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Willingness to Pay for Ecosystem Services in Protected Areas: Case Study of Old Oyo National Park, Nigeria

Amusa, T.O.*[a] Ashimolowo, B.[a] and Wahab M.K.A[b]

[a]*Department of Forest Resources Management, University of Ilorin, Nigeria*
[b]*Department of Forest Resources Management, Osun State University, Nigeria*
**Corresponding Author: Phone. +234(0)08051750289; E-mail. amusa.to@unilorin.edu.ng*

ABSTRACT

Despite the importance of national parks and other forms of protected areas in providing ecosystem service functions in Nigeria, there is still inadequate recognition of this value among stakeholders and policy makers. Therefore, this study was carried out to assess the willingness to pay (WTP) for ecosystem services in Old Oyo National Park (OONP), Southwest Nigeria Open-Ended (OE) Contingent Valuation Method (CVM) was applied to identify WTP and quantify monitory value of identified ecosystem services in the study location through a simple random sampling of support zone communities (SZCs) of the park. A total number of 225 copies of questionnaire were administered to households to collect data in selected communities using a face-to-face approach. Descriptive statistical tools and multiple linear regression were used to analyze the obtained data. Results showed that the total monetary value of all ecosystem services provided by OONP was ₦1,908,048 per annum per household, with regulating services having the highest figure of ₦1,251,888.00. There was no significant relationship between WTP for identified ecosystem services in the park and selected demographic variables of respondents ($R = 0.168$; $R^2 = 0.028$; Adj $R^2 = -0.003$). Although majority of respondents were able to identify ecosystem services provided by OONP, they were unwilling to pay for these services, thereby leading to low monetary valuation.

Keywords: Contingent; ecosystem; valuation; zone communities; Old Oyo National Park

Introduction

Biodiversity and ecosystems are preserved in protected areas (PAs) across the globe. In many parts of the world where most of the landscape have already been transformed by agriculture or industry, PAs may be the only natural or near natural ecosystems remaining (Stolton *et al*., 2015). Historically, PAs were established due to the concern of over-exploitation of natural resources by local people. National parks, in particular, were planned to shelter the lasting "wilderness" of a given country and are principally dedicated to the maintenance of extraordinary areas or emblematic plant and animal species. National parks play many roles among which "preserving nature" has become a matter of considerable social, political, economic and scientific concern (Alemu, 2016). They represent many cultural, aesthetic and spiritual values to the local people. The biodiversity conservation value of national parks also underpins their provisioning of

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

ecosystem service functionswhich are indispensable to man (Cardinale *et al*., 2012).

Ecosystem Services (ES) are the provision of natural resources and healthy ecological systems that produce environmentally and economically valuable goods and services (Warner, 2008). They are the benefits that people obtain from ecosystems (Millennium Ecosystem Assessment-MEA, 2005). The MEA further classifies them into provisioning, regulating, supporting and cultural services. They provide wide range of goods and services to human-being which range from the relatively simple, such as reliable flow of clean water to complex such as carbon sequestration (de Groot *et al*., 2012). Ultimately, the human life depends on ecosystem services for fundamental necessities such as clean air, clean water and food production (Jianguo, 2013).

The complexity of the provision of services from ecosystems has been extensively discussed during the past couple of decades (de Groot *et al*., 2012; Keune and Dendocker, 2013). Nevertheless, a number of authors have suggested that monetary value should be placed on the social, cultural, ecological and economic services generated by different ecosystems in order to continue to provide the goods and services on a sustainable basis. Willingness to Pay (WTP) for forest and other ecosystems conservation are seen as a means of measuring displeasure against their conversion to other uses and as a supportive argument for the invaluable roles they play in sustaining the livelihood of the people. It also highlights the potential to generate additional resources in managing PAs. Strand *et al* (2018) in their assessment of ecosystem services of the Brazilian Amazon Forest reported values ranging from US$56.72 ± 10 per hectare per year to US$737 ± 134 per hectare per year for various ecosystem services in about 12% of the forest. Similarly, KC *et al* (2013) reported a mean willingness to pay of NRs. 33,347 (about US$ 460) per year by all users for recreational and aesthetic services in Baghmara Buffer Zone Community Forest of Nepal. These studies underscore the potential of monetary-tag on ecosystem services.

