PARTICIPATORY FOREST MANAGEMENT, INSTITUTIONAL FRAMEWORK AND CONSERVATION OF MAU FOREST PROGRAMME IN BOMET COUNTY, KENYA

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DECLARATION

This research thesis is my original work and has not been presented in any University or any other institution for higher learning for the award of any degree.

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This research thesis is dedicated to my wife Lilian Cherotich and my children; Kevin Kipkorir, Ian Kipkoech, Hysen Cherono and Kane Kipngeno who have been very inspirational throughout my study.

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ABBREVIATIONS AND ACRONYMS

ANOVA:	Analysis of Variance
ASFADA:	Arabuko Sokoke Forest Adjacent Dwellers Association.
BBN:	Bayesian Belief Network
CBFMP:	Community Based Forest Management Plan
CBNRM:	Community Based Natural Resource Management
CCs:	County Councils
CF:	Community Forestry
CFAs:	Community Forest Associations
CFGs:	Community Forest Groups.
CFM:	Community Forest Management
CFUGs:	Community Forest User Groups
CIFOR:	Centre for International Forestry Research
CPRs:	Common Pool Resources
ECs:	Executive Committees
FAO:	Food and Agriculture Organization
FUGs:	Forest User Groups
GHGs:	Green House Gases
IAD:	Institutional Analysis and Development
IFRI:	International Forestry Resources and Institutions.
IUCN:	International Union for Conservation of Nature.
JFM:	Joint Forest Management
KEFRI:	Kenya Forest Research Institute
KFS:	Kenya Forest Service

KFAN: Kenya Forest Action Network

KFWG: Kenya Forests Working Group

KTDA: Kenya Tea Development Authority

KWS: Kenya Wildlife service

MA: Millennium Ecosystem Assessment

MCDA: Multi-criteria Decision analysis

NACOSTI: National Commission for Science, Technology and Innovation

NFAP: National Forest Action Plan

NFF: National Forest Fund

NGOs: Non-Governmental Organizations

NTFPs: Non-Timber Forest Products

NMK: National Museum of Kenya

NRM: Natural Resource Management

NWFP: Non wood forest products

PBA: Practice Based Approach

PES: Payment for Ecosystem Services

PFM: Participatory Forest Management

RECOFTC: Regional Community Forestry Training Centre

REDD+: Reduced Emissions from Deforestation and Degradation

SD: Standard deviation

SLA: Sustainable Livelihood Approach

SPSS: Statistical package of Social Scientist

UNDP: United Nations Development Programme

UNEP: United Nations Environmental Programme

VIF: Variance Inflation Factor

VFC: Village Forest Committees

ABSTRACT

Forests play a key role in the livelihoods of local people in most developing countries. Mau Forest in Kenya is threatened by unsustainable uses and conversion to alternative land uses. In spite of the consequences of forest fragmentation, biodiversity erosion and reliance of local communities on forests for ecosystem goods and services, there is little quantitative information on forest use and dependence to guide sustainability. The study investigated the influence of Participatory Forest Management, institutional framework and Conservation of Mau Forest Programme in Bomet County. The study was guided by the following objectives: i. To examine the extent to which participatory forest planning influence conservation of Mau forest programme. ii. To assess the extent to which participatory forest monitoring influence conservation of Mau forest programme. iii. To establish the extent to which participatory implementation of forest management practices influence conservation of Mau forest programme. iv. To determine the extent to which participatory evaluation influence conservation of Mau forest programme. v. To establish the combined influence of participatory forest management on conservation of Mau forest programme. vi. To determine the extent to which institutional framework influence conservation of Mau forest programme. vii. To establish the moderating influence of institutional framework on the relationship between Participatory Forest Management and conservation of Mau forest programme. This study was grounded on Forest Transition Theory and Practice based approach and was guided by descriptive survey and correlational research design. A sample of 364 respondents was drawn from a target population of 4100 people engaged in forest conservation programme using Yamane (1967) Formula. Quantitative data was collected through a self-administered structured questionnaire while qualitative data was collected through an interview guide. Research instruments were pilot tested for validity through content-related, construct and face validity. Reliability was tested using Cronbach alpha coefficient. Quantitative data was analyzed using descriptive statistics and inferential data analysis was done using Pearson correlation coefficient, regression analysis (enter method) and multiple regression analysis (stepwise method).Hypotheses was tested using p-value approach. Due to insufficient evidence from the data, the Null hypotheses failed to be rejected in five objectives: 1($r=0.087$, p-value=0.132), 2.($r=-0.021$, p-value=0.721), 3.($r=0.03$,p-value = 0.959), 4.($r=-0.048$,p-value=0.43). It was concluded that there is no significant relationship between them and conservation of Mau forest programme. On objective 5; (p-value=0.521),the null hypothesis failed to be rejected and concluded that there is no significant relationship between the combine influence of Participatory Forest Management and conservation of Mau forest programme. For objective 6, with $r=-0.15$, p-value=0.007, the null hypothesis was rejected and concluded that there is a significant relationship between institutional framework and conservation of Mau forest programme. Objective 7,with Model1:p-value=0.0.007 and Model 2:$Z=-0.189$,p-value=0.005,the null hypothesis was rejected and concluded that there is a significant relationship between the moderating influence of institutional framework on the relationship between PFM and conservation of Mau forest programme. Recommendation made is that Forestry reforms should rightly focus on creating community user groups, establishing common rules and providing public infrastructure. Also, there is a growing need for mixed methods research approach in line with pragmatism paradigm in the construction and interpretation of reality.

CHAPTER ONE

INTRODUCTION

1.1.Background of the study

The world's overall forest area amounts to simply over four billion hectares, equal to 31% of the entire land area, and on average of 0.6 ha per capita (FAO, 2010). Forests are considered the second most essential natural useful resource after water throughout the world. Worldwide, forest industries additionally offer employment for 60 million human beings even as some 1 billion people rely upon drugs derived from forest flora for their medicinal needs (World Bank, 2006). They serve as a source of food, oxygen, shelter, pastime, and spiritual sustenance, and they're the source for over 5 thousand (5,000) commercially-traded merchandise, starting from pharmaceuticals to timber and clothing (CBD, 2009). Forest performs a wide range of vital environmental and climatic functions and it serves as homes to most people of the world's plant and animal species. The importance of forest can be categorized under environmental, social and economic (Abass, 2007), and based on this people have traditionally connected spiritual, philosophical and aesthetic importance to forest. Forest resources play a key role in protecting the environment and are of great importance to the sustainable development of each society.

Rural populations in Sub-Saharan Africa and parts of Asia such as Nepal and Bangladesh rely on forests, directly or indirectly, for their daily needs for subsistence and income (Kaimowitz, 2003; Phiri, Chirwa, Watt and Syampungani, 2012). Forest resources provide a much-needed safety net between harvest seasons and during other periods of stress such as crop failure, drought and social conflict (Fisher, 2004). McDermott and Schreckenberg, both (2009) Say that forests are often the most accessible local resource, and thus also form the basis for creation of rural communities. The goals of international forestry have slowly changed over the last three decades from development in the 1970s through development and conservation in the 1980s to growth, conservation and participation in the 1990s (Shackleton, Campell, Wollenberg and Edmunds, 2002). Calls for the transition of power to local level are common throughout the international community, and all understand the central role that local resource users play in handling them.

Furthermore, Agrawal, Cashore, Hardin, Shepherd, Benson, and Miller, 2013), argue that forests have traditionally been a significant tool for economic growth and development. Forests and

forest services, however, are increasingly decreasing significantly, thereby jeopardizing the ability of current and future local communities to fulfill their essential forest needs. Many countries, especially in Asia and Africa, have since undergone a review of forestry policies and legislation to integrate elements of Participatory Forest Management to sustainably conserve and manage resources. Wily (2002) says, Participatory Forest Management (PFM) is commonly accepted as an alternative form of management of forest resources in many developing countries. PFM is gradually being used as a method by which to achieve critical forest preservation and biodiversity conservation. It is achieved by a process of forest resource governance inclusion, equality and democratization (Amanor, 2003). The role of local communities in natural resource management is also an integral part of national policies and strategies and projects around the world that are funded globally. (Phiri, 1999).

In most developing countries, community participatory forestry policies emerge as a response to 'institutional failure' regarding the sustainable management of the forest resources (Siry, Frederick and Ahmed, 2005; and Shahbazet and Ali, 2006). The main thrust of collaborative or participatory forest management is to develop partnerships between local communities and forest departments (representing the state). To sustainably manage forests through a friendly relationship and trust. Participatory forest management is an arrangement in which key stakeholders sign mutually enforceable agreements specifying the respective functions, responsibilities, benefits and authority for managing specified forest resources (Matiku, 2011). Participatory Forest Management (PFM), a form of decentralization has been adopted by more than 21 African states as an alternative method of managing forest resources (Wily, 2002). PFM is the local involvement of communities in the management of forests done through a process of inclusion, equity, and democratization of governance of the forest resources (Agrawal and Gupta, 2005).

Based on their study in Asian forest management, Lee and Park (2001) believe that the participation of local people in forest resource management can maintain the integrity of local ecology, that forest co-management can facilitate forest protection and development, help to reduce poverty, and further to meet their survival needs. Comparatively, more scholars in Europe and United States study on the participatory forestry, such as Anonymous (2010),

Kathleen Wolf, Linda Kruger (2010), Reddy (2002). They believe that the participatory method has been used as an important means to protect forests, coordinate partnership between forestry and relevant agencies, and carry out conflict management. In Bangladesh, the program was launched in the 1980s with the objective of involving local communities in managing forest resources.

In Ethiopia PFM was recommended by NGOs to solve the problem of forest degradation (Mustalahti, 2006). The motivation behind PFM programme in Bale region was to conserve the unique biodiversity and ecological functions of the Greater Bale Mountains Eco region, whilst establishing and enhancing sustainable local community livelihoods (FARM, 2007). Over the past 15 years the Tanzanian government promoted PFM (both joint forest management and community-based forest management) as a major strategy for managing natural forests for sustainable use and conservation. Such management is currently either operational or in the process of being established in 3.6 million ha of forest land and in 1,800 villages. Data from three case studies of forests managed using participatory and non-participatory forest management approaches suggest that community involvement in forest management was correlated with improved forest condition (Blomley, Fliegner, Isango, Zahabu, Ahrends and Burgess 2008). Tanzania provides an example where, in recent years, substantial rights and powers over forest resources have been transferred to local democratically elected bodies (Wily, 2001) through participatory forest management (PFM) initiatives. PFMs main objectives include: improvement of forest quality, livelihoods, and local governance of natural resource management institutions (URT, 2003).

With this regard, three decades have passed since the introduction of Participatory Forest Management (PFM) with the general objective of controlling forest degradation and achieving conservation of biodiversity on the one hand, and empowering communities to participate and improve their living condition on the other hand (Fisher, Prabhu and McDougall, 2007). In Kenya, the first PFM site was at Arabuko-Sokoke Forest established in 1997 but without a supportive legislative framework (Thenya *et al*., 2007). Today there are more than one hundred CFAs that are distributed across various parts of Kenya (Ongugo, Mogoi, Obonyo and Oeba, 2008).

1.2. Statement of the problem

The indigenous forests provide not only wood products but a wide range of goods and services to the local users including medicinal plants, honey and thatching grass, fodder, fuel wood and charcoal, as well as sand, saplings, seeds, cultural sites and food. Both local and international researchers use forests for scientific and social studies. In addition,carbon sequestration, soil and water conservation are also major roles played by these modified forests (Wandago, 2002). Kenya has a fairly low forest cover with closed canopy forest overlaying approximately 1.24 million hectare while plantations 0.16 million hectare. The total forest area is less than 3 per cent of the total land area of Kenya. Most of the indigenous forests occur in high potential areas where they are under severe pressure and competition from other forms of land use. Considering its genetic, ecological and economic value, Mau forest is not only a local resource and a national heritage but an important natural resource with regional and global impact. But, there has been a decrease in forest cover due to encroachment, expansion of human settlements into previously forested areas, illegal logging, forest fires, agriculture and government excisions (NEMA 2009).

Overall, forest excision and extensive human encroachments resulted in a cumulative loss of about 25 percent of the Mau's more than 107,000 ha from 1989 to 2009 (GOK, 2009). However, the Mau Forest Complex (MFC) has undergone significant changes in land use in the past three decades or so due to the increased human population demanding land for settlement and subsistence farming. The invasion has resulted in dramatic and severe land degradation, deforestation of headwater catchments and destruction of previously existing wetlands within the fertile upstream sections. The effects of anthropogenic activities are slowly taking toll as is evident from decreasing river discharges during low flow periods, and deteriorating river water quality through pollution from point and non-point sources (Kenya Forests Working Group, 2001; Baldyga, Miller, Driesse and Gichaba, 2007). The dwindling land and water supplies have resulted in instability and conflicts linked to the limited resources market by the local communities dwelling next to the forest.

Participatory Forest Management (PFM) is being adopted widely in many developing countries as an alternative method of managing forestry resources (Wily, 2002). Participatory Forest Management is increasingly being used as an approach through which to achieve sustainability

of threatened forests and conservation of biodiversity. This is done through a process of inclusion, equity, and democratization of governance of the forest resources (Amanor, 2003). The positive results of implementing Participatory Forest Management process will be demonstrated through the changed attitude of local forest-adjacent communities and hence, a change in the level of forest conservation. But, such results will be highly influenced by the mode of participation adopted by the PFM implementation process since it is prudent for all stakeholders to participate in planning forest conservation programs, implementation, and monitor and evaluate the activities.

Previous studies have shown that the Kenya Forest Service officers are unable to patrol and guard the entire forest parameter due to their low capacity; hence the desperate need to engage local communities in forest conservation (Matiku, Ogol and Mireri, 2011). Unfortunately the Forest Act has remained largely unimplemented as the institutional structures for the Kenya Forest Service has not been completed and devolution of forest management powers is not yet to take place (Matiku et al. 2011). Because Mau Forest conservation has not been successful, a study needs to be carried out to determine the influence of Participatory Forest Management, Institutional Framework on Conservation of Mau Forest Programme in Bomet County, Kenya.

1.3. Purpose of the study

The study investigated the extent to which Participatory Forest Management influences Conservation of Mau Forest Programme. The study also sought to establish the moderating influence of institutional framework on the relationship between Participatory Forest Management and Conservation of Mau Forest programme in Bomet County, Kenya.

1.4. Objectives of the study

The study was guided by the following research objectives:

(i) To examine the extent to which participatory forest planning influence conservation of Mau forest programme

(ii) To assess the extent to which participatory forest monitoring influence conservation of Mau forest programme

(iii) To establish the extent to which participatory implementation of forest management practices influence conservation of Mau forest programme

(iv) To determine the extent to which participatory evaluation influence conservation of Mau forest programme

(v) To establish the combined influence of participatory forest management on conservation of Mau forest programme

(vi) To determine the extent to which institutional framework influence conservation of Mau forest programme

(vii) To establish the moderating influence of institutional framework on the relationship between Participatory Forest Management and conservation of Mau forest programme

1.5. Research questions

The study was guided by the following research questions:

(i) How does participatory forest planning influence conservation of Mau forest programme?

(ii) To what extent does participatory forest monitoring influence conservation of Mau forest programme?

(iii) To what extent does participatory implementation of forest management practices influence conservation of Mau forest programme?

(iv) How does participatory evaluation influence conservation of Mau forest programme?

(v) What is the combined influence of participatory forest management on conservation of Mau forest programme?

(vi) To what extent does institutional framework influence conservation of Mau forest programme?

(vii) What is the moderating influence of institutional framework on the relationship between Participatory forest management and conservation of Mau forest programme?

1.6. Research Hypotheses

The study was guided by the following research hypotheses:

1. **H_0**: There is no significant relationship between participatory forest planning and conservation of Mau forest programme

2. **H_0**: There is no significant relationship between participatory forest monitoring and conservation of Mau forest programme
3. **H_0**: There is no significant relationship between participatory implementation of forest Management practices and conservation of Mau forest programme
4. **H_0**: There is no significant relationship between participatory evaluation and conservation of Mau forest programme
5. **H_0**: There is no significant relationship between the combined effect of Participatory Forest Management and conservation of Mau Forest programme
6. **H_0:** There is no significant relationship between institutional framework and conservation of Mau forest programme
7. **H_0:** The strength of the relationship between Participatory Forest Management and conservation of Mau forest programme does not depend on institutional framework.

1.7. Significance of the study.

The study would extend the understanding of the Participatory Forest Management in Kenya under the Constitution and the Forests Act, 2005. The changes in the legal framework used in forest conservation interventions may affect the position of the local people in resource access and control, and the different social groups among them. The study therefore, could make a useful contribution in demonstrating how legal reforms can contribute to sustainable forest management and improved community livelihoods.

In addition, the study would provide important information to Kenya Forest Service for making decision on which gender is relevant target group for education and mobilization concerning management of community forest. Based on the findings of this study, active participation of the community forest user groups in implementation of forest conservation activities would benefit them as they greatly depend on Mau Forest. Therefore, they would be able to make their activities better suited for conservation of forest.

The findings of the study might be helpful to the government and NGOs in formulating appropriate programs and policies to address the issues and problems associated with community forestry. Hence, the findings from the study would serve as useful baseline data which can inform numerous follow-up studies in the future on forest conservation programmes. In addition, the methodology used in this study would assist researchers who may want to conduct similar studies on forest management in future.

1.8. Limitation of the study

The main limitations encountered in this study was transport hitches. Since the study was conducted in villages surrounding Mau forest, there were challenges in transport during the rainy season. The poor condition of roads in the study area made travelling cumbersome as well but this was addressed by use of motor-bike and footing when it was necessary. In addition, during collection of data, due to the low literacy level of some respondents, they were faced with challenges while responding to questionnaires and interview guide. This was minimized by allowing them more time to respond to the questions and also well trained research assistants aided in clarifying issues using a simple language for them to understand.

1.9. Delimitation of the study

The study was delimited only to the communities living adjacent to South West Mau Forest in Bomet County. Those were the people living in the villages which surrounded Kenya Forest Service stations of Bomet, Itare, Mara Mara and Ndoinet. These forest stations are in charge of forest conservation activities in Mau Forest carried out by the members of Community forest associations. Also, the study was delimited only to selected variables that influence forest conservation programme. The study only targeted households living adjacent to South west Mau forest from four administrative units (Kenya forest stations), which formed part of the research population. These were the people living within a distant of 1-5 Kms from the edge of the forest. Kenya Forest Service officers and Community Forest Association (CFAs) committees were also targeted in the study.

1.10. Basic Assumptions of the Study

In this study, it was assumed that the respondents provided honest information on issues raised in research instruments concerning forest conservation activities in Mau Forest. Since it was not possible to independently verify the correctness of these information, the study assumed that the information presented by respondents was reliable. It was further assumed that the methodology used in this study was appropriate to investigate the influence of the variables under study, unravel the study problem and answer the research questions appropriately. Furthermore, it was assumed that the findings of the study would be useful in unravelling critical issues necessary for improving the activities in conservation of Mau Forest programme.

1.11. Definition of Significant Terms used in the study

Institutional Framework: The system of formal laws, regulations, procedures, informal conventions, stakeholders with their roles, customs and norms, that shape forest conservation activities and behaviour. This include partnership with external institutions, training on forest conservation and conflict resolution mechanisms

Conservation of Mau forest Programme: These are the programmes aimed at improving forest condition in Mau Forest carried out by stakeholders engaged in conservation activities including afforestation and reforestation, access to fodder, value addition to forest products so as to enhance the livelihoods of forest adjacent communities and sustainability of forests.

Participatory Evaluation: This is a process where community forest user groups engage in assessing the impact of forest conservation programme such as extent of forest for scenic and amenity purpose including sharing of evaluation results and used of improved jikos.

Participatory Forest Management: This refers to the systems in which communities (forest users and managers) and government services (forest department) work together to define rights of forest resource use, identify and

develop forest management responsibilities, and agree on how forest benefits will be shared. This include participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation.

Participatory Forest Monitoring: Participatory monitoring is an ongoing process where local forest users systematically record information about their forest, reflect on it and take management action in response to what they learn which include control of cattle grazing and sanctioning law breakers. It include control of cattle grazing and monitoring control of forest fires.

Participatory Forest Planning: The method includes a series of tasks, preferably beginning with decision-making processes, issue identification and finishing with a forest management strategy that directs the protection of the forests. This also involves frequency of forest user meetings and forest management program use.

Participatory Implementation of Forest Management Practices: are methods used by forest managers-whether they are government agencies, private companies, local communities, or individuals –to plan, keep inventory of forest data and execute their activities in an accountable manner while managing, demarcating forest boundaries, exploiting and conserving forests.

1.12. Organization of the study.

This thesis is organized in five chapters:

Chapter One covers the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, research hypotheses, significance of the study, delimitations of the study, limitations of the study, basic assumptions of the study and definition of the significant terms used in the study.

Chapter Two gives an in-depth review of literature related to the study from a global, regional and national perspective. It also addresses the empirical literature related to the study based on the research objectives. This is based on participatory forest planning and conservation of Mau Forest programme, participatory forest monitoring and conservation of Mau Forest programme, participatory implementation of forest management practices and conservation of Mau Forest programme and participatory evaluation and conservation of Mau Forest programme. Furthermore, it gives theoretical framework, conceptual framework, summary of research gaps and summary of literature review.

Chapter Three describes research methodology used in the study including the research design, research paradigm, target population, sampling procedures and sample size, data collection procedures, research instruments, data analysis techniques, ethical considerations and operationalization of variables.

Chapter Four covers data analysis, interpretation and discussions. Since the research designs in the study were descriptive and correlational research designs, and the research approach was mixed methods, descriptive and inferential analysis were carried out in a cross-sectional manner as per the research objective.

Chapter Five of the study presents the summary of findings, conclusions, recommendations and suggestions for further research. References made in the study are appended in the Reference section of this thesis. In addition, authorization letter to collect data, research instruments and the map of Mau Forest are appended in the Appendices section.

CHAPTER TWO
LITERATURE REVIEW

2.1. Introduction

This chapter gives the literature review related to Participatory Forest Management, institutional framework and conservation of Mau Forest programme. Conservation of Mau Forest programme is the dependent variable which is influenced by the independent variables: participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation. Institutional framework was reviewed as a moderating variable. This section also presents a theoretical framework guiding the study, conceptual framework, research gaps and summary of the literature review.

2.2. Conservation of Mau Forest Programme

In many countries, the focus has been on enabling active participation in local people's management whose livelihoods depend on the natural environment to achieve goals of poverty reduction and conservation. Although implementation of these policies is inconsistent and incomplete (Sundar, 2001), national leaders and policy makers in many developed countries, as well as aid officials and technical experts in donor countries, have adopted this general approach (Bebbington, Dharmawan, Fahmi and Guggenheim, 2004).

The emphasis on the participation of local communities in the management of natural resources has contributed to an analysis of how such a strategy has been applied and its achievements and shortcomings. The outcomes of some decentralization schemes and concerns about how to react to changing conditions have led others to conclude that such an strategy is too optimistic (Barrett, Brandon, Gibson and Gjertsen, 2001; Campbell and Shackleton, 2001). Krishna (2004) (Sees these schemes as premised on four premises that are only partial truths: that populations are homogeneous, that conventional spheres of work are natural and therefore contribute to the conservation of resources, that decentralization ensures efficient use of resources, and that involvement and self-help are the keys to fair and sustainable use of resources.

Agrawal and Gibson (1999) echo the criticism of this participatory approach, with their clear presumption that societies are small spatial units with homogeneous social structures, mutual values and shared norms. Some condemn these participatory management systems for paying scant attention to the nestedness in the external financial, structural and physical climate of community-based institutions (Agrawal, 2001). Another limiting factor for decentralization projects is that failure to grant stable, long-term property rights restricts the investment by communities in resource management (Knox, Meinzen-Dick, Swallow and Place, 2002). Multi-stakeholder negotiations common to participatory strategies often fail to identify the power imbalance between stakeholders. The more influential societal actors exploit the situation to their own benefit while vulnerable groups, such as women or ethnic minorities, are disproportionately marginalized (Shackleton et al., 2002; Campbell and others, 2003; Bebbington et al., 2004). In addition, the weakness of existing institutions at all levels contributes to the inability to implement strategies that emerge from interactions (Barrett et al., 2001; Oyono, 2004). This calls for a study to determine the influence of the institutional framework on the Mau Forest Conservation programme.

Many rural households in developing countries and Africa in particular are predominantly engaged in diverse livelihood strategies and activities. One of these strategies is the extraction of forest products and it provides a substantial contribution to their well-being (Babulo, Muys, Nega, Tollen, Nyssen and Deckers, 2009). Other livelihood strategies include crop cultivation, livestock husbandry, unskilled jobs and trading. A livelihood is defined as comprising 'the capabilities, assets and activities required for a means of living. In recent years the importance of NTFPs commercialisation as a means to reduce poverty and conserve forests has become prominent as the dependence of poor rural livelihoods on forest income increases (Campbell and Luckert, 2002). A meta-analysis of 51 case studies from 17 developing countries, conducted by Vedeld, Angelsen, Bojo, Sjaastad and Berg,(2007), revealed that the income from forest products especially fuel wood, wild food and fodder represented a mean of 22% of the total income in the population sampled.

Similarly, Babulo et al.2009), after sampling 360 rural households in 12 villages in northern Ethiopia, found that income from forest products occupied the second largest share of the mean total household income after crop income. Many governments in Africa also value timber production for income generation more than any other forest ecosystem services, whereas livelihoods in many rural communities in Africa depend to a greater extent on NTFPs for subsistence and income generation (Vedeld et al. ,2007, Babulo et al.,2009). This is similar with the global trend for which the highest proportion (30%) of the functions of the world's forests is designated for production of timber and also NTFPs. Food security is determined by food availability, access, utilization and the stability of food supply (FAO 2003). Forest products especially NTFPs contribute to food security either through direct family consumption or by indirect means such as the selling of NTFPs to buy other household food items. There is need to assess how NTFPs motivate CFA members to implement PFM programs in Mau Forest.

A study carried out by UNEP (2002) on deforestation in African countries revealed that weak ineffective policies, laws and regulations are seen as the main cause of deforestation. However, it is not only lack of proper government policies and laws that fail the environmental conservation, but the major challenge is in lack of proper functioning institutions that fail to stop over-exploitation of forests. This is also a view taken by Neumann (2005) who argues that states promote environmental degradation through its failure to implement its laws and policies on environmental conservation. This failure, in his view, originates from the historical events and decisions of the state. He notes that, the political economy of the state that emphasizes on more land accumulation and a development that favours forest destruction is the undoing of environmental conservation.

The Mau Forest Complex is the largest closed-canopy montane ecosystem in Eastern Africa.
It encompasses seven forest blocks within the Mau Narok, Maasai Mau, Eastern Mau, Western Mau, Southern Mau, South West Mau and Transmara regions. The area is thus the largest water tower in the region, being the main catchment area for 12 rivers draining into Lake Baringo, Lake Nakuru, Lake Turkana, Lake Natron and the Trans-boundary Lake Victoria (Kundu, China and Chemelil, 2008; Olang and Fürst, 2011). The economic importance of the Mau forest is evidenced by the fact that in 2007, the Maasai Mara Reserve and Nakuru Park generated revenue of over USD 10 million from Park entry fees alone (UNEP, 2008).The rivers originating from

the Mau produce hydro-electric power with an estimated potential hydropower generation of approx. 535 megawatts, representing 57% of the total electricity generation capacity in Kenya in 2009 (GOK, 2009).

A further benefit of the forest is its role in climate regulation as a reservoir and sink of carbon dioxide, the main greenhouse gas (GHG) contributing to global warming and climate change (Hesslerová and Pokorný, 2010). These rivers feed into various lakes, such as Nakuru, Baringo, Natron, Naivasha, Turkana and Victoria. The lakes and rivers also provide much-needed water for pastoral communities and agricultural activity and supply essential ecosystem services such as micro climate regulation, water purification; water storage and flood mitigation. In addition, the hydro-power potential of the Mau forest is estimated to be about 535 MW, which equals about 47% of the total installed electric power generation capacity in Kenya. Apart from provision of local public goods such as food, herbs, and wood-fuel, the forest also supplies global public goods and services like wildlife habitat, carbon sequestration and biodiversity conservation. But a study done by Towett (2004) traces the cause of the destruction of the Mau Forest. To him this is the root cause of forest destructions in Kenya. On the other hand, the excision of the Mau Forest land was encouraged by the "*shamba" system*. This later graduated to a system through which forest land was excised. The excised land was used to reward political and non-political loyalists.

Anders (2000) noted, the foundation of PFM is that local community can and will conserve forests if rendered legal right to access and use the resource to generate tangible benefits - a benefit that confers the retaining of the forests rather than removing them. Indeed, PFM is dualistic in purpose - it is about the economic and social benefits of forest dependent community from the forests, as it is about the conservation of the forest resources. In so doing PFM establishes an interface where conservation concerns of the State and the livelihood needs of local communities can be served equitably. PFM is not only about benefit sharing, but also about empowerment and decision making on issues that immediately and vitally concern communities. PFM deals with community participation as they are gaining a new role as forest managers and legal users, and need to be organized, establish appropriate institutions, define their needs, develop plans and implement the plans to achieve a successful forest management and meet their needs.

2.3. Participatory Forest Management Approach in the Conservation of Mau Forest

The participatory approach(PFM) entailed a shift of conservation focus from nature as protected through exclusive state-led, top-down, technocratic control, to nature as managed through inclusive, bottom-up, participatory endeavours. This new paradigm is grounded on the argument that "if conservation and development could be simultaneously achieved, then the interests of both could be served". This amalgamation of conservation and development aims has often been termed a "win-win" solution, or "pro-poor" conservation (Adams, 2004).This is done through a process of inclusion, equity, and democratization of governance of the forest resources (Agrawal and Gupta, 2005). Local community participation in utilization and management of forest resources through collective action has become widely accepted as a possible solution to the failure of the centralized, top-down approaches to forest conservation, hence the increased adoption of PFM in most developing countries (Wily, 2001; Agrawal, 2007). There is need to carry out the study to ascertain the influence of Participatory Forest Management on conservation of Mau Forest.

Giving the fact that these resources are of great importance to millions of people, especially those whose livelihoods directly depend on them, Boon, Ahenkan, Baduon, (2009) stated that the past two decades have witnessed an increased attention by the world community to the issue of conservation and wise use of forest resources. Many programmes are introduced by governments and institutions to protect forests but with local people involved in participatory forests management, generally protect their forests and access to government managed forests out of self-interest (Kunwar 2002), forest become more secured. Participatory approach is increasingly seen as both a desirable and a feasible option used to manage forest in many parts of the world, but particularly in the developing parts where forest remains an integral part of peoples' livelihood. Thus, strengthening local control and governmental oversight is urgently needed to assure long-term sustainability.

Participatory forest management is an arrangement where key stakeholders enter into mutually enforceable agreements that define the respective roles, responsibilities, benefits and authority in the management of defined forest resources (Matiku, 2011). Participatory Forest Management (PFM) is a management tool that involves mobilizing of local people for group action in

managing specific forest area adjacent to their settlement in order to ensure socio-economic development of community and reduce pressure on forests. This involves sharing responsibilities and benefits according to a well-defined and mutually agreed on set of rules and regulations. The agreed rules and regulation are planned, implemented, maintained and monitored by the village institutions (Ongugo et.al, 2009).

Participatory Forest Management is part of a wider initiative to devolve power of management and decision making from the government to the local communities. PFM is also intended to legalize and regulate some illegal uses of forest by the communities, (Mbugua, 2007). PFM serves as an alternative form of forest governance which has been embraced by many nations. However, how it has succeeded depends on implementation at specific sites. Mbuvi, Maua, Ongugo, Koech, Othim and Musyoki (2009) states that the emerging PFM is where the state through Kenya Forestry Service (KFS) and communities are both involved in the development of forest management guidelines and agreements.

More often than not, PFM promises to increase participation in ways that will profoundly affect who manages, uses and benefits from forest resources. Likewise, greater access to decision makers, higher levels of participation by various social groups in decision making, and the accountability of decision makers are often the claimed effects of participation (Andersson *et al*., 2004). The specific objectives of PFM are different in each country. Protection of national forest degradation and rural poverty alleviation were the main motivation behind leasehold forestry in Nepal and joint forest management in India (Pokharel, 2008).

In some other countries, such as Honduras, PFM has been associated with government decentralization programme. Previous studies focused on proposals for a range of natural resources management tactics, such as providing appropriate development opportunities (Abbot, Thomas, Gardner, Neba and Khen, 2001), emphasizing local community involvement (Western 1994; Getz et al. 1999), adopting shared management (Murphree,1994), ensuring local autonomy, guaranteeing rights to harvest (Fearnside, 1989; Browder, 1992), promoting knowledge (Jacobson and McDuff, 1998), awarding direct cash compensation (Ferraro and Kiss, 2002), and encouraging tourism with no focus on the impact of the initiatives on household

wealth of forest adjacent dwellers. Hence, PFM is a multi-stakeholder approach where the private sector, institutions and communities are involved in management of forests and sharing of benefits that accrue from such management processes. While PFM can be considered in the wider perspectives of Community Based Natural Resource Management (CBNRM), Community Forest Management (CFM) is the most emphasized approach for implementing PFM in many developing countries. CFM is basically an approach towards achieving forest sustainability and biodiversity conservation with socioeconomic objectives (Kellert et al 2000).These socio-economic objectives include, equity, conflict resolution, awareness, forest production, poverty reduction, and sustainable utilization.

Several studies have analysed household characteristics that influence community participation in forest management. However, the evidence based on participatory forestry is geographically biased towards South Asia, notably Nepal and India (Adhikari, 2004; Agrawal and Gupta, 2005; Dolisca, Carter, McDaniel, Shannon and Jolly, 2006; Maskey, Gebremedhin and Dalton, 2006). This is problematic, given that there are large differences in society and nature, as well as the models of participatory forestry, between Asia and Africa. The success of PFM projects in some countries like Nepal and India has resulted into sustainable use of forest resources thereby witnessing the contribution of the sector to Millennium Development Goals (Fisher, Prabhu and McDougall, 2007). The initial focus on involving community in government programmes for reforestation and forest protection has also gradually evolved towards more devolution of decision-making power and more active use of forest resource by the local communities. The initial goal of the program was to supply forest products to local people on a sustainable basis, however, in the course of implementation, the program was found effective in improving the livelihood of local community.

However, in Nepal, the program suffered from a number of challenges including: value addition problem to forest products through enterprise development, multiple forest management regimes, assuring better coverage of the program, use of the community forests for poverty reduction and income generation and better fund utilization for the users group. Fisher, Prabhu and McDougall, (2007) mention the socio cultural hierarchy, the entrenched bureaucratic culture of multilateral government agency and limited human and financial resources as a major challenges of Nepal's

PFM programme. To alleviate these problems the following actions were taken. First, the community forestry was redefined for livelihood support. Second, income of the community forestry was used for poverty reduction. Third, more Community Forest access were given to the poor as sub-user groups. Finally, allowing Community Forest User Groups to establish enterprise in the vicinity and increasing the involvement of local government in Community Forest. Experience from Nepal suggests the reconfiguration of forest policies and operational rules as a prerequisite for sustainable forest management and livelihood promotion. The legal framework also needs to develop over time to meet the specific local needs. The increase in market demand for none timber forest products further strengthened the community association (Fisher, Prabhu and McDougall, 2007). This calls for a study to determine whether the same experiences as those in Nepal are also witnessed in Mau Forest while implementing PFM programs.

Many governments have made efforts at decentralizing mainly due to pressure from donors, non-governmental organizations and local politics (Agrawal and Ribot 1999), but what many governments term as decentralization is not truly democratic since power, property rights and access to resources are not fully transferred or shared (Larson, 2005). In recent years, decentralization has found solid footing as a government strategy to shift power to those who are affected by the exercise of power(Agrawal and Ostrom 2001; World Bank, 1997).It has also become a tool for achieving development goals in ways that respond to the needs of local communities and build social capital (World Bank, 2000; Shyamsundar, 2008).The underlying argument promoting devolution as transfer of power, accompanied by 'downward accountability', is that it can ensure economic efficiency and sustainable resource use, and contribute to equity (Ribot, 2002, 2003). However, socio-economic heterogeneity and gender inequality within communities may lead to a failure of collective action mechanisms (Baland, Bardhan, Bowles, 2006). Decentralization takes different forms: deconcentration, delegation, devolution and privatization (Meinsen-Dick and Knox 2001; Blaser, Kuchli, Colfer and Capistrano 2005). Effective conservation programmes in Mau Forest are also realized if there has been efficient decentralization of power and resources to CFA members.

Many researchers have conducted researches about the major factors that determine the effectiveness of community based resource management. Almost all of them agree on one important factor, institutions, for the success of collective action in managing a common resource (Agrawal, 2001; Agrawal, 2006; Van Vugt; 2007). This does not mean that well-established institutions alone lead to success of common resource management approach. Researchers have further explored the determinants of successful collective action and come up with different factors (Agrawal, 2001; Gibson, 2005). A study done by Agrawal (2001) analysed the findings of the three well-known scholars of commons: Ostrom, Wade, Philippe and Plateau to produce a comprehensive theoretical generalization in diagnosing the major determining factors of effective and sustainable common resource management. He also added some factors from his previous findings. In general, the factors described by Agrawal are classified into four major categories: biophysical characteristics of the resource, characteristics of the user group, institutional arrangements and external factors. In his analysis, Agrawal also tried to identify limitations of previous investigations (Agrawal, 2001; Agrawal, 2003). First, factors like demographic characteristics of respondents were not included in the analysis of prior researchers. Knowledge about the magnitude and relative importance of those variables are also very poor due to absence of statistical analysis particularly those based on data from local level (Argawal, 2001; Argawal, 2003; Argawal, 2006).

Studies have found that economic value of forests is one of the major determining factors on individual decisions whether to participate or not in the management of a common resource. Behera and Engel (2006), in India, revealed the significance of economic value of forests to successful PFM programme. A person who generates much from forests or whose livelihood greatly depends on forests has a high probability to get involved in PFM. A study conducted by Matta and Alavalapati (2005), based on an empirical analysis of joint forest management in India, explore variations in the perceptions of collective action by community members and factors which affect community perception. The investigation underlined the need for a shared understanding of collective action among community members for successful and sustainable joint forest management. The author suggests careful consideration of the level of understanding before and during implementation of community based natural resource management.

Scholars of commons agree on the significant positive relationship between household size and community participation in common forest management (Agrawal, 2005; Chhetri, 2005; Faham et al, 2008). In explaining the role of area, scholars of common link it to elevation which in turn significantly determines quality of forest and/or the type of non- timber forest products found in the area (Agrawal, 2006). Chhetri in his study in Nepal found a significant association of participation in resource utilization with forest condition, though the relationship was not strong (Chhetri, 2005). The relationship between distance from forest and participation is not clear. Chhetri (2005) and Kugonza, Bunyiza and Byakagaba, (2009) found a negative relationship between distance from forest and community involvement in forest protection, resource utilization and decision-making.

Moreover, quantitative study conducted in Nepal recommended that household with large number of livestock has a high probability to participate in community forest management than their respective counterparts (Chhetri, 2005). This is very true for pastoralist communities as they need forests and grass for fodder to feed their cattle. This finding is in line with the finding of Agrawal and Chhatre. The study by Agrawal and Chhatre in three Indian states, who used an econometric model and suggest that household's livestock assets are strongly and positively related with the involvement in protection and development of forest resources (Agrawal and Chhatre, 2006).

On the other hand, Argawal and Chhatre (2006) in their study in the northern part of India suggested that when utility, or the over-all subsistent benefit, from a common resource increases, resource users make greater efforts to protect the forest. High levels of dependence encourage greater participation in forest governance (Lise, 2000). A qualitative study in North-western Uganda, based on participatory rural appraisal method by Kugonza et al (2009) suggests that the attitude of people towards community forest management is influenced by education. They further recommend that the attitude of the community towards common resources can be changed by educating the community about common resource management.

Agrawal (2001) discusses participation by women in CFGs as determined by first, rules of entry where women need to be included in the groups. Therefore, members' rules need to be more inclusive. They also need to be informed of any changes taking place. Second, changes in social norms which include segregation of public space are necessary. Third, there must be changes in social perception especially by men towards women and fourth, property rights favouring women are important to increase the weight of their worth. Additionally problems like inaccurate assessment of resource depletion are likely to arise if women are excluded, as they are more familiar with forest conditions than men. There can be problems in catching transgressors especially women, conflict resolutions may have male bias (Agarwal 2010), non-incorporation of women's specific knowledge of species varieties (Sarin and Khanna 1993), ignorance of plantation of plant species preferred by women.

However, in recognition of the role of local forest adjacent communities in reduction of forest destruction and degradation, the Kenyan government introduced the concept of PFM (MENR, 2005, 2016). This was first entrenched by the enactment of the Forest Act (2005) and the subsequent National Forest Act (2016). Under the PFM arrangement in Kenya, the government retains ownership of the forest while forest-adjacent communities, organized in the form of Community Forest Associations (CFAs), obtain user rights. In spite of this, Mau Forest Complex has witnessed a number of positive developments geared towards regeneration. A public-private sector partnership under the auspices of the Save the Mau Trust has stepped up efforts to rehabilitate the degraded portions of the forest. Despite the prominence of strategies linking conservation and development as primary conservation tools, and strong arguments for and against their effectiveness (Wells and Brandon, 1992; Barrett and Arcese, 1995; Oates, 1999; McShane and Wells, 2004), there have been few quantitative comparative assessments of their successes and failures.

2.4. Participatory Forest Planning and Conservation of Mau Forest Programme

Forest planning is a process that involves a sequence of activities, ideally starting with decision problem recognition and ending with a forest plan. Involving the public in the planning process would allow for public values to influence the outcome. Basically, participation can be used to increase the legitimacy of a decision and to facilitate implementation, as well as to improve the

substantive quality of the decision in terms of total social benefit. In addition, participation can be an end in itself, fulfilling democratic or other local empowerment objectives (Buchy and Hoverman, 2000). Therefore, there is need to assess if CFA member are participating in making decisions on forest conservation activities in Mau Forest.

On one hand, CIFOR's forest governance work using adaptive collaborative management strategies on Africa, Asia, and Latin America resulted in increased decision-making and bargaining power among marginalized groups, particularly women (Colfer, and Capistrano, 2005). Consultations with stakeholders have been instrumental in ensuring access for women and men to local forest services and in increasing women's access to district-level budgeting processes (CIFOR, 2009; de Vries and Sutarti, 2006; Komarudin, Siagian and Colfer, 2008; Syamsuddin, Komarudin and Siagian, 2007). With regard to improved policy implementation, failure to take gender into account in policy analysis undermines potential incentives for effective policy implementation, as it can distort perception of human impacts on resource management; obstruct forestry planning and skew resource allocation (FAO 2007).

Bina Agarwal's (2010) recent volume on Gender and Green Governance highlights the value of looking at the two-way relationship between gender involvement in forest management and resources themselves: not only do men and women have preferences and reliance on different forest products, but women's and men's participation can also have different outcomes for resource quality. Women's participation in decision-making has been found to substantially boost forest regeneration (Agarwal, 2010), decreasing the incidence of illicit logging and other unsanctioned practices (Agarwal, 2009, Agrawal, Yadama, Andrade and Bhattacharya, 2004), and their presence in communities of forest users enhances their capacity to control and settle disputes (Westerman and Ashby, 2005). Owing to job obligations and regular cooperation, many of these changes are due to higher rates of social capital among women (Agarwal, 2010, Westerman, and Ashby 2005). The effect of women's participation on the management of the Mau Forest project, needs to be examined.

The Studies have pointed out that participation of women in forest protection committees, meetings and forest protection, has led to 25 percent higher control on illicit grazing than in communities where women do not participate in these activities (Agrawal *et. al.,* 2006)**.** Therefore, women tend to be more cooperative (Westermann and Ashby, 2005) and better conservationists than men. In many community-forestry programs it has been found that rules of forest-use formed by men have been too restrictive, resulting in larger burden on women as they have to spend more time on collection of forest products (Pandolfelli, Meinzen- Dick and Dohrn, 2007) or use inferior substitutes, stall feed animals, lose income earlier obtained from selling forest products. Some existing studies have examined CFA roles in the decentralization process of Kenyan forests and highlighted the emerging issues which have slowed down the development of the PFM process (Mogoi, Obonyo, Ongugo, Oeba and Mwangi, 2012; Musyoki, Mugwe, Matundu and Muchiri, 2013). The issues identified included the right for communities to license, extraction and movement of forest products, arrest and prosecution of offenders in forests under PFM, and the cost and benefit sharing.

However, participatory forest planning can be a complicated and delicate task. The complexity springs from the fact that several stakeholders are involved and that these stakeholders very often have conflicting interests; that is, the situation has both a multiple stakeholder and a multiple criteria character. The delicate task is to make the participatory process legitimate and accepted by stakeholders, because the stakeholders may have very different expectations of a participatory process (Kangas, Saarinen, Saarikoski, Leskinen, Hujala, Tikkanen, 2010; Webler and Tuler, 2001).

A detailed review of the stakeholders is important at the outset of a participatory process. If key stakeholders are left out of the loop, central issues may be overlooked and the overall image of the situation will therefore be incomplete. It can potentially mean that the solution discovered in the process won't be a solution to the real problem. In addition, a mechanism where key actors are left out is unlikely to be recognized as a participatory process and could be hindered in implementation. It is possible to identify and explain the level of public engagement in a decision-making situation using engagement ladder (Buchy and Hoverman, 2000). For effective

successful implementation of PFM programs in Mau Forest, a thorough stakeholder analysis must be met for smooth operations to be realized.

A simplified version of Arnstein's original ladder of participation, published by the International Association of Public Participation (IAP2, 2007), contains relevant levels that correspond to the use of participation in forest planning situations. Furthermore, in some situations, such as forest planning, there are not only general values to consider, but spatial and place-specific values may be at least as important to stakeholders. To capture that kind of values, maps are needed when stakeholders are expressing their criteria. Often, an iterative process in which alternatives are refined according to stakeholders' preferences would be desirable (Castelletti and Soncini-Sessa, 2006), but time and resources constraints can make this unfeasible. Thus, alternatives must be generated carefully; they must be non-dominated, realistic, and not too extremely directed toward any single stakeholder's interests, but at the same time, they must span the objective space sufficiently (Hiltunen et al. 2009). Place-specific values identified by stakeholders should be considered in the generation of alternatives. Varying modes of expression can be used when stakeholders state their preferences: in a group or individually, at a personal meeting or by a form, on one occasion or iteratively.

Furthermore, the choice of mode and MCDA technique must depend on the situation and the stakeholders (Belton and Stewart, 2002; Kangas and Kangas, 2005). In cases where more-complex MCDA techniques are used, a personal meeting with possibilities to adjust preferences as knowledge of the situation increases would be a desirable working mode (Kangas and Kangas, 2005). In the final step, preferences in the form of weights for criteria and alternatives are combined by some kind of decision rule resulting in global priorities for the alternatives. The global priorities are overall weights that make it possible to rank the alternatives in a preference order.

One promising approach for handling the complexity is by structuring the planning process with multiple criteria decision analysis (MCDA), (Mendoza and Martins, 2006). Although MCDA is basically a decision analysis tool for single decision-maker situations, the multi-criteria character also makes MCDA potentially useful as a tool for participatory planning. Belton and Stewart

(2002) describe MCDA as a process that seeks to integrate objective measurement with value judgment and to make explicit and manage subjectivity. The process has three key phases: Problem identification and structuring, Model building and use and development of action plans.

In the forestry context, approaches combining participatory planning or group decision making and MCDA are relatively new, though studies of participatory forest planning in combination with MCDA techniques have been published during the past decade (Laukkanen, Palander and Kangas, 2004; Maness and Farrell, 2004; Pykäläinen et al., 1999; Sheppard and Meitner, 2005). A general model for the participatory MCDA process contains five phases, which are interconnected: First is Stakeholder analysis meant to identify all relevant stakeholders and to determine the extent of their participation. The extent of public participation in a decision-making situation can be defined and described using the ladder of participation (Buchy and Hoverman, 2000). The level of participation indicates to what extent the participants have the possibility to influence the participatory process and its outcomes: the higher up the ladder the participants are, the more impact their opinions will have on the final decision. Thus, the participatory ladder defines the relationship among the participants in terms of how power is being redistributed, where *power* means control over resources and decision-making.

Secondly, there is need to structure the decision problem so as to define the decision problem by identifying and structuring the stakeholders' objectives and attributes. Third is the development of alternatives*:* The aim of this step is to define or develop alternative solutions to the decision problem. Often, an iterative process in which alternatives are refined according to stakeholders' preferences would be desirable (Castelletti and Soncini-Sessa, 2006), but time and resources constraints can make this unfeasible. Thus, alternatives must be generated carefully; they must be non-dominated, realistic, and not too extremely directed toward any single stakeholder's interests, but at the same time, they must span the objective space sufficiently (Hiltunen et al. 2009). Place-specific values identified by stakeholders should be considered in the generation of alternatives.

Another one is elicitation of preferences in order to obtain the stakeholders' preferences for criteria and alternatives in terms of each criterion. Preferences are subjective judgments made by the stakeholders on the importance or value of a criterion or an alternative. The last one is ranking of alternatives in the form of weights; for criteria and alternatives are combined by some kind of decision rule resulting in global priorities for the alternatives. The composition of the committee is a critical issue in decision making about the use of community forest. In principle, the executive committee (EC) should have representation from all members, and thus its decisions will reflect the needs and desires of all members (Yadav, Bigsby and MacDonald, 2008).

2.5. Participatory Forest Monitoring and Conservation of Mau Forest Programme

Participatory monitoring is an ongoing process where local forest users systematically record information about their forest, reflect on it, and take management action in response to what they learn. Monitoring subjects range from timber harvesting and honey production to institutional transparency and community forest enterprise accounting. Methods include vegetation samples, transects, fire calendars, field diaries, community workshops, rainfall measurements and many more. There are three general reasons for monitoring: First, it can help tropical forest managers and users answer questions or concerns(Cunha dos Santos 2002) about issues such as sustainable management and livelihoods, biodiversity conservation, human wellbeing, political processes and institutions, and ecosystem services. Second, monitoring not only provides answers to questions about forest management, but also creates a culture of questioning. Thirdly, monitoring can be a crucial mechanism for enforcing compliance with important forest management rules, such as resource use and access, conservation, and benefit distribution.

Recent thinking has concluded that monitoring is more than a way of generating information; it is a catalyst for learning processes at the core of adaptive forest management. Colfer, 2005) discusses how monitoring serves an integral role in the iterative cycle of planning, action, assessment and learning-a cycle that generates systematic progress and adaptation to change (Colfer 2005, Guijt 2007, Fisher et al. 2007). With regard to this, Participatory monitoring, where the monitoring data is obtained by the local community members, a reasonable alternative

may be. However, the methods must be simple if local people and government staff are to be involved successfully.

Over time the field of development collaboration has moved from implementation-based methods to results-based approaches (Kusek and Rist 2004), widely used by different actors in development research (UNDP 2009). Results-based monitoring and assessment is a management technique that can help track the progress achieved and show the impacts of projects or other interventions such as programs. It helps the organizations to gather evidence not only to complete the project as expected, but also to execute in a way that will have the intended effect. Examining outcomes and impacts is an important part of this, which offers responses to the demand for performance which transparency by stakeholders and other interested parties (Kusek and Rist 2004). RBM is an evolving process of learning from evolving input and changes. Some actors prefer to use the term 'Managing for Development Results' (MfDR) to stress development rather than just organizational achievements (UNDP 2009).

Therefore, effective monitoring is vital to long term forest management. Communities may need to be trained, so they are clear on what they are monitoring and are able to select indicators to evaluate changes in ecological conditions. They also need to be willing to use sanctions for rule breakers. When sanctions are strictly enforced, they prevent free-riding and instill a sense of trust, which motivates more active participation (Ghate and Nagendra 2005). Hence, Monitoring is judged against outputs, activities and inputs which have been planned or agreed. Monitoring means observing, and collecting information, and reflecting on what has been observed. In case of Community Forestry-to check, whether users are still on course of achieving their aims and if necessary to change the course in monitoring.

Recent analyzes of a broad forest management database have shown that the presence of tracking resource usage and sanctioning breaches of rules has a clear connection with improved forest conditions (Ostrom and Nagenra 2006; Coleman 2009), offering support to the hypothesis that tracking and sanctioning, or as Gibson et al. refer to it, control compliance, plays a crucial role in the performance of forest management.

Gibson, Williams and Ostrom (2005) indicated that the enforcement of rules is carried out by local user groups, but the data they depend on use a very broad concept of user groups that includes any 'group of people who harvest, use and/or preserve one or more forests and share the same rights and duties with forest products, even though they may or may not be formally organized Who considers evidence in IFRI data that structural variables played a role in explaining the monitoring and sanctioning variations. They find that group members control and sanction, harvest rights for group members and residual claim on the property. They also found that monitoring and sanctioning by external organizations was related to the involvement of local area NGOs

Moreover, Agrawal and Goyal (2001), however, point out that monitoring is a lumpy collective: a certain amount of monitoring is required before it can be minimally effective. Thus, they argue that very small groups may be unable to engage in effective monitoring because they may not be able to hire enough guards to exclude outsiders from using the resource. They develop a model and evaluate empirical evidence from the Indian Himalaya which suggests that medium sized groups may be more effective than either small or large groups. For the purposes of forest management, the effect of group's size may also be mediated by forest size: larger forests likely require more monitoring than small forests, holding group size constant.

Where resource users regularly monitor and sanction resource use, the condition of forest resources will likely be better than where rules are not enforced (Banana and Gombya-Ssembajjiwe, 2000; Gibson et al., 2005). Ambient monitoring is the method of regularly examining over time the state of social and/or environmental factors, independent of any interference in conservation. Also referred to as "status review" (Stem, Margoluis, Salafsky and Brown, 2005) or "monitoring surveillance" (Nichols and Williams, 2006). The aim of environmental monitoring is not to quantify the results or effects of conservation initiatives, but rather to describe the wider social and ecological context in which conservation takes place.

2.6. Participatory Implementation of Forest Management Practices and Conservation of Mau forest programme

Akpama (2002) maintained that, people's participation in communal forestry management does not mean just convincing people to carry out the tasks identified for them in the course of management. It means that people either individually or collectively are involved in identifying the problems and their causes and assessing the native scope and magnitude of interventions required to ameliorate crisis. He however, identified two levels of participation of communal involvement in resources management. The first level of approach is known as the 'blueprint or large-oriented' in which projects are defined in forms or mechanism, for the delivery of pre-refined packages of good services to specific large groups. Communal participation or involvement in this context is understood in terms of willingness of local people to undertake the required activities that can bring about proper management of the environmental resources. The second approach is the "process-oriented approach" where specific categories of activities are defined by the local people themselves. Participation in this context is understood to mean that the people themselves assumed ownership and accountability for activities which they have identified and developed and ready to manage (Akpama 2002).

Also, Ibor and Abi (2005) maintained that, participatory forest management avails the communities the unique opportunity of discussing or negotiating with logging companies or individuals from a position of strength through better understanding of the true value of their forest resources. The community could begin to have a sense of belonging and see the forest ecosystem as their property, which they must do everything to protect. This development is likely to contribute significantly to the improvement of their socio-economic well-being. Furthermore, Anyanwu (2002) stressed the need for community education programmes, stating that, the principle of community participation is deeply inherent in the very nature of community education. He further explained that the idea of participation as it applies to community education strongly implies that success is assured where the effort of local community is channeled to the solution of a problem deemed as-common to the people. He views the principle of community participation as the active involvement of the local people in the planning, execution, utilization and assessment of community education programmes. It emphasizes the

initiative of the people as a means of stimulating the active participation of all citizens in programmes designed to induce development in their community.

However, conservation is costly, requiring investments in time and money. For example, forest guards must be paid and equipped, and new trees must be seeded, nursed, and planted, at a cost of time and money. Scholars and policy makers have long argued that decentralization is a good way to maximize the benefits of forest conservation because (among other reasons) local governments are closer to their constituents and are more accountable to electoral pressures (Treisman, 2007). Therefore, the argument goes, democratic pressures from voters are likely to make conservation more successful in decentralized regimes (World Resources Institute 2005).There is need to ascertained whether CFA members are accessing financial resources for effective implementation of PFM on conservation of Mau Forest programme.

In Nepal, 'forestry funds' are a core aspect of community forestry. The income into these funds comes from timber sales, NGOs, and through penalties and fees charged to local users. Fund resources are used for local construction, schooling, health services, micro-credit (Pokharel et al., 2004, Pokharel, 2008).A pertinent concern is whether community benefits (such as schools or community halls) create the right incentives for sustainable resource use. Infrastructural benefits are rarely tied to prudent use of resources. They equally benefit households who follow community rules as well as households that defect.

With forest services undergoing decentralization, privatization and downsizing, many states are resisting the adoption of new forest management practices at the national level. Decentralization has not been followed by a transition of decision-making and executive authority, clarification as to who has what rights and obligations, and budgets and other services required, from the center to community institutions (Barrow, Clarke, Grundy, Kamugisha and Tessema 2002).Examples in Africa, Asia and Latin America provide evidence of the preservation and even recentralization of power by central governments (Ribot, Agrawal and Larson 2006). Forest management is often misdirected to district councils that lack resources, expertise, or interest (especially where high-value resources are scarce), rather than to community-based institutions (Odera, 2004).

In that respect, central governments have rescinded power and rights, such as by transferring authority to private interests over rehabilitated community forests. Compliance beyond forest-managing community membership is often difficult to enforce (Odera 2004). Most CBFM is established through formal agreements between communities and states, which vary in degree of autonomy in decision-making. States usually maintain lawful power of natural resources (Ribot, 2002). As a result, CBFM also does not allow communities to gain a more complete share of wealth through greater ownership and authority of resources (Wily, 2002).

Indeed, for joint management to progress beyond rhetoric requires credible commitments by the state to local communities in both policy and practice. Since systems of forest management are bound within structures of inequality and political contexts disadvantageous to the rural poor, the institutional design of partnerships must be radically restructured to enable equitable participation and negotiation processes among different categories of stakeholders (Kumar, 2005). Where ownership, power, and responsibility are devolved directly to communities, there are good prospects of producing strong and credible institutions capable of supporting CBFM and rural development. Democratic decentralization involves secure power transfer and accountable representation that guides the "division of decision-making, rule-making, implementation, enforcement, and dispute resolution powers", thereby contributing significantly to equity, justice and efficiency (Ribot, 2002).

In the last two decades or so, it has become clear that most of these decentralization reforms have had mixed results (Gibson and Lehoucq, 2003). Even so, decentralization, and the promotion of conservation through democratic accountability remains an important part of many pro-conservation policies. Recently, the PES (payments for ecosystem services) approach – the second of these policy approaches – has begun to garner substantial attention. The promise behind PES schemes is that people who control some ecosystem are paid to conserve that ecosystem, ostensibly in return for the services provided by the ecosystem. For example, owners of forested lands might be paid in return for the carbon sequestration their forests provide. By paying for ecosystem services, the theory goes, PES schemes incentivize the conservation of resources providing those services.

As the program develops, it is becoming clear that payments to local governments – economic incentives – are likely to play an important role in future REDD activities. As such, it is important to know whether such economic incentives effectively motivate governments to invest in forest conservation. The effects of decentralization, it seems, mostly depend on local context. For example, the effects of decentralization on common pool resource governance may depend on local enforcement of forestry rules (Gibson et al., 2005), local institutional performance (Andersson, 2006), property rights (Agrawal and Ostrom, 2001), heterogeneity (Poteete and Ostrom 2004), and/or central government supervision among other factors.

One key finding is that "downward accountability" is important for promoting conservation and sustainable management of common pool resources in decentralized settings (World Resources Institute 2005; Ribot, 2002). Such an association will have to be vetted based on the following criteria before it can be allowed to operate: its objectives, composition of its management committee, election procedures, and the purpose for which its funds may be used. Despite all these requirements, CFAs just like any other institution may be mismanaged and eventually collapse. In addition, communities that form forest associations may not be homogenous. They may also have varying socio-economic objectives for forming the associations. Lack of homogeneity may also affect their forest management objectives and this in effect may have an impact on the forest resources to which they adjacent.

2.7. Participatory Evaluation and Conservation of Mau Forest Programme

Evaluation on its part is assessment of ongoing or already completed activities in order to find out how they support decision making and how the objectives are being met. Evaluation can be applied to many initiatives, including projects (UNDP 2009). Evaluation is done in the mid-way or at the end of an initiative, and it is periodical by nature. The evaluation process takes into consideration the wider image and the objectives, which are not as concrete as the outputs, reviewing how successfully the objectives have been achieved.

In addition, impact assessment sometimes follows a project and takes place after a period of time has passed to assess the long-term effects. It is also systematic by nature but not continuous such as monitoring, and it concentrates on analyzing the effects of the project measures and the

change that happened. Impact assessment can include information about the change being positive or negative, intended or not, long-term or short-term. It aims at understanding the reasons behind the change at output or goal level. Impact assessment can also bring up general strategic matters that can be applied in the future. Management assessment is the process of measuring the management inputs, activities, and outputs associated with a conservation intervention, in order to identify management strengths, weaknesses, and needs (NOAA, 2011). They are not linked to specific performance goals or explicit program logic, but are instead predicated on the assumption that conservation interventions with sufficient management capacity and appropriate activities are more likely to deliver positive conservation outcomes than interventions with low capacity and misaligned activities (Ervin, 2003; Leverington et al., 2010).

Thus, management assessments allow one to know if an intervention is ‘‘well-managed’’. Management assessments originated in the late 1990s, when it became clear that (a) declaration of protected areas did not necessarily result in adequate management inputs, and (b) biodiversity was declining, despite the increasing number and spatial extent of protected areas (Ervin, 2003). Today, they are still primarily employed by governments and international organizations to assess protected areas and protected area systems (NOAA, 2011), though this approach is applicable to other conservation interventions. In addition, management assessment is distinct from ‘‘management effectiveness evaluation’’ and its associated tools, though data generated by the latter are often used to assess the adequacy of management inputs, activities and outputs. They vary in complexity, but the most commonly used methods are relatively fast, simple, and inexpensive to implement (NOAA, 2010, 2011). They often employ a standardized, self-administered questionnaire to measure intervention inputs such as funding, personnel, activities for instance enforcement, boundary demarcation, and outputs-management plans and regulations (Ervin, 2003; NOAA, 2011).

In order to promote public reporting and transparency, many donors include management assessment as a mandatory component of protected area M&E (such as Global Environment Facility, World Bank, Critical Ecosystem Partnership Fund). Management assessments have been used in more than 6200 protected areas around the world (Leverington et al., 2010), and are increasingly being used to assess national and international management and conservation

strategies (Pavese, Leverington and Hockings, 2007; Quan, Ouyang, Xu and Miao, 2011). Performance measurement is the process of measuring progress toward specified project, program, or policy objectives, including desired levels of activities, outputs, and outcomes (DAC, 2002).

Sometimes referred to as ‘‘performance monitoring’’ (Rich, 1998) or ‘‘performance evaluation’’ (USAID, 2011), performance measurement rose to prominence in the 1980s and early 1990s, as governments and private sector actors responded to a perceived need for greater accountability regarding the performance of public and private sector program investments in education, public health, social services, and other fields (Rich, 1998; Wholey, 1997). The conservation sector was a relative latecomer to performance measurement, with concerted efforts widely implemented only since the 1990s (Stem et al., 2005). Government agencies, non-governmental organizations (NGOs), and academia subsequently developed numerous performance measurement methodologies (Kapos et al., 2008; Margoluis and Salafsky, 1998; UNDP/GEF, 2005). Though the term ‘‘performance measurement’’ has sometimes been used interchangeably with ‘‘performance-based,’’ ‘‘results-based,’’ or ‘‘outcomes-based’’ management, performance measurement is recognized as a mechanism to provide information necessary for management such as decision-making.

In addition, impact evaluation is the systematic process of assessing the causal effects of a project, program, or policy (Gertler et al., 2011). By comparing what actually happened with an intervention to what would have happened without it, impact evaluations measure the intended and unintended consequences attributable to a conservation intervention (Gertler, Martinez, Premand, Rawlings and Vermeersh, 2011). In addition to providing evidence regarding positive and negative impacts, well-designed impact evaluations may provide insights into the variation in impacts within and among groups, the attributes of an intervention that foster positive (or negative) impacts, and the contexts in which an intervention is most likely to succeed or fail (Miteva, Pattanayak and Ferraro, 2012).

Recent impact evaluations have examined the impacts of protected areas on forest fires, recovery planning on the status of endangered species and communal conservancies on human well-being (Glew, 2012). Impact evaluations inform decisions associated with curtailing, reforming, and expanding conservation initiatives (Gertler et al., 2011). Accordingly, the use of impact evaluations is most appropriate with fully implemented programs or interventions, where the goals and activities of the initiative have been defined, and where potential users of the evaluation are identified and prospects for use are strong (GAO, 2009). For emerging or contested interventions, where the theory of change that links interventions to impacts remains unproven, impact evaluation may have particularly high policy relevance and prospects for use by decision-makers (Gertler et al., 2011; Patton, 2003).

Furthermore, systematic review contributes to a shared evidence base for decision-makers, addressing questions concerning whether an intervention works or not, and its degree of impact (Pullin and Knight, 2009). Systematic reviews are normally conducted by an independent review team that combines subject matter experts with review and synthesis experts (CEE, 2010). In addition, Systematic reviews require significant resources, time, and technical expertise (CEE, 2010). Though systematic reviews are standard in other sectors, they have not been widely used in conservation, despite their potential (but see www.environmentalevidence.org). Moreover, processes are needed to integrate evidence from systematic reviews into useful policy guidance. Government agencies and NGOs are beginning to commission systematic reviews to help meet their evidence needs and inform decision making (Bowler, Buyung-Ali, Healey, Jones, Knight and Pullin, 2012). With an increase in the number of studies that measure the impacts of conservation interventions, opportunities for systematic review and its application to conservation policy will grow commensurately.

Participation in environmental protection programs, however, is both laden with importance and nuanced (Conrad, Cassar, Christie and Fazey, 2011) and there are no specific criteria for calculating it. There are only very few empirical sources of detailed assessment (Rowe and Frewer, 2000). Although authors accept that an optimal evaluation should ask the participants ' views on the participatory process (Blackstock, Kelly and Horsey, 2007, Reed, 2008),This cannot always be the case. Moreover, in order to implement a CBNRM project for those

considering a participatory phase, it is important to know what makes the process successful from the start, and how results can be measured. This compares with the participants' ex-post evaluation. Evaluation of participatory methods tends to be calculated, or both, by method or result-based variables.

Outcome-based assessment, on one hand, seeks to define performance that indicates project success. Rowe and Frewer (2004) propose that outcome-based assessments should begin with the concept of performance in the project sense, the creation of metrics and procedures to assess performance and then evaluate it. The performance metrics can be useful in measuring participation but are also subjective and vary according to stakeholder expectations. In addition, many performance factors could be considered contingent on the process that contributed to the results, and therefore, could be regarded as process-based factors themselves. Whereas control, for example, is beneficial outcome, Empowerment infers the re-balancing of power by raising awareness or education to disenfranchised stakeholder groups (Potter et al., 1999), which can and should be viewed from various viewpoints (Twyman, Dougill, Sporton and Thomas, 2001).

