, quarterly or seasonal?

.....
.....
3.5 How did CFA members participate in the development of the forest management plan?

.....
.....
3.6 How was your CFA involved in the development of work plans?

.....
3.6 How is your CFA involved in the implementation of the forest management plan?

a) Separately as a CFA, kindly list the activities

.....
.....
b) CFA Jointly with KFS, kindly list the activities

.....
3.6 Describe the relationship between your CFA and the KFS in the following areas

a) Keeping promises made in the agreement

.....
.....
b) Information sharing

.....
.....
c). Joint work planning

.....
.....
d). Budget formulation

.....
.....
e). Review of implementation plan

.....
.....
f). Planned activities implementation

.....
.....
g). Gender mainstreaming

.....
.....
.....
h). Conflict resolution
.....
.....

.....
SECTION FOUR: LEVEL OF IMPLEMENTATION OF KEREITA FOREST PARTICIPATORY FOREST MANAGEMENT PLAN PROGRAMS.

4.1 Are there annual work plans developed for the implementation of the forest management plan?
.....
.....

4.2 Which activities in the programs have been successfully implemented from 2010-2018?

Activity	Year Planned	Year Undertaken

i). Tree seedlings

Number planted	Where	When	By Who

ii). Rehabilitated areas

Number of areas rehabilitated	Where	When	By Who

.....
.....
.....

5.2 Are there any conflicts between (a) CFA and KFS (b) within CFA (c) within KFS (d) other ?
Yes or No
If yes, kindly list them

.....
.....
.....

SECTION SIX: OPPORTUNITIES IN FOREST CONSERVATION BY THE CFA

6.1 Since inception of your CFA which forest management activities have improved in the forest
Explain.....

.....
.....
.....

6.2 Would you like to be involved more in Participatory Forest Management and Conservation?

(1) Yes (2) No.
If yes, how?

.....
.....
.....
.....

6.3 What in your own opinion, are the opportunities for improving participatory forest resources
management and conservation in Kereita Forest Ecosystem in the following areas?

(a) Governance

.....
.....
.....

(b) Management and conservation

.....
.....

(c)Utilization

.....
.....

(d)Sustainability and increase of forest cover

.....
.....

(e)Benefits to the community

.....
.....
.....
.....

6.4 In your opinion what more strategies can be employed to improve CFA involvement in forest
conservation and management

.....

.....
.....

*Please return filled questionnaire to: ANNE THEURI, Nairobi, Kenya.
Tel: +254-0702335172
Email: atthuo@yahoo.com*

