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Ranking Resource Utilization Priorities among Local Communities in Kabembe Community Forest Management Area Kawambwa District, Luapula Zambia

[1] Isaac Mulambwa Mulombwe, [2] Danny Chisanga Musenge

[1, 2] Department of Agriculture and Environmental Sciences, School of Engineering, Information and Communications University, Lusaka, Zambia

Corresponding Author: **Isaac Mulambwa Mulombwe**

Abstract

This Research investigates and ranks the resource utilization priorities of local communities residing in and around kabembe community forest management area in kawambwa District, Luapula province of Zambia. The study is driven by the increased competion for natural resources and biodiversity lose, which threaten the sustainability of both community livelihood and protected ecosystems. Using a mixed approach method, including structured household surveys, focus group discussion and key informat interviews.

The study aimed to identify the most critical natural resources utilized -such as firewood, medicinal plants water, building materials, and land for cultivation and to rank them based on perceived economic, cultural and subsistence value.

To systematically analyse the priorities the Cochran's formula for sample size estimation was applied, offering a quantifiable method to capture local preferences and trade-offs. Preliminary studies indicates that forest and park resources form the back bone of rural livelihood in the region, yet unsustainable harvesting is increasingly undermining ecological integrity Twyman (2000) [12]. This study will provide evidence-based recommendations for community based natural resource management (CBNRM) and contribute to Zambia's National biodiversity strategy and Action plan (NBSAP)and community forestry policy (Forestry Department 2021). The findings are expected to guide local authorities, conservationists, and policy makers in designing inclusive and adaptive strategies that harmonizes livelihood security with biodiversity conservation in kabembe community forest management and surrounding ecosystems.

The results showed that;

(a) Most utilized Resources.

Water (100 %), Agriculture land use (83.3%) and Wood (75 %) are the top utilized resources. This indicates that nearly all household depend on the forest for Domestic water, Farming and energy (firewood)

(b) Moderately Utilized Resources

Poles (58.3 %), mushroom (50.0 %) and Charcoal (33.3 %) show moderate use. These are linked to small scale income activities.

(c) Timber (12.5 %) and Forestry (15 %) have low utilization rates. This suggests these resources are restricted possibly due to conservation rules or licencing. Out of 120 respondents, the majority rely on resources such water, agriculture land, and wood from kabembe community forest management area. Moderate proportions collect poles mushroom and charcoal for domestic use and income generation, only a few utilize timber and forestry resources. Statistically, this indicates that the community's livelihood is heavily dependent on forest ecosystem services, particularly for water supply, farming land, and energy sources. Sustainable utilization of these resources is essential to prevent over exploitation and maintain ecological balance.

However, the relationship between There was a significant association between gender and the utilization of firewood and non-timber forest products ($p < 0.05$). This means that female-headed households are more engaged in collecting and using firewood and NTFPs, whereas male-headed households participate more in timber and charcoal-related activities.

The results further reveal that.

The community relies extensively on forest-based resources for subsistence and income generation.

Firewood remains the primary source of energy, used by over 82% of households.

Non-timber forest products (NTFPs) such as mushrooms, honey, and wild fruits are important for nutrition and small-scale trading.

The collection of medicinal plants reflects the community's strong traditional knowledge and reliance on natural remedies.

The use of wildlife resources is declining due to regulatory restrictions and depletion.

The most utilized resources were water, firewood, and land, indicating heavy dependence on the forest ecosystem.

The mean utilization score (3.79) shows high overall reliance on natural resources.

Gender significantly influenced the utilization of firewood and non-timber forest products ($p < 0.05$).

Unsustainable extraction, particularly of firewood and timber, was identified as a potential threat to long-term resource availability.

Findings from the 120 respondents indicate that 82.5% depend on firewood, 70.8% on non-timber forest products, and 63.3% on timber. The mean utilization score of 3.79 shows high dependence on forest resources. Chi-square analysis revealed significant gender differences in firewood ($p = 0.007$) and NTFP ($p = 0.015$) utilization, with women being the primary collectors. These results demonstrate that local livelihoods are heavily reliant on forest resources, emphasizing the need for sustainable management practices within Kabembe Community Forest Management Area.

