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Public perception of ecosystem service functions of peri - urban forest for sustainable management in Ogun State

Adekunle, M. F.*, Agbaje, B. M. and Kolade, V. O.

[1]Department of Forestry and Wildlife Management, P.M.B. 2240, Abeokuta, Nigeria.
[2]College of Environmental Resources Management, Federal University of Agriculture, Abeokuta, Nigeria.

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Forest ecosystems and landscapes are under strong and multiple pressures that challenge their capacities to continue to deliver the many and critical environmental goods and services that all life systems require. This study was therefore carried out to evaluate public perceptions on the ecosystem services (ES) of Arakanga Forest Reserve in order to provide relevant information for successful initiatives towards a sustainable management of Arakanga Forest Reserve. Data were collected from two categories of respondents, those living within 1 km radius of Arakanga Forest Reserve (Neighbourhood) and those living more than 1 km radius (Non-Neighbourhood) with the aid of pretested questionnaire. Two hundred (200) questionnaires were used, 100 for each category of respondents. Simple Descriptive Statistical tools such as frequencies, means, percentages and tables were used to summarise the data. In order to determine the way ES were perceived by the people, five positive and five negative validated perceptional statements against a 5- point Likert scale (LS) ranging from strongly agreed (5), agreed (4) undecided (3), disagreed (2) and strongly disagreed (1) for positive and vice-versa was administered to the people. Class boundaries of means of LS were used to draw inferences on respondents' perceptions. The class boundaries are: < 1.0 < 1.5 = strongly disagreed; ≥ 1.5 < 2.5 = disagreed; ≥ 2.5 < 3.5= undecided; ≥ 3.5 < 4.5 = and agreed ≥ 4.5 ≤ 5.0 = strongly agreed. Male respondents were in the majority (52%) with a modal age group of 30 - 44 years (37%). Majority of them were married (73%) with between four - six people in the household, an indication that forest ES utilization can be transferred to the new generation. A high level of formal education (95%) was recorded, this ranged from primary to tertiary education and a modal income of ₦18, 000 annually, (₦ = naira) (1USD= ₦160). The categories of ES derived from Arakanga Forest Reserve include food, fuel, fibre and environmental services such as watershed regulation and recreation. Inferences from class boundaries of means from LS analysis showed that respondents agreed with the provisioning, regulating, supporting and cultural services of Arakanga Forest Reserve (Mean class boundaries: 3.9 - 4.2). This is an indication that the people were not averse to the continuous existence of Arakanga Forest Reserve because of its positive externalities. Conclusively, with more public enlightenment, management strategies could be fashioned out involving all stakeholders for sustained provision of ES in Arakanga Forest Reserve.

Key words: Forest, ecosystem services, public perceptions.

INTRODUCTION

The forests especially those found in the urban and peri-urban areas are valued for the basic necessities of life generally referred to as food, fuel and fibre. They provide other important services that are often

perceived to be free and limitless. These include air and water purification, flood and climate regulation, biodiversity, and scenic landscapes. These goods and services referred to generally as Ecosystem services, are categorised into provisioning, regulating, cultural and supporting services (MEA, 2005; Adekunle et al., 2012). Forest ecosystem services lack a formal market and are traditionally absent from society balance sheet because they are always considered as free gifts of nature. As a result their critical contributions are overlooked in public, corporate and individual decision making processes.

Often ecosystem services have been regarded as 'free goods', particularly those of which there is no market. In many cases this has led to forest ecosystems being degraded or destroyed through lack of incentives to protect them. Forest ecosystem services are also considered 'public goods'. These are positive benefits resulting from good forest management that can be enjoyed by all. Forest managers under property rights and institutions responsible for providing benefits cannot exclude beneficiaries from enjoying the services ('non-excludable'), and the beneficiaries are not in competition with one another ('non-rival'). This undermines the formation of markets, since beneficiaries have no incentives to pay suppliers. Thus, in most part of the world; forest ecosystems are not traded in the market and have no price (Scherr et al., 2004). Hence, the need to examine people's perceptions and dispositions towards the services rendered by the forests. With these revelations, the continuous provision of the ecosystem service is at risk if the public do not perceive the forest favourably.

