



## ASSESSMENT OF THE CONSERVATION VALUES OF OSUN OSOGBO SACRED GROVE, OSUN STATE, NIGERIA

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### ABSTRACT

High Conservation Values (HCV) are unique biological, critical ecosystem functions, cultural significant features of an ecosystem. Paucity of knowledge on HCV of Osun Osogbo Sacred grove, South western Nigeria is a serious consideration for this study. Data was generated through field survey, interview and direct field observation. Interview was conducted for the priests, grove staff and traditionalists while systematic line transect was employed in the laying of plots to establish abundance and diversity of the flora species. Feeding point count was carried out for the observation of fauna species at a particular period of the study. *Cercopithecus mona* recorded the highest frequency compared to *Guenon cercopithecus erythrogaster*. A total of forty (40) tree species were found with Margalef and Shannon-Weiner index of 19.20 and 2.30 respectively. *Celtis zenkeri* had the highest relative density (13.04) followed by *Colla hispida* (9.42). Thematic analysis of the cultural significance revealed that use and non-use values were attached to the resources in the grove. Combined efforts of government officials, community guards and traditionalist were employed as conservation mechanism. It is recommended that assessment of high conservation value of the forest should be based on information on diversity of species, critical ecosystem functions and services.

**Keywords:** Cultural significance, High conservation values, Landscape, Sacred grove, Tree species diversity index.

### INTRODUCTION

Forests are home to flora and fauna species and are beneficial to local communities (Rahman *et al.* 2011) it is therefore pertinent to identify and protect significant environmental, biological and cultural features within forests for sustainable management (Castañeda 2000). Furthermore, all-natural habitats especially forest inherits rare or endemic species (Metcalf and Ford 2009) and sacred sites that are particularly important for biodiversity conservation (Jennings *et al.* 2003). All types of forests are unique and important and exhibit conservation value such as old-growth, ancient, primary, virgin, intact, primeval or continuity forests (Buchwald 2005). However, High Conservation Value Forests (HCFS) are forests with unique characteristics and outstanding values that are of critical importance, which needs to be appropriately managed or protected in order to maintain or enhance the identified values (Jennings *et al.* 2003). These significant values may be in form of diversity of species, landscape-level, ecosystems and mosaics, ecosystems and habitats, critical ecosystem services community needs and cultural values (Patru-Stupariu *et al.* 2013). High conservation value forests provide benefits for human



well-being in form of ecosystem services that are non-value and economic significance (EFTEC 2005), natural systems function (Cano-Santana *et al.* 2008), satisfying societies' cultural needs (Patru-Stupariu *et al.* 2013) and offer attractions with high tourism potential (Edinger and risk 2000). Any of these attributes determine the priority of High Conservation Value Forest as basis for conservation.

Invariably, several factors are threatening the values of forest as a result of increasing demand for timber, Non-timber forest products, solid minerals, fertile soil, archaeological materials, antiquities and other treasures (Fuwape 2003, Phan 2017, Nguyen *et al.* 2020). There are indications that modern human demands for natural resources have led to the transformation of a large fraction of pristine habitats into 'anthropogenic biomes' (Ellis 2008). Alexandratos and Bruinsma (2012) and Tilman *et al.* (2011), opined those forests are facing increasing pressure from human in an attempt to meet the growing demand for food, fiber and fuel. As there is increasing trend in agricultural intensification in richer nations and greater land clearing (extensification) in poorer nations, global demand for crop production is forecasted a 100-110% increase from 2005 to 2050 (Tilman *et al.* 2011). Achieving this target without widespread deforestation, biodiversity loss, and greenhouse gas emissions will require a range of innovative strategies including increasing productivity, reducing waste, biodiversity resource management and optimizing land use (Godfray *et al.* 2010). Tilman *et al.* (2011) went further to explain that if the current trends of greater agricultural intensification in developed nations and land clearing developing nations were to continue, ~1 billion ha of land would be cleared globally by 2050.

Habitat fragmentation as a result of clearing forest areas to give way for agriculture is a serious threat not only to tree species diversity but also to wildlife species

distribution, ecosystem services, conservation status and population density (Chima and Omoemu 2012). This forms part of the view of Teobaldelli *et al.* (2009) that forest ecosystems cover approximately 30% of the terrestrial area of the world, which are habitat for a disproportionate share of the world biodiversity. Dymond *et al.* (2008), earlier stressed that the recognition of the ecological, ethical and cultural importance of this biodiversity will greatly increase the need to conserve it.

Sacred groves are patches of forest that have been conserved purposely for their spiritual and cultural values (Khan 2003, Kandari 2014). They are in various sizes ranging from a few to several acres and are regarded as abode of some respected traditional spirits and ancestral gods (Devi 2000). This explains the reasons for restricting human influence such as felling of trees and killing of animals, mining and excavation in the sacred groves except for spiritual personification (Sharma 2000). Preservation and conservation of sacred groves as a category of protected area have received serious attention in the recent time as a result of increasing pressure from anthropogenic activities that are seriously threatening their existence (Oladeji 2012, Oyelowo 2018) highlighted traditional methods of conservation and management of sacred groves as appropriate strategy to safeguard sacred grove from extinction. The authors opined that sustaining socio-cultural and religious functions of the groves could boost the tourism sector if the inherent potentials are properly harnessed by the management authority. This agrees with the findings of Wehner (2002) that sometimes, the intricate link between biodiversity and cultural belief of the people are considered as basis for conservation and management of sacred site. To achieve this task therefore, a number of traditional regulatory mechanisms should be developed and reinforced by practices, taboos, and a combination of prohibitions and restrictions to regulate the entry and use of resources in the groves (Yembilah 2009).