At the other hand, participatory process-based assessment focuses on the group participation requirements that will guarantee the performance criterion based on result. The outcome-based performance metrics allows for consideration of different stakeholder preferences and the ways they work to produce outcomes criteria of success. Kapoor (2001) asserts that while participatory processes for community engagement in CBNRM are likely to be contextually more appropriate and inclusive than traditional top-down processes, there are many factors impacting their effectiveness and the extent to which they are meaningful. These include power relations, inclusivity and definitions of community. A process-based focus that then links to the outcome-based criteria of success allows consideration of different stakeholder perceptions and the ways in which they interact to deliver outcomes. For example in a study by Webler and Tuler (2007) it was shown that while most participants agreed that good practices include inclusivity and openness, there were marked differences in opinions on information provision, leadership and power. This highlights the need to consider participant diversity and to evaluate which community engagement processes allow for different perspectives to be considered.

Rowe and Frewer (2004) say that different-scale variables often influence the mechanism, such as national political styles and government-related expectations. Chess and Purcell (1999) note that method selection such as seminars or public meetings is not as critical as fostering and managing group dynamics and clarifying the aims of the project. However, Stringer, Dougill, Fraser, Hubacek and Prell,(2006) suggest that neighborhood working groups can enable neighborhood members to take ownership of the process and work with relevant stakeholders in an iterative way.

2.8. Institutional Framework and Conservation of Mau Forest Programme

State monopoly of property ownership did not only degrade forest access right of locals but also their age-old traditional systems of forest resource management, including local knowledge and institutions. The action of local people is often governed by the apparently informal but customary or traditional rules regarding use of natural resources. And before traditional systems were displaced, they remained important actors in sustainable forest management for instance the Gada system of the Borana Oromo. Gibson et al. (2000) also argue that local institutions can help mitigate the some factors responsible for deforestation. It is becoming clear also that local institutions filter or ignore the rules of central governments when these overrun their traditional systems of resource use. Too often locals create their own new institutes or use their age-old traditional institutes and patterns of activities in natural resource utilization that diverge widely from government rules and expectations. Since these local institutions guide the daily consumption of natural resources, it is essential to recognize and keep them at the centre of new strategies designed for sustainable forest management.

In the past two decades, the role of community in environmental governance has received increasing attention from those interested in renewable natural resources such as forests, fisheries, and wildlife. This emphasis is well placed—literally hundreds of millions of households in developing countries need these resources to survive (White and Martin 2002). As the discussion on the subject has blossomed, many social scientists and scholars of sustainable development have analyzed the factors that promote or hinder the ability of community-level actors to conserve resources (Agrawal and Chhatre 2006; Andersson, 2006). Of special interest

to scholars of resource conservation has been the work on property rights theory and institutional analysis (Dietz, Ostrom and Stern, 2003; Gibson and Ostrom, 2000; Ostrom 2005).

Under the current wave of decentralization reforms, national governments in more than 60 countries are attempting to involve local communities and lower level administrative bodies in the process of resource governance. Simultaneously, the policy emphasis on community has led to the increasing salience, and sometimes discovery, of existing community-level initiatives for natural resource management outside the official sanction of the state (Nygren, 2005). The growing literature on decentralization and forests naturally leads to questions about how much decentralized governance of forests is superior to that by local-level community institutions in which state officials play a small role if any. Findings related to this question can help inform new policy initiatives on decentralized resource governance, and provide a better basis for judgments about whether ongoing decentralization efforts should promote greater involvement of central government officials in local management (Anderson et al., 2006). Governments play a key facilitating role in building forest users technological capacity and empowerment (Agrawal and Gupta 2005, Andersson 2006). The institutions have created, created rules and regulations that ensure sustainable living by accessing capital and markets (Ballabh, Balooni and Dave, 2002).

Mixed findings on the efficacy of local organizations, however. In Tanzania, for example, degraded and overused woodlands have been regenerated with implementation of laws, while in Malawi use and consumer control has been associated with both success and failure (Campbell, Shackleton and Wollenberg, 2003). Local institutions collapse has been attributed to a lack of enabling environment; unsustainable resource exploitation; heterogeneity among households; lack of legitimate local institutions and resource characteristics (Campbell et al., 2003). Kayambazinthu, Matose, Kajembe, and Nemarundwe, on the other hand, (2003) suggested that institutions focused on tradition and culture are given legitimacy at local level and are more stable and lasting.

Therefore, the effectiveness of participatory forest management (PFM) depends on local people working together to manage long-term resources using local communities as an alternative to

rigid control and enclosure (Pretty, 2003). This arrangement is consistent with Armitage et al. (2009), Lockwood (2010) and Zulu (2012)'s suggestion, which advocated multi-level institutional frameworks that transcend differences at various levels and simultaneously allow multi-level management and social learning. For the communities the development of these organizations represented a new social capital. It is argued that high rates of social capital increase and relax collective action (Gibson et al. 2005).

Accordingly, formal user groups have been reported as a key mechanism for enhancing community members' participation in forest management and thus generating more functional communities and PFM incentives (Agrawal and Gupta 2005, Zulu, 2012). Devolved management success depends on rural communities that establish and sustain local institutions through common engagement in local decision-making (Ostrom, Gardner and Walker 1994; Paudel, Monterroso, Cronkleton 2010). The Framework for Institutional Analysis and Development (IAD) was used to define and clarify the success of local forest organizations (Andersson, 2006; Ostrom et al., 1994). The IAD framework allows analysis of institutional settings in situations where people interact and follow rules (Symajgl, Leitch and Lynam, 2009).

It is good to note that special services for participatory forestry have been introduced in a growing number of countries (Wily, *2002*). Although this is merely identified as a special service, bureau or desk, within the forest department, more and more countries, such as Gambia, Ghana, Guinea Bissau, Kenya, Lesotho, Mali, Morocco, South Africa, Cameroon and Uganda, have units that are explicitly aimed at promoting participatory forestry. It is recognised that prolonged delays in implementation of CBFMs are caused by different factors such as inadequate political support, unclear attitudes and commitment among foresters (perhaps due to fear of loss of influence and authority), inadequate empowerment of VFCs, weak local institutions (many of which lack functional guidelines for role performance), misplaced decentralisation of forest management to district councils (that do not have resources or interest in CBFM), and failure to devolve accompanying funds and other resources from the centre to community institutions.

Hence, community participation is achieved primarily through CFAs, and integrated management of forests is the central principle motivating the new policy (Ongugo, Mbuvi, Maua, Koech and Othim, 2007). Arising from this new policy and law, new institutions are emerging to implement the process of involving local communities in the management of forests resource with central and local government institutions such as the Kenya Forest Service (KFS) and the county councils (CCs). In order for the local communities to enter into such co- management arrangements, they are legally expected to form and register Community Forest Associations (CFAs) within different forests distributed across the country (MENR, 2007).

These Community based organizations have assumed great importance since the new Forest Act vests management responsibility and benefits with already organized local actors. For example, the government has provided funds to CFAs for a variety of projects such as Plantation Establishment and Livelihood Improvement Schemes. Many CFAs have also benefited from other forest stakeholders such as National Museum of Kenya (NMK), Kenya Wildlife Service (KWS), NGOs and Kenya Forestry Research Institute (KEFRI) that have committed funds for various types of house hold income enhancement schemes. As a result, community members were attracted to participate in CFAs because of the increased benefits they expected to receive from their participation in forest conservation. A number of CFAs have been formed through sensitization of communities adjacent to the major forests in the country by the Kenya Forest Action Network (KFAN) and the Kenya Forests Working Group (KFWG) (Ongugo *et al*., 2007).

Lately, the Kenya Forest Service has also been spearheading the formation of CFAs as a step towards meeting the requirements of the Forest Act (2005). The CFAs rely only on membership fee and subscription by members as their main sources of funds (Kinyanjui, 2007).The national level benefits and local level benefits both are shared in the community forestry through arrangement between government and community (Carlsson and Berkes, 2005). The state owns the ownership of land and the community owns the rights of resources utilization and management. Therefore, the dynamics of community forest belongs to the relationship between government and local community through the statutory arrangement and activities of forestry organizations. The provisions of governmental laws and regulations including various directives

and community structure including cultural and normative values have a great effect on the activities of the community forests in benefits extraction and distribution.

2.9. Theoretical Framework

This research study was guided by Forest Transition theory and Practice based approach.

2.9.1. Forest Transition Theory

Forest Transition Theory originally applied two main nonexclusive pathways to explain forest transitions (Angelsen and Rudel, 2013). First, the economic development path, which follows the environmental Kuznets curve model, argues that countries go through an initial period of industrialization and economic and population growth, causing increases in deforestation. At a later stage of development, economic activities shift from agricultural and resource extraction to an economy based on service industry, agricultural intensification, higher incomes, increased environmental awareness and migration from rural to urban areas, reducing pressure on forests, and finally leading to forest resurgence. This explain forest encroachment where the local communities in Mau forest cleared forest to pave way for cultivation.

The second path described by the Forest Transition Theory is the so called 'forest scarcity path'. Here, deforestation leads to a perceived decrease in the ability of forests to provide environmental services and goods. Rising timber prices and growing demand for environmental services from society and the private sector provide incentives for policies and activities geared towards tree planting, sustainable forest management, general reforestation and regeneration of forests and conservation of remnant forest areas (Rudel, et al., 2005; Angelsen and Rudel, 2013).

After a period of high deforestation rates, when the forest area has been reduced significantly, a scarcity of forest products and/or a decline in the flow of services provided to societies by forest ecosystems prompts governments and land managers to establish effective afforestation programs. This explains how KFS, county government, NGOs and local community have come up with programmes to conserve the Mau forest. Under this perspective, proposed by Rudel et al. (2005), the forest transition can be explained due to a response by governments and private sector to a perceived scarcity of forests and their direct and indirect goods and services. The forest scarcity can also be perceived due to increases in perceived risks of landslides on

deforested slopes, and floods in downstream watersheds. With rising timber and other forest products' prices and a perception of risks related to natural disasters, investments are made by governments and landowners in tree planting and more intensive forest management.

In addition, Angelsen and Rudel (2013) segregate the forest scarcity pathway into two distinct drivers of forest transition that initiate and are addressed through different processes, the scarcity of forest products and the scarcity of forest environmental services. The former explains how the scarcity of forest products due to shrinking forest areas and rising demand for forest products due to economic growth stimulates forest conservation, sustainable and better forest management, and the establishment of plantations in order to relieve pressure on natural forests, as was observed in India (Kohlin and Parks 2001). Similarly, Foster and Rosenzweig (2003) demonstrate how this higher demand and lower supply leads to higher prices and therefore incentivizes reforestation due to market pressures. The direct involvement of governments in creating policies to incentivize reforestation has also been observed in Niger during the 1990s leading to important increases in forest area (FAO 2010).

2.9.2. The practice-based approach

Lots of scholarly studies and literature on Participatory Forest Management use systemic methods to evaluate, appreciate and explain the effectiveness and failure of these projects (Agrawal 2001; Ostrom 1999; Quinn et al. 2007; Stellmacher 2007; Wollenberg et al., 2007). The Nobel Prize laureate Elinor Ostrom was a pioneer in this area and in her book Governing the Commons (Ostrom 1990), It has been shown that community institutions that manage forest commons responsibly (and other common property resources, such as water) can be very effective (something that has been denied or ignored by scholars of common property resource management so far) calling for an effective institutional framework to support local community engagement in forest conservation activities.

Inspired by Bourdieu (1990) and drawing on more recent theories of practice (Giddens 1984; Reckwitz 2002; Schatzki et al. 2001; Shove et al., 2012), a PBA (Arts et al. 2013) needs to be implemented to clarify the (lack of) efficiency of a PFM system in a specific locality. The practice-based approach explains how various practitioners interact with trees, ecosystems,

habitats, wildlife and act on forest policies, environmental discourses, codes of conduct, or empirical perspectives, ranging from local forest managers on the ground to policy makers on a global level. It is also about the involvement of communities, NGOs, stakeholders and citizens in governance of the forest and nature. The PBA has a variety of features: First, the basic unit of study is neither the social system nor the individual person, but the intermediate 'private process' where person and structure are interwoven (Giddens 1984). Those activities are rooted deeply in local backgrounds, traditions and climates (Reckwitz 2002; Schatzki 2002). Second, to understand human behaviour, we need to look at social behaviors as a whole rather than at specific variables such as rewards, expectations, laws, desires, wealth or power (Bourdieu 1977, 1990; Shove et al. 2012). A PBA would therefore be considered 'holistic,' rather than 'reductionist' in nature (Arts et al. 2013).

Thirdly, social practices include not only how people relate to other people, but also to things, artifacts and other forms of life in their environment (Latour 2005; Schatzki 2013). A social practice can therefore be defined as ‘an ensemble of doings, sayings and things in a specific field of activity’ (Arts et al. 2013).Finally, although social practices are considered to be relatively stable, through internal logics and routines, they could – from a historical perspective – have been otherwise; hence, ‘contingency’ is an important aspect in any PBA (Behagel 2012). This implies that they can be changed through collective action.

2.10. Conceptual Framework

For this study, the conceptual framework consists of the independent variables: participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation. It also highlights the moderating variable: institutional framework and the dependent variable Mau Forest Conservation programme. PFM involves sharing responsibilities and benefits according to a well-defined and mutually agreed on set of rules and regulations. Participatory forest planning is measured using indicators like development of forest management plan, election of forest executive committees which influences the way conservation of Mau forest programme is implemented. The agreed rules and regulation are planned, implemented, maintained and monitored by the village institutions. (Ongugo et.al, 2009).

Participatory forest monitoring also influences conservation of Mau forest programme in that, when CFA engage in monitoring forest conservation activities, it would lead to improved conservation of Mau forest programme. Colfer, 2005) discusses how monitoring serves an integral role in the iterative cycle of planning, action, assessment and learning-a cycle that generates systematic progress and adaptation to change (Colfer 2005, Guijt 2007, Fisher et al. 2007).

Participatory implementation of forest management practices influence the successful implementation of Mau forest programme in that the way activities are implemented by different stakeholders would affect the project outcome. It means that people either individually or collectively are involved in identifying the problems and their causes and assessing the native scope and magnitude of interventions required to ameliorate crisis (Akpama, 2002).

Participatory evaluation conducted by stakeholders enabled them to learn from past mistake and improve in future. Therefore evaluation results must be shared for the CFAs to effectively implement conservation of Mau forest programme. By comparing what actually happened with an intervention to what would have happened without it, impact evaluations measure the intended and unintended consequences attributable to a conservation intervention (Gertler, Martinez, Premand, Rawlings and Vermeersh, 2011).

For effective conservation of Mau forest programme should be supported by legal framework, norms and values of the stakeholders. Therefore, Participatory Forest Management should be backed by institutional framework for successful conservation of Mau forest programme.

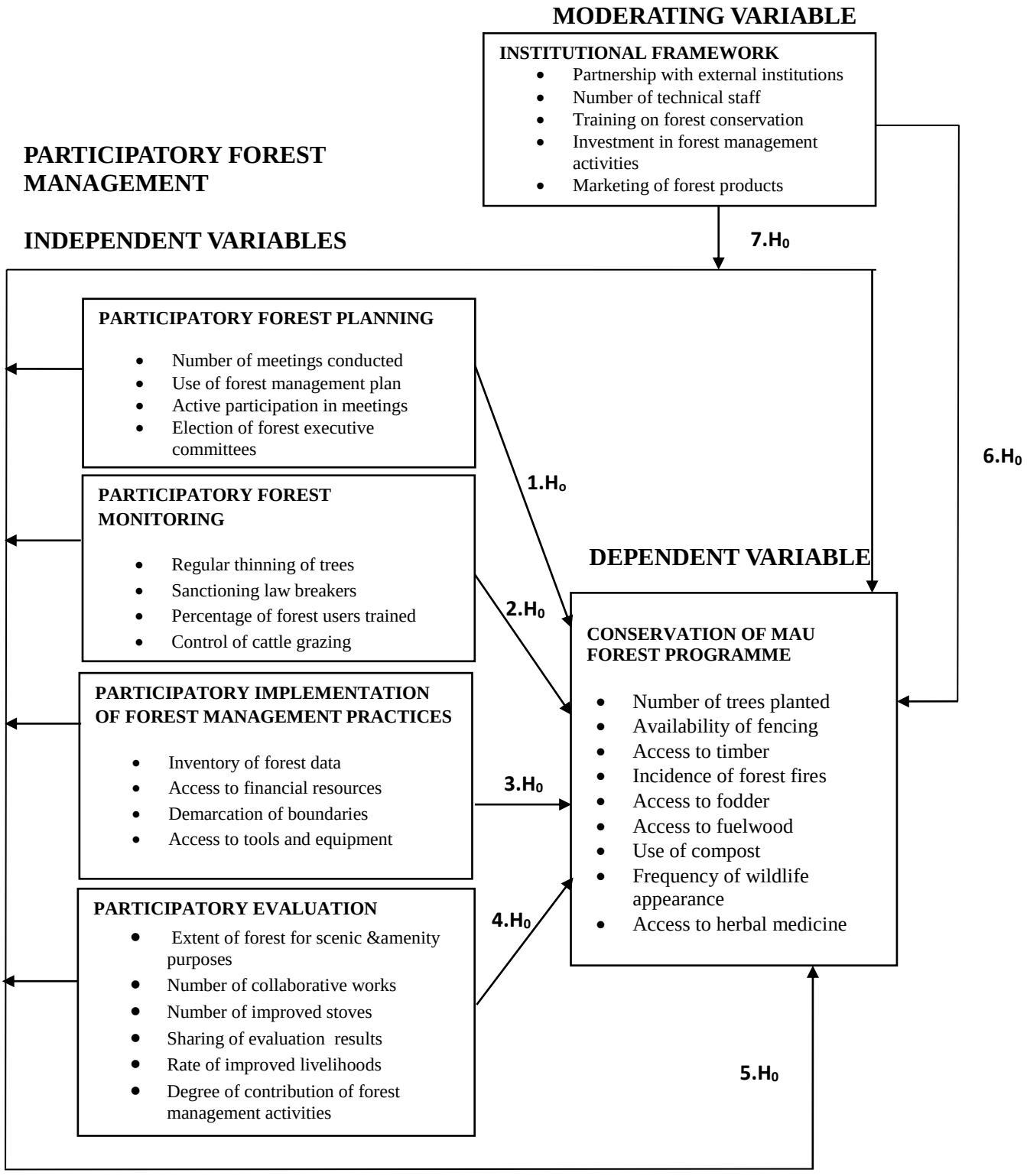

Figure 1: Conceptual Framework for Participatory Forest Management, Institutional Framework and Conservation of Mau Forest Programme

2.11. Summary of Literature Review

Forests and forest resources are currently declining substantially, thus threatening the current and future local communities' ability to meet their basic needs from the forest. Participatory Forest Management is part of a wider initiative to devolve power of management and decision making from the government to the local communities. Involvement of local communities in natural resources management is now a significant feature of national policies and practices and of internationally supported programmes throughout the world. A study carried out by UNEP (2002) on deforestation in African countries found out that weak ineffective policies, laws and regulations are seen as the main cause of deforestation. Recent analyses of a large database on forest management have found out that existence of monitoring of resource use and sanctioning of rule violations has a strong correlation with improved forest condition (Gibson, Williams et al.2005; Ostrom and Nagendra 2006; Coleman 2009), lending support to the proposition that monitoring and sanctioning, or as Gibson et al. refer to it, rule enforcement, plays a crucial role in the successful governance of CPRs such as forests.

Participation in environmental management initiatives is both value laden and complex (Conrad, Cassar, Christie and Fazey, 2011) and there are no standard methods for its measurement (ibid, 2011). While authors agree that ideal evaluation would ask the opinions of the participants in the participatory process (Blackstock et al., 2007, Reed, 2008), this is not always possible. In addition, for those planning a participatory process to initiate a CBNRM project, it is useful to know what makes the process successful from the outset, and how outcomes can be assessed. This contrasts with *ex-post* evaluation by the participants. Evaluation of participatory approaches tends to be measured through process or outcome-based factors, or both. In addition, performance of community forest conservation programmes are mostly realized when they are backed by good forest policy and legal framework that stipulates how CFAs operate while interacting with forest resources in order to ensure their sustainability.

Moreover, a well operational institutional framework in forest sector must be in place so as to monitor how forest conservation related activities are implemented as per the forest operational plans in place. Furthermore, conservation programs are enhanced when there is an adequate

financial resource that is sustainable so as to facilitate activities carried out by the groups. The funds also go a long way in incentivizing forest conservation related projects.

2.12. Knowledge gaps

A study was conducted by Charles and Kepha (2016) on Effects of Devolution on Forest Conservation and Management: A Case of Kenya Forest Service. This research adopted a descriptive approach on the effects of devolution on forest conservation and management in Kenya forest service within Nairobi County government in Kenya. The target population composed of the management staff of the Kenya Forest Service in Nairobi County. The target population was 300 staff in management. The researcher used stratified random sampling procedure to select a sample size of 90 respondents who were then issued with a structured and non-structured questionnaire. The results showed that management style, socio-economic activities as well as organizational culture have a bearing on forest conservation and management. Also County governments lagged behind in managing forest conservation and management, but the socio-economic activities play a greater part in managing forest conservation and management by the Kenya Forest Service. The current study sought to find out the influence of participatory approach by KFS and community forest user groups on conservation of Mau Forest.

A study done by Behera and Engel (2006), in India, revealed the significance of economic value of forests to successful PFM programme. A person who generates much from forests or whose livelihood greatly depends on forests has a high probability to get involved in PFM. Gibson also suggested that the likelihood to participate in PFM increases significantly as the economic benefits one could generate from PFM increases. There is need to ascertain relationship between benefits sharing and forest conservation in Mau Forest.

An examination was done by Alemayehu N. Ayana, Nathalie Vandenabeele & Bas Arts (2015): Performance of participatory forest management in Ethiopia: institutional arrangement versus local practices. The main dataset was, therefore, generated through an in-depth case study of Agama Forest Cooperative (AFC) by studying natural resource management practices and encompassed sensory participant observation, interviews, free diary, transect walks and

participation in forestry research activities. The findings indicated that despite the establishment of such a new institutional arrangement, the local forest management practices have hardly been shaped by the objectives and rules of the PFM approach. The mismatch between the PFM objectives, rules and actual practices was evidenced in a number of circumstances in the study village. There is need to study on the influence of PFM in conservation of Mau forest.

Argawal and Chhatre (2006) in their study in the northern part of India suggested that when utility, or the over-all subsistent benefit, from a common resource increases, resource users make greater efforts to protect the forest. High levels of dependence encourage greater participation in forest governance (Lise, 2000). The study should be done to establish how over-reliance on forest products influence conservation activities in Mau Forest.

A qualitative study in North-western Uganda, based on participatory rural appraisal method by Kugonza et al (2009) suggests that the attitude of people towards community forest management is influenced by education. They further recommend that the attitude of the community towards common resources can be changed by educating the community about common resource management. This study need to ascertain the extent to which change of attitude towards CFA activities influence Mau Forest conservation programme.

A study by Matta and Alavalapati (2005), based on an empirical analysis of joint forest management in India, explores variations in the perceptions of collective action by community members and factors which affect community perception. The investigation underlined the need for a shared understanding of collective action among community members for successful and sustainable joint forest management. A study should be undertaken to establish the influence of institutional framework on conservation of Mau Forest programme.

The study done Matiku et al (2012) examined the impact of participatory forest management (PFM) on the wealth of households living adjacent to Arabuko–Sokoke Forest (ASF). Between 2008 and 2009, questionnaires were used to collect data in PFM and non-PFM zones. Data on wealth parameters were collected. Data was collected up to 5 km from forest hedge along 10 km transects sampling 600 households. The results showed that in the PFM zones, community

benefits arising from PFM have translated into improved household wealth. The PFM zones have households who have higher levels of education, food reliability and better housing. The non-PFM zones showed frequencies of households that have no crop field, always have insufficient food, do not own a cow, goat or chicken and have no house or are headed by females. A similar study should be done to establish the relationship between PFM and conservation of Mau Forest.

A study was done by Dye and Stringer, et al.(2014) on Assessing participatory practices in community-based natural resource management : experiences in community engagement from southern Africa and found out that Specific engagement methods are found to be less important than the contextual and environmental factors associated with each project. An evaluation of participation by making explicit links between the community participatory process and project outcomes need to be done in Mau Forest.

Table 2.1: Knowledge gaps

Variables	Author(year)	Title of the study	Methodology	Findings	Knowledge gaps
Participatory Forest Planning	Charles and Kepha (2016)	Effects of Devolution on Forest Conservation and Management: A Case of Kenya Forest Service	Descriptive research design Stratified sampling Questionnaire	The study findings established that management styles, socio-economic activities, and organizational culture affect forest conservation and management at Kenya Forest Service in Kenya.	The study sought to establish the influence of participatory forest planning such as devolution of property rights, decision-making processes on forest conservation program
	Michael, Gilbert and Fredrick(2016)	Influence of Institutional Facilities on Adoption of Forest Innovations In Kenya	Structured interview Purposive sampling Quartile graph-based quantitative model	Institutional facilities are important because of their relationship with performance. Although the hypothesis indicated that available facilities have no influence on adoption of forest innovations ($P>\alpha$), all institutions attribute adoption of innovations to available facilities. Across institutions, ICT presents conservation initiatives with opportunities for enhancing awareness on adoption of forest innovation processes.	The study sought to determine how planning and use of forest management plan influence forest conservation programs
Participatory Forest Monitoring	Dyer,et .al.(2014)	Assessing participatory practices in community-	Case studies Semi-structured interviews	Specific engagement methods are found to be less important than the contextual and environmental factors associated with each project evaluation of	The study looked at appropriate methods used to ensure community

Variables	Author(year)	Title of the study	Methodology	Findings	Knowledge gaps
		based natural resource management: experiences in community engagement from southern Africa	Focus group discussion	participation by making explicit links between the community engagement process and project outcomes, and by identifying further criteria that can be considered in process and outcome-based evaluations.	participation in monitoring forest conservation programs.
	Solomon and Teketay(2017)	Perceptions and attitudes of local people towards participatory forest management in Tarmaber District of North Shewa Administrative Zone, Ethiopia: the case of Wof-Washa Forests	Structured questionnaire Descriptive statistics and Multiple linear regression analysis	several socio-economic variables significantly affected perceptions and attitudes of local people towards the PFM introduced and implemented in Wof-Washa Kebele. The study revealed that local people had positive attitudes towards PFM. The positive attitudes of the local people towards PFM may be connected with the perceived benefits	The study looked at ways of integrating indigenous knowledge with modern conservation approaches in monitoring of forest conservation activities
	Yemiru Tesfaye et. al.(2012)	Factors Associated with the Performance of User Groups in a Participatory Forest Management	Key informant interviews Group interviews	The findings indicate the importance of taking into account the needs of members of user groups, differences among local people in dependence on forest income, and differences in values attached to the forest in the design of participatory forest management.	The study sought to determine ways of promoting effective participation of CFA members in forest conservation programmes

Variables	Author(year)	Title of the study	Methodology	Findings	Knowledge gaps
		around Dodola Forest in the Bale Mountains, Southern Ethiopia			
Participatory Implementation of Forest Management Practices	Langat et. al.(2015)	Forest use and dependence by forest adjacent households on East Mau forest ecosystem, Kenya	Semi-structured and structured questionnaire	Findings showed that forest income is significant to households contributing up to 33% of household income. Fuel wood (firewood and charcoal) contributed up to 50%, food, 27%, construction material, 18% and grass products (fodder and thatching material) 5% of forest income. These translate to (US$) 509.0, 274.9, 186.2 and 53.4 per household per year respectively. The data authenticated that poor households are more dependent on forest resources.	The study sought to find out the influence of forest products on conservation of Mau Forest programme
	Jane Mutune, Raphael, Wahome, Mungai(2015)	Local Participation in Community Forest Associations: A Case Study of Sururu and Eburu Forests, Kenya	Purposive sampling Probit model Interview guide	The probit model was used to assess the socio-economic factors determining participation in the CFAs. The study established that gender ($P<0.05$), group membership ($P<0.0001$), ownership of tree nursery ($P<0.0001$), wealth status ($P<0.0001$), percentage share of wage income ($P<0.05$), and farm size allocated to trees ($P<0.05$) significantly influenced CFA participation. However, because of high opportunity participation costs some poor (68%) and rich (65%) households did	The study looked at the influence of community forest user groups on conservation of Mau Forest

Variables	Author(year)	Title of the study	Methodology	Findings	Knowledge gaps
				not participate in CFA activities. Since households participated in CFAs to derive livelihood gains, unclear participation benefits offered little incentive to get involved. Thus participation in CFA activities remained low. There was a strong positive relationship between CFA participation and *percentage share of forest income* before CFA establishment Gender is an important factor to consider for successful implementation of PFM in Kenya.	
Participatory Evaluation	Christoph et. al (2015)	Institutions for sustainable forest governance: Robustness, equity, and cross-level interactions in Mawlyngbna, Meghalaya, India	in-depth and focused, semi-structured interviews that were triangulated with direct observation of community meetings, participatory timeline development, periodicals, documents	Interviewees from higher levels mentioned constraints resulting from the abundant illiteracy among rural people which inhibits administrative processes. They also confirmed the suspicion of villagers that the motives of government authorities can be driven by their party's political and power interests. Respondents also identified potential benefits from increased forest related cross-level interactions. Capacities to deal with large-scale hazards such as diseases and climate change impacts could be built with help from professional organisations of other levels. Furthermore, investments such as infrastructure facilities often exceed the financial capacities of communities which would require cross-level funding.	The study sought to evaluate role of forest institutions in strengthening peoples' participation in forest conservation activities

Variables	Author(year)	Title of the study	Methodology	Findings	Knowledge gaps
	Mbuvi et al.(2015)	Determining the potential for introducing and sustaining participatory forest management: A case study of South Nandi Forest of Western Kenya	Participatory Rural appraisal Focus group discussion Respondents recall and livelihood framework analysis	Firewood was the most accessed forest products Presence of forest presented several livelihood improvement opportunities within settlement areas The community members have high interests in PFM	The study investigated the influence of Participatory evaluation on conservation of Mau Forest especially on the livelihood of the CFA members
	Alemayehu,Ayana, Nathalie and Bas (2015)	Performance of participatory forest management in Ethiopia: institutional arrangement versus local practices ,Free diaryTransect walks	Qualitative ethnographic case study Participant observation Semi-structured interview and indepth interview Key informant interview	Findings reveal that the local forest management practices have hardly been shaped by the objectives and rules of the PFM approach. The mismatch between the PFM objectives, rules and actual practices was evidenced in a number of circumstances in the study village.	The study looked at ways of empowering forest institutions and role of participatory forest management in improving performance of conservation programs
	Matiku, Mireri and Ogol (2012)	Is participatory forest management (PFM) an asset or liability to local community	Questionnaire Interviews Random sampling Chi-squire	In Arabuko-Sokoke Forest, the household livelihoods 'sustainability' aspect is largely depended on PFM resources becoming available to all households around the forest so as to ensure that forest	The current study looks at ways of implementing PFM and the performance of PFM on forest conservation.

Variables	Author(year)	Title of the study	Methodology	Findings	Knowledge gaps
		households adjacent to Arabuko Sokoke Forest, Kenya?		natural capital resource base is maintained for present and future generations. The results showed that in the PFM zones, community benefits arising from PFM have translated into improved household wealth. The PFM zones have households who have higher levels of education, food reliability and better housing. The non-PFM zones showed frequencies of households that have no crop field, always have insufficient food, do not own a cow, goat or chicken and have no house or are headed by females. The study concludes that PFM is a critical forest conservation tool that should be implemented in non-PFM zones.	
Institutional framework	Jephine et.al.(2012)	Communities, Property Rights and Forest Decentralization in Kenya: Early Lessons from Participatory Forestry Management	IFRI questionnaires used Focus groups discussions Interviews	Conflicts due to lack of clear benefits sharing mechanisms. Crafted rules for harvesting and maintenance are present. Good mechanisms of electing leaders do not depend on external financing. Rights to revenue stream from forest resources must be shared with the community	The study looked at how clear policy and legal framework in PFM implementation influences forest conservation

Variables	Author(year)	Title of the study	Methodology	Findings	Knowledge gaps
	Grundy, Campbell, White, Prabhu , Jensen and Ngamile(2004)	Participatory Forest Management in Conservation Areas: The Case of Cwebe, South Africa	Focus group discussions key informant interviews Participant observation	The importance of the Reserve in local peoples' livelihood strategies was clearly revealed but, in the absence of a functional, locally legitimate management body, the Reserve is being over-exploited, with local villagers and outsiders capitalising on low forest rents and lack of enforcement of rules. A *de facto* 'open access' system is therefore in place. Monitoring is ineffective	There is need to look at ways of ensuring Intensive institution-building for any participatory management system to be successful
	Josephine Musyoki et. al. (2016)	Factors influencing level of participation of community forest associations in management forests in Kenya	Semi structured questionnaires Participatory Rural Appraisal tools, including focused group discussions	The level of participation of CFA members in PFM activities was positively and significantly influenced by the level of perceived PFM benefits ($\chi 2$ = 38.73, P=0.05); range of farm size ($\chi 2$=12.72, P=0.05); and nature of the head-of-household ($\chi 2$ =29.99, P=0.001). As such, benefits gained from the forest play important role as incentives to community participation in PFM.	The study sought to unravel the influence of forest benefits on forest conservation programs and extent of value addition to forest products in Mau forest

CHAPTER THREE
RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the methodology used in the study. It describes the research design, research paradigm, target population, sample size and sampling procedures, research instrument, piloting testing of research instrument, validity and reliability of the research instrument, data collection procedures, data analysis techniques ,ethical consideration and operationalization of variables.

