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CONTRIBUTION OF COMMUNITY-BASED FOREST CONSERVATION APPROACHES IN THE SUSTAINABILITY AND MANAGEMENT OF ABERDARE FOREST (NDARAGWA FOREST)

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Abstract
The study sought to identify the community-based forest conservation approaches that have contributed to the sustainable management of Aberdare Forest (Ndaragwa forest). The study was undertaken within Ndaragwa forest in the Aberdare Forest Ecosystem, Nyandarua County. The researcher targeted all the forest officials working in Ndaragwa Forest station and the local community living near the forest. Purposive sampling was employed when conducting interview for forest officials. The data was collected through questionnaires, interview schedules and field observations. The researcher used the Statistical Package for Social Sciences (SPSS) version 25 and Microsoft Excel for data analysis. This implies that there is a strong positive relationship between Community-based forest conservation and sustainable forest management that is significant at 5 per cent levels of significant. This is attained through capacity building and holding beliefs for the local community that would have been aimed at empowering them to take care of the surrounding natural resources. In devolved governance, the forestry sector needs to incorporate participatory forest management and co-management. The study recommended that the local communities should be engaged in community-based forest conservation strategies like preparation of tree nurseries and raising tree seedlings for planting to increase forest cover and preservation of indigenous trees, as agro-forestry reduces over-reliance on the forest.

Key terms: Aberdare Forest, Community-Based Forest, Conservation Approaches, Management, Sustainability.

1.0 INTRODUCTION

Forests are critical natural resources because of their multiple roles, such as supporting biodiversity, carbon sequestration, and livelihoods of human communities (Canada-Government, 2015). The Food and Agricultural Organisation (FAO, State of Forest Rome, 2018) outlines the critical role that forests play, including carbon sequestration, provision of clean air and water, ecotourism, conservation of biodiversity, agricultural support, and control of land degradation. Globally, 30.6 per cent of the total land area is covered by forests (FAO, 2018). This is an acute reduction from findings contained in the Forests Research Assessment (FRA, 2015a) report, which showed that 31.6 per cent of the land was covered by forests in 1990 (FAO, 2018). At the international level, the recommended forest cover is (FAO, 2016) 10 per cent of the total land surface area of all countries.

Sub-Saharan Africa's land mass cover is estimated to be 27.1 per cent forested area (FAO, 2018). This shows that Africa has less forest cover than the world average. Although there have been improvements in the world's forested area estimates, African countries have experienced a decline in forest cover (FAO, 2018). FRA 2015 report shows that more than half of the world's forests have been reduced to less than half over the last twenty-five years (Rodney et al., 2015). Zambia, which has about 66 per cent of its land covered by forest, faces the problem of deforestation, charcoal burning, farming, and human encroachment (Government of The Republic of Zambia, Ministry of National Development Planning, 2017). In Mozambique and Uganda, deforestation has been associated with poverty (FAO, 2018). The forest can be used for sustainability to improve the livelihood of the communities, hence becoming a blessing to the community (FAO, 2018). In Kenya, the Food and Agricultural Organisation reported that in the year 2015, forests covered an area equivalent to 4.4 million hectares, which comprises about 7.5 per cent of the total land area (FAO, 2015a). The task force on Forest Resources Management and logging activities reported that in 2018, the forest cover in Kenya was 7.4 per cent (Ministry of Environment and Forestry, 2018). Through previous research on the important role played by adjacent communities, the government recognised the importance of the Participatory Forest Management Act 2016, which advocates that adjacent people to the forest should be involved fully in the management of the forest and share benefits (GoK, 2016).

Despite efforts to promote the sustainable management of Aberdare Forest, the ecosystem continues to face threats such as illegal logging, land degradation and climate change (KFS, Forest Conservation and Management Act 2016, 2016). There is a need to examine the role community-based participation can play in protecting and conserving the forest Ecosystem in the context of Nyandarua. However, little is known about the specific mechanism through which community-based participation can contribute to sustaining the management of Aberdare Forest or about the factors that influence the effectiveness of the approaches. As a result, there is a need for study to identify the community-based forest conservation approaches that have contributed to the sustainable management of Aberdare Forest (Ndaragwa forest) in order to inform the development of more effective and sustainable conservation strategies.

