Dependence on Forest Resources, and Community Perception of Existing Management Strategies of Akure-Ofosu, Oluwa, and Akure Forest Reserves in Southwest Nigeria

*1,2ELUJULO, O; 3ADETULA, OI; 3AKINBOWALE SA; 2,4ADELOLA TR

*1Institute of Ecology and Environmental Studies, Obafemi Awolowo University, Ile-Ife, Nigeria
2Youth in Agroecology and Restoration Network (YARN)
3Federal University of Technology, Akure, Nigeria
4University of Cape Town, South Africa

*Corresponding Author Email: opeyemi.elujulo1@gmail.com
Co-Authors Email: olaoluwaadetula@gmail.com; akinloluakinbowale@gmail.com; temitopeadelola2@gmail.com

ABSTRACT: A good understanding of community use and perception of existing forest conservation and management practices plays a significant role in achieving conservation objectives. This study investigated the level of dependence on forest resources, and community perception of existing management strategies in Akure-Ofosu, Oluwa, and Akure forest reserves in southwest Nigeria using appropriate standard methods. A semi-structured questionnaire and key informant interviews were used to engage a total of 150 households and three community heads within 5 km of the forest reserves, including Ala-Elefosan, Onipetesi, and Aponmu communities respectively, for data collection. Data obtained revealed that majority (72, 94, and 76%) of respondents in Ala-Elefosan, Onipetesi, and Aponmu respectively, depend on the forestland for crop farming, which could account for the alarming rate of decline in forestlands. A large number of the respondents across the study areas also reported that existing conservation strategies are reinforcing household poverty as they are not able to farm freely within the reserve. The study further gave credence to the high dependence on the forest reserves to meet the basic needs and subsistence of forest communities and concluded that current management measures hold the possibility for conflicts and illegal activities in the region. It is therefore suggested that an integrated approach that engages the forest communities in the decision-making processes through inclusive governance, and measures that can address the mutual exclusivity between livelihoods and conservation should be put in place.

Forest reserves are identified as a major supporting structure for biodiversity conservation and sink for greenhouse carbon emissions (Walpole and Goodwin, 2001). However, activities such as change in land use, deforestation, and degradation have continued to reduce forest cover over the years (Purity, 2011). This has been exacerbated by the existing mutual exclusivity between livelihoods and conservation. According to Rotich *et al*., (2020), and USAID (2006) over 80% of people living below the poverty line around the world are dependent on forests in some

varying capacities, with a representation of over 600 million people across the African continent are dependent on forests and woodlands to meet their needs (Center for International Forestry Research, 2005). Unfortunately, this level of dependence has not been possible without its impact on the biophysical structure of forests globally, consequently suggesting the need for an integrated management approach that meets conservation goals. In Nigeria for instance, linked to the rapidly increasing population met with shrinking resources, the biophysical structure of

Nigeria's landscape, and the biodiverse natural resources have continued to face mounting pressure, particularly in the agriculture, forest, and other land use sector. This has also been exacerbated by the impacts of the climate crisis. The rich array of forests in Nigeria provides ecosystem services, and a wide range of resources to Nigerians, ranging from non-wood products including hunting field, medicinal herbs, protection for watersheds, carbon sequestration, and tourism, among others (Owolabi, 2019), to logs and fuel wood products. These realities acknowledge that communities living in close association with forest reserves are largely instrumental in achieving set conservation objectives. Several authors (Alison *et al.*, 2005; Hariohay *et al*, 2020; Rotich *et al.*, 2020; Htay and Roskaft, 2020) have documented that an understanding of the attitude and perception of forest-dependent communities on the use and management of forests, as well as the major drivers of their perceptions, cannot be invalidated in the efforts to conserve biodiversity, address conflicts, and in the design of improved management decisions and policies. It is with this understanding that the current study was carried out to understand the attitude as well as the level of dependence of the communities living in close association with three forest reserves in Akure, Nigeria, to draw a valid conclusion and recommendation for improved and sustainable management of forest resources. This study therefore aimed at investigating the level of dependence on forest resources, and community perception of existing management strategies in Akure-Ofosu, Oluwa, and Akure forest reserves in southwest Nigeria.