3.2. Research Paradigm

Though many paradigms exist, the paradigm that guided this study was pragmatism. Pragmatism was adopted for this study since both quantitative and qualitative aspects of Participatory Forest Management were investigated. Buchanan and Bryman (2007) argue that 'paradigm' wars among researchers have intensified due to increased epistemological diversity within business and organizational research. The choice of pragmatism paradigm in this study was informed by the ontological, epistemological, axiological and methodological underpinnings of pragmatism in retrospect of the other paradigms. Alan (2009) indicates that a researcher is guided by the ontological, epistemological, axiological and methodological orientations.

Therefore, ontologically, pragmatism offers the middle ground desired in mixed methods approach balancing between the fixed nature in the construction of reality advocated by positivism paradigm in quantitative designs and the subjective nature of reality propagated by both constructivism and emancipatory paradigms in qualitative designs. Epistemologically, pragmatism frees the researcher to selectively interact with the research. In positivism and post-positivism, the researcher distances from the research while in constructivism and emancipatory paradigms, the researcher and the research are inseparable (Alan and Emma, 2011). In this study, the researcher and the research were distanced in the quantitative aspects of the study which would have been restricted by both constructivism and emancipatory paradigms. The researcher conducted research in collection and analysis of qualitative data which would have been limited by either positivism or post-positivism paradigms.

From an axiological perspective, Johnson and Anthony (2004) argue that pragmatism is the best suited for mixed methods research approach in that the paradigm balances between quantitative research which is value free with no researcher bias and qualitative research which is potentially value laden.

The other reason that informed the researcher's choice of a given research paradigm is the research methodology. Other proponents of pragmatism such as Tashakkori and Teddlie (2010) indicate that methodologically, the paradigm balances between deductive logic used in quantitative research and inductive logic used in qualitative research. Since both deductive and inductive logic were desired in this study, pragmatism emerged as the best paradigm to guide the research methodology.

This involves using the method which appears best suited to the research problem and not getting caught up in philosophical debates about which is the best approach (Bhattacherjee, 2012). There was need to combine both positivist and interpretivism positions within the scope of a single research according to the nature of the research question. Pragmatism is outcome-oriented and aims at determining the meaning of things (Johnson and Onwuegbuzie, 2006) or focusing on the product of the research. Pragmatism is based on the belief that theories can be both contextual and generalizable by analyzing them for ‘‘transferability’’ to another situation.

3.2.1. Research Design

The research designs that were used in this study were descriptive survey design and correlational research design. The choice of these two research designs was informed by the fact that both descriptive and inferential data analysis were required in this study. Shield and Rangarjan (2013) indicate that descriptive survey is used to describe characteristics of a population or a phenomenon being studied. Creswell (2012) indicates that correlational research design is the measurement of two or more factors to determine or estimate the extent to which the values for the factors are related or change in an identifiable pattern. In this study, both the causal effects of relationships as well as the extent to which the combination of predictor variables influenced the outcome of the dependent variable was desired, then both descriptive research design and correlational research design were the most suitable for the current study.

While descriptive survey helped the researcher to describe phenomena, correlational research design helped the researcher to identify predictive relationships by using correlations and stepwise regression modelling.

According to Harwell (2011), using quantitative methods, the researcher attempts to maximize the objectivity, replicability, and generalizability of findings, and often interested in the prediction. Quantitative methodology was used in this study to complement qualitative data especially in situations in which the researcher needed precise measurement or to classify features, count them, and construct statistical models in an attempt to explain what was observed. By use of mixed mode research approach, qualitative and quantitative data analysis were carried out simultaneously in a cross-sectional manner. In research methods for business, Sekaran (2003) indicates that mixed mode approach can be classified into mixed models and mixed methods.

In this study, mixed methods approach was followed. Hence, both descriptive and inferential data analysis were carried out simultaneously in a cross-sectional integrated manner. This means that descriptive, inferential and qualitative analysis were carried out in the study as per research objective. Proponents of mixed methods approach such as Alan Bryman and Emma Bell (2011) argue that mixed methods help researchers undertake data analysis with the research freedom to make use of both descriptive and inferential data analysis techniques as advanced by pragmatism research paradigm.

3.3. Target Population

The study was conducted in the Mau forest conservancy in Bomet County, Kenya. The Mau forest provides a range of ecosystem services and supports significant population in terms of livelihood needs. The choice of the Mau forest was based on two criteria: high susceptibility to degradation and a long history of community forestry, with the highest number of CFAs of any forest in Kenya. The 35 CFAs are evenly spread across the entire Mau forest complex, each with different levels of forest cover and with high levels of biodiversity. Hence, the site provided key lessons and best practices for promotion of participatory forest management across the country. Mau Forest is also the largest closed canopy forest among the five major Water Towers in Kenya and has lost over a quarter of its forest resources in the last decade. The forest is located at 0°30’

South, 35°20’ East within the Rift Valley Province. It originally covered 452, 007 ha but, after the 2001 forest excisions, the current estimated size is about 416, 542 ha. The Mau conservancy is made up of 22 forest blocks, of which 21 are gazette forests managed by KFS. The remainder is Mau Trust Land Forest (46,278 ha), which is managed by the Narok County Council (NEMA, 2013). The Mau forest complex is the largest water catchment area in Kenya where many rivers originate such as the Nzoia, Yala, Nyando, Sondu, Mara, the first three of which are cross-boundary between Kenya-Uganda-Tanzania; Kenya-Ethiopia and Kenya-Tanzania respectfully. Since Lake Victoria, (Africa's largest lake, world’s largest tropical lake and world's second largest freshwater lake) is mainly fed by the Mau, then, the Mau Forest Complex affects the livelihoods of the over 130 million people in countries of East and Central Africa.

The Mau is the largest remaining near continuous blocks of mountain of indigenous forest in East Africa. It is classified as a Montane forest with mountain ecosystems that form life zones characterized by dense forests at moderate elevations which transit to grasslands or tundra as the altitude increases. It has moist forest vegetation types in the windward and the leeward sides of Lake Victoria respectively occurring at 2100 - 3300 m above sea level, with rainfall above 1500 mm, and dry forest vegetation occurring at 1800 - 2900 m above sea level where the annual rainfall is 700 -1350 mm (Beentje, 1994). Mau forest is a classic example of biodiversity with flora and fauna with wide genetic, species and ecosystem diversity. This unique genetic diversity includes rare and endangered animals such as the Bongo antelope, the Colobus monkey and the forest elephant making it a haven for scientists as well as tourists.

The study targeted 4100 people comprised of 50 Kenya Forest Service officers (KFS), 100 chairpersons of Community Forest Association (CFAs) committees and 3950 households living adjacent to South West Mau Forest in Bomet County. These households surrounded four administrative units (Kenya Forest Service) departments of Bomet forest station, Itare, Mara-Mara and Ndoinet (KNBS, 2013). These people were the Community Forest User groups living within a distant of one to five Kilometres from the edge of the forest. For every household, one representative who is the household head, alternate head or an adult who had been in the household for a period not less than six months was targeted.

Table 3.1: Target population

Categories	Number of Members
Kenya Forest service officers (KFS)	50
Forest executive committees of CFAs	100
Households	3950
Total	**4100**

3.4. Sample Size and Sampling Procedure.

This section describes the sample size that the researcher used, and sampling procedures that was followed in drawing up the sample size for the study.

3.4.1. Sample Size

According to Kothari (2004) sample size must be large enough to be representative of the universe population. The sample size was determined using Yamane (1967).The formula was used to calculate the sample size (n) given the population size (N) and a margin of error (e). It is a random sampling technique formula to estimate sampling size. The formula was selected as it put into consideration the population size. The study used a 95% confidence level, which leads to a significance level of 0.05.

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

Where:

n = no. of samples

N = total population

e = error margin / margin of error (0.05)

$$n = \frac{4100}{1+4100x\ (0.05^2\ )}$$

n=364

Using this formula, a sample size of 364 respondents were obtained from a target population of 4100 people.

3.4.2. Sampling Procedures

In this study, Multi-stage sampling technique was used because of the research context due to the large population. Multi-stage sampling technique helped the researcher to select respondents through three sampling stages giving respondents more reliable equal chances of being selected starting with selection of sub-locations at the first stage, followed by selection of homesteads at the second stage and finally selection of Households. Oso and Onen (2009) observe that a multi-stage sampling procedure progressively selects smaller areas until the individual members of the sample have been selected through a random procedure. In addition, Sekaran (2003) indicates that in sampling procedures, a minimum of 30% of sub-populations is essential for statistical analysis. At the first stage, 30% eight sub-locations surrounding Mau Forest in Bomet county were selected. While selecting 30%, the 9 sub-locations were arranged alphabetically and every even number was selected for study. The 3 selected sub-locations formed the research sub-populations.

In the second stage of the sampling procedure, households (research categories) were randomly selected for study from the 3 sub-locations (sub-populations). The households were selected in the field using a systematic random sampling technique. While using this technique, Kenya Forest Stations were used as the central point. Every 4th homestead to the east and west and 3rd to the north and south was sampled and in each homestead, one household head was randomly selected until 351 households were realized.

Also, Purposive sampling technique was used to select a respondent from every household who was a household head, alternate head or an adult household member who had lived in the household for more than six months because they would have interacted with other on implementation of forest conservation programmes. First, the people were listed in order to compute the probability of selection for each individual using the Le-Brick- Diop-Alemadi method - proposed for areas with larger households (Le, Brick, Diop, and Alemadi, 2013). The number of households in the selected sub-locations were obtained using the formula below and each sub-location was assigned a proportionate number of sample households.

$$\text{Sample household at sub-location} = \frac{\text{Population households at sub-location} \times 351}{\text{Total population of households in sampled study area}}$$

In addition, purposive sampling technique was also used to select the respondents from Kenya Forest Service officers and Community Forest Association (CFA) executive committees. Therefore, 4 Kenya Forest Service officers were selected and 9 executive Committees of the Community Forest Associations, who were mostly in charge of forest conservation programme were purposefully picked since they were few. The following formula was used to obtain the respective sample size as shown in Table 3.2

$$\text{Sample size} = \frac{\text{Target population} \times 364}{\text{Total population}}$$

Table 3.2: Selected Sample Size

Population strata	Target population	Sample size
Kenya Forest Service officers	50	4
Forest Executive committees	100	9
Households	3950	351
Total	**4100**	**364**

3.5. Research Instruments

A self-administered structured questionnaire was used to collect the quantitative data. The questionnaire was organized in seven sections. The first section sought to obtain background information of respondents. The second section obtained information on the dependent variable, conservation of Mau Forest programme while section three to six obtained information on the independent variables. Section seven sought information on the moderating variable, institutional framework. Questionnaires were administered to household members (CFUGs) and CFA executive committees.

Questionnaires were appropriate for this study since they collected information that was not directly observable as they inquired about feelings, motivations, attitudes, accomplishments as well as experiences of individuals (Mellenbergh, 2008). The items that were in the questionnaire were close ended and were used for parametric analysis to test the relationships under investigation in the study. Structured questionnaires are regarded the most appropriate for large populations of respondents and when the nature of the information required is detailed. The use

of this tool assumes that the respondents understand the significance of the research and can understand the items in the instrument (Donald and Delno, 2006). This was in form of Likert-scales anchored by a five point rating ranging from strongly disagree to strongly agree. Saunders (2003) stated that a questionnaire is useful in obtaining objective data because participants are not manipulated in any way by the study.

In addition, interview guide was used to collect the qualitative data. An interview guide was administered among Kenya Forest Service officers in Mau forest. The use of an open-interview strategy enables better exposure of the interviewees' personal perspectives, their deeper thoughts, emotions and ambitions (Paton, 1990). This less structured approach allowed the interviews to be much more like conversations than formal events with predetermined response categories, permitting the respondents' views to unfold, rather than the predisposition of the researcher.

3.5.1. Pilot Testing Research Instrument

Research instruments were pilot tested in Chepalungu Forest in Bomet County. According to Cooper and Schilder (2007), the pilot test should constitute 10% of the sample, therefore; the pilot test was conducted in line with his recommendation. Hence, 35 households were selected and 1 Community Forest Association executive committees responded to the questionnaires. The researcher gave them adequate time to respond to the items in the research instrument and provided clarity where necessary. In addition, 1 KFS officers were purposively selected to respond to interview guide.

3.5.2. Validity of the Research Instruments

Researchers are interested in three types of validity: content related, criterion related, and construct validity (Donald and Delno, 2006). Huber (2004) describes content-related validity as the instrument's content and format; criterion-related validity as the ratio of scores obtained using an instrument to scores obtained using one or more instruments or measures; and construct validity as the essence of the psychological concept or attribute being evaluated. A test is then said to possess validity for the construct to the degree that it conforms to expected correlations with other theoretical propositions. The validity of the content was checked to evaluate the

accuracy with which the instruments captured the variables under study. This validity method test was chosen because it was consistent with study goals and research paradigm. Expert opinion was therefore sought as to test the validity of the research instruments. This was done through the guidance of research experts from the University of Nairobi, officials of the Kenya Forest Service and committees of the Community Forest Association committees. Construct validity was also determined by examining whether a consistent significant proportion of high scores in subjects investigating independent variables would correlate positively or negatively with scores in items investigating the dependent variable. This was achieved by a review of multiple scores from various topics.

In addition, the criterion-related validity relates to evidence of a relationship between the attributes in a measuring tool and its performance on some other variable (DeVon et al., 2007). This criteria should be relevant; what is considered the right measure; freedom from bias-giving every subject an equal opportunity to score well and consistent or reproducible qualities (Kothari, 2009). So to validate this, the reliability test was done.

3.5.3. Reliability of Research Instruments

According to Nunan (1999), reliability demands that the findings of the study should be consistent, dependable and replicable. According to Zohrabi (2013) obtaining similar results in quantitative research is straightforward due to their numerical nature, but achieving identical results in qualitative research is demanding and difficult due to subjectivity and narrative form of the data. Lincoln and Guba (1985) pointed out that it's easier to think of how the data collected can be dependable and consistent. This study used a split half technique as a measure of reliability. The method was preferred since it required only one test administration (Allen and Yen, 2002).The best reliability when using split half method is achieved when the two halves are as near parallel as possible (Allen and Yen, 2002) since such halves produces almost equal means, variance and covariances (Chakrabartty, 2011). The outcome of the study is determined by the quality of research instrument (Alan and Emma, 2011).

To improve reliability, a pilot testing of research instruments was done in Chepalungu Forest in Bomet County. External reliability was addressed by making the questions straightforward and

understandable as possible, and this would decrease misunderstandings and guide direct responses to the questions. Internal reliability analysis was done using the Alpha coefficient (Cronbach's alpha, 1951). Cronbach's **α** (alpha) determines the internal consistency or average correlation of items in the instrument to gauge its reliability. The Alpha coefficient ranges from 0 to 1 and can be used to characterize the reliability of factors derived from dichotomous (such as questions with two potential responses) and/or multipoint oriented questionnaires or scales (such as rating scale: 1 = bad, 5 = excellent). Higher scores make the scale more accurate. According to Nunnaly (1978) an acceptable coefficient of reliability is a score of 0.7. The research instruments were revised where $\alpha < 0.7$, before going to acceptable levels for field work. A zero coefficient implies that the tool has no internal consistency while that of one implies complete internal consistency, so this implies that the research tools were reliable.

Hence, in the pilot test conducted, the composite Cronbach Alpha Reliability Coefficient for the research instrument was 0.7186. Since Cohen and Swerdlik (2010) and Nunnally et al. (1978) recommend a minimum acceptable reliability coefficient of 0.70, then the test instrument used in this study satisfied this criteria and was considered highly reliable and appropriate for data collection. But, Larry (2013) indicates that the limiting factor in the use of the Cronbach's (alpha) Coefficient is when the data analysis involves missing data due to reasons such as poor return of research instruments. In this study, because of the literacy nature and accessibility of the respondents, there was a minimal data loss. This was attributed to the fact that the target population from which respondents were sampled were people who appreciated the significance of the study. Reliability coefficient results are shown on table 3.3.

Table 3.3: Reliability coefficients

Variables	No of items	Reliability coefficient
Conservation of Mau forest programme	10	0.692
Participatory forest planning	10	0.712
Participatory forest monitoring	10	0.777
Participatory implementation of forest management practices	10	0.701
Participatory evaluation	10	0.698
Institutional framework	10	0.732
Composite Cronbach's (alpha) reliability coefficient		**0.7186**

3.6. Data Collection Procedures

Tashakkori and Teddlie, 2010) indicate that the type of data collected is informed by the objectives of the study. The researcher visited the Kenya Forest Service offices in Bomet County, and the local administrative offices for introduction and clearance to undertake research in the region. The researcher recruited research assistants and data quality managers who aided in distributing and collecting questionnaires. First, research assistants were trained on the contents of research instruments before proceeding to the field. The researcher requested the household heads and CFA executive committees to fill the questionnaire as honest as possible and follow up was done to check if the questionnaires were duly filled. In addition, the researcher conducted the interviews with the officers of the Kenya Forest Service. Letters expressing the desire to undertake research from the targeted KFS officers were dispatched prior to conducting the interviews and follow up was done through telephone calls to book appointment with the interviewees. During the interview process, the researcher introduced the purpose of the research and its significance in conservation of Mau Forest programme.

3.7. Data Analysis Techniques

Mixed methods data analysis techniques were employed in this study by incorporating both descriptive and inferential data analysis. Data collected was coded and entered into Statistical Packages for Social Scientists (SPSS Version 25.0) and analyzed using descriptive and inferential statistics.

3.7.1. Quantitative Data Analysis

Descriptively, non-parametric data were analyzed using absolute and relative (percentage) frequencies, central tendency and dispersion measurements (mean and standard deviation, respectively). Measures of central tendency are used when the set of data values is finite and the data is expected to cluster around some central value (Weisberg, 1992). Quantitative data were therefore presented in tables and immediately interpreted. Then data was calculated whether it had a strong or a weak central pattern based on the standard deviation from the numerical mean. Standard deviation also tests confidence for statistical results when describing the heterogeneity of a given population (Ghahramani, 2000).

3.7.2. Qualitative Data Analysis

In addition, qualitative data in this study included discourse analysis and content analysis which drew upon the analysis of conversations and written text in the context of the views expressed. Qualitative data was analyzed based on the content matter of the responses. Hence, responses with common themes or patterns were grouped together into coherent categories.

3.7.3. Inferential Analysis

For the parametric data, Pearson's Product Moment Correlation Coefficient (r) and Stepwise Regression (R2) analysis were used. In statistics, Pearson's Product Moment Correlation (r) is a measure of the linear dependence (correlation) between two variables and can give a positive or negative value of their relationship (Huber, 2004). Pearson's Product Moment Correlation Coefficient (r) was used in this study to analyze the linear relationship between the main predictor variable and the dependent variable. Hence, inferential data analysis was done using Pearson correlation coefficient, regression analysis (enter method) and multiple regression analysis (stepwise method). Therefore, for the purposes of using parametric statistics such as Pearson correlation and regression analysis, normal distribution of variables were measured. However the regression analysis equation were given for standardized and unstandardized coefficients.

To analyze the influence of the moderating variables on the relationship between the independent variable and the dependent variable, Stepwise Regression (R2) analysis was used. Larry (2013) indicates that Stepwise Regression (R2) involves mathematical modeling whereby the predictor variables are deliberately chosen without necessary being backed by theory. In addition, hypothesis testing was done using p – value approach because it aided in decision regarding the null hypothesis and also gave additional insight into the strength of the decision. The significance level of 0.05 was used since it is the level mostly used in project management and it is a universally accepted value for statistical significance. The p – value obtained was interpreted based on the alpha level or significance level. Due to Singpurwalla (2013), correlation technique is used to analyze the degree of relationship between two variables. Therefore, Pearson's Product-moment correlation coefficient was used to determine the strength and the direction of the relationship between dependent variable and the independent variables. The simplest form of

regression analysis is a univariate regression or a model with one independent variable (Singpurwalla, 2013). Univariate regression analysis was used to establish the influence of each of the independent variables on the dependent variable.

An empirical model was used to test the statistical significance of the relationship involving the independent variable. In analyzing moderating variable, multiple regression models were used to guide the study. Regression analysis was used to estimate regression coefficient and determine the prediction levels. Simple regression analysis was used to obtain the influence of the independent variables on the dependent variable. The following were regression models for testing the seven hypotheses:

Regression model one

To examine the influence of Participatory Forest Planning on conservation of Mau Forest programme, the following model was used.

$Y=\beta_0 +\beta_1 X_1 + \varepsilon$

Where;

Y = Conservation of Mau Forest programme

β_0= Constant

β_1 =Coefficients (slope)

X_1= participatory forest planning

ε = Error term

Regression model 2

To assess the influence of Participatory Forest Monitoring on Conservation of Mau Forest programme, the following model was used.

$Y=\beta_0 +\beta_2 X_2 + \varepsilon$

Where;

Y = conservation of Mau Forest programme

β_0= Constant

B_2=Coefficients (slope)

X_2= Participatory Forest Monitoring

ε = Error term

Regression model 3

To establish the influence of Participatory implementation of forest management practices on conservation of Mau Forest programme, this model was used.

$Y=\beta_0 +\beta_3 X_3 + \varepsilon$

Where;

Y = conservation of Mau Forest programme

β_0= Constant

B_3=Coefficients (slope)

X_3= Participatory implementation of forest management practices

ε = Error term

Regression model 4

To ascertain the influence of Participatory evaluation on conservation of Mau Forest programme, the following model was used.

$Y=\beta_0 +\beta_4 X_4 + \varepsilon$

Where;

Y = conservation of Mau Forest programme

β_0= Constant

B_4=Coefficients (slope)

X_4= Participatory evaluation

ε = Error term

Regression model 5

Multiple regression analysis was used to establish the relations between the combine influences of Participatory Forest Management on conservation of Mau Forest programme. Multiple regression attempts to determine whether a group of variables together predict a given dependent variable. Since there are four independent variables in this study, the multiple regression model was as follows:

$$Y=\beta_0 +\beta_1 X_1 +\beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Whereby: Y= conservation of Mau Forest programme

β_0 = Constant

$\beta 1 - \beta 4$ =Coefficients(Slope)

X1 = participatory forest planning

X2 = participatory forest monitoring

X3 = participatory implementation of forest management practices

X4 = participatory evaluation

ε = Error term

Consequently, a moderator is a variable that affects the direction and the strength of the relationship between an independent or predictor variable and a dependent criterion variable. Therefore, this variable may reduce or enhance the direction of the relationship between a predictor variable and a dependent variable, or it may change the direction of the relationship between the two variables from positive to negative. A moderator is supported if the interaction of predictor and moderator on the outcome of the dependent variable is significant. The study used a stepwise Regression (R^2) analysis to analyze the influence of moderating variable-institutional framework (z) on relationship between independent and dependent variables.

Regression model 6:

$Y=\beta_0 +\beta z +\varepsilon$

Where;

Y = conservation of Mau Forest programme

β_0= Constant

β_z = Coefficients (slope)

Z = Institutional framework

ε = Error term

Regression Model 7

To test the moderating influence of institutional framework on the relationship between Participatory Forest Management and conservation of Mau Forest programme, the following statistical model used for analysis was as follows:

$Y=\beta_0+\beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4+ \beta_{1Z}X_1Z+ \beta_{2Z}X_2Z+ \beta_{3Z}X_3Z +\beta_{4Z}X_4Z + \varepsilon$

Where:

Y is the dependent variable; conservation of Mau Forest programme

β_0 = constant

β_i is the coefficient of X_1X_i for i=1,2,3,4

X_1 = participatory forest planning

X_2 = participatory forest monitoring

X_3 = participatory implementation of forest management practices

X_4 = participatory evaluation

Z is the hypothesized moderator (institutional framework)

B_Z is the coefficient of X_i *Z the interaction term between institutional framework and each of the dependent variables for i=1, 2, 3, 4

ε is the error term.

Table 3.4: Test of Hypothesis

Hypothesis	Type of Analysis and Model	Interpretation of Results
1.There is no significant relationship between participatory forest planning and conservation of Mau Forest programme	Correlation analysis Univariate regression analysis $Y=\beta_0+\beta_1X_1+\varepsilon$	For $p < 0.05$, H_0 will be rejected; and H_A not rejected
2.There is no significant relationship between participatory forest monitoring and conservation of Mau forest programme	Correlation analysis Univariate regression analysis $Y=\beta_0+\beta_2X_2+\varepsilon$	For $p < 0.05$, H_0 will be rejected; and H_A not rejected
3.There is no significant relationship between participatory implementation of forest management practices and conservation of Mau forest programme	Correlation analysis Univariate regression analysis $Y=\beta_0+\beta_3X_3+\varepsilon$	For $p < 0.05$, H_0 will be rejected; and H_A not rejected
4.There is no significant relationship between participatory evaluation and conservation of Mau forest programme	Correlation analysis Univariate regression analysis $Y=\beta_0+\beta_4X_4+\varepsilon$	For $p < 0.05$, H_0 will be rejected; and H_A not rejected
5. There is no significant relationship between the combined influence of Participatory Forest Management and conservation of Mau forest programme	Correlation analysis Multivariate regression analysis $Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\varepsilon$	For $p < 0.05$, H_0 will be rejected; and H_A not rejected
6.There is no significant relationship between institutional framework and conservation of Mau Forest programme	Correlation analysis Multivariate regression analysis (stepwise method) $Y=\beta_0+\beta z+\varepsilon$	For $p < 0.05$, H_0 will be rejected; and H_A not rejected
7.The relationship between Participatory Forest Management and conservation of Mau Forest programme does not depend on institutional framework	$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_{1Z}X_1Z+\beta_{2Z}X_2Z+\beta_{3Z}X_3Z+\beta_{4Z}X_4Z+\varepsilon$	For $p < 0.05$, H_0 will be rejected; and H_A not rejected

3.8. Ethical Considerations

Data collection begun after obtaining a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). The researcher then sought for permission to collect data from the director Kenya Forest Service in Bomet County. Authority was also sought from the area chiefs and the assistant chiefs of the villages living adjacent to Mau Forest. Training of research assistants was also conducted before embarking on data collection process. The respondents were informed on the purpose of the study so that they could participate voluntarily in data collection and clarifications given to them where necessary. The respondents were not required to write their names on the questionnaires for privacy and confidentiality reasons. In addition, the respondents were informed that information collected would be kept confidential and used only for academic purpose. Moreover, there were no risks or harm since respondents were only required to give their views on the objectives of the study.

3.9. Operationalization of variables

The following gives an in-depth analysis of operational definition of variables that guided the research study. This is based on the research objectives, variables; indicators, measurement scale, types of analysis and tools of analysis.

Table 3.5: Operationalization of variables

The study objectives, variables, indicators for each variable, measurement scale and type of analysis done are shown in Table 3.4.

Objectives	Independent variables	Indicators	Measurement	Measurement Scale	Data Analysis Techniques	Tools of analysis
1.To examine the extent to which participatory forest planning influence Conservation of Mau Forest Programme	Participatory forest planning	• Number of meetings conducted • Use of forest management plan • Active participation in meetings • Election of forest executive committees	• Number of meetings • Level of use of management plans • Level of participation	Ordinal Ordinal Ordinal	Descriptive statistics Inferential statistics	Regression analysis Pearson's Product Moment correlation coefficient Arithmetic mean and standard deviation Frequency distribution tables, Tabulation &percentage
2.To assess the extent to which participatory forest monitoring influence Conservation of Mau Forest programme	Participatory forest monitoring	• Regular thinning of trees • Sanctioning law breakers • Percentage of forest users trained • Control of cattle grazing	• Level of thinning of trees • Type of sanctions used • Percentage of users trained • Extent of control of cattle grazing	Ordinal Nominal Ordinal Ordinal	Descriptive statistics Inferential statistics	Regression analysis Pearson's Product Moment correlation coefficient Arithmetic mean and standard deviation Frequency distribution tables, Tabulation &percentage
3.To establish the extent to which Participatory implementation of forest management practices influence Conservation of Mau Forest Programme	Participatory implementation of forest management practices	• Inventory of forest data • Availability of CFUGs records • Presence of accountability • Presence of partnership	• Availability of inventories • Presence of records • Level of accountability • Extent of partnership	Ordinal Ordinal Ordinal Ordinal	Descriptive statistics Inferential statistics	Regression analysis Pearson's Product Moment correlation coefficient Arithmetic mean and standard deviation Frequency distribution tables, Tabulation &percentage

4.To determine the extent to which Participatory evaluation influence Conservation of Mau Forest Programme	Participatory evaluation	• Extent of forest for scenic and amenity purposes • Number of collaborative works • Number of improve stoves • Sharing of evaluation results • Rate of improved livelihoods • Degree of contribution of forest management activities	• Extent of forest use for scenic purpose • Extent of collaboration • Number of stoves • Level of sharing results • Level of improved livelihoods • Extent of forest management activities	Ordinal Ordinal Ordinal Ordinal Ordinal Ordinal	Descriptive statistics Inferential statistics	Regression analysis Pearson's Product Moment correlation coefficient Arithmetic mean and standard deviation Frequency distribution tables, Tabulation &percentage
5. To establish the combined influence of Participatory Forest Management on Conservation of Mau Forest programme	**Dependent variable: Conservation of Mau Forest programme**	• Number of Trees planted • Availability of fencing • Access to timber • Incidences of Forest fires • Access to fodder • Access to fuelwood • Use of compost • Frequency of wildlife appearance • Availability of water sources	• Number of trees planted • Existence of fences • Extent of access to timber • Extent fire damages • Percentage of access to fodder • Percentage of access to fuelwood • Extent of compost used • Number of wildlife • Number of water sources	Ordinal Ordinal Ordinal Ordinal Ordinal Ordinal Ordinal Ordinal Ordinal	Descriptive statistics Inferential statistics	Regression analysis Pearson's Product Moment correlation coefficient Arithmetic mean and standard deviation Frequency distribution tables, Tabulation &percentage

6.To determine the moderating influence of institutional framework on the relationship between Participatory Forest Management and Mau Forest Conservation Programme	Institutional framework	• Partnership with external stakeholders • Number of Technical staff • Training on forest conservation • Investment in forest management activities • Marketing of forest products	• Number of partnerships • Number of staff • Level of training • Extent of investment • Percentage of products sold	Ordinal Ordinal Ordinal	Descriptive statistics Inferential statistics	Regression analysis Pearson's Product Moment correlation coefficient Arithmetic mean and standard deviation Frequency distribution tables, Tabulation &percentage

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSSION

4.1. Introduction

This chapter presents the study results which has been analyzed and discussed based on themes drawn from study objectives. The thematic areas include: Questionnaire return rate, Basic Test of statistical assumptions, Demographic information of respondents, Conservation of Mau Forest Programme, Participatory Forest Planning and conservation of Mau Forest programme, Participatory Forest Monitoring and conservation of Mau Forest programme, Participatory implementation of Forest Management Practices and conservation of Mau Forest programme, Participatory Evaluation and conservation of Mau Forest programme, Institutional Framework and conservation of Mau Forest programme, Moderating influence of institutional framework on the relationship between Participatory Forest Management and conservation of Mau Forest programme.

4.2. Questionnaire Return Rate.

Out of the 360 questionnaires issued to the respondents, only 297 were duly filled and returned. This gave a return rate of 82.5%. This was achieved since the researcher conducted a daily briefs with the respondents and research assistants. According to Nulty (2011), a response rate of 75% is adequate for data analysis for making conclusions and inferences about a population. Therefore, for this study, a response rate of 82.5% enabled the researcher to proceed in carrying out data analysis.

4.3. Background Information of the Respondents

The research sought the background information of the respondents based on their gender, age bracket, education levels, roles and length of work in conservation of Mau Forest programme. Data was sought on whether respondents were males or females. This was done to ascertain that respondents were normally distributed between the two genders because in this study, none of the gender was given preferential consideration in the selection of respondents. Respondents were therefore asked to indicate their gender .This is shown on table 4.1.

Table 4.1: Background information of the respondents

Gender	Frequency	Percent
Male	173	58.2
Female	124	41.8
Total	**297**	**100**
Respondents age bracket		
18- 20 years	24	8.1
21-30 years	62	20.9
31-40 years	77	25.9
41-50 years	102	34.3
50 years and above	32	10.8
Total	**297**	**100**
Respondents education level		
Post graduate	1	0.3
Graduate	23	7.7
Diploma	48	16.2
KCSE	104	35.0
Others	121	40.7
Total	**297**	**100**
Respondents Length of work		
1-5 years	55	18.5
6-10 years	209	70.4
11-15 years	23	7.7
16 years and above	10	3.4
Total	**297**	**100**
Respondents role		
CFA member	293	98.7.
Forest executive committee	4	1.3
Total	**297**	**100**

4.3.1. Distribution of Respondents by Gender

The findings indicated that 173(58.2%) of respondents were male and 124(41.8%) were female. This complies with the government requirement of leadership that at least 30% of either gender (GOK, 2012). Since the respondents in this study were skewed favourable in respect to gender spread, enhanced the quality of the analysis of results given that the study was guided by pragmatism research paradigm which Anthony (2004) indicates as the best suited paradigm for mixed methods research design as it incorporates multiple realities in research for instance the gender factor.

4.3.2. Distribution of Respondents by Age Group

Also, the respondents were asked to indicate their age group in years. This was done to ascertain whether respondents were normally distributed in respect to age since an individual's age was not a consideration in the selection of respondents in this study. Age groups were classified into five categories: 18-20 years, 21 – 30 years; 31 – 40 years; 41 – 50 years; 51 years and above.

The research findings indicated that 24(8.1%) of the respondents were between 18 and 20 years; 62(20.9%) were between 21 and 30 years; 77(25.9%) of the respondents were between 31 and 40 years; 102(34.3%) of the respondents were between 41 and 50 years and 32(10.8%) of the respondents were above 50 years. Since the majority of the respondents fall within 20-30 years implied that they were an active group who could participate actively and could engage in productive activities like tree planting, monitoring and caring which are aimed at conservation of Mau Forest. Moreover, these were the people whose capacities needed to be built for successful implementation of conservation projects. Age is often used as a proxy for experience and knowledge, thus is an important factor in understanding local people's attitudes towards forest management approaches (Pokharel, 2012). Older individuals are expected to have better knowledge, understanding and experience levels of traditional forest management and conservation. For example, Dolisca *et al.,* (2006) found that whilst younger individuals may participate in forest management to contribute to decision making, older individuals may participate to contribute to conservation.

4.3.3. Distribution of Respondents by Highest Level of Education

Consequently, respondent's level of education was considered important in this study in respect to responding to the research instruments as well understanding the conservation of Mau Forest programme. The level of education of the respondents was considered important in this study because they were required to fill in the questionnaire individually. The options that were provided in this item were: Post-graduate; Graduate; Diploma; KCSE, and others. The findings indicated that 1(0.3%) of the respondents had a post graduate qualification which implied that they were more knowledgeable on issues to do with forest conservation.

23(7.7%) of the respondents had a bachelor's degree and 48(16.2%) were Diploma holders, 104(35%) had KCSE certificate and 121(40.7%) had KCPE and below. Majority of the respondents had KCSE certificate and above which implied that they might not have adequate knowledge and skills to engage in a productive forest conservation efforts due to lack of adequate understanding of forest policy and implementation which does not support conservation of Mau Forest. In addition, difference in personality traits including levels of education could influence how people think, their beliefs and attitudes towards programmes undertaken.

Though many respondents with diploma and bachelors qualifications may not have personally undertaken comprehensive research projects, the level of their training allowed them to appreciate the significance of research in the society. Since 16.2% of the respondents had at least diploma level qualifications, then it was anticipated that these respondents would willingly cooperate in forest conservation activities. The findings also indicated that respondents with diploma and bachelors level qualifications had basic skills such as development of performance indicators and production of quarterly reports. Although a number of studies have shown that levels of education may influence individuals' attitudes toward forest and forest management initiatives (Shrestta and Alavalapati, 2006; Lise, 2000), the direction of influence is inconsistent.

Mehta and Heinen (2001), found that formal education had a positive and significant influence on individual's attitudes toward forest conservation in some communities, however in other communities no significant relationship between formal education and individual's attitudes toward forest conservation was observed. Shrestta and Alavalapati (2006) and Lise (2000), have argued that formal education enhances an individual's ability to obtain and understand information; hence educated individuals are more likely to identify with forest management programmes that are aimed at conservation. Furthermore, educated individuals may be more willing to participate in decision making activities as they may be better able to speak in meetings with forest extension staff than less educated individuals (Dolisca *et al.*, 2006).

4.3.4. Distribution of Respondents by Length of Work as Community Forest Users

Respondents were asked to indicate how long they had worked as members of CFAs. The duration an individual had worked in CFAs was considered important in appreciating the concept of conservation of Mau Forest programme. The results indicated that 55(18.5%) of the respondents had worked for a period of 1-5 years, 209(70.4%) had worked for 6-10 years and 23(7.7%) had worked for a period of 11-15 years. Also, 10(3.4%) of the respondents had worked for 16 years and above meaning that they possessed adequate knowledge and experience pertaining forest conservation activities. This implies that majority of the respondents had worked as members of CFA for a period of five years and above. In addition, interviews conducted indicated that many respondents had been members of CFAs and hence they understood most on the value of forests which motivated them to participate actively in forest conservation programmes.

4.3.5. Distribution of Respondents as per the Roles Played

The findings indicated that 293(98.7.2%) of the respondents were CFA members and 4(1.3%) were Forest executive committees. This means that there exist a clear framework for forest management in Mau Forest and hence a supportive leadership was in place that could channel members to engage in forest conservation activities.

4.4. Basic Test for Statistical Assumptions

Assumptions in linear regression include multicollinearity, normality, heteroscedasticity, linear relationship and no autocorrelation. In this study, multicollinearity was tested using Variance Inflation Factor and tolerance. There was no multicollinearity if Variance Inflation Factor (VIF) for the independent and dependent variable was <10 but if VIF >10, then there was a problem of multicollinearity (Cooper and Schindler, 2008). Normality of data was tested using kolmogorov-smirnov and Shapiro-wilk's test. Moreover, heteroscedasticity was done using Glejser test and linear relationship was done using scatter plot.

4.4.1. Test for Normality

Regression analysis tends to assume that data was collected from normal population (Moriya, 2008). Data which are not distributed normally may disrupt an association between independent and dependent variables (Bhattacherjee, 2012). Hence, violation of this assumption would invalidate regression analysis. In this study, Kolmogorov-Smirnov test statistic (KS-test) and Shapiro-Wilk test (SW-test) were done to ascertain if the research data was collected from a normal population. Kolmogorov-Smirnov test statistic (KS-test) determines if two datasets differ significantly without making any assumption about the distribution of data. In addition to calculating the D statistic, KS-test indicates whether the data is normal or lognormal. The test helps researchers to view the data graphically to understand how the data is distributed. Also, the KS-test quantifies a distance between the empirical distribution function of the sample and the cumulative distribution function of the reference distribution, or between the empirical distribution functions of two samples (Corder and Foreman, 2009). This study used Shapiro-Wilk W test which is based on the correlation between the data and the corresponding normal scores and provides better power. The statistic is positive and less than or equal to one. Being close to one indicates normality. The judgment followed these guidelines; W is insignificant if the variable's distribution is not different from normal. W statistics = 1 when a sample variable data is perfectly normal. When W is significantly smaller than 1, then the distribution is non-normal (Ghasemi and Zahediasl, 2012).

All the statistics in the test (W) were above 0.895. The least was 0.895 and the highest was 0.993. None of the variables had W statistics =1, therefore none was a perfect normal distribution but the scores were significantly closer to 1 which was acceptable since, perfectly normal distribution is rarely achievable. When testing whether a population is normal using SW-test, statistic, the null hypothesis is rejected if the value of W is too small (Shapiro and Wilk, 1965). In this study, all the SW-test statistics were approaching $1 > 0.05$ and hence the null hypothesis that the population was not normal is rejected. The results of Kolmogorov-Smirnov test statistic and Shapiro-Wilk test are shown in Table 4.2.

Table 4.2: Kolmogorov-Smirnov and Shapiro-Wilk Test

Variables	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Conservation of Mau Forest Program	0.101	297	0.000	0.969	297	0.000
Participatory Forest Planning	0.056	297	0.026	0.991	297	0.070
Participatory Forest Monitoring	.089	297	0.000	0.983	297	0.001
Participatory Implementation of forest management practices	0.055	297	0.033	0.993	297	0.150
Participatory evaluation	0.079	297	0.000	0.895	297	0.000
Institutional framework	0.106	297	0.000	0.967	297	0.000

a. Lilliefors Significance Correction

4.4.2. Test for Multicollenearity

Multicollenearity is used to determine the probability that independent variables-which are equal or greater than 2, in a particular multivariate regression model are highly or significantly correlated (Cooper and Schindler, 2008). If the correlations among the independent variables are strong, the standard error of the coefficient tends to increase thus leading to undesirable events. The study used Variance Inflation Factor (VIF) to measure the level of correlation among the variables. The principle that VIF which is greater than ten tends to warrant further investigation (Chatterjeet al.2000). Multicollinearity is checked by analyzing the tolerance values under collinearity to ensure that the assumption is not violated (Asteriou and Hall, 2011). In particular, $1\text{-}R^2$ values should be more than 0.1 which implies low multicollinearity (Shirley, Stanley and Daniel, 2005). If two variables are perfectly collinear, singularity is said to exist and an exact linear relationship exists between the two predictor variables with a correlation coefficient equal to 1.0 or -1.0. On the other hand, Pedace (2013) argues that multicolinearity occurs when the correlation coefficient of two predictor variables is equal to or greater than 0.7. In this study, multicollinearity was non-existent between the predictor variables.

Table 4.3: Collenearity statistics

Variables	Tolerance	VIF
Participatory forest planning	0.964	1.037
Participatory Forest monitoring	0.975	1.026
Participatory implementation of forest management practices	0.965	1.037
Participatory evaluation	0.973	1.027

Tolerance is an indicator of how much of variability of the specified independent variable is not explained by the other independent variables in the model. If this value is very small (less than 0.10), it indicates presence of high multiple correlation with other variables suggesting the possibility of multicollinearity. The tolerance values were ranging between 0.964 and 0.975 indicating absence of multicollinearity. VIF (Variance inflation factor) is just the inverse of the Tolerance value (1 divided by Tolerance). VIF values above 10 would be a concern here, indicating multicollinearity. VIF values were between 1.027 and 1.037; therefore the test shows that there were no issues of multicollinaerity in the variables.

4.4.3. Heteroscedasticity and Homoscedasticity Test

A sequence of random variables is homoscedastic if all random variables in the sequence have the same finite variance. Though the assumption of homoscedasticity simplifies mathematical modelling, Moriya (2008) argues that serious violations in homoscedasticity may result in overestimating the goodness of fit as measured by the Pearson coefficient although this does not invalidate regression results. Heteroscedasticity is the absence of homoscedasticity. A collection of random variables is heteroscedastic if there are sub-populations that have different variabilities from others. Heteroscedasticity in regression analysis can invalidate statistical tests of significance that assume that the modelling errors are uncorrelated and normally distributed and that their variances do not vary with the effects being modelled. In this study, Glejser test was conducted by regressing absolute residual value of the independent variables with the regression equation:

ut =A+BXt+Vi

If the value sig.>0.05, then there is no problem of heteroscedasticity (Glejser, 1969). All the sig. values were greater than 0.05 hence there was no problem of heteroscedasticity.

Table 4.4: Glejser test for Heteroscedasticity

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.033	2.179		.015	.988
	Participatory Forest Planning	-.029	0.035	-.048	-.822	0.412
	Participatory Forest Monitoring	0.021	0.040	0.031	0.531	0.596
	Participatory implementation of Forest Management practices	-.023	0.038	-.036	-.613	0.540
	Participatory evaluation	0.122	0.033	0.214	2.696	0.051

4.4.4. Control of Type I Error and Type II Error

In order for statistical findings to be valid, a researcher need to control Type I and Type II errors which occur due to the wrong interpretation of results during tests of various statistics. Type I error occurs when the null hypothesis is rejected when it was supposed to be accepted while Type II error occurs when the null hypothesis is accepted when it was supposed to be rejected (Larry, 2013). In this study, Type I error was minimized by using a confidence level of 95% implying that the standard variate was 1.96 and the sample proportion (p) was less than or equal to 0.05 as recommended by Larry (2013). Here, Type II error was minimized by taking a large enough sample of 364 respondents as recommended by Yamane (1967) sample size criterion.

4.4.5 Analysis of Likert-Type Data

In this study, seven of the sections in a questionnaire comprised of items in a Likert type scale format using a scale of SD – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; and SA – Strongly Agree, (Alan 2001). The items in the Likert Scale were both in affirmative and negation statements. Each of the seven sections of Likert type scale format had ten items. The items were limited to ten so as to increase the response rate. As Frauke et al. (2008) argue that when a questionnaire is too lengthy, the response rate is low and the quality of the responses is compromised. In addition, Frauke et al. (2008) propose that ten objectively constructed items for each research variable in a Likert type scale are sufficient to measure a desired construct where

mathematical modelling is involved in data analysis which necessitate the need for coalescing indicators of various variables.

Concerning equidistance of Likert-type scales and validation of inferential methods using experiments and simulations, Lantz (2013) pointed that Likert-type data are often assumed to be equidistant by applied researchers so that they can use parametric methods to analyse the data. Since the equidistance assumption is rarely tested, Lantz (2013) argues that the validity of parametric analyses of Likert-type data is often unclear and that the preferred statistical method to analyse Likert-type data depends on the nature of their non-equidistance as well as their skewness. In addition, during analysis of Likert-type data, Carifio and Rocco (2007) indicates Strongly Disagree (SD) $1 < SD < 1.8$; Disagree (D) $1.8 < D < 2.6$; Neutral (N) $2.6 < N < 3.4$; Agree (A) $3.4 < A < 4.2$; and Strongly Agree (SA) $4.2 < SA < 5.0$. This scale gives an equidistance of 0.8. These weighting criteria of responses of Likert-type data as per Carifio and Rocco (2007) were followed in data analysis during interpretation of results.

4.5. Conservation of Mau Forest Programme

The study sought to examine the influence of Participatory Forest Management on conservation of Mau Forest programme. Therefore, the respondents were requested to give the opinions on their levels of agreement or disagreement based on the statement in a likert scale of 1-5 where: 1=strongly disagree, 2=disagree, 3=Neutral, 4=Agree and 5= strongly agree. The results are presented on Table 4.5.

Table 4.5: Conservation of Mau Forest Programme

Statement	SD	D	N	A	SA	Mean	SD
	f %	f %	f %	f %	f %		
B1.You participate frequently in planting trees in Mau Forest	10 (3.4)	17 (5.7)	19 (6.4)	111 (37.4)	140 (47.1)	4.19	1.017
B2. You normally fence off forest areas	113 (38.0)	83 (27.9)	22 (7.4)	39 (13.1)	40 (13.5)	2.36	1.438
B3.You extract timber from the forest	128 (43.1)	101 (34.0)	32 (10.8)	14 (4.7)	22 (7.4)	1.99	1.183
B4. You harvest non-timber forest products from the forest	19 (6.4)	21 (7.1)	25 (8.4)	104 (35.0)	128 (43.1)	4.01	1.174
B5. You obtain a lot of compost manure from the forest	38 (12.8)	58 (19.5)	68 (22.9)	75 (25.3)	58 (19.5)	3.19	1.308
B6. You frequently encounter wildlife in the forest	17 (5.7)	41 (13.8)	32 (10.8)	97 3(2.7)	110 (37.0)	3.81	1.231
B7. There are good water sources in the forest area	20 (6.7)	17 (5.7)	24 (8.1)	87 (29.3)	149 (50.2)	4.10	1.188
B8. You protect water catchment areas in the forest	16 (5.4)	24 (8.1)	27 (9.1)	74 (24.9)	156 (52.5)	4.11	1.190
B9. You obtain fuel-wood from the forest	45 (15.2	33 (11.1)	33 (11.1)	92 (31.0)	94 (31.6)	3.53	1.42
B10. You occasionally witness forest fires	131 (44.1)	97 (32.7)	33 (11.1)	16 (5.4)	20 (6.7)	1.98	1.174
Composite Mean and Standard deviation						**3.327**	**1.2323**

Table 4.5 shows that on statement B1- You participate frequently in planting trees in Mau Forest. Out of 297 respondents who participated in the study, 111(37.4%) agreed that they participate in tree planting, 140(47.1%) strongly agreed, 17(5.7%) disagreed, 10(3.4%) strongly disagreed and 19(6.4%) of the respondents were neutral. The line item mean score of 4.19 and Standard deviation (SD) of 1.017 was higher than the composite mean and Standard deviation (SD) of 3.327 and 1.23. This implies that the line item mean influences planting trees in Mau Forest which in turn support conservation of Mau Forest programme as it led to improved regeneration of forest cover. This concurs with the findings on success of PFM projects in some countries like Nepal and India which has resulted into sustainable use of forest resources thereby witnessing the contribution of the sector to Millennium Development Goals (Fisher, Prabhu and McDougall, 2007). This was supported by qualitative data given by one of the KFS officer who said that:

"We support the CFA members to establish tree nurseries in their homes by supplying them with the tree seedlings. Also, we partner with Kenya Tea

Development Authority and James Finlay to support the CFA members." KFS officer

On statement B2- You normally fence off forest areas, out of the 297 respondents who participated in the study, 113(38.0%) strongly disagreed that they participate in fencing off forest areas in Mau forest. Also, 83(27.9%) disagreed, 39(13.1%) agreed and 40(13.5%) strongly agreed while 22(7.4%) were neutral. The line item mean score of 2.36 and SD of 1.438 was less than the composite mean of 3.37 and SD of 1.232 which implies that failure by CFA members to fence off forest areas encourages free riding of cattle to forest area leading to destruction of trees which undermine forest conservation efforts. It was also evident that some communities living adjacent to the forest encroached the forest area as there was no clear cut boundary fences.

Statement B3- You extract timber from the forest, 128(43.1%) of the respondents strongly disagreed, 101(34.0%) disagreed that they extract timber from Mau forest. 14(4.7%) agreed, 22(7.4%) strongly agreed while 32(10.8%) were neutral. With this regard, the line item mean score of 1.99 and SD of 1.183 were less than composite mean of 3.327 and SD of 1.232 implying that extraction of timber from the forest does not support conservation of Mau forest programme. Also, it could be difficult to access timber by the CFA members because of strict enforcement of laws governing timber extraction enforced by the KFS officers. The synergy to organize and protect the forest has been contributed by a local NGO sensitizing the community to be active in preventing timber poaching. The impact of this has been witnessed through retention of high value timber trees after ban on poaching.

On statement B4- You harvest non-timber forest products from the forest. Majority of the respondents, 104 (35%) agreed and 128 (43.1%) strongly agreed that they harvest NTFPs from Mau forest. But 21(7.1%) of the respondents disagreed, 19(6.4%) strongly disagreed, and 25(8.4%) Neutral. The line item mean score of 4.01 and SD of 1.174 was higher than the composite mean score of 3.327 and SD of 1.232. This implies that harvesting of NTFPs from the forest had support Conservation of Mau Forest programme because it motivated the local community to continue conserving these products such as mushrooms, honey and herbal medicine hence promoting sustainability. The findings in line with a study done by Behera and Engel (2006), in India which revealed the significance of economic value of forests to successful

PFM programme. A person who generates much from forests or whose livelihood greatly depends on forests has a high probability to get involved in PFM projects.

On statement B5- You obtain a lot of compost manure from the forest. 75(25.3%) of the respondents agreed that they obtain a lot of compost manure from Mau forest and 58(19.5%) strongly agreed but 58(19.5%) disagreed, 38(12.8%) strongly disagreed and 68(22.9%) were neutral. Since the line item of 3.19 and SD of 1.308 was greater than a composite mean score of 3.327 and SD of 1.232, implies that presence of compost manure is an indicator that there are big trees that drop their leaves and the CFA members protect the forest which promote conservation of Mau forest programme. Compost collected by the community from the forested area is normally used in their farms during planting season which in turn leads to a higher crop yields. This motivated CFA members to dedicate their time and effort in forest conservation activities.

On statement B6- You frequently encounter wildlife in the forest. 110(37%) of the respondents strongly agreed that they encounter wildlife in Mau forest. But 41(13.8%) disagreed, 17(5.7%) and 32(10.8%) were neutral. The line item mean score 3.81 and SD of 1.231 was greater than the composite mean 3.327 and SD 1.232 indicating that availability of wild animals in Mau Forest is because of the CFA's participation in wildlife protection. It was noted that the common wild animals like antelopes were present in the forest. The people had been sensitized to avoid poaching by KFS officers and they collaborated in wildlife protection.

Statement B7- There are good water sources in the forest area. 87(29.3%) of the respondents agreed that there are good water sources in Mau Forest. 149(50.2%) strongly agreed, 17(5.7%) disagreed with 20(6.7%) who strongly disagreed while 24(8.1%) were neutral. The line item mean score of 4.10 and SD of 1.188 was higher than the composite mean score and SD of 3.327 and 1.23 implying that, presence of good water sources in Mau forest is a good indicator that Mau forest is a water catchment area that should be protected at all cost.

On statement B8- You protect water catchment areas in the forest. Out of the 297 respondents, 74(24.9%) of them agreed that they participate in protecting water catchment areas. 156(52.5%) strongly agreed, 24(8.1%), disagreed, 16(5.4%) strongly disagreed while 27(9.1%) were neutral. The line item mean score of 4.11 and SD of 1.190 was greater than the composite mean score of 3.327 and SD of 1.23. This implies that members' participation in protecting water catchment areas in the forest enhances conservation of Mau forest programme.

Statement B9-You obtain fuel-wood from the forest. 92(31.0%) of the respondents agreed and 94(31.6%) strongly agreed that they obtain fuel-wood from Mau forest. But 45(15.2%) of the respondents strongly disagreed with 33(11.1%) disagreed while 33(11.1%) were neutral. The line item mean score of 3.53 and SD of 1.42 was higher than the composite mean score of 3.327 and SD of 1.232. This means that when members obtain fuel wood from the forest motivate them to contribute in forest conservation programs. This was supported by qualitative data from a KFS officer who said that:

> *"The community forest user groups obtain a lot of firewood from the forest since that is the main source of energy in most of their houses as they lack alternative sources. But, they are only allowed to collect those which have fallen off from the trees." KFS officer*

On statement B10- You occasionally witness forest fires. 131(44.1%) of the respondents strongly disagreed that they witness forest fires in Mau Forest. 97(32.7%) disagreed, 20(6.7%) strongly agreed with 16(5.4%) but 33(11.1%) of them were neutral. The line item mean score of 1.98 and SD of 1.174 was less than the composite mean score and SD of 3.327 and 1.232 implying that presence of fires in the forest do not support conservation of Mau forest as it led to the loss of trees in the long run.

4.6. Participatory Forest Planning and Conservation of Mau Forest Programme

The first objective that the study sought was to examine the extent to which participatory forest planning influence conservation of Mau Forest programme. Therefore, the respondents were requested to give the opinions on their levels of agreement or disagreement based on the

statement in a likert scale of 1-5 where: 1=strongly disagree, 2=disagree, 3=Neutral, 4=Agree and 5= strongly agree. The results are presented on table 4.6

Table 4.6: Participatory Forest Planning and Conservation of Mau Forest Programme

Statement	SD f %	D f %	N f %	A f %	SA f %	Mean	SD
C1. You hold frequent meetings to plan forest conservation activities	31 (10.4)	21 (7.1)	47 (15.8)	104 (35.0)	94 (31.6)	3.70	1.271
C2. You participate in making major decisions concerning forest conservation	36 (12.1)	54 (18.2)	44 (14.8)	103 (34.7	60 (20.2)	3.33	1.312
C3. Forest management plans and inventories guiding forest conservation exist	27 (9.1)	39 (13.1)	33 (11.1)	114 (38.4)	84 (28.3)	3.64	1.269
C4. You participate in developing forest management plans	27 (9.1)	30 (10.1)	34 (11.4)	111 (37.4)	95 (32.0)	3.73	1.261
C5. Women participate equally and can hold leadership positions	34 (11.4)	46 (15.5)	37 (12.5)	107 (36.0)	73 (24.6)	3.47	1.320
C6. Election of forest executive committees are done fairly	33 (11.1)	39 (13.1)	46 (15.5)	104 (35.0)	75 (25.3)	3.50	1.300
C7. You participate actively in the meetings while discussing on forest conservation issues	17 (5.7)	29 (9.8)	46 (15.5)	125 (42.1)	80 (26.9)	3.75	1.127
C8. Forest management plans are consistent with all legal requirements	17 (5.7)	35 (11.8)	35 (11.8)	119 (40.1)	91 (30.6)	3.78	1.169
C9. Executive(EC) committee meetings are frequently conducted	25 (8.4)	35 (11.8)	38 (12.8)	113 (38.0)	86 (29.0)	3.67	1.243
C10. Forest management plans are reviewed and updated regularly	25 (8.4)	43 (14.5)	40 (13.5)	107 (36.0)	82 (27.6)	3.60	1.262
Composite Mean and Standard deviation						**3.617**	**1.366**

Table 4.6 showed that Statement C1- You hold frequent meetings to plan forest conservation activities. Out of 297 respondents, 104(35.0%) of the agreed that they hold frequent meetings to plan forest conservation activities in Mau forest. 94(31.6%) strongly agreed while 21(7.1%) disagreed, 31(10.4%) strongly disagreed and 47(15.8%) were neutral. The line item mean of 3.70 and SD of 1.271 was higher than the composite mean score of 3.67 and SD of 1.366. This implies that when CFA members hold frequent meetings to plan on forest conservation activities, they would make decisions which support conservation of Mau forest programme.

Statement C2- You participate in making major decisions concerning forest conservation. 103(34.7%) of the respondents agreed and 60(20.2) strongly agreed, 36(12.1%) strongly disagreed with 54(18.2%) disagreed while 44(14.8%) of the respondents were Neutral, The line item mean score of 3.33 and SD of 1.312 was less than the composite mean score and SD of 3.617 and 1.366 which means that it does not support conservation of Mau Forest programme. If CFA members fail to make decisions about which activities to implement on forest conservation, then decisions may be made by other agents hence ownership of programmes are compromised. This is supported by other scholars who said that Participatory forest planning can be a complicated and delicate task. The delicate task is to make the participatory process legitimate and accepted by stakeholders, because the stakeholders may have very different expectations of a participatory process (Kangas et al., 2010; Webler and Tuler, 2001).

Statement C3- Forest management plans and inventories guiding forest conservation exist. 114(38.4%) of the respondents agreed that forest management plans and inventories guiding forest conservation exist. 84(28.3%) strongly agreed but 39(13.1%) of the respondents disagreed with 27(9.1%) who strongly disagreed and 33(11.1%) were neutral. Since the line item mean score of 3.64 and SD of 1.269 was greater than the composite mean score of 3.617 and SD 1.366 indicates that existence of forest management plans enabled CFA members to implement activities scheduled as planned which in turn promoted accountability of all stakeholders leading to effective conservation of Mau Forest programme.

On statement C4- You participate in developing forest management plan. Out of the 297 respondents who participated in the study, 111(37.4%) agreed that they participated in developing forest management plan. 95(32.0%) strongly agreed, 30(10.1%) disagreed, 27(9.1%) strongly disagreed and 37(12.5%) were neutral. The line item mean score of 3.73 and SD of 1.261 was higher than the composite mean score of 3.617 and SD of 1.366. This implied that community participation in development of forest management plan supports conservation of Mau Forest programme. This is because the issues raised in the plan include those from the community forest user groups thereby encouraging ownership of the forest conservation initiatives.

Statement C5- Women participate equally and can hold leadership positions. 107(36.0%) of the respondents agreed that women participate equally and can hold leadership positions. 73(24.6%) strongly agreed, 46(15.5%) disagreed, 34(11.4%) strongly disagreed while 37(12.5%) of them were neutral. Since the line item mean score of 3.47 and SD 1.320 was less than the composite mean score of 3.617 and SD of 1.320 implies that women do not participate actively in forest conservation programmes in Mau forest and there is inequality in leadership positions which hamper implementation of forest conservation programmes in Mau Forest. It was noted that women in leadership positions held the post of treasurer while men mostly occupied the positions of the chairpersons. This limited women's capacity to influence major decisions in CFAs. This is not in line with previous studies done which found out that women's participation in decision making has been found to significantly improve forest regeneration (Agarwal, 2007; 2010), it reduces the incidence of illegal harvesting and other unsanctioned activities (Agarwal, 2009, Agrawal *et al*. 2004), and their presence in forest user groups enhances the capacity to manage and resolve conflicts (Westerman *et al.,* 2005).

On statement C6- Elections of forest executive committees are done fairly. 104(35%) of the respondents agreed, 75(25.3%) strongly agreed, 33(11.1%) strongly disagreed, 39(13.1%) disagreed while 46(15.5%) were neutral. The line item mean score of 3.50 and a SD of 1.300 was less than the composite mean score and SD was 3.617 and 1.366 implying that lack of fairness in election of forest executive committees by CFA members do not promote conservation of Mau forest programme. This create mistrust among CFA which tend to create conflicts. Common conflicts cited was triggered by misappropriation of group funds, leadership wrangles and conflicts of interests. This was supported by qualitative data from a KFS officer at Itare forest station who said that:

> *"Election of CFA officials is done after every three years. Conflicts are witnessed at times among the group members but there are clear mechanisms are in place on how confllicts are solved. Also forest Management Plan exist and CFA members participate fully while it is being reviewed on a regular basis" KFS officer.*

Statement C6- You participate actively in the meetings while discussing on forest conservation issues. 125(42.1%) of the respondents agreed that they participate actively in the meetings.

80(26.9%) strongly agreed, 17(5.7%) strongly disagreed, 29(9.8%) disagreed and 46(15.5%) of them were neutral. The line item mean score of 3.75 and SD of 1.127 was higher than the composite mean score of 3.617 and SD of 1.366. This implies that active participation of CFUGs during the meetings enabled them make informed decisions geared towards improvement of forest conservation programmes in Mau forest. This concurs with the other findings that the extent of public participation in a decision-making situation can be defined and described using the ladder of participation (Buchy and Hoverman, 2000). The level of participation indicates to what extent the participants have the possibility to influence the participatory process and its outcomes: the higher up the ladder the participants are, the more impact their opinions will have on the final decision.

On statement C8- Forest management plans are consistent with all legal requirements. 119(40.1%) of the respondents agreed that forest management plans are consistent with all legal requirements. 91(30.6%) strongly agreed 35(11.85%) disagreed, 17(5.7%) strongly disagreed and 35(11.8%) of the respondents were neutral. The line item mean score of 3.78 and SD of 1.169 was higher than the composite mean and SD of 3.617 and 1.366. This means that forest management plans which are in consistent with all legal requirement such as the Kenya Forest Act create an enabling environment for conservation of Mau Forest programme.

Statement C9- Executive committee (EC) meetings are frequently conducted. 113(38.0%) of the respondents agreed that the EC meetings are done frequently. 86(29.0%) strongly agreed, 35(11.8%) disagreed, 5(8.4%) strongly disagreed while 38(12.8%) of the respondents were neutral. Since the line item mean score of 3.67 and SD of 1.243 was higher than the composite mean score and SD of 3.617 and 1.366 indicates that conducting executive committee meetings regularly had supported conservation of Mau forest programme because the members would share the progress of the activities regularly.

On statement C10- Forest management plans are reviewed and updated regularly. 107(36.0%) of the respondents agreed that forest management plans are reviewed and updated regularly. 82(27.6%) strongly agreed, 43(14.5%) disagreed, 25(8.4%) strongly disagreed and 40(13.5%) were neutral. The line item mean score of 3.60 and SD of 1.262 was less than the composite

mean score of 3.617 and SD of 1.366. This implies that failure to review forest management plan on a regular basis did not support conservation of Mau forest programme because plan could be adjusted to incorporate new issues that may arose during programme implementation.

4.6.1. Correlation Analysis between Participatory Forest Planning and Conservation of Mau Forest Programme

The study sought to establish the relationship between participatory forest planning and Conservation of Mau Forest programme. The results are presented on Table 4.7.

Table 4.7: Correlations Results for the influence of Participatory Forest Planning on Conservation of Mau Forest Programme

		Conservation of Mau forest Programme	Participatory Forest Planning
Mau Forest Conservation Program	Pearson Correlation	1	0.087
	Sig. (2-tailed)		0.132
	N	297	297
Participatory Forest Planning	Pearson Correlation	0.087	1
	Sig. (2-tailed)	0.132	
	N	297	297

Table 4.7 shows a correlation index between participatory forest planning and conservation of Mau Forest programme. The Pearson's Product Moment Correlation coefficients showed the value of r = 0.087 and a probability of 0.132. Shirley et al. (2005) indicates that for a weak correlation, "r" ranges from + 0.10 to + 0.29; in a moderate correlation, "r" ranges between + 0.30 and + 0.49; while in a strong correlation, "r" ranges from + 0.5 and + 1.0. The positive or negative sign points to the direction of the relationship. Since r = 0.087 in this case, then there was a weak positive linear correlation between the two variables. The p-value = 0.132 was more than 0.05 level of significance which implies that this weak relationship was not significant. This could have been influenced by the lack of commitment and negative attitude by the community forest user groups towards Mau Forest conservation programme. A qualitative study in North-western Uganda, based on participatory rural appraisal method by Kugonza et al (2009) suggests that the attitude of people towards community forest management is influenced by education.

4.6.2. Regression Analysis between Participatory Forest Planning and Conservation of Mau Forest Programme

R squared was used to show variation in conservation of Mau Forest programme which can be explained by Participatory Forest Planning. From the regression analyses the values of R, R^2, F ratio, t-values and p values were obtained. The R-value shows the strength of the relationship between the variables, R^2-(coefficient of determination) value shows the extent to which variations in independent variables explain the dependent variable, F-value shows the statistical significance of the overall model, t-values represent the significance of individual variables, Beta values show the effect of the independent variable on the dependent variable (positive or negative) and p-values represents the confidence level at 95% or 0.05 significant level.

Table 4.8: Model summary for Participatory Forest Planning and Conservation of Mau Forest Programme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.087[a]	0.008	0.004	4.49224

a. Predictors: (Constant), Participatory Forest Planning

On Table 4.8, $R^2 = 0.008$ shows how much participatory forest planning predicts conservation of Mau forest programme. Therefore, 0.8% of participatory forest planning is predicting the changes in conservation of Mau forest programme. This shows that if conservation programmes are carried out by CFA members as per the plan, objectives of PFM results in improved conservation of Mau Forest.

4.6.3. Analysis of Variance for Participatory Forest Planning and Conservation of Mau Forest programme

Analysis of variance was used to determine whether the model was a good fit for the data in determining the influence of participatory planning on Mau Forest Conservation programme. The results were shown on Table 4.9.

Table 4.9: ANOVA for Participatory Forest Planning and Conservation of Mau Forest Programme

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.925	1	45.925	2.276	0.132[b]
	Residual	5953.173	295	20.180		
	Total	5999.098	296			

The results on Table 4.9 indicates that the significance level of 0.05 which is less that the p-value, 0.132 the regression model may not have been a good fit in predicting the influence of Participatory forest planning on conservation of Mau Forest programme.

4.6.4. Coefficients for Participatory Forest Planning and Conservation of Mau Forest Programme

Table 4.10 Shows regression coefficients for the influence of Participatory Forest planning on conservation of Mau Forest programme.

Table 4.10: Coefficients of Participatory Forest Planning and Conservation of Mau Forest Programme

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	30.378	1.947		15.599	0.000
	Participatory Forest Planning	0.080	0.053	0.087	1.509	0.132

Table 4.10 shows that participatory forest planning has a positive significant influence on Mau Forest conservation programme as shown by the regression coefficient 0.08 and a p-value of 0.132. The findings indicated that when CFA members regularly meet to discuss and plan on the best ways of conducting forest conservation activities, it would successfully contribute to an improved condition of Mau Forest.

4.6.5. Testing of Hypothesis 1

The null hypothesis was that: There is no significant relationship between participatory forest planning and conservation of Mau forest programme. From the data obtained, the p-value of 0.132 is more than the significant value of 0.05.There being no sufficient evidence from the sampled data, the null hypothesis failed to be rejected and concluded that there is no significant relationship between participatory forest planning and conservation of Mau Forest programme.

4.7. Participatory Forest Monitoring and Conservation of Mau Forest Programme

The second objective that the study sought was to assess the extent to which participatory forest monitoring influence conservation of Mau Forest programme. The respondents were requested to give the opinions on their levels of agreement or disagreement based on the statement in a likert scale of 1-5 where: 1=strongly disagree, 2=disagree, 3=Neutral,4=Agree and 5= strongly agree. The results are presented on table 4.11.

Table 4.11: Participatory Forest Monitoring and Conservation of Mau Forest Programme

Statement	SD	D	N	A	SA	Mean	SD
	f %	f %	f %	f %	f %		
D1. You monitor planting and caring of trees in the forest	14 (4.7)	14 (4.7)	8 (2.7)	132 (44.4)	129 (43.4)	4.17	1.024
D2. You participate in thinning and pruning of trees in the forest	2 (0.7)	7 (2.4)	9 (3.0)	130 (43.8)	149 (50.2)	4.40	0.725
D3. You control cattle grazing in the forested areas	26 (8.8)	22 (7.4)	30 (10.1)	112 (37.7)	107 (36.0)	3.85	1.236
D4. Law breakers are normally sanctioned in Mau forest conservation programme	9 (3.0)	24 (8.1)	55 (18.5)	110 (37.0)	99 (33.3)	3.90	1.052
D5. You monitor and control forest fires and other natural disturbance in the forest	37 (12.5)	34 (11.4)	51 (17.2)	93 (31.3)	82 (27.6)	3.50	1.336
D6. Monitoring system usually update data on regular intervals	42 (14.1)	58 (19.5)	39 (13.1)	90 (30.3)	68 (22.9)	3.28	1.381
D7. You participate in monitoring protection of water sources in Mau forest	18 (6.1)	32 (10.8)	41 (13.8)	90 (30.3)	116 (39.1)	3.86	1.220
D8. Monitoring reports are publicly disclosed on a regular basis	40 (13.5)	47 (15.8)	45 (15.2)	95 (32.0)	70 (23.6)	3.36	1.354
D9. Monitoring system utilize remote sensing and other relevant technology in forest management	142 (47.8)	82 (27.6)	36 (12.1)	18 (6.1)	19 (6.4)	1.96	1.192
D10. You participate in monitoring changes in forest cover	93 (31.3)	101 (34.0)	34 (11.4)	41 (13.8)	28 (9.4)	2.36	1.305
Composite Mean and Standard deviation						**3.464**	**1.183**

Table 4.11 shows that on statement D1-You monitor planting and caring of trees in the forest. Out of the 297 respondents who participated in the study, 132(44.4%) of them agreed that they participated in planting and caring of trees in Mau forest. 129(43.4%) strongly agreed, 14(4.7%) disagreed and 14(4.7%) strongly disagreed while 8(2.7%) of them were neutral. The line item mean score of 4.17 and SD of 1.024 was higher than the composite mean score of 3.464 and SD was 1.183. This implies that monitoring planting and caring of trees by CFA members supported conservation of Mau forest programme which led to an increase in forest cover.

Statement D2-You participate in thinning and pruning of trees in the forest. 130(43.8%) of the respondents agreed that they participate in thinning and pruning of trees. 149(50.2%) strongly agreed, 7(2.4%) disagreed, 2(0.7%) strongly disagreed and 9(3.0%) were neutral. Since the line item mean score of 4.40 and SD was 0.725, it was higher than the composite mean score of 3.464 though SD was 1.183. This indicates that members' participation in thinning and pruning of trees in the forest resulted in healthy the trees planted which in turn led to success of conservation of Mau forest programme.

On statement D3-You control cattle grazing in the forested area. 112(37.7%) of the respondents agreed that they participated in the control of cattle grazing in forested areas. 107(36.0%) strongly agreed, 26(8.8%) strongly disagreed, 22(7.4%) disagreed and 30(10.1%) were neutral. The line item mean score of 3.85 and SD of 1.236 was higher than the composite mean score of 3.464 and SD of 1.183 which implies that controlling grazing of cattle within the forest area protected young trees planted and allowed natural regeneration of indigenous trees and other vegetation in the forest which supported conservation of Mau forest programme.

Statement D4- Law breakers are normally sanctioned in conservation of Mau forest. 110(37.0%) of the respondents agreed that law breakers are sanctioned. 99(33.3%) strongly agreed, 55(18.5%) were neutral, 24(8.1%) disagreed and 9(3.0%) strongly disagreed. The line item mean score of 3.90 and SD was 1.052, which was higher than the composite mean score of 3.464 and SD was 1.183. This indicated that people who violate laws and regulations governing forest conservation were punished led to the success of conservation of Mau forest programme. The findings are in line with the findings of other scholars that where resource users regularly

monitor and sanction resource use, the condition of forest resources will likely be better than where rules are not enforced (Gibson, Andersson, Ostrom and Shivakumar, 2005).

Statement D5- You monitor and control forest fires and other natural disturbance in the forest. 93(31.3%) of the respondents agreed that the monitor and control forest fires and other natural disturbance in Mau forest. 82(27.6%) strongly agreed, 51(17.2%) were neutral while 34(11.4%) disagreed and 37(12.5%) strongly disagreed. Because the line item mean score of 3.50 and a SD of 1.336 was higher than the composite mean score of 3.464 and SD of 1.183, it implies that when members monitor and control forest fires, conservation of Mau forest programme is supported since trees and other natural vegetation are saved from destruction.

On statement D6- Monitoring system usually update data on regular intervals, 90(30.3%) of the respondents agreed that monitoring system update data on regular intervals. 68(22.9%) strongly agreed, 39(13.1%) were neutral, 58(19.5%) disagreed and 42(14.1%) strongly disagreed. The line item mean score of 3.28 and SD of 1.381 was less than the composite mean score of 3.464 though SD was 1.183. This means that when CFA members failed to keep and update monitoring data on a regular basis they would lack point of reference in future project implementation which does not aid conservation of Mau forest programme. Monitoring enables CFA members to gather evidence about not only completing the initiative as planned, but also succeeding in a way that has the intended effect. In addition, examining outcomes and impacts is a crucial part of this, and it provides answers for the stakeholders' and other interested parties' demand of results and accountability (Kusek and Rist 2004).

Statement D7- You participate in monitoring protection of water sources in Mau forest. 116(39.1%) of the respondents strongly agreed that they participated in monitoring protection of water sources. 90(30.3%) agreed, 32(10.8%) disagreed, 18(6.1%) strongly disagreed while 41(13.8%) of them were neutral. The line item mean score of 3.86 and SD of 1.220 was higher than the composite mean score of 3.464 and SD of 1.183 which indicate that monitoring protection of water sources by CFA members aided conservation of Mau Forest programme since water catchment area is conserved.

On statement D8- Monitoring reports are publicly disclosed on a regular basis, 95(32.0%) of the respondents agreed that monitoring reports are publicly disclosed to CFA members. 70(23.6%) strongly agreed 47(15.8%) disagreed, 40(13.5%) strongly disagreed while 45(15.2%) were neutral. Since the line item mean score of 3.36 and SD of 1.354 was less than the composite mean score of 3.464 though SD was 1.183. Therefore, members' failure to share monitoring reports constrained stakeholders on tracking the progress of conservation activities and indicated that there could be issues of lack of accountability which led to mistrust and lack of transparency among the groups which does not support conservation of Mau forest programme.

In one hand, Statement D9-Monitoring system utilize remote sensing and other relevant technology in forest management. 142(47.8%) of the respondents strongly disagreed that monitoring system utilize remote sensing and other relevant technology in forest management. 82(27.6%) disagreed, 18(6.1%) agreed, 19(6.4%) strongly agreed while 36(12.1%) of the respondents were neutral. The line item mean score 1.96 and SD of 1.192 was less than the composite mean score and SD was 3.464 and 1.183. Thus, failure to incorporate use of technology in forest management had led to inefficiency of CFA members which slow down programme implementation in conservation of Mau forest programme.

On the other hand, Statement D10- You participate in monitoring changes in forest cover. 101(34.0%) of the respondents disagreed that they participated in monitoring changes in forest cover. 93(31.3%) strongly disagreed, 41(13.85) agreed, 28(9.4%) strongly agreed and 34(11.4%) of the respondents were neutral. The line item mean score of 2.36 and SD of 1.305 was less than the composite mean of 3.464 though SD was 1.183. This means that CFA members' failure to engage in monitoring forest cover change do not support conservation efforts in Mau forest as members would not notice if there is any progress or not. The results were supported by the qualitative data form the KFS officers interviewed at Mara Mara Forest station who said that:

> "*Monitoring forest conservation programmes need adequate human resource and there is a big challenge since Kenya Forest rangers are few and could not patrol the entire forest. KFS should employ more scouts from the community to aid in monitoring activities" KFS officer*

4.7.1. Correlation Analysis between Participatory Forest Monitoring and Conservation of Mau Forest Programme

The study sought to establish the correlations between participatory forest monitoring and conservation of Mau Forest programme and the results are presented on Table 4.12.

Table 4.12: Correlation results between Participatory Forest Monitoring and Conservation of Mau Forest Programme

Variables		Conservation of Mau Forest Programme	Participatory Forest Monitoring
Conservation of Mau Forest Programme	Pearson Correlation	1	-.021
	Sig. (2-tailed)		0.721
	N	297	297
Participatory Forest Monitoring	Pearson Correlation	-.021	1
	Sig. (2-tailed)	0.721	
	N	297	297

Table 4.12 shows a correlation index between participatory forest monitoring and conservation of Mau Forest programme of r = -0.021 and a probability of 0.721. The Pearson's Product Moment Correlation coefficients showed the value of r = -0.021. Shirley et al. (2005) indicates that for a weak correlation, "r" ranges from + 0.10 to + 0.29; in a moderate correlation, "r" ranges between + 0.30 and + 0.49; while in a strong correlation, "r" ranges from + 0.5 and + 1.0. The positive or negative sign points to the direction of the relationship. It can therefore be argued that for r < 0.1, there was a weak negative linear correlation between the two variables under investigation. Since r = -0.021 in this case, then there was a weak negative correlation between Participatory forest monitoring and Conservation of Mau Forest programme. The p-value of 0.721 was found to be more than 0.05 level of significance which implies that this weak relationship was not significant. This weak relationship could have been contributed by other factors which were not under investigation since the respondents indicated that they carried out monitoring though were not conversant with what to monitor in the forest. Monitoring is judged against outputs, activities and inputs which have been planned or agreed. Monitoring means observing, and collecting information, and reflecting on what has been observed .Since they did not sanction law breakers it contradicted the findings of other scholars who said that when

sanctions are strictly enforced, they prevent free-riding and instill a sense of trust, which motivates more active participation (Ghate and Nagendra 2005).

4.7.2. Regression Analysis between Participatory Forest Monitoring and Conservation of Mau Forest Programme

R squared was used to show variation in conservation of Mau Forest programme which can be explained by Participatory Forest Monitoring and the results are presented on Table 4.13.

Table 4.13: Model summary for Participatory Forest Monitoring and Conservation of Mau Forest Programme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.021[a]	0.000	-.003	4.50856

a. Predictors: (Constant), Participatory Forest Monitoring

$R^{2=}$ 0.000 shows how much participatory forest monitoring predicts Conservation of Mau Forest programme. The finding shows that participatory forest monitoring in conservation of Mau forest programme still remains a challenge since close to 0.1% of monitoring predicts variation on conservation of Mau forest programme.

4.7.3. Analysis of Variance for Participatory Forest monitoring and Conservation of Mau Forest Programme

Analysis of variance was used to determine whether the model was a good fit for the data in determining the influence of participatory forest monitoring on Conservation of Mau Forest programme. The results were presented on Table 4.14.

Table 4.14: ANOVA for Participatory Forest Monitoring and Conservation of Mau Forest Programme

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.593	1	2.593	.128	.721[b]
	Residual	5996.505	295	20.327		
	Total	5999.098	296			

b. Predictors: (Constant), Participatory Forest Monitoring

Table 4.14. Shows that the significance level 0.05 was less than the p-value 0.721. This implies that regression model was not a good fit in predicting the influence of participatory forest monitoring on conservation of Mau forest programme.

4.7.4. Coefficients of Participatory Forest Monitoring and Conservation of Mau Forest Programme

Table 4.15 Shows regression coefficients for the influence of Participatory Forest monitoring on conservation of Mau Forest programme.

Table 4.15: Coefficients of Participatory Forest Monitoring and conservation of Mau Forest Programme

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	34.054	2.156		15.795	0.000
	Participatory Forest Monitoring	-0.022	0.062	-0.021	-0.357	0.721

Table 4.15 shows that participatory forest monitoring had an inverse influence on conservation of Mau forest programme as shown by the regression coefficient -0.022 and a p-value 0.721. The findings indicate when CFA members conduct regular participatory forest monitoring of forest conservation activities lead to an improvement of conservation programmes in Mau Forest.

4.7.5. Testing of Hypothesis 2

The null hypothesis was that: There is no significant relationship between participatory forest monitoring and conservation of Mau Forest programme. The p-value was 0.721 is more than 0.05 level of significance which implies that due to insufficient evidence form the sampled data, the null hypothesis failed to be rejected and it was concluded that there was no significant relationship between participatory forest monitoring and conservation of Mau forest programme. Furthermore, Gibson et al. (2005) and Ostrom (1990) suggested that high levels of social capital and collective action arrangements could sustain regular monitoring of rule enforcement needed for long-term sustainability.

4.8. Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

The third objective that the study sought was to establish the extent to which participatory implementation of forest management practices influence conservation of Mau Forest programme. Therefore, the respondents were requested to give the opinions on their levels of agreement or disagreement based on the statement in a likert scale of 1-5 where:1=strongly disagree,2=disagree,3=Neutral,4=Agree and 5= strongly agree. The results are presented on table 4.16

Table 4.16: Participatory Implementation of Forest Management Practices and conservation of Mau Forest Programme

Statement	SD	D	N	A	SA	Mean	SD
	f %	f %	f %	f %	f %		
E1. You participate in conducting a comprehensive natural inventories of forest data	59 (19.9)	73 (24.6)	46 (15.5)	79 (26.6)	40 (13.5)	2.89	1.356
E2. You are aware of rights and duties in accordance to the law and regulations in forest management	15 (5.1)	23 (7.7)	32 (10.8)	118 (39.7)	109 (36.7)	3.95	1.114
E3. You access necessary tools and equipment used in forest conservation activities	63 (21.2)	102 (34.3)	44 (14.8)	64 (21.5)	24 (8.1)	2.61	1.258
E4. Government and forest managers regularly inform you about forest conservation issues and activities	33 (11.1)	50 (16.8)	39 (13.1)	103 (34.7)	72 (24.2)	3.44	1.319
E5. Forest managers have adequate range of expertise on forest conservation	31 (10.4)	59 (19.9)	43 (14.5)	93 (31.3)	71 (23.9)	3.38	1.321
E6. You access adequate financial resources to aid in implementation of forest conservation programme	69 (23.2)	87 (29.3)	42 (14.1)	64 (21.5)	35 (11.8)	2.69	1.350
E7. You access extension services or technical support related to forest management	64 (21.5)	90 (30.3)	42 (14.1)	67 (22.6)	34 (11.4)	2.72	1.333
E8. There is effective mechanism for promoting two-way communication about forest management between communities, government and forest managers	37 (12.5)	58 (19.5)	33 (11.1)	103 (34.7)	66 (22.2)	3.35	1.347
E9. You engage in partnership with other willing stakeholders in forest conservation	31 (10.4)	34 (11.4)	29 (9.8)	102 (34.3)	101 (34.0)	3.70	1.323
E10. You participate in demarcating boundaries of forest areas	75 (25.3)	89 (30.0)	37 (12.5)	66 (22.2)	30 (10.1)	2.62	1.341
Composite Mean and Standard deviation						**3.135**	**1.306**

Table 4.16 shows that Statement E1- You participate in conducting a comprehensive natural inventories of forest data. 73(24.6%) of the respondents disagreed that they participate in conducting natural inventories of forest data. 59(19.9%) strongly disagreed, 79(26.6%), 40(13.5%) strongly agreed while 46(15.5%) were neutral. The line item mean score of 2.89 and SD of 1.356 was less than the composite mean score of 3.135 and 1.306. This indicates that failure to conduct a comprehensive natural inventories of forest data such as the number of trees planted hinders conservation of Mau forest programme because CFA members lack appropriate records for future reference pertaining implementation of conservation activities.

On statement E2-You are aware of rights and duties in accordance to the law and regulations in forest management. 118(39.7%) of the respondents agreed, 109(36.7%) strongly agreed, 32(10.8%) were neutral, 23(7.7%) disagreed and 15(5.1%) strongly disagreed. The line item mean score of 3.95 and SD of 1.114 was higher than the composite mean of 3.135 though SD was 1.306 indicating that CFA members' awareness of their rights and duties while participating on PFM programmes led to successful implementation of conservation of Mau forest. This enabled CFA members dedicate their time and energy to plant, care and protect trees

Statement E3- You access necessary tools and equipment used in forest conservation activities. 102(34.3%) of the respondents disagreed that they accessed necessary tools and equipment. 63(21.2%) strongly disagreed, 64(21.5%) agreed, 24(8.1%) strongly agreed and 44(14.8%) of the respondents were neutral. The line item mean score of 2.61 and SD of 1.258 was less than the composite mean score of 3.135 and SD of 1.306 indicating that lack of tools and equipment hinder implementation of forest conservation activities as the members would not access wheelbarrow, hoes and polythene tubes used in tree nurseries.

On statement E4- Government and forest managers regularly inform you about forest conservation issues and activities. 103(34.7%) of the respondents agreed, 72(24.2%) strongly agreed, 33(11.1%) strongly disagreed and 50(16.8%) disagreed but 39(13.1%) of the respondents were neutral. The line item mean score of 3.44 and SD of 1.319 was higher than the composite mean score of 3.135 and SD of 1.306. This implies that regular sharing of information on issues touching on forest conservation practices by the KFS officers and other stakeholders acted as

empowering CFA members to act appropriately implement conservation of Mau forest programme.

Statement E5-Forest managers have adequate range of expertise on forest conservation. 93(31.3%) of the respondents agreed that forest managers have adequate range of expertise on forest conservation. 71(23.9%) strongly agreed, 43(14.5%) were neutral, 59(19.9%) disagreed and 31(10.4%) strongly disagreed. The line item mean score of 3.38 and SD of 1.321 was higher than the composite mean of 3.135 and SD of 1.306. This indicates that forest executive committees and KFS officers have adequate knowledge and experience to guide CFA members on best practices for instance, issues to do with tree nursery development, caring of trees and harvesting of NTFPs will promote forest conservation programme in Mau forest.

Statement E6-You access adequate financial resources to aid in implementation of forest conservation programme. 87(29.3%) of the respondents disagreed, 69(23.2%) strongly disagreed, 42(14.1%) were neutral while 64(21.5%) agreed and 35(11.8%) strongly agreed that they access adequate financial resources which aided them in purchasing tools and equipment and even tree seedlings. The line item mean score of 2.69 and SD of 1.350 was less than the composite mean score of 3.135 and SD of 1.306. This means that lack of adequate financial resources demotivate CFA members and finally hindering their participatory processes. Conservation is costly, requiring investments in time and money. For example, forest guards must be paid and equipped, and new trees must be seeded, nursed, and planted, at a cost of time and money. But Fund resources are used for local construction, schooling, health services, micro-credit (Pokharel et al., 2004; Pokharel, 2008). Effective performance of local institutions is often hindered by high transaction costs and poor funding (Zulu, 2012).

Statement E7-You access extension services or technical support related to forest management. 90(30.3% of the respondents disagreed that they accessed extension services or technical support related to forest management. 64(21.5%) strongly disagreed, 67(22.6%) of the respondents agreed, 34(11.4%) strongly agreed while 42(14.1%) were neutral. The line item mean score of 2.72 and SD of 1.333 was less than the composite mean score of 3.135 and SD of 1.306. This implies that lack of extension services or capacity building hinder performance of CFA members

as they would lack necessary guidance which does not support conservation of Mau forest programme. This concurs with Anyanwu (2002) who stressed the need for community education programmes, stating that, the principle of community participation is deeply inherent in the very nature of community education.

On statement E8-There is effective mechanism for promoting two-way communication about forest management between communities, government and forest managers. 103(34.7%) of the respondents agreed, 66(22.2%) strongly agreed, 33(11.1%) of them were neutral, 58(19.5%) disagreed and 37(12.5%) strongly disagreed. The line item mean score of 3.35 and SD of 1.347 was higher than the composite mean of 3.135 and SD of 1.306; implying that existence of effective mechanisms for promoting two-way communication led to building of trust among members hence minimizing frequent conflicts and promoted cohesion and team work among CFA members which support conservation of Mau forest programme.

Statement E9- You engage in partnership with other willing stakeholders in forest conservation. 102(34.3%) of the respondents agreed that they partner with other willing stakeholders. 101(34.0%) strongly agreed, 34(11.4%) disagreed, 31(10.4%) strongly disagreed and 29(9.8%) of the respondents were neutral. The line item mean score of 3.70 and SD of 1.323 was higher than the composite mean score of 3.135 and SD of 1.306 implying participation of willing stakeholders like NGOs promoted conservation of Mau forest as they empowered CFA members by providing training and other incentive like financial resources. This was supported by the qualitative information from a KFS officer who said that:

> *"We partner with other willing stakeholders to conserve Mau forest like Kenya Wildlife Service, James Finlay, Kenya Tea Development Authority, Water Resource Users Association, public administration and county government of Bomet" KFS officer*

Lastly on statement E10-You participate inn demarcating boundaries of forest areas, 89(30.0%) of the respondents disagreed, 75(25.3%) strongly disagreed, 37(12.5%) were neutral, 66(22.2%) agreed and 30(10.1%) of the respondents strongly agreed. The line item mean score of 2.62 and SD of 1.341 was less than the composite mean score of 3.135 and SD of 1.306 implying that

failure to demarcate boundaries of forest area tends to attract encroachment of communities to the forest and free entrance of livestock which does not support conservation of Mau forest programme. The results mirrors that of Degefa (2010), Gibson et al. (2005) and Kellert et al. (2000), who indicated that defining boundaries of both the resource and users, reduced uncertainty on who will benefit and bear the cost of management, as well as ensure sustainable utilization of the resources.

4.8.1. Correlation between Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

The study sought to establish the correlations between participatory implementation of Forest management practices and conservation of Mau Forest programme and the results presented on Table 4.17.

Table 4.17: Correlation results between Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

		Conservation of Mau Forest Programme	Participatory Implementation of Forest Management Practices
Conservation of Mau Forest Programme	Pearson Correlation	1	0.003
	Sig. (2-tailed)		0.959
	n	297	297
Participatory Implementation of forest management practices	Pearson Correlation	0.003	1
	Sig. (2-tailed)	0.959	
	n	297	297

Table 4.17 shows a correlation index between participatory implementation of forest management practices and conservation of Mau Forest programme of r = 0.003 and a probability of 0.959. The Pearson's Product Moment Correlation coefficients showed the value of r = 0.003. Shirley et al. (2005) indicates that for a weak correlation, "r" ranges from + 0.10 to + 0.29; in a moderate correlation, "r" ranges between + 0.30 and + 0.49; while in a strong correlation, "r" ranges from + 0.5 and + 1.0. The positive or negative sign points to the direction of the

relationship. It can therefore be argued that for r < 0.1, there was a weak positive linear correlation between the two variables under investigation.

The p-value of 0.959 was more than 0.05 level of significance, implying that this weak relationship was not significant. This weak relationship could have been contributed by the fact that majority of the respondents were not participating effectively in implementation of forest management practices meant for conservation of Mau Forest. This was supported by qualitative data from KFS officers interviewed at Itare forest station and Mara Mara forest station who concurred that:

> "*CFA members as forest user-groups need to be trained on group management, governance and empowerment. Moreover, there is financial challenge since many households engaged in forest conservation lack adequate tools and resources aiding in forest conservation programme." KFS officer*

4.8.2. Regression Analysis between Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

R squared was used to show variation in Mau Forest conservation programme which can be explained by Participatory implementation of Forest management practices. The results were shown on Table 4.18.

Table 4.18: Model summary for Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.003[a]	0.000	-.003	4.50952

a. Predictors: (Constant), Participatory Implementation of forest Management practices

$R^{2=}$ 0.000 shows how much participatory implementation of forest management practices predicts conservation of Mau Forest. This means that 0.1% of participatory implementation of forest management practices explains variations in conservation of Mau forest programme. Most CFA members said they were not participating appropriately in carrying out activities meant for conservation of Mau Forest.

4.8.3. ANOVA for Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

Analysis of variance was used to determine whether the model was a good fit for the data in determining the influence of participatory implementation of forest management practices on Mau Forest Conservation programme. The results were shown on Table 4.19.

Table 4.19: ANOVA for Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.054	1	0.054	0.003	0.959[b]
	Residual	5999.044	295	20.336		
	Total	5999.098	296			

b. Predictors: (Constant), Participatory Implementation of forest management practices

Table 4.19 Shows that the significance level 0.05 was less than the p-value 0.959. This implies that regression model was not a good fit in predicting the influence of participatory implementation of forest management practices on conservation of Mau forest programme.

4.8.4. Coefficients of Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

Table 4.20 Shows regression coefficients for the influence of Participatory implementation of forest management practices on conservation of Mau Forest programme

Table 4.20: Coefficients for Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	33.196	1.836		18.081	0.000
	Participatory implementation of forest management practices	0.003	0.058	0.003	0.051	0.959

Table 4.20 shows that participatory implementation of forest management practices has a significant positive influence on conservation of Mau Forest Programme as shown by the regression coefficient 0.003 and a p-value 0.959. The findings indicate that an improvement in conducting participatory implementation of forest management practices leads to an improved conservation of Mau forest.

4.8.5. Testing of Hypothesis 3

The null hypothesis was that: There is no significant difference between participatory implementation of forest management practices and conservation of Mau Forest Programme.

The p-value was 0.959 which is more than 0.05.Due to insufficient evidence from the sampled data, null hypothesis failed to be rejected and concluded that there was no significant relationship between participatory implementation of forest management practices and conservation of Mau Forest programme.

4.9. Participatory Evaluation and Conservation of Mau Forest Programme

The fourth objective that the study sought was to determine the extent to which participatory evaluation influence conservation of Mau Forest Programme. Therefore, the respondents were requested to give the opinions on their levels of agreement or disagreement based on the statement in a likert scale of 1-5 where: 1=strongly disagree,2=disagree,3=Neutral,4=Agree and 5= strongly agree. The results are presented on table 4.21.

Table 4.21: Participatory Evaluation and Conservation of Mau Forest Programme

Statement	SD f %	D f %	N f %	A f %	SA f %	Mean	SD
F1. There are beautiful sceneries in Mau Forest meant for promotion of social amenities	11 (3.7)	24 (8.1)	26 (8.8)	127 (42.8)	109 (36.7)	4.01	1.056
F2. There is a good collaboration among members in forest conservation activities in Mau Forest	22 (7.4)	33 (11.1)	32 (10.8)	108 (36.4)	102 (34.3)	3.79	1.234
F3. You use improved stoves while cooking in your houses	96 (32.3)	94 (31.6)	28 (9.4)	60 (20.2)	19 (6.4)	2.37	1.293
F4. You share evaluation results about forest conservation practices	19 (6.4)	29 (9.8)	30 (10.1)	113 (38.0)	106 (35.7)	3.87	1.188
F5. The livelihood of the people has improved greatly as a result of forest conservation programme in Mau Forest	29 (9.8)	33 (11.1)	46 (15.5)	111 (37.4)	78 (26.3)	3.59	1.257
F6. You have adequate capacity to participate in forest conservation activities	98 (33.0)	57 (19.2)	42 (14.1)	37 (12.5)	63 (21.2)	3.31	1.333
F7. Household income generation are contributed by forest conservation activities in Mau Forest	29 (9.8)	46 (15.5)	39 (13.1)	96 (32.3)	87 (29.3)	3.56	1.317
F8. Forest conservation activities has led to investment in local community infrastructure and development	26 (8.8)	29 (9.8)	40 (13.5)	104 (35.0)	98 (33.0)	3.74	1.257
F9. There is improved security, support and cohesion as a result of building Community Forest Associations	38 (12.8)	20 (6.7)	35 (11.8)	127 (42.8)	77 (25.9)	3.62	1.288
F10. Due to conservation efforts, people are accessing a lot of forest products	28 (9.4)	45 (15.2)	17 (5.7)	104 (35.0)	103 (34.7)	3.70	1.333
Composite Mean and Standard deviation						**3.556**	**1.256**

Table 4.21 showed that on Statement F1- There are beautiful sceneries in Mau forest meant for promotion of social amenities. Out of 297 respondents who participated in the study, 109(36.7%) strongly agreed that there are beautiful sceneries in Mau forest meant for promotion of social amenities. 127(42.8%) agreed, 26(8.8%) were neutral, 24(8.1%) of the respondents disagreed

and 11(3.7%) strongly disagreed. The line item mean score of 4.01 and SD of 1.056 was greater than the composite mean score of 3.556 and SD of 1.256, implying that presence of beautiful sceneries like huge trees and waterfalls acted as good tourist attraction sites in Mau forest which supported conservation of Mau forest programme. This was supported by qualitative data from KFS officer interviewed who said that:

> "*There are beautiful sceneries in Mau forest which need to be harnessed for ecotourism. These include presence of giant trees, waterfalls along River Mara Mara, good swamps, fishing camps and rock outcrops." KFS officer*

Statement F2-There is a good collaboration among members in forest conservation activities in Mau forest. 108(36.4%) of the respondents agreed that there is a good collaboration, 102(34.3%) strongly agreed, 32(10.8%) were neutral, 33(11.1%) of the respondents disagreed and 22(7.4%) strongly disagreed. The line item mean score of 3.79 and SD of 1.234 was higher than the composite mean score of 3.556 and SD of 1.256 indicating that existence of good collaboration among the members led to reduction of conflicts as CFA members worked cohesively which promote effective conservation of Mau forest programme.

Statement F3-You use improved stoves while cooking in your houses. 96(32.3%) of the respondents strongly disagreed that they used improved stoves in their houses. 94(31.6%) disagreed, 60(20.2%) agreed and 19(6.4%) strongly agreed but 28(9.4%) were neutral. The line item mean score of 2.37 and SD of 1.293was less than the composite mean score of 3.556 and SD of 1.256. This means that failure by CFA members to use improve stoves in their homes encouraged encroachment of the community to the forest area to extract firewood thus destroying the trees which hinder effective conservation of Mau forest programme.

On statement F4-You share evaluation results about forest conservation practices. 113(38.0%) of respondents agreed that they share evaluation results. 106(35.7%) strongly agreed, 30(10.1%) were neutral, 29(9.8%) disagreed and 19(6.4%) of them strongly disagreed. Since the line item mean score of 3.87 and SD of 1.188 was higher than the composite mean score of 3.556 and SD of 1.256 implies that sharing of evaluation results about forest conservation practices enabled

members to learn from past experiences and improve in future undertakings while implementing conservation of Mau forest programmes.

On statement F5-The livelihood of the people has improved greatly as a result of forest conservation programme in Mau forest. 111(37.4%) of the respondents agreed that the livelihood of the people has improved. 78(26.3%) strongly agreed, 46(15.5%) were neutral, 33(11.1%) disagreed and 29(9.8%) strongly disagreed. The line item mean score of 3.59 and SD of 1.257 was greater than the composite mean score of 3.556 and SD of 1.256 which implies that the wellbeing of CFA members has improved due to their participation in forest conservation activities. The funds obtained from the sale of NTFPs and establishment of community based organizations are channeled to improve their standards of living at home. This motivated them to participate further in forest conservation programmes. The findings are in line with those of other scholars that, individuals who depend on forest for their income source and livelihood often have positive perceptions of forest management approaches that allow resource harvesting and utilization (Lise, 2000; McFarlane and Boxall, 2000).

Statement F6-You have adequate capacity to participate in forest conservation activities. 98(33.0%) of the respondents strongly disagreed that they have adequate capacity to participate in forest conservation activities. 57(19.2%) disagreed, 63(21.2%) strongly agreed, 37(12.5%) agreed and 42(14.1%) of the respondents were neutral. The line item mean score of 3.31 and SD of 1.333 was less than the composite mean score of 3.556 and SD of 1.256. This implies that CFA members face a lot of challenges during implementation of forest conservation activities as they need capacity building to offer skills to CFA members on project implementation through provision of financial incentives and training.