2.0 LITERATURE REVIEW

Globally, forest management policies have shifted from government control to a more participatory approach that focuses on the active participation of communities and private sectors (Schreckenberg et al., 2006). In the whole world, people living near forests play a critical role in forest conservation. The local people's capacity should be built to empower them to take care of their resources (FAO, 2018). Countries

with considerable forest cover have adopted new forest management policies (FAO, 2016). The Food and Agricultural Organization (FAO) indicates that the current policies focus on forest management generally translates as the prime goal of sustainable forest management and improved human livelihood (FAO, 2016).

In India, the Kurdha community forest successfully protected the Tangi Orissa forest through patrols. The villagers consciously decided to protect the forest since they valued it as their natural source of posterity (Rabongo, 2015). The community forest controlled the access to the forest by some of them doing patrols while others provided food to the people who were doing protection. Each of the five communities gave out two people who were to spearhead the protection of the forest, which they valued as they believed that it was the dwelling place of their rain God who brought rain to them (Rabongo, 2015).

In Africa, local communities were involved in managing the forest resources. In Ethiopia, the communities protected the forests after signing agreements to conserve forests with the government. This improved the status of the forest (Mohammed & Inoue, 2012). In Tanzania, the forest cover registered positive growth after the community was incorporated into the management of the forest (Rabongo, 2015). Jacob and Brockington (2010) stress that in Africa; the transformation in the forestry sector has led to changes that have incorporated participatory forest management, co-management, and devolved governance. In a study by Ongungo (2007), participatory forest management should be centred on the community as the critical stakeholder but equally focus on other crucial stakeholders such as the government, public and private sectors, especially the forest industry.

In Kenya, the Ministry of Environment, Water and Natural Resources (Ministry of Environment, 2014) reported that before 2005, the management of public forests was based on protection through state-driven command and control systems with minimal participation from other stakeholders. In response to the challenges in the government-controlled management of forests, a new forest policy and Forest Act were developed (Forests-Act, 2005). Two approaches were put in place and introduced. These approaches are community participation and participatory forest management. In Kenya, PFM (Participatory Forest Management) is taken as an arrangement in which mutual agreement is entered between authorities and communities, noticeably describing the rights and duties of all stakeholders (KFS, Participation forest management guidelines, 2015). There have been several successful PFM initiatives, for example, Arabuko-sokoke forests, Kakamega forest, and Olbolossat forests, among others (Kinyili, 2014). The community should be given technical assistance to manage the forest effectively (Kidenya, 2015). The reforms introduced by the act of parliament (Forests-Act, 2005) in the management of forests that incorporate participation and involvement of stakeholders were expected to contribute to community incentives for sustainability.

The study by Ongugo et al. (2008) concluded that to balance stakeholders' incentives with the burdens and responsibilities they bear, income from PFM ought to benefit the stakeholders for them to sustain their commitment to participatory forest management. PFM can only be successful if stakeholders benefit from their involvement in PFM. When forest stakeholders become aware of their guaranteed share of benefits from the forest, they participate and manage forests sustainably.

3.0 METHODOLOGY

A mixed-method research approach was adopted, combining both qualitative and qualitative research techniques. This involved the use of both qualitative and quantitative techniques in a single study, which is very useful for complementary purposes. The qualitative data explains the summaries of observations found in quantitative data. Mixed methods were used because they allow the use of both quantitative and qualitative methods in the process of research (Creswell & Piano, 2011). The researcher used a descriptive research design. This method was suitable to describe the current status of the forest as it is. A descriptive research design is very detailed in describing the current status of forest research (Wekesa, 2007). Descriptive research design uses questionnaires and interviews to collect data from the respondents to get opinions, habits, attitudes and knowledge of sampled individuals. The researcher targeted all the forest officials working at Ndaragwa Forest Station. The research employed a multistage sampling technique that comprised cluster sampling, sub-diving the study area into 4 villages. The number of households to be selected in every cluster was determined using proportionate sampling. Representatives in every cluster were selected using Simple Random Sampling (SRS). Finally, the heads in the sampled households were selected purposively. Similarly, purposive sampling was used to identify forest officials to be involved in the study as key informants. The Sampling frame was 1,090 individuals, with only one member being interviewed per cluster. To calculate the sample size, a simplified formula for proportions was applied based on Yamene (1967). The data was collected using questionnaires, field observation and interview schedules. Data on on-farming tree availability and tree planting patterns, together with household use of tree products, were generated using field observations. The researcher conduct pretesting to make sure that the tool's reliability is tested. Data collection tools were administered to the same group of respondents twice, and then the reliability coefficient was calculated.

