



EVALUATION OF TIMBER TREES PRODUCING VALUABLE FRUITS AND SEEDS IN CROSS RIVER STATE

ERIC OFFIONG AND DANIEL O. OTU

(Received 9 June 2023; Revision Accepted 30 June 2023)

ABSTRACT

The study assessed two rain forest reserves in Cross River State for timber trees producing economically valuable fruits and seeds. The reserves are Afi River and Oban West forest reserves. A total of 18 and 42 tree species were enumerated in Afi River and Oban West respectively. In Afi River forest, *Brachystegia eurycoma* had the highest population of 5 per hectare while *Canarium schweinfurtii*, *Dacryodes edulis*, *Garcinia kola*, *Irvingia gabonensis*, *Parkia bicolor*, *Pentaclethra macrophylla*, *Recinodendron heudelotii*, *Tetrapleura tetraptera* and *Vitex* species had the least of 1 each per hectare. In Oban West forest reserve, *Allanblakia floribunda* had the highest population of 11 per hectare, while *Brachystegia eurycoma*, *Chrisophyllum albidum*, *Recinodendron heudelotii*, *Tetrapleura tetraptera* and *Xylopiya aethiopica* had the least of 1 each per hectare. It is observed that most of the timber trees producing valuable fruits and seeds have low frequency of occurrence due to timber exploration thereby calling for their conservation and protection.

KEYWORDS: Exploitation, Endangered, Conservation, Protection, Management

INTRODUCTION

The tropical rainforests are the world's most vital vault of biodiversity, and are a natural repository of genetic diversity, which offers a rich wellspring of therapeutic plants, high return foods for daily consumption and a lot of other helpful products (Addai *et al.*, 2016). Forest resources are vital to numerous individuals all through the world. On a global scale, a large number of individuals who live in rural areas depend on the products like, wild fruits, vegetables nuts, edible roots, honey, palm leaves, medicinal plants, and bush meat which are derived from the forest to generate income and also for consumption in their households (Andel, 2006). The need to manage and conserve the tropical high forest sustainably cannot be over emphasized. The tropical high forest is the most biologically diverse ecosystem in the world (Turner, 2001) and has been a great source of livelihood from time immemorial.

There is more to be harvested from the forest than trees. Non wood forest products (NWFPs) are an integral part of the livelihood of the 500 million people who live in or near tropical forests that cover 20 percent of the world's land mass [Canadian International Development Agency, (CIDA, 2003) and Udo (2002)] assert that forestry has contributed to the industrial sector of the economy by providing major raw materials (saw logs, veneer logs and plywood) needed by wood based industries. Other areas through which forestry contributes to development are provision of food, health care and energy for domestic use. Examples are *Irvingia gabonensis* Baill, *Chrysophyllum albidum* G. Don, *Garcinia kola* Heckel, *Monodora myristica* Dunal etc. Many of the timber trees of the tropical rainforest produce a variety of highly valuable non timber forest products (NTFPS) like edible and medicinal fruits, seeds, nuts and oils. A considerable number of the trees also produce industrial raw materials like latex,

Eric Offiong, Department of Forestry and Wildlife Resources Management University of Calabar, Calabar, Nigeria.

Daniel O. Otu, Department of Forestry and Wildlife Resources Management University of Calabar, Calabar, Nigeria.

tannin, gum exudates, dyes and resin. The non-timber forest products of these trees are, in some cases, much more valuable than the timbers. They can be harvested for many years without cutting down the trees as contrasted by timber harvesting. Also, their harvesting activity often has infinitesimal impact on the ecosystem. Ford Foundation (1998) opined that the non timber forest products (NTFPs) are particularly in important part of multiple-use strategies, because they increase the range of income generating options for forest dependent villagers while avoiding some of the ecological costs of timber exploitation.

As efforts are being geared to check-mate wanton destruction of the remaining areas of the tropical forest and promote sustainable exploitation of its resources, adequate data on tree species producing multiple products is imperative to the actