Multiple use benefits and land cover protection in peri urban forest in Ogun State, Nigeria

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Abstract
This paper examined multiple use benefits and land cover protection of a peri urban forest in Abeokuta, Ogun State, Nigeria. A total of 100 respondents were selected from 4 communities (rural dwellers) living close to the forest. Stratified random sampling approach was used for the study with each community representing a stratum and 25 respondents randomly selected from each community. The results revealed that majority of the respondents were female (53%), married (86%) with no formal education (52%) and forest exploitation cut across all ages with age class 41-50 year-old dominating. The dominating household size (7-8) was prominent in the exploitation of the forest. Items exploited from the forest include firewood, medicinal plants, leaves, snails, bush meat and geological materials. The annual income of respondents ranged between N60,000-N240,000 with 43% of the respondents in this category. Forest contribution to total income in the area was low (15-18%), while contribution to ecosystem services was not evaluated. Despite this, all the respondents were involved in the exploitation of the forest resources (100%). Thus, the forest was regarded as a community forest, a concept not well accepted in Nigeria but put into practice in the study area. Therefore, there is need to protect the forest because of the support to livelihood and the environment. Consequently, respondents indicated participation in protecting the vegetation to ensure sustainable exploitation. It is therefore recommended that devolutionary governance of peri urban forests must be encouraged in Nigeria and other developing countries to strengthen decision making by involving resident communities. This will go a long way in ensuring land reform that will improve tenure security of the rural communities and thereby reduce inter and intra community conflicts for peaceful co-existence.
Key words: Communities; Low forest income; Devolutionary governance; Land reform; Land tenure.

Introduction

Nigeria is a country rich in biodiversity. The growing population in the country benefit from different ecosystems and the natural environment. Nigeria has lowland rainforest areas as well as high forest, large patches of montane, freshwater wetlands, savanna, plateau, mangroves and coastal areas with wide climatic variation. Consequently, Nigeria is recognized internationally as a country with abundant biodiversity.

Groombridge and Jenkins (2002) reported that in Nigeria, rainforest is home to over 1,417 known species in fauna and at least 4,715 species of vascular plants. Therefore, forests have the highest species diversity of any terrestrial ecosystem in Nigeria and the world. However, Nigeria faces extreme pressure on biodiversity coupled with human activities that continue to modify the natural environment through accelerated socio-economic activities and thereby contribute to land cover changes to threaten the life support base of man. Forests however, provide

employment for people and contribute to the Gross Domestic Product of the nation. Forest resources in Nigeria are distributed on State basis with eight major forest types. As one of the states with forest resources, Ogun State has forest reserve that falls under the purview of a peri urban forest. According to Wiggins and Holt (2000), peri urban was described as areas beyond the closed settled limits of any urban area but are sufficiently close enough to the urban area to have frequent and substantial interactions with the urban economy. Close enough was taken to mean within 30 minutes of journey of the city by public transport. This expression describes Arakanga forest reserve in Abeokuta, Ogun State, Nigeria. As a peri urban forest there are growing settlements developing close to the forest in view of the benefits derivable from the forest. This is in addition to the interaction with the urban economy.

The values of a peri urban forest transcend the valuation of forests as land banks as hitherto was the perception of early settlers. The list of goods and services that urban forestry and peri urban forestry can provide is impressive. Trees and green spaces help keep cities cool, act as natural filters and noise absorbers; improve microclimates and protect and improve the quality of natural resources, including soil, water, vegetation and wildlife. Trees contribute significantly to the aesthetic appeal of cities, thereby helping to maintain the psychological health of their inhabitants. Beyond ecological and aesthetic benefits, peri urban forest has a role in helping resource - poor populations meet basic needs.

This therefore underscores the importance of this study with the following objectives: (i) describe the socio-economic characteristics of peri urban forest population, (ii) determine the economic contribution of peri urban forest to livelihoods in Ogun State, (iii) identify the multiple benefits of the forest and (iv) determine the contribution of the respondents to land cover protection in the study area.

