

SOCIO-ECONOMIC ANALYSIS OF BENEFITS OF IBADAN URBAN FOREST RESERVES

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ABSTRACT

This study examined the percentage distribution of benefits obtained from Ibadan urban forest reserves across policy relevant socio-economic classes of the populace in order to draw research and policy implications. Descriptive and inferential statistics were employed to analyse data obtained from a multi-stage random survey of 397 residents of Ibadan metropolis. The results show that benefits obtained from the urban forest reserves do not depend significantly on gender ($\chi^2=2.57$; $p>0.05$), age-class ($\chi^2=8.58$; $p>0.05$), educational-status ($\chi^2=7.24$; $p>0.05$) and income-level ($\chi^2=5.05$; $p>0.05$) of the respondents. The results also reveal the importance of these reserves as sources of medicinal plants for the health care of the metropolitan residents. These results buttress the pertinence of investigating the needs of different socio-economic classes of the public before development projects are initiated. It is recommended for managers of Ibadan urban forest reserves to set aside portions of the reserves for the conservation and multiplication of medicinal plants.

INTRODUCTION

The benefits of urban forests are diverse and several, meeting various physiological, sociological, psychological, ecological, educational and economic needs of the urban populace. These benefits are so salient in an urban environment, where air, land and noise pollutions as well as high rates of crime, unemployment and all manners of stress are prevalent. Urban forests have a positive impact on air quality through absorption of pollutants by the leaves, sequestration of atmospheric CO₂ in woody biomass, and reduction of temperature and associated ozone formation. Trees also rainfall with leaves and branch surfaces, thereby reducing runoff volumes and delaying the onset of peak flows. Root growth and decomposition increase the capacity and rate of soil infiltration by rainfall and reduce overland flow. Urban forest canopy reduces soil erosion by diminishing the impact of raindrops on bare surfaces

By virtue of their proximity to people, urban forests provide substantial environmental and recreational benefits to urban dwellers. Trees as a natural solar-powered system could help restore balance to dysfunctional urban ecosystems. Besides, urban forests are strands in the urban fabric that connect people to nature and to each other (FAO 2000).

Johnston (1996) drew attention to the potentials of major urban forestry projects to provide training and employment through environmental improvement initiatives. This is corroborated by Webb (1999) who consider the potential of sustainable urban forestry programmes in attracting tourism and investment. Carter (1994) claims that the general potential benefits of urban forests include material and environmental services. The material benefits consist of fuelwood, fodder, timber and poles, spices, fibres, medicine and several other non-timber forest produce (NTFPs). These may fulfil subsistence needs or be used for income generation by the urban poor or operators of cottage industries. Environmental and social benefits on the other hand include landscape enhancement, recreation, education and general well being; a habitat for wildlife; climate modification; the control of erosion, air and noise pollution; the protection of catchment areas for urban water supplies and the productive use or safe disposal of urban wastes. Similarly, Kuchelmeister (1998) acknowledges the significant contributions of urban forests to food supply and mitigation of poverty in some cities.

Socio-economic analysis of public views is of paramount importance to policy development because it helps policy makers to have an idea of how each socio-economic unit of the population is reacting to existing policies, or will react to prospective policies on specific issues of interest. Bearing in mind the proportion of each socio-economic unit in a given population, policy makers would be able to assess or anticipate the level of reaction in favour of or against a particular policy.

Socio-economic analysis has to do with the simple comparison of the number, or proportion of components within a unit of population in a project, event, village, office or community. It also involves the complex processes of examining the relations between those counted, defining who has the right access to or control of specific resources, noting such policy relevant socio-economic variables like age, gender, education and income. Socio-economic analysis as a tool in development studies enhances deeper understanding of the activities of interest to each unit of the population in the society, and the problems and opportunities that each of them faces in carrying-out those activities.

The focus of the analysis is not on the social, biological or economic differences of the units of the population, but rather on the experiences of each unit as members of the society. The concept is central to sustainable development, since development activities aimed at promoting sustainable use of natural resources and finding solutions to environmental problems should take into consideration, careful assessment of differences in interests, motivation and perceptions of benefits across various socio-economic classes of the population in order to define a most appropriate policy. Accurate information about existing socio-economic structure and relationship within a population helps designers of programmes and projects to take into account the needs and interests of the target beneficiaries. The objective of this study therefore, is to examine the percentage distribution of these benefits across relevant socio-economic classes of the populace of Ibadan metropolis, in order to draw research and policy implications on the conservation of the city's urban forest reserves.