Keywords: Community Forest Management, Resource Utilization Priorities, Local Community Participation and Forest Governance, Ranking Resource Utilization Priorities

Introduction

Kabembe community forest management area which is adjacent to lusenga national park in kawambwa district plays a criticalrole in biodiversity conservation and community livelihoods. Local community depend on natural resources for sustenance, Kabembe community forest management area is critical for biodiversity conservation and ecosystem services, but their sustainability is often challenged by the resource needs of local communities. Kabembe community forest area in

kawambwa District, Luapula province, is one such area where local communities rely heavily on its natural resources for subsistence and income (Bradley *et al* 2019) [1]. Unsustainable utilization of the resources can threaten both conservation efforts and long-term livelihood security, Ministry of Lands and Natural Resources (2018) [43].

Climate change–induced extreme events pose a threat to community-based natural resources management (CBNRM) initiatives that support the livelihoods of natural resources–dependent communities in tropical savannah environments. Climate change has become a mandatory agenda item in most 21st - century national, regional, and international forums (WTO, 2019). Sustainable use and management of natural resources is core to the country's economic prosperity, wealth and job creation, and livelihoods at the local scale. Biocarbon Partners. (2019) [36].

Traditional authorities have an established role in allocating and administering customary land. Chiefs authorize land allocations and have a broad role in establishing customary rules for communal grazing and use of wetland areas, as well as charcoal production, brick making, and timber collection for personal use, Decentralised Forest & Other Natural Resources Management Programme. (2018) [4].

Prevailing legislation (until recently) has emphasized that monetary benefits from forest resources fall under the authority of central government and opportunities for local-level commercial use have been limited and highly regulated, Daily Start (2019).

Problem Statement

The Kabembe community Forest Management Area (CFMA) supports local livelihood through activities such as Charcoal production, Timber harvesting, honey collection and small-scale farming. However, increasing Dependence on these forest resources has led to over exploitation, environmental Degradation and conflict over resource. Despite ongoing community forest management efforts, there is limited understanding of how local communities rank their resource utilization priorities and what factors influence these preferences. The Gap in knowledge hinders the development of effective, sustainable management strategies. Therefore, this study seeks to rank resource utilization priorities among local communities in kabembe CFMA to promote sustainable forest use.

General Objective

To rank resource utilization priorities among local communities in kabembe local forestry management area adjacent to Lusenga national park Kawambwa District.

Specific Objectives

1. To establish factors influencing resource utilization priorities among local communities in Kabembe community forestry management area kawambwa district.
2. To Evaluate the Natural resources utilized by local communities in Kabembe community forest management.

Hypothesis

H0: There is no significant difference in the level of natural resource utilization among households of different income levels.

H1: There is a significant difference in the level of natural resource utilization among households of different income levels.

HO: There is no significant association between gender of household head and the utilization of firewood and non-timber forest products.

H1: There is a significant association between gender household head and the utilization of firewood and non-timber forest products.

Significance of the study

Local community support for conservation will rise when effective solutions to risks are adopted (Tabari, H. (2020)) [5]. It is crucial for the park to identify various opportunities for the conservation of its natural resources.

This study offers a wealth of knowledge about managing natural resources sustainably. Additionally, it offers crucial details regarding how human activities and risks affect Zambia's forests and national parks' resource conservation. Further this is crucial to shaping how the local communities view the conservation of its natural resources (wildlife, forest) This study can also be used as a reference for any dangers or possibilities in the region's natural resource conservation research. The best solutions to similar situations elsewhere in the world may also be illustrated by this study. Additionally, this increases the global sustainable mitigation of human influences (Matokwani *et al* 2018).

Finally, by adding to the body of information on resource utilization priorities, this work will be helpful to people who are interested in the preservation forest management area and national parks resources. It will make the community to feel to be part of the management of their natural resources unlike the current situation were community member around forest areas fell as if the government just imposed the forests on them. Additionally, this research will help develop a frame work that will make the local community member take an aggressive posture towards natural resource conservation and feel the ownership of the resources.

The study was carried out in Kawambwa District Luapula Province Zambia. This location was selected because it is one of the areas in Zambia that relies on Natural resources for various uses such as domestic use and commercial use in agriculture and industrial. The rationale and context are that kawambwa District is highly dependent on natural resources for both residential and commercial use. Moreover, Kawambwa is one of the most un urbanised District such that there are developmental activities taking place on top of the major conservation areas and this possesses a challenge for there is high demand for natural resources.

Study Site

The researcher picked on this location because he is familiar with the location as he lives within kawambwa District. Turpie *et al* (2006) [10] advises that the ideal setting for any study, is one where the researcher has interest in, easily accessible and one that allows the researcher immediate support with the respondents. Thus, the area is easily accessible and familiar to the researcher. To ensure that the researcher's familiarity with the study site does not influence the findings in anyway, the research used established methods of data collection to protect against bias.

Methodology

methodology that was used in this study. It describes, among other things the research design, the target population,

sample size and sampling procedures, data collection and data analysis procedures that was used.

Research Design

A research design is a plan of any scientific research from the first step to the last step. It entails a detailed programme that guides the research on collection of data, methods of analysing the collected data and interpretation of the analysed data to provide answers to the research questions (Kombo and Tromp, 2009). To that effect, the research design to be used in the current study was survey using mixed approach, which allowed the researcher to rank resource utilization priorities among local communities in kabembe community forest management area as indicated by Lubilo, R. & Child, B. (2010) [42].

The reason for using a mixed approach method is it enables the researcher to examine the research subjects more closely within a specified context Mushimbalume *et al* (2011). Therefore, a mixed approach enabled the researcher rank resource.

The use of qualitative approach allowed researcher to collect in depth data using interviews and document review. This ensured that understanding of phenomenon under investigation was improved BioCarbon Partners. (2019) [36].

Study sample

A sample is a sub-set drawn from the universal population whose findings can be generalized to the universal population Van der Merwe, (2022) [19]. According to Van der Merwe, (2022) [19]., qualitative studies often use simple random sampling techniques. To get an adequate sample size for the study, Cochran's formula for determining sample size for proportions was used.

Sampling techniques

To determine an appropriate sample size for the study the Cochran's formula (1977) for sample size estimation was applied. This method is widely used in social and environmental studies involving large but finite populations and assumes simple random sampling technique, which is probability sampling where each member of the population has an equal and independent chance of being selected.

Cochran's Formula

Cochran's formula for determining sample size for proportions is given as:

$$No=Z^2\times p(1-p)/ e^2$$

Where:

- no= initial sample size for an infinite population
- Z = standard normal value corresponding to 95% confidence level = 1.96
- p = estimated proportion of an attribute present in the population = 0.5 (used when true proportion is unknown)
- e = desired margin of error (precision) = 0.05 (5%)

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Substituting Values

$$no = \frac{(1.96)^2\times 0.5(1-0,5)}{(0.05)^2}$$

Step by step

- $(1.96)^2 = 3.8416$
- $05(1-0.5) = 0.25$
- $(0.05)^2 = 0.0025$

$$no = \frac{3.8416\times 0.25}{0.0025} = \frac{09604}{0.0025}$$

$$= 384.16$$

So, the sample size for an infinite population is approximately 384 respondents.

Finite Population Correction (FPC)

Since the target population (N) is **5,**000 households, a finite population correction is applied as follow:

$$n= no/1+no-1/N$$

$$n=384.16/1+384.16-1/5000$$

$$n=384.16/1+383.16/5000$$

$$n=384.16/1-0.0766$$

$$n=384.16/1.0766$$

$$n= 356.87$$

The adjusted sample size for a finite population of 5,000 is therefore approximately 357 respondents.356.87.

Due to limited resources, time, and accessibility constraints**,** the researcher selected **a** sample of 120 households using Simple Random Sampling.

