ASSESSMENT OF THE EFFECTS OF LOCAL COMMUNITY ACTIVITIES ON FOREST RESOURCES ON ECHUYA CENTRAL FOREST RESERVE IN MUKO SUBCOUNTY RUBANDA DISTRICT, UGANDA

BY

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FEBRUARY, 2022

DECLARATION

I OKWARIKUNDA PROSPER do hereby declare that this dissertation is my original work and that it has not been submitted to any institution of higher learning for an academic award.

…….. ……

OKWARIKUNDA PROSPER DATE

APPROVAL

I the undersigned supervisor do confirm here that this research dissertation has been written under my supervision and is now ready for assessment as procedural for award of Master's degree of Nkumba University.

....

MS. Ameria Nabukonde Date

DEDICATION

This research work is dedicated to my late Father Mr. Charles Bagambe (RIP), Mother, Mrs. Hope Bagambe, Sisters; Phionah, Praise, Precious and Brother; Broads plus all my friends for without their financial and moral support I could not have managed to produce this work. With God, Everything is Possible.

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ABBREVIATIONS AND ACRONYMS

CVI: Content Valid Index

ECFR: Echuya Central Forest Reserve

FLEG: Forest Law Enforcement and Governance

MWE: Ministry of Water and Environment

NFTPA: The National Forestry and Tree Planting Act

NWFP**:** Non-wood forest products

NFA: National Forestry Authority

UBOS Uganda Bureau of Statistics

UN: United Nations

ABSTRACT

The study examined the effects of local community activities on forest resources of Echuya Central Forest Reserve in Muko Sub county Rubanda District. It was based on three objectives that is; to identify the forest resources obtained by the local communities from Echuya Central

Forest Reserve; to examine the local community activities being carried out in areas around the forest reserve and to assess the policy and legal framework for conserving the forest resources in the country .

Results showed that; for objective one, respondents from all parishes indicated that bamboo was the most extracted forest resource because of its high demand by granary and harvesting baskets weavers who buy it in large quantities. For objective two; residents practiced crop farming mainly in Kagaano parish (30%) and Ncundura parish (15%) of Muko Sub County because of the availability of land for cultivation in these parishes. For objective three, the study found out that the most effective framework for forest resource extraction from Echuya central forest reserve at the time of data collection was the use of monitoring resource harvesting. Adhering to resource use guidelines and conducting forest patrols. Harvesting permits were issued by National Forestry Authority supervisor in all the three parishes of Karengyere, Kagaano and Ncundura.

A number of methods were used to collect data during field work and they included; interview method whereby several interviews were conducted with the local communities, observation and photography method whereby a number of community activities were observed and photographs were taken.

The study findings concluded that increasing forest resource extraction was a great socioeconomic and environmental challenge in Rubanda district. Basing on field observations and interviews, the increasing forest resource extraction could be as a result of increased population. Furthermore, areas with high population and much forest resources extraction could be harnessed through setting up strong local community institutional framework to regulate and control resource access activities by the local communities.

The study therefore recommended that Government needs to engage resource users in formulating effective resource assess guidelines and procedures as well as strengthening local community institutional frameworks including training of resource users committees.

CHAPTER ONE: INTRODUCTION

This chapter covers the background to the study, highlighting the aspects of community activities on the abundance of forest resources based on the theoretical, historical, conceptual, and context background. The chapter further provides information on the problem statement, objectives of the study, research questions, significance of the study, and the scope of the study in terms of time, geographical and content scope.

1.1Study Background

Echuya forest was first gazetted with its original boundary description as crown forest of 16 square miles in the Laws of Uganda (1951) by Legal Notice 257 of 1939. After demarcation the gazetted area was amended by Legal Notice 245 of 1947, to 15.21 square miles. All Crown Forests in Uganda were then regazetted as Central Forest Reserves in Legal Notice 41 Notice 324 of 1948. Echuya Forest was regazetted by Statutory Instrument No. 11 of 1963, which was amended by Statutory Instrument 206 of 1964. All these regazettement events reflect the forest cover loss events that started then and are still prevalent up to date. Echuya CFR has 20 percent of its area situated in Bufumbira County in Kisoro District and the remaining 80 percent in Rubanda District. The southern end runs along the north eastern border of Rwanda. It lies between 1°14´ – 1°21´S and 29°47´ – 29°52´E, covers an area of 34 km2, with an altitudinal range of 2270 – 2750 m. It is situated on a high altitude ridge running between Lake Bunyonyi, 5 km to east, and Mgahinga Gorilla National Park, about 20 km to the south west. It is 11 km east of Kisoro Town. The main Kabale to Kisoro road passes through the northern end. The forest is covered by Uganda Department of lands and Survey map sheets 93/2 and 93/4 (series Y732) at 1:50,000.

Forestry is crucial to lives of millions of Ugandans especially the poorest sections of society. (Turyahabwe, 2019). The dependence of poor people on forest resources and their ability to improve their livelihoods through forestry services has for long not been adequately recognized in Uganda. Benefits of forests and trees to Ugandans especially the poor has mainly focused on the numerous direct benefits inform of food, energy, employment, incomes, quality of life and increased resilience to shocks and stresses. Little attention has been directed at quantifying and valuing the many environmental and ecological benefits that forests provide. For example,

forests and trees provide support to agriculture and many environmental services that are taken for granted or are poorly understood. Supply of clean water and maintenance of soil fertility are major services provided by forests and trees and are important to the poor who cannot afford alternatives such as piped water or fertilizers. Because these services are considered "free", they are undervalued and without investment and adequate protection of forests and trees they are declining fast.

Forest conservation in Uganda is guided by several Policies, Acts and Regulations. The National Forestry and Tree Planting Act (NFTPA) 2003 which repealed the Forests Act (1964) Cap 246, and the Timber (Export) Act 1965 Cap 247. The forest resources management is guided by Policy (2001), the National Forest Plan (2002) and led to the establishment of the National Forestry Authority (NFA) as a legally mandated to manage CFRs, while the District Forestry Services (DFSs) under local governments manage Local Forest Reserves and provide advisory services to local communities and private forest owners on the management of their forests which constitute a larger percentage of forests in the country (MWE 2012).

The Act is an enabling law that provides new and positive opportunities for better management of the forestry sector to balance the traditional "regulatory" functions of government. It provides for new opportunities for collaboration with sectorial partners, private sector and civil society. The NFTPA (2003) clarified institutional roles and responsibilities, including those for law enforcement in forest governance (Kamugisha, 2017).

However, the local communities have largely been left behind in terms of forest conservation, particularly in forest resources conservation. There continues to be conflict between community and government in dealing with the issues of securing livelihood and protecting natural resources. It serves as a bottom-up approach which emphasizes the 'participation' of stakeholders in meeting the local community needs and at the same time, achieve sustainable management of natural resources (Fisher 1995:7, Borrini-Feyerabend et al.2014). The Uganda Forestry Policy 2001 states that Forest conservation is where people live near the government forests, there is typically a history of open-access use of these forest reserves, by individual farmers or residents who depend on these forests for wood and non-wood products. The

government administration finds it increasingly difficult to police and regulate this open access without communal responsibility.

Forests are important for the role they play in society providing a range of ecological and socio-economic functions. Ecological and regulating services include erosion prevention, moderation of extreme flows, sediment traps, climate modification, soil formation, maintenance of water tables in surrounding lands, and as centers of biodiversity and wildlife habitat. Socio-economic or provisioning services include food, medicines, water supply, fisheries, dry season grazing for livestock, nutrient and toxin retention, tourism, and so on. They are also important for recreational and spiritual reasons (Turyahabwe, 2016).Results from the FAO Global Forest Resources Assessment 2015 shows that global forest area has decreased by 3% from 1990 (4,128 million hectares) to (3,999 million hectares). In 2015, net forest loss is mainly in the tropics and rates of forest loss are highest in low income countries.

1.2 Problem statement

Forest destruction has been due to lack of recognition of forests as anything but unusable wastelands (MWE, 2015). Forests continue to be degraded and their area across the country is below that recorded in the 90s. In the urban areas, there is indiscriminate encroachment for settlements while in the rural areas; there is much conversion to agriculture (Ministry of Water and Environment, 2014).In most of the rural areas where forests exit, there are little or no economic activities to provide income for the people (Turyahabwe, 2019).

The daily subsistence of the people is dependent on the forest exerting pressure onto the remaining forests as a result of deforestation. Hence, resources obtained from the forest include water, firewood, building poles, timber, medicinal herbs, vegetables, honey, fruits, and animals. (Turyahabwe, 2019). There are agricultural practices and extractive activities conducted in the forest reserves for example; crop farming, animal grazing, illegal hunting, charcoal burning, firewood, medicinal, honey, fiber materials, poles, fishing etc. extraction. All these human activities have greatly contributed to forest degradation in forested areas all over the world.

Agricultural activities (crop growing and animal keeping), brick making, sand mining, stone quarrying, fish farming, establishment of eucalyptus woodlots and wetland fires are major causes of forests destruction in Rubanda district (UBOS, 2019). These activities are being carried out unbalanced, excessively and inappropriate for the resource.