On statement F7- Household income generation are contributed by forest conservation activities in Mau forest. 96(32.3%) of the respondents agreed that household income generation are contributed by forest conservation activities in Mau forest. 87(29.3%) strongly agreed, 39(13.1%) of the respondents were neutral while 46(15.5%) disagreed and 29(9.8%) of them strongly disagreed. The line item mean score of 3.56 and SD of 1.317 was greater than the composite mean of 3.556 and SD 1.256, implying lot of products were obtained by the

community from the forest including NTFPs such as honey, fodder and herbs which they could sell for income and this positively motivate them to conserve the forest. This confirms a study by Matta and Alavalapati (2005), based on an empirical analysis of joint forest management in India, and explores variations in the perceptions of collective action by community members and factors which affect community perception. A meta-analysis of 51 case studies from 17 developing countries, conducted by Vedeld et al. (2007), revealed that the income from forest products especially fuel wood, wild food and fodder represented a mean of 22% of the total income in the population sampled. Similarly, Babulo et al. (2009), after sampling 360 rural households in 12 villages in northern Ethiopia, found that income from forest products occupied the second largest share of the mean total household income after crop income. This concur with the findings of Coulibaly-Lingani, Svadogo, Tigabu, and Oden (2011) who opines that majority of those participating in forest management programs in Burkina Faso were those receiving direct benefits from Participating in such programs. Also, Degeti and Yemshaw (2003) pointed that the level of benefits that people in Oromia region derived from the forest was directly related to their level of participation in forest management for instance benefitting from forest products like fodder for their livestock.

Statement F8- Forest conservation activities has led to investment in local community infrastructure and development. 104(35.0%) of the respondents agreed and 98(33.0%) strongly agreed that forest conservation activities has led to investment in local community infrastructure and development. 40(13.5%) were neutral, 29(9.8%) of the respondents disagreed and 26(8.8%) strongly disagreed. The line item mean score of 3.74 and SD of 1.257 was higher than the composite mean of 3.556 and SD of 1.256 which indicate that the community has benefited a lot from forest conservation activities since it has led to investment in local community infrastructure and development such as improvement of road networks and building of neighbouring schools. The findings are in line with those of Matiku et al (2011) who found that households in PFM zones are more aware of the significance of the forest to their livelihoods. They also re-invest incomes from nature-based businesses into household quality enhancement. Furthermore, households from PFM zones pointed out that butterfly farming, honey harvesting and mushroom farming had helped them generate income which they use in paying school fees, food and to cultivate their farms for food production.

Consequently, statement F9-Thre is improved security, support and cohesion as a result of building community forest associations. 127(42.8%) of the respondents agreed, 77(25.9%) strongly agreed, 38(12.8%) strongly disagreed, 20(6.7%) disagreed and 35(11.8%) of the respondents were neutral. The line item mean score of 3.62 and SD of 1.288 was higher than the composite mean score of 3.556 and SD of 1.256. This implies that improved security, support and cohesion among CFA members has created a supportive environment which could promote efficient participatory process. This concur with a study by Webler and Tuler (2007) which indicated that while most participants agreed that good practices include inclusivity and openness, there were marked differences in opinions on information provision, leadership and power. This highlights the need to consider participant diversity and to evaluate which community engagement processes allow for different perspectives to be considered.

On statement F10-Due to conservation efforts, people are accessing a lot of forest products. 104(35.0%) of the respondents agreed that due to conservation efforts, people are accessing a lot of forest products. 103(34.7%) strongly agreed, 45(15.2%) disagreed, 28(9.4%) strongly disagreed and 17(5.7%) were neutral. The line item mean score of 3.70 and SD of 1.33 was higher than the composite mean score of 3.556 and SD of 1.256. This means that people were accessing a lot of forest products due to conservation efforts in Mau Forest for instance fodder, mushrooms and herbal medicine which support conservation of Mau forest hence promoting sustainability. Concerning level of economic benefit from forest, findings concur with previous studies, (Behera and Engel, 2006; Argawal and Chhatre 2006 and Gebremdhin 2008) who found that a higher level of economic benefits from forests encourage the community to participate in the management of forest resources. Concurrently, the result of this study shows that as level of economic benefit increase, the probability of households of being high level participant rises. Therefore, households deriving more benefits from Mau forest participate more in forest conservation activities.

4.9.1. Correlation Analysis between Participatory Evaluation and Conservation of Mau Forest programme

The study sought to establish the correlations between participatory evaluation and conservation of Mau forest programme and the results presented on Table 4.22.

Table 4.22: Correlation results between participatory evaluation and Mau Conservation of Mau Forest programme

Variables		Conservation of Mau forest programme	Participatory evaluation
Conservation of Mau forest programme	Pearson Correlation	1	-0.048
	Sig. (2-tailed)		0.413
	n	297	297
Participatory evaluation	Pearson Correlation	-0.048	1
	Sig. (2-tailed)	0.413	
	n	297	297

Table 4.22 shows a correlation index between participatory evaluation and conservation of Mau forest programme. The Pearson's Product Moment Correlation coefficients showed the value of r = -0.048 and a probability of 0.413. Shirley et al. (2005) indicates that for a weak correlation, "r" ranges from + 0.10 to + 0.29; in a moderate correlation, "r" ranges between + 0.30 and + 0.49; while in a strong correlation, "r" ranges from + 0.5 and + 1.0. The positive or negative sign points to the direction of the relationship. It can therefore be argued that for $r < 0.1$, there was a weak negative linear correlation between the two variables under investigation, since r = -0.048. The p-value of 0.413 was found to be more than 0.05 level of significance which implies that this weak relationship was not significant. Furthermore, the findings is supported by qualitative data from KFS officers interviewed who said that:

> *"The community user-groups obtained a lot of forest products form Mau Forest which has led to improved livelihood of the people. In addition, the products obtained from the forest include fuel-wood, honey, fodder and herbal medicine. Moreover, the roads linkage has been improved in the area and schools surrounding forest area normally receive support from donors." KFS officer*

Therefore, effective forest resource management as advanced in PFM require balancing benefit entitlements and responsibilities of managing forest resources. Hence an increased level of perceive benefits would generally lead to a higher level of participation among CFA members.

4.9.2. Regression Analysis between Participatory Evaluation and Conservation of Mau Forest Programme

R squared was used to show variation in conservation of Mau Forest programme which can be explained by Participatory evaluation. The results were shown on Table 4.23.

Table 4.23: Model summary for Participatory Evaluation and Conservation of Mau Forest Programme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.048[a]	0.002	-0.001	4.50441

a. Predictors: (Constant), Participatory evaluation

$R^{2=}$ 0.002 shows how much participatory evaluation predicts conservation of Mau Forest. 0.2% is predicting hence most stakeholders indicate that they were no participating effectively in carrying out evaluation process meant for improved conservation of Mau Forest. But the Standard error is 4.504 which is lower than 5% which indicate that if stakeholders conduct evaluation practices on programme implementation, there would be improvement on conservation of Mau Forest programme.

4.9.3. Analysis of Variance between Participatory Evaluation and Conservation of Mau Forest Programme

Analysis of variance was used to determine whether the model was a good fit for the data in determining the influence of participatory evaluation on Conservation of Mau forest programme. The results are as shown on Table 4.24.

Table 4.24: ANOVA for Participatory Evaluation and Conservation of Mau Forest Programme

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.645	1	13.645	0.672	0.413[b]
	Residual	5985.453	295	20.290		
	Total	5999.098	296			

b. Predictors: (Constant), Participatory evaluation

Table 4.24 Shows that the significance level 0.05 was less than the p-value 0.413. This implies that regression model was not a good fit in predicting the influence of participatory evaluation on conservation of Mau forest programme.

4.9.4. Coefficients of Participatory Evaluation and Conservation of Mau Forest Programme

Table 4.25 Shows regression coefficients for the influence of Participatory evaluation on conservation of Mau Forest programme.

Table 4.25: Coefficients for Participatory Evaluation and Conservation of Mau forest Programme

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	34.780	1.836		18.947	0.000
	Participatory evaluation	-0.042	0.051	-0.048	-0.820	0.413

Table 4.25 shows that participatory evaluation has a negative significant influence on conservation of Mau forest programme as shown by the regression coefficient -0.042 and a p-value 0.413. The findings indicate that an improvement in conducting participatory evaluation by the Kenya Forest Service and Community Forest Association members leads to effective conservation programmes in Mau Forest.

4.9.5. Testing of Hypothesis 4

There is no significant relationship between participatory evaluation and Mau Forest conservation programme. The p-value was 0.413 which is more than 0.05. Therefore, due to insufficient evidence from the sampled data, null hypothesis failed to be rejected and concluded that there is no significant relationship between participatory evaluation and conservation of Mau Forest programme.

4.10. Joint influence of Participatory Forest Management on Conservation of Mau Forest programme

The fifth objective that the study sought was to establish the joint influence of participatory forest management on Mau Forest conservation programme. The results are presented on table 4.26.

4.10.1. Regression Analysis between Participatory Forest Management and Conservation of Mau forest Programme

R squared was used to show variation in Mau Forest conservation programme which can be explained by the joint influence of Participatory Forest Management. The results were shown on Table 4.26.

Table 4.26: Model summary for joint influence Participatory Forest Management and conservation of Mau Forest programme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.109[a]	0.012	-0.002	4.50566

a. Predictors: (Constant), participatory evaluation, participatory implementation of forest management practices, participatory forest monitoring, participatory forest planning

R-squared was used to show variation in the dependent variable (Mau Forest conservation program) which could be explained by the dependent variables: participatory Forest planning, Participatory Forest Monitoring, Participatory implementation of forest management practices and Participatory evaluation. In the study, the R square was 0.012 which implies that independent variables could explain1.2% of conservation of Mau forest programme. When PFM programmes are implemented well, there would be improvement in conservation of Mau forest programme.

4.10.2. Analysis of Variance for Joint Influence of Participatory Forest Management and Conservation of Mau Forest Programme

Analysis of variance was used to determine whether the model was a good fit for the data in determining the joint influence of participatory forest management on Conservation of Mau Forest programme. The results were shown on Table 4.27.

Table 4.27: ANOVA for Join Influence Participatory Forest Management on Conservation of Mau Forest Programme

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	71.213	4	17.803	0.877	0.478[b]
	Residual	5927.884	292	20.301		
	Total	5999.098	296			

b. Predictors: (Constant), Participatory evaluation,, Participatory implementation of forest conservation practices, Participatory forest monitoring, Participatory forest planning

Table 4.27 Shows that the significance level 0.05 was less than the p-value 0.478. This implies that regression model was not a good fit in predicting the influence of independent variables (Participatory evaluation, Participatory implementation of forest conservation practices, Participatory forest monitoring, Participatory forest planning) on conservation of Mau forest programme.

4.10.3. Coefficient for Joint Influence of Participatory Forest Management and Conservation of Mau Forest Programme

Table 4.28 Shows regression coefficients for the joint influence of Participatory Forest Management on conservation of Mau Forest programme.

Table 4.28: Coefficient for Joint Influence of Participatory Forest Management on Conservation of Mau Forest Programme

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	32.794	3.398		9.650	0.000
	Participatory Forest Planning	0.090	0.055	0.098	1.651	0.100
	Participatory forest monitoring	-0.023	0.063	-0.022	-0.374	0.708
	Participatory implementation of forest management practices	-0.002	0.059	-0.002	-0.039	0.969
	Participatory evaluation	-0.053	0.052	-0.060	-1.018	0.309

The regression equation was:

$Y=32.794+0.90X_1+-0.023X_2+-0.002X_3+-0.053X_4$

Table 4.28 shows that participatory forest planning has a positive relationship with conservation of Mau forest programme as shown by regression coefficient of 0.90, (p-value= 0.100). In one hand, participatory forest monitoring has a negative relationship with conservation programme as shown by regression coefficient of -0.023, (p-value =0.708). On the other hand, participatory implementation of forest management practices has a negative relationship with conservation of Mau forest programme as shown by regression coefficient of -0.002, (p-value=0.969). Finally, Participatory evaluation has a negative relationship with conservation of Mau forest programme as shown by regression coefficient of -0.053, (p-value=0.309).

4.10.4. Testing of Hypothesis 5

The null hypothesis was that: There is no significant relationship between the combined influence of Participatory Forest Management and conservation of Mau Forest programme. The p-value was found to be 0.522 which is more than 0.05. Due to insufficient evidence from the sampled data, null hypothesis failed to be rejected and concluded that there is no significant relationship between the combined influence of Participatory Forest Management and conservation of Mau Forest programme.

4.11. Institutional framework and Conservation of Mau Forest Programme

The sixth objective was to establish the moderating influence of institutional framework on the relationship between participatory forest management and Mau forest conservation programme. Therefore, the respondents were requested to give the opinions on their levels of agreement or disagreement based on the statement in a likert scale of 1-5 where: 1=strongly disagree, 2=disagree, 3=Neutral, 4=Agree and 5= strongly agree. The results are presented on table 4.29.

Table 4.29: Institutional framework and conservation of Mau Forest Programme

Statement	SD f %	D f %	N f %	A f %	SA f %	Mean	SD
G1. Partnership with external institutions exist for effective conservation of Mau Forest	25 (8.4)	12 (4.0)	28 (9.4)	119 (40.1)	113 (38.0)	3.95	1.182
G2. There are a good number of trained staff aiding in implementation of forest conservation activities	94 (31.6)	113 (38.0)	23 (7.7)	49 (16.5)	18 (6.1)	2.27	1.237
G3. Adequate budget and staff are allocated for conservation activities in Mau Forest	82 (27.6)	134 (45.1)	22 (7.4)	52 (17.5)	7 (2.4)	2.22	1.104
G4. There is a ready market for forest products obtained from Mau Forest	20 (6.7)	31 (10.4)	26 (8.8)	121 (40.7)	99 (33.3)	3.84	1.192
G5. Equity is ensured while sharing forest benefits	27 (9.1)	30 (10.1)	30 (10.1)	127 (42.8)	83 (27.9)	3.70	1.233
G6. Forest products undergo value addition before marketing	93 (31.3)	129 (43.4)	23 (7.7)	45 (15.2)	7 (2.4)	2.14	1.093
G7. Effective mechanisms are in place for transparent engagement and conflict resolution	19 (6.4)	21 (7.1)	27 (9.1)	119 (40.1)	111 (37.4)	3.95	1.151
G8. There is a well-defined and assigned clear property rights over forest resources to users	25 (8.4)	31 (10.4)	21 (7.1)	116 (39.1)	104 (35.0)	3.82	1.252
G9. Stakeholders clearly understand what activities are allowed and not allowed within Mau Forest area	27 (9.1)	37 (12.5)	26 (8.8)	106 (35.7)	101 (34.0)	3.73	1.295
G10. Regular training is done to promote effective conservation activities in Mau Forest	96 (32.3)	122 (41.1)	31 (10.4)	33 (11.1)	15 (5.1)	2.15	1.143
Composite Mean and Standard deviation						**3.177**	**1.188**

Table 4.29 shows on statement G1- Partnership with external institutions exist for effective conservation of Mau forest. Out of 297 respondents who participated in the study, 119(40.1%) of the respondents agreed that partnership with external institution exist for effective conservation of Mau forest. 113(38.0%) strongly agreed, 28(9.4%) of the respondents were neutral, 25(8.4%) strongly disagreed and 12(4.0%) disagreed. The line item mean score of 3.95 and SD of 1.182 was higher than the composite mean score of 3.177 and SD of 1.188. This implies that partnership with institutions like KTDA, James Finlay, and County government gave CFA members necessary support to carry out activities for conservation of Mau forest programme for

instance financial incentives and guidance. The success of participatory forest management (PFM) relies on the collaboration of local people for long-term resource management using local groups as alternative to strict regulation and enclosure (Pretty, 2003). This was supported by qualitative data obtained from an interview with KFS officers who said that:

> *"There exists a clear institutional framework aiding Mau Forest conservation programme since there are laws and regulation governing the operations of the CFAs. In addition, technical support is provided by the Kenya Forest Service in conjunction with other partners like KTDA and James Finlay who normally supply CFA members with tree seedlings."*

Hence, to realize better forest conservation and enhanced contribution to community livelihoods, a joint management partnership will facilitate participation of multiple stakeholders. Tacconi et al. (2006) referred to it as under right circumstances which entails democratic decentralization which improve efficiency, equity, democracy and resource management. It is prudent to involve all stakeholders in a whole project cycle-in defining activities to be executed, program implementation and monitoring and evaluation process.

Statement G2-There are a good number of trained staff aiding in implementation of forest conservation activities. 113(38.0%) of the respondents disagreed, 94(31.6%) strongly disagreed, 49((16.5%) of them agreed, 18(6.1%) strongly agreed and 23(7.7%) were neutral. The line item mean score of 2.27 and SD of 1.237 was less than the composite mean score of 3.177 and SD of 1.188. This implies that inadequate number of trained staff would not enabled CFA members to receive extension services on the best ways of implementing conservation programmes successfully. The findings contradict those of Faham, Rezvanfar and Shamekhi, (2008) in their study in Iran who discovered a strong positive and significant correlation between extension education course and participation. The model of placing a locally-trained extension officer into the community provides an important two-way link between communities and the program as well allowing learning. Stringer et al. (2012) also identified this approach as good practice in their assessment of projects in Malawi and Zambia. Here, local volunteers working alongside government extension staff were trained in managing and diversifying income sources through

natural resource management thereby identifying issues at an early stage and reducing negative impacts.

On statement G3- Adequate budget and staff are allocated for conservation activities in Mau forest. 134(45.1%) of the respondents disagreed and 82(27.6%) strongly disagreed that adequate budget and staff are allocated for conservation activities in Mau forest. 22(7.4%) of the respondents were neutral, 52(17.5%) agreed with 7(2.4%) who strongly agreed. The line item mean score of 2.22 and SD of 1.104 was less than the composite mean score of 3.177 and SD of 1.188 which implies that inadequate budget allocation constraints acquisition of resources needed to run PFM programmes successfully as this will hinder CFA members from purchasing the necessary tools and equipment used in implementing conservation programmes.

Statement G4- There is a ready market for forest products obtained from the Mau forest. 121(40.7%) of the respondents agreed and 99(33.3%) strongly agreed that a ready market exist for forest products. 26(8.8%) of them were neutral, 31(10.4%) disagreed and 20(6.7%) strongly disagreed. The line item mean score of 3.84 and SD of 1.192 was higher than the composite mean score of 3.177 and SD of 1.188 indicating that availability of ready market for forest products supports conservation of Mau forest programme because CFA members could sell them and obtain funds which is channeled back to conserve the forest. Also, the funds obtained is used to improve the livelihoods of the community thus motivating members to engage further in conservation activities. This is in line with the findings of other scholars that governments have a key facilitative role in building technical capacity and empowerment of forest users (Agrawal and Gupta 2005, Andersson 2006). The institutions developed, devise rules and regulations that ensure sustainable livelihoods through access to resources and markets (Ballabh et al. 2002).

On statement G5- Equity is ensured while sharing of forest benefits. 127(42.8%) of the respondents agreed and 83(27.9%) strongly agreed that equity in ensured while sharing of forest benefits. 30(10.1%) disagreed, 20(6.7%) strongly disagreed and 26(8.8%) of them were neutral. The line item mean score of 3.70 and SD of 1.233 was higher than the composite mean score of 3.177 and SD of 1.188. This indicates that equity in sharing of forest benefits by the CFA

members promoted cohesion and reduced frequent conflicts which motivated the CFA members to dedicate their efforts further to forest conservation.

Statement G6-Forest products undergo value addition before marketing, 129(43.4%) of the respondents disagreed and 93(31.3%) strongly disagreed that forest products undergo value addition before marketing. 23(7.7%) of them were neutral while 45(15.2%) agreed and 7(2.4%) strongly agreed. The line item mean score of 2.14 and SD of 1.093was higher than the composite mean of 3.177 and SD of 1.188, indicating that members were not capable of improving the quality of products obtained from the forest like honey which force them to sell raw fetching low prices. This in turn will no support conservation of Mau forest programme because it demotivate people to participate effectively. A variety of NTFPs should be developed in Mau Forest to avoid relying on a single product. Also there is need to increase their value through organic or forest certification and niche marketing. Furthermore, income sources like eco-tourism and other environmental service payments should be established so that agricultural land users do not outcompete forest land use as witnessed among communities living adjacent to forest (Wood, 2007). This was evident in the local community living adjacent to Itare and Ndoinet forest stations.

On statement G7-Effective mechanisms are in place for transparent engagement and conflict resolution. 119(40.1%) of the respondents agreed and 111(37.4%) strongly agreed that effective mechanisms are in place for transparent engagement and conflict resolution. 27(9.1%) of the respondents were neutral, 21(7.1%) disagreed and 19(6.4%) strongly disagreed. The line item mean score of 3.95 and SD of 1.151 was higher than the composite mean score of 3.177 and SD of 1.188 indicating that there was cohesion among the groups which promoted forest conservation programmes. Creation of formal user groups has been reported to be a key mechanism in enhancing participation of community members in forest management and therefore, generate more functional communities and PFM incentives (Agrawal and Gupta 2005, Zulu, 2012). Community participation is achieved primarily through CFAs, and integrated management of forests is the central principle motivating the new policy (Ongugo, *et al*., 2007). On the other hand, Kayambazinthu et al. (2003) indicated that institutions that are based on tradition and culture are given legitimacy at local level and are more stable and lasting.

Statement G8-There is a well-defined and assigned clear property rights over forest resources to users. 116(39.1%) of the respondents agreed, 104(35.0%) strongly agreed, 21(7.1%) of the respondents were neutral, 31(10.4%) disagreed and 25(8.4%) strongly disagreed. The line item mean score of 3.82 and SD of 1.252 was higher than the composite mean score of 3.177 and SD of 1.188, implying presence of clear property rights created provide a legal framework to CFA members to effectively participate in implementing PFM programmes in Mau Forest. Decentralization of natural resource management requires the devolution of both responsibilities and power (Agrawal and Ribot, 1999). Furthermore, communities should have powers to access, utilize and benefit from the resource equitably (Cronkleton *et al.*, 2012).

On statement G9- Stakeholders clearly understand what activities are allowed and not allowed within Mau forest area. 106(35.7%) of the respondents agreed, 101(34.0%) strongly agreed, 26(8.8%) were neutral while 37(12.5%) of the respondents disagreed and 27(9.1%) strongly disagreed. The line item mean score of 3.73 and SD of 1.295 was higher than the composite mean score of 3.177 and SD of 1.188. This implies that knowledge of stakeholders about activities allowed to be conducted within forest areas would lead to protection of trees and clear harvesting of products because CFA members would shun from illegal practices which could undermine the success of conservation initiatives. Key stakeholders need to optimize their potential as per the formal and informal mandate. Hence KFS should need to create awareness on the forest policy opportunities, PFM guidelines provisions for CFA members to enhance their capacity.

Statement G10-Regular training is done to promote effective conservation activities in Mau forest. 122(41.1%) of the respondents disagreed and 96(32.3%) strongly disagreed, 31(10.4%) were neutral while 33(11.1%) of the respondents agreed and 15(5.1%) of them strongly agreed. The line item mean score of 2.15 and SD of 1.143 was less than the composite mean score of 3.177 and SD of 1.188 which implies that failure to conduct regular training among CFA members meant to promote effective conservation activities, does not promote conservation of Mau forest programme. This is because members were not empowered to participate effectively in forest conservation activities as they were not enlightened on effective ways of implementing PFM practices.

4.11.1. Correlation Analysis between Institutional Framework and Conservation of Mau Forest Programme

The study sought to establish the correlations between institutional framework and conservation of Mau Forest programme and the results presented on Table 4.30.

Table 4.30: Correlation Results for Institutional Framework and Conservation of Mau Forest Programme

Variables		Conservation of Mau Forest programme	Institutional framework
Mau Forest Conservation programme	Pearson Correlation	1	-0.157**
	Sig. (2-tailed)		0.007
	n	297	297
Institutional Framework	Pearson Correlation	-0.157**	1
	Sig. (2-tailed)	0.007	
	n	297	297

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

Table 4.30 shows a correlation index between institutional framework and Mau Forest conservation programme. The Pearson's Product Moment Correlation coefficients showed the value of r = -0.157 and a probability of 0.007. Shirley et al. (2005) indicates that for a weak correlation, "r" ranges from + 0.10 to + 0.29; in a moderate correlation, "r" ranges between + 0.30 and + 0.49; while in a strong correlation, "r" ranges from + 0.5 and + 1.0. The positive or negative sign points to the direction of the relationship. Since r = -0.1577 in this case, then there was a weak negative linear correlation between the two variables. The p-value of 0.007 was less than 0.05 level of significance which implies that this weak relationship was significant. Therefore, existence of a good institutional framework guiding forest conservation activities leads to the success of conservation of Mau forest programme.

4.11.2. Regression Analysis between Institutional Framework and Mau Forest Conservation Programme

R squared was used to show variation in conservation of Mau Forest programme which can be explained by institutional framework. The results were presented on Table 4.31.

Table 4.31: Model summary for Institutional Framework and Conservation of Mau Forest Programme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.157[a]	0.025	0.021	4.45372

a. Predictors: (Constant), Institutional framework

$R^{2=}$ 0.025 shows how much institutional framework predicts Conservation of Mau forest programme. Therefore, 2.5% of institutional framework predicts conservation of Mau Forest programme. Since the Standard error of 4.454 is lower than 5%, the relationship between institutional framework and conservation of Mau forest programme is significant indicating that proper institutionalization of forest conservation program enhances PFM goals.

4.11.3. Analysis of Variance between Institutional framework and Conservation of Mau Forest Programme

Analysis of variance was used to determine whether the model was a good fit for the data in determining the influence of institutional framework on Conservation of Mau Forest programme. The results were shown on Table 4.32.

Table 4.32: ANOVA for Institutional Framework and Conservation of Mau Forest Programme

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	147.580	1	147.580	7.440	0.007[b]
	Residual	5851.517	295	19.836		
	Total	5999.098	296			

b. Predictors: (Constant), Institutional framework

Table 4.32 Shows that the significance level 0.05 was higher than the p-value 0.007. This implies that regression model was a good fit in predicting the influence of institutional framework on conservation of Mau Forest programme.

4.11.4. Coefficients of institutional framework and Mau Forest conservation Programme

Table 4.33 Shows regression coefficients for the influence of institutional framework on conservation Mau Forest programme.

Table 4.33: Coefficients for Institutional Framework and Conservation of Mau Forest Programme

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	39.085	2.140		18.262	0.000
	Institutional framework	-0.182	0.067	-0.157	-2.728	0.007

Table 4.33 shows that institutional framework has a negative significant influence on Mau Forest conservation programme as shown by the regression coefficient -0.182 and a p-value 0.007. The findings implies that when institutional framework is enhanced, like enforcement of laws governing forest conservation, it influences conservation of Mau forest programme in a negative direction. The relationship is significant in that, an improvement in creation of supportive institutional framework leads to successful conservation of Mau Forest programme.

4.11.5. Testing of Hypothesis 6

There is no significant relationship between institutional framework and conservation of Mau forest program. The p-value was 0.007 which is less than 0.05, therefore, null hypothesis was rejected and it was concluded that institutional framework influences Mau Forest conservation programme. Existence of good policies and legal framework provide a supportive working environment to CFA members to carry out forest conservation activities.

4.12. Moderating influence of Institutional Framework on the Relationship between Participatory Forest Management and Conservation of Mau Forest Programme

The study sought to establish the moderating influence of institutional framework on the relationship between Participatory Forest Management and Conservation of Mau Forest programme. The variation in the dependent variable that could be explained by the independent variables and moderating variable were presented in two models.

Table 4.34: Model Summary for Moderating Influence of Institutional Framework on the Relationship between Participatory Forest Management and Conservation of Mau Forest Programme

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.109[a]	0.012	-.002	4.506	0.012	0.877	4	292	0.478
2	0.195[b]	0.038	0.022	4.453	0.026	7.955	1	291	0.005

From the Table 4.34, the first model comprised of participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices, participatory evaluation. R square was 0.012 which implied that 1.2% of conservation of Mau forest programme could be explained by participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation.

The second model constituted participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices, participatory evaluation, *institutional framework, participatory forest planning *institutional framework, participatory forest monitoring *institutional framework, participatory implementation of forest management practices *institutional framework, participatory evaluation * institutional framework. By introducing the moderator (institutional framework) in the second model, R squared was 0.038 which implied that the introduction of institutional framework in the second model led to an increase in r-squared. This showed that institutional framework moderates the relationship between Participatory Forest Management and Conservation of Mau Forest programme.

4.12.1. Coefficients for moderating influence of institutional framework on the Relationship between Participatory Forest Management and Conservation of Mau Forest Programme

Table 4.35 Shows regression coefficients for the moderating influence of institutional framework on the relationship between Participatory Forest Management and conservation of Mau Forest programme.

Table 4.35: Coefficients for Moderating Influence of Institutional Framework on the Relationship between Participatory Forest Management and Conservation of Mau Forest Programme

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	32.794	3.398		9.650	0.000
	Participatory Forest Planning	0.090	0.055	0.098	1.651	0.100
	Participatory Forest Monitoring	-0.023	0.063	-0.022	-0.374	0.708
	Participatory implementation of forest management practices	-0.002	0.059	-0.002	-0.039	0.969
	Participatory evaluation	-0.053	0.052	-0.060	-1.018	0.309
2	(Constant)	38.506	3.922		9.818	0.000
	Participatory forest planning	0.100	0.054	0.109	1.860	0.064
	Participatory Forest Monitoring	-0.019	0.062	-0.018	-0.313	0.755
	Participatory implementation of forest management practices	-0.012	0.058	-0.012	-0.203	0.839
	Participatory evaluation	-0.050	0.051	-0.057	-0.984	0.326
	Institutional framework	-0.189	0.067	-0.163	-2.820	0.005

In the first model, by substituting the beta values and constant term, model 1 formed the first step in regression modeling was as follows:

$Y=32.794+0.090X_1+-0.023X_2+ -0.002X_3+ -0.053X_4$

The findings show that participatory forest planning has a positive influence on conservation of Mau Forest programme as shown by a regression coefficient of 0.90(p-value= 0.100). In addition, participatory forest monitoring has a negative influence on conservation of Mau Forest programme as shown by a regression coefficient of -0.023(p-value=0.708). In addition, participatory implementation of forest management practices has a negative influence on conservation of Mau Forest programme as shown by regression coefficient of -0.002 (p-value=0.969). Finally, Participatory evaluation has a negative influence on conservation of Mau forest programme as shown by regression coefficient of -0.053(p-value=0.309).

In the second regression model, by substituting beta values and the constant term, model 2 emanating from the second step in regression modeling was as follows:

$Y= 32.794+0.90X_1+-0.023X_2+-0.002X_3+-0.053X_4+.100X_1*Z+-0.019X_2*Z+-0.012X_3*Z+-0.050X_4*Z$

This implies that show by introducing the moderator, institutional framework to the model, participatory forest planning has a positive influence on Mau Forest conservation program as shown by a regression coefficient of 0.100(p-value= 0.064). Also, participatory forest monitoring has a significant negative influence on Mau Forest conservation programme as shown by a regression coefficient of -0.019(p-value=0.755). Moreover, participatory implementation of forest management practices has a significant negative influence on Mau Forest conservation programme as shown by regression coefficient of -0.012 (p-value=0.839). Participatory evaluation has a significant negative influence on Mau Forest conservation programme as shown by regression coefficient of -0.050(p-value=0.3326).Consequently, institutional framework has significant negative influence on conservation of Mau Forest programme as shown by regression coefficient of -0.189(p-value=0.005).

4.12.2. Testing of Hypothesis 7

The null hypothesis was that: The relationship between Participatory Forest Management and Mau Forest conservation programme does not depend on institutional framework. The p-value of 0.005 which is less than 0.05.Due to the sufficient evidence from the data, the null hypothesis was rejected and concluded that the relationship between Participatory Forest Management and

Forest conservation of Mau Forest programme depends on institutional framework. Clear policies and legal framework enables CFA members to implement the objectives of Participatory Forest Management for sustainability of forest.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the summary of findings, conclusions and recommendations.

5.2. Summary of Findings

The section presents the summary of findings based on the following sub-thematic areas.

5.2.1. Participatory Forest Planning and Conservation of Mau Forest Programme

Firstly, objective one of the study sought to examine the influence of Participatory Forest Planning on conservation of Mau Forest Programme. The composite mean score was 3.67 and SD was1.366. This indicates that when CFA members plan on forest conservation activities before executing would positively influence implementation of activities meant for Forest conservation. The Pearson's Product Moment Correlation coefficients showed the value of r = 0.087 and a probability of 0.132 implying that there was a weak positive linear correlation between the two variables. When CFA members operate as per the forest management plan, it would result in improved conservation of Mau Forest. R^2 = 0.008, therefore, 0.8% of Participatory forest planning contribute to the success of conservation of Mau forest programme. The coefficient of participatory forest planning and conservation of Mau Forest programme was, β =0.080 indicating that an improvement in conducting participatory forest planning by different stakeholders leads to effective conservation of Mau forest programme.

5.2.2. Participatory Forest Monitoring and Conservation of Mau Forest Programme

Secondly, objective two of the study sought to assess the influence of Participatory Forest Monitoring on conservation of Mau forest programme. The composite mean score was 3.464 and SD was 1.183 which implies that when CFA members continuously participate in monitoring implementation of forest conservation activities would result in improved condition of the forest. A correlation index between participatory forest monitoring and conservation of Mau forest programme was r = -0.021 and a probability of 0.721. This indicates that there was a weak negative correlation between Participatory forest monitoring and Conservation of Mau forest programme. R^2 = 0.000, therefore, 0.1% of Participatory forest monitoring contribute to the

success of conservation of Mau forest programme. The coefficient of participatory forest monitoring and conservation of Mau Forest programme was β = - 0.022 implying that an improvement in conducting forest monitoring by CFA members had a negative relationship with conservation of Mau forest programme. The results further indicated that though monitoring of forest conservation activities were seen to bring a positive change, most CFA members were not fully engaged due to inadequate awareness and scarce resources.