MATERIALS AND METHODS

Study Areas: This study was carried out in Akure Forest Reserve, Oluwa Forest Reserve, and Akure Ofosu Forest Reserve. Geographically, the Akure Forest reserve is located in a humid rainforest of Akure South Local government Area of Ondo State, Nigeria. It lies between latitudes 7°16′ and 7°18′ N of the Equator and longitudes 5° 9′ and 5°11′E of the Greenwich Meridian, with a total land area cover of 69.93 km^2 (Adelakun and Adeoye, 2019). The Akure Ofosu Forest Reserve is geographically located in Akure North Local Government Area of Ondo State, Nigeria, where it shared a boundary with Ala Forest in Akure North Local Government and Idanre-Ofosu forest reserve in Idanre Local Government. The land area is about 394 km^2. The study area is notable for the commercial production of industrial raw materials such as timber and non-timber forest product (Folayan and Bifarin, 2009).
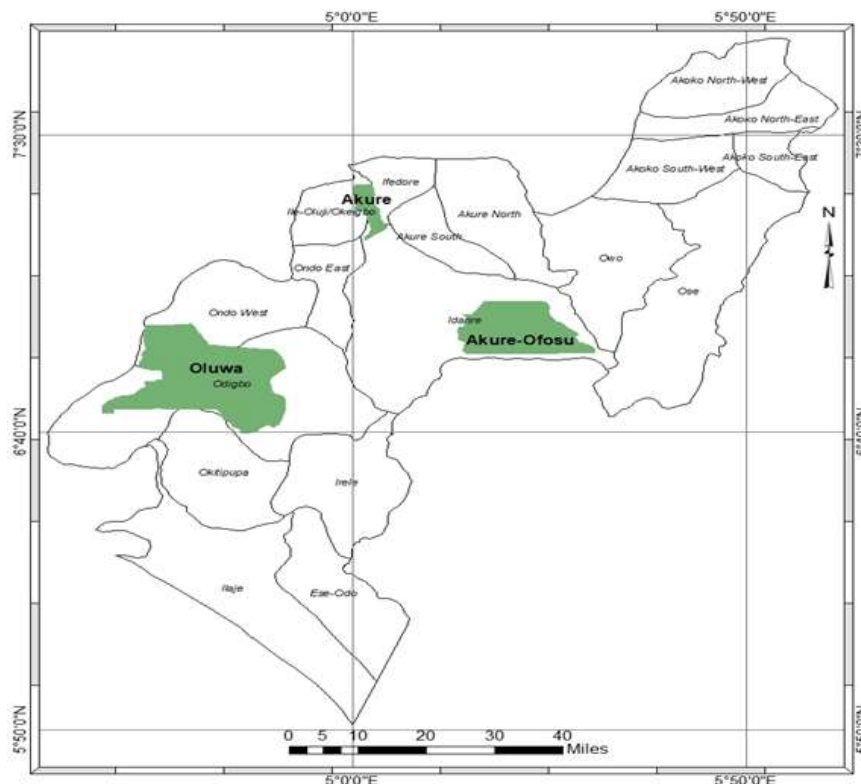
Fig 1: Map of Ondo state showing the 3 different Forest reserves covered

ELUJULO, O; ADETULA, O. I; AKINBOWALE, S. A; ADELOLA, T. R.

The Oluwa Forest Reserve is located approximately between latitude 6°38' and 6°59'N and longitudes 4° 23' and 4° 46'E. The reserve covers 82,940 Hectares of land consisting of both natural forest and plantation establishment of different species. It is part of the Omo-Shasha-Oluwa Forest reserves. The soils are well-drained, mature, red, stony, and gravely in the upper parts of the sequence according to (Onyekwelu *et al*., 2006). The natural vegetation of the Forest reserve is the tropical rainforest. The type of ecosystem across the three Forest reserves is the tropical rainforest. These Forest reserves were selected for the study because the natural vegetation of the Forest reserves has been degraded to secondary regrowth, and fallow regrowth at uneven stages of regrowth, or replaced by annual and perennial crops including cocoa, and kola (Orimoogunje, 2014).

