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## Perception of Girei community on biodiversity conservation in Girei forest reserve of Adamawa state, Nigeria

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### Abstract

A contingency valuation survey was carried out to determine the willingness of the respondents to accept compensation for the losses due to restriction and readiness to pay to have access to Girei forest reserve. A stratified random sampling procedure was used to select one hundred and eighty (180) respondents for this study using structured questionnaire, out of which 173 was retrieved. Data on socio-demographic characteristics of respondents were collected and analyzed. The results showed that willingness to accept compensation was significantly related ( $p \leq 0.05$ ) to gender, age, educational level and occupation of the respondents while the annual income of the household had no significant influence on willingness to accept compensation ( $p \geq 0.05$ ). The results also showed that willingness to pay was significantly related ( $p \leq 0.05$ ) to the age, educational level and annual household income of the respondents while gender and occupation of the respondents had no influence on willingness to pay.

**Keywords:** Contingent valuation, sustainable management, biodiversity, perception

### 1. Introduction

The establishment of protected areas (PA) such as forest reserves, game reserves and national parks is a common way of protecting biodiversity from habitat loss and hunting pressures in many developing countries. Protected areas enhance conservation by restricting bush meat hunting, collection and the conversion of land into agriculture. Communities adjacent to forest reserves in Nigeria normally consume, exchange or sell non-timber forest products (NTFP) sourced locally as part of their livelihood strategies. According to Abu and Adebisi (2002) <sup>[3]</sup>, many people in forest fringes rely on collection and sale of forest products to supplement their farm income. The livelihoods of 1.6 billion people depend on forests and its provides a home for more than 300 million people worldwide (WWF, 2010) <sup>[14]</sup>. It is estimated that total global trade in forest products was valued at around US \$379 billion in 2005 (WWF, 2010). According to Agbeja (2004) <sup>[1]</sup>, one method of ensuring and regulating the role of forestry in national is creation of forest reserves.

Many goods and services provided by biodiversity are commercial. But not changes quantifiable in monetary terms. Many of these goods and services are not traded in the market place and do not have an obvious price on commercial value (UNEP, 2011) <sup>[13]</sup>. The negative effects is if these un-priced values are not included in the decision making process, the final decision can favor outcome which have a commercial value. Hence, decision makers cannot have full awareness of the consequences for biological diversity conservation (Dikgang and Muchapondwa, 2012) <sup>[7]</sup>. There are several techniques for the estimation of non market value of biological diversity. These include the travel cost methods, replacement cost (Groot *et al.*, 2006) <sup>[8]</sup>, conversion cost (Abila, 1998) <sup>[5]</sup>, and benefit transfer (Schuijt, 2002) <sup>[12]</sup>. However, the contingent valuation method (CVM) may be the only appropriate method to estimate the full benefit of potential future conversation programs.

As pressures on the forest reserves increase, this leads to over exploitation, exploration and other conversion of forest ecosystems or other land use which normally result in the decimation of biodiversity as well as in extinction of many valuable plant species and animals (Agbogidi 2002, Iroko *et al.*, 2008) <sup>[20]</sup>. This study aims to measure the value of loss of access to Girei forest reserve in which local users would receive monetary compensation for the losses and what they are willing to pay for a better and secured access to the reserve.

**2. Methodology**

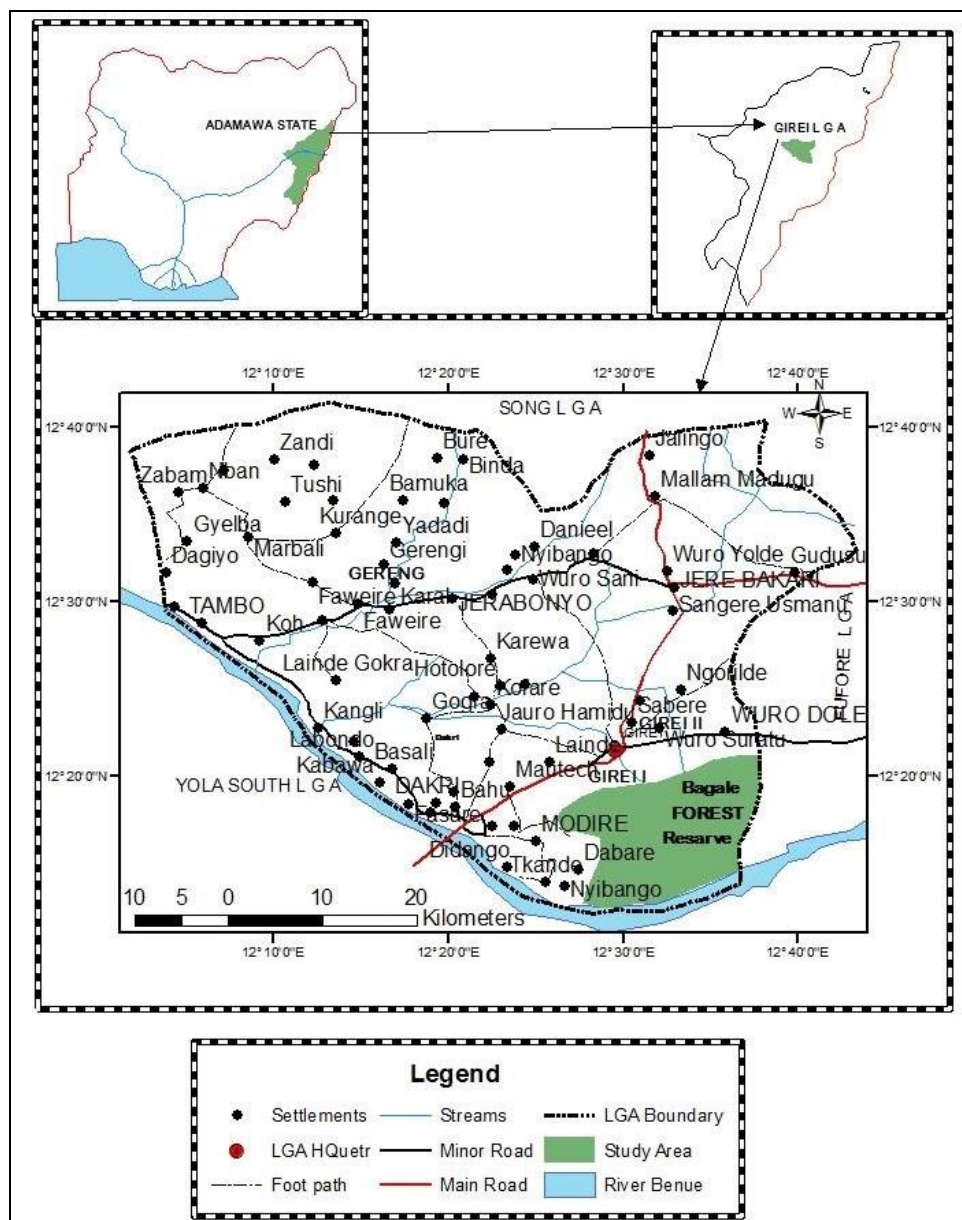
**2.1 Study area**

The study was carried out in two wards (Tambo and Worodole) that surrounded Girei forest reserve of Adamawa State. The forest reserve is located between Latitude 8° N and 11° N and Longitude 11.5° E and 13.5° E. The gross area of the State is 3.90 million Hectares, at of which 2.87 million hectares are arable, in which two percent (2%) of the arable lands were cropped, while eighty percent (80%) were under utilized. The Local Government is boarded by Song Local Government Area in the North, Fufore Local Government Area in the East, while River Benue act as a physical boundary between the local Government Area, and Yola North and Demsa Local Government Areas. (Adabayo and Tukur, 1999) [4].

Girei Local Government falls under the sudan savannah type of vegetation and it experiences district dry and net seasons with temperature and humidity varying with seasons.

The wet or rainy season fall between April and November, which is characterized by single maxima in August. During

this season, the moisture laden south west trade wind from the Atlantic Ocean blow over the area. 70% percent of the total rainfall in the area happen to fall within four months of May to August. The area has an average of 62 raining days, while average amount of rainfall recorded in the area is 972mm. The dry season which is the harmattan period is between December to March. The period is characterized by dry, dusty and hazy Northern trade wind that blows over the area from sahara desert. Tempreture within the area varies with season. Although the temperatures are relatively high almost all the year round, temperature of the area ranges from 27° C-45 °C. December and January is the coldest months with an average temperature of 34 °C. The nature vegetation of the area is Sudan Savannah type which is characterized by the thick vegetation around hills and mountain ranges. The vegetation has a wide variety of savannah tree species among which are; *Acacia* spp, *Combretum* spp, *Adansonia* spp, *Anogeissius* spp, (Adabayo and Tukur, 1999) [4].



Source: GIS Laboratory, Geography Department MAUTECH, Yola (2018).

**Fig 1:** Map of Adamawa State showing the Study Area

**2.2 Survey and sampling procedure**

The study was conducted in the wards surrounding Girei forest reserve based on the reasoning that the local communities who reside in those wards are the ones who co-exist with the forest reserve most of the time. One hundred and eighty respondents were only chosen using stratified random sampling procedure. Only heads of households members were interviewed on the premise that they make day to day decisions for the good of household members.

**2.3 Data collection**

Data were collected on the socio-demographic characteristics such as gender, age, educational levels, occupation and income level of the respondents. Household survey and contingent valuation questionnaire was used to interview 180 heads of households on what they are willing to accept as compensation for the losses due to restriction and readiness to pay to have access to the forest reserve, out of which 173 were retrieved.

**2.4 Data analysis**

Descriptive statistical tools involving the use of frequency tables and percentages were employed in analyzing the retrieved data. Chi-square was used to test if there exist any significant relationship between what amount respondents

were willing to accept for the losses due to restriction of access to the forest reserve, in relation to their socio-demographic characteristics and what they are willing to pay in order to have a better and secured access to the reserve.

**3. Results and Discussion**

**3.1 Socio-demographic characteristics of the respondents**

**3.2 Willingness to accept compensation and the amount willing**

Majority of the respondents (96%) are willing to accept compensation for losses due to the restriction of access to Girei forest reserve while (4%) are not (Table 1). If small incentives is given to the people and proper awareness is provided on the values of conservation, this will go a long way in helping to protect the biodiversity in the forest reserve.

The amount they are willing to accept for compensation varies between ₦10,000 to ₦40,000 per month. This result agrees with the findings of Hannemann (1994) <sup>[9]</sup>, who reported the large and empirical divergence between individual’s willingness to accept and willingness to pay measures may not be indicative of some failure in research methodology but a situation accepted as a general perception.

**Table 1:** Frequency of the respondents on willingness to accept compensation and the amount willing

Willingness to accept	No. of Respondents	Percentage (%)
Yes	166	96.0
No	7	4.0
Total	173	100
Amount to Willing to Accept per Month (#)		
10,000 - 20,000	5	2.9
20,000 - 30,000	114	65.9
30,000 - 40,000	47	27.2
Not willing to accept	7	4.0
Total	173	100
Mean amount to accept ₦27,530 ± ₦5,803		

**3.3 Socio-demographic characteristics of the respondents in relation to willingness to accept compensation**

Presented in Table (2) are the socio-demographic characteristics of the respondents in relation to willingness to accept compensation. The table revealed that, 152 (91.6%) males and 14 females are willing to accept compensation for the losses due to the restriction of access to the forest reserve while only 6 (%) males and 1 female, are not willing. The chi-square value of 0.46 shows that there is no significant relationship ( $p \geq 0.05$ ) between the gender of respondents that are willingness to accept compensation for the losses due to the restriction of access to the forest reserve.

The results on the age class of the respondents shows that, majority of the respondents between the age bracket of 36 to 40 are willing to accept compensation, this was followed by ages 41 to 45 and 46 and above, while, ages between 31 to 40 had the least number of respondents, it was only 6 and 1 respondent in the age bracket of 36 - 40 and 41 - 45 respectively that are not willing to accept compensation. Chi-square result 3.13 shows that there is no significant relationship ( $p \geq 0.05$ ) between the age of respondents and their willingness to accept compensation for the losses due to the restriction of access to the forest reserve.

The educational background of the respondents shows that 8, 26 and 104, respondents that had tertiary, secondary and primary education respectively are willing to accept compensation, while only 8 respondents with no formal education shows interest to accept compensation. Chi-square result 3.96 revealed that there was no significant relationship ( $p \geq 0.05$ ) between the educational level of the respondents and their willingness to accept compensation for the losses due to the restriction of access to the forest reserve.

Table (2) revealed that majority of the respondents (92) are farmers and are willing to accept compensation, followed by traders (40) and civil servant (18). The result shows that (7) respondents in all are not willing to accept compensation. The chi-square result 7.67 indicates there was no significant relationship ( $p \geq 0.05$ ) between the occupation of the respondents and their willingness to accept compensation for the losses due to the restriction of access to the forest reserve.

Majority of the respondents (59) within the income class of ₦251,000-₦300,000 per annum are willing to accept compensation to restrict access to the forest reserve, followed by (47) of the respondents within the income class of ₦301,000-₦350,000 per annum (Table 2). The result

shows that only (7) respondents in all are not willing to accept compensation. Chi square result 13.21 shows that there is significant relationship ( $p \leq 0.05$ ) between the household income and what they are willing to accept as compensation for the losses due to the restriction of access to the forest reserve.

**Table 2:** Chi-square Test on willingness to accept compensation in relation to socio-demographic characteristics of the respondents

Demographic characteristics	Yes	No	Chi-square value	Remark
<b>Sex</b>				
Male	152	6	$\chi^2$ cal = 0.46	
Female	14	1	$\chi^2$ tab = 3.84	N.S
Total	166	7		
<b>Age class (Years)</b>				
31-35	11	0		
36-40	96	6		
41-45	42	0		
46-50	16	1	$\chi^2$ cal = 3.13	
50 and above	1	0	$\chi^2$ tab = 9.48	N.S
Total	166	7		
<b>Education</b>				
No formal	29	2		
Primary	104	2		
Secondary	26	2	$\chi^2$ cal = 3.96	N.S
Tertiary	8	1	$\chi^2$ tab = 7.81	
Total	166	7		
<b>Occupation</b>				
Unemployed	1	0		
Farming	92	3		
Trading	40	1		
Wage labor	15	1	$\chi^2$ cal = 7.67	N.S
Civil servant	18	2	$\chi^2$ tab = 0.48	
Total	166	7		
<b>Income class (₹) per annum</b>				
151,000 - 200,000	11	0		
201,000 - 250,000	47	0		
251,000 - 300,000	59	3		
301,000 - 350,000	47	3		
351,000 - 400,000	1	0	$\chi^2$ cal = 13.21	*
401,000-above	1	1	$\chi^2$ tab = 11.07	
Total	166	7		

N.S = Not significant, \* = Significant

**3.4 Willingness to pay and the amount willing to pay**

The amount the respondents are willing to pay (Table 3) revealed that 163 (94.2%) of the respondents are willing to pay if there is better and secured access to the forest reserve while 10 (5.8%) are not willing to pay any amount. Majority of the respondents 158 (91.3%) are willing to pay between ₹100-₹1000 monthly if there is better and secured access to the forest reserve (Table 3). The mean amount willing to be paid by respondents monthly was ₹568 ± ₹476. Those that said they will not pay suggested that forest should be protected at all cost and resident should not be asked to pay, because they do not trust the management. Some, even said it is their right to use the forest reserve. This result is in accordance with the findings of Pearce and Turner (1990) [11]. Who reported that Willingness to accept and Willingness to pay are not the same? It also confirmed the report of Whitehead (1994) [15]. Who stated that previous empirical research reveals that WTP is several times lower than WTA.

**Table 3:** Frequency of the respondents on willingness to pay for compensation and the amount

Willingness to pay	No. of respondents	Percentage (%)
Yes	163	94.2
No	10	5.8
Total	173	100
<b>Amount willing to pay per Month (₹)</b>		
Greater than 100	4	2.3
100 - 1000	158	91.3
1000 - 10,000	1	0.6
Not willing to pay	10	5.8
Total	173	100
<b>Mean amount to pay ₹568±₹476</b>		

**3.5 Socio-demographic characteristics of the respondents in relation to willingness to pay**

The results of the respondent demographic characteristics (Table 4) revealed that (153) males and (10) female are willing to pay for a better and secured access to the reserve while (10) respondents in all are not willing to pay any amount. The Chi-square value of 22.89 shows a significant relationship ( $p \leq 0.05$ ) between the willingness of respondents to pay in order to have a secured access to the reserve and the gender of the respondents. This agrees with the findings of Baral (2011) [6]. Who reported that there is no significant relationship between willingness to contribute to conservation cause and the gender of the respondents? The willingness to pay in relation to the age of respondents revealed that majority of the respondents (94) within the age class of 36-40 years are willing to pay in order to have a better and secured access to the forest reserve, followed by (41) within age class of 41-45 years and (1) respondent within the age class of (50) years and above (Table 4). The result shows that (10) respondents in all are not willing to pay any amount. Chi-square results revealed that there is no significant relationship ( $p \geq 0.05$ ) between the willingness of respondents to pay and age of the respondents. Likewise, the educational status of the respondent shows that majority of the respondents (103) respondents had primary school education, this was followed by respondents with no formal education (29). Among the respondents sampled, it was only (10) respondents that are not willing to pay. (Table 4). The Chi-square value results 6.24 shows that there is a significant relationship ( $p < 0.05$ ) between the educational level of the respondents and willingness to pay. This disagrees with the findings of Barral (2011) [6] who reported that there is no significant relationship between the willingness to contribute to conservation cause and the educational level of the respondents. The occupational status of the respondents in relation to willingness to pay (Table 4) revealed that majority of the respondents (94) are farmers and are willing to pay in order to have better and secured access to the reserve, followed by traders (37) and only one non-employed respondent. The result shows that (10) respondents all are not willing to pay any amount. There was a significant relationship between the willingness to pay and the respondents occupation ( $p \leq 0.05$ ) as revealed by chi-square test. The income status of the respondents shows that majority of the respondent (59) within the income class of ₹251,000-₹300,000 per annum are willing to pay for a better and secured access to the reserve, this was followed by (48) respondents which fell within the income class of

₦301,000- ₦350,000 per annum. The result shows that only (9) respondents are not willing to pay any amount. Chi-square value results of 0.09 shows that there is no significant relationship ( $p>0.05$ ) between the willingness of the respondents to pay in order to have a secured access to the forest reserve and the household income of the respondents

**Table 4:** Chi-square test on willingness to pay in order to have a better and secured access to the forest reserve in relation to socio-demographic characteristics of the respondents

Demographic Characteristics	Yes	No	Chi-square	Remark
<b>Gender</b>				
Male	153	5	$\chi^2$ cal = 22.89	
Female	10	5	$\chi^2$ tab = 3.84	*
Total	163	10		
<b>Age class (years)</b>				
31-35	10	1		
36-40	94	8		
41-45	41	1		
46-50	17	0	$\chi^2$ cal = 3.01	
50 and above	1	0	$\chi^2$ tab = 9.48	N.S
Total	163	10		
<b>Educational Qualification</b>				
No formal education	29	2		
Primary	103	3		
Secondary	23	4	$\chi^2$ cal = 6.24	
Tertiary	8	1	$\chi^2$ tab = 7.84	N.S
Total	163	10		
<b>Occupation</b>				
Unemployed	1	0		
Farming	94	1		
Trading	37	4		
Wage labour	14	2	$\chi^2$ cal = 9.60	*
Civil servant	17	3	$\chi^2$ tab = 9.48	
Total	163	10		
<b>Income class (₦ per annum)</b>				
151,000 - 200,000	10	1		
201,000 - 250,000	44	3		
251,000 - 300,000	59	3		
301,000 - 350,000	48	2		
351,000 - 400,000	1	0	$\chi^2$ cal = 0.09	N.S
401,000 - above	2	0	$\chi^2$ tab = 11.07	
Total	164	9		

N.S = Not significant, \* = Significant

**4. Conclusion**

The study has shown that even though the forest reserve is a vital source of livelihood to the people surrounding it, the people are willing to accept certain amount in form of incentives as compensation to restrict the over exploitation of the forest resources and even pay a little amount as contribution to the conservation of the forest reserve. This will go a long way in ensuring that the resources obtained from the forest reserve are available for future generations. These findings can be useful in decision making for policy makers regarding the economic feasibility of bio diversity in this area.

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