Meanwhile, public perceptions on the use and conservation of the forest need to be researched into in order to come out with management strategies of ensuring continuity in the provision of ecosystem services. Hence, the relevance of this study which attempted to evaluate public perceptions and disposition on the ecosystem services functions of Arakanga Forest reserve. This is predicated on the fact that for any meaningful advocacy to be made for AFR (Arakanga Forest Reserve) in the area of conservation, people's perceptions, awareness and views have to be investigated.

METHODOLOGY

General environment of Abeokuta

This study was carried out in Arakanga Forest Reserve (AFR). It is one of the 9 forest reserves in Ogun State with a land area of about 2.39 km^2.The reserve is predominantly of high forest and savanna vegetation type. It is situated at the border between Abeokuta North and Opeji ward of Odeda Local Government Area. Arakanga Forest Reserve is a peri -urban forest (Konijnendijk et al., 2004). A peri - urban forest reserve has been described as trees and forest resources outside but close to urban areas because they are major contributors of goods and services to urban society (Konijnendijk et al., 2004). In the light of the above, Arakanga Forest Reserve is closer to Abeokuta city; hence the description of Abeokuta is relevant in this study as described in Adekunle and Oluwalana (2000).

Abeokuta is the capital of Ogun State and the traditional home of the Egba's stratified into Abeokuta North and South Local Government Areas. The Egba's have been traditionally divided into four namely: Egba Ake, Oke- Ona, Gbagura, and Owu .Three types of religion are widely practiced by the people. These include Christianity, Islam and traditional religion. The Christians predominate (Adekunle and Oluwalana, 2000).

Geographically, Abeokuta lies on latitude 7°15N and longitude 3°25E .The town is about 81 km South -West of Ibadan, the Oyo State capital and 106 km North of Lagos former Nigeria capital city. Abeokuta lies on an altitude of about 157 m above sea level amidst isolated outcrop of natural formation of granite rocks which gave the town's landscape its undulating characteristics. The ancient and historic 'Olumo Rock' is a popular tourist and holiday resort in the town. It is about 17, 228 meters above sea level and is located in the central part of the town while the popular 'Itoku Market' popularly known for traditional 'Adire' cloth is located close to the 'Olumo rock'.

Abeokuta has a humid weather with an average temperature of about 27.4°C and an annual rainfall of 128 cm in the Southern part of the city to 105 cm in the Northern part. The 'Ogun river' transverses from the southern part of the town to the western part. The town is a nerve centre of commercial activities such as banking, cloth weaving and dyeing, trading and carving. Both modern and traditional agriculture are widely practiced in the town. Some of the prominent agricultural products include maize, cassava, yam and livestock. The town is also an educational centre with educational institutions providing formal education up to university level.

Methods of study

The study was carried out in the following stages

a) Collection and review of all accessible published and unpublished literatures on forests and ecosystem service perceptions, urban forestry and climate change.
b) Participant Observation.

Sampling procedure

Multi-stage sampling technique was used to collect the data involving a three - stage design procedure.

Stage1: The division of the study area into two (2): Neigbourhood (that is residents within 1 km radius of Arakanga Forest Reserve) and Non-Neigbourhood (that is residents living more than 1 km radius of Arakanga Forest Reserve) to represent primary selection units which denote the strata from where the data were collected. Each primary selection unit denotes a stratum.
Stage2: Purposive selection of 4 locations from each stratum.
Stage3: Simple random selection of 25 respondents in each of the locations in each stratum. Further details of sampling procedures are summarized in Table 1.

Data collection

The main instrument of data collection was a structure and pre-

*Corresponding author. E-mail: adekunlefm@yahoo.com.

Table 1. Sampling design.