In Nigeria, the establishment of national parks began in 1979 when the federal government promulgated Decree 46 of 1979 (later Act 46 of 1979) and proclaimed Kainji Lake National Park (KLNP) as the first National Park in the Country (NNPS, undated). The 1979 National Park Act placed Nigeria among comity of nations, which has demonstrated the political will to check the senseless plundering of natural resources so that the future generation can appreciate and enjoy their natural heritage. Apart from KLNP, additional six national parks were established in quick succession to bring the number of national parks in the country to seven as at 1999. Meanwhile, national parks in the country have evolved as a fundamental necessity for sustaining the natural capital of the whole nation and indeed livelihoods of the people. Lately in December 2020, the Nigerian government approved the establishment of ten new national parks across the country bringing the total number of national parks to seventeen nationwide. The additional parks were established to increase Nigeria's

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

potentials for nature conservation and ecotourism.

Despite the importance of national parks and other forms of PAs in providing ecosystem service functions in the country, there is still inadequate recognition of this value among stakeholders and policy makers (Akindele *et al*., 2021). There is a dearth of empirical information on the economic value of ecosystem services provided by national parks in the country. Therefore, this study was carried out to assess the willingness to pay (WTP) for ecosystem services in Old Oyo National Park (OONP) as a way of economic valuation of these services. This is important towards creating awareness on the importance and value of ecosystem services provided by PAs in Nigeria so as to influence policy makers in the allocation of funds for conservation of biodiversity resources in the country.

Methodology

Study Area

The study area is Old Oyo National Park (OONP). It is one of the seventeen National Parks in Nigeria. It islocated across northern Oyo State and southern Kwara State. It is geographically situated on latitudes 8° 15’ -9° 00’N and longitude 3° 35’ - 4° 42’ E covering about 251,200 hectares of land (Figure 1). The location has inevitably placed the park at a vantage position of abundant land area as well as diverse wildlife and cultural/historical settings. The park was established to preserve the cultural, historical and archaeological features in the abandoned sites of the then capital city of the ancient Oyo Empire at Oyo-Ile, Bara and Koso in addition to protecting, preserving, conserving and managing representative samples of indigenous flora and fauna of the south west geographical region of Nigeria.

It is rich in plant and animal resources including buffalo, bushbuck, kob and a variety of birds. Annual rainfall in the park ranges between 900 mm and 1,500 mm, and mean annual temperature is between 12^{o} and 37^{o} C. Vegetation of OONP has been classified as southern guinea savanna. However, more intense studies have classified the southern portion of the vegetation as forest savanna mosaic with wooded savanna containing relic of moist semi-deciduous forest, grading northwards into drier mixed leguminous wooded savanna with a continuous lower stratum of perennial grasses (Ibrahim and Adetoro, 2015). The economy of the support zone communities of OONP is largely agrarian, and of great importance to hunting and collection of non-timber forest products by households. OONP is made of five ranges namely: Sepeteri, Tede, Marguba, Oyo-Ile, and Yemoso. The park is easily accessible from south-western and north-western Nigeria.