Findings from literature revealed that identifying locally important ecological, social, and cultural features that maintains traditional beliefs of local communities and enhances critical environmental and cultural values of forests is crucial to conservation and sustainable management (UNEP 1999, Brown *et al.* 2013, Dorji 2019). This will promote sustainable tourism including ecotourism, cultural tourism and spiritual tourism in sacred grove (Oladeji and Akinrinola 2010). This in turn will improve economic growth, job creation and rural development especially in Osogbo the host community and the environs of Osun Osogbo Sacred grove (Adetola *et al.* 2016, Oladeji and Olatuyi 2020). However, Mckercher *et al.* (2002) opined that droopy attitude to the negative impacts of heritage tourism coupled with high attention only on its benefits will exacerbate the tendency of moving to the edge of unsustainable heritage tourism development. Thus, development of strategy for sustainable conservation and management of sacred groves should be complemented by study on the impact on ecology (Oni *et al.* 2020). Also, there is a need for in depth environmental impacts assessment to provide useful information on the social, ecological and cultural importance of the sacred site needed to formulate policy on its sustainable conservation and management. This forms part of the reasons highlighted by Ogunfolakan *et al.* (2016) on rapid ecological and environmental assessment of Osun Osogbo sacred grove and concluded that the grove is a unique landscape that combines important environmental, biological and cultural features. Wahab *et al.* (2014) held the view that human activities such as encroachment into the grove are beginning to have negative effect on the rich ecotourism potentials that are being conserved. The impact of human activities (farming, hunting, fuelwood harvesting, etc.) on the environment and biodiversity conservation Muni Pomadze coastal area with cumulative implications on “Aboakyer” Festival of the local Effutu

people was equally emphasised (Wuver and Attuquayefio 2006).

These aforementioned authors Mckercher *et al.* (2002), Wuver and Attuquayefio (2006), Wahab *et al.* (2014), Ogunfolakan *et al.* (2016) have clearly revealed that there is a need to combine studies on the assessment of ecological, social, cultural and economic values of sacred sites in order to clearly understand their impacts towards formulating blueprint and policy framework in the quest to achieving sustainability.

Review of literature on study of High Conservation Values across the world revealed useful information on the conservation values of forest fragments to palaeotropical bats (Mathew *et al.* 2008). Mathew *et al.* 2008 concluded that species that roost in tree cavities or foliage may be more vulnerable to habitat fragmentation than those that roost in cave. A framework within which logging companies can collaborate with other conservation practitioners in adhering to Forestry Stewardship Council (FSC) certification was developed as a strategy for implementing ‘Ape friendly practices in central Africa’s logging concessions (David *et al.* 2013); and High Conservation Forest Value analysis in Asubima forest reserve revealed the people living in the vicinity of the forest reserve depend on it for their means of livelihood (Westerlaan *et al.* 2011). The authors went further to report that the people depend of the forest for the collection of Non-Timber Forest Products and to perform their cultural rites. However, there is dearth of information on High Conservation Values (HCV) of sacred groves in Nigeria. This has adversely hampered formulation of policies towards sustainable conservation and management of these sites. Lack of appropriate safeguard measures and approach that can be put in place to support or maximise social, ecological, cultural and economic benefits derivable from sacred groves by the local communities have equally necessitated this research. Fauzi (2001) opined that understanding the social,



ecological, cultural and economic importance of a site can be helpful in a drive to offset the negative consequences on the biodiversity. Linder, 2013 and Wich *et al.* (2014) emphasised that in-depth understanding of the social, cultural and economic lives of the people in the local communities is the best approach to protect them.

The intent of this study therefore is to assess the conservation values of Osun Osogbo Sacred Grove in term of diversity of species, ecosystems and habitats variations, critical ecosystem services community needs and cultural values. Heritage Site Managers, Cultural Heritage Conservation institutions like UNESCO, National Commission for Museums and Monuments saddled with the responsibility to oversee the conservation and management of site, ecotourism resource

planners, Governmental and Non-Governmental Organisations, Cultural heritage practitioners, researchers and other relevant stakeholders will benefit tremendously from the data that will be generated and research output in formulating policy towards sustainable heritage site development.

## METHODS

The study was conducted in Osun Osogbo World Heritage Site (OOWHS) located in Osogbo Local Government council in the State of Osun, Nigeria on the  $7^{\circ} 45' 20''$  N /  $4^{\circ} 33' 08''$  E encompasses over 75 ha in the core zone and 47 ha in the buffer zone. The study site is 285m above the sea level and primarily deciduous forest (Figure 1).