BACKGROUND INFORMATION

Ibadan metropolis comprising five local government areas namely: Ibadan North, Ibadan North-West, Ibadan North-East, Ibadan South-West and Ibadan South-East used to have four forest reserves. These were Oke- Aremo, Ogunpa Dam, Eleyele and Alalubosa Forest Reserves. They were constituted over a forty-year period (1916 to 1956) to provide fuelwood and building poles for the metropolitan population. They were also to provide watershed protection for Ogunpa dam, Alalubosa Lake and Eleyele dam (Popoola and Ajewole: 2001, 2002, Ajewole 2003). Today, Alalubosa and Oke-Aremo reserves have completely given way for various infrastructural developments in the metropolis, while Eleyele is a patch of highly degraded forest. Ogunpa Dam Forest Reserve suffered similar fate, leaving behind a small preserved area; the Agodi gardens currently being rehabilitated by the Oyo State Government for use as a recreation forest cum zoological garden.. This development makes it imperative to investigate which of the possible benefits is of importance to different categories of the populace, so as to know what to provide for different interest groups.

DATA COLLECTION AND ANALYSIS

Data Collection and Sampling Procedures

The data for this study were obtained from a questionnaire survey of 400 residents of Ibadan metropolis. Aspects of primary data collected included the respondents' socio-economic characteristics and their perceptions of the urban forests of Ibadan metropolis. In all, 397 questionnaires were successfully used for the analysis. Multi-stage random sampling procedure was adopted in collecting the data. The metropolis was stratified into two (i) neighbourhood; comprising the residents who live within 1 km radius of the urban forest reserves, and (ii) non-neighbourhood; comprising residents living beyond 1-km radius of the forest reserves. The neighbourhood stratum was further stratified into four cells, each cell comprising residents living within 1-km radius of adjoining areas surrounding each of the four forest reserves. The non-neighbourhood stratum was also further stratified to five cells, each comprising the residents living outside the 1-km radius of the adjoining areas surrounding the urban forest reserves, but within the five local government areas that constitute the metropolis. Names of major streets in each of the resulting nine cells were collected from the Metropolitan Planning Authority. Using a table of random numbers, two streets were picked from each of the nine cells.

Twenty-five respondents were sampled in each of the two selected streets of four cells in the neighbourhood stratum, while 20 respondents were drawn from each of the two selected streets of the five cells in the non-neighbourhood stratum. This gave a sample size of 400 respondents. Owing to incomplete information in three of the questionnaires, they were discarded. The effective sample size used in the subsequent analysis was 397. Descriptive statistics and chi-square analysis were employed in analysing the data.

The Analytical Model

The chi-square model for a $r \times c$ contingency table is specified as:

$$\chi^2 = \frac{1}{G} \sum \frac{(G a_{ij} - S_i T_j)^2}{S_i T_j}, \text{ with } (r-1)(c-1) \text{ degrees of freedom... Equation (1) (Freeze, 1984)}$$

Where

- χ^2 = estimated chi-square value
- G = sum of all the observations
- a_{ij} = individual observation in i th row and j th column.
- S_i = sum of individual observations in i th row
- T_j = sum of individual observations in j th row
- r = number of rows
- c = number of columns

RESULTS AND DISCUSSIONS

Percentage Distribution of Benefits of Ibadan Urban Forest Reserves across Socio-economic Classes

Since the data for the study were collected through random sampling, there may exist variations in the number of sampled respondents among the components of a particular socio-economic unit of the population. Population disaggregation analysis (PDA) was thus employed to compensate for this possible variation. PDA takes the sampled population of each component of a particular socio-economic unit to be 100%, so that intra-unit comparative analysis can be standardised. For instance in Table 1 with 163 female and 243 male respondents, out of whom 34 females and 54 males identified fuelwood as benefits they had previously obtained from the urban forest reserves, the percentages of females and males that had obtained fuelwood from the urban forest reserves were taken to be 20.9% and 23.1% respectively. Thus the results of the effects of gender, age, education and income on the community perceptions of the benefits of Ibadan urban forest reserves are presented in Tables 1, 2, 3 and 4.