Sampling Technique and Analysis: The study was conducted through the use of primary data. The data were collected through the combination of structured questionnaires and key informant interviews in the project communities. The three communities used for the study, were purposively selected from each Forest reserve as representatives of the forest-dependent communities based on the proximity to the reserves. A sample size of 50 households was drawn from the communities around each Forest reserve to make a total of 150 households across the study areas who were the respondents to the structured questionnaire. Key Informant Interviews (KII) were used to collect qualitative data from three (3) community heads in the study areas. The KII was done to ensure a better understanding of the existing conservation strategies in the Forest reserves and their impacts on the livelihoods of the surrounding communities.

Data analysis: Data obtained from the studies were coded and analyzed using SPSS (17.0), and Microsoft Office Excel was used to generate the frequency distribution and percentages for descriptive statistics. The relationship between the socioeconomic and the forest resource was analyzed using the Pearson chi-square test at P<0.05.

RESULT AND DISCUSSIONS

Socio-demographic characteristics of Respondents: Table 1 shows the socio-demographic characteristics of respondents across the three Forest reserves. A large number (78.0, 88.4, and 84.0%) of respondents in Ala-Elefosan, community in Akure Ofosu, Onipetesi community in Oluwa, and Aponmu community in Akure forest reserves respectively were males. Also, a greater proportion of the respondents across the study communities were within the age groups 26 through 55 years, which usually represents the productive age groups. In terms of education, a significantly higher number (32, 56, and 34%) of respondents in Ala-Elefosan, Onipetesi, and Aponmu communities respectively, reported schooling up to primary education.

Table 1: Socio-demographic characteristics of Respondents

	Akure Ofosu N = 50	Oluwa N = 50	Akure N = 50	X^2	p-value
Sex				1.82	0.40
Male	39 (78.0)	44(88.0)	42(84.0)		
Female	11(11(22.0)	6(12.0)	8(16.0)		
Age				12.25	0.14
18-25	4(80.0)	1(2.0)	4(8.0)		
26-35	6(12.0)	3(6.0)	6(12.0)		
36-45	8(16.0)	7(14.0)	15(30.0)		
46-55	14(28.0)	19(38.0)	8(16.0)		
56 and above	18(36.0)	20(40.0)	17(34.0)		
Marital Status				8.50	0.21
Married	31(62.0)	42(84.0)	37(74.0)		
Single	9(18.0)	4(8.0)	8(16.0)		
Divorced	2(4.0)	0(0.0)	2(4.0)		
Widowed	8(16.0)	4(8.0)	3(6.0)		
Household Size				10.55	0.03*
1-5	16(32.0)	7(14.0)	15(30.0)		
6-11	29(58.0)	30(60.0)	31(62.0)		
12-19	5(10.0)	13(26.0)	4(8.0)		
Annual Average Cash Income (USD)				12.10	0.02*
<1000	22(44.0)	12(24.0)	23(46.0)		
1000 - 2000	26(52.0)	30(60.0)	26(52.0)		
>2000	2(4.0)	8(16.0)	1(2.0)		
Educational level				25.84	0.001*
No Education	1(2.0)	7(14.0)	1(2.0)		
Non-formal Education	5(10.0)	2(4.0)	8(16.0)		
Junior High School	16(32.0)	28(56.0)	17(34.0)		
Senior High School	13(26.0)	8(16.0)	16(32.0)		
University Education	15(30.0)	5(10.0)	8(16.0)		

* p<0.05 X^2 Chi-square

This could be said to have contributed to the knowledge of forest management strategies demonstrated by the respondents in the assessment of existing conservation strategies from the lens of the forest communities. Majority of the households across the study communities were between 6-11 members, suggesting a high demand and dependence on the natural resources in the Forest reserves. Additionally, Majority (52, 60, 52%) across Ala-Elefosan, Onipetesi, and Aponmu communities respectively, reported that the average annual income of the household heads was between 1000 and 2000 USD. This figure was reported by respondents who had other side businesses that they do alongside farming, such as trading, shop owners, and farmers with cocoa plantations, while a few respondents (4, 16, and 2%) in Akure Ofosu, Oluwa, and Akure respectively reported an average annual income above 2000 USD, mostly accounted for by respondents who have other official jobs in government or private entities in the state.