This, if not checked, may cause an irretrievable loss of the forests and its ecological functions. It is therefore through this study that documented the major activities taking place in areas around the forests and their implications on the natural forest resources base and how to handle them.

1.3 Objectives of the study

1.3.1 General Objective

The overall objective of the study was to examine the effects of local community activities on forest resources of Echuya Central Forest Reserve in Muko Sub county Rubanda district, Uganda.

1.3.2 Specific objectives

1. To identify the forest resources harvested by the local communities from Echuya Central Forest Reserve.
2. To examine the local community activities being carried out in areas around Echuya Central Forest Reserve.
3. To find out the regulations, guidelines and procedures for forest resource access in Echuya Central Forest Reserve.

1.4 Research Questions

1. What are the forest resources harvested by the local communities from Echuya central forest reserve?
2. What are the community activities being carried out in areas around Echuya central forest reserve?
3. What are the regulations, guidelines and procedures for forest resource access in Echuya Central Forest Reserve?

1.5 Justification

The outcomes of the study provided recommendations to policy and decision makers in the forestry sub sector under the Ministry of Water and Environment on the best practices for forest

conservation particularly towards improving community livelihoods. Findings from this study provide relevant information on forest resources of Echuya Central Forest Reserve with the relevant knowledge about the effects of community activities on the forest resources and measures that can be used to conserve and promote the sustainable use of forest resources.

This helped to improve on the livelihood of the adjacent forest communities. This study specifically assessed the effects of community activities on forest resources of Echuya Central Forest Reserve.

1.6 Significance

The findings from the study contributed significantly to the already existing stock of knowledge on community activities and their effects of forest resources. The information was made available for reference by other authors. The study enabled the student attain his master's degree in natural resources management of Nkumba University. Since, for a student to graduate he must undertake a research study as part of the assessment for the academic award.

1.7 Scope of the Study

1.7.1 Time scope

The study was limited to the period of 2011-2021. This is the period where it was reported that community activities directly or indirectly affect the forest resources.

1.7.2 Geographical Scope

The study was conducted in Echuya Central Forest Reserve and local communities in Muko sub-county found in Rubanda District, western Uganda. The choice of the sub-county was informed by reports of community activities having negative impact on the forest resources.

1.8 Unit of Analysis

The households were the unit of analysis. Only households found within 1-kilometer radius from Echuya Central Forest Reserve participated in the study.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter presents the review of the study topic and its objectives i.e. the community activities being carried out around Echuya Central Forest Reserve, the forest resources that communities extract form the forest reserve and the policies and laws put forward to conserve and protect the forest resources in the forest reserve. The literature review was as follows: the first section presents a general literature related to the local community activities in areas around forest reserves, forest resources extracted from forest reserves and then the policies and laws to protect and conserve the forest resources in forest reserve.

2.2 Local community activities in and around forest reserves

The loss of forest resources in form of forestry destruction and deforestation are human induced activities, often related to land use, such as mining, forest production, tourism, fishing, hunting, agriculture. Both practices have speeded up the process of land degradation to satisfy human needs and income, resulting in a decline in worldwide forestry zone and a significant decrease in carbon stowing zone. It was estimated that 20 percent of the forest area decreased due to the above-mentioned activities; further reports showed that many plants and species of animals are currently threatened (De Groot et al., 2009).

Ecotourism can provide local communities with the motivation to maintain and protect forests and wildlife. “Ecotourism has a far greater potential for contributing to income and livelihoods in poor rural communities than what is realized,” noted FAO’s Edgar Kaeslin, a forestry officer working on wildlife and protected area management at FAO. “It is crucial that local people are fully involved in ecotourism activities and receive sufficient benefits from their services.”

However, large numbers of tourist at popular sites can quickly overload ecosystems and damage fragile natural resources, sometimes permanently. Also, there is a risk that powerful players will dominate and squeeze out smaller local operators. In some cases, ill designed “ecotourism” has wittingly or unwittingly introduced negative influences to local people, disrupted local economies and tarnished unique indigenous cultures. In some instances, indigenous peoples have even been displaced or dispossessed of traditional access to natural areas.

Agriculture is vital for livelihoods in Africa (FAO, 2019). The performance and productivity of agriculture (both subsistence sector and the commercial sector) is very low in comparison with other regions like Europe (FAO, 2019). This is among others due to soil fertility as a major constraint on productivity. Wood extraction for domestic fuel wood or charcoal production is a major issue in Africa, because most people still use wood and charcoal for cooking, since there are no other affordable energy sources available (FAO, 2019). Only 7.5% of the rural population has access to electricity (FAO, 2019). The increase in collection of fuel wood is also due to a decline in productivity and subsequent decline in income thus greater dependence on off-farm employment such as collection of fuel wood and production of charcoal.

In central Africa commercial logging has increased between 1990 and 1997 and the volume of timber exported annually from countries of the Congo basin has increased ten-fold (Lobet, 2019). Commercial logging is mostly carried out by large international companies primarily from Asia, which buy or rent the land in order to harvest the timber. According to (Laporteetal. 2017) industrial logging has become the most extensive land use in Central Africa, with more than 600,000 square kilometers (30%) of forest currently under concession.

Development of infrastructure has also led to commercial logging and timber production in Africa carried out by large international companies which are closely connected to the development of infrastructure. These companies create new roads in the areas they operate in. Though transport extension is not aimed at promoting human settlement, road construction creates easy access for settlers, who colonize the areas around the newly implemented roads after logging activities are finished. In the republic of Congo, the rate of road construction has increased from 156km per year during the 1976 to1990 period to 660 km per year after 2000. In the Democratic Republic of Congo rates of logging for road construction increased from 336km per year during 1986 to 1990 period to456 km in 2000-2002 (Laporte et al. 2017).

2.3Forest resources harvested from forest reserves.

Globally, the forested area dedicated to the production of wood and non-wood products dropped from 1.16 billion hectares to 1.13 billion hectares over the 2000-2010 periods (UNEP, 2012). This decline, also evident at the regional level, is due largely to the deforestation associated with the expansion of the agricultural frontier, poor forest management practices, fire, excessive firewood extraction and illegal cutting. The land area covered by tree farms, however, grew more rapidly in Latin America between 2000 and 2010 (3.23% annually) than in any other region of the world (UNEP, 2010). Historically, there have been two major causes for the destruction of tropical rainforests. First, much prime forest land has been lost from conversion to farmland and encroachment by settlers (Repetto et al, 2008). Second, logging and extraction of forest products by commercial and local interests have been an important cause of deforestation (Repetto 2008, World Bank, 2008). Excessive logging has led to reduction of forest cover, creating appropriate conditions for encroachment and habitation (Poore and Sayer, 2011). Expansion of agriculture may continue to be the major cause of the loss of biodiversity in countries like Uganda which has large tracts of land under forests. However, in many developing countries, only a few natural rainforests remain intact and encroachment possibilities are limited (Repetto and Gillis, 2008).

The contribution of forest resources to the livelihood strategies of poor people has long been appreciated as significant. Most rural poor people rely directly and indirectly on forests for their livelihoods. How to ensure that poor people have rights and opportunities to access forest resources, as well as responsibilities for the sustainable management of forest resources, has become a central question in debates (Shimizu and Trudel, 2006; Tevera and Mukora, 2007). People in most developing countries often depend on extracting resources from nearby forests for their livelihoods, whether for consumption or fuel wood, or as a source of income. Community or social forestry relates to forestry activities by rural people in the local environment. It involves community and individual participation in the planning, execution and management of a variety of social and economic forestry elements (Tevera and Mukora, 2007) It is people's needs which, in theory, determine tree planting and harvesting priorities. People are seen as partners in the planning and management of forest resources, rather than as resource exploiters to be controlled or excluded.

Forestry can play a significant role for the wellbeing of the people living in and around the forest areas, and conversely, these people can play a major part in making the forests around them more productive. Managing forests primarily with a view to protecting, developing and utilizing them is sustainable forest management.

Non-wood forest products (NWFPs) include medicinal plants and raw materials for pharmaceutical products; other plant-based products, including foods, spices, herbs, fodder, fibers, fragrances, seeds, resins and oils; and animal-based products such as bush meat, hides, honey, beeswax and edible insects. In 2011 NWFPs generated an estimated US$88 billion in income world-wide, though this probably an under-estimate. About 80 per cent of the population of the developing world uses NWFPs for health and nutritional needs and in 2011 forest products contributed to the provision of shelter for an estimated 1.3 billion people (FAO's Global Forest Resources Assessment) NWFPs tend not to feature on the policy agenda, but some countries have adopted specific national strategies, promoting their sustainable use and fostering the development of small-scale non-wood forest enterprises.

Wood Forest Products like biomass for wood energy, sawn hard wood, sawn soft wood, wood based panels, paper, paper board and wood pulp and value added wood products (FAO's Global Forest Resources Assessment, 2011).A worldwide rise in demand for forest products in 2013 resulted in the highest timber harvest in the whole world in six years. Both producers of round wood and consumers/importers are vitally interested in the economics of forest products conversion and comparative advantage. Both seek opportunities to 'capture' the benefits of primary and secondary processing for the benefit of local income generation and employment. Traditionally, converted forest products have followed a typical hierarchy from simple forms of solid wood such as sawn wood to partially restructured wood as veneers and panels, and further to various re-constituted products such as particleboard and fiberboard. Alternatively, wood may flow directly into primary fiber utilization through pulping and potentially paper and paperboard.

2.4Regulations, Guidelines and Procedures for forest resource access

The institutional and legal framework connotes the systems of formal laws, regulations, procedures, informal conventions, customs and norms that shape Socio economic activity and behavior. It is the broad system of rules that governs and regulates decision making, agreements, laws and legislations relating to management of forestry resources, the international legal dimensions of forest conservation among which include the African Conventions and more other international and globally recognized conventions on forest protection and management. Several African states over the years have been facing problems regarding the environment. The states in realizing this acknowledged their duty to harness the natural and human resources of Africa and as such they came up with the appropriate means of conserving and protecting the forest cover through conventions.

Lawry (2010) argues that where forest habitats have little economic value to local people because of restrictive access rules, sustainable local management institutions are unlikely to emerge. Incentives for conservation by local people can be improved by increasing the value of the resource to local people by, for example, granting more access rights or by granting local communities a percentage of forest concession revenues. Deforestation in developing countries, the largest source of emissions from the forestry sector, has remained at high levels since 1990 (FAO, 2015). The causes of tropical deforestation are complex, varying across countries and over time in response to different social, cultural, and macroeconomic conditions (Geist and Lambin, 2018). Broadly, three major barriers to enacting effective policies to reduce forest loss are: (i) profitability incentives often run counter to forest conservation and sustainable forest management (Tacconi *et al.*, 2016); (ii) many direct and indirect drivers of deforestation lie outside of the forest sector, especially in agricultural policies and markets (Wunder, 2014); and (iii) limited regulatory and institutional capacity and insufficient resources constrain the ability of many governments to implement forest and related sectoral policies on the ground (Tacconi *et al.*, 2016).

Forest resource protection in many countries addresses issues from the definition of the forest, to the establishment of the government agencies responsible for aspects of forest policy and

management, to the creation of mechanisms for conflict resolution, and other concerns (FAO'S Global Forest Resources Assessment 2015).

While it is tempting to call all threats to the world's forests 'illegal', it would be an unhelpful oversimplification to assert that violations of forest resource protection are the only, or even the most important hazards. Even where regulations are violated in the course of forest destruction or degradation, more intricate and elaborate chains of causation, involving poverty, environmental change, competing demands and other forces are also at work.

Forest policy pro**c**esses, such as the UN Forum on Forests, and the International Tropical Timber Organization have provided support to national forest planning efforts but have not yet had demonstrable impacts on reducing deforestation (Speth, 2017).The World Bank has modified lending policies to reduce the risk of direct negative impacts to forests, but this does not appear to have measurably slowed deforestation (WBOED, 2020).The World Bank and G-8 have recently initiated the Forest Law Enforcement and Governance (FLEG) process among producer and consumer nations to combat illegal logging in Asia and Africa (World Bank, 2015). It is too early to assess the effectiveness of these initiatives on conserving forests stocks. The Food and Agricultural Organization (FAO) Forestry programme has for decades provided a broad range of technical support in sustainable forest management (FAO, 2016); assessing measurable impacts has been limited by the lack of an effective monitoring programme (Dublin and Volante, 2014).

In countries where institutional and regulatory capacities are insufficient, new clearing by commercial and small-scale agriculturalists responding to market signals continues to be a dominant driver of deforestation (Wunder, 2014).A number of national initiatives are underway to combat illegal logging (Sizer *et al.,* 2015). While these have increased the number of charges and convictions, it is too early to assess their impact on forest degradation and deforestation. Legally protecting forests by designating protected areas, indigenous reserves, non-timber forest reserves and community reserves have proven effective in maintaining forest cover in some countries, while in others, a lack of resources and personnel result in the conversion of legally protected forests to other land uses (Mertens *et al.,* 2014).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter is divided into several sections addressing the research design, location of the study, study population, sample size and sampling methods, data collection procedures, data analysis, methods of quality assurance in the form of reliability and validity, ethical issues, and limitations. "The chapter provides a description of the research type, presents the research design and the methods used to collect and analyze data. Both qualitative and quantitative approaches were used in this study. Therefore, the study adopted mixed-method design. The chapter further presents information on the research procedure, data collection procedure, and the sampling design. Primary data collection methods and secondary data collection methods are enlisted in this chapter. The chapter also contains a discussion on how data shall be validated, its reliability, and the ethical considerations that were involved. Some anticipated challenges to data collection are also stated. Burton and Bartlet (2009) emphasizes that it's important for the researcher to develop proper guidelines and methodology so as to remain focused.

3.2 Research Design

Cross-sectional research design was adopted to ensure that data is collected from different communities within a radius of 1km from the forest reserve. The respondents were randomly selected from three parishes of Karengyere, Kagaano and Ncundura which are neighboring Echuya Central Forest Reserve. Respondents that participated in the study were communities living within a radius of 1 km from the boundary of Echuya Central Forest Reserve. Both qualitative and quantitative approaches were adopted while conducting the study.

The study used a questionnaire survey, observation techniques and semi-structured interviews to collect the data. Interviews were the main method of data collection for all the objectives of the study. Key Informant Interviews were also conducted with Rubanda District Natural Resources Department officials. Observation checklist was also used to help in identifying community activities carried.

3.3Study Area

Echuya Forest Reserve is situated in Bufumbira County in Kisoro District and RubandaCounty. The southern end runs along the north-eastern border of Rwanda. The forest lies between 1'14' - 1'21' S and 29'47' - 29'52'E, covers an area of 34 km, and has an altitudinal range of 2270 - 2570 m. It is situated on the high altitude range running between Lake Bunyonyi, 5km to the East, and Mgahinga Gorilla National Park, 13 km to the south west. It is 11 km east of Kisoro and 15 km west of Kabale town. The main Kabale - Kisoro road passes through the northern end. The forest lies at the heart of the biodiversity rich Albertine rift eco-region and is a site of global biodiversity importance and hence is categorized by Bird Life as an important Bird Area because of the high diversity of bird species, some of which are globally threatened and endemic.

Echuya is particularly known for its high quality bamboo, *Yushania alpina*. There are also areas of broad-leaved forest, particularly along the Eastern side and higher altitude northern end of the Kabale - Kisoro road. The forest cover is approximately 80% mature *Macarangakilimandscharia* and *Hageniaabyssinica* forest and 20% mountain bamboo *Yushaniaalpina*. The forest is surrounded by areas with a very high rural population density that depends entirely on natural resources and forest products for their basic livelihood needs e.g. firewood, bamboo for construction, medicinal plants to mention a few). Most of the landscape around Echuya has been deforested, leaving the Central Forest Reserve as the only local source of forest products. The surrounding communities have been using forest products unsustainably due to lack of alternative sources of livelihoods.

