VILLAGERS WILLINGNESS TO PAY FOR FOREST CONSERVATION IN IBADAN, OYO STATE, NIGERIA

Abstract

The study was carried out to determine the willingness to pay for forest conservation among villagers living at the perimeter fence of International Institute of Tropical Agriculture (IITA), Ibadan, Oyo State, Nigeria. The multistage sampling procedure was adopted for the study. A total number of four hundred and eight respondents comprising of farmers, hunters, herbalists and herb sellers were randomly selected and interviewed using copies of well-structured questionnaire. Data were analysed using descriptive statistics and Logit regression model. The study showed that the average age of farmers and hunters was 55 and 57 years while the average age of herb sellers was 43 and herbalist 63 years. Majority of the respondents pooled together are male, married with an average age of 55 years and household size of 7 members. The larger percentage of them were native of the study area, not educated, not employed, but having the monthly income between 12,000- 20,000 naira (US$33.38 to US$55.63) and closer to the forest by 1-9 km. The mean willingness to pay for forest conservation was ₦114.38 (US$0.32) per month per household and the total willingness to pay was ₦3, 461,024.42 (US$9, 627.32) per month. The study further revealed that there was significant relationship between the socio-economic characteristics of the respondents and their willingness to pay for forest conservation. Variables such as gender, educational level, occupation, income and bid amounts had significant effect on the willingness to pay for forest conservation. The study therefore recommends that monetary value should be placed on the social, cultural, ecological and economic services generated by the forests for the forests to continue to provide goods and services on a sustainable basis. Also, the willingness to pay for forest conservation can be used as an alternative measure of displeasure against the conversion of the forests to other uses and as a supportive argument for the invaluable roles the forests play in sustaining the livelihood of the people.

Keywords: Villages, Respondents, Stratified, Variables, Contingent valuation, Logit.

Introduction

Globally, forests area covers 4,032,905 hectares or 31% of the world's land total [17]. However, these areas are exposed to threats that are mainly caused by human activities where the world population is rising and the global economic expands. The threats include human settlement, infrastructure development, tourism, recreation and resource extraction [12]. Tropical rainforest accounts for only 7% of earth's dry surface area; rainforests accommodate 70% of animal and plant species in world ecosystems [21]. It is one of the most bio-diverse in the world and provides a wide range of goods and services that are fundamental to human populations locally and globally ([9]; [14]; [34]). Tropical forests are currently subject to strong pressure from agricultural expansion, leading to unprecedented deforestation rates ([18]; [24]; [25]).

Nigeria is characterized by abundant forest resources: [16] statistics indicate that 12.2% of Nigeria's land area (11,089,000 ha) is covered with forests. However, forests in Nigeria are

seriously threatened by deforestation and other environmental problems. Forest resources in Nigeria include timber, fuelwood, wildlife, inland fisheries and forage, which are physical and have market-determined values. Other outputs of forests are recreation, amenity and environmental protection, which all have non-market-determined value. An estimated 4,614 vascular-plant species have been recorded in Nigeria. According to [20], these include 38 endemic species of the defunct Western and Midwestern area, 39 endemic species from what used to be the Northern region and 128 from the former Eastern region. On NTFPs resources, [29] identified 8 NTFPs from the mangrove swamp, 19 traded products from the moist forests, 17 from the southern Guinea savannah, 12 in the Sudan savannah and 56 for the whole country. Nigeria has a very rich fauna as a result of its diverse vegetation types. With 18 primate species, the Okwangwo Division of Cross River National Park has the highest diversity recorded at any single site in Africa, including the endangered Cross River Gorilla, *Gorilla gorilla* diehli. Eight major forest types are found in Nigeria, including savannah woodland, lowland rainforest, freshwater swamp forest, mangrove forest, montane forest, riparian forest, plantation (agriculture) and plantation (forest).

In fact, a great percentage of Nigeria's luxurious vegetation has been removed and several species have become extinct [38]. The [42] records show that between 70 and 80% of Nigeria's original forest has disappeared and presently the area of its territory occupied by forests is reduced to 12%. In the period between 2000 and 2005, Nigeria lost about 2,048,000 ha of forest [16]. Nigeria is reported as the fourth leading country in the world and first in Africa having the highest annual forest loss. The forest depletion situation is worsened by the fact that the rate of forestation which has been estimated in the country as a whole is less than 5% of the rate of deforestation which has been estimated at above 398,000 hectares per annum. This is one of the highest deforestation rates in Africa at 2.6% per year [15]. According to [16], Nigeria has the highest rate of deforestation in the world and between 2000 and 2005; the country lost 55.7% of its primary forests with a rate of forest change of 31.2%. Between 1990 and 2005, in total, Nigeria lost 35.7% of its forest cover or about 6,145,000 hectares. A lot of damage has been done to Nigeria's land through the processes of deforestation, notably contributing to the overwhelming trend of desertification [30]. The current high level of demand for forest products has outstripped the sustainable level of supply and this situation may deteriorate further unless concrete steps are taken to manage the forests in sustainable ways. The rapid rate of deforestation in the country (approximately 3.5% per annum, [8]) translates into an average loss of 350,000 ha to 400,000 ha every year [31]. In line with this ugly trend of deforestation [7] sighted in [15] lamented that Nigeria's total forest estate, i.e. areas constituted forest reserves, which stood at 10% of the country's land mass in 1976, had shrunk to less than 6%. Although Nigerian government established several forest reserves for conservation of forest resources, these forest reserves have been seriously neglected and received little or no improvement in terms of investment and management.

Tropical rainforests, wetlands and other biodiversity-rich ecosystems continue to decline at an alarming rate. Underestimation of the value of the many goods and services provided by forests and nature areas has been recognised as one of the major causes of the failure to protect and manage them in a sustainable way. There is an overall consensus that in decision-making procedures regarding the use of natural resources not only should the easily quantifiable costs and benefits of forests and nature areas be taken into account, but also those that are more difficult to determine: the intangible costs and benefits. This raises the need for proper valuation tools to quantify and visualise the multiple benefits –but also the costs– of forests and nature areas.

Valuation of the goods and services provided by forests and nature areas is needed because these areas are under great pressure and are in fact disappearing. Lack of knowledge and awareness of the total value of the goods and services provided by these natural resources will obscure the ecological and social impact of the conversion of forests into construction materials, infrastructure, industrial areas, houses or agriculture. Even when these impacts are understood, there is often lack of financial resources for sustainable management of forests and nature areas. More information about the ecological, economic and social or cultural values of forests and nature areas, and the synergy between these values, is necessary in order to feed the public dialogue and to internalise these values as part of policy and decision-making. Moreover, in many cases, those who derive benefits from the forest or from nature services, such as the owners of hotels or the visitors who enjoy nature, are not the ones who incur the costs and make the investments necessary to manage the forest properly. This means that the costs and benefits are not in the same hands. Proper valuation of all the goods and services provided by the forest or nature area can help understand the extent to which those who profit from the forest also bear the cost of managing it [39].

Various approaches have been used to attach monetary values to non-market goods and services of the forest by economists [41]. They include revealed and stated preference methods. The revealed preference methods are based on how individual actually behaved in a real market situation while the stated preference methods are based on how individuals say they will behave under the hypothetical market situation. Prominent among the stated preference method is the contingent valuation method (CVM) which is a means of quantifying public preference and willingness-to-pay (WTP) for forest goods and services or willingness to accept compensation for losing access to the forest goods and services. These methods have been employed by researchers ([32], 2002; [5]; [6]; [3]) to ascribe monetary values to forest goods and services.

Forest ecosystem provides goods and services that are difficult to value by direct market approach. Putting a value (especially monetary values) on a good such as the forest ecosystem can help to provide an incentive for people to produce and conserve it. This is because the current economic crisis is leading to pressure on government budgets and on the budgets available to maintain existing forest reserve. This problem can be tackled through information on the monetary values of forest ecosystem services. This information is presently lacking and where available are always scanty and many times inaccessible. Hence, it is necessary to determine the willingness to pay for forest conservation or protection in the study area in order to establish the true value of the forest. This will promote the ability of the forest ecosystem to withstand the competition from alternative land uses, particularly agriculture which is very rampant, and provides landowners and users to make informed decisions and plausible trade-offs on forest reserves investment.

Objectives of the Study

The broad objective of this study was to determine villager's willingness to pay for forest conservation in Ibadan, Oyo State, Nigeria.

The specific objectives are to:

i. describe the socio-economic characteristics of the respondents.
ii. value the forest protection preferences (benefits)
iii. postulate relationship of the socio-economic characteristics of the respondents to their willingness to pay for forest conservation.