Level of dependence on forest reserve among the various communities: Table 2 below shows the level of dependence on the natural resources in the area among the studied communities. The major source of income in communities around the Forest reserves was reportedly Farming within the Forest reserves, with a representation of 72.0, 94.0, and 76.0% in Ala-Elefosan, Onipetesi, and Aponmu communities

respectively, which might account for the increased land conversion for agriculture within the forest reserves at the expense of forestland cover (Adeleke, 2018). Also, majority (44.0, 62.0 and 54.0%) of the respondents in Ala-Elefosan, Onipetesi, and Aponmu communities respectively, also reported collecting forest products primarily for both sales and consumption, which is also in alignment with the report of USAID (2006) that over 80% of people that live below the poverty line depend on forests in some varying capacities to meet their need. Additionally, respondents of the Key Informant Interviews also corroborated the survey responses, stating that the communities around the three forest reserves depended solely on the reserves for economic activities. For example, participants from the three communities reported that "we harvest trees from the forest reserve to cook and we also sell to make money to buy other things. A KII participant from Ala-Elefosan community also reported that their only source of livelihood is from the forest, saying "we are farmers, these is where we get money from after selling our cocoa and other farm produce". The level of conversation of forest lands for farming activities documented through this study corroborate the work of Adelakun and Adeoye (2019), that reported an increase in farmland within Akure Forest reserve. The result also supports the work of Appiah *et al*., (2009), who reported a linear relationship between farming engagement for livelihood and deforestation in Ghana.

Table 2: Level of dependence on forest reserve among the various communities

	Akure Ofosu N = 50	Oluwa N = 50	Akure N = 50	X^2	p-value
Major Source of Income					
Crop farming	36(72.0)	47(94.0)	38(76.0)	16.45	0.04*
Animal husbandry	1(2.0)	0(0.0)	1(2.0)		
Traditional Medicine	0(0.0)	0(0.0)	2(4.0)		
Petty Trading	13(26.0)	2(4.0)	9(18.0)		
Hunting/trapping	0(0.0)	1(2.0)	0(0.0)		
Forest dependent activity important to livelihood					
Hunting	2(4.0)	2(4.0)	3(6.0)	1.54	0.96
Farming	34(68.0)	38(76.0)	34(68.0)		
Firewood Harvesting	10(20.0)	8(16.0)	10(20.0)		
Medicine	4(8.0)	2(4.0)	3(6.0)		
Purpose of collecting forest products					
Sale	18(36.0)	15(30.0)	19(38.0)	6.10	0.20
Consumption	10(20.0)	4(8.0)	4(8.0)		
Sales and Consumption	22(44.0)	31(62.0)	27(54.0)		

*p<0.05 X^2 Chi-square

Conservation strategies in relation to livelihoods: This study also assessed the understanding and perception of participants on land cover change in the forest reserves, as well as their knowledge of existing conservation strategies in relation to livelihoods in

each of the communities (Table 3). A greater number (90.0, 96.0, and 98.0%) of respondents in Ala-Elefosan, Onipetesi, and Aponmu communities respectively said they are familiar with forest management, which may be because majority of the

respondent attained education from junior high school to university degree. Also, majority (52, 50, and 46%) of the respondents in Ala-Elefosan, Onipetesi, and Aponmu communities respectively, identified restriction of access to the forestlands for farming activities within the forest reserves as one of the major existing strategies put in place for management in the forest reserves. A large number of the respondents across the study areas also reported that the restrictions is reinforcing household poverty because they are not able to farm like they used to. For example, *a participant from Onipetesi* community stated that "we can't say the conservation strategies have been successful, because we were evicted from the forest, we couldn't work on our farms again. Farming is the only means of livelihood that we have and if we are chased away from farms people might venture into other means of livelihood like stealing and illegal logging". This response suggest the existence of mutual exclusivity between livelihoods and conservation efforts which can potentially result in the increased exploitation of forest resources to meet their needs. This corroborates the study of Pandey (1996), which reported the existing linkage between rural poverty and the decline in forest resources. Another existing conservation strategy currently implemented is addressing illegal logging in the forest reserves. For example, *a* participant from Onipetesi community also stated that "if not for the forest guards everything will be destroyed in the forest. People cut down trees indiscriminately and set fire to them"

Table 3: Conservation strategies in relation to livelihoods

Conservation strategies	Akure Ofosu N = 50	Oluwa N = 50	Akure N = 50	X^2	p-value
Are you familiar with sustainable forest management strategy					
Yes	45(90.0)	48(96.0)	49(98.0)	3.44	0.20
No	5(10.0)	2(4.0)	1(2.0)		
Examples of conservation strategy					
Conservation education	3(6.0)	1(2.0)	1(2.0)	9.42	0.31
Restriction of illegal logging	14(28.0)	17(34.0)	18(36.0)		
Farming restriction within the forest reserve	26(52.0)	25(50.0)	23(46.0)		
Hunting Restriction					
Penalty for defaulters	1(2.0)	0(0.0)	2(4.0)		
	6(12.0)	7(14.0)	6(12.0)		
Do these strategies affect your livelihood?					
Yes	45(90.0)	48(96.0)	49(98.0)	6.80	0.15
No	5(10.0)	2(4.0)	1(2.0)		
Most negative influence to your livelihood					
Conservation education	2(4.0)	1(2.0)	0(0.0)		
Law enforcement	8(16.0)	3(6.0)	9(18.0)	15.84	0.10
Farming Restriction	25(50.0)	32(64.0)	26(52.0)		
Hunting Restriction	1(2.0)	0(0.0)	5(10.0)		
NTFP harvesting restriction	13(26.0)	14(28.0)	10(20.0)		
Livelihood support	1(2.0)	0(0.0)	0(0.0)		

Community Perception on Conservation Strategies: Participants were asked about their knowledge of the land cover change in the forest reserve and majority (90, 96, and 96%) of respondents from Ala-Elefosan, Onipetesi, and Aponmu communities respectively, acknowledged that the forest cover has declined over the past decade.

For the question on what can be done to improve the conservation of the forest reserves, majority (36, 40, and 30%) from Ala-Elefosan, Onipetesi, and Aponmu communities respectively, answered that providing alternative means of livelihood for the surrounding communities have the potential to advance conservation effort.

This was followed by providing conservation education among the communities. Majority (92, 100, 98%) Ala-Elefosan, Onipetesi, and Aponmu communities respectively also indicated their interest in participating in skill acquisition and capacity-building programs (Table 4). These responses confirm the work of Adams *et al*., (2004) that the provision of alternative means of livelihood or other strategies that alleviates poverty among forest-dependent communities may have beneficial impacts on conservation objectives. The survey responses also corroborate the work of Levang *et al*., (2005), that the availability of education facilities can potentially discourage communities living in close association with forest reserves from extracting and exploiting natural resources for income in many instances (Levang *et al*., 2005. Additionally, responses from the KII participants reported the need for the inclusion of forest communities in consultations and management processes.

Table 4: Community perception about forest management and its sustainability

Community Perception	Akure Ofosu N = 50	Oluwa N = 50	Akure N = 50	X^2	p-value
Forest cover has declined over the past decades					
Agree	45 (90.0)	48 (96.0)	48 (96.0)	2.13	0.35
Disagree	5 (10.0)	2 (4.0)	2 (4.0)		
What should be done to improve conservation					
Alternative livelihood	18 (36.0)	20 (40.0)	15 (30.0)		
Improve conservation education	12 (24.0)	13 (26.0)	9 (18.0)	16.39	0.04*
Strengthen conservation policies	6 (12.0)	7 (14.0)	7 (14.0)		
Capacity building	3 (6.0)	6 (12.0)	7 (14.0)		
Training on improved livelihood activities	11 (22.0)	4 (8.0)	12 (24.0)		
Are you interested in capacity building and skill acquisition programs					
Yes	46 (92.0)	50 (100)	49 (98.0)	2.14	0.34
No	4 (8.0)	0 (0.0)	1 (2.0)		

For example, a participant from Aponmu communities in Akure Forest explained that *"the government should hold a dialogue with us because we pay money for this place but the forest guards won't allow us to come in"*. Another participant also said that "for those of us who plant in the forest, the state should tax us, and the guards should deal with those who are falling trees indiscriminately". Another participant from Ala-Elefosan community of Akure Ofosu forest reserve also said that "the government officials should tell the guards to stop extorting us".

Conclusion: The high level of dependence on the forest reserves by the forest communities could be linked to the alarming decline in the forestlands, as reported in this study. However, with the current management strategies of restricting accessibility identified as a major driver of household poverty within the forest communities, there is a need for an integrated approach that can address the mutual exclusivity between livelihoods and conservation, to ensure that the forest management plans do not result in unintended outcomes of conflict and activities that are illegal in the region.

REFERENCES

Adams, WM; Aveling, R; Brockington, D; Dickson, B; Elliott, J; Hutton, J; Roe, D (2004). Biodiversity conservation and the eradication of poverty. *Sci.* 306(5699): 1146-1149.

Adelakun, G; Adeoye, N (2019). Analysis of Pattern and Extent of Deforestation in Akure Forest Reserve, Ondo State, Nigeria. *J. of Environ. Geog.* 12. 1-11.

Adeleke, B (2018). Human population growth as proximate cause of wetland dynamics. *Int. J. of Human Capital in Urban Manage.* 2. 10.22034/ijhcum.2017.02.04.002.

Alison, O; Beth, A; Kaplin, A (2005). A framework for understanding community resident perceptions of Masoala National Park, Madagascar. *Found. Environ. Conserv.* 32(2):156–164.

Appiah, M; Blay, D; Damnyag, L; Dwomoh, FK; Pappinen, A; Luukkanen, O (2009). Dependence on forest resources and tropical deforestation in Ghana. *Environ. Dev. Sustain.* 11: 471-487.

Center for International Forestry Research (2005). Contributing to Africa's development through forests strategy for engagement in subSaharan Africa. *CIFOR*, 41.

David, O (2019). Forest Loss in Nigeria, the Impact on Climate and People from the perspectives of illegal Forest activities and Government Negligence. Siam University.

Folayan, JA; Bifarin, JO (2009). Forestry Potentials in Employment Generation in Akure-Ofosu Forest Reserve of Ondo State, Nigeria. *Int. J. of Creat. and Technol. Dev.* 1: 1 - 3, 2009.

Guthiga, PM (2008). Understanding local communities' perceptions of existing forest management regimes of a Kenyan rainforest. *Int. J. of Social Forestry* 1(2):145-166.

Hariohay, KM; Gambay, JG; Røskaft, E (2020). Attitudes of local leaders towards wildlife conservation in village areas in southern Ngorongoro Conservation Area, Karatu District, Tanzania. *Int. J. of Biodi. and Conser.* 12(3):227-239.

Htay, T; Røskaft, E (2020). Community dependency and perceptions of a protected area in a threatened

ecoregion of Myanmar. *Int. J. of Biodi. Conser.* 12(4):240-252.

Levang, P; Dounias, E; Sitorus, S (2005). Out of the forest, out of poverty? *Forests, Trees and Livelihoods* 15(2): 211-235.

Onyekwelu, JC; Mosand, R; Stimm, B (2006). Productivity, site evaluation and state of nutrition of Gmelina plantations in Oluwa and Omo Forest reserves, Nigeria. *Forest Eco. and Manage.* 229: 214–227.

Orimoogunje, O (2014). Forest Cover Changes and Land Use Dynamics in Oluwa Forest Reserve, Southwestern Nigeria. *J. of Landscape Ecology*. 7. 25-44.

Pandey, S (1996). Deforestation and rural poverty in developing countries: the role of social work. *J. Sociol. Soc. Welf*. 23(1):8

Purity, AO (2011). Payback Anticipation: A Driving Force in Community Participation in forest management. Paper presented at the 13th Biennial Conference of international Association for the Study of commons (IASC) in Hyderabad India. 10-14th January, 2011. Pp 15.

Rotich, B; Makindi, S; Esilaba, M (2020). Communities' attitudes and perceptions towards the status, use and management of Kapolet Forest Reserve in Kenya. *Int. J. of Biodi. and Conser.* 12. 363-374.

USAID (2006). Issues in Poverty Reduction and Natural Resource Management. United States Agency for International Development, Washington, DC.

Walpole, MJ; Goodwin, HJ (2001). Local Attitude towards Conservation and Tourism around Komodo national Park, Indonesia. *Environ. Conser.* 28(2):160-166.