**Figure 1:** Map of Osogbo Metropolis showing the location of the groove. *Source:* United Nations educational cultural and scientific organization (2005).



### Field survey

Systematic line transect was employed in the laying of sample plots. Two transects of 260 m in length each at 500 m apart were used. Temporary sample plots of 25 m × 25 m were laid at 50 m interval in an alternative direction along each transect after an offset of 10m. A total of 6 plots at 3 plots per transect were used in this study. Within each plot, all living trees with Diameter at Breast Height (dbh) ≥ 10 cm were identified and their diameter at the base, diameter at breast height, diameter at the middle, diameter at top, and height measured using Spiegel relaskop. The botanical name of every living tree encountered in each sample plot was recorded and possible effort was made not to omit any eligible stem in a sample plot. This is because any species omitted will indicate the absence of such species in the ecosystem. All trees identified on field were guided by field books and knowledgeable personnel in tree species identification.

Feeding Point observation was carried out during the survey of the fauna species in the grove. This involves the researchers positioning themselves at a particular point where the animals used to converge to collect food from the passerby and farmers between certain periods of time. The observations were carried out between 11.00am and 4.00pm on the first day and between 10.00am and 5.00pm in the second day. These hours are chosen because they are the peak period these animals used to come to this point to collect food from the generous passerby. Since this is a daily routine, the animals are very conversant with this hour and this mode of feeding is accepted by the management of the grove.

### Key Informant Interview

Three categories of Key Informant that were encountered at the grove include Staff of National Commission for Museums and Monuments, the local community guard and the traditionalist (worshippers and the priest). While convenient or accidental sampling was employed to sample the

traditionalist (worshippers and the priests), purposive sampling was used in selecting the staff of National Commissions for Museums and Monuments and Local Community Guards. Based on the sampling techniques, 5 staff of National Commission for Museums and Monuments, 3 members of the local community assigned to the grove, 8 traditionalist worshippers and 4 priests that were encountered at the various shrines in the grove (Table 1). The variables measured through the Key Informant Interview were meant to ascertain the actual location of critical sacred sites that were of great cultural values and associated benefits, gender restriction, indigene/ non-indigene restriction, associated intangible heritage resources (festivals, believe) and payment made to assess the cultural and spiritual values of the site. Other reasons for conducting the Key Informant interview were to determine the cultural significance and develop conservation mechanism for preserving the site. The view of the Key Informant was rated on the Likert scale of 3 (agree, undecided, disagree). **Data Analysis** Data collected on the Key Informant Interview were analysed qualitatively through thematic analysis while data collected through systematic line transect were analysed quantitatively and presented descriptively in the form of tables and Chart. Diversity indices computed are: relative frequency, species relative density, species relative dominance Shannon-Wiener diversity index and Margalef's index.

#### (i) Relative Frequency (RF)

$$RF = \frac{\text{Frequency of a species}}{\text{Sum frequencies of all species}} \times 100$$

#### (ii) Species relative density (RD)

$$RD = \frac{n_i}{N} \times 100$$

Where:

RD (%) = species relative density;

$n_i$  = number of individuals of species  $i$ ;

N = total number of all tree species in the entire community



**Table 1:** Interview selection process, variable and rationale for the key informant interview in Osun Osogbo sacred grove.

Table Methods	Participant	Selection criteria and rationale	Codes	Themes (description of themes)
Key informant interviews	8 grove's staff	Employed by government and local communities (convenient sampling)	<ul style="list-style-type: none"> <li>• Locations of critical sacred importance</li> <li>• Cultural values and benefit associated to the grove</li> </ul>	<ul style="list-style-type: none"> <li>• Critical Sacred locations include Igbo Ifa and Ilediohuntoto</li> <li>• Place of worship, spiritual consultation, place of celebration of traditional festivals</li> </ul>
	8 traditionalists	Osun devotees (convenient sampling)	<ul style="list-style-type: none"> <li>• Gender restriction</li> <li>• Non-indigene restriction</li> <li>• Festivals</li> </ul>	<ul style="list-style-type: none"> <li>• There is no gender restriction</li> <li>• There is no restriction based on the indigene or non-indigene</li> <li>• iwopopo, iboriade, ibiarugba, ikesinrodo, odunegungun</li> </ul>
	4 priests	Osun worshippers (convenient sampling)	<ul style="list-style-type: none"> <li>• payment to assess use values and non-use values</li> <li>• role of community, traditionalist and priests in habitat protection</li> </ul>	<ul style="list-style-type: none"> <li>• The values did not attract payment except for spiritual consultation</li> <li>• Local communities volunteer, priests and traditionalist offer rituals to protect the grove.</li> </ul>
			<ul style="list-style-type: none"> <li>• consequences for loss of cultural values</li> </ul>	<ul style="list-style-type: none"> <li>• Penalty and loss of cultural and spiritual values</li> </ul>
			<ul style="list-style-type: none"> <li>• trees and animals of cultural significance</li> </ul>	<ul style="list-style-type: none"> <li>• Trees (Iroko, Mohogany), Monkeys and fishes are Osun sons and daughters</li> </ul>