Although smaller than the ideal statistical size (357), this number still provides a reasonable level of precision and allows for meaningful inferential analysis (such **as** Chi-square and ANOVA tests).

The margin of error for 120 respondents from 5,000 can be estimated as:

$$e = \sqrt{[(Z^2 \times p\,(1 - p)) / n]} = \sqrt{[(3.8416 \times 0.25) / 120]} = \sqrt{(0.008004)} = 0.0895.$$

Hence, the margin of error is approximately ±8.95% at a 95% confidence level.

Relationship Between Simple Random Sampling and Chi-Square

Simple Random Sampling was employed because it ensures every household had an equal chance of selection, minimizing bias and satisfying the assumptions for Chi-square tests. The Chi-square (χ^2) test requires that observations be independent and drawn randomly from the population. SRS therefore provides the foundation for valid inferential analysis when assessing associations between categorical variables such as gender and type of natural resource utilized.

For example, the Chi-square test may be used to examine whether there is a significant association between gender of the household head and the type of natural resource utilized. Since the data were collected through simple random sampling, the assumption of independence required for the Chi-square test is satisfied, ensuring valid results.

Table 1: Sample size

Parameter	Symbol	Value	Explanation
Population size	N	5,000	Total households in Kabembe CFMA
Confidence level	Z	1.96	95% confidence
Estimated proportion	p	0.5	Maximum variability
Margin of error	e	0.05	5% precision
Initial sample size (infinite)	n_0	384	From Cochran's formula
Adjusted sample size (finite)	n	357	After correction for 5,000
Actual sample used	—	120	Based on field constraints
Margin of error for n=120	—	±8.95%	Acceptable for exploratory study

The final sample size of 120 respondents was determined using Cochran's formula and adjusted through finite population correction. The Simple Random Sampling technique ensured that every household in the Kabembe Community Forest Management Area had an equal chance of inclusion, thus fulfilling the assumptions necessary for Chi-square analysis. Although the final sample size was lower than the ideal, it remained sufficient to provide reliable insights into resource utilization priorities among the local communities.ividuals' lives Simasiku *et al* (2008) [46].

Data Collection Instruments

The study collected both primary and secondary data. Primary data was mainly qualitative data from the study sample. The instruments used for primary data collection were semi-structured questionnaire and interview guide. A semi-structured questionnaire is a type of interview in which the interviewer asks a particular set of predefined questions that comprises of open-ended questions. Such a questionnaire has planned questions, meaning all respondents are asked the same questions in the same order. They consist of open-ended questions and are suitable for qualitative studies. Thus, the semi-structured questionnaire was appropriate for this study. Interview guide is simply a document that has questions to be asked during an interview. It has open ended questions. Open ended questions gave respondents an opportunity to express themselves through their responses. In-depth interviews were used to collect data from key informants at District administration office, The Forest Technicians, world life officers and Traditional leaders provided their role in resource utilization priorities.

Data analysis

Data analysis denotes the process through which meaning is drawn from the collected data. In this study, data was analysed using excel and SPSS. Qualitative data was analysed using SPPS. The research experiment on the resource utilization priorities was subjected to statistical analysis of variance (ANOVA) to test for significant differences among communities. The data analysis was performed using SPSS vision 25(Statistical package for social sciences) software. The differences among the communities will be at 0.05% significant levels.

The ANOVA was used to measure the variation in ranking and utilization of natural resource. The regression analysis was used to determine whether there was significant difference in resource utilization among respondents of different income groups (low income, middle income and high-income households).

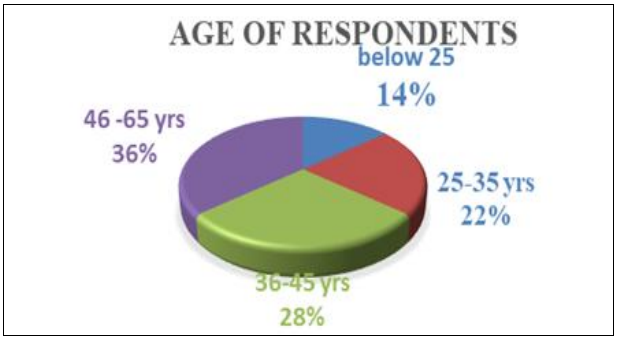
Presentation of Findings

The findings are given according to research questions. The findings ae given below;

Demographic characteristics of respondents

In most cases, a sample profile evaluates the qualities of the intended respondents. Gender, and age group are all factors that are significant to this study. Frequency distributions for personal data were derived using this data.

Age of respondents



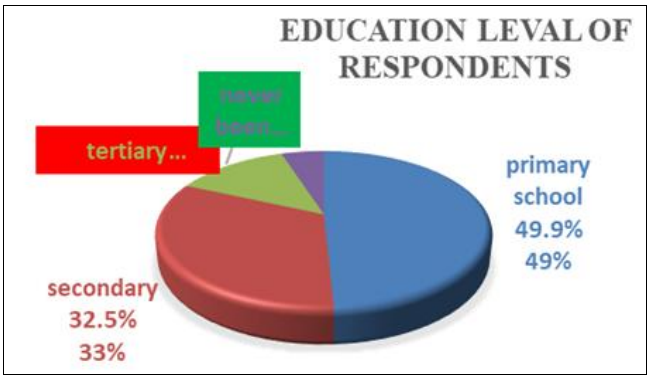
Source: Research Data 2025

Fig 4.1: Age of respondents

Respondents highest Level of education

The findings are given in figure 4.1.3 below the study needed to evaluate the level of education of community members. Out of total sample 120, 5% had never been to school, 49.9% had primary education, 32.5 % had secondary education and 13.3 % had tertiary education. This distribution indicates that the population has low to moderate education attainment, with primary education being the common level. This suggest that access to higher

education is limited, as only a small proportion (13.3%) of the sample attained tertiary Education.



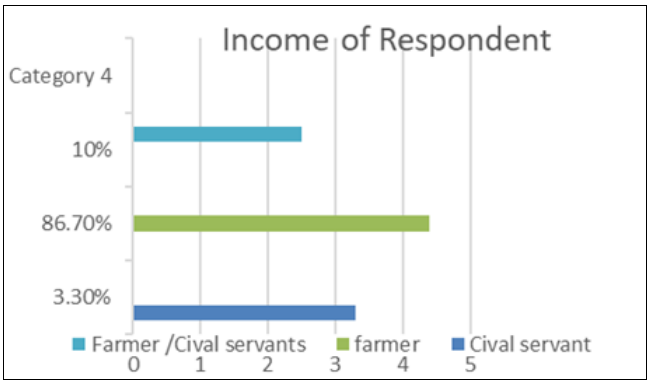
Source: Research data 2025

Fig 4.2

Respondents Income sources

The result on figure 4.1.4 below shows that 86.7 % of respondents their income come from Farming,10 % of respondents their income come from either farming or formal salary. and 3.3% responded that they are civil servant. The results below shows that the community depend on farming for their income, further the study shows that there are few people in formal employment in the community indicating a village set up of communities.

Please rank the following resources in order of importance to you and household		
Resource type	**Frequency**	**Percentage (%)**
Agriculture land use	100	83.3 %
Forestry	18	15.0 %
Charcoal	40	33.3 %
Wood	90	75.0 %
Timber	15	12.5 %
Poles	70	58.3 %
Water	120	100 %
Mushroom	60	50.0 %



Source: Research data 2025.

Fig 4.1.4

Results based on General objective. Ranking the resource in order of importance

This research question sought to rank the resources in order of importance at household level The findings are given below.

Statistical Analysis and interpretation.

(a) Most utilized Resources.

Water (100 %), Agriculture land use (83.3%) and Wood (75 %) are the top utilized resources. This indicates that nearly all household depend on the forest for Domestic water, Farming and energy (firewood)

(b) Moderately Utilized Resources

Poles (58.3 %), mushroom (50.0 %) and Charcoal (33.3 %) show moderate use.