Stratum	Locations	No of respondents	Total
Neighbourhood	Abe igi	25	100
	Asela	25	
	Ayo Bus Stop	25	
	Quarry	25	
Non - Neighbourhood	Iberekodo	25	100
	Mokola	25	
	Elega	25	
	Ajitadun	25	
Total	**8**	**200**	**200**

Source: Field Survey (2011)

tested questionnaire and interview guide. Two hundred (200) questionnaires were administered interpersonally to 25 respondents in each of the settlements as shown in Table 1. The questionnaire was in two parts. Section A, elicited information on bio-data, socio-economic characteristics of the respondents and questions on ecosystem services of peri - urban forest trees. Section B of the questionnaire bothered on the perceptions of respondents on ecosystem services functions of the forest.

Analytical techniques

The variables analyzed were: sex, age, income, education, household size, marital status, occupation, place of origin and period of residence.

Descriptive statistical tools such as frequency, mode and percentages were used to describe the socio-economic characteristics of the ecosystem services of Arakanga Forest Reserve.

Likert scale analysis

In order to determine the way ecosystem services were perceived by the people, 5 positive and 5 negative validated perceptional statements against a 5-point Likert scale ranging from strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree for positive and vice-versa for negative was administered to the people. Levels of perceptions of ecosystem services were determined using standard deviation plus or minus Mean score (X) that is S.D ± X. This was used to classify the perceptions of the respondents into favourable, indifferent and unfavourable perceptions in line with Torimiro and Dionco - Adetayo (2004).

Class boundaries of means were used to draw the inferences following Del (2010) Class boundaries are: < 1.0 < 1.5 = strongly disagree; ≥ 1.5 < 2.5 = disagree; ≥2.5 < 3.5= undecided; ≥ 3.5 < 4.5= and agree ≥4.5 ≤ 5.0 = strongly agree.

RESULTS

Socio-economic characteristics of respondents

The socio-economic characteristics of the respondents are summarized in Table 2. Out of all the sampled respondents, 104 (52%) of them were males while the remaining 96 (48%) were females. The modal age group ranged from 35 to 44 years (37%) followed by those between 25 and 34 years old representing about 29% of the total respondents. This is an indication that a large proportion of the respondents were in the active working group. A large population of active working age group in the society might lead to pressure on the forest resources as previously reported by Adekunle and Agbaje (2012). These findings agree with the result of Igben (1988) and Lawal and Adebowale (2004) who recorded that the productive age group of farming respondents in Ogun State ranged between 31 and 45 years. Also, majority of the respondents were married, 73% with 59% of them having between 4 and 6 persons in their household. These findings showed that forest resources exploitation can be transferred to oncoming generations. More also, a large population of people in the household means more mouths to feed meaning that more of the forest system services will be demanded.

The level of formal education among the respondents was high (95%). This ranged from primary to tertiary education. This trend could be because Abeokuta and by implication Ogun State happens to be the cradle of formal western education in Nigeria. The self employed respondents had the highest frequency 65 or 33%.They include timber contractors, granite and stone suppliers and taxi drivers. These groups were always found under the tree canopies relaxing when they are less busy. This trend could also be because the Arakanga Forest Reserve is one of the areas noted for quarrying and stone excavation. About 40% of them earned ₦10, 000 and below per month. This is far below the Federal Government of Nigeria approved minimum wage of ₦18, 000 per month. This findings affirmed the general statement that a large number of Africans especially Nigerians are living below 1USD per day. The management implication is that these categories of people are likely to depend more on natural resources like the forest, consequently leading to over exploitation and degradation of the forest.

Table 2. Socio - economic characteristics of respondents according to proximity to the Arakanga Forest Reserve.

Variable	Frequency	%	Mode
Gender			
Male	104	52	Male
Female	96	48	
Total	200	100	
Age (years)			
15 -24	32	16	
25 -34	57	28.5	
35 -44	74	37	35 -44
45 -54	36	18	
55 and above	1	0.5	
Total	200	100	
Marital status			
Single	54	27	
Married	146	73	Married
Total	200	100	
Household sizes			
1 - 3	22	11	
4 - 6	117	58.5	
7 - 9	52	26	4 - 6
10 and above	9	4.5	
Total	200	100	
Level of education			
No formal	11	5.5	
Pry. education	57	28.5	
Sec. education	84	42	Sec. Education
Tertiary	47	23.5	
Postgraduate	1	0.5	
Total	200	100	
Occupation			
Trading	51	25.5	
Artisan	52	26	
Government worker	32	16	
Private worker	65	32.5	Private worker
Total	200	100	
Income(₦)			
1,000 - 10,000	81	40.5	₦1,000 - 10,000
10,000 - 20,0000	55	27.5	
20,000 - 50,000	57	28.5	
50,000 and above	7	3.5	
Total	200	100	

Source: Field Survey (2011)

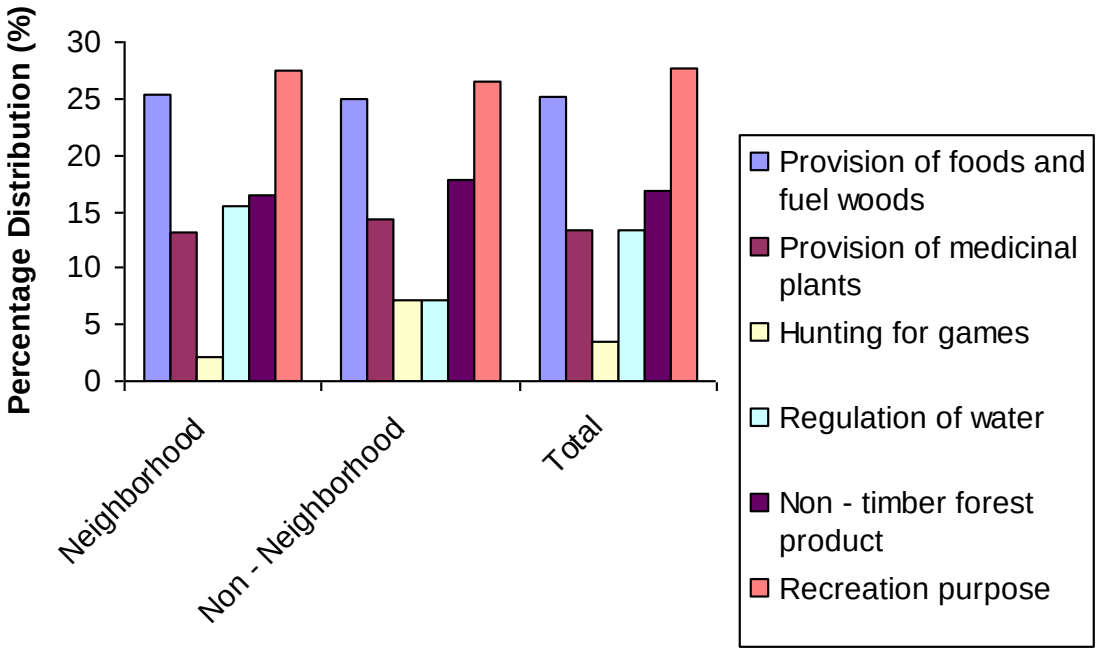

Figure 1. Ecosystem services and benefits derived from Arakanga Forest Reserve.

Categories of ecosystem services derived from Arakanga Forest Reserve

The different products and services derived from Arakanga Forest Reserve and their frequencies are summarised in Figure 1. According to the table, they are made up of food, fuel and fibres (25.2%), medicinal products (13.4%), wild animals products (3.4%) and non-timber forest products like mushroom, fruits and leaves (16.8%). Regulation of watershed and recreation were some of the environmental services mentioned by the respondents. They accounted for 13.4% and 27.7% respectively. The high level and negative impacts of forest communities' dependence of people on biological and non -biological resources of the forest have been reported in other research works such as Adekunle et al. (2011). As majority of these products are exploited from the wilds, species extinction might result due to over-exploitation.