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

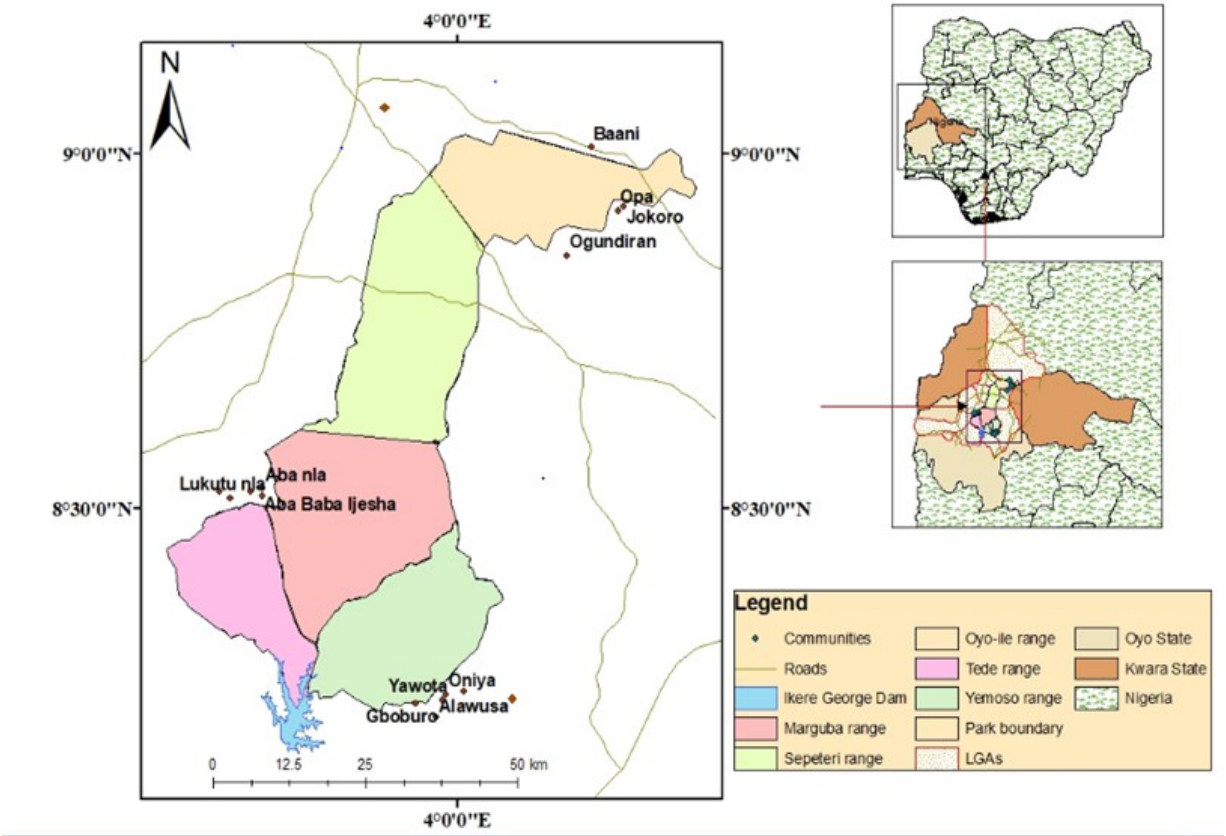

Figure 1: Map of the Study Location

Sampling Procedure and Data Collection

The Open-Ended (OE) Contingent Valuation Method (CVM) was applied to identify willingness to pay and quantify monitory value of identified ecosystem services in the study location. The Contingent Valuation (CV) is a standardized and widely used survey method for estimating Willingness to Pay (Loomis, 1996). The OE method is flexible, easy to understand and analyse, and produces direct continuous individual WTP. The study population comprised local people in support zone communities (SZCs) of OONP (these are communities that lie within 5 km radius to the boundary of the park). A simple random sampling technique was adopted to select three ranges out of the five ranges of the park.

These include: Marguba, Oyo-Ile and Yemoso. Thereafter, five communities were surveyed from each of the three ranges. In all, fifteen communities were randomly selected out of 37 communities that fall within 0 – 5 km radius to the boundary of the park in the three ranges surveyed. This represents a sampling intensity of 40.5%. Data were

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

obtained with the aid of a questionnaire that elicited relevant information from the respondents on issues related to the objectives of the study. A total number of 225 copies of questionnaire were administered to households in the selected communities using a face-to-face approach. To identify ecosystem services provided by OONP in the study area, respondents were asked to indicate various ecosystem services provided by the park. To determine the willingness of the local people to pay for the management and conservation of the park, respondents were to voluntarily state the amount to be paid for the ecosystem services identified.

Data Analysis

Descriptive statistical tools such as frequencies, means, modes and percentages were used to analyze the results. Also, multiple linear regression was employed to find out the relationship between WTP for identifiedecosystem services (dependent variables) and selected demographic variables (independent variables). The following multiple linear regression modelwas developed to find out the relationship between the WTP and the factors affecting WTP by the local people.

$WTP = ß_0 + ß_1X_1 + ß_2X_2 + ß_3X_3 + ...+ß_nX_n + error$

Where, WTP is willingness to pay by the local people for the sustainable management and conservation of ecosystem servicesin OONP; $ß_0$ to $ß_n$ are parameters to be estimated; and $X_1$to X_n are explanatory variables influencing WTP.