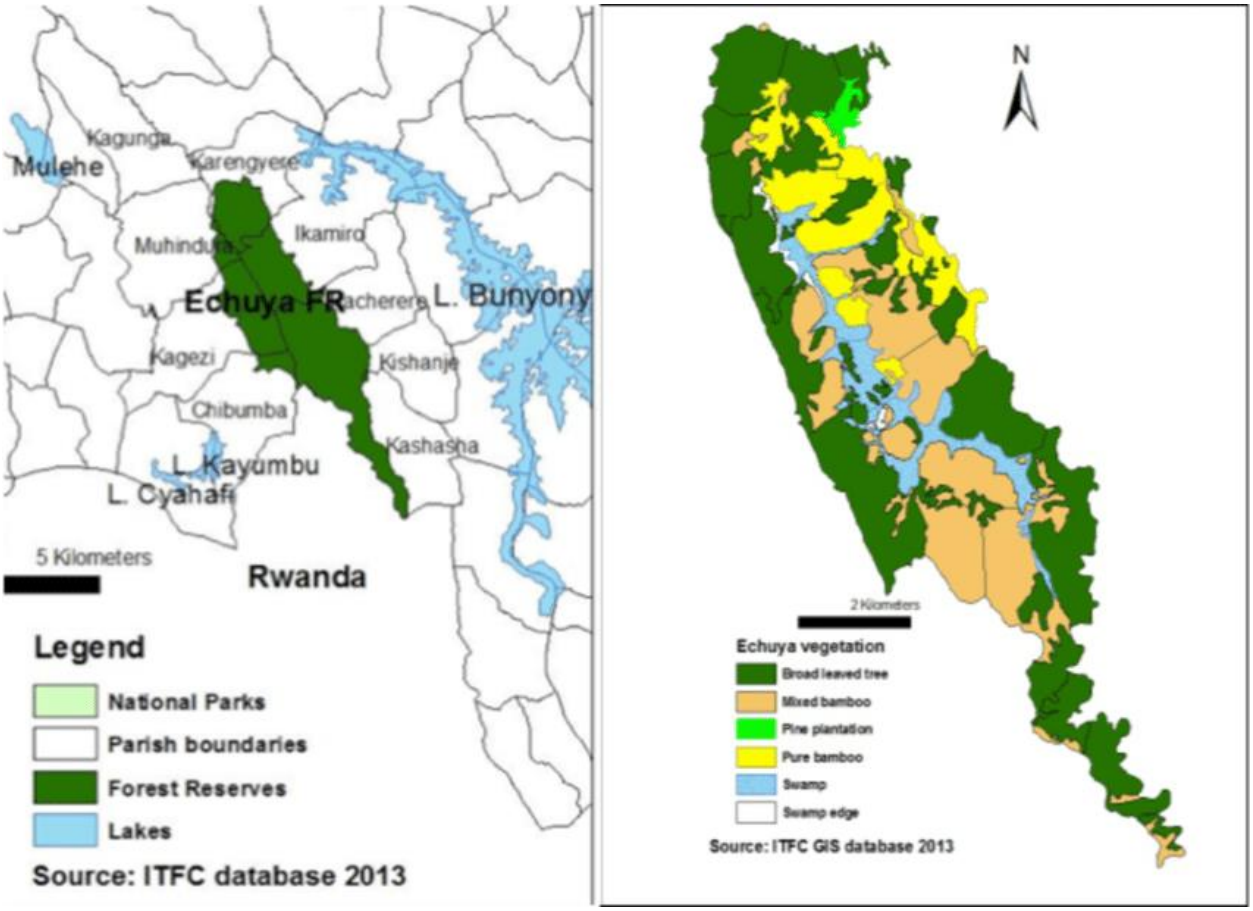

Plate 3.1 Map of Echuya Central Forest Reserve. Source: Google map, 2021

3.3.1 Climate

The climate is tropical with two rainfall peaks from March to May and September to November. Annual mean temperature range, minimum: 7-15°C, maximum: 20-27°C. Annual rainfall: 1,400-1,900 mm. Echuya Central Forest Reserve (ECFR) is a unique Afromontane habitat and an area of high endemism (Plumptre et al., 2003).Geologically the area is associated with up warping of the western rift valley, and its underlying rocks are generally phyllites and shales, with some quartz, quartzite and granitic outcrops of the Karagwe-Ankole System. The soils are predominantly humic red loams, moderately to highly acidic and deficient in bases. The climate is tropical with two rainfall peaks from March to May and September to November. Annual mean temperature range, minimum: 7-15°C, maximum: 20-27°C. Annual rainfall: 1,400-1,900 mm.

3.3.2 Vegetation

The swamp vegetation was dominated by sedges Carex and includes tussock vegetation and giant lobelias. The swamp drains north-west into the Murindi river. The reserve is dominated by *Hagenia-Rapanea* moist montane forest and montane bamboo *Arundinaria*. Banana and Tweheyo (2001) described Echuya as dominated by bamboo, *Sinarundinaria alpina*, and where this is less dense there are woody and herbaceous plants. There are areas of broad leaved forest trees, particularly along the eastern side and at higher altitude northern end, north of Kabale to Kisoro road. The forest also contains the large Muchuya Swamp that runs north to south along the centre of the reserve and drains it to the south. The reserve is surrounded by densely populated agricultural land.

Echuya Central Forest Reserve (ECFR) is a unique Afro-montane habitat and an area of high endemism (Plumptre et al., 2003). However, high human population density, extreme poverty and heavy dependence on forest resources by neighboring communities exert immense pressure on the forest reserve. Based on existing literature, Plumptre et al. (2003) compiled the known species' information for seven taxa in ECFR. The same study also reported intense human illegal activities, which were associated with changes in habitat structure and declining trends (and loss) of flora and fauna species.

3.3.3 Topography

It is one of the highland Districts of Uganda and its topography is mainly green, interlocking and heavily cultivated hills with spectacular valleys. The District covers a land area of 660.2 sq. km. The altitude of the District ranges between 1,219 metres (3,999 ft) and 2,347 metres (7,700 ft) above sea level. Located in the South Western region of the Republic of Uganda, Rubanda District borders with Kisoro to the West, Rukungiri and Kanungu to the North, Kabale to the East and the Republic of Rwanda to the South. The people are predominantly Bakiga, but also the Batwa (Pygmies), the Banyarwanda and the Bahororo tribes exist in the district.

3.4 Study's Target Population

Respondents were selected from Muko sub-county. This was the target population for assessment on the effects of community activities on the forest resources in Muko Sub County. Muko sub-county was selected purposively, because it contained the highest number of communities (households) that live near the forest reserve (Tweheyo, 2018). Using Slovin's formula a sample of 400 respondents has been determined from a population of 1346households. The District Forestry Officer and District Environmental Officer, plus Sub-County Production Coordinator of Muko were also selected purposively based on the nature of their work which relates to the topic under investigation. The study population is distributed as shown in Table 1.

Table 3.1: Distribution of the Target Population

Category	**Target population**	**Actual sample**	**Method of enrolment**
Communities around EFR	13,346	400	Simple random sampling
District Environment Officer	01	01	Purposive sampling
District Agricultural Officer	01	01	Purposive sampling
Sub-county production officers	01	01	Purposive sampling

Source: primary data 2021.

3.5 Sampling

The study area had 13,346 households (UBOS, 2018). From these, a sample size of 400respondents has been calculated to participate in the study. From these households, a sample of 400 respondents has been selected to participate in the study; calculated using Slovin's the formula:

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{13346}{1+13346(0.05)^2}$$

$$n = 13346$$

$1+13346(0.05)^2$

$n = \frac{13346}{1+13346\ (0.0025)}$

$n = \frac{13346}{1+13346\ (0.0025)}$

$n = \frac{13346}{13347\ (0.0025)}$

$n = \frac{13346}{33.675}$

n = 400

3.5.1 Exclusion Criteria

Households living within a radius of 1 km far from the forest reserve were not selected because they may not be frequently depending on the forest reserve for survival.

3.5.2 Inclusion criteria

Only households living within a radius of 1 km to the forest reserve were selected for the study because they mainly depend on the forest reserve for survival.

3.6 Data Collection Methods

Data was collected through a household questionnaire survey; key informant interviews, observation, and photography methods complemented the household questionnaire to collect primary data.

3.6.1Questionnaire Method

A semi-structured household questionnaire was designed in accordance with the study objectives which shall be stated as themes. The household questionnaire contained both closed and open-

ended questions to ensure collection of sufficient data from the 400 respondents. The questionnaire was researcher-administered with help of research assistants.

3.6.2 Interview Method

General interviews were conducted with 400 respondents from Muko sub-county. Interviews aimed at comparing and enhancing responses generated from other methods such as photographs and questionnaires.

3.6.3Observation method

During fieldwork, the researcher took photographs on activities being carried out around the forest reserve. Photographs were part of qualitative data that support quantitative data generated from household questionnaires.

3.7 Quality Assurance (Validity and Reliability Tests)

Semi-structured interviews were conducted on a one-on-one basis with the 4 key informants to ensure that reliable data was collected. Key Informants Interviews involved the District Environmental Officer, District Forestry Officer, and the Sub-County Production Coordinator of Muko Sub County. Pre-testing was done to ensure validity of major variables in the household questionnaire. Later, after pre-testing, the reliability and validity of the research tool (household questionnaire) was subjected to a Content Valid Index (CVI) test using Cronbach's Alfa. This helped to ensure that the variables in the questionnaire are appropriate and shall produce valid and reliable results.

3.8 Data Processing

Raw data collected during fieldwork was edited to correct any mistakes and errors which could have happened during data collection. This helped to ensure consistence and accuracy of data collected to minimize error during analysis. Interviews were transcribed into excel coding matrix for analysis. The coding matrix helped in determining of themes per each study objective. Numerical codes were assigned to quantitative data; the data was edited, and entered to computer analysis package SPSS version 20. Interview data and that collected through observation was transcribed in form of field notes and used to support discussion of results.

3.9 Data Analysis

Quantitative data was analysed using SPSS, where qualitative data from interviews was analysed thematically using content analysis. Descriptive analysis was used to determine the community activities around forest reserves (objective 1), and to assess the forest resources extracted from the forest reserves (objective 2) and policies and laws put forward to conserve and protect forest reserves.

3.11 Ethical Considerations

The researcher obtained informed written consent from respondents to participate in the study; consent was designed for respondents to sign on condition that the researcher shall ensure anonymity during interviews, and continuously inform the respondents that the study was solely for academic purposes, and that their participation is voluntary. Conducting research ethically ensures that respondents provide information freely without bias (Resnik, 2015).At every stage of data collection, the researcher introduced the purpose of the study, and informed the respondents before interviews, and administration of questionnaires the benefits of the study, and their voluntary participation. A consent form was designed for respondents to sign in before participating in the study.

Confidentiality*:* To gain respondents confidence to participate in the study, participants were informed that the study was purely for academic purposes.

Anonymity*:* During interviews, the researcher used pseudo names for interviewees, as a way of keeping them anonymous. This was aimed at ensuring free expression of respondents to collect as much data as possible. The respondents were briefed to pick pseudonyms which were agreed upon and selected at the beginning of each interview. The researcher ensured that audiotapes of interviews and transcribed material are kept safely at all times during and after fieldwork.

CHAPTER FOUR: RESULTS AND FINDINGS

This chapter presents the findings of the study including of bio-data of the respondents, the forest resources extracted from the Echuya central forest reserve, the kind of community activities carried out around Echuya Central Forest Reserve and the policies and laws put forward to protect and conserve the forest resources of Echuya Central Forest Reserve.

Plate 4.1: Entrance of Echuya central forest reserve with a sign post. **Source:** Primary data, 2021

4.0 Demographic Characteristics of Respondents.

4.1. Distribution of respondents by parish.

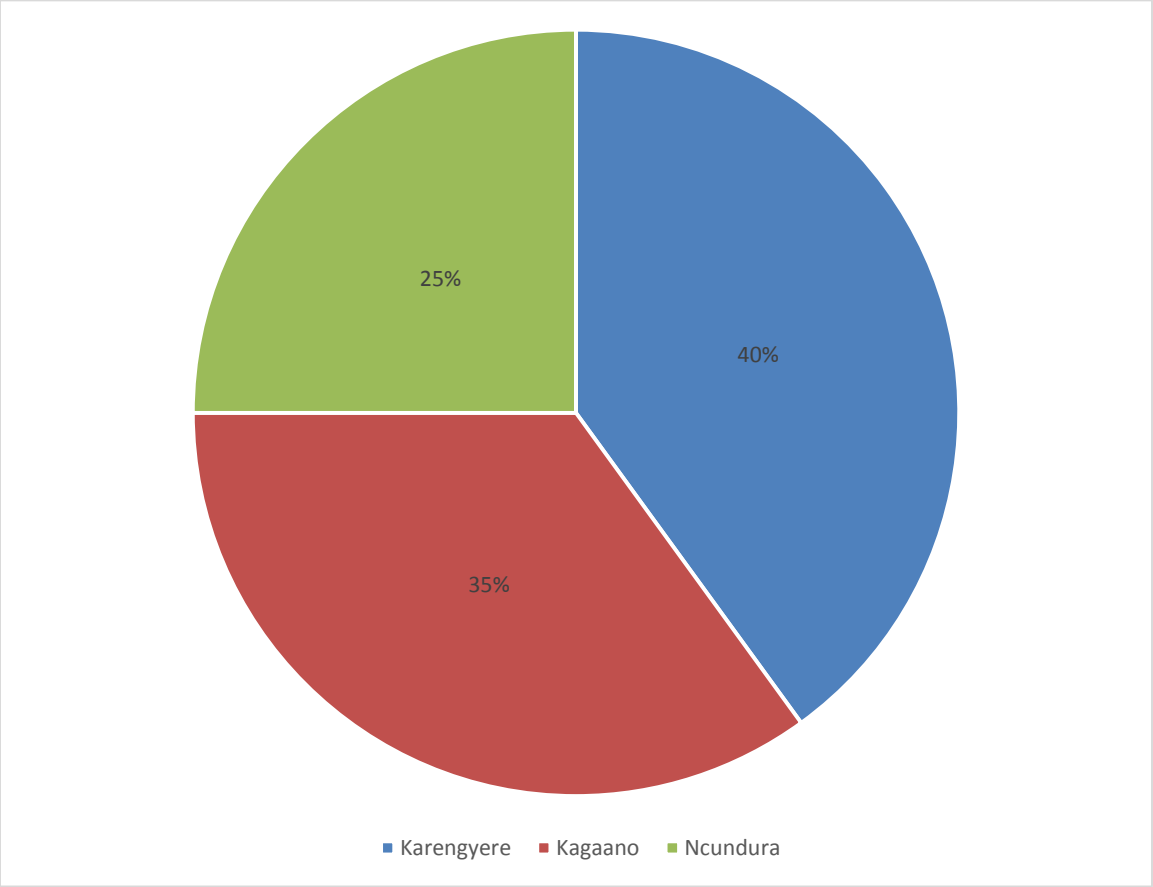

Figure 4.1 Distribution of Respondents per parish

Source: Primary data, 2021

During the study, the research identified respondents in areas around Echuya central forest reserve correlated with the population statistics. As seen in figure 4.1, a significant number of respondents (40%)-160 respondents were from Karengyere Parish-the most densely populated parish because of being a trading centre and 35% (140 respondents) from Kaagano parish and 25%(100 respondents) from Ncundura as shown below by the pie chart.

4.1.2 Respondent's level of education and knowledge on forest resources conservation and management.

Table 4.1: Respondent's level of education and forest resources conservation and management knowledge.

PARISH	Percentage (%) of literate respondents (above primary level)	Knowledge on forest resources conservation Practices (Number of respondents)	
		YES	NO
Karengyere	40%	130	30
Kagaano	35%	120	25
Ncundura	25%	80	15
Total	100%	330	70

Source: (Primary data, 2021)

There was a great correlation between the levels of education with basic knowledge on forest resources conservation and management practices. In Karengyere for instance, most respondents with a higher level of education at 70% have some knowledge on forest resources conservation and management unlike the other parishes. The literacy level of respondents has improved especially in the trading centre parish of Karengyere; however, this trading Centre parish has the largest number of respondents with ordinary level education up to tertiary institutions (40%), Kagaano parish (35%) and Ncundura parish (25%) of the sample.

4.1.3 Distribution of settlement types by parish.

Table 4.2: Distribution of settlement type by parish

Parish	Number of households basing on settlement type		
	Congested households	**Middle Income households**	**High Income households**
Karengyere	155	40	25
Kagaano	65	30	15
Ncundura	35	25	10
TOTAL	**255**	**95**	**50**

Source: Primary data, 2021

Furthermore, the high concentration of businesses and people in Karengyere trading centre shows that most congested households (60%) are found in this parish with an increasing proportion of middle income settlements in the parishes of Kagaano and Ncundura respectively and this clearly relates to the level of tenancy and occupancy. In most trading centres of Uganda, most of the people are tenants who rent houses either for small scale businesses or living houses (UBOS, Report, 2017). In high and middle income zones, most households are landlords or permanent owners.

4.1.4 Age and Sex distribution of respondents per parish

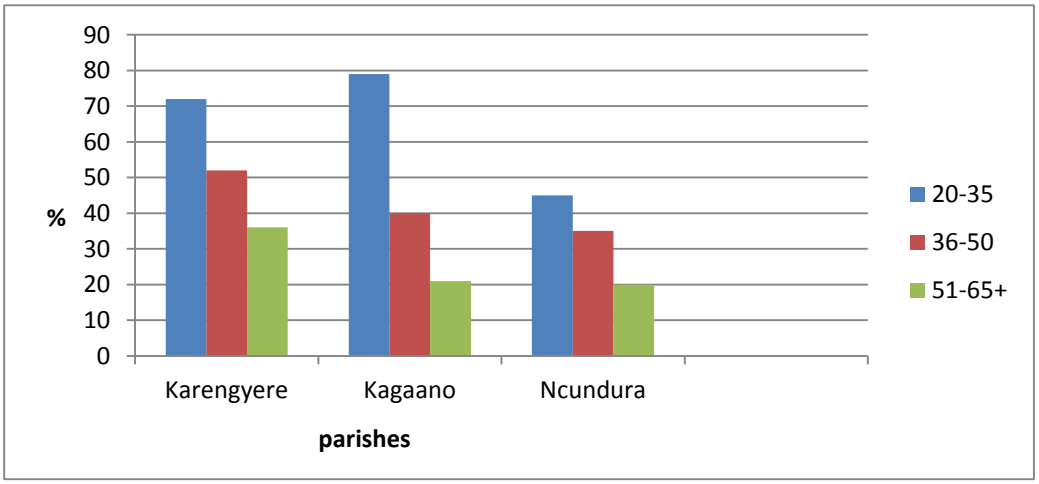

Figure 4.2: Distribution of the age of respondents per parish. Source: Primary data, 2021.

Most of the respondents were youth accounting for 2/3 of the total sample. Basing on the sample, Karengyere parish has 45% (72/160 respondents) of the inhabitants as youth, 52/140 respondents were middle aged and 36/100 respondents were the elderly. Kagaano parish with 35% (79/140 respondents) of the inhabitants as youth, 40/140 respondents were middle aged and 21/140 respondents were the elderly. Ncundura parish with 45/100 respondents as youth, 35/100 respondents middle aged and 20/100 respondents as the elderly.

Table 4.3: Distribution of gender per parish.

Parish	**Distribution of gender of respondents per parish**	
	Male	Female
Karengyere	65	95
Kagaano	52	77
Ncundura	43	68
TOTAL	**160**	**240**

Source: Primary data, 2021

In relation to the gender dimension of respondents, a large proportion of the respondents were female (60%) to males (40%). According to the UBOS Report (2017), women are the major social group in most districts of Uganda for example, Rubanda district in particular. The study considered a relatively higher percentage of women because they were the readily available group at the homesteads during the administering of respondent's questionnaire interviews. The largest percentage of female respondents was in Karengyere parish and the smallest was in Ncundura parish.

4.2.1 Forest resources harvested from the forest reserve by the local communities

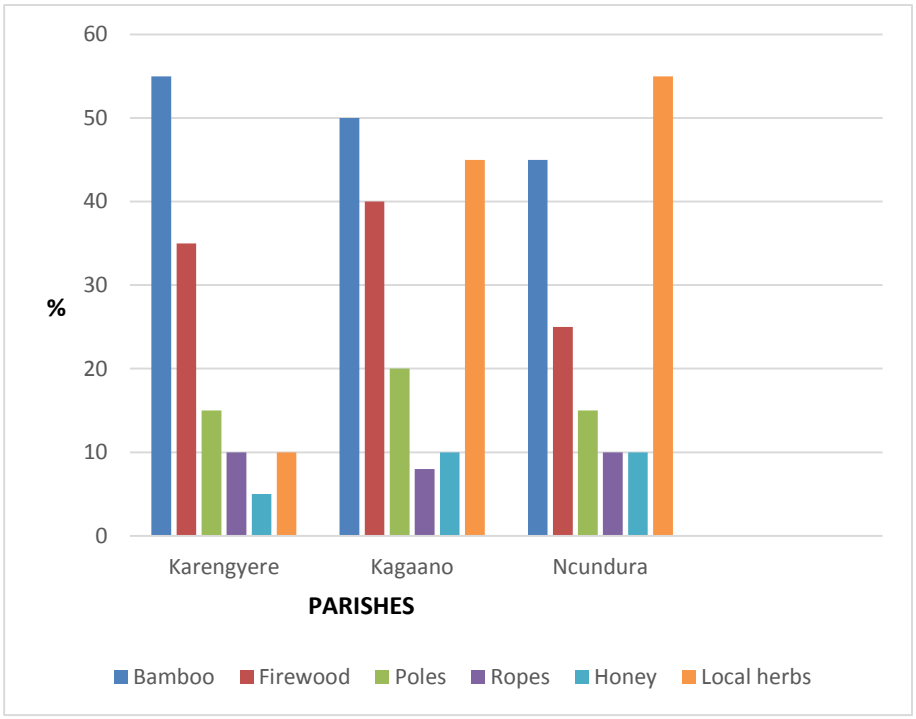

Figure 4.3: Forest resources harvested from Echuya Central Forest Reserve

Source: Primary data, 2021

The characterization of forest resources extracted by respondents indicated that the commonest forest resource extracted by respondents in all parishes is bamboo at 70% (*Bambusa vulgaris*) by (Mellisa Petruzello, 2013). The respondents from all parishes further explained to me that bamboo is the most extracted forest resource because of its high demand by granary and harvesting baskets weavers who buy it in large quantities. The District Forestry Officer however narrated that locals around echuya forest reserve have been encouraged and supported to plant their own bamboo in their private land to reduce on the pressures on the forest reserve.

Plate 4.2: Bamboo bundles being inspected before they are taken by the locals

Source: primary data 2021

This is followed by biomass firewood at 20% which is also increasing especially in the parishes of Kaagano and Ncundura because it's the only available source of energy to the locals. The locals are advised to only pick small tree branches that fall down but not cutting down trees. According to the District Forestry Officer, biomass being the immediate source of energy to the locals, there is high demand for its which has greatly affected the existence of the forest reserve.

Plate 4.3: Batwa women carrying firewood harvested from Echuya central forest reserve

Source: primary data 2021

Poles were also mentioned by the respondents which are extracted mainly for building temporary houses for the locals. Some locals go into the forest to get poles for building harvesting granaries for storing dried food stuffs like maize, sorghum and millet.

Respondents also mentioned ropes which are got from muvule shrubs and are used for weaving granary top covers. These ropes are dried up first and after water are applied onto them to soften them during weaving of granary top covers and harvesting baskets and winnowing baskets. Natural honey collection was also mentioned by (Batwa) respondents in Ncundura parish mainly. This honey is basically used as a food supplement and curing some diseases like cough. The natural honey is collected from inside tree stumps that have been colonized.

Local herbs were also mentioned by the respondents during my study. Diseases like malaria fever and skin rush among babies are mainly treated by these local herbs from the forest reserve.

These locals mainly collect mahogany and muvule leaves, boil them first and give to the sick to cure some of these diseases.

4.2.2 Community activities carried out in areas around Echuya central forest reserve.

Table 4.4: Community activities practiced per parish

Parish	Community activities practiced in the areas					
	Crop farming	Grazing	Brick making	Stone Quarrying	Sand mining	Total
Karengyere	25	40	35	40	40	**180**
Kagaano	55	30	25	20	15	**145**
Ncundura	20	20	15	10	10	**75**
Total	100	90	75	70	65	**400**

Source: Primary data, 2021

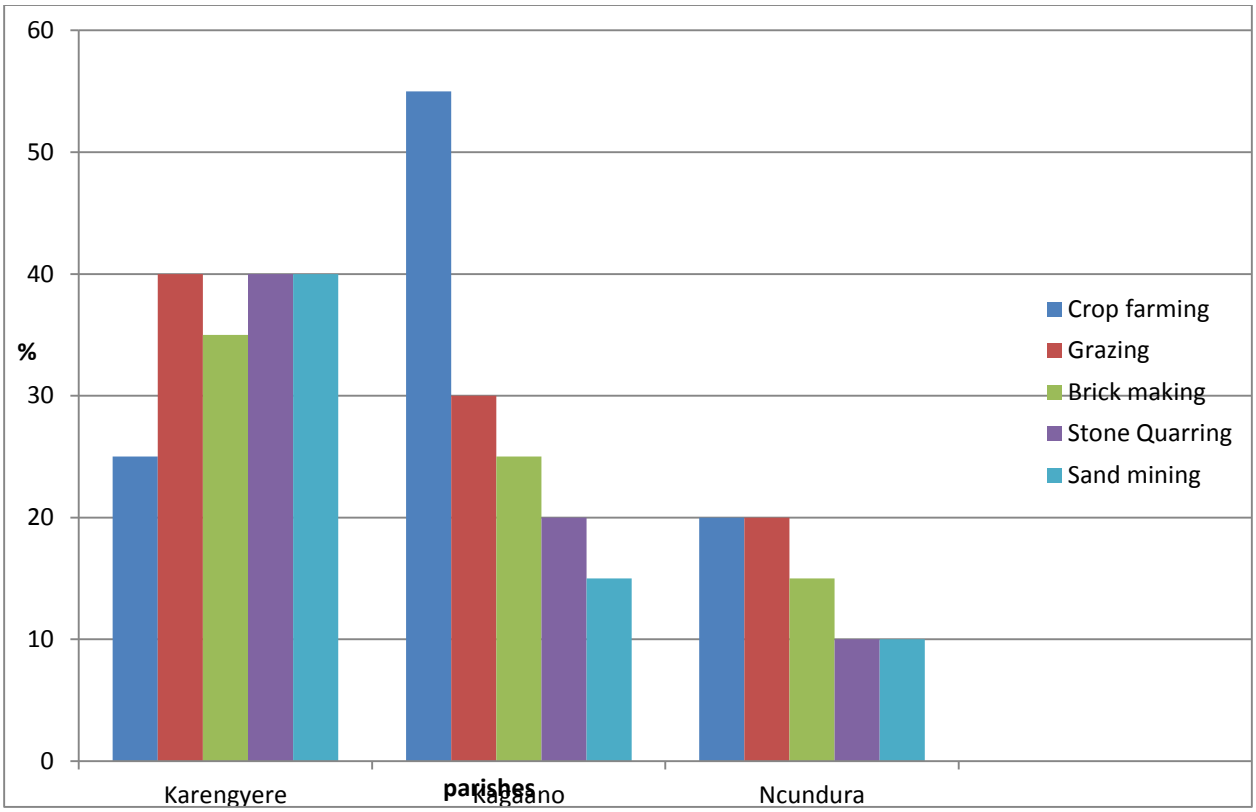

Figure 4.4: Community activities carried out in areas around Echuya central forest reserve
Source: Primary data, 2021

During my study, about 45% of the respondents indicated that crop farming was mainly in Kagaano (30%) and Ncundura (15%) parishes of Muko Sub County because of the availability of land for cultivation in these parishes. It was established that since these parishes are sparsely populated, land is still available and fertile.

Crops like Irish potatoes, sweet potatoes and sorghum are mainly considered for food and cash. Other economic activities like sand mining, animal rearing, stone quarrying and brick making are also practiced but in smaller quantities.

In Karengyere trading centre parish, crop farming is not common because of limited land space for cultivation. Mainly brick making (15%) and sand mining (15%) are practiced in the available small fragmented plots. Other economic activities like stone quarrying and brick laying are also practiced but in small quantities.

One District Officer reported that farmers in communities around Echuya central forest reserve have always been advised to plant agro forestry crops together with trees. However, only 15% have responded to plant crops with trees. He further explained to me that failure to adopt agro forestry in these Echuya parishes has greatly contributed to the encroachment of the forest reserve for survival by community members.

Plate 4.4 Women in Kagaano parish cultivating land for planting around Echuya central forest reserve. Source: primary data 2021

4.3.1 Guidelines and procedures put forward to protect and conserve the forest resources of Echuya central forest reserve.

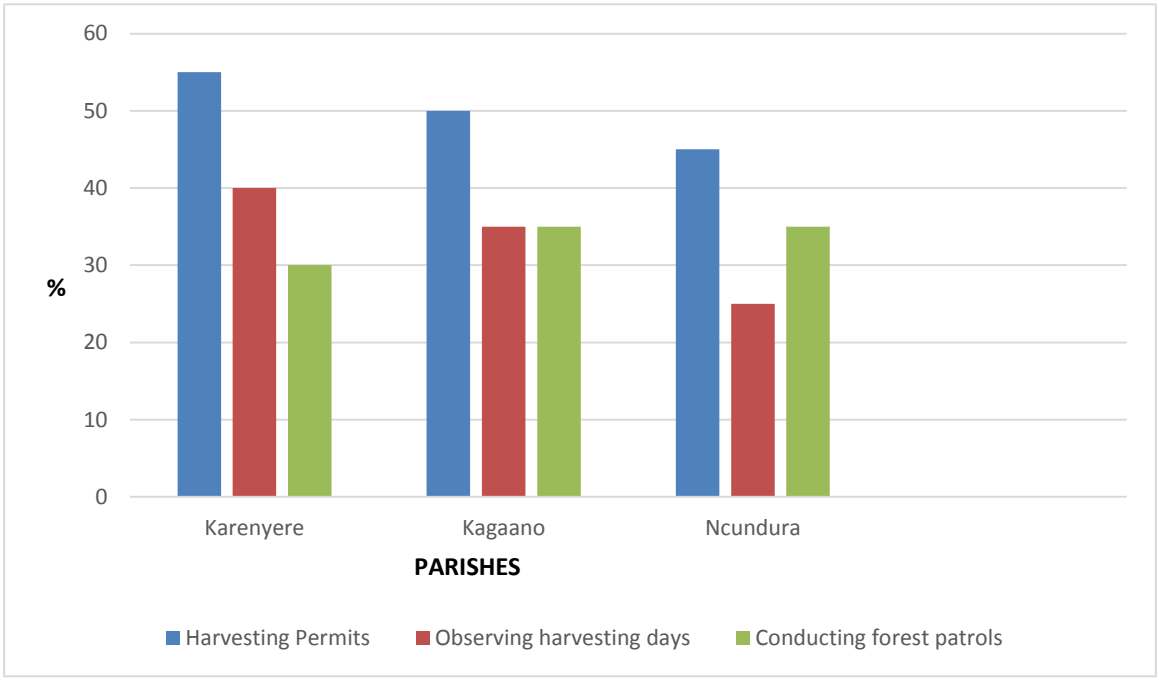

Figure 4.5: Guidelines and Procedures put forward to conserve forest resources of Echuya Central Forest Reserve. Source: Primary data, 2021

The study found out that the most key policy guideline effective for forest resource extraction from Echuya central forest reserve at the time of data collection was the use of monitoring resource harvesting permits, observing harvesting days (Wednesdays) and conducting forest patrols. Harvesting permits are issued by National Forestry Authority supervisor in all the three parishes of Karengyere, Kagaano and Ncundura. He also ensures that the community members around Echuya central forest reserve observe the harvesting days (Wednesdays).

According to one respondent, some community members around Echuya central forest reserve are mandated to conduct forest patrols in all forest compartments, identify areas that have been encroached, and reporting encroachers to National Forestry Authority.

He however reported to me that sometimes forest patrols can be abrupt so as to be able to arrest encroachers like poachers, unauthorized bamboo cutters, poles cutters, bush burners and charcoal

burners. He narrated that this has greatly helped them to protect and conserve the Echuya central forest reserve.

He further narrated that tree planting programmes have been introduced in these communities but communities respond slowly. About (15%) of these communities have responded which has greatly affected the survival of Echuya forest reserve.
However, one District official reported that limited budget allocations to the natural resources department of the district by government has also contributed to low implementation of some these projects and programmes like tree planting.

It was established that National Forestry Authority signed a memorandum of understanding with people living next to Echuya forest allowing them to access it. Echuya Forest was surrounded by Bakiga in Rubanda, Bafumbira in Kisoro and the Batwa communities.
Echuya Central Forest Reserve is known as a major tourist destination because it is a habitat of various bird species. Echuya forest has been out of bounds to residents. One resident of Karengyere village says that under the new arrangement they were allowed to access the forest for some resources like bamboo and also share some of the funds raised from tourists visiting the forest.

Another resident of Kagaano Parish said that under the collaborative management system, the community was expected to put up infrastructure in the forest such as welcoming centers for tourists, and walk boards. The officer in charge of South Western National Forestry Authority said that under the collaborative forest management the community owns the forests and was allowed to preserve it. He said that the memorandum also allows residents to collect bamboo, firewood, put up beehives and collect herbs for medicinal from the forest.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

5.1Introduction

This chapter presents a summary of findings, conclusions and recommendations. The summary is based on the findings of the study objectives and the recommendations are based on the discussion of the findings and analysis of the data as well as interpretation of the findings addressing the research questions that the study aimed to explore and explain.

5.2 Discussion of research findings.

Forest resources conservation and management is an increasing phenomenon in forest conservation and management globally that requires integrated and drastic measures and strategies to manage. This has been evident through the myriad strategies and techniques that responsible authorities and individuals have cropped out to achieve. Basing on current research findings, it is evident that forest resources conservation and management in Uganda and the world is a very big challenge to individuals, and responsible authorities in Rubanda district- despite the gross target of promoting conservation and management strategies to conserve the environment.

This calls for systematic development of processes and systems that aim at increasing efforts by the central government, local governments and different stakeholders at parishes and local communities to increase knowledge, and willingness for proper conservation and management of forest resources. However, despite the relatively clear framework in forest conservation at district level, the study identified gross disparity in the level of forest conservation knowledge amongst households and limited cooperation. Hence, implementation and enforcing of proper forest resources conservation and management in Rubanda district is still lacking.

5.2.1 Forest resources extracted from Echuya Central Forest Reserve.

The study found out that the most common forest resource extracted from Echuya central forest reserve is bamboo in all the three parishes of Karengyere, Kagaano and Ncundura. However, there is an increase in bamboo harvesting in Karengyere parish being a trading centre and densely populated compared to other parishes. This finding directly correlates with a study done

by Tweheyo and Turyahabwe, 2018 that found out that there is a spatial variation in forest resources harvesting (bamboo mainly) in Echuya central forest reserve part of Kisoro district. Although local authorities contend that there is a human resource gap in forest resource conservation and management, respondents critically argued that less transparency and bureaucracy from the responsible authorities partly account for the irregular forest resources conservation and management.

5.2.2 Community activities being carried out around Echuya central forest reserve.

The study identified various community activities practiced in areas around Echuya central forest reserve in Muko sub county, Rubanda district. It was established that crop farming was the predominant community activity practiced in the parishes of Kagaano and Ncundura to a larger extent. However, in Karengyere, sand mining was established as the most predominant community activity practiced on a large scale alongside other activities like brick laying.

5.2.3 Policy guidelines and procedures put forward to conserve and manage forest resources of Echuya central forest reserve.

The study found out that the most common policies and laws effective for forest resource extraction from Echuya central forest reserve at the time of data collection is harvesting permits, observing harvesting days (Wednesdays) and conducting forest patrols. Harvesting permits are issued by National Forestry Authority supervisor, in all the three parishes of Karengyere, Kagaano and Ncundura. NFA supervisor also ensures that the community members around Echuya central forest reserve observe the harvesting days (Wednesdays). According to the District Forestry Officer, Rubanda, some community members around Echuya central forest reserve are mandated to conduct forest patrols in all forest compartments, identify areas that have been encroached and report to National Forestry Authority.

5.3 Conclusion

Study findings highlighted that increasing forest resource extraction is a great socioeconomic and environmental challenge in Rubanda district. The expansion of Karengyere trading centre is projected to increase the multiplier effect of forest resource extraction due to increased

population and emergence of congested housing units. This is presumed from a hypothesis that as an urban unit expands, there is likelihood in forest resources pressure of extraction.
Therefore, in an emerging trading centre like Karengyere, there is need for the development of early warning programmes, systems and proactive mechanisms that integrate all households and local authorities towards sustainable and feasible forest resource conservation and management.

Basing on field observations and interviews, the increasing forest resource extraction could be as a result of increased population. Furthermore, areas with high population and much forest resources extraction could be harnessed through setting up local initiatives to regulate and control such activities by the local communities.

5.4 Recommendations.

1. Government needs to develop and implement conservation and awareness program to enable resource users and the rest of the local communities to understand their role and responsibilities in enhancing sustainable management of forest resources.
2. Government needs to engage resource users in formulating effective resource assess guidelines and procedures as well as strengthening local community institutional frameworks including training of resource users committees.
3. There is need for government to promote on farm tree planting to reduce human pressure on forest resources.

5.5 Suggested areas for further research.

1. Development of local capacity for sustainable forest resources conservation and management in areas around Echuya central forest reserve.
2. Assessing the willingness of the communities around Echuya central forest reserve to conserve and protect the forest reserve.
3. Evaluating the impact of local households on the conservation and management of Echuya central forest reserve.