Perceptions of respondents on ecosystem services functions of Arakanga Forest Reserve

The perceptions of the respondents on the ecosystem service functions of Arakanga Forest Reserve are summarized in Table 3. Drawing inferences from the class boundaries of means as shown in the table, the respondents agreed with the provisioning, regulating, supporting and cultural services of the forest reserve with mean class boundaries between 3.9 and 4. This could be because majority of the respondents have experienced or exploited the reserve for any of these benefits as previously indicated in Figure 1. These findings agree with that of Adekunle (1998), that Nigerians richness in biodiversity of plants and animals enhance the provision of an array of products and services in rural and urban economies. According to the study of Oseomobo (1991), the Nigeria rural economy is highly dependent on forest products to generate income and to provide food and medicare. The respondents also agreed that the forest harbours evil spirit with a mean of 4.2. This could be due to illiteracy as some still holds to old beliefs and traditions. Although, the people use to hold this view as an unconscious means of conserving the forest resources. However, the socio - cultural values and the use of the forest for religion practices is still subsisting. Hence, the large percentages of respondents still belief that the forest harbours evil spirits. However, some of the respondents disagreed that the forest serve no purpose in urban area and that there are better need for the use of land for non - forestry purposes. In which case these set of respondents are not averse to the existence and benefits of the ecosystem services of the forest.

Conclusion

It can be concluded from this study that a large percentage of the public are indifferent in their perceptions of the ecosystem services of Arakanga Forest Reserve despite the benefits derived. These categories of people require some public enlightenment on the ES of the forest for sustainable management. It

Table 3. Distribution of respondents by perception on ecosystem services.

Perceptional statement on ecosystem services	Strongly agree 5	Agree 4	Undecided 3	Disagree 2	Strongly disagree 1	Mean class boundaries	Standard deviation	Inferences based on mean class boundaries
Forest reserve can provide fuel wood, medicine and timber.	102(51.1)	91(45.5)	01(0.5)	04(2.5)	01(0.5)	4.4	0.68	Agreed
Forest reserve can protect the environment against environmental hazard.	65(32.5)	59(29.5)	70(35.0)	04(2.0)	02(1.0)	3.9	0.92	Agreed
Forest reserve can be used for recreation and spiritual purpose.	83(41.5)	102(51.0)	08(4.0)	04(0.2)	03(1.5)	4.3	0.77	Agreed
Forest reserve can be used to generate income.	73(36.5)	103(51.5)	21(10.5)	02(1.0)	01(0.5)	4.2	0.77	Agreed
Forest reserve serve no purpose in urban centre	09(4.5)	26(13.0)	49(24.5)	69(34.5)	47(23.5)	2.4	0.71	disagreed
There are better need for use of land for non-forestry purpose such as housing and industrialization.	20(10.0)	34(17.0)	39(19.5)	52(26.0)	55(27.5)	2.5	1.3	disagreed
Forest harbour evil spirit.	91(45.5)	54(27.0)	35(17.5)	07(03.5)	13(6.5)	4.0	1.1	Agreed
Planting of trees is a waste of time.	06(3.0)	04(2.0)	42(21.0)	91(45.5)	57(28.5)	2.1	0.9	Agreed

Figures in parenthesis are % values
Sources: Field Survey (2011)

can also be deducted from this study that though at a low percentage, the respondents that perceived the ES favourably should be encouraged to be involved in tree planting for socio- economic sustainability. This study further revealed that the people agreed that the Arakanga Forest Reserve provide some benefits such as food, fibre, fuel, medicine and recreational facilities. It is therefore imperative that the reserve should be properly maintained and where there has been degradation, a replanting should be embarked upon. These are necessary if the reserve is to continue to render these ecosystem services in perpetuity.

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