Probability (WTP) = $ß_0$+ $ß_1$sex + $ß_2$age + $ß_3$level of education +$ß_4$occupation + $ß_5$monthly income + $ß_6$household size + $ß_7$residency status +$ß_8$length of residency + $ß_9$distance from the park +error

Independent variables including as sex, level of education, occupation and residency status were treated as binary variables, while age, monthly income, household size, length of residency and distance from the park were regarded as continuous variables.

Results

Identified Ecosystem Services Provided by Old Oyo National Park

The ecosystem services provided by Old Oyo National Park as identified by the local people are shown in Table 1. The ecosystem servicescovered the four classes of provisioning, regulating, supporting and cultural services as specified by the Millennium Ecosystem Assessment Report (MEA, 2005). The results show that fuelwood, bushmeat, animal fodder, medicinal resources and other non-timber forest products are the provisioning services identified from the park by the local people. Bushmeat has the highest frequency of mention (54.72 %), followed bynon-timber forest products (14.5 %) andmedicinal resources. Animal fodder accounted for the least mention percentage (2.67 %). In terms of regulating services, the local people identified clean water, clean air, pollination services, climate regulation, storm prevention and windbreak as services provided by the park. Clean water had the highest percentage of mention (23.3%), followed by clean air (23.2

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

%), climate regulation (20.5%) and storm prevention (17.3%). Pollination services received the least mention in this category (0.7 %). Furthermore, the various cultural services provided by the park were identified as space for recreation (47.8%), avenue for formal and informal education (45.9%) and source of inspiration for art and religion (6.31 %). Identified cultural services by the park include habitat for wildlife (83.1%) and preserve for biodiversity conservation (71.1%).

Table 1: Identified Ecosystem Services Provided by Old Oyo National Park

Ecosystem Services	Frequency*	Percentage
Provisioning Services		
Fuelwood	21	13.2
Bushmeat	87	54.7
Animal Fodder	6	3.8
Medicinal Resources	22	13.8
Non-Timber Forest Products	23	14.5
Regulating Services		
Clean Air	200	23.2
Clean Water	201	23.3
Pollination	6	0.7
Climate Regulation	177	20.5
Storm Prevention	149	17.3
Windbreak	130	15.1
Cultural Services		
Space for Recreation	159	47.8
Source of Inspiration for Art and Religion	21	6.3
Avenue for Informal and Formal Education	153	45.9
Support Services		
Habitat for Wildlife	187	83.1
Biodiversity Conservation	160	71.1

*Multiple responses were allowed.

Willingness of Local People in SZCs to Pay for Identified Ecosystem Services Provided by Old Oyo National Park

Results on willingness of respondents to pay for identified ecosystem services provided by Old Oyo National Park show that majority of the sampled population (95%) were unwilling to pay for the identified ecosystem services provided by the park, while only five percent (5%) were willing to pay (Figure 2).

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

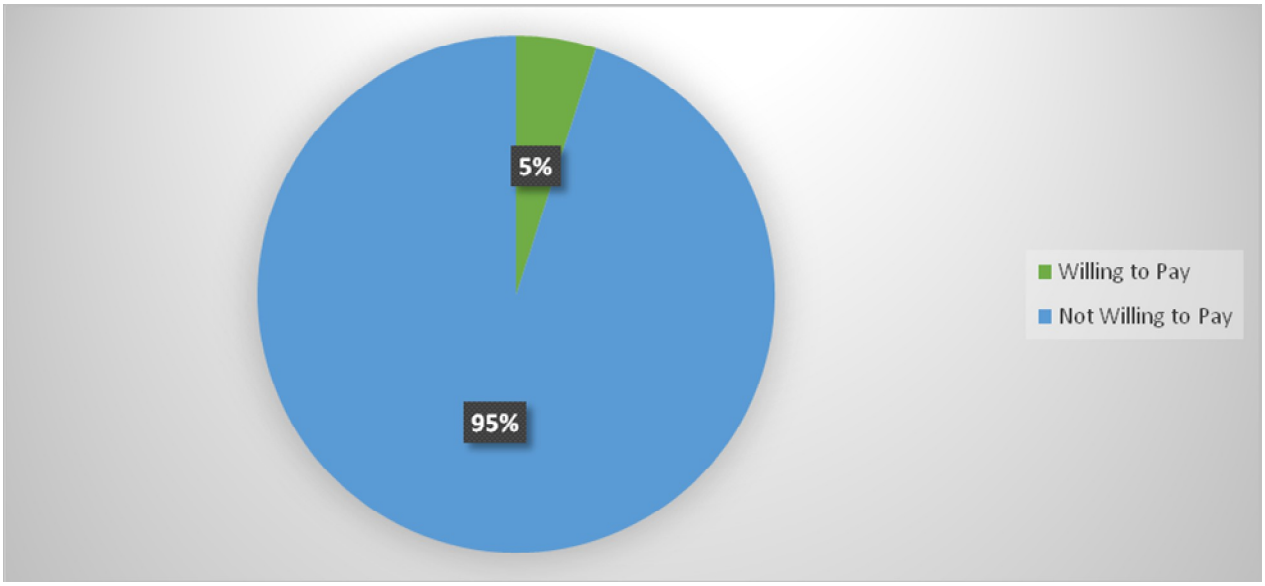

Figure 2: Willingness to Pay by Local People for Identified Ecosystem Services Provided by Old Oyo National Park

Monetary Values of Ecosystem Services in Old Oyo National Park

The results of monetary valuation for the various classes of ecosystem services provided by Old Oyo National Park based on willingness to pay are shown in Tables 2-5. For provisioning services, a total of ₦311,568 was calculated for all household per annum, with bushmeat having the largest amount of ₦215,520 per annum per household. This was followed by fuelwood (₦48,000.00/annum/household), other non-timber forest products (₦24,048.00/annum/household) and medicinal resources (₦24,000.00/annum/household). Animal fodder received no monetary value by the local people. For regulating services, a total ₦1,251,888 was calculated for all household per annum, with provision of clean air receiving the largest amount of ₦298,128 per annum per household.

This was followed by climate regulation (₦278,400.00/annum/household) and clean water (₦274,560.00/annum/household), while pollination services received the least amount (₦132,960/annum/household). The total amount calculated for cultural services was ₦189,120 for all household per annum, with space for recreation having the largest amount of ₦128,640.00 per annum per household, whileavenue for formal and informal education received ₦60,480.00 per annum per household. Source of inspiration for art and religionreceived no monetary value by the local people. For supporting services, a total of ₦155,520 was calculated for all household per annum. Habitat for wildlife has the largest amount of ₦113,280.00 per annum per household, while space forbiodiversity

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

conservation received ₦42,240.00per annum per household. The total monetary value of all ecosystem services provided by OONP per annum per household is ₦1,908,048, with regulating services having the highest figure of ₦1, 251, 888.00. This was followed by provisioning services (₦311, 568.00/annum/household), while supporting services has the lowest figure of ₦155, 520 per annum per household (Table 6).

Table 2: Monetary Values of Provisioning Services in Old Oyo National Park

Provisioning Services	Aggregate monetary value per Week (₦)	Aggregate monetary value per Month (₦)	Aggregate monetary value per Year (₦)	Mean/Year (₦)
Fuelwood	1,000.00	4,000.00	48,000.00	213.33
Bushmeat	4,490.00	17,960.00	215,520.00	957.87
Animal fodder	0.00	0.00	0.00	0.00
Medicinal resources	500.00	2,000.00	24,000.00	106.67
Non-timber forest products	501.00	2,004.00	24,048.00	106.88
Total	**6,491.00**	**25,964.00**	**311,568.00**	**₦1,384.75**

Table 3: Monetary Values of Regulating Services in Old Oyo National Park

Regulating Services	Aggregate monetary value per Week (₦)	Aggregate monetary value per Month (₦)	Aggregate monetary value per Year (₦)	Mean/Year (₦)
Clean air	6,211.00	24,844.00	298,128.00	1,325.00
Clean water	5,720.00	22,880.00	274,560.00	1,220.00
Pollination	2,770.00	11,080.00	132,960.00	591.00
Windbreak	5,580.00	22,320.00	267,840.00	1,190.00
Climate regulation	5,800.00	23,200.00	278,400.00	1,237.00
Prevention of storm	0.00	0.00	0.00	0.00
Total	**26,081.00**	**108,324.00**	**1,251,888.00**	**5,563.00**