4.0 RESULTS AND DISCUSSION

Community-Based Forest Conservation Approaches on Sustainable Management of Aberdare Forest

The researcher sought to identify the community-based forest conservation approaches that have contributed to the sustainable management of Aberdare Forest (Ndaragwa forest). The response was categorised in ascending order from 1 to 5 with 1=Never, 2=Rarely, 3=Not Sure, 4= Sometimes, 5=Always. The response was summarised using descriptive statistics, namely mean (μ) and standard deviation (**δ**). If the $\mu > 3$, it implies that the respondents agreed with the statement asked, while $\mu < 3$ implies that the respondents are in dispute with the statement. The measure of dispersion, namely standard deviation (**δ)**, proofs that there was some divergent response, which implies that the responses were independent. The results are shown in Table 1 below.

Table 1: Community-Based Forest Conservation Approaches

Statements	**1**	**2**	**3**	**4**	**5**	**μ**	**δ**
There is capacity building for the local community, empowering them to take care of the surrounding natural resources	21.2	32.7	25.0	17.3	3.8	2.5	1.0
There are deliberate efforts by the local	10.9	32.7	36.4	10.9	9.1	2.7	1.5

community to protect the forest since they value it as their natural source of posterity							
Members of the community control the access to the forest by some of them doing patrols while others provide food to the people who are doing protection	85.5	9.1	5.5	0.0	0.0	1.2	0.7
Members of the community hold beliefs that highly regard the forest as a cultural and traditional heritage.	54.5	21.8	14.5	9.1	0.0	1.8	0.9
Through devolved governance, the forestry sector has led to changes that have incorporated participatory forest management and co-management.	18.2	45.5	25.5	5.5	5.5	2.3	1.0
There is adequate stakeholder engagement by consulting the local community, government, NGOs, and private sector, among others.	12.7	18.2	61.8	3.6	3.6	2.7	1.1
The community should be given technical assistance to manage the forest effectively	5.5	3.6	12.7	21.8	56.4	4.2	0.8
Community is sensitised on their guaranteed share of benefits from the forest, motivating them to participate and manage forests sustainably	32.7	20.0	30.9	12.7	3.6	2.3	1.2

Source: Researcher, 2023

According to Table 4, most respondents were of the opinion that capacity building for the local community that would have been aimed at empowering them to take care of the surrounding natural resources is rarely done, according to 32.7 per cent with a mean of 2.5 < 3. It was established that there are not enough or deliberate efforts by the local community to protect the forest for the value of the natural source of posterity, as indicated by 32.7 per cent of the respondents and a mean of 2.7 < 3. This falls short of what FAO, State of Forest Rome (2018) recommends: the need for the local people's capacity should be built to empower them to take care of their resources.

It was found that members of the community do not control the access to the forest by some of them doing patrols, nor do they provide food to the people who were doing protection as stated by 85.5 per cent and a mean of 1.2 < 3. Members of the community were found not to hold beliefs that highly regard the forest as a cultural and traditional heritage, as shared by 54.5 per cent and shown by a mean of 1.8 < 3. Similarly, the devolved governance and forestry sector brought in significant changes in incorporating participatory forest management and co-management as shown on 45.5 per cent and a mean of 2.3 < 3.

However, this is not as per the assertions by Rabongo (2015), who emphasises that the villagers should consciously decide to protect the forest since they value it as their natural source of posterity.

There was inadequate stakeholder engagement that would have involved consulting the local community, government, NGOs, and private sector, among others, according to 18.2 per cent and a mean of 2.7 < 3. The community was considered not to be adequately sensitised on their guaranteed share of benefits from the forest that would have motivated them to participate and manage forests sustainably according to 32.7 per cent and mean of 2.3 < 3. The community should be given technical assistance to manage the forest effectively according to 56.4 per cent and a mean of 4.2 > 3. This agrees with Kidenya (2015), who states that the community should be given technical assistance to manage the forest effectively.

KIs Opinions on Community-Based Forest Conservation Approaches Protection of Aberdare Forest Ecosystem

The KIs were requested to give their opinions on the contribution of the local community to the preservation and sustainable management of Aberdare Forest. The KIs gave opinions on the roles played by the local communities by stating the following.

> "Local community report those destroying the forest to the relevant authorities. They help to curb the forest fires. Through ecotourism activities, they earn government revenue. They preserve indigenous trees. They also provide labour in forest tree nurseries as casuals."

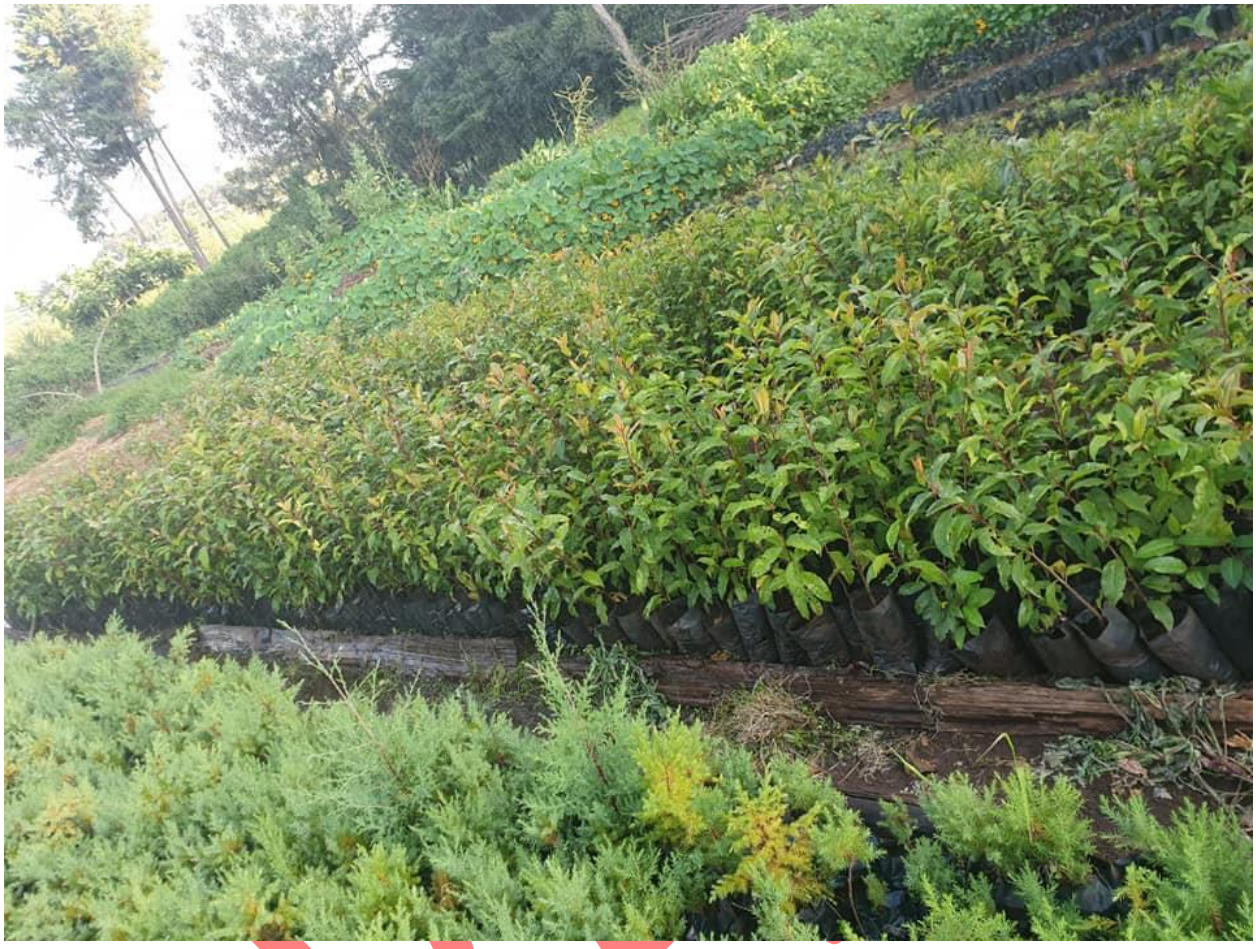

Figure 1: Tree Nurseries alongside Ndaragwa Forest
Source: Researcher, 2023

"They also prepare tree nurseries and raise tree seedlings for planting to increase forest cover, as shown in Figure 1 above. The nurseries provided a wide variety of trees, both exotic and indigenous, thus providing seedlings for replanting trees and conserving the forest."

Figure 2: Image of Agro-Forestry by Local Communities in Ndaragwa Forest
Source: Researcher, 2023

"The local community practice agro-forestry as shown in Figure 2 below, reducing over-reliance on the forest."

Figure 3: Image of Shamba System in Ndaragwa Forest

> "Under the *shamba* system, farmers grow both plantation trees and food crops on small plots, tending the trees and harvesting the crops until the trees become established."

The researcher further asked the KIs for their opinions on the benefits that they foresee in engaging the local community in forest conservation and management decisions. The responses were as follows;

> "There are many benefits with the engagement of the community as they are vigil in averting rogue persons who might destroy the forest. They support forest coverage by raising and managing tree nurseries and tree seedlings for planting. They educate each other on the importance of forests. They also value forests as a source of rivers and livelihood, thus conserving the environment. Through their experiences and expertise in forest conservation, they give ideas on how the forest should be conserved and protected."

The researcher sought to gather the opinions of the KIs on the challenges that have arisen in the process of engaging the local community in forest conservation. The KIs give their responses as follows;

> "Some of the local community members start forest fires which destroy the forest. Most of the community members get involved in forest destruction through illegal logging and charcoal burning. Some community members overgraze in the forest, causing soil erosion. There is an obstruction of water from rivers that rise from the forest. Animals, especially goats and cows, grazed in the forest by the local community destroy trees."

The KIs were requested to suggest the remedies to the challenges discussed above. Below are some of the suggested remedies;

> "Apprehending, arresting and prosecuting perpetrators who destroy forests. It is necessary to give grazing permits to the local community as per the carrying capacity of the forest. The local community should be sensitised to the importance of conserving the forest. There should be control and regulation of obstruction of water intakes in the rivers that rise from the forest. There should be effective techniques for curbing forest fires. Tree seedlings should be provided to the local community to plant during the rainy season so as to promote agro-forestry."

Discussion

Community-Based Forest Conservation Approaches in the Aberdare Forest Ecosystem

The study revealed that there is no adequate capacity building for the local community that would have been aimed at empowering them to take care of the surrounding natural resources. There are not enough deliberate efforts by the local community to protect the forest for the value of the natural source of posterity. Members of the community do not control the access to the forest by some of them doing patrols, nor do they provide food to the people who are doing protection. The local community was found not to hold beliefs that highly regard the forest as a cultural and traditional heritage. Devolved governance, the forestry sector brought in significant changes in incorporating participatory forest management and co-management. There was inadequate stakeholder engagement that would have involved consulting the local community, government, NGOs, and the private sector, among others. The local community was not adequately sensitised on their guaranteed share of benefits from the forest that would have motivated them to participate and manage forests.

5.0 CONCLUSION AND RECOMMENDATION

Conclusions: The researcher sought to identify the community-based forest conservation approaches that have contributed to the sustainable management of Aberdare Forest (Ndaragwa forest). There is a strong positive relationship between Community-based forest conservation and sustainable forest management that is significant at 5 per cent levels of significance. This is attained through capacity building and holding beliefs for the local community that would have been aimed at empowering them to take care of the surrounding natural resources. In devolved governance, the forestry sector needs to incorporate participatory forest management and co-management. Other crucial activities entail stakeholder engagement that involves consulting the local community, government, NGOs, and the private sector, among others.

Recommendation: The study recommends that the members of the local community be adequately involved in the Aberdare Forest Ecosystem. They should be engaged in community-based forest conservation strategies like preparation of tree nurseries and raising tree seedlings for planting to increase forest cover, preservation of indigenous trees, as well as agro-forestry, reducing over-reliance on the forest.

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