Analysis of Benefits Obtained by Gender

Observations from Table 1 reveal that the three most important benefits that females obtained from the urban forest reserves were medicinal plants, fuelwood and timber. Thus 23.3%, 20.9% and 19% of the sampled females claimed to have obtained medicinal plants, fuelwood and timber respectively from the urban forest reserves. As regards the sampled males, even though the three benefits remained the most important there was a slight difference in the order of importance. Most of the males (23.1%) identified fuelwood as the benefits they had previously obtained from the urban forest reserves, while 20.5% and 19.7% claimed to have respectively obtained timber and medicinal plants from the urban forest reserves. The implication of these results was that fuelwood is a very important benefit of the Ibadan urban forest reserves, since it ranked first among the males and second among the females. The chi-square test of dependence does not,

however, show any significant dependence between benefits obtained and gender ($\chi^2=2.57$; $p>0.05$).

Table 1: Distribution of Benefits Obtained from Ibadan Urban Forest Reserves by Gender

Gender		Fuelwood	Timber	Medicinal Plants	Recreation	Spiritual Meditation	Fruits	Total
Female	Freq	34	31	38	24	6	30	163
	%	20.9	19	23.3	14.7	3.7	18.4	100
Male	Freq	54	48	46	42	10	34	234
	%	23.1	20.5	19.7	17.9	4.3	14.5	100

Analysis of Benefits Obtained f by Age-class

Table 2 presents the distribution of benefits obtained from Ibadan urban forest reserves according to different age classes. The table shows that four benefits were of major importance to the age-class 15-24 years. About 23% of the sampled respondents in this age group identified fuelwood and medicinal plants, followed by 18% who identified timber and fruits as the benefits they had previously obtained from the urban forest reserves. The trend with the age class 25-34 was somewhat similar because 20.9% of the respondents in the age group identified fuelwood and medicinal plants, followed by 19.6% who identified timber as benefits previously obtained from the urban forest reserves. In the case of the age group 35-44 years, 23.6% of the respondents in this age group identified timber, while 19.4% identified fuelwood and recreation as the benefits obtained from the urban forest reserves. Furthermore 26.9%, 23.1% and 19.2% of the respondents in the age class 45-54 years, identified fuelwood, medicinal plants and timber respectively as the benefits previously obtained from the urban forest reserves. In the case of the age group 55 years and above, 33.3% identified fuelwood, while 25% identified timber and medicinal plants as benefits previously obtained from the reserves. From the foregoing, it is apparent that fuelwood again ranked topmost among other benefits obtained from the reserves, since it came first in four of the five age groups and second in the fifth group in terms of the proportion of the respondents in each age group who identified it as benefit previously obtained from the forest reserves. Medicinal plants which ranked first in two of the age groups and also second in another two came next to fuelwood in order of importance, while timber ranked third, reflecting the proportions of respondents in each age group who identified them as benefits previously obtained from the forest reserves. It is important to note the appearance of fruits and recreation each of which was identified as the second most important benefit previously obtained from the urban reserves, by the sampled respondents in the age groups 15-24 and 35-44 years. It is also interesting to note that the chi-square test shows that the benefits obtained are not significantly dependent on age class distribution of the respondents ($\chi^2 = 8.58$; $p>0.05$).

Table 2: Distribution of Benefits Obtained by Age-class

Age-class (years)		Fuelwood	Timber	Medicinal Plants	Recreation	Spiritual Meditation	Fruits	Total
15-24	Freq	32	25	32	21	4	25	139
	%	23	18	23	15.1	2.9	18	100
25-34	Freq	31	29	31	26	7	24	148
	%	20.9	19.6	20.9	17.6	4.7	16.2	100
35-44	Freq	14	17	12	14	4	11	72
	%	19.4	23.6	16.7	19.4	5.6	15.3	100
45-54	Freq	7	5	6	4	2	2	26
	%	26.9	19.2	23.1	15.4	7.7	7.7	100
Above 55	Freq	4	3	3	1	-	1	12
	%	33.3	25	25	8.3	-	8.3	100