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

Table 4: Monetary Values of Cultural Services in Old Oyo National Park

Cultural Services	Aggregate monetary value per week (₦)	Aggregate monetary value per Month (₦)	Aggregate monetary value per Year (₦)	Mean/Year (₦)
Space for recreation	2,680.00	10,720.00	128,640.00	572.00
Source of Inspiration for Art and Religion	0.00	0.00	0.00	0.00
Avenue for formal and informal education	1,260.00	5,040.00	60,480.00	269.00
Total	**3,940.00**	**15,760.00**	**189,120.00**	**841.00**

Table 5: Monetary Values of Supporting Services in Old Oyo National Park

Supporting Services	Aggregate monetary value per week (₦)	Aggregate monetary value per Month (₦)	Aggregate monetary value per Year (₦)	Mean/Year (₦)
Habitat for wildlife	2360.00	9,440.00	113,280.00	503.00
Biodiversity conservation	880.00	3,520.00	42,240.00	188.00
Total	**3,240.00**	**12,960.00**	**155,520.00**	**691.00**

Table 6: Summary of Monetary Values of Identified Ecosystem Services in Old Oyo National Park

Ecosystem Services	Total Monetary value/Year (₦)	Mean (₦)
Provisioning Services	311, 568.00	1,390.00

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

Regulating Services	1,251, 888.00	5,563.00
Cultural Services	189,120.00	841.00
Supporting Services	155,520.00	691.00
Total	**1,908,048.00**	**2,121.00**

Factors Influencing Willingness to Pay for Ecosystem Services Among Local People in SZCs of Old Oyo National Park

Multiple regression analysis of relationship between willingness to pay for identified ecosystem servicesand selected demographic variables of respondents shows that none of the variables (sex, age, level of education, occupation, monthly income, household size, residency status, length of residency and distance from the park) has a predictive effect on willingness to pay. The multiple R value of 0.168 indicates a very weak relationship between WTP and the independent variables investigated. With R square value of 0.028, it shows that only 2.8% of the total variation in WTP was explained by those selected demographic variables (independent variables).

Table 7: Relationship Between WTP and Selected Demographic Variables of Local People in SZCs of Old Oyo National Park

	Coefficients	Standard Error	t Stat	P-Value	Lower 95%	Upper 95%
Intercept	0.256	0.164	1.563	0.120	-0.670	0.578
Sex	-.110	.061	-0.347	-1.816	0.710	-0.230
Age	0.024	0.014	0.016	0.129	0.223	0.187
Level of Education	0.089	0.032	0.279	-0.683	0.520	0.159
Household size	0.010	0.041	0.017	0.246	0.806	-0.071
Occupation	-0.006	0.018	-0.022	-0.331	0.741	-0.041
Monthly Income	-1.223E-007	0.000	-0.032	-0.481	0.631	0.000

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

Length of Residency	0.000	0.000	0.290	1.527	0.128	0.000
Residency Status	0.045	0.063	0.049	0.718	0.473	-0.079
Distance to the park	0.035	0.032	0.076	1.100	0.273	-0.028

Regression Statistics Value

Multiple R	*R Square*	*Adjusted R Square*	*Standard Error*	*Observation*
0.168	0.028	-0.003	0.4423	9

Discussion

Identified Ecosystem Services Provided by Old Oyo National Park

The results show that regulating services of clean water and clean air received higher mention when compared to other categories of ecosystem services among the local people of OONP. This is in contrast to the widely held belief that humans tend to prefer provisioningservices first within all the categories ecosystem services (Agbenyega *et al.*, 2009; Hartter, 2010). A possible explanation for the finding may be the awareness of the fact that the study area is a protected site where material benefitsfrom ecosystems are restricted. Meanwhile, the low mention of pollination as a regulating ecosystem service presents a curious observation. This observation may be due to the technicality of how pollination promotes yield of farm produce, a phenomenon that may not be well understood by local people because majority of them have no formal education where they could have learnt that.

The relative mention of bushmeat as an ES also points to the perception of its importance as a source of protein among the people, therefore reflectingits actual demand despite the conservation policiesthat prohibit its exploitation from the protected area. Similarly, the study shows that rural people in OONP thinkhighly of support (habitat for wildlife, biodiversity conservation) and cultural services (space for recreation, avenue for informal and formal education) which is linked to ecotourism potential of the park. This is similar to findings from Zhang *et al.* (2016) on local stakeholderswho appreciate more of the cultural services offered by protected area.

Willingness of Local People in SZCs to Pay for Identified Ecosystem Services Provided by Old Oyo National Park

Although respondents were able to identify ecosystem services in OONP, majority were unwilling to pay for these services. This is in contrast to reports from Ajewole and Popoola (2001), Adekunle and Sanni (2009), Adekunle and Agbaje (2011) and Arabomen *et al* (2019) who reported a high number of responses on

Journal of Sustainable Environmental Management. Vol. 14, 11-25, 2022. ISSN: 2141-0267
www.awife.org.ng/publications/jsem.html

willingness to pay for environmental service functions of urban trees among respondents in their studies. The finding of this study on low response on willingness to pay for ecosystem services in OONP indicates a perception of "public and free gift nature" of these services among the respondents and that it is the duty of government to cover cost if any for the services. It also points to the "free-rider" problems associated with these services. The "free-rider" problem occurs when "non-participants" do not have to pay for the provision of these non-excludable and non-rival services (Obeng *et al*, 2018).

Monetary Values of Ecosystem Services in Old Oyo National Park

This study further shows that the monetary value placed on the identified ecosystem services by the respondents was higher for regulating services when compared to other categories of ecosystem services. This follows the trend in the mention value of identified ecosystem services and invariably points to the order of preference in the ecosystem services provided by the park. The results also show that the mean total value (₦2,121.00/year; ₦176.75/month) of identified ecosystem services in the park compared with what was obtained in some past studies. For instance, Ariyo *et al* (2018) reported a mean willingness to pay of ₦114.38 (US$0.32) per month per household by villagers for forest conservation in Ibadan, while Adekunle and Agbaje (2011) recorded an individual mean monthly willingness to pay of ₦165.22 (N150 = 1USD) for ecosystem services in Arakanga forest reserve (a peri- urban forest) near Abeokuta, Nigeria. This value, although indicative, is low and could be attributed to the low-income statusof most of the respondents. It could also be because local people are in most cases averse to paying for public goods and services such as the forest (Adekunle and Agbaje, 2011).

Factors Influencing Willingness to Pay for Ecosystem Services Among Local People in SZCs of Old Oyo National Park

The results indicate a non-predictive ability of selected demographic variables of respondents (sex, age, level of education, occupation, monthly income, household size, residency status, length of residency and distance from the park) on willingness to pay for ecosystem services in OONP. This is in contrast to reports from many studies where authors have identified various factors influencing WTP for ecosystems among user groups. Adamu *et al* (2017) revealed that 68.4% of respondents among the local people around Yankari Game Reserve in Nigeria were willing to pay for conservation of the game reserve with gender, age, income, bid amount and attitudes being the significant predictors of WTP. Similarly, KC et al (2013) identified distance to forest, family size, nature of residence, gender and size of land holding to be the prominent factors that affected local users' willingness to pay for ecosystem services in Baghmara Buffer Zone Community Forest of Nepal. Adekunle and Agbaje (2011) also reported that income and household sizes are the socio-economic factors by which the monetary values of ecosystem service functions of Arakanga forest reserve in Abeokuta could be predicted. The difference between our finding and those

of other studies could be due to differences in study area and perhaps, large homogeneity in respondents' attributes and responses.

Conclusion and Recommendation

The study documented the various ecosystem services of OONP as identified by the local people. There is a high preference on regulating services as a category of ecosystem services offered by the park. The monetary value placed on the ecosystem services is low and this could be attributed to the low-income statusof most of the respondents as well as their non-willingness to pay for the services obtainable from the park. There is also no relationship between willingness to pay for identified ecosystem services in the park and selected demographic variables of respondents. It is recommended that more awareness outreach activities be carried out by management authorities of the park in order to build more environmental knowledge and sensitivity among the local people.

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