5.2.3. Participatory Implementation of Forest Management Practices and Conservation of Mau Forest Programme

Objective three of the study sought to establish the influence of Participatory implementation of forest management practices on conservation of Mau forest programme. From the findings, the composite mean score and SD was 3.135 and 1.306 which implies that participation of CFA members in implementing forest management practices resulted in a positive improvement of forest conservation programme. A correlation index between participatory implementation of forest management practices and conservation of Mau forest programme was r = 0.003 and a probability of 0.959. R^2 = 0.000 which means that 0.1% of Participatory implementation of forest management practices influence conservation of Mau forest programme. The coefficient of participatory implementation of forest management practices and conservation of Mau Forest programme was, β = 0.003. The results further indicated that most of the activities still lacked proper execution as CFA members could not access necessary tools and equipment which could be attributed to inadequate availability of financial resource. Also, implementation of PFM programs has contributed to improved livelihood of the community due to benefits obtained from the forest products.

5.2.4. Participatory evaluation and Conservation of Mau Forest Programme

Objective four sought to determine the influence of Participatory evaluation on conservation of Mau forest programme. The composite mean score and SD was 3.556 and 1.256 implying that participatory evaluation of forest conservation programme by different stakeholders including the local community would contribute to the success of forest conservation programme. The Pearson's Product Moment Correlation coefficients showed the value of r = -0.048 and a probability of 0.413 which means that participatory evaluation had a negative influence on

conservation of Mau forest programme. Therefore, when CFA members regularly evaluate their participatory processes, they learn from mistakes made and rectify them in future which contribute to improvement of forest conservation. $R^{2=}$ 0.002 shows how much participatory evaluation predicts conservation of Mau Forest. So, participatory evaluation contributed up to 0.2% of forest conservation programme. Coefficients of participatory evaluation and conservation of Mau forest programme was, $\beta = -0.042$ indicating that if members participate efficiently in evaluating their activities, there would be improvement in forest conservation programmes.

5.2.5. Participatory Forest Management and Conservation of Mau Forest Programme

Objective five of the study sought to establish the combine influence of Participatory Forest Management on conservation of Mau forest programme. R-squared was used to show variation in the dependent variable- conservation of Mau forest programme which could be explained by the dependent variables: participatory Forest planning, Participatory Forest Monitoring, Participatory implementation of forest management practices and Participatory evaluation. In the study, the R square was 0.012 which implies that independent variables could explain1.2% of conservation of Mau forest programme. Effective implementation of PFM programmes by the CFA members would bring a tremendous improvement in forest conservation.

5.2.6. Institutional Framework and Conservation of Mau Forest Programme

In one hand, objective six of the study sought to determine the influence of institutional framework and conservation of Mau forest programme. The composite mean score and SD was 3.177 and 1.188 indicating that existence of clear policies and legal framework guiding implementation of activities by the CFA members had a positive significant contribution to the success of forest conservation programmes. The Pearson's Product Moment Correlation coefficients showed the value of r = -0.157 and a probability of 0.007. Since r = -0.1577 in this case, then there was a weak negative linear correlation between the two variables. Also, R^2 =0.025 shows how much institutional framework predicts Conservation of Mau forest programme. Hence, institutional framework contribute up to 2.5% successful implementation of forest conservation programme. But the standard error is 4.454 which is lower than 5%. Coefficient of institutional framework and conservation of Mau forest programme was, β = -

0.182. Therefore, the relationship between institutional framework and conservation of Mau forest programme is significant.

5.2.7. Moderation of Institutional Framework on the relationship between Participatory Forest Management and Conservation of Mau Forest Programme

On the other hand, objective seven sought to establish the moderating influence of institutional framework on the relationship between Participatory Forest Management and conservation of Mau forest programme. The first model comprised of participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation. R squared was 0.012 which implied that 1.2% of Mau Forest conservation programme could be explained by participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation.

In the second model, R squared was 0.038 which implied that the introduction of institutional framework in the second model led to an increase in r-squared. This showed that institutional framework moderates the relationship between Participatory Forest Management and Conservation of Mau forest programme.

5.3. Conclusions

The first objective of the study investigated the extent to which Participatory Forest planning influence conservation of Mau forest programme. The findings indicated that there was a weak positive linear correlation between the two variables. It is concluded that participation of CFA members in planning forest conservation activities such as reviewing of forest management plan, electing of executive committees and actively participating in meetings had a significant contribution to the success of forest conservation programmes.

The second objective sought to assess the influence of Participatory Forest Monitoring on conservation of Mau forest programme. There was a weak negative correlation between Participatory forest monitoring and Conservation of Mau forest programme. But descriptive statistics confirmed that when community forest user groups engage in monitoring planting of trees in Mau forest, caring and thinning led to an improved forest condition. In addition,

existence of a good conflict resolution mechanisms among forest user groups led to cohesiveness among the CFA members which in turn support conservation of Mau forest programme.

The third objective sought to ascertain the influence of Participatory implementation of forest management practices on conservation of Mau forest programme. The findings showed that there was a weak positive correlation between the two variables. It was noted that CFA members lacked proper keeping of inventory of forest data, but there was a good partnership between Kenya Forest Service and other stakeholders which supported CFA members with incentives like tree seedlings and offered training and other extension services which enabled them to appropriately executive activities meant for conservation of Mau Forest.

The fourth objective sought to ascertain the influence of Participatory evaluation on conservation of Mau forest programme. The findings indicated that there was a weak negative linear correlation between the two variables under investigation. Furthermore, participatory evaluation enabled CFA members to recognize existence of good sceneries in Mau Forest meant for tourism attraction. Also, most people still relied on firewood in their houses which significantly contribute to forest degradation. However, participatory forest management has contributed significantly to improved livelihood of CFA members.

Objective five of the study sought to establish the combine influence of Participatory Forest Management on conservation of Mau forest programme. R-squared was used to show variation in the dependent variable (conservation of Mau forest programme) which could be explained by the dependent variables: Participatory Forest planning, Participatory Forest Monitoring, Participatory implementation of forest management practices and Participatory evaluation. Therefore, the Participatory Forest Management contributed to improved conservation of Mau Forest since different stakeholders for instance the community, KFS, NGOs and county government have partnered to implement forest conservation programs.

The sixth objective of the study sought to determine the influence of institutional framework on conservation of Mau forest programme. The findings showed that there was a weak negative significant linear correlation between the two variables. Therefore, clear institutionalization of

forest conservation programme for example empowering of the CFA and provision of financial resources had significantly created an enabling working environment for CFA members to achieve the goals of Participatory Forest Management.

Finally, objective seven sought to establish the moderating influence of institutional framework on the relationship between Participatory Forest Management and conservation of Mau forest programme. Therefore, the introduction of institutional framework in the second model led to an increase in r-squared which showed that institutional framework moderates the relationship between Participatory Forest Management and Conservation of Mau forest programme.

5.4 Recommendations

This section gives recommendations for policy action and recommendations for practice.

5.4.1. Recommendations for Policy action

1. Participatory Forest Management has to be incentive-compatible at the household level. Forestry reforms should rightly focus on creating community forest user groups, establishing common rules and providing public infrastructure. However, these mechanisms will be successful only if they offer both short-term and long-term benefits to households. Also, it was noted that most CFA members have knowledge of tree planting and management thereby guiding other members in carrying out forestry-related activities. In addition, there is vast potential in the indigenous knowledge of members of CFA since they have lived in the forests for a long time. Such knowledge is important in education, research, and even in ecotourism which needs to be tapped as a way of enhancing the sustainability of the forest resources.

2. Fuel wood and fodder meet daily subsistence needs and Non-Timber Forest Products are a source of cash as well as food to forest adjacent communities. There is need to ensure sustainable extraction by CFUGs. This can be realized through better forest and plantation management, use of energy saving technologies and rules enforcement on forest entry. It was found that tangible benefits that were available to the CFA members from the forests contributed to the cohesiveness of the CFA members. These benefits

ensured the sustainability of the groups and therefore the principle of benefit sharing needs to be strengthened for the success of Participatory Forest Management programs.

3. It is noted that creating local institutions alone is not enough but these institutions need to be built up by equipping them with resources, provision of training and offering clear property rights in order to make them downwardly accountable. There is need to provide appropriate leadership where it is missing and strengthened where possible. Hence, both the national and county governments, NGO and donor support should continue in providing CFAs the required technical and monetary support for effective implementation of forest conservation programme in Mau Forest.

4. There should be clear property rights for CFA members. This is because, CFA members have the responsibility to protect forests, but not the rights to sanction encroachers or to use the revenues earned from forests. Also, they are insecure over their rights of access to forests and conflicts are witnessed due to lack of equity in benefits sharing. This is an issue that needs to be addressed at the policy level since the state has to be able to enforce the laws.

5. An effective monitoring is vital to long term forest management. Therefore, local communities need to be trained so that they are clear on what they are monitoring so that they are able to select indicators to evaluate changes in forest conservation programme. It is important for the government to offer training to all CFA members so as to increase their level of participation in forest conservation activities. In addition, CFA members should be willing to use sanctions for rule breakers because when sanctions are strictly enforced, they prevent free-riding and instill a sense of trust, which motivates more active participation.

6. There is need to build trust between the Kenya Forest Service officers and local communities by empowering these local institutions and giving them authority in the context of this participatory forest management system. There should be a provision for continuous education and training of forest department employees regarding the new

paradigm of forest management. In addition, systematic and periodic external evaluation system should be adopted to ensure proper implementation of participatory forestry management projects in future.

5.4.2. Recommendation for Practice

There were some aspects in the study where inadequacy was noted in the responses from the self-administered questionnaires and realities were only unearthed by use of the interview guide as a research instrument. For example, majority of the respondents were neutral in the questionnaires on most of the items. However, the face to face interviews confirmed that CFA members did not participate in conducting inventories of forest data thus showing that forest institutions did not have an effective M&E system. The implications of these findings to research methodology are triangulation in data collection procedures including in the selection of the research instruments in order to unravel some hidden issues.

Another implication of the findings from this study for methodology is the need to use a mixed methods research approach in line with pragmatism paradigm so as to construct and interpret reality. For instance, where inferential data analysis indicated whether relationships existed between variables in the study and the strength of the relationships that existed, inferential analysis mostly ignored multiple realities which could have been lost especially where relationships were not proved to exist. For example, in this study, most inferential analysis showed that there was no correlations among majority of variables under examinations. Consequently, descriptive statistics revealed important aspects of participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation that influence conservation of Mau forest programme. But, inferential analysis failed to show correlations among those variables with the dependent variables. However, inferential analysis showed the moderating influence of institutional framework on conservation of Mau Forest programme.

5.4.3 Contribution of the study to the body of knowledge

The findings indicated that institutionalization of forest conservation programme led to enhancement of Participatory Forest Management in Mau Forest. With R^2 =0.025 shows how much institutional framework influences Conservation of Mau forest programme. This implies that 2.5% of institutional framework brings changes in Forest conservation program which enhances successful implementation of PFM in Mau Forest. Also, the findings confirmed that existence of clear policies and regularity framework enabled CFA members to implement activities resulting in improved conservation forest. In model one, R squared was 0.012 which implied that 1.2% of conservation Mau forest programme could be explained by participatory forest planning, participatory forest monitoring, participatory implementation of forest management practices and participatory evaluation. In the second model, R squared was 0.038 which implied that the introduction of institutional framework in the second model led to an increase in r-squared. This showed that institutional framework moderates the relationship between Participatory Forest Management and Conservation of Mau forest programme.

5.5. Suggestions for Further Research

The study recommends that future studies should be done on the following areas:

1. Implementation of Participatory Forest Management requires a community with a reasonable level of economic development. This is because in their initial involvement in forest management, the communities will have to give more than they can benefit from the forest resources. This is true for most of the utilizable means provided for in the Forests Act for instance, honey harvesting, ecotourism, timber production among others. Therefore research need to be carried out to evaluate the influence of values addition of forest products on economic development of forest adjacent community.

2. Another conflict that is likely to arise in the course of implementing the Participatory Forest Management is on conservation versus exploitation of the forest. A major objective for involving communities in management of forest is to foster forest sustainability over time. From the findings, it was clear that the motivation of most members of Community forest associations was the opportunity to utilize forest resources without the existing government restrictions but only a few had perceived forest

conservation as a priority. Therefore, future research need to be done to determine the ways of promoting community participation for sustainability of forest conservation programmes among community forest Associations in Kenya.

3. There is a prevailing attitude of the community versus the attitude required if Participatory Forest Management implementation is to ensure forest sustainability. Communities still have the attitude that they are fully entitled to the forest land and perceive it as if they have been denied for so long. If the forest land could be used at their discretion, most community members would convert it to agriculture which is seen to be a more profitable land use. Future research should be done to ascertain the influence of peoples' perception on Participatory Forest Management.

4. Promotion of people's participation in forest conservation programs requires concerted efforts from the government, non-governmental organizations, academic institutions and business sectors. This could be achieved by providing different subsidies like technical support and tree seedlings. It is evident that the local people are highly dependent on forest wood for cooking and construction purposes. Therefore, future research need to be done on influence of provision of alternative sources of energy on Conservation of Forests in Kenya.

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APPENDICES

Appendix 1: Introductory Letter

JULIUS KIBET CHERUIYOT
P.O BOX 396-20406
SOTIK
OCTOBER, 2017

DIRECTOR KENYA FOREST SERVICE

P.O.BOX,

BOMET

Dear Sir/madam,

RE: REQUEST FOR DATA COLLECTION

I am a PhD candidate of the University of Nairobi, pursuing a course of Doctor of Philosophy degree in Project Planning and Management. I am conducting a research on **'Participatory Forest Management, Institutional framework and Conservation of Mau Forest Programme in Bomet County, Kenya'**

You are a key stakeholder in my area of study. Therefore, I would like to request for your permission to collect data from your employees and members of the community forest associations in Mau Forest.

The information sought will only be used for research purposes and will be treated with a lot of confidentiality. Respondents are not required to write their names on the questionnaires.

Thank you in Advance.

Yours faithfully,

Julius Kibet Cheruiyot
L83/98107/2015
Julikibet2@gmail.com

Appendix 2: Questionnaire for Community Forest User-groups and Community Forest Association Committees

Please do not write your name on the questionnaire. Kindly provide your honest opinion on all the items in the questionnaire. All the information provided will be used for academic purposes only and will be kept confidential.

Put a tick **(√)** in the box provided to show your response where applicable, response can also be written.

SECTION A: Background information of Respondents

1. What is your gender? ☐ Male ☐ Female

2. Select your age bracket?
   - ☐18- 20 Years
   - ☐ 21-30 Years
   - ☐ 31-40 Years
   - ☐ 41-50 years
   - ☐ 51 Years and Above

3. What is your highest level of education?
   - ☐ Post Graduate
   - ☐ Graduate
   - ☐ Diploma
   - ☐ KCSE
   - ☐Others (specify)……..

4. Which position are you working in Community Forest Association?
   ☐Community Forest Association (CFA) member ☐Forest Executive Committee

5. How long have you been the member of Community Forest User Group?
   ☐1 to 5 years ☐ 6 to 10years ☐ 11 o 15 years ☐ 16 years and above

SECTION B: Conservation of Mau Forest Programme

6. This section covers the dependent variable of this study. You are requested to give your opinion based on the level of agreement or disagreement with the statements on a likert scale of 1-5 where SA – Strongly Agree; A – Agree; N – Neutral; D – Disagree; and SD – Strongly Disagree

Parameters	**Strongly agree (SA)**	**Agree (A)**	**Neutral (N)**	**Disagree (D)**	**Strongly Disagree (SD)**
B1).You participate frequently in planting trees in Mau Forest					
B2).You normally fence off forest areas					
B3). You extract timber from the forest					
B4).You harvest Non-timber forest products from the forest such as fodder, medicinal herbs or honey					
B5).You obtain a lot of compost manure from the forest					
B6).You frequently encounter wildlife in the forest					
B7).There are good water sources in the forest area					
B8).You protect water catchment areas in the forest					
B9).You obtain fuel-wood from the forest					
B10).You occasionally witness forest fires					

SECTION C: Participatory Forest Planning

7. This section covers the independent variable of this study. You are requested to give your opinion based on the level of agreement or disagreement with the statements on a likert scale of 1-5 where SA – Strongly Agree; A – Agree; N – Neutral; D – Disagree; and SD – Strongly Disagree

Parameters	**Strongly agree (SA)**	**Agree (A)**	**Neutral (N)**	**Disagree (D)**	**Strongly Disagree (SD)**
C1). You hold frequent meetings to plan forest conservation activities					
C2).You make major decision regarding forest conservation					
C3).Forest management plans and inventories exist					
C4).Forest management plans are developed with participation of local communities					
C5).Women participate equally and can hold leadership positions					
C6).Election of forest executive committees are done fairly					
C7).You frequently attend meetings to discuss on issues of forest conservation					
C8).Forest management plans are consistent with all legal requirements					
C9).Executive(EC) committee meetings are frequently conducted					
C10).Forest management plans are reviewed and updated regularly					

SECTION D: Participatory Forest Monitoring

8. This section covers the independent variable of this study. You are requested to give your opinion based on the level of agreement or disagreement with the statements on a likert scale of 1-5 where SA – Strongly Agree; A – Agree; N – Neutral; D – Disagree; and SD – Strongly Disagree

Parameters	**Strongly agree (SA)**	**Agree (A)**	**Neutral (N)**	**Disagree (D)**	**Strongly Disagree (SD)**
D1).You participate in thinning and pruning of trees in the forest					
D2).You monitor planting and caring of trees in the forest					
D3).You control cattle grazing in the forested areas					
D4).You normally sanction law breakers in the forest management					
D5).You monitor and control forest fires and other natural disturbance in the forest					
D6).Monitoring systems usually update data on regular intervals					
D7).You participate in monitoring protection of water sources in the forest					
D8).Monitoring reports are publicly disclosed on a regular basis					
D9).Monitoring system utilize remote sensing and other relevant technology in forest management					
D10).You monitor changes in forest cover					

SECTION E: Participatory Implementation of Forest Management Practices

9. This section covers the independent variable of this study. You are requested to give your opinion based on the level of agreement or disagreement with the statements on a likert scale of 1-5 where SA – Strongly Agree; A – Agree; N – Neutral; D – Disagree; and SD – Strongly Disagree

Parameters	**Strongly agree (SA)**	**Agree (A)**	**Neutral (N)**	**Disagree (D)**	**Strongly Disagree (SD)**
E1).You participate in conducting a comprehensive natural inventories of forest data					
E2).You are aware of rights and duties in accordance to the law and regulations in forest management					
E3).You access necessary tools and equipment used in forest conservation activities					
E4).Government and forest managers regularly inform you about forest conservation issues and activities					
E5).Forest managers have adequate range of expertise on forest conservation					
E6).You access adequate financial resources to aid in implementation of forest conservation programme					
E7).You access extension services or technical support related to forest management					
E8).There is effective mechanism for promoting two-way communication about forest management between communities, government and forest managers					
E9).You engage in partnership with other willing stakeholders in forest conservation					
E10).You participate in demarcating boundaries of forest areas					

SECTION F: Participatory Evaluation

10. This section covers the independent variable of this study. You are requested to give your opinion based on the level of agreement or disagreement with the statements on a likert scale of 1-5 where SA – Strongly Agree; A – Agree; N – Neutral; D – Disagree; and SD – Strongly Disagree

Parameters (Activities)	**Strongly agree (SA)**	**Agree (A)**	**Neutral (N)**	**Disagree (D)**	**Strongly Disagree (SD)**
F1).There are beautiful sceneries in Mau forest meant for promotion of social amenities					
F2).There is a good collaboration among members in forest conservation activities in Mau Forest					
F3).You use improved stoves while cooking in your houses					
F4).You share evaluation results about forest conservation practices					
F5).The livelihood of the people has improved greatly as a result of forest conservation programme in Mau Forest					
F6).You have adequate capacity to participate in forest conservation activities					
F7).Household income generation are contributed by conservation activities in Mau Forest					
F8).Forest conservation activities has led to investment in local community infrastructure and development					
F9).There is improved security, support and cohesion as a result building Community Forest Associations					
F10).Due to conservation efforts, people are accessing a lot of forest products					

SECTION G: Institutional Framework and Conservation of Mau Forest Programme

11. This section covers the moderating variable of this study. You are requested to give your opinion based on the level of agreement or disagreement with the statements on a likert scale of 1-5 where SA – Strongly Agree; A – Agree; N – Neutral; D – Disagree; and SD – Strongly Disagree

Parameters(Activities)	**Strongly agree (SA)**	**Agree (A)**	**Neutral (N)**	**Disagree (D)**	**Strongly Disagree (SD)**
G1).Partnership with external institution exist for effective conservation of Mau Forest					
G2).There are a good number of trained staff aiding implementation of forest conservation activities					
G3).Adequate budget and staff are allocated for conservation activities in Mau Forest					
G4).There is a ready market for forest products obtained from Mau Forest					
G5).Equity is ensured while sharing forest benefits					
G6).Forest products undergo value addition before marketing					
G7).Effective mechanism are in place for transparent engagement and conflict resolution					
G8).There is a well-defined and assigned clear property rights over forest resources to users					
G9).Stakeholders clearly understand what activities are allowed and not allowed within Mau Forest area					
G10).Regular training are done to promote effective conservation activities in Mau Forest					

Appendix 3: Interview guide with Kenya Forest Service officers

Participatory Forest Planning

1). How are CFA committees elected? What criteria's were followed during the selection Democratic or autocratic?

2). Do CFAs participate in making of forest management plans? What are its future management plans?

Participatory Forest Monitoring

3). Do all people have easy access to the forest and its resources? If no, what are the difficulties?

4). Are the monitoring reports publicly disclosed on a regular basis?

Participatory Implementation of Forest Management Practices

5). What challenges do CFA members encounter in the course of implementation of their activities?

6). Do you offer trainings to CFA members? If so, you train them about what?

Participatory Evaluation

7). Are there beautiful sceneries in Mau Forest?

8).Do CFA members access variety of forest resources in Mau Forest?

Institutional Framework

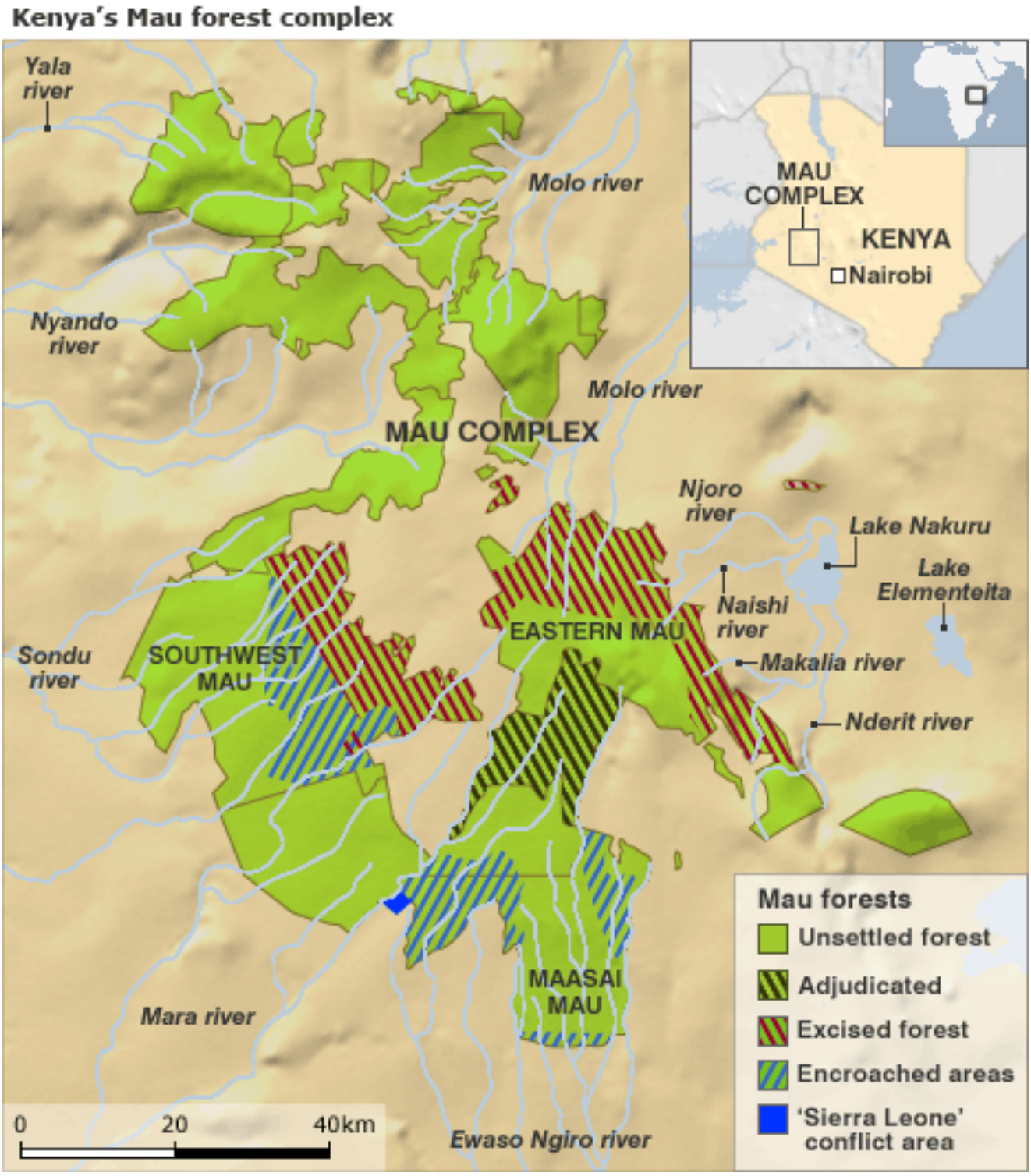
9). Have you traditions, practices and local laws on management of the forested resources?

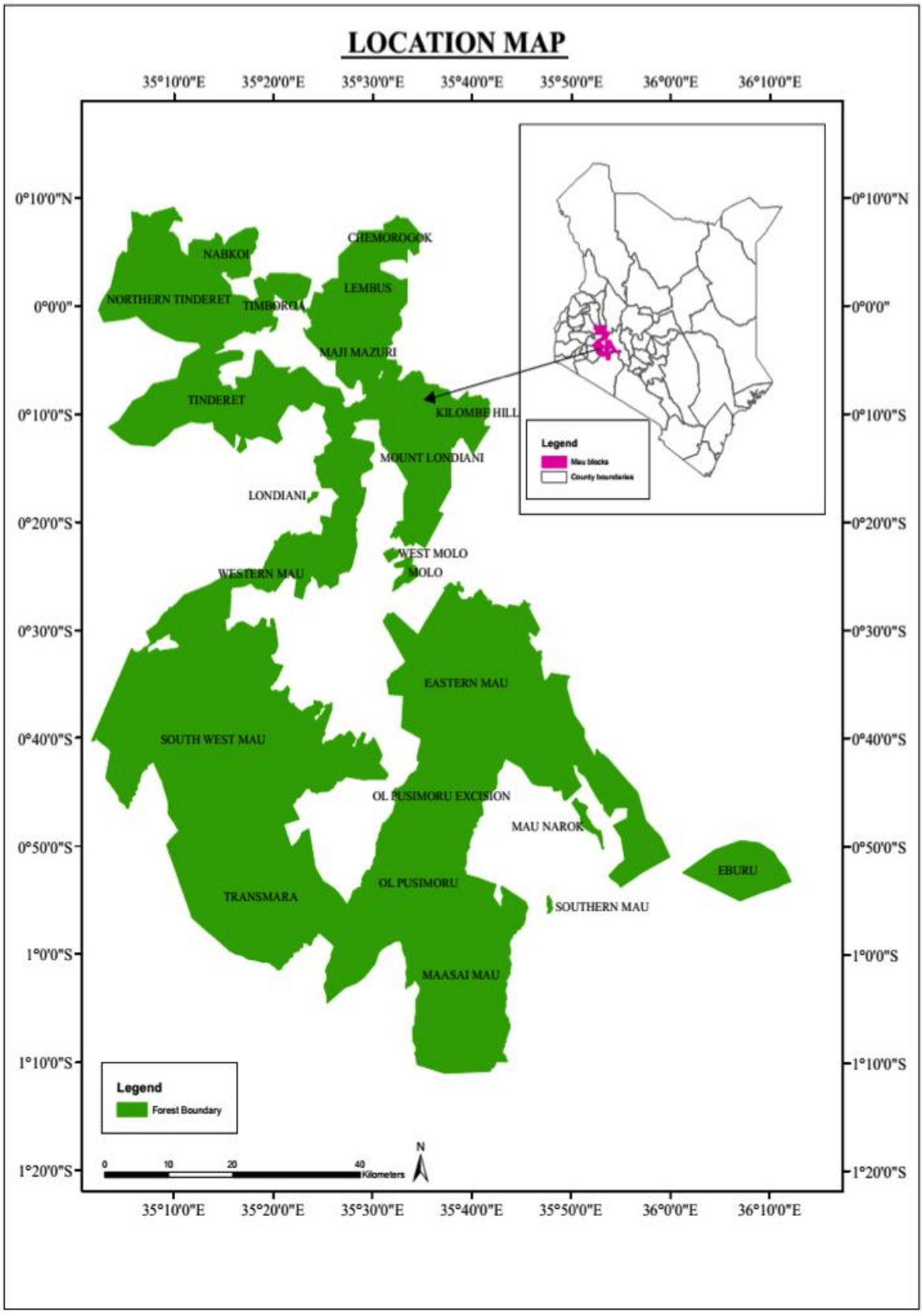
10. What is the role of Government and NGO officials in the local people's effort of CFUG and its committee formation, Operational plan designing?

The end

Thank you for your participation

Appendix 4: Map of Mau forest




LOCATION MAP
35°10'0"E
35°20'0"E
35°30'0"E
35°40'0"E
35°50'0"E
36°0'0"E
36°10'0"E
0°10'0"N
0°0'0"
0°10'0"S
0°20'0"S
0°30'0"S
0°40'0"S
0°50'0"S
1°0'0"S
1°10'0"S
1°20'0"S
NABKOI
CHEMOROGOK
LEMBUS
NORTHERN TINDERET
TIMBORUA
MAJI MAZURI
TINDERET
KILOMBE HILL
MOUNT LONDIANI
LONDIANI
WEST MOLO
MOLO
WESTERN MAU
EASTERN MAU
SOUTH WEST MAU
OL PUSIMORU EXCISION
MAU NAROK
EBURU
OL PUSIMORU
SOUTHERN MAU
TRANSMARA
MAASAI MAU
Legend
Mau blocks
County boundaries
Legend
Forest Boundary
0
10
20
40
Kilometers
N

Appendix 5: Data Collection Letter from Kenya Forest Service

TEL: NO. BOMET 051-8000484
Fax.No.051-8009706
Email: zmbomet@kenyaforestservice.org
When replying please quote

KENYA
Forest Service

CONSERVATOR OF FOREST'
BOMET COUNTY,
P.O BOX 304 - 20400
BOMET

REF: KFS/BMT/9/1/1(37) **11th /10/2018**

THE STATION FOREST MANAGERS,

- **ITARE FOREST STATION**
- **NDOINET FOREST STATION**
- **MARAMARA FOREST STATION**

RE: DATA COLLECTION - JULIUS KIBET CHERUIYOT – L83/98107/2015

The above mentioned student from the University of Nairobi is a **PhD** candidate, pursuing a course of Doctor of Philosophy degree in Project Planning & Management. He is currently conducting a research on **'Participatory Forest Management, Institutional framework and Mau Forest Conservation Programme in South West Mau forest in Bomet County. Please allow him to collect the required data** without destroying any existing plants and also assist him to meet the Community Forest user groups (households) and the Community Forest Association Committees for purpose of information gathering and data collection.

F. M. MISONGE.
ECOSYSTEM CONSERVATOR,
BOMET COUNTY.

CC. The Head,
Mau Forest Conservancy.

The CFA Chairmen - ITARE
- NDOINET
- MARAMARA

Appendix 6: Research Authorization Letter

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/8212/24890** Date: **13th October, 2018**

Julius Kibet Cheruiyot
University of Nairobi
P.O. Box 30197-00100
NAIROBI

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Participatory forest management, institutional framework and Mau Forest Conservation Programme in Bomet County, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Bomet County** for the period ending **12th October, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Bomet County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Bomet County.

The County Director of Education
Bomet County.

Appendix 7: Research Permit

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

1. **The License is valid for the proposed research, location and specified period.**
2. **The License and any rights thereunder are non-transferable.**
3. **The Licensee shall inform the County Governor before commencement of the research.**
4. **Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.**
5. **The License does not give authority to transfer research materials.**
6. **NACOSTI may monitor and evaluate the licensed research project.**
7. **The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.**
8. **NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.**

National Commission for Science, Technology and innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 21224

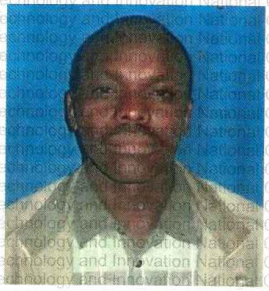
CONDITIONS: see back page

THIS IS TO CERTIFY THAT:
MR. JULIUS KIBET CHERUIYOT
of UNIVERSITY OF NAIROBI, 396-20406 Sotik,has been permitted to conduct research in *Bomet County*

on the topic: *PARTICIPATORY FOREST MANAGEMENT, INSTITUTIONAL FRAMEWORK AND MAU FOREST CONSERVATION PROGRAMME IN BOMET COUNTY, KENYA*

for the period ending:
12th October,2019

Permit No : NACOSTI/P/18/8212/24890
Date Of Issue : 13th October,2018
Fee Recieved :Ksh 2000



.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation