Estimating Non Users Willingness to Donate for Improve Conservation of Yankari Game Reserve, Bauchi Nigeria; Random Parameter Model Approach

Muhammad Sanusi Ibrahim [1], Moh`dRusli Yacob[2], Buhari Abdulkarim[3]

[1]Geography Department, School of General Studies, Abubakar Tatri Ali Polytechnic Bauchi, Bauchi State, Nigeria.
[2]Department of Environmental Economics, Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 Serdang, Selangor,
[3]Departmentof Geography, Isa Kaita College of Education Dutsin Ma, Katsina State, Nigeria.

Abstract: YGR serves many functionssuch as, biodiversity, ecological, hydrological, education and research site and economic functions. The reserve hosted over 20,000 tourists from over 100 countries. This makes it the most popular tourist destination in Nigeria and, if properly managed, it could become a significant part in the development and promotion of tourism throughout the country. Despite all these, this reserve is currently under serious threats from a various series of negative activities. Underrating YGR non-market resources values in making decisions is adjudge to be a major negative factor of the reserve conservation and resources management. This study was aim at estimating the unique non market preferred economic values of YGR ecosystem using choice experiment technique (CE) study. In the non-users estimation model, the Random Parameter Model (RPL) was used to estimate the marginal value of the respondents for different attributes of the non-market values of conserve resources of YGR. The results points out the respondents' positive preferences towards improve conservation of YGR.
Key words; *Yankari game reserve, protected, biodiversity, resources management, choice experiment, Random Parameter Model (RPL)*

I.   INTRODUCTION

Ecosystem conservation is seen as the activity of avoiding any steps that can disturb or temper with the fauna and flora of Yankari Game Reserve. Conservation worldwide is seen as an activity of safeguarding and protecting of plants and animal species and their habitats. However, the rate at which these plants and animal species are being deflated by humans is geometrically overtaking their natural decline (Chanie & Tesfaye, 2015: Meduna, Ogunjinmu and Onadeko, 2009). Human activities in destructing and exploiting of natural ecosystem resources necessitate the establishment of conservation and protection of environmental natural resources (Grigoroudis, Petridis & Arabatzis, 2014). Establishments of game reserves and parks are aim to ensure that varieties of plants and animals species are conserved and protected for future generation to benefit (Jia, Fu, Feng, Hou, Liu & Wang, 2014: An, Li, Guan, Zhou, Wang, Deng & Jiang, 2007).

The ever rapid growth of ecosystem resources of the present day society leads to habitat destruction and fragmentation, extinction of species and general decline or biodiversity loss (Frikvist, Erika, 2015; Larby & Patricia, 2009). Conservation is aim at maintaining and protecting the ecological ecosystem resources, biodiversity genetically materials, protection of culture and rural area development as a whole (Newing, 2010)

II.   REVIEW OF LITERATURE

Biodiversity conservation and protected area

Conservation is the ethical use and protection of treasured resources, such as plants, minerals, animal, water bodies, land and other resources and it is focused on maintaining the natural sphere in order to safeguard the sources of resources (Soule, Tegene & Wiebe, 2000; Soule & Wilcox 1980).

Environmental resources conservation serves as ecosystem maintenance system, such as the sequestential of carbon, educational and recreational services, flooding and erosion mitigation and control (Jia, Fu, Feng, Hou, Liu & Wang, 2014). Such areas are to serve as avenues of poverty reduction and job creation and sustainable community and conservation development (Rogerson & Sim, 2012). Therefore, conservation of

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natural environment resources is a wealth of life which is found on earth plants, animals, microorganisms and the system that exist in (Olaleru, & Egonmwan, 2014).

Protected area are referred to as the cornerstone for ecosystem and biodiversity conservation because of its significant in biodiversity conservation and the services it rendered in ecosystem services it offers to our societies (Htun, Mizoue and Yoshida, 2012). Those services rendered necessitated the need for the creation or establishment of protected areas so that the vital resources of the environment will be protected and sustained (Barber, et al., 2012).

Establishment of Nigeria protected areas is traced back to the 17th century and the first protected area to be conserve was the Forest reserves by Mr. Thompson in 1896 at the Colony and protectorate of Lagos (Adekunle, 2007). In 1916, the Forestry Law was reviewed to outspread the jurisdiction of the Forest Department to the Northern protectorate (Hyman, 1993). Conservation of these areas came as a result of the government interest to sustain the natural resources in them for present and future generations to benefit. All the conserved areas have a compact character with biogeographically important attributes. The concepts of conserving wildlife in Nigeria forest game reserves came up in the early 1930s, with the suggestion that game reserves should be established in savanna areas of (Ejidike & Ajayi, 2013; Joppa, Loarie & Pimm, 2008; Terborgh, 2002; Afolayan and Ajayi, 1980). Anadu in (1987) suggested that established forest reserves, game reserves, national parks and other protected areas will positively result in protecting natural resources utilization for sustainable human benefits. The conservation policy of natural resources in game reserves, national parks and other protected was as a result of government interest in preventing extinction of most flora and fauna in the wild (Olaniyi, 2016; Olakunle, Omotayo & Odewumi, 2011; Anderson, 2004; Aduradola, 2004). Globalization, industrialization, rapid population boost and urbanization have altered food production patterns and consumption rate in ways that extremely affect ecosystems resources (Barau, Buba, Maikeri, Tukur, Gabuin, Kabir & Danba, 2015; FAO, 2010). Management and conservation of natural resources especially the ones that replenish themselves under optimum conditions necessitate attention to ensure their sustainability. Therefore, the desires for wildlife conservation came into reality through the demarcation of Yankari game reserve (1280 km2) in Bauchi State in 1956 and opening it off to the public in 1962 as premier game reserve in Nigeria (Usman & Adefalu, 2010; Ejidike & Ajayi 2013).

The conservation impact and effect on any particular settlement results from a complex set of interacting conditions, some having to do with geography and location, some with the dwelling, and still others with the social and economic characteristics of the people living there (Hewitt, 2014 & 1983; Drabek & McEntire 2003; Quarantelli, 1987 & 1995; Bates and Peacock, 1987). According to Cannon: there are no really generalized opportunities and risks in nature, but instead there are sets of unequal access to opportunities and unequal exposures to risks which the roots of local disaster vulnerability are increasingly recognized to be the pre-existing patterns of community settlement and development (Lobenstine 2014; Diaz & Pulwarty, 2012; Bennett, 2009; Pielke, 2005; Anderson, 1994; Pulwarty and Riebsame, 1997; Pielke and Pielke, 1997), including 'the on-going social order, its everyday relations to the habitat and the larger historical circumstances' (Hewitt, 2005 & 1983). The impact of a natural event on any given community, for example, is not random, but determined by everyday patterns of social interaction and organisation, particularly the resulting stratification paradigms which determine access to resources (Bandopadhayay, 2014; Oliver-Smith, 2009 & 1986; Maskrey, 1993 & 1989; Few, 2003; Bolin and Stanford, 1998) are consequences of the socio-economic system.

Choice experiment

Choice experiment is another format of conjoint analysis which can be used to estimate the economic valuation of every kind of environmental good and services, use and non-use values (Hanley and Barbier, 2009). In fact, Choice experiment originates in the fields of transportation and market research, where it was mainly used to study the trade-offs between the characteristics of transport projects and private goods (Hoyos, 2010). Choice experiment has only recently been applied to non-market valuation of environmental goods and services and health economics (Bateman *et al.,* 2002). In the field of environment and natural resources economics using Choice experiment are becoming ever more frequently (Hoyos, 2010). Choice experiment is well suited in the valuation of non-market goods (Jobstvogt, 2014; Hanley and Barbier, 2009). The first study to apply Choice experiments to estimate non-market value of environmental services was Adamowicz *et al.,* (1994). Since then, quite an increasing number of studies were conducted, e.g. Saul, 2007; Adamowicz *et al.,* (2004); Boxall *et al.,* (1996); Layton and Brown, (2000); for application to environment and e.g. Scott, 2003; Ryan and Hughes, (1997); and Vick and Scott (2008 & 1998), for application to health (Hoyos, 2010).

Choice experiment involves the act of designing different options deferring interms of attributes and levels. The respondents are then asked to choose their most preferred options. The baseline alternative or status quo is always included in each option in order to achieve a welfare measure that is consistent with economic theory. Using Choice experiment technique provides great information which will be applied in determining the

most preferred design for the environmental goods and services. Several advantages of Choice experiment make its application more popular in areas such as economics (Adamowicz *et al.,* 2004; Layton and Brown, 1998).

There are many reasons that lead to increase in applying Choice experiment: (i) reduction in some potential biases of CVM; (ii) more information is elicited from each respondent compared to CVM; (iii) there is also the possibility of testing the internal consistency of the technique (Alpizar *et al.,* 2001). Application of Choice experiment survey will provide value of many alternatives of policy outcome. Choice experiment technique has the capability of providing values to more than one scenario, and it is also flexible, multipurpose and cost effective technique.

There are extensive literatures on Choice experiments by many authors, example, Adamowicz *et al.,* 2004; Hanley et al., 1998; Louviere *et al.,* 2000. Probability of selecting or rejecting an alternative over others can be estimated by using a random utility model framework. Hence, the effect of the attributes levels can be estimated as well. It is possible to also estimate Hicksian surplus measure of value, which individual respondent's places on each attribute (Ben-Akiva and Lerman, 1985; Hanemann, 1984). The viewpoint of multiple levels of each attribute that can be included in the choice set experiment uses an attribute-based approach to estimate its utility. Changes in the attributes level can be estimated using compensated demand functions (Hanley and Barbier, 2009).because of the complexity of natural resources decision, Choice experiment method results can be used to investigate the importance attached to attributes and will aid in gaining useful information on preferences over a number of decisions alternatives (Bateman et al., 2002). The data obtain can be used to estimate the economic value of various combination of attributes and their levels. Hence compare to CVM, more and much information and data can be elicited and collected from a single Choice experiment survey.

Admowicz *et al.,* (1998) reviewed the different steps of Choice experiment study as below:
i.   Identification of appropriate attributes
ii.   Defining the relevant measurement unit of each attribute
iii.   Assigning the number and magnitude of the attributes levels
iv.   Experimental design
v.   Questionnaire design
vi.   Model estimation
vii.   Use of parameters to simulate choices

Step i-iii can be defined as preparing background information in CVM studies. During this stage CVM researchers are focused on accurate preparation and presentation of the valuation scenario in a clear and concise way that provides sufficient information for the targeted respondents. In CE, these stage involves collection of secondary data, focus group discussions, using of experts ideas in defining attributes and their levels, and pre-testing the survey to review and receive feedback from a portion of the targeted respondents in order to determine whether the attributes and their levels are well understood by the respondents or not. The main aim of CE and CVM studies are to present that can be understood by respondent and get their feedback as well.

Step iv is only applicable to Choice experiment technique, designing the attributes and their levels in the choice sets is a very fundamental step in CE studies. But in dichotomous choice CVM, experimental design is interms of specification of bids and their levels. Carson *et al.,* (1994) illustrate the problem of experimental design. In Choice experiment, design with four attributes and three levels for each attribute, the potential alternative would be 3^4. Assuming the choice sets includes only three alternatives, and then the number of possible triples would be about 85,320. If the number of choices sets is to be restricted to 54, then here the problem arises about the selection of 54 triples from a large number of possible triples. Loivire (1988) was able to give a all-inclusive appraisal of works of experimental design. There is no single theory, which results in best choice sets for any given situation. Given the importance of experimental design in Choice experiment, the best and general principles in designing choice sets are their usability in the related statistical model and the outcome result (Carson *et al.,* 1994).

Step v is also applicable to CVM. The act of questionnaire designation is the main activity in all stated preference techniques. In Choice experiment, respondents are asked to consider different sets of choices. Their decision will be about number of attributes and their levels and the number of alternatives in the CE scenario. The respondents are then asked to consider the components and choose their best most preferred alternative choice sets. This step is very complicated in CE studies than in CVM studies (Adamowicz *et al.,* 1998).

Step vi and vii are still common to both CE and CVM studies. Bothe CE and CVM techniques, using econometric models of "random utility model" in estimating the welfare measures is necessary. The model is applicable in estimating welfare and the yield measures of compensating variation from CE.

In Choice experiment technique, respondents are faced with different sets of choice sets of options, it if belief that the complexity and context of their decision, the number of attributes and the relationships between them, the number of choice sets, time constraints and other factors may affect the decision of the respondents

(Adamowicz,2008; Swait and Adamowicz, 1996). Adamowicz, (2008) and Swait and Adamowicz (1996) revealed that respondents learning for some replications and repeats it during other choice sets and fatigue sets will affect choice task in positive or negative manner. They noted that " the dominance of the fatigue or learning effect in any given task (may be due to the number of replications, number of attributes, or lack of familiarity with the choices) may produce a strictly increasing or decreasing relationship between cognitive burden and variance in any empirical data set.

Thus, they recommend use warm up questions to help the respondents to get better understanding from choice task. Carson and Louviere (1994) indicated that "without "warm-up" sets, the quality of responses to the first few choice sets may suffer". Adamowicz, (2008) and Swait and Adamiwicz (2001) found that in a choice task including of 16 choice sets in which each choice sets has three alternatives, the respondents can answer to the first half of the questions with no fatigue. They conclude that respondents can evaluate 24 hypothetical options which are grouped in small choice sets. Carson and Louviere (1994) suggested that an average questionnaire including seven attributes which formed as four choices sets and four alternatives in each choice set. Accordingly, they claimed to have successfully administered survey with choice tasks ranging from 1 to 32. Adamowicz *et al.,* (1998) implied that respondents can respond to large numbers of choice sets with more than 6 alternatives tend to exceed cognitive limit. The respondents understanding of different attributes and levels are of great importance. It is worthy to note that, presenting choice tasks with obvious dominates in their characteristics to other alternatives produce no information about marginal effects of attributes on the choice probabilities, and hence it must be avoided (Adamowicz, 2008; Swait and Adamiwicz, 1996).

Importantly "status quo" term should be included in all choices sets. This is indicating the current situation of the area or resource of study and is known to be certain but other proposed management options are uncertain. Since people mostly avoid risky situation at their life's hence, they may choose status quo term over other options. Boxell *et al.,* (1996) and Mazzotta *et al.,* (2005) mentioned the importance of status quo alternative and describe it with an Alternative-specific constant (ASC) in the econometric model. Both of these studies stated ASC as a significant factor in Choice experiment studies. They believed that respondents have some preferences towards or against status quo that is not attributed to the values of respective attributes, carter paribus. Respondents may opt for status quo because they are not interested in the valuation program. However, they may contribute in valuation exercise because they are not satisfy with the present situation and they opt to pay to change the current situation, but they may not understand the nature of trade off or different alternatives and choice sets.

Population, sampling methods and data collection
Study Population
Alkaleri local government at which Yankari game reserve is located and chosen for this study has a population of 328,284 and 54,714 households (NBS, 2012). The targeted respondents are all members of the adjoining communities who are above eighteen (18) years of age.

MAP OF ALKALERI SHOWING STUDY AREAS
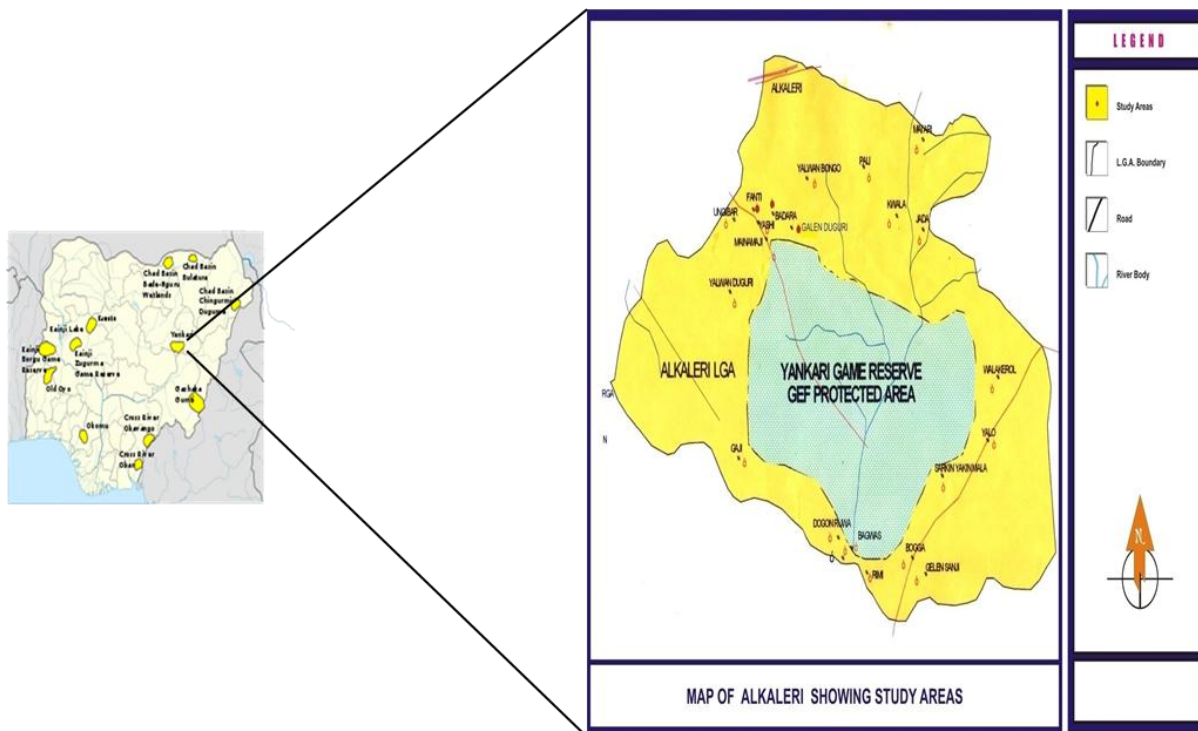
Sample sixe
The NOAA panel recommended face-to-face interview mode was used in the elicitation of the 440 samples. The Yamane (1976) formula of determining sample size was applied in determining the 400 sample size. However, 40 (10%) additional questionnaires were added to the 400 drawn samples to curtail questionnaire rejection or poor return rate (Ismail, 1992).

Sampling technique
The adjoining communities of the reserve were stratified into four (4) based on their direction and proximity from the reserve boundry. However, ten (10) communities were strategically selected using Ms excel random number generator and the respondents were randomly selected from the selected communities.

Data Collection
The face-to-face questionnaire interview was used in eliciting the study data on both male and female. The enumerators were male and female as well, due to cultural and religious constraint of the locality, whereas the female enumerators administer questionnaires to female respondents at their respective houses or working places the male enumerators attend to male respondents. A total of 440 respondents were interviewed and 422 valid responses obtained after treatment of outliers, missing cases of vital information on vital questions.

Instrument Design
The structured Questionnaire survey method of data elicitation has been declared to be the foremost tool used in quantitative studies (Jagsi et al., 2015; Ware et al., 2000). It is a well-structured set of questions that elicit responds from respondents either by writing their views or by selecting from a given alternatives (Coombe & Davidson, 2015; Kerr & Churchill, 2001). Therefore, the instrument used in this study data collection is the direct face-to-face questionnaire interview method containing hypothetical scenario on the importance of Yankari game reserve and the need for participatory and improved conservation for the future generation to benefit. The "take it or leave it (TIOLI)" Yes or No option to the respondents on their willingness is adjudge to be the easier to answer (Yacob et al., 2009) and was presented to elicit the respondents willingness to participate towards the improve conservation reserve.

Socio-demographic profile of the Respondents
The output result of the socio demographic characteristics of the respondents is presented in Table 1, as the total retrieved questionnaires from the respondents was four hundred and twenty two (422). Male respondents constituting of 321 (76.1%) while that of women is 101 (23.9%) respondents. These can be linked to the socio cultural and religious belief of Muslims of northern Nigeria that mostly prevent their wives and female associate from staying outdoors and taking part on social activities.

The age mean score of the respondents is 35 years, respondents age ranging from 18-25 years constitute of 107(25.4%), 119(28.3%) respondents fall within the range of 26-35 years, 103(24.4%) respondents fall within the range of 36-45 years, while 53(12.6%) and 40(9.5%) fall within the range of 46-55 years and 56 and above years respectively.

From the survey result, the marital status of the respondents indicates that married respondents constitute of 279(66.1%) while the non-married (singles) are 143(33.9%). The respondent level of education indicates that 105(24.9%) attended a non-formal type of education, those with primary qualification were 83(19.7%), 187(44.3%) respondents have secondary school qualification which constitute majority of the research respondents. Those that attended colleges, polytechnics and university (tertiary education) constitute only 47(11.1%) of the respondents.

The result of the occupational status of the respondents shows that 95(22.5%) are been employed by government while those that are self-employed were 128(30.3%). 133(315%) of the respondents are farmers while unemployed and retirees constitute of 51(12.1%) and 15(3.6%) of the total survey respondents respectively.

The membership to association respondents indicates that 226(53.6%) belong to a particular association that relates to conservation were as those that did not belong to any association constitute of 196(46.4%). The respondents gross monthly income indicates that 167(39.6%) earn between N10,000-N20,000 monthly, those that earn between N21,000-N30,000 were 129(30,6%) while those within the range of N31,000-N40,000 were 97(23.0%) respondents and N41,000-N50,000 were 23(5.5%) of the respondents. Respondents with the highest monthly income of N51,000 above constitute only 6(1.4%) of the survey respondents. The mean score of gross monthly income of the respondents from the result analysis is N25,597.

Table 1 Socio-demographic profile of the Respondents

Element	Freq.	Percentage (%)
Gender		
Male	321	76
Female	101	23.9
Age		
18-25	107	25.4
26-35	119	28.3
36-45	103	24.4
46-55	53	12.6
56 and above	40	9.5
Marital status		
Non married	143	33.9
Married	279	66.1
Educational level		
Non formal	105	24.9
Primary	83	19.7
Secondary	187	44.3
Tertiary	47	11.1
Occupation		
Government employed	92	22.5
Self-employed	128	30.3
Farmers	133	31.5
Unemployed	51	12.1
Retiree	13	3.6
Membership of Association		
Yes	226	53.6
No	196	46.4
Level of Income		
₦10,000-₦20,000	167	39.6

₦ 21,000-₦ 30,000	129	30.6
₦ 31,000-₦ 40,000	97	23.0
₦ 41,000-₦ 50,000	23	5.5
₦ 51,000 and above	6	1.6

Choice Experiment Technique Analysis

Statistical result analysis of the choice experiment is presented. Firstly, the descriptive analysis of choice experiment technique attributes, followed by the basic Random Parameter Model (RPL) and finally the multinomial logit interaction model.

Table 2 is the descriptive analysis of attribute used in this study. The choice experiment was designed with the positive assumption that the observable utility function would follow an additive form. Therefore, in all the models, the used attributes were in 1 and 2, so the utility is increasing based on the improvement of the level of either, natural environment, conservation services, plants and animals species, rivers and streams quality and the last attribute is price (improve conservation fees). The first and second options in all the observations is indicating a positive change in level of some attributes, while the last option is the option with no any change or improvements which is referred as "status quo".

The rationale behind price attribute, the more the price goes higher it leads to lower level of vote or acceptability on any improvement of any of either natural environment, conservation services, plants and animals and the water and spring quality.

Table 2 Descriptive Analysis of Attributes

Variables (Attributes and Levels)	Freq. (%)	Expected sign	
ENT (Natural environment)			
Not satisfactory	5064 (66.7%)	-	
Less satisfactory	1266(16.7%)	+	
Satisfactory	1266(16.7%)		+
CON (Conservation services)			
Weak	5064(66.7%)	-	
Moderate	1266(16.7%)		+
Perfect	1266(16.7%)	+	
PLA (Plants and Animals Species)			
Low	5064(66.7%)	-	
Medium	1266(16.7%)	+	
High	1266(16.7%)		+
WAT (Rivers and Streams quality)			
Unacceptable	5064(66.7%)	-	
Moderately acceptable	1266(16.7%)	+	
Acceptable	1266(16.7%)		+
Conservation value:			
Current condition (Status quo)	(33.3%)	-	
₦1000.00 conservation contribution	(22.2%)	+	
₦1500.00 conservation contribution	(22.2%)	+	
₦2000.00 conservation contribution	(22.2%)	+	

Basic Random Parameter Model (RPL)

This study is highlighting the simple Random Parameter models of choice experiment technique. All the Basic, Interaction and Marginality models variables were selected based on their signs, coefficients and significance of the attributes and model fitness. The conditional logit model was applied for the purpose of this research. Three (3) sets of options were presented to the respondents with varying changes or improvements characteristics attributes levels and cost. Option A and B are set of attributes combinations and their levels with an annual cost to the respondents while option C was always the current situation "Status quo".

There as; $U=\beta_1 X_1 + V_2 X_2 + \beta_3 X_3 + \ldots + \varepsilon_0$

Where, β_1, β_2............ B_k are related coefficient on main attributes and X_1, $X2$.......X_k are the main attributes. In the basic model Random Parameter Model (RPL), only the main attributes were inserted. It is expected that the respondents will value those levels of attributes that will lead to higher quality and provide higher utility to the conserved environment. Table 4is showing the basic Random Parameter Model (RPL).

Base on the basic Random Parameter Mode (RPL) , all the attributes are found to be statistically significant at 1%, 5% and 10% confidence level with the exception of RIV2_INC (P-Value .0942) , while the PRC (monetary contribution) has a negative sign as expected and also significant at 1%. The negative sign is saying that, as the monetary contribution increases, the respondent are less likely to contribute. The coefficients are entailing a positive relationship be both the signs and weight of the model variables. The model fitness is obtained as Log likelihood function (-1370.875), Log L fucn No coefficients (-2303.7900), R-squared (.40495) and RsqAdj (.40181).

Table 4 Basic Model Random Parameter Model (RPL)

RANDOM PARAMETER INTERACTION MODEL			
Variables	**Coefficient**	**Standard Error**	**P-Value**
ENT2	2.40647477	.24328388	.0000
ENT3	7.25953250	.54826109	.0000
CON1	1.09270413	.22311128	.0000
CON3	4.79665198	.41472449	.0000
PLA2	2.41877049	.19750818	.0000
PLA3	6.30668894	.55057387	.0000
RIV2	.62921748	.66313994	.0000
RIV3	4.09754469	.61132156	.0000
PRC	-.00308684	.00024603	.0000
RIV3_EDU	1.23075495	.45485959	.0068
CON2_EDU	-.63860993	.29611729	.0310
RIV2_INC	.356352D-05	.212940D-05	.0942
Log likelihood function		-1370.875	
Log L fucn No coefficients		-2303.7900	
R-squared		.40495	
RsqAdj		.40181	

Table 6 Random Parameter Model Approach

Random parameter Marginal Logit Model		
Variables	**Marginal value**	**P-Value**
ENT2	747.4240118	.0000
ENT3	2430.075995	.0000
CON2	272.2274093	.0000
CON3	1548.303985	.0000
PLA2	798.5951698	.0000
PLA3	2081.163023	.0000
RIV2	225.7185203	.0000
RIV3	1547.650001	.0000
Note: ***Significance at 1%, **Significance at 5%, *Significance at 10%		

Compensating Surplus

The choice experiment compensating surplus value of multiple changes in attributes level for the improve conservation of Yankari game reserve was estimated using the welfare measures formulae (Bateman et al., 2003 and Hanrmann, 1984):

$CS = [\ln \sum \exp(V_{i1}) - \ln \sum \exp(V_{i1})]/\alpha = \beta cv(V_{i1} - V_{i0})$

While,

$V_{i0} = \alpha + \beta_N N_0 + \beta_B B_0 + \beta w W_0 + \beta_E E_0$

$V_{i1} = \alpha + \beta_N N_1 + \beta_B B_1 + \beta w W_1 + \beta_E E_1$

Where Compensating Surplus welfare measure, $\alpha$is the marginal utility (represented by coefficient of monetary attribute), V_{i0} and V_{i1} are the indirect utility function before and after the change in attribute levels. Using the stated formulae, the compensating surplus of YGR was estimated as ₦2413.39 per household per annum as the utility the respondents are willing to donate improvement in the conservation of YGR from its current situation.

Aggregate value of Compensating Surplus for improve conservation of YGR

According to Richer (1995), estimating aggregate value is by multiplying the compensating surplus by the number of households in the area of the study. The total households in study area based on the Nigeria National Bureau of statistics (2015) is found to be 54,714, the calculated mean willingness to pay is ₦2,430.075995. The total aggregate value or contribution for the improve conservation of Yankari game reserve is estimated as, 54,714 households multiply by compensating surplus ₦2,430.075995 is equals to ₦132,959,178 per annum.

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