(iii) **Species relative dominance (RDo (%))**

$$RD_o = \frac{\sum Ba_i \times 100}{\sum Ba_n}$$

Where:  $Ba_i$  = Basal area of individual tree belonging to species  $i$ ;  $Ba_n$  = Stand basal area

(iv) **Species diversity** was calculated using the Shannon-Wiener diversity index

$$H' = -\sum_{i=1}^S p_i \ln(p_i)$$

Where:

$H'$  = Shannon-Wiener diversity index;  
 $P_i$  = proportion of  $S$  made up of the  $i^{th}$  species,  
 $\ln$  = natural logarithm

(v) **Species richness** was calculated using Margalef's index

$$D = \frac{S - 1}{\ln N}$$

Where:  $S$  = number of species;  $N$  = number of individuals

## RESULTS

### Abundance and tree species diversity in Osun-Osogbo sacred grove

In this study, a total of forty tree species belonging to thirty-four genus and twenty family were encountered. The families identified during the survey include: Meliaceae, Sterculiaceae, Ulmaceae and Apocynaceae. *Celtis zenkeri* of the family Ulmaceae has the highest frequency (48) per hectare followed by *Cola hispida* (35) of the



family Sterculiaceae while the rest had lower number of occurrences. The Relative Density (RD) of tree species in Osun-Osogbo sacred grove varied between 0.72 to 13.04%. *Celtis zenkeri* (13.04) has the highest relative density followed by *Cola hispida* (9.42). Relative dominance also ranged from 0.12 to 0.56%. *Antiaris africana* has the highest relative dominance (0.56) followed by *Celtis zenkeri* (0.52). The value of Shannon-Weiner

diversity index (H') and Margalef Index obtained for the studied site was 2.30 and 19.2 respectively (Table 2).

### Observation on fauna species

Average of seventeen (17) Mona monkeys and six (6) White throated monkeys were observed during the period of study. This is presented in Table 3

**Table 2:** Relative density, Relative dominance, Alpha and Gamma diversity indices of tree species in Osun Osogbo Sacred Grove

S/N	Family	Species	Frequency /ha	Relative density	Relative dominance	Shannon index
1	Leguminosae	<i>Albizia zygia</i>	3	0.72	0.17	0.01
2	Leguminosae	<i>Albizia ferruginea</i>	11	2.89	0.28	0.04
3	Apocynaceae	<i>Alstonia boonei</i>	3	0.72	0.15	0.01
4	Combretaceae	<i>Anogeissus leiocarpus</i>	3	0.72	0.15	0.01
5	Moraceae	<i>Antiaris Africana</i>	21	4.78	0.56	0.09
6	Leguminosae	<i>Baphia nitida</i>	3	0.72	0.12	0.01
7	Euphorbiaceae	<i>Ricinodendrum heudelottii</i>	3	0.72	0.13	0.01
8	Fabaceae	<i>Brachystegia eurycoma</i>	3	0.72	0.17	0.01
9	Fabaceae	<i>Brachystegia nigerica</i>	29	7.97	0.39	0.19
10	Bombaceae	<i>Ceiba petandra</i>	3	0.72	0.16	0.01
11	Ulmaceae	<i>Celtis mildbreadii</i>	16	4.34	0.33	0.07
12	Ulmaceae	<i>Celtis zenkerii</i>	48	13.04	0.52	0.37
13	Annonaceae	<i>Cleistopholia patens</i>	3	0.72	0.19	0.01
14	Sterculiaceae	<i>Cola milleni</i>	8	2.17	0.25	0.02
15	Sterculiaceae	<i>Colla hispida</i>	35	9.42	0.42	0.24
16	Boraginaceae	<i>Cordia milleni</i>	3	0.72	0.19	0.01
17	Leguminosae	<i>Dialium guineensis</i>	8	2.17	0.25	0.03
18	Asparagaceae	<i>Draceana marginata</i>	3	0.72	0.17	0.01
19	Euphorbiaceae	<i>Drypetes afzelii</i>	5	1.44	0.22	0.02
20	Meliaceae	<i>Entandrophragma utile</i>	3	0.72	0.24	0.01
21	Moraceae	<i>Ficus exasperate</i>	5	1.44	0.22	0.02
22	Apocynaceae	<i>Funtumia elastic</i>	11	2.89	0.27	0.04
23	Tiliaceae	<i>Grewia carpinifolia</i>	3	0.72	0.15	0.01
24	Sapindaceae	<i>Leucanodisus cupanioides</i>	13	3.62	0.30	0.05
25	Phyllanthaceae	<i>Margaritaria discoidea</i>	5	1.44	0.23	0.02
26	Rubiaceae	<i>Millettia thonningii</i>	5	1.44	0.24	0.02
27	Pandaceae	<i>Microdesmis puberula</i>	3	0.72	0.14	0.01
28	Moraceae	<i>Morus mesozygia</i>	3	0.72	0.19	0.01
29	Sterculiaceae	<i>Nesogordonia papaverifera</i>	21	5.79	0.36	0.12
30	Apocynaceae	<i>Picralima nitida</i>	5	1.44	0.24	0.02
31	Euphorbiaceae	<i>Ricinodendron heudolotii</i>	5	1.44	0.24	0.02
32	Rubiaceae	<i>Rothmannia whitfieldii</i>	19	5.07	0.35	0.09
33	Anacardiaceae	<i>Spondia mombin</i>	5	1.44	0.24	0.02
34	Sterculiaceae	<i>Sterculia trigacantha</i>	3	0.72	0.12	0.01
35	Meliaceae	<i>Trichilia Africana</i>	5	1.44	0.23	0.02
36	Meliaceae	<i>Trichilia heudelotii</i>	3	0.72	0.16	0.01
37	Meliaceae	<i>Trichilia welwitschii</i>	27	7.24	0.38	0.16
38	Moraceae	<i>Trilepsium madagascariense</i>	3	0.72	0.15	0.01
39	Sterculiaceae	<i>Triplochiton scleroxylon</i>	3	0.72	0.15	0.02
40	Rutaceaea	<i>Zanthoxylum zanthoxyloides</i>	5	1.44	0.23	0.02
<b>Total</b>			<b>366</b>			<b>H'= 2.30</b>