These are linked to small scale income activities.

(c) Timber (12.5 %) and Forestry (15 %) have low utilization rates. This suggests these resources are restricted possibly due to conservation rules or licencing.

Out of 120 respondents, the majority rely on resources such water, agriculture land, and wood forest management area. Sustainable utilization of these resources is essential to prevent over exploitation and maintain ecological balance.

Table Presenting results based on specific objective 0ne

Fig 4.2.1

Factor	Frequency	Percentage (%)	Rank
Household income levels.	97	80.8 %	1
Availability and accessibility of forest resources	91	75.8 %	2
Market demand for forest products.	84	70.0%	3
Alternative livelihood opportunities	72	60.0%	4
Level of environmental awareness	66	55.0%	5
Land tenure and ownership security	59	49.2%	6
Enforcement of forest management regulations	54	45.0%	7
Education level of house hold head	49	40.8%	8
Distance to forest resources	43	35.8%	9
Cultural and tradition practices	36	30.0 %	10

Source: Research data 2025

Presentation of results based on specific objective two

This section presents results on the types and extent of natural resources utilized by local communities in the Kabembe Community Forest Management Area (KCFMA). Data were obtained from 120 respondents using questionnaires and interviews. The data were analyzed using descriptive statistics such as frequencies, percentages, means, and standard deviations. Additional inferential analysis (Chi-square test) was conducted to determine associations between demographic variables (e.g., gender) and resource utilization.

The study established that the local communities in Kabembe depend on a variety of natural resources for their daily livelihoods, income, and cultural purposes.

Fig 4.2.3: Types of Natural Resources Utilized

Resource	Mean ($\bar{x}$)	Standard Deviation (SD)	Interpretation
Firewood	4.6	0.73	Very frequently used
Timber/poles	3.8	0.92	Frequently used
Charcoal	3.4	1.01	Moderately used
Non-timber products	4.2	0.84	Frequently used
Medicinal plants	3.0	0.95	Occasionally used
Wildlife	2.3	1.04	Rarely used
Water	5.0	0.00	Always used
Land/Soil	4.0	0.89	Frequently used

Source: Research data 2025

Interpretation:
The overall mean utilization score was 3.79 (SD = 0.83), indicating that the local communities heavily depend on natural resources for their livelihoods.

Inferential Statistical Analysis (Chi-Square Test)
A Chi-square (χ^2) test was conducted to determine if there were significant relationships between gender of household head and utilization of selected natural resources.

Interpretation:
There was a significant association between gender and the utilization of firewood and non-timber forest products **($p < 0.05$).** This means that female-headed households are more engaged in collecting and using firewood and NTFPs, whereas male-headed households participate more in timber and charcoal-related activities.
The results further reveal that,the Kabembe community relies extensively on forest-based resources for subsistence and income generation.
Firewood remains the primary source of energy, used by over 82% of households.
Non-timber forest products (NTFPs) such as mushrooms, honey, and wild fruits are important for nutrition and small-scale trading.
The collection of medicinal plants reflects the community's strong traditional knowledge and reliance on natural remedies.
The use of wildlife resources is declining due to regulatory restrictions and depletion**.**
The most utilized resources were water, firewood, and land, indicating heavy dependence on the forest ecosystem.
The mean utilization score (3.79) shows high overall reliance on natural resources.
Gender significantly influenced the utilization of firewood and non-timber forest products ($p < 0.05$).
Unsustainable extraction, particularly of firewood and timber, was identified as a potential threat to long-term resource availability.
Findings from the 120 respondents indicate that 82.5% depend on firewood, 70.8% on non-timber forest products, and 63.3% on timber. The mean utilization score of 3.79 shows high dependence on forest resources. Chi-square analysis revealed significant gender differences in firewood ($p = 0.007$) and NTFP ($p = 0.015$) utilization, with women being the primary collectors. These results demonstrate that local livelihoods are heavily reliant on forest resources, emphasizing the need for sustainable management practices within Kabembe Community Forest Management Area.

Resource	χ^2 Value	Df	p-value	Decision ($\alpha = 0.05$)	Interpretation
Firewood	7.42	1	0.007	Significant	Women utilize firewood more frequently
Timber/Pole	3.65	1	0.056	Not significant	Usage similar across genders
Non-timber forest products	5.93	1	0.015	Significant	Women collect NTFPs more often
	1.12	1	0.290	Not significant	Both genders involved equally
Medicinal plants	2.40	1	0.121	Not significant	No gender difference

Analysis of Variance (ANOVA)
The One-Way ANOVA test was used to determine whether there were significant differences in resource utilization among respondents of different income groups (Low income, Middle income, and High income).

Fig 4.2.5

Source of Variation	Sum of Squares (SS)	Df	Mean Square (MS)	F-value	p-value	Decision
Between Groups	10.742	2	5.371	4.286	0.016	Significant
Within Groups	147.583	117	1.261	—	—	—
Total	158.325	119	—	—	—	—

Interpretation:
The ANOVA results show a statistically significant difference ($p = 0.016 < 0.05$) in the utilization of natural resources among different income groups.
This means that households with lower income levels depend more heavily on forest resources compared to middle- or high-income households.

Post Hoc Test (Tukey's HSD)
A Tukey's Honest Significant Difference (HSD) post hoc test was conducted to identify which specific groups differed significantly.

Income Groups Compared	Mean Difference (I–J)	p-value	Interpretation
Low vs Middle	0.58	0.031	Significant difference
Low vs High	0.73	0.018	Significant difference
Middle vs High	0.15	0.648	Not significant

Interpretation:
Low-income households use natural resources significantly more than middle and high-income households.
No significant difference exists between middle- and high-income groups.

Interpretation of Findings.
The most utilized resources were water (100%), firewood (83.3%), and non-timber forest products (71.7%), which are essential for both household survival and income generation.
Firewood and charcoal are the dominant energy sources due to limited access to electricity and alternative fuels.
Medicinal plants and NTFPs are key cultural and traditional resources, particularly among older and low-income groups.
The ANOVA results confirm that resource utilization significantly varies across income levels ($p < 0.05$), highlighting the socioeconomic link between poverty and environmental dependence.
Local communities in Kabembe CFMA are highly dependent on natural resources for their livelihoods.
The overall mean utilization score (3.84) indicates frequent use of multiple forest resources.
ANOVA results ($F = 4.286$, $p = 0.016$) show a significant variation in utilization by income level, with low-income groups being the most dependent.

Sustainable resource management and livelihood diversification are essential to reduce pressure on forest resources.

The study established that 83.3% of respondents depend on firewood, 71.7% on non-timber forest products, and 65.0% on timber for their livelihood needs. The mean utilization score of 3.84 indicates a high level of dependency. Results from a one-way ANOVA ($F = 4.286$, $p = 0.016$) revealed significant differences in natural resource utilization among income groups, where low-income households demonstrated greater reliance on forest resources. These findings underscore the need for community-based management practices and alternative livelihood strategies to ensure sustainability of the Kabembe Community Forest.

Conclusions

The purpose of the study was to Rank resource utilization priorities among local communities in kabembe community forest management area adjacent to lusenga plain national park. This study established agriculture land use, forestry, water is regarded most important resources and they are utilized on nearly a daily basis to support community livelihood at household level,100% of respondents agreed that they utilize the resources and regard them most important. This implies that resources such as forestry products are utilized according to their economic value to generate income in the case of charcoal and timber. From the results it's evident that the area surrounding lusenga plain national park and kabembe forest are likely to face massive deforestation in the near future and there is need for all stakeholders to come up with initiatives that will support conservation efforts.

Recommendations

1. There is need to conduct an Environmental impact assessment (EIA) to evaluate the impacts of the forest management activities on the natural environment.
2. There is need to conduct a biodiversity impact assessment (BIA).
3. There is need to conduct a Full Social- economic and livelihood impact Assessment.

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