Hypothesis of the study

The hypothesis of the study was stated in the null form as follows:

Ho: There was no significant relationship between socioeconomic factors and willingness to pay for forest conservation in the study area

Methodology

Study area: The study areas are the villages by IITA perimeter fence in Akinyele Local Government area of Ibadan, Oyo State, Nigeria. The Local Government Council is bounded on the East by Lagelu Local Government, on the North by Afijio Local Government, on the South by Ibadan North Local Government and on the West by Iddo Local Government. The whole Local Government Council area is five hundred and seventy five square kilometers (575km^2). The average annual rainfall is about 1200mm and ecological zone type is forest savanna. The major occupations of the people residing in the area are farming, carpentry, trading, marketing, food processing as well as carving work. Crop such as cassava, maize, yam, pepper, cucumber, watermelon, tomatoes and okras are mostly grown in the area. IITA is located at longitude 7^0 30' 8''N, latitude 3^0 54' 37''E and 243m above sea level [36]. In 1965, the Federal Government of Nigeria allocated some 1000 hectares of land for the establishment of the main IITA campus. Prior to the acquisition of land by IITA through the Federal Government of Nigeria, there are patches of secondary forest which serves as a means of livelihood to the villagers in the area. The most extensive land use pattern was arable and tree crop and about 3000 people lived in about twenty eight villages scattered in this area. These villages where relocated to the perimeter fence of IITA where there was an expanse of secondary forest. At the period of this study, only seventeen villages exist at the perimeter fence of IITA and the secondary forest had been taken over by development leaving patches of scattered forest in the area.

Data Collection and Sampling Methods: Data were collected for this study in year 2016. A multistage sampling procedure was adopted for this study. All the seventeen villages by IITA perimeter fence were purposefully selected because of the following reasons (i) the villages were once located on the area were IITA is presently located (ii) the closeness of the villages to IITA forest and (iii) the presence of forest patches in all the villages. These villages are namely Lagbe, Akinola, Ofakun, Alaraba, Olodo, Laniba, Oloro, Oyafi, Adetoyebi, Awumoro, Aba Oso, Ajanbata, Olosun, Falao, Oluana, Adeogun and Idi-ose. Respondents were stratified into four major groups in each of the village: namely farmers, hunters, herb sellers and herbalists. Within each stratum, a random selection of six respondents was carried out making twenty four respondents in each village and a total number of four hundred and eight respondents in all the seventeen villages.

There was a pre-test survey of thirty four respondents randomly selected from each stratum prior to the main survey. This helped to determine the bid amount elicited in the actual dichotomous-choice contingent valuation component of the survey for each group of respondents. The pre-test survey was an open ended contingency survey format and the goal was to ask how much the respondents were willing to pay if necessary to ensure that the degradation of the forest is abated. The respondents were shown two sets of imageries in photographs so that they can be properly informed on what they are being expected to value through the elicitation of their WTP. The first photograph represented deforested environmental scenes and the second showed forested environment and they were told of the consequences resulting from such deforestation. The forest in their individual area was used as reference point. The method allowed the respondents to talk freely about how much they

were willing to pay for forest conservation. The data so generated were used to develop the bid vector (b_1..... b_n). It involved the choice of unique bids being based on equal linear incremental between the upper and lower bound bids on the pre-test open-ended contingent survey data. This result in the choice of 4, unique bid amounts for farmers, 5 each for hunters and herbalist and 6 unique bid amounts for herb sellers respondents that was used in the actual dichotomous-choice contingent valuation method (DC-CVM) survey. In order to decide the optimum sample allocation to the selected bids, the pre-test open-ended contingent valuation survey generated bid amounts were grouped into four for farmers, five each for hunters and herbalist and six for herb sellers. These bid amounts so selected for each group (farmers, hunters, herb sellers and herbalist) of respondents were used in the valuation survey which was carried out by administering randomly the various unique bid amounts among the various respondents and group of respondents in the study area. The administered bid amount elicited the respondents' willingness to pay (yes/ or no) for forest conservation.

Analytical tools: Descriptive statistics were used to analyse the socio-economic data. Contingent Valuation Method (CVM) was used to determine the total willingness to pay of the respondents for conserving forest (forest protection). The maximum likelihood estimation of the Logit regression coefficient was used to determine the mean willingness to pay. The Logit model was equally used to postulate the relationship between the socio-economic characteristics of respondents and their acceptance probability to the bids elicited for forest conservation (protection) in the survey and by implication the WTP. This helped to fulfill objective iii.

The Logit regression model was stated thus

$$Li = \text{Log}\ \frac{Pi}{1-Pi} = \frac{1}{1+\exp^{-(\beta o + \beta i Xi)}} \quad \text{..... } \textit{equation } 1$$

Li = Respondents probability of acceptance to the bid offered
β_o = Constant/ Intercept
βi = Coefficients to be estimated
1-Pi = Respondents probability of nonacceptance to the bid offered
Xi = Set of independent variables

$$Li = \frac{1}{1+\exp^{-(\beta_o + \beta_i X_i + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots\ldots \beta_{11} X_{11})}} \quad \text{..... } \textit{equation } 2$$

X_1 = Age (Years)
X_2 = Sex (Dummy, 1= male, 0= female)
X_3 = Household size (number)
X_4 = Marital status
X_5 = Nativity of the household (native= 1, 0 otherwise),
X_6 = Educational level (Years of schooling)
X_7 = Occupation
X_8 = Nearness of respondents to forest (Distance in Km)
X_9 = Employment (Dummy, employed= 1, not employed= 0)
X_{10} = Income (Naira)
X_{11} = Bid offered to the respondents to elicit willingness to pay (Naira)

Li is a proxy for WTP. It represents the dependent variable which is a dummy of the binary choice Logit model adopted for the objective iii. It is defined as "1" if respondents accept bids elicited and "0" if not. X_1 represents the age of the respondents in years, X_2 is the

variable for the sex of the respondents. Where the respondent is male, the dummy takes the value of "1" and when female, it takes the value of "0". The household size (X_3) indicates the number of people available per household by the respondents in the study area, X_4 shows the marital status of the respondents while the dummy variable (X_5) reveals the nativity of the household. Where the respondents are a native of the study area, the dummy takes the value of "1" and when otherwise, it takes the value of "0". The educational level (X_6) shows the school years attained by the respondents, X_7 is a variable for the occupation of the respondents while X_8 variable indicates the nearness of the respondents to the forest. The employment dummy (X_9) variable shows the employment status of the respondents. Where the respondents stated they are employed, the dummy takes the value of "1" and when otherwise, it takes the value of "0". X_{10} is the total monthly income of the respondents while X_{11} represents the bids elicited in the dichotomous choice contingency valuation method (DC-CVM) survey. This is the variable price (shadow price) of the environmental amenity (forest conservation or protection) for which the stated preference in the form of WTP of the respondents was sought.

The unrestricted mean WTP (P^+) according to [13] was calculated from the coefficient derived by the model as follows:

$P^+ = a/|\beta|$ ..... *equation* 3

This has the possibility of producing the undesirable negative WTP, the restricted WTP (P+) adopted for this study was shown as

$P^+ = 1/|\beta| * \text{In}(1+\exp^{bo})$ ..... *equation* 4

Where, bo = intercept, β = coefficient of the bid

Total WTP = Mean WTP * Total population of respondents

Results

Descriptive Statistics of the Survey

Descriptive Statistics of the Respondent's Willingness to Pay for Forest Conservation: Table 1 shows the descriptive statistics of the respondent's willingness to pay for forest conservation. The average age of farmers and hunters was 55 and 57 years while the average age of herb sellers was 43 and herbalist 63 years. The highest age group was found between 41- 60 years for farmers, hunters and herb sellers with 67.65%, 68.63% and 60.78% respectively while 64.71% of herbalist had the highest age between 61-80 years. The percentage of farmers that were male was 85.29 while 14.71% were female. 100% of hunters and herbalist were male while herb sellers had 100% female. 71.32% of the total respondents were male while 28.68% were female. Majority of the respondents were married with hunters' respondents having the highest value of 96.08% followed by herbalists 95.10%, farmers and herb sellers had 94.12% and 92.16% respectively. 94.36% of the total respondents were married, 2.21% were single, 2.45% and 0.98% were widower and widowed respectively. The highest household size was found in the group between 6-10. Herbalist had the highest household size of 77.45%, followed by hunters, herb sellers and farmers with 71.57%, 64.71% and 60.78% respectively. 68.63% of the total respondents had household size between 6-10 members, 12.99% had family size within 11-15 while only 18.38% had it between 1-5. The percentage of the respondents that were not educated was 97.06%, 86.27%, 68.63% and 67.65% for hunters, herbalist, herb sellers and famers. Only 22.55%, 21.57%, 12.75% and 1.96% farmers, herb sellers, herbalist and hunters had primary six educations while 9.80% of famers and herb sellers, and 0.98% of hunters and herbalist had secondary school education. The total number of respondents that were educated both primary and secondary school education was 20.10% while 79.90% of them were not educated. Majority of the respondents interviewed were native to the area with a value of 89.71% while 10.29% were non-native residing in the area. The nearness of the respondents to the forest showed

that 86.27% of famers, 83.33% of herbalist, 66.67% herb sellers, and 37.25% of hunters were closer to the forest with a distance of 1-3 km. The percentage of hunters, herb sellers, herbalists and farmers that were closer to the forest by 4-6 km were 48.04%, 24.51%, 11.77% and 13.73% respectively. Only 14.71%, 8.82%, and 4.90% of hunters, herb sellers and herbalist were closer to the forest by 7-9 km. 68.38% of the total respondents were closer to the forest by 1-3 km while 24.50% and 7.12% of them had forest closer to them by 4-6 and 7-9 km respectively. In term of employment, all the herb sellers' respondents were not employed apart from selling of herbal plants, they formed 100%. The percentage of unemployed herbalist, farmers and hunters were 87.25%, 79.41% and 39.22% respectively while 60.78% of hunters, 20.59% of famers and 12.75% of herbalists were employed. 56.86% of famers, 44.12% of herb sellers, 36.27% of hunters and 5.88% of herbalists had income ranges between 4, 000 to 12, 000 naira (US$11.13 to US$33.38). The percentage of hunters, herb sellers, famers and herbalist that had individual income ranges between 12, 000 to 20, 000 naira (US$33.38 to US$55.63) were 58.82%, 55.88%, 43.14% and 20.59% respectively. Only 52.94% and 20.59% of herbalist had their income ranges from 20,000-28,000 naira (US$55.63- US$77.89) and 28, 000 to 36, 000 naira (US$77.89 to US$100.14), while 4.90% of hunters had it between 20, 000 to 28, 000 naira (US$55.63 to US$77.89). 44.61% and 35.78% of the total respondents had their income ranges between 12, 000- 20, 000 naira (US$33.38 to US$55.63) and 4, 000- 12, 000 naira (US$11.13 to US$33.38) while 14.46% and 5.15% had it between 20, 000-28, 000 naira (US$55.63 to US$77.89) and 28, 000-36, 000 naira (US$77.89 to US$100.14) respectively. The willingness to pay the bid amount offered to the respondent's shows that 89.22% of hunters and 86.27% of herbalists were willing to pay the bid amounts offered to them while 83.33% of herb sellers and 77.45% of famers were equally willing to pay the bid amounts offered to them for the protection of the forest.

Total value of Forest Protection preference: The total value for forest protection preference by the respondents was obtained by calculating the restricted mean willingness to pay and the total willingness to pay value.

Restricted Means WTP Computation

The restricted mean WTP is given as $P^{+} = 1/|\beta| * \ln(1+\exp^{bo})$

$1/0.0065465 * \ln(1+\exp^{1.527648}) =$ ₦114.38

$152.75337967 * \ln(5.607328) = 152.75337967 * 0.748756 =$ ₦114.38

The mean willingness to pay per respondent was ₦114.38 per household per month.

The currency rate of Naira versus US Dollars as at 12th - 18th March, 2018 was ₦359.50 to a dollar. Therefore the mean willingness to pay per respondent was ₦114.38 per household per month, equivalent to US$0.32.

Total WTP Computation as a proxy for value of protecting forest: The restricted willingness to pay per household was ₦114.38 (US$0.32) monthly. The population of Akinyele local government according to the national population commission [27] in 2006 was 211,811 people. Using this population information with average number of household per respondent in the study area which was 7, consequently, the average number of household per the population of the local government was (211,811/7) 30259 households. However, the total willingness to pay was given as mean WTP multiply by the number of household in the study area. Thus, the total willingness to pay for the whole study was given as (₦114.38 * 30259) ₦3, 461,024.42 (US$9, 627.32) monthly. Therefore, the total willingness to pay for forest conservation/ protection was ₦3, 461,024.42 (US$9, 627.32) per month. This value will increase with an increase in the population of the study area.

Relationship between the Socio-Economic Characteristics of the Respondents and their Willingness to Pay for Forest Conservation: The relationship between the socio-economic characteristics of the respondents and their willingness to pay for forest conservation were analysed by using logistic regression model as described in equation 1 and 2. Table 2 below presents the maximum likelihood estimates of the model. The result shows that five out of eleven variables in the model had significant coefficient. These variables are sex (X_2), educational level (X_6), occupation (X_7), income (X_{10}) and bid amount offered to the respondents (X_{11}). These five variables had significant effects on the willingness to pay for forest conservation. The coefficient of age (X_1), household size (X_3), marital status (X_4), nativity (X_5), nearness to the forest (X_8) and employment (X_9) were not significant. This implies that age, household size, marital status, nativity, nearness to forest and employment do not affect the decision on the likelihood of the willingness to pay for forest conservation by the respondents. The coefficient of income has a positive effects on the WTP in accordance with a- priori expectations and significant at 1%. In other words increase in income will enhance the respondent's willingness to pay. The sex of the respondents and bid amounts offered to the respondents represented by coefficient of variable X_2 and X_{11} are negatively signed and both significant at 1% level. Also, educational level represented by coefficient of variable X_6 was negatively signed and significant at 5% level, reducing this variable will enhance the respondent's willingness to pay. The coefficient of occupation represented by variable X_7 was positive and also significant at 5% level, conversely, increasing this variable will enhance the respondent's willingness to pay. The log-likelihood ratio (LR) statistics exhibited appropriate signs and was significant at 1% probability level, meaning that the explanatory variables included in the model explained the probability of WTP of the respondents and thus the null hypothesis which says there was no significant relationship between socioeconomic characteristics and willingness to pay for forest conservation in the study area was thereby rejected.

Discussion

The socio-economic characteristic of the respondent's willingness to pay for forest conservation shows that the larger percentages of them both male and female were willing to pay for the protection of the forest. This may be due to the fact that both male and female are expected to benefits from the productive and environmental service functions of the forest and are expected to be more willing to pay for forest protection. The average age of all the respondents pooled together was 55 years. The higher the age the better the experience and the more likelihood will be the respondent's willingness to pay for forest protection. 94.36% of all the respondents were married with the highest household size of 6-10 members. Increase in household size may enhance the respondent's intergenerational equity motive that is the likelihood of wanting to pay more for forest protection to ensure their future generations benefits from the variety of service and life support system which the forest provides to sustain their existence. A large household size, on the other hand, may mean more willingness to deforest to meet their immediate daily needs for existence. The majority of respondents were not educated; this may affect their willingness to pay because the higher the level of educational attainment, the more will be the level of respondent's environmental awareness and so the more likelihood will be their willingness to pay for forest protection. The proportion of the respondents that were native of the study area was more than non-native. Based on ethnocentric ground, the non- native is less expected to be willing to pay for the protection of the forest in their area as compared to the native. The non- native is not likely to have as much stake in conservation as the native. The greater percentage of the respondents were closer to the forest by 1-3 km, the closer the forest to the respondents the

greater the access and benefits derived from the productive and environmental service functions of the forest and the more likelihood the willingness to pay for its protection by the respondents. The occupation of the respondent's ranges from farming, hunting, herbs selling and herbalist, these occupations were related to forest activities. The closer the relationship of respondent's occupation to the forest, the more likelihood will be the respondent's willingness to pay for forest conservation. The majority of the respondents were not employed, but having the monthly income between 12,000- 20,000 naira (US$33.38 to US$55.63). The higher the employment and income, the greater the likelihood of respondents willingness to pay for forest conservation.

The relationship between the socio economic characteristics of the respondents and their willingness to pay for forest conservation were analysed by using logistic regression model. Five out of eleven variables in the model have significant effects on the willingness to pay for forest conservation. These variables are sex (X_2), educational level (X_6), occupation (X_7), income (X_{10}) and bid amount offered to the respondents (X_{11}). This agrees with the findings of [1] which found gender, education, income, age, bids price and regular visit to be significant on the visitor's willingness to pay for conservation in Yankari Game Reserved, Bauchi. [32] in willingness to pay for rehabilitation of Ibadan urban environment through reforestation projects recorded employment and proximity to reserves as the socio-economic variables that influenced WTP for the environmental service functions of forests in Ibadan Metropolis. [4] recorded income, sources of income and years of existence as the factors that significantly influence WTP for environmental service of forest trees by cooperate organisations. Also, [28] in willingness to pay for Environmental Service Functions of Mangrove Forest in Uzere, Delta State, found years of residence and occupation as the variables that significantly affect WTP for the environmental service functions of mangrove forest in Uzere, Delta State. The coefficient of age (X_1), household size (X_3), marital status (X_4), nativity (X_5), nearness to forest (X_8) and employment (X_9) were not significant meaning that the variables do not affect the decision on the likelihood of the willingness to pay for forest conservation by the respondents. The coefficient of income has a positive effect on the WTP in accordance with a priori expectation and significant at 1% probability level. In other words increase in income will enhance the respondent's willingness to pay. This result conforms to the findings of many studies where a positive relationship existed between income and willingness to pay, such as the study of [40]; [11]; [33]; [35] and [37]. The sex of the respondents and bid amounts offered to the respondents represented by coefficient of variable X_2 and X_{11} are negatively signed and both significant at 1% level. [40] and [19] found a positive relationship between male gender and WTP. The negative sign on the coefficient of bid amount indicates an inverse relationship between the variable and the WTP. This outcome supports the economic theory of demand and many CVM studies of Willingness to pay ([2]; [10]; [22]; [26]; [33]. [23] emphasised that while using the CVM-WTP format, an increase in bid price decreases the probability of willingness to pay and vice versa. Also, educational level represented by coefficient of variable X_6 was equally negatively signed and significant at 5% level. Conversely, reducing this variable will enhance the respondent's willingness to pay. The negative sign of the coefficient of education disagree with the findings of [1] who found a positive relationship between the level of education and the willingness of the visitors to pay for forest conservation and also disagree with many studies where education plays a significant role in determining the willingness to pay ([10]; [40]; [19]). The negative sign of educational variable could be due to the fact that majority of the respondents in the study area were not educated. The coefficient of occupation represented by variable X_7 was positively signed and significant at 5% level of probability. This may be due to the fact that the respondents had occupations that are related to forest.

The closer the relationship of respondent's occupation to the forest, the more likelihood will be the respondent's willingness to pay for forest protection. The log-likelihood ratio (LR) statistics exhibited appropriate signs and significant, meaning that the explanatory variables included in the model explained the probability of WTP of the respondents for forest conservation. The restricted mean willingness to pay per household was ₦114.38 (US$0.32) monthly while the total willingness to pay for forest conservation for 30259 households was found to be ₦3, 461,024.42 (US$9, 627.32) per month. This value will increase with increase in population of the study area.

Conclusion

The study used a dichotomous choice contingent valuation method in estimating the villager's willingness to pay for forest conservation. Dichotomous choice provided just two options of either voting 'Yes' or 'No' to the bid price provided to each respondent under a hypothetical market scenario. It is easier to respond to the DC questions as respondents are already familiar with the discrete choices in a market transaction. Thus, [22] suggested that the DC format is considered to be the superior elicitation method compared to open-ended format which lack realism and generally criticized for being associated with high percentage of protest bid mainly due to difficulties in estimating the willingness to pay.

Based on the results of the study on table 1, it can be concluded that majority of the respondents pooled together are male, married with average age and house hold size of 55 years and 7 members. The larger percentage of them were native of the study area, not educated, not employed, but having the monthly income between 12,000- 20,000 naira (US$33.38 to US$55.63) and closer to the forest by 1-9 km. The larger proportions of the respondents both males and females are willing to pay for forest conservation. The mean willingness to pay for forest conservation was ₦114.38 (US$0.32) per month per household and the total willingness to pay was ₦3, 461,024.42 (US$9, 627.32) per month. From table 2, it can be concluded that the relationship between the socio economic characteristics of the respondents and their willingness to pay were determined by factors like sex, educational level, occupation, income and bid amounts offered to the respondents.

This study, like many others, is not without limitations. Some important variables may have been left out of the models. Variables, such as deforestation awareness, visitation to the forest, intergenerational equity (support forest conservation for future generations), membership of an environmental organization, and attitude towards species or forest protection, can be incorporated in the models in future research. In addition, future studies may consider collecting data across the population irrespective of the respondent's occupation and such could cover a wider study area and for over a long period of time in order to capture all and sundry.

Recommendation

From the findings of this research, the following recommendations were made:

1. Monetary value should be placed on the social, cultural, ecological and economic services generated by the forests for the forests to continue to provide goods and services on sustainable basis.

2. The willingness to pay for forest conservation can be used as an alternative measure of displeasure against the conversion of the forests to other uses and as a supportive

494 argument for the invaluable roles the forests play in sustaining the livelihood of the
495 people.
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497 3. Forest managers and decision makers should embrace and emphasize the concept of
498 willingness to pay as an alternative way of mobilising funds for forest protection and
499 conservation.
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Table 1: **Descriptive Statistics of the Respondent's Willingness to Pay for Forest Conservation**

Socioeconomics characteristics	Crop farmers		Hunters		Herb sellers		Herbalist			
	Frequency	%age	Frequency	%age	Frequency	%age	Frequency	%age	Total	Percentage
Age										
21-40	5	4.90	1	0.98	40	39.22	-	-	46	11.27
41-60	69	67.65	70	68.63	62	60.78	33	32.35	234	57.35
61-80	28	27.45	29	28.43	-	-	66	64.71	123	30.15
81-100	-	-	2	1.96	-	-	3	2.94	5	1.23
Sex										
Male	87	85.29	102	100	-		102	100	291	71.32
Female	15	14.71	-	-	102	100	-	-	117	28.68
Marital Status										
Single	-	-	1	0.98	8	7.84	-	-	9	2.21
Married	96	94.12	98	96.08	94	92.16	97	95.10	385	94.36
Widowed	4	3.92	-	-	-		-	-	4	0.98
Widower	2	1.96	3	2.94	-		5	4.90	10	2.45
Household size										
1-5	39	38.24	4	3.92	29	28.43	3	2.94	75	18.38
6-10	62	60.78	73	71.57	66	64.71	79	77.45	280	68.63
11-15	1	0.98	25	24.51	7	6.86	20	19.61	53	12.99
Level of Education										
Primary six	23	22.55	2	1.96	22	21.57	13	12.75	60	14.71
Secondary	10	9.80	1	0.98	10	9.80	1	0.98	22	5.39
Not educated	69	67.65	99	97.06	70	68.63	88	86.27	326	79.90
Nativity										
Native	92	90.20	87	85.29	98	96.08	89	87.25	366	89.71
Non-native	10	9.80	15	14.71	4	3.92	13	12.75	42	10.29
Nearness to forest (Km)										
1-3	88	86.27	38	37.25	68	66.67	85	83.33	279	68.38

Socio economics characteristics	Crop farmers Frequency	%age	Hunters Frequency	%age	Herb sellers Frequency	%age	Herbalist Frequency	%age	Total	Percentage
Nearness to forest (Km)										
4-6	14	13.73	49	48.04	25	24.51	12	11.77	100	24.50
7-9	-	-	15	14.71	9	8.82	5	4.90	29	7.12
Occupation										
Farming	80	78.43	-	-	-	-	-	-	80	19.61
Hunting	-	-	88	86.27	-	-	-	-	88	21.57
Herb selling	-	-	-	-	77	75.49	-	-	77	18.87
Herbalist	-	-	-	-	-	-	96	94.12	96	23.53
Others	22	21.57	14	13.73	25	24.51	6	5.88	67	16.42
Employment										
Employed	21	20.59	62	60.78	-	-	13	12.75	96	23.53
Not employed	81	79.41	40	39.22	102	100	89	87.25	312	76.47
Income										
4000- 12,000 (US$11.13- US$33.38)	58	56.86	37	36.27	45	44.12	6	5.88	146	35.78
12,000- 20,000 (US$33.38- US$55.63)	44	43.14	60	58.82	57	55.88	21	20.59	182	44.61
20,000-28,000 (US$55.63- US$77.89).	-	-	5	4.90	-	-	54	52.94	59	14.46
28,000-36000 (US$77.89- US$100.14)	-	-	-	-	-	-	21	20.59	21	5.15
Willingness to pay										
Willing to pay	79	77.45	91	89.22	85	83.33	88	86.27	343	84.07
Not willing to pay	23	22.55	11	10.78	17	16.67	14	13.73	65	15.93

510 Source: Computed from Field Survey Data, 2016

Table 2: Maximum Likelihood Estimation of Respondents to WTP Questions

Variables	Coefficient	Standard error	Z values	P> |Z| values
Age (X_1)	-0.0132672	0.0239542	-0.55	0.580
Sex (X_2)	-2.278437	0.6056215	-3.76	0.000***
Household size (X_3)	0.1388486	0.0858648	1.62	0.106
Marital status (X_4)	-0.2064308	0.5366017	-0.38	0.700
Nativity (X_5)	0.5120932	0.5656031	0.91	0.365
Educational level (X_6)	-0.1164787	0.0456517	-2.55	0.011**
Occupation (X_7)	0.2848162	0.1275025	2.23	0.025**
Nearness to forest (X_8)	0.052923	0.1082219	0.49	0.625
Employment (X_9)	0.5165104	0.4701175	1.10	0.272
Income (X_{10})	0.0002011	0.0000404	4.97	0.000***
Bid amount (X_{11})	-0.0065465	0.0015872	-4.12	0.000***
Constant	1.527648	1.612479	0.95	0.343

Source: Computed from Field Survey Data, 2016.

*** Significant at 0.01, ** Significant at 0.05
Prob. >Chi2= 0.0000
LR chi2 (11) = 88.07
Pseudo R^2 = 0.2461
Log likelihood = -134.88391
Number of obs. = 408

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