References

Banana and Tweheyo, (2001). The Ecological changes of Echuya afro montane bamboo forest, Uganda. December 2001 African Journal of Ecology 39(4):366-373

Burton and Bartllet, (2009). Importance of practitioner research for teacher development. Published: 2009 DOI: https://dx.doi.org/10.4135/9780857024527

Resnik, D.B (2015). What is Ethics in Research & Why Is It Important? First published: 30 June 2015. https://doi.org/10.1002/9781444367072.wbiee001.pub2

De-vaus, (2013). Research Design in Social Research January 2001British Educational Research Journal 39(6) DOI:10.1016/S0020-7489(01)00040-2Publisher: SAGE

FAO, (2015) Global Forest Resources Assessment 2015: How are the World's Forests Changing? FAO, Inter Departmental Working, 2015

FAO, (2019). The State of Food and Agriculture 2019. Moving forward on food loss and waste reduction. Rome. License: CC BY-NC-SA 3.0 IGO.

Geist and Lambin, (2018) Proximate Causes and Underlying Driving Forces of Tropical Deforestation. February 2018 BioScience 52(2):143-150 DOI:10.1641/0006-3568%282002%29052%5B0143:PCAUDF%5D2.0.CO;2

Speth,J.G (2017). International forestry review and sustainable development. Publisher: Cambridge University Press DOI: https://doi.org/10.1017/CBO9780511626777.001

Mertens et al; 2014. From natural forest to coffee agro forest: Implications for communities of large mammals in the Ethiopian highlands. December 2018

Lawry, S. W. 2010. "Tenure Policy Towards Common Property Natural Resources in Sub-Saharan Africa." *Natural Resources Journal 30:403-404.*

Tacconi et al; 2016. Strengthening policy research and development through foreign aid: the case of reducing deforestation and forest degradation in Indonesia. Australian Forestry, 80:3, 188-194, DOI: 10.1080/00049158.2017.1335579.

MWE, (2014). The national state of environment report for Uganda. http://www.nemaug.org

Nadine Laporte, (2017). Expansion of Industrial Logging in Central Africa. July 2007 Science 316(5830):1451 DOI:10.1126/science.1141057Source PubMed

Turyahabwe, N. (2016). Total economic value of forest products and services in Uganda. 15 Sep 2019, 2019:192656 DOI: 10.1155/2013/192656 PMID: 24163614 PMCID: PMC3791690

Plumptre et al (2003). Governance principles for protected areas in the 21th century: A discussion paper phase 2IUCN (ID: MON-071468)

Poore, D. and Sayer, J. (2011).The Management of Tropical Moist Forest Lands: Ecological Guidelines. Gland, Switzerland and Cambridge, U. K.: International Union for Conservation of Nature, 2011.

R. S. de Groot, R. Alkemade, L. Braat, L. Hein, and L. Willemen, "Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making," Ecol. Complex., 2010, doi: 10.1016/j.ecocom.2009.10.006.

Repetto, R. and Gillis, M. Public Policies and Misuse of Forest Resources. New York: Cambridge University Press, 2008.

Repetto, R. The Forest for the Trees: Government Policies and the Misuse of Forest Resources. Washington DC: World Resources Institute, 2008.

KamugishaR. (2016). Exploring the impacts of forest tenure reform on forest ecosystems and livelihoods. Pages 132-156 | published online: 21 Apr 2016.

Shimizu T, Trudel M, (2006). Methodology and case studies on linkages between poverty and forestry: Afghanistan, Iran, Kyrgyzstan and Turkey. FAO LSP WP 35. Access to Natural Resources Sub Programme.

Sizer, (2015). Drivers of illegal and Destructive Forest Use. Publisher: International Union of Forest Research Organizations (IUFRO)

Wunder,S(2014). Forests, Livelihoods, and Conservation: Broadening the Empirical Base. December 2014, Pages S1-S11

Tevera DS, Mukora CM, (2007). Common Property Resources.In DS. Tevera CM. Mukora (eds.), Environmental Policy Planning and Management in Southern Africa. Dept of Geography and Environmental Science: University of Zimbabwe. pp. 50-57.

Tweheyo, (2018). Sampling in Qualitative Research: Improving the Quality of Research Outcomes in Higher Education. Makerere Journal of Higher Education ISSN: 1816-6822; 4(2) (2013) 169 – 185 DOI: http://dx.doi.org/10.4314/majohe.v4i2.4 © The Author(s) 2018 Reprints & permission: EASHESD http://ajol.info/majohe.

UBOS, (2019). Uganda Wood Asset and Forest Resources Accounts. June 2019.

UNEP, (2010). Environment Outlook for Latin America and the Caribbean. 374 pp. ISBN: 978-92-807-2956-6.

UNEP, (2011). Resource Efficiency in Latin America: Economics and Outlook. UNEP/Red Mercosur.

UNEP, (2012). GEO-5: Global Environmental Outlook.

World Bank, (2015). Forests and terrestrial ecosystems report. Published by World Bank 2015.

ANNEXES

ANNEX 1: FIELD RESEARCH QUESTIONAIRE

SELF-ADMINISTERED QUESTIONNAIRE FOR RESPONDENTS IN MUKO SUBCOUNTY RUBANDA DISTRICT, UGANDA.

Dear respondent, I am OKWARIKUNDA PROSPER a student of Nkumba University pursuing a Master's Degree in Natural Resources Management. I am here to carry out research on effects of community activities on forest resources of Echuya Central Forest Reserve in Muko Sub County Rubanda District. You have been selected to participate in the study. Feel free to answer the questions because the information collected will be used for academic purpose only.

General information (tick where appropriate).

Name of respondent (optional)…….

Parish …….. Village……..

Date of interview……....

SECTION A: Demographic characteristics of respondent.

1. Sex

(a) Male ☐ (b) Female ☐

2. Age bracket

(a) 20-29. ☐ (b) 30-39 ☐ (c) 40-49 ☐ (d) 50-59 ☐ (e) 60 and above ☐

3. Head of house hold

(a) Mather ☐ (b) Father ☐

4. Level of education

(a) None ☐ (b) Primary ☐ (c) Secondary ☐ (d) Tertiary ☐

5. Number of children

(a) 0 ☐ (b) 1 ☐ (c) 2 ☐ (d) 3 ☐ (e) 4 ☐ (f) Above 5 ☐

6. Marital status

(a) Married ☐ (b) Single ☐ (c) Divorced ☐ (d) Separated ☐

7. For how long have you been in this area?

(a) 0-3years ☐ (b) 4-6years ☐ (c) 7-9years ☐ (d) 9 and above ☐

SECTION B: **Information about forest resources harvested from Echuya Central Forest Reserve.**

8. Do you go into Echuya Central Forest Reserve?

(a) Yes ☐ (b) No ☐

9. How often do you go into Echuya Central Forest Reserve?

(a) Once a week ☐ (b) Twice a week ☐ (c) Daily ☐ (d) Not at all ☐

10. What do you get from Echuya Central Forest Reserve?

(a) Bamboo ☐ (b) Firewood ☐ (c) Poles ☐ (d) Ropes ☐ (e) Honey ☐

(f) Others specify ☐

11. What is the use of the forest resources extracted from the Echuya Central Forest Reserve?

(a) For sale ☐ (b) Home consumption ☐

SECTION C: **Information on community activities carried out around Echuya Central Forest Reserve**

12. Do you carry out some community activities around Echuya Central Forest Reserve?

(a) Yes ☐ (b) No ☐

13. Which activities do you carry out around Echuya Central Forest Reserve?

(a) Crop farming ☐ (b) Grazing ☐ (c) Brick making ☐ (d) Sand mining ☐

(e) Others specify ☐

14. Why do you carry out these activities?

……

……

……

……

15. For how long have you been carrying out these activities?

(a) 0-3years ☐ (b) 4-6years ☐ (c) 7-9years ☐ (d) Above 9years ☐

SECTION D: Information on policies and laws put forward to conserve the forest resources.

16. Are you aware of the policies and laws that govern forest resource extraction?

(a)Yes ☐ (No) ☐

(a) Harvesting Permits ☐ (b) Observing harvesting days ☐ (c) Forest patrols ☐

17. If yes, what are some of these policies and laws you know?

…….

……

…….

18. In your opinion, do you think these policies and laws are effective in this area?

If, yes, explain

……

……

……

……..

If no, explain

……

……

…….

ANNEX 2: INTERVIEW GUIDE FOR DISTRICT AGRICULTURAL, ENVIRONMENT AND FORESTRY OFFICERS.

Which is your department?

When was it established?

What is your role in Rubanda district?

Do you know Echuya central forest reserve?

Are you aware of the activities carried out around Echuya forest reserve?

Which are these activities?

Are you aware of the forest products extracted from the forest reserve?

Which are these forest products?

Are you aware of policies and laws put forward to protect and conserve the forest products?

What could be these policies and laws?

ANNEXES 4: OBSERVATION CHECKLIST (OBSERVE & TAKE PHOTOGRAPHS)

- ❑ Forest resources extracted from Echuya central forest reserve.
- ❑ Community activities being carried out around Echuya forest reserve.
- ❑ Observe whether the set policies and laws are implemented.
- ❑ Sites and sizes of crop gardens
- ❑ Observe whether there is intercropping taking place.
- ❑ Degraded land as a result of community activities.
- ❑ Other economic activities taking place