Material and methods

Study area

The study was carried out in Abeokuta, Ogun State, Nigeria (Fig. 1). Abeokuta lies within Latitude 7° and 7°5' N and Longitude 3°3' and 3°37' E. Arakanga Forest Reserve (AFR) is one of the nine (9) forest reserves in Ogun State that falls under the purview of a peri urban forest. AFR is about 2.3 Km^2 long and made up of both the high forest and savanna vegetation. Although the reserve is located in Odeda Local Government Area, it is closer to Akomoje, the headquarters of Abeokuta North Local Government Area and about 5 Km from the centre of Abeokuta, the capital city of Ogun State (Awojuola 2001; Onakomaiya et al. 1992). The environment is characterized by two distinct seasons. The longer wet season last for eight months (March-October) and shorter dry season last for four months (November- February). The relative humidity is high all year round, generally above 80% during the wet season and

fluctuates between 60-80% during the dry season. The most humid months coincide with the rainy season spanning between March and October. Humidity and the long wet season ensure adequate supply of water and continuous presence of moisture in the air. This trend promotes perennial tree growth. The soils in the area are dominated by clayey loam developed on underlying granite. There are also laterite soils. Abeokuta has extensive free forest areas with two gazetted forest reserves of 61.19 Km² land area. Major timber crops include Teak and Gmelina with other

indigenous species from the free areas. The major occupation of the people in the study area is farming with agricultural crops such as cassava, maize, cocoyam, plantain, palm produce and vegetables. The area is also rich in fauna resources such as fish of various species, grasscutter, giant rat, grey rat, monitor lizard, weaver birds and others. Stone quarrying is also well developed. Major non-farm employments are provided by transportation and forestry activities such as timber exploitation, firewood, leaves collection and charcoal production.
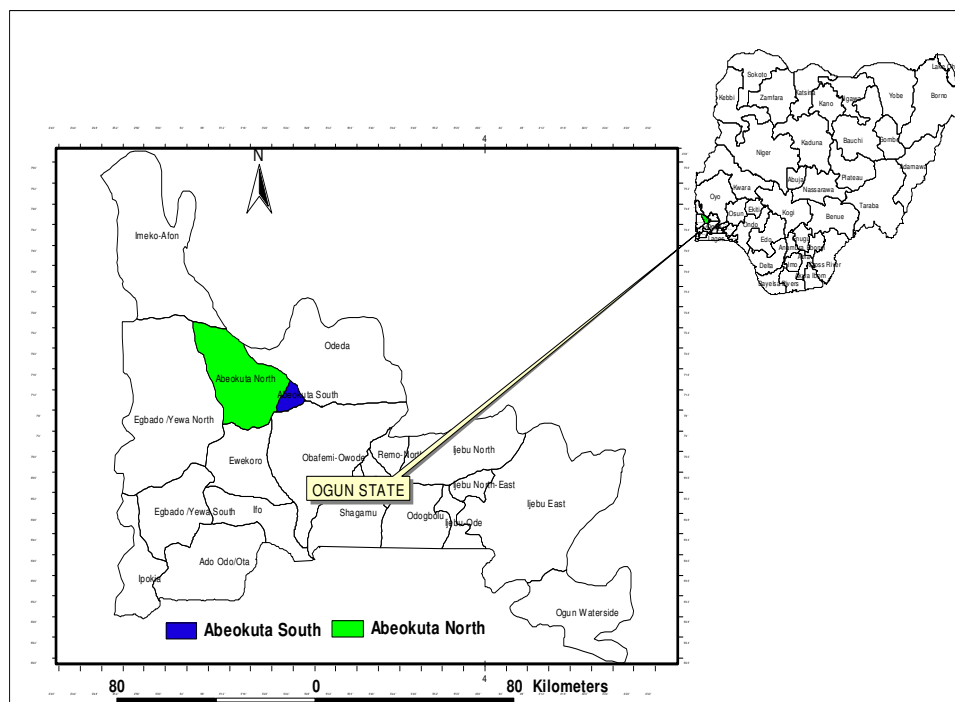

Figure 1. Map of Ogun State showing the study area.

Data collection

Primary data were collected from four settlements to Arakanga Forest Reserve, Abeokuta in Ogun State. Stratified Sampling technique was used for the study. Each village in the study area represents a stratum. From each stratum, respondents were randomly selected. A total of 100 respondents with 25 from each stratum were selected. The villages are Ajegunle, Ibode-Olude, Ilugun-Titun and Mawuko. The instrument of data collection was through the administration of questionnaire and personal interview. The respondents cut across civil servants (local residents), rural dwellers and knowledgeable members of the society. Questionnaire information addressed socio-demographic characteristics of the respondents such as age, gender, marital status, educational background, family size, and others. Technical questions deal with multiple benefits derived from the reserve and the protection of land cover despite resource exploitation from the forest. The study was carried out between June and September, 2013.

Multiple benefits

The rating of various benefits and grades derived from the reserve was also determined. Hansel table of multiple benefits was used as presented in Table 1.

Data analysis

Descriptive statistical tools such as frequency distributions mean and percentages were used to summarize

data. The percentage contribution of forest income to total income was assessed using earnings and income source by shares. The multiple use benefit was evaluated with Hansel (1965) table of multiple benefits. Respondents participation in land cover protection was assessed with respondents participation in vegetation cover protection.

Table 1. Multiple benefits.

Grades	Benefits					
	1	2	3	4	5	6
1	(Size Class)		Insignificant			
2	V		Significant			
3	IV		More significant			
4	III		Important			
5	II		Very important			
6	I		Indispensable			

Benefits: 1- Firewood collection, 2- Snail gathering, 3- Medicinal plant collection, 4- Leaves collection, 5- Hunting activities, 6- Geological material extraction (sand, stone, gravel). *Grades*: 1- Insignificant, 2- Significant, 3- More significant, 4- Important, 5- Very important, 6- Indispensable. Source: Adapted from Hansel (1965).

Results and discussion

Demographic profile of respondents

Table 2 shows the result of the demographic profile of the respondents in the study area. A description of the demographic profile provide the necessary frame work upon

which the result of the study and the recommendations were based. Majority, 53% of the respondents were female and male, 47%. Consequently, forest activities in the neighborhood were female dominated. The age distribution showed that 42% were between the age range of 41-50 year-old indicating the dominant age group of the respondents. The data also shows that majority, 86% of the respondents were married and 12% were single and 2% widower.

The household size of the respondents ranged from 1 to 8. Household size of 5-6 recorded 44% as the most preponderance household size. On education, majority 52% of the respondents had no formal education, 25% had primary education, while 16% had secondary education and only 7% of the respondents had Tertiary education. Ethnic distribution indicates Yoruba with 90% as the most preponderance group in the study area and this could be attributed to the fact that the area is predominantly Yoruba speaking environment.

Table 2. Demographic profile of respondents (field survey in 2013).

Variables	Frequency	Percentage (%)
Gender		
Male	47	47
Female	53	53
Total	100	100
Age (year-old)		
21-30	16	16
31-40	38	38
41-50	42	42
51-60	3	3
61-70	1	1
Total	100	100
Marital status		
Single	12	12
Married	86	86
Divorced	0	0
Widow(er)	2	2
Total	100	100
Household Size		
1-2	13	13
3-4	38	38
5-6	44	44
7-8	5	5
Total	100	100
Educational level of respondents		
Primary	25	25
Secondary	16	16
Tertiary	7	7
No formal education	52	52
Total	100	100
Tribe		
Yoruba	90	90
Igbo	9	9
Hausa	1	1
Total	100	100

Table 3 shows the socio-economic characteristics of the respondents. Majority of the respondents 51% were involved in farming. Also, 43% of the respondents were low income earners earning less than N60,000 per annum. All the respondents were involved in forest exploitation but in utilization 91% confirmed direct utilization of the exploited products.

Respondents and economic activities

Table 4 shows the distribution of respondents based on economic activities in the study area. The table shows that firewood collection and wages recorded the highest percentage of 24% each, followed by leaves collection 21%, then geological material collection 11%, hunting 8%, snail gathering 7% and medicinal plants collection 5%.

Table 3. Socio-economic background of respondents (field survey in 2013).

Variables	Frequency	Percentage (%)
Occupation		
Farming	51	51
Civil service	9	9
Artisan	19	19
Trading	21	21
Total	100	100
Annual income		
< N60,000	43	43
N60,000 ≤ N120,000	24	24
N120,000 ≤ N180,000	21	21
N180,000 ≤ N240,000	9	9
> N240,000	3	3
Total	100	100
Exploit forest resources?		
Yes	100	100
No	-	-
No response	-	-
Total	100	100
Utilize forest resources?		
Yes	91	91
No	4	4
No response	5	5
Total	100	100

Table 4. Economic activities at the reserve (field survey in 2013).

Activity	Frequency
Firewood collection	24
Snail Gathering	7
Medicinal plants collection	5
Leaves collection	21
Wages	24
Hunting	8
Geological materials	11
Total	100

Earnings and income source by shares and location

Table 5 presents the earnings and income shares by source on stratum basis. The table shows that income diversification was common at the study area. All respondents in the study area received income from several sources. The table shows high earnings in wages from civil service. It shows the contribution of forest activities (firewood collection, snail gathering, medicinal plants, leaves collection, hunting activities, and geological material) to economic emancipation. Arnold (1998) examined the contribution of forests to sustainable livelihoods and noted that forests contribute to income, food security, reduced vulnerability, increased welfare and sustainable use of natural resource base. The observation in this study is in line with the findings of Arnold (1998). In Ajegunle settlement, the forest contributes 17% to total income, in Ibode-Olude it contributes 15%. Also in Ilugun-Titun of total income, it contributes 18% and in Mawuko 15%. Wages contribute 58% in Ajegunle, 63% in Ibode-Olude, 57% in Ilugun-Titun and 63% in Mawuko. Also, Geological material contributes 25% in Ajegunle, 22% in Ibode-Olude, 25% in Ilugun-Titun and 23% in Mawuko.

Multiple Benefits derived from the reserve

The population derives benefits from the reserve. The benefits were firewood, snail, medicinal plants, leaves, bush meat and geological material. Table 6 shows the evaluation of combined benefits derived from the reserve. The results showed the analysis of the Benefits: Firewood (1), is the most dominant use, followed by benefit (4), that is, Teak leaves collection and then medicinal plants collection (3), snail gathering, geological material collection and the least is hunting activities.

Table 5. Earnings and income source by shares and location (field survey in 2013).

Variables	Forest	Wages	Geological material
Earnings			
Ajegunle (N=25)	0.23	0.22	0.24
Ibode-Olude (N=25)	0.25	0.27	0.24
Ilugun-Titun (N=25)	0.25	0.21	0.24
Mawuko (N=25)	0.27	0.30	0.28
Total Income			
Ajegunle (N=25)	0.17	0.58	0.25
Ibode-Olude (N=25)	0.15	0.63	0.22
Ilugun-Titun (N=25)	0.18	0.57	0.25
Mawuko (N=25)	0.15	0.63	0.23

Field survey in 2013.

Table 6. Evaluation of combined benefits derived from the reserve (field survey in 2013).

Grades	Benefits						
	1	2	3	4	5	6	Total
1	27	39	31	33	77	73	15,558
2	7	9	4	6	4	4	214
3	3	1	9	5	2	1	121
4	22	25	34	21	1	2	2,711
5	7	14	10	9	6	4	478
6	34	12	12	26	10	16	2,476
Total	100	100	100	100	100	100	-

Benefits: 1- Firewood collection, 2- Snail gathering, 3- Medicinal plant collection, 4- Leaves collection, 5- Hunting activities, 6- Geological material extraction (sand, stone, gravel). *Grades*: 1- Insignificant, 2- Significant, 3- More significant, 4- Important, 5- Very important, 6- Indispensable. Source: Adapted from Hansel (1965).

Land cover protection

Land cover protection specifically vegetation was determined through vegetation loss and human activities. The significance of vegetation protection in forest utilization could be appreciated from the fact that land cover changes is more pronounced with peri urban forest due to population pressure on the resources. Accordingly, Hess (2013) reported that significant vegetation loss to other land cover types would reduce carbon storage and indirectly contribute to green house gases that threaten the life support base of man. Population pressure was identified as a major factor in land cover change in forest reserves in Ogun State (Oduntan et al. 2013). Therefore, peri urban forest is one of the vulnerable forests subject to land cover change. The forest has been protected from indiscriminate exploitation, burning or change in land cover. Table 7 shows the participation of the respondents in vegetation cover protection.

Table 7. Participation in land cover protection (field survey in 2013).

Variable	Frequency	Percentage (%)	Mode
Prevent farming in plantation	39	39	39
Reduce annual fire	10	10	-
Unsustainable harvest of forest resources	24	24	-
Prevent grazing in plantation	5	5	-
Protect forest from charcoal production	22	22	-

A proper examination of the variables involved in vegetation protection showed the prevention of farming in the forest as the prominent variable that could affect land cover. This observation is in line with the findings of Philips (1996) and Adekunle et al. (2013) that submitted that forests are affected by large scale anthropogenic activities and prominent among the activities is farming which affects the ecosystem and the environment. Consequently, anthropogenic activities impact on physical environment, biodiversity and other resources which is pronounced through over exploitation of resources or pollution generated per unit GDP (Hawksworth and Bull 2008; Sahney et al. 2010). Furthermore, the industrialization of agriculture during the last 150 years, specifically the widespread use of fossil fuel powered farm machinery for ploughing and other farm activities has resulted in massive topsoil loss and vegetation removal. Therefore, economic activities coupled with increasing human population impacted seriously on the environment to the point that the effect of humanity on the environment can no longer be ignored. Current incidences of submerged cities and towns in Asia and part of Europe were never recorded in history when the universe was adequately under forest cover. Thus, past and present behavior of humanity is responsible for damage to the environment and the damage is on the increase with man currently threatened within the environment and thus necessitating protection of existing vegetation.

This study has shown the importance of peri urban forests to nearby communities in terms of contribution to livelihoods and the environment. Nearby settlements depend on the forest for economic activities that contribute to total income. Therefore, the concept of community forestry is put into practice unconsciously in a location where the concept is relatively new. This concept therefore calls for devolutionary governance to allow for people's participation in decision making in peri urban forests so as to prevent forest degradation in Ogun State and Nigeria and also in developing countries because of deplorable situation of forest estates in the across the globe. This will therefore address the issue of land reform in peri urban forests. Consequently, land reform will improve the tenure security of local population for proper protection of vegetation cover. According to Wily and Mbeya (2001), land reform among local communities would provide tenure security for forest estates protection. Thus, this will contribute significantly to reduce communities conflicts - intra and inter on land matters for peaceful co-existence.

References

Adekunle VAJ, Oke DO, Okunlola JO, Akinbohun AO (2013) Anthropogenic activities in protected areas in Ekiti and Ogun States, Nigeria and their contributions to rural livelihood. In: *XXXV Annual Conference of Forestry Association of Nigeria (FAN)*, Sokoto, Nigeria.

Arnold MJE (1998) Forestry and sustainable rural livelihoods. In: Carney D (ed) *Sustainable rural livelihoods, what contribution can we make?* London: Department for International Development. p.155-166.

Awojuola E (2001) *Ogun State investors guide*. Abeokuta, Ogun State: Published by Eni-Meg Nigeria Ltd. in Collaboration with Ogun State Ministry of Industries and Social Development. 382p.

Groombridge B, Jenkins MD (2002) *World atlas of biodiversity*: earth's living resources in 21st century. London : University of California Press. 340p.

Hansel W (1965) Die bewertung von wohlfahrtswirkungen. *Allgemeine Forstzeitschrift*, 20(33):506-507.

Hawksworth DL, Bull AT (2008) *Biodiversity and conservation in Europe*. vol.7. Springer Netherlands. 439p. doi: 10.1007/978-1-4020-6865-2

Hess G (2013) *The triangle environment*. North Carolina: North Carolina State University.

Oduntan OO, Soaga JAO, Akinyemi AF, Ojo SO (2013) Human activities, pressure and its threat on forest reserves in Yewa division of Ogun State, Nigeria. *Journal of Environmental Research and Management*, 4(5):260-267.

Onakomaiya SO, Oyesiku K, Judge FJ (1992) *Ogun State in maps*. Oyo State, Nigeria: Rex Charles Publication. 187p.

Philips OL (1996) Long term environmental changes in tropical forests: increasing tree turnover. *Environmental Conservation*, 23:235-248.

Sahney S, Benton MJ, Ferry PA (2010) Links between global taxonomic diversity, ecological diversity and the expansion of vertebrates on land. *Biology Letters*, 6(4):544-547. doi: 10.1098/rsbl.2009.1024

Wiggins S, Holt G (2000) *Poverty, urban poverty, and forest and tree goods and services*. Reading: The University of Reading, Department of Agricultural and Food Economics. 40p. (Report ZF 0136)

Wily LA, Mbaya S (2001) *Land, people and forest in eastern and southern Africa at the beginning of the 21st Century*: the impact of land relations in the role of communities in forest future. Nairobi, Kenya: IUCN Eastern Africa Regional Office. 298p.