Analysis of Benefits Obtained Education-class

Table 3 contains the distribution of benefits obtained from Ibadan urban forest reserves according to different levels of education of the respondents. The table shows that the trend is similar to some extent to the trends observed in the preceding results. About 25.07% of the sampled respondents who had primary education identified fuelwood and medicinal plants, while 21.4% identified timber as the benefits previously obtained from the urban forest reserves. However, 25.3%, 20.8% and 20.1% of the sampled respondents who had secondary education, identified fuelwood, medicinal plants and timber respectively as the benefits obtained from the urban reserves. The situation is a bit different among the sampled respondents who had tertiary education. Consequently 20.9%, 20.5% and 20% identified medicinal plants, fuelwood and timber respectively as benefits previously obtained by them from the reserves. These results indicate that fuelwood and medicinal plants ranked highest, while timber came next among the benefits previously obtained from the reserves. The chi-square test also indicates a non-significant dependence between benefits previously obtained and level of education of the respondents, ($\chi^2 = 7.24$; $p > 0.05$).

Table 3: Distribution of Benefits Obtained from Ibadan Urban Forest Reserves by Education-class

Education-class		Fuelwood	Timber	Medicinal Plants	Recreation	Spiritual Meditation	Fruits	Total
Primary	Freq	7	6	7	3	2	3	28
	%	25	21.4	25	10.7	7.1	10.7	100
Secondary	Freq	39	31	32	21	3	28	154
	%	25.3	20.1	20.8	13.6	1.9	18.2	100
Tertiary	Freq	44	43	45	40	11	32	215
	%	20.5	20	20.9	18.6	5.1	14.9	100

Analysis of Benefits Obtained Income-class

The results in Table 4 show that 21.8%, 21.2% and 19.2% of the respondents who earned less than ₦1000 identified fuelwood, medicinal plants and timber as benefits obtained from the reserves. Similarly, 23.4%, 22.3% and 19.7% of respondents earning between ₦1000 and ₦5000, identified fuelwood, medicinal plants and timber respectively as the benefits obtained from the reserves. The trend is slightly different among the respondents earning between ₦5001 and ₦10000, where 23.7% identified timber while 21.1% identified both fuelwood and recreation as the benefits obtained from the urban forest reserves. Most (26.7%) of the respondents earning above ₦10000, identified both fuelwood and timber, while 20% identified both medicinal plants and recreation as benefits previously obtained from these reserves. The results show that as income increased; recreation started to feature as a prominent benefit obtained from the reserves. However, the chi-square test does not show a significant relationship between benefits obtained from the reserves and income ($\chi^2=5.05$; $p>0.05$).

Table 4: Income-class Distribution of Benefits Obtained from Ibadan Urban Forest Reserves

Income-class (₦)		Fuelwood	Timber	Medicinal Plants	Recreation	Spiritual Meditation	Fruits	Total
	Freq	34	30	33	24	8	27	156
	%	21.8	19.2	21.2	15.4	5.1	17.3	100
1001-5000	Freq	44	37	42	31	6	28	188
	%	23.4	19.7	22.3	16.5	3.2	14.9	100
5001-10000	Freq	8	9	6	8	2	5	38
	%	21.1	23.7	15.8	21.1	5.3	13.2	100
Above 10000	Freq	4	4	3	3		1	15
	%	26.7	26.7	20	20		6.7	100

Ordinal Ranking of Benefits by Proportion of Occurrences in the Socio-economic Classes

In this section, ranking of benefits was carried out according to the percentages of occurrences in each component of each of socio-economic class. The objective of this is to rank the benefits in order of prominence across the various socio-economic groups. Consequently since six benefits were considered, the one that had the highest percentage of occurrence in any particular component of a socio-economic class was accordingly rated 1, while the benefit with the lowest percentage was rated 6. The average of scores was thereafter computed and the benefit with the lowest number became the most prominent (Table 5).

A look at the results in Table 5 indicates that fuelwood has an average score of 1.3, implying that it is the most prominent benefit across all the socio-economic classes of the respondents. This is followed by medicinal plants with an average score of 1.9; timber with a score of 2.2; recreation with score of 3.5, fruits with a score of 4.1 and venue for spiritual meditation which has an average score of 5.6.

It should not be very surprising that fuelwood is the most prominent benefit across the various socio-economic groups, since in the first instance, provision of fuelwood was one of the principal reasons for constituting some of these forest reserves especially Oke-Aremo and Eleyele (Lamb; 1941, Allison; 1956). Moreover, the reserves were virtually "mined" for fuelwood during the national energy workers' crisis of 1994. These reserves would continue to be looked unto for supply of fuelwood to the metropolitan residents particularly the poor among them. This is because electricity supply continues to be consistently "epileptic", while the tariff paradoxically continues to rise, gradually moving towards making electricity beyond the reach of the urban poor. This situation is worsened by the incessant hikes in the prices of petroleum products. These are individually and severally making the use of electricity, gas and kerosene for domestic cooking an almost impossible ambition for the urban poor.

However, of greater importance is the finding that collection of medicinal plants from the urban reserves ranked second in prominence, as a benefit that cuts across the various socio-economic classes, more so that the original management plan for these reserves did not specify this as a possible benefit. The consistent downward trend in the national economy and the current campaign on the safety and efficacy of herbs in primary health care delivery, have popularised the use of herbs particularly among urban dwellers. The implications are that for the urban forest reserves of Ibadan to fulfil their roles optimally, their development would entail a major revision in the management objectives beyond environmental conservation and recreation to rather allow for greater and more diversified production possibilities.

Table 5: Ordinal Ranking of Benefits

Socio-Economic Classes		Fuelwood	Timber	Medicinal Plants	Recreation	Venue for Spiritual Activities	Fruits
Gender	Female	2	3	1	5	6	4
	Male	1	2	3	4	6	5
Age (Years)	15-24	1	2	1	4	5	2
	25-34	1	2	1	3	5	4
	35-44	2	1	3	2	5	4
	45-54	1	3	2	4	5	5
	Above 55	1	2	2	3	6	3
	Sum		18	31	27	49	78
Education	Primary	1	2	1	3	4	3
	Secondary	1	3	2	5	6	4
	Tertiary	2	3	1	4	6	5
Income (₦)	≤ 1000	1	3	2	4	6	5
	1001-5000	1	3	2	4	6	5
	5001-10000	2	1	4	2	6	5
	> 10000	1	1	2	2	6	3
Average		1.3	2.2	1.9	3.5	5.6	4.1

Hypotheses Testing

The summary of the results of hypotheses tested at $p=0.05$, is presented in Table 6. The chi-square-calculated is less than the chi-square tabulated for each of the variables. Therefore, it may be inferred that benefits obtained from the Ibadan urban forest reserves do not significantly depend on the considered policy relevant socio-economic variables. These results contrast the findings of Popoola and Ajewole (2001), who claimed that the benefits obtained from Ibadan urban forest reserves were dependent on location factor, i.e. the proximity of the respondents to at least one of the forest reserves.

Table 6: Summary of Results of Hypotheses

Variables	χ^2_{cal}	χ^2_{tab}	(c-1)(r-1)df	Remarks
Gender	2.57	11.07	5	Accept H_0
Age	8.58	31.41	20	Accept H_0
Education	7.24	18.31	10	Accept H_0
Income	5.05	25	15	Accept H_0

CONCLUSION

This study has highlighted the importance of demographic studies using population disaggregation analysis (PDA), particularly with reference to the benefits obtained from Ibadan urban forest reserves. Although the findings show that benefits obtained are not significantly dependent on the socio-economic variables considered, it has notwithstanding been an "eye opener" to the importance of a benefit that was not in the original management plan, but which has become of great value to the metropolitan residents. This produce should be incorporated into the new management objectives of the reserves. Consequently, there should be within the reserves a herbal farm where medicinal plants could be cultivated for the use of members of the public. This farm should be set aside, and interested members of the public may have to pay fees to have access. In addition, managers of such farm would have to put in place adequate harvesting regulatory mechanisms for resource sustainability. Such a farm would serve several purposes, such as the provision of medicinal plants for health care delivery, biodiversity conservation of medicinal flora and opportunities for bio-prospecting. The research and policy implications that could be drawn from this study include the need to always investigate the requirements of different socio-economic units of the society prior to the initiation of development projects, as well as the need to set-up appropriate mechanisms for the establishment and sustainable management of herbal farms in urban forest reserves.

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