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Assessment of Timber Resource Exploitation in Shasha Forest Reserve, Osun State, Nigeria: Implication for Sustainable Forestry

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ABSTRACT: Records on rate of timber exploitation are very essential for sustainable forestry. They help in managing the forest sustainably. Therefore, the study collected and analysed data on rate of timber exploitation in Shasha forest reserve in Osun state. Logs arranged and set to be taken out of the forest were identified and measured every Monday between December, 2017 and June, 2018 for twenty-eight (28) weeks. The species and families of logs encountered were identified. A total of 13,944 logs were assessed. Fifteen (15) families belonging to twenty-one (21) species of logs were identified. Result revealed that Sterculiaceae family with five species was the most exploited. *Ricinodendron heudelotti* has the highest number of exploited logs with overall frequency of 27.71%. *Ricinodendron heudelotti* had the highest basal area and volume with values of 18018776.71cm² and 113289.36cm³ respectively. The study concludes that the population of *Ricinodendron heudelotii* tree was high in Shasha forest which made it available for extraction at high rate. The study recommends strict monitoring and enforcement of sustainable forestry laws with regular inventory and up-to-date inventory of timber exploitation rate from the reserve.

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Exploitation of forest resources often causes deforestation (permanent destruction of indigenous forests or woodlands). According to International Institute of Tropical Agriculture (IITA), Nigeria has lost about 400,000 hectares of forest land to deforestation. It was reported that huge sum of 180 billion naira is loss annually to deforestation. Exploitation has both positive and negative implications. Among the positive implications are its contribution to income, its associated reduction of poverty, creation of employment and a huge contribution to both national and local economies. On the other hand, the negative implications include; depletion of the resource base, erosion, contribution climate change and extinction of indigenous forest species (Iheke and Eziuche, 2016). Forest resources exploitation is a precondition for livelihood of forested communities, who do not have alternative sources of income (Chilalo and Wiersum, 2011). Forest management is plagued with multiple challenges as guiding rules of managing forest in a sustainable way are longer in operation (Adekunle *et al*., 2010). In Nigeria today, forest management is faced with challenges such as illegal felling, over exploitation, deforestation/ and or conversion to other land use to mention a few due to population expansion and its attendant anthropogenic activities. These constitute serious threat to sustainable forestry. Sustainable forestry is defined as the system of managing the forest to meet the current needs and desires of the society for forest resources, without undermining the availability of these resources to upcoming generation (Boyle *et al*., 2016). That is, reduce the pace of forest destruction, while meeting the needs of the present generation without compromising the need of future generation. The indicator of sustainable forestry is a forestry practice that imitates natural pattern of disturbance and regeneration. Thus, helping to maintain a balance the environment, wildlife. Several studies have shown that timber components have been widely acknowledged as a great contributor to both national and local economies (Iheke and Eziuche, 2016), not many of such studies have captured the rate of exploitation in terms of quantity. Forests are fragmenting, shrinking, and getting deforested. Most of the forest areas are drifting towards lower limits of resiliency (FAO, 2000). This is evident in Shasha forest reserve. Also, despite the immense value of this

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timber resource, forests within Shasha forest reserve are been cleared as demand for timber increases. The extreme exploitation of timber resources has reduced their range and abundance compared with what was obtainable in the past. Record keeping system is very poor in Nigeria (Adekunle *et al*., 2010). Consequently, data on rate of timber exploitation are generally lacking for reserves across Nigeria. If available, analysis and comparism will be easy. This will make for informed decision and effective management planning on sustainable utilization of these resources. Therefore, needs for research on the rate at which timber are exploited from our reserves. This study therefore seeks to assess the timber resource exploitation within Shasha forest reserve, Osun State, Nigeria. Specifically, to ascertain the rate of exploitation during the current harvesting period, identify the various species exploited and also determine the volume of logs (portion of trees which had been cut to different sizes depending upon taper or the need of length) exploited. This study will help in the sustainable conservation and effective management of the Shasha forest reserve.