**Table 3:** Scientific and family names of fauna species at Osun Osogbo Sacred Grove

Scientific name	Common name	Frequency	Starting time	Ending time	Day
<i>Guenon cercopithecus erythrogastrer</i>	White throated monkey	7	11am	4pm	1 <sup>st</sup>
<i>Cercopithecus mona</i>	Mona monkey	20	11am	4pm	1 <sup>st</sup>
<i>Guenon cercopithecus erythrogastrer</i>	White throated monkey	5	10am	5pm	2 <sup>nd</sup>
<i>Cercopithecus mona</i>	Mona monkey	15	10am	5pm	2 <sup>nd</sup>

**Cultural significance of Osun Osogbo Sacred Grove**

Result of the analysis of Key Informants (KI) that were interviewed revealed that they attached spiritual and cultural benefits to cultural festivals such as “atupa oloju merindinlogun” (meaning a lamp with 16 lighting outlets), “ikesinrodo” (meaning going to the river bank with the Arugba the calabash carrier) that are being celebrated at the grove (Table 4). These festivals are adjudged to be of high cultural significance. It is believed that the trees in Osun sacred grove serve as clothes to the river goddess. The trees and the fishes in the river are

regarded as sons and daughters of Osun while the monkeys are viewed as messengers to Osun, the river goddess and they are of high cultural significance. The KIs believed that the conservation of the trees (such as *Albizia spp*, *Alstonia boonei*, *Antiaris africana* and *Triplochiton scleroxylon* and monkeys (*Guenon cercopithecus erythrogastrer* and *Cercopithecus mona*) is key for traditional and spiritual rites. Urbanization around the grove is considered to have negatively influenced migration of some fauna species such as elephant and python from the grove.

**Table 4:** Perception of the interviewees on the cultural significance of Osun Osogbo sacred groove.

Variable	Perception/ belief
Locations of critical sacred importance	80% of the interviewees Agreed to Igbo Ifa, Ilediountoto as locations of sacred importance and can be assessed by priests and ogboni initiates. 20% of the interviewees were undecided.
Gender restriction	95% of the interviewees agreed that Osun Osogbo sacred grove can be assessed by male and female. 5% of the interviewees were of the view that there were gender restrictions to worship and performing spiritual and cultural rites in the grove.
Non-indigene restriction	82% of the interviewees agreed to non- indigene restriction in the spiritual and cultural rites of the grove. 18% were undecided.
Festivals	91% of the interviewees agreed that Atupaolojumerindinlelogun, iwopopo, iboriade, ibiarugba, ikesinrodo, odunegungun are traditional festivals having high cultural significance attached to them. 9% disagreed, and were of the view that all festivals associated to the grove are culturally significant.
payment to assess use values and non-use values	93% of the interviewees agreed that payments are made to assess the grove for tourism activities, Research and Consultation. 7% were undecided.
Cultural values and benefit associated to the grove	90% of the interviewees agreed that Osun sacred grove has Spiritual benefit, economic and socio-cultural benefits and promotes exchange of culture amidst the local communities and tourists. 10% were undecided.





Variable	Perception/ belief
Role of community, traditionalist and priests in habitat protection	96% of the interviewees agreed that Local communities volunteer for grove protection, priests and traditionalist offer rituals to protect the grove. 4% were of the view that the Osun goddess has the power to protect the grove.
consequences for loss of cultural values	87% of the interviewees agreed that Perpetrators are penalized by the government and Osun goddess and the community may suffer from the loss. 13% were undecided.
Trees and animals of cultural significance	97% of the interviewees agreed that Trees (Iroko, Mohogany) are Osun clothing, Monkeys are Osun messengers, fishes are Osun sons and daughters. 3% were undecided.

### Use and Non-use value

The cultural significance of Osun Osogbo sacred grove is valued to be use and non-use values. The actual use value of the grove is for celebration of cultural festival and spiritual consultation with Osun and Ifa priests (table 4); while the non-use value of the grove can be categorised into grouped (a) altruism which is based on the value placed by the priest and Osun goddess to preserving the river and the sacred forest so that others can use the grove for drinking or spiritual benefits. For this reason, the sacred grove is readily accessible to all (Table 5). The other form of non-use value is the existence value which is refer to the value placed on preserving and conserving the grove (statues of different deities associated with the Yoruba belief; biodiversity that serve as “agbo” of medical significant) as a resource that is continuously in existence as a sacred site (Table 6).

### Forest functions of Osun Osogbo Sacred Grove

Osun Osogbo sacred grove performs a great number of forest functions that meets local, national and global demands, as a natural formation and as a product of skilful human activity (table 6). The protective function of

the grove has stabilizing effect on the natural environment, this forest functions are either co-dependent or linked together. Preservation of cultural items can be linked to physical development in the grove

### Traditional approach for preservation and management of Osun Osogbo Sacred Grove

Forest preservation under Osun Osogbo sacred grove system is secured using taboos, rituals, dedicating the forest to deities, government and grove guards. The local communities, priests and traditionalist play a significant role towards the conservation of the grove, the use of ritual is one of the fundamental ways Osun priest preserve the biological and cultural features of the grove.

Osun priest and priestesses safeguard the grove through rituals that are performed weekly, monthly and annually. Community guards are members of the community that render voluntary service in the area of securing the grove to complement the efforts of the government official that are employed as grove guards thereby ensuring that perpetrators are kept away from the grove (Table 7).



**Table 5:** Valuation of the cultural significance of Osun Osogbo sacred grove

Variables	Perception
locations of critical sacred importance	95% of the interviewees agreed that locations of critical sacred importance are Non-use values. while 5% are undecided
Festivals	92% of the interviewees agreed that festivals associated to the grove are Use and Non-use values. 8% were undecided
payment to assess the site for cultural tourism and research purposes,	94% of the interview agreed that payment to assess the site for cultural tourism, research purposes and consultation are Use values, while 6% of the interviewees disagreed to consultation as a use value, they were of the view that Osun is accessible to all.
Cultural values and benefits associated to the grove	97% of the interviewees agreed that cultural benefits associated to the grove are Use and non-use. 3% were undecided
trees and animals of cultural significance	93% of the interviewees agreed that trees and animals are of high cultural significance and are Use and non-use values. 7% were undecided

**Table 6:** Forest area function of Osun Osogbo sacred grove

Forest function	Means of identification	Subjective response	Objective response
Protective function			
<ul style="list-style-type: none"> <li>• air circulation</li> <li>• habitat for endemic species (monkeys) and variety of flora species (iroko, Mahogany)</li> <li>• Ecological balance (water circulation and balance)</li> </ul>	Observation	95% of the interviewees agreed to the protective forest functions of the grove. 5% were undecided	Protective unction was observed through transverse of existing tracks and trails in the grove
Social function	Observation	90% of the interviewees agreed to the social forest functions of the grove.	Social function was observed through transverse of existing tracks and trails in the grove
<ul style="list-style-type: none"> <li>• tourism</li> <li>• economic benefit</li> <li>• physical culture development</li> </ul>	Observation and interview	10% were undecided	
Cultural function			
<ul style="list-style-type: none"> <li>• initiation rites and ceremonies</li> <li>• Preservation of cultural item (statues of different deities associated with the Yoruba belief)</li> <li>• Home to deity to enhance traditional belief of local communities</li> </ul>	Observation and interview	93% of the interviewees agreed to the cultural forest functions of the grove since most of the interviewees partake in the festivals and spiritual rites associated to the grove.7% were undecided	Cultural function was observed through transverse of existing tracks and trails in the grove



**Table 7:** Conservation mechanism for preserving the grove

Conservation mechanisms	Role	Perception
Taboo	Through respect and fear of the taboos and deity, people keep away from the sacred grove.	95% of the respondents were of the view that taboo has high influence in the conservation of the grove. 5% were undecided
Dedicating the forest to deities	Through fear of deity, people keep away from the sacred grove.	94% of the respondents were of the view that Dedication of the forest to deities has very high influence in the conservation of the grove. 6% were undecided
Rituals	Priests perform rituals to appease the goddess to preserve the grove	91% of the respondents were of the view that Rituals has high influence in the conservation of the grove. 9% were undecided
Community guards	Secure the grove from perpetrators	70% of the respondents were of the view that community guards have low influence in the conservation of the grove that the Osun goddess was capable to protect the grove, 30% agreed that community guards play a major role in the conservation of the grove.
Government guards	Secure the grove from perpetrators	85% of the respondents were of the view that government guards have low influence in the conservation of the grove that the Osun goddess was capable to protect the grove, 15% agreed that government guards play a major role in the conservation of the grove.

## DISCUSSION

Species diversity is an important attribute of a natural community that influences the functioning of an ecosystem. Ecosystem functioning according to Groot *et al.* (1992) is the capacity of natural process and components to provide goods and services that satisfy human needs, directly or indirectly. This simply implies that the higher the biodiversity, the more efficient the functioning of the ecosystem. This study revealed high diversity indices for tree species in Osun Osogbo sacred grove. These values are within the range reported by (Abdulai 2011) but lower than the values reported by Onyekwelu *et al.* (2004). Higher species diversity of Osun-Osogbo is attributed to its mature, fairly undisturbed forest type, which supports a rich and diverse flora and fauna as revealed by the International Union for Conservation of Nature (IUCN 2005). Plant diversity tends to correlate well with overall species diversity

(Abdulai 2011). About 70% of Osun-Osogbo grove is primary forest (IUCN 2005). The proportional abundance estimates of trees in the sample plots showed *colla hispida* was the most abundant which supported by Onyekwelu and Olusola (2014).

Findings from this study show that Osun Osogbo sacred grove performs a great number of forest functions (protective, social and cultural) that meets local, national and global demands, as a natural formation and as a product of skilful human activity. Riegert (2010) coined the term “forest function” to describe the benefits that fulfil a societal demand. The protective function of the grove (air circulation, habitat for endemic fauna species and variety of flora species, water circulation) has a stabilizing effect on the natural environment; this explains reasons why significant values are attached to its cultural (traditional), social (tourism) and economic (indirect income earners) roles. Placing monetary or economic value



on species and ecosystems are useful exercise to integrate the cost of using and conserving biodiversity which enhances economic benefit as social function of forest (De Groot *et al.* 2002). Cost, 2011 recognised the functions of forests in maintaining the ecological processes and in protecting fragile ecosystems that serve as rich storehouses of cultural and biological resources. The ability of Osun Osogbo sacred grove to perform natural systems function (Cano-Santana *et al.* 2008) and satisfying societies' cultural needs (Patru-Stupariu *et al.* 2013) as observed in this study justify its consideration for High Conservation Value. Furthermore, Osun sacred grove preserves the cultural evolution in term of initiation rites, cultural festivals and ceremonies; preservation of tangible cultural items associated with the Yoruba belief; enhance traditional belief of local communities in form of taboo, rituals and dedication to forest deities. The association of traditions and festivals such as iboriade, odunegungun, ikesinrodo with biodiversity in the grove is of high conservation value because it helps in the preservation of the tradition of Osun Osogbo communities and offer potentials for tourism. This supports the findings of Patru- Stupariu *et al.* (2013) that the significant values of the forest may be in form of critical ecosystems services community needs and cultural values, also EFTEC, 2005 reported that High conservation value forests provide benefits for human well-being in form of ecosystem services that are non-value and economic significance (EFTEC, 2005). In the same vein, Cano-Santana *et al.* (2008) observed that natural systems function, satisfy societies' cultural needs (Patru-Stupariu *et al.* 2013) and offer attractions with high tourism potential (Edinger and risk 2000). Findings from this study support the claims of Wahab, 2014 that the forest areas and Osun River in the grove are unique ecotourism attractions. The research findings also revealed that the rich biological diversity (value of Shannon-Weiner diversity index (H') (2.30) and Margalef's Index

(19.2), intangible heritage resources (traditional festivals and spiritual consultation) and scenery offer forest functions (air circulation, habitat for endemic species, water circulation and nutrient balance; and tourism) and cultural magnitude (initiation rites and ceremonies, home to deity) that are fundamental in satisfying the basic social, cultural; and economic needs of local communities. These natural features have potential to fulfil both economic and social functions which are present and futuristic (FAO 2017). Also, this study recognised the distinctive attributes of Osun Osogbo sacred grove to perform multiple functions with interface. The complex interaction between the forest functions justifies the need to develop an integrative forest management system (Kraus 2013).

Osun Osogbo sacred grove is regarded as High Conservation Value Forest considering the benefits the grove provides in sustaining human well-being in form of ecosystem services that are non-value and are cultural – economic significance. Sacred groves are regarded as one of the most common types of cultural landscape (Harmon 2004) that possessed values necessary for conservation thereby ensuring availability of natural resources for present and future generations (Agnoletti 2000). There is a visible evidence (Ogunfolakan 2006, Wahab 2014) of the use and non-use values of cultural identity attached to the grove in term of rendezvous for celebration of annual cultural festivals and worshipping of Osun River goddess that serves as “agbo” for spiritual consultation. Carmona *et al.* (2003) justified economic and commercial values among important reasons for continuity of cultural memory and heritage conservation. The non-use value of the grove to the local communities as indicated by the Key Informant during Interview connotes a strong cultural significance as a sacred site that has been preserved over the decades for the intrinsic/existence values. This supports the findings of Swamy, *et al.* (2003) that sacred groves in Tamil Nadu, India are conserved for their intrinsic non-use value. Over the



past two decades, there has been growing recognition of the relevance of culture and cultural diversity for the conservation of biodiversity and for sustainable development, as made explicit during the WSSD in 2002 (Oviedo *et al.* 2000; Skutnabb-Kangas *et al.* 2003; Borrini-Feyerabend *et al.* 2004). Cultural diversity in remote regions is closely linked to biodiversity, as there is a symbiotic relationship between habitats and cultures and between ecosystems and cultural identity. Indeed, religious rules and rituals often strengthen this relationship and are characterized by a conservation ethic. Turner and Berkes (2006) opined that community conserved areas constitute the oldest form of protected area, and include sites such as sacred groves and community managed commons. The unique characteristics and outstanding cultural significance of heritage site are important criteria for consideration as High Conservation Values that needs to be appropriately managed (Jennings *et al.* 2003, Pătru-Stupariu *et al.* 2013). Forest and nature are the foundation of cultural and religious custom, belief and practice (Agnoletti 2000). These claims sustain the views and perception of Osun devotees about sacred forest, not as a source of metaphors for this world, but as a spiritual world of its own. In this direction Osun Osogbo sacred grove supplies cultural service that strengthens their belief. The natural environment provides a setting for cultural processes, activities and belief systems to be developed and sustain; and subsequently, landscapes form a diverse cultural archive of human endeavours (Schaaf and Cathy 2006, Berkes 2008).

Forest preservation under Osun Osogbo sacred grove system is secured using taboos, rituals, dedicating the forest to deities, government and grove guards. This is an integrative management system as highlighted by (Kraus 2013). The local communities, priests and traditionalist play a significant role towards the conservation of the grove through performing rituals which is one of the fundamental ways Osun priest

preserve the biological and cultural features of the grove. Others include spiritual consultation and celebration of cultural festival. Cultural knowledge and practices have often contributed specific strategies for the sustainable use and management of biodiversity (Carlson and Maffi 2004). Rituals are visionary insight into the invisible spirit world, chant developed from experimentation, and secures clusters of rainforest features (Wilson 2006).

There is need to strengthening integrative management system in a bid to tackle increasing threats to conservation and management of both tangible and intangible cultural heritage resources. Traditional rules, laws, taboo and beliefs have, over time, been substantially erased from the minds and culture of local communities due to over population, urbanization and civilization, resulting in the encroachment and degradation of sacred groves (Wild 2009). The combined efforts of local communities, government staff of National Commissions for Museum and Monuments and the traditionalist have safeguarded the grove from land speculators, repel poachers and protect shrines from destructive allies such as wild fire, civilisation and western education. This has been reinforced by tradition, belief systems, taboos and sanctions on which Osun sacred groves was established. According to Di Bé, (2010), forests reserved for activities of worship, are subjected to specific management rules. Osun Osogbo Sacred Grove possessed flora, fauna, hydrological formations and cultural resources of significant outstanding values that are of crucial importance to the host community; hence these resources must be safeguarded. Noise from the vehicular movement on the minor road that cut across the grove also poses risk to the grove. The significant outstanding ecological, social, cultural and economic values of Osun Osogbo sacred grove spelt out concrete reason on its concept and universal significance (Oladeji and Olatuyi 2020).



## CONCLUSION

There are indications that Osun Osogbo Sacred grove possess some unique characteristics and outstanding ecological, social and cultural attributes that are of High Conservation Values. However, the cultural values are of critical importance to the host communities and are of High Conservation Forest Values. This attested to the enlistment of the grove as a UNESCO Cultural sites regarded as abode of some respected traditional spirits and ancestral gods. This heritage resource has been preserved and conserved over the years through traditional sacred grove system including the use of taboos, rituals, dedicating the forest to deities, government and grove guards. The roles of the local communities especially the priests and traditionalist in this regard cannot be overemphasised. The biocultural diversity has both use and non-use values as a cultural tourism destination and logical and cult play a significant role towards the conservation of the grove, the use of ritual is one of the fundamental ways Osun priest preserve the biological and cultural features of the grove. This explains the reasons for restricting human influence such as felling of trees and killing of animals, mining and excavation in the sacred groves except for spiritual personification. Osun Osogbo sacred grove equally performs a great number of forest functions (protective, social and cultural) that meets local, national and global demands, as a natural formation and as a product of skilful human activity. Species diversity is also a very important attribute of a natural community that influences the functioning of an ecosystem. This study revealed high diversity indices for tree species in Osun Osogbo sacred grove. This means that the higher the biodiversity, the more efficient the functioning of the ecosystem. Osun Osogbo Sacred Grove possessed unique characteristics and outstanding values that are of critical importance, which needs to be appropriately managed or protected in order to maintain or enhance the identified values possessed in term of diversity of species, ecosystems and

habitats variations, critical ecosystem services community needs and cultural values. The value of the abundance and diversity index obtained in this study are clear indications that the sacred grove has been protected and sustained from anthropogenic activities through taboos and believes and traditions.

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### Authors' Contributions

S.O. and D.O. conceived the project topic as postgraduate Master Thesis leading to the award of M. Tech. (Biodiversity conservation option), Department of Ecotourism and Wildlife Management, Federal University of Technology, Akure. The collection of data was undertaken by S.O. D.O. and A. while analysis of the data was carried out by D.O and A. The literature review was undertaken by D.O with contributions from S.O and A. The drafting of the work was carried out by D.O supervised by S.O. and A. The editing was done by the S.O. and A. for intellectual content. The authors agreed the submission of final and edited copy for publication.

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