MATERIALS AND METHODS

Study Area: The research was carried out in Shasha Forest Reserve, Osun State, Nigeria. The forest is situated between latitude 6°5'0 N to 7°80' N and longitude 40°10' E to 4°45' E. It occupies a total land area of 31, 541Ha. The reserve was first gazette in 1925 as part of the old Shasha Forest Reserve under an agreement with the Ijebu Native Authority. The reserve shares boundaries with Omo Forest Reserve on the west. The northern and eastern boundaries are with Ife Forest Reserve and Oluwa Forest Reserve in Osun state and Ondo state respectively. The reserve is subdivided into two major Areas; 4 and 5. There are about forty communities within and around the forest reserve. The population of these communities range from 200 to 2000 inhabitants (Olokeogun *et al.*, 2014). Shasha Forest Reserve is in the lowland rain forest of South- Western Nigeria. The annual rainfall ranges from 890 mm to 2200 mm. The rainy season in Shasha Forest Reserve commences from March/April and lasts till November. The average relative humidity is 70% while the mean monthly temperature is 28°C. There are two main seasons in the year, a dry season with dry northeast trade wind which causes Harmattan predominates from November to March, and a rainy season characterized by the South-west monsoon wind which brings rain from April to October(Olokeogun *et al* ., 2014). The topography of the area is generally undulating, lying at altitude between 90m and 140m above sea level. The vegetation is mainly a high forest type. The soil of the area were formed from rocks of Pre-Cambrian basement complex formation particularly granites, gneisses, quartz-schist, biotite gneisses and schist. They were formed under moist semi-deciduous forest cover and belong to the major soil group called ferruginous tropical soil (Olokeogun *et al.*, 2014).

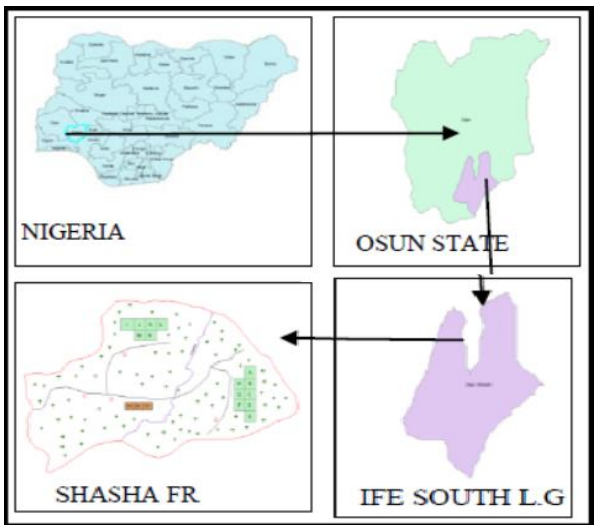

Fig 1: Location of the Study Area

Data Collection: The logs arranged and set to be taken out of the forest were identified and measured every Monday between December, 2017 and June, 2018 for twenty-eight (28) weeks. The species and families of logs encountered were identified using the identification guide manual of trees of Nigeria (Keay, 1989) and with the assistance of a taxonomist at Forest Herbarium, Ibadan (FHI).The log length was measured using a measuring tape while the diameter at both end points of log and diameter at middle of the

log were measured using girthing tape. A total number of 13,944 logs were assessed.

Data analysis: The data collected from the measurements were analysed using the following methods;

Basal Area (BA)

$$BA = \frac{\pi d^2}{4} \qquad (1)$$

Where; BA = Basal area (m^2); π = 3.14; d = Diameter

Volume Estimation: Volume was estimated from basal area of logs (at both end points of the log and middle of the log) and log length. Based on the data collection from this study, the volume was estimated using Newton's formula (Husch *et al*., 2003).

$$V = \frac{S_1 + 4S_m + S_2 \; x \; 1}{6} \qquad (2)$$

Where; S_1, S_2 = BA at end points of log: $4S_m$ = BA at middle of the log; l = length of log; V = Volume

RESULTS AND DISCUSSION

Specie*s Composition of Logs:* Table 1 shows name, family and the number of the species that are exploited between the study periods. It was observed that fifteen (15) families belonging to twenty-one (21) species of logs were exploited during the study period. Sterculiaceae family has the highest number of species with five (5) species, followed by Combretaceae and Fabaceae families with two (2) species while other families has a single species each. Also *Ricinodendron heudelotii* of Euphorbiaceae family has the highest number of exploited logs with 27.71%, followed by *Irvingia gabonensis* with 12.05% while *Brachystegia nigerica* and *Mansonia altissima* had the least percentage frequency of 0.60%.

Basal Area: Figure 2 show that *Ricinodendron dronheudelotii* has the highest basal area of 18018776.71 cm², 24215571.63 cm² and 30113289.36 cm² at top, middle and at the base respectively. This is closely followed by *Irvingia gabonensis* with 2772657.95 cm², 4125835.93 cm² and 5278630.22 cm² for top, middle and Diameter at Breast Height respectively and *Terminalia Ivorensis* with basal area of 1878337.01cm², 2345804.45 cm² and 2925130.27 cm² for top, middle and base respectively while *Mansonia altissima* has the least basal area of 6789.80 cm² at the top, 7331.94 cm² at the middle and 8570.35 cm² at the base.

Volume Estimation: Figure 2 show that the *Ricinodendron heudelotii* has the highest volume of 88398223.62 cm³ which followed by *Irvingia gabonensis* and *Terminalia ivorensis* with estimate volume of 14970140.57 cm³ and 8649149.00 cm³ respectively while *Mansonia altissima* has the least volume of 27244.73 cm³

Table 1: Species Composition of logs

S/N	Family	Species	Frequency	% Frequency
1	Apocynaceae	*Alstoniaboonei*	252	1.81
2	Boraginaceae	*Cordiamillenii*	336	2.41
3	Combretaceae	*Terminalia superba*	336	2.41
		Terminalia ivorensis	1232	8.84
4	Cucurbitaceae	*Cucurbita klaineana*	924	6.63
5	Dilleniaceae	*Tetracera potatoria*	84	0.60
6	Ebenaceae	*Diospyros iturensis*	504	3.61
7	Euphorbiaceae	*Ricinodendron heudelotii*	3864	27.71
8	Fabaceae	*Albizia lebbeck*	420	3.01
		Millettia thonningii	560	4.02
9	Irvingiaceae	*Irvingia gabonensis*	1680	12.05
10	Leguminosae	*Brachystegia nigerica*	84	0.60
11	Malvaceae	*Ceiba pentandra*	504	3.61
12	Moraceae	*Ficus exasperate*	812	5.82
13	Sapotaceae	*Chrysophyllum albidum*	168	1.20
14	Sterculiaceae	*Cola gigantean*	224	1.61
		Mansonia altissima	84	0.60
		Nesogordonia papaverifera	868	6.22
		Sterculia oblonga	252	1.81
		Triplochiton scleroxylon	532	3.82
15	Ulmaceae	*Celtis zenkeri*	224	1.61
Total			**13944**	**100**

Fuwape, (2001) and Adekunle *et al*. (2010) assert that timber exploitation if not well planned could be detrimental to the environment and biodiversity conservation. The result from the study revealed a high rate of timber exploitation. This is against the tenets of sustainable forestry (Adekunle *et al*., 2010) and will in the long run results in overharvesting and in some cases complete extinction of some indigenous species. *Ricinodendron heudelotii* reported as one of the highest species by Adekunle (2006) in Shasha are now

been harvested. This might be due to rapid growth rate, level of maturity and market demand. The volume of trees exploited from the reserve is very high. This is an indication that the demand for timber is higher than what can be sustainably supplied. From the study, 13,944 timbers were extracted without replacement (reforestation) which can cause the extinction of some species in the particular forest reserve which is in accordance with the findings of Field Trip Earth in 2008. This agrees with the study of Olajide *et al.* (2008) who reported that what is removed from the reserves are more than the natural regenerative ability of the forest and subsequently its resilience. This can further result in the massive clearing of the forest reserve inherent exposure of the soil surface thereby increasing local evapotranspiration. This in turn can possibly cause imminent and complete loss of the forest reserve via unsustainable logging and obvious alteration of the microclimate of the environment. The continuous harvesting of timber without adequate plan to replenish will lead to forest that are degraded both genetically and systematically. This affects the forest ability to perform its multifunctional ecosystem services (Gamfeldt *et al.*, 2013; Ratcliffe *et al*., 2017). Therefore, a clarion calls to rethink and earnestly bring to play the tenets of sustainable forest management which is the way out of the total collapse of our forests. Sustainable forestry avails us the prospects of social and economic security. This includes; increased food security, poverty eradication, reduced land degradation amongst others (Adekunle *et al*., 2010). Thus, the onus is on all stakeholders; forest managers, policy makers and the society at large to fraternize to manage our forest in a way that we can use them now and the future generation can still have access to this gift of nature. This way, we will prevent looming danger that eminent from indiscriminate forest clearing.

Table 2: Estimate of the volume of logs

S/N	Species	S_1 (m^2)	S_m (m^2)	S_2 (m^2)	V (m^3)
1	*Albizia lebbeck*	186500.16	225901.06	306330.64	851359.90
2	*Alstoniaboonei*	31933.44	52934.67	89593.26	203180.78
3	*Brachystegia nigerica*	170769.06	145305.60	196931.75	578526.85
4	*Ceiba pentandra*	278424.36	387776.99	467885.02	1400658.77
5	*Celtis zenkeri*	37477.44	55360.17	69999.53	200530.12
6	*Chrysophyllum albidum*	23679.04	34189.54	51573.06	129255.59
7	*Cola gigantean*	32557.39	57125.93	82460.78	209433.84
8	*Cordiamillenii*	72650.79	102508.56	152806.50	387438.00
9	*Cucurbita klaineana*	588162.96	873193.86	1277517.23	3266871.78
10	*Diospyros iturensis*	245415.39	332986.50	436512.63	1227791.86
11	*Ficus exasperata*	844215.93	1168843.74	1486269.03	4271239.26
12	*Irvingia gabonensis*	2772657.95	4125835.93	5278630.22	14970140.57
13	*Mansonia altissima*	6789.80	7331.94	8570.35	27244.73
14	*Millettia thonningii*	414815.94	632756.74	767591.44	2263957.14
15	*Nesogordonia papaverifera*	676936.26	931179.11	1279200.94	3463427.10
16	*Ricinodendron heudelotii*	18018776.71	24215571.63	30113289.36	88398223.62
17	*Sterculia oblonga*	16913.88	42846.25	65605.48	154797.02
18	*Terminalia ivorensis*	1878337.01	2345804.45	2925130.27	8649149.00
19	*Terminalia superba*	84901.80	142133.44	192768.64	515902.49
20	*Tetracera potatoria*	8116.97	9417.47	11178.92	34730.13
21	*Triplochiton scleroxylon*	306880.36	442105.73	565916.80	1610263.83
TOTAL		**26696912.64**	**36331109.29**	**45825761.83**	**132814122.38**

Note: S1, S2, S3 means at top, middle and Diameter at Breast Height respectively

Conclusion: The study revealed high volume timber extraction without replacement. The study therefore recommends that for proper planning and managing of Shasha forest reserve, the exploitation rate of the forest should be monitor and forest policy on timber logging and harvesting should be implemented. Regular inventory should be carried out on the exploitation status of the Shasha forest reserve as a yardstick to monitor the exploiting rate of the forest reserve while encouraging community forest management system.

REFERENCES

Adekunle, V. A. J. (2006). Conservation of tree species diversity in tropical rainforest ecosystem of southwest Nigeria. *J of Trop For. Sci.* 18 (2): 91–101.

Adekunle, V.A.J., Olagoke, A.O and Ogundare, L.F (2010). Rate of timber production in a tropical ecosystem south-western Nigeria and its implications on sustainable forest management, *J of For. res*, 2(21): 225-230

Boyle, J.R., Tappeiner II, J.C., Waring, R.H. and Tattersall, C (2016): Sustainable forestry: Ecology and silviculture for resilient forests. *Elsevier* https://doi.org/10.1016.B978-0-12-409548-9.09761-X

Chilalo, M. and Wiersum, K. K. (2011).The Role of Non-Timber Forest Products for Livelihood Diversification in Southwest Ethiopia. *Agric and For. issues* 3 (1): 44-59

FAO (2000). Forest Resources of Bangladesh: Country Report Rome, 2000. pp. 91

Field Trip Earth (2008).Surveying Wildlife in Nigerian Forest.

Fuwape, J.A. (2001). The impacts of forest industries and wood utilization on the environment. *J of Trop for res*, 17 (2):78-90

Gamfeldt, L., Snall, T., Bagchi, R., Jonsson, M., Gustafsson, L., Kjellander, P., Ruiz-Jaen, M.C., Froberg, M., Stendahl, J., Philipson, C.D., Mikusinski, G., Andersson, E., Westerlund, B., Andren, H., Moberg, F., Moen, J; Bengtsson, J. 2013. Higher levels of multiple ecosystem services are found in forests with more tree species, *Nat comm*, 4(1), 1-8

Hush, B., Beers, T.W., and Kershaw, J.A. (2003). *Forest mensuration*. Wiley.

Iheke, O. R. and Eziuche, A. O. (2016).Forest Resources Exploitation and Its Implications on Rural Agro-Economy in Isiala Ngwa North Local Government Area of Abia State, Nigeria. *Nign J of Agric, Food and Environ.* 12(1):37-43

Olajide, O., Etigale, E.B. and Udofia, S.I. (2008). Wood-based industries production and sustainable of industrial wood raw materials in Nigeria. In: Onyekwelu, J.C., Adekunle, V.A.J. and Oke, D.O. (eds). Research for development in forestry, forest products natural resource management. The first National Conference of the forest and forest products society held at the Federal University of Technology, Akure, Nigeria, 16th-18th April, 2008.Pp 212-215

Olokeogun, O.S., Iyiola, O.F and Iyiola, K. (2014).Application of Remote Sensing and GIS in land use/land cover mapping and change detection in Shasha forest reserve, Nigeria. *The Intl Arch of the Photo Remote Sensing and Spa Info Sci*. XL-8-613

Ratcliffe, S., Wirth, C., Jucker, T., Plas, F., Scherer-Lorenzen, M., Verheyen, K., Allan, E., Benavides, R., Bruelheide, H., Ohse, B., Paquette, A., Ampoorter, E., Bastias, C.C., Bauhus, J., Bonal, M., Castagneyrol, B., Checko, E., Dawud, S.M., De Wandeler, H., Domisch, T., Finer, L., Fischer, M., Fotelli, M., Gessier, A., Granier, A., Grossiord, C., Guyot, V., Hasse, J., Hattenschwiller, S., Jactel, H., Jaroszewics, B., Joly, F., Kambach, S., Kolb, S., Koricheva, J., Liebersgesell, M.., Milligan, H., Muller, S., Pollastrini, M., Purschke, O., Radoglou, K., Raulund-Rasmussen, K., Roger, F., Ruiz-Benito, P., Seidl, R., Selvi, F., Seiferling, I., Stenlid, J., Valladares, F., Vesterdal, L. Baeten, L. (2017). Biodiversity and ecosystem functioning relations in European forests depends on environmental context. *Ecol. Letters* 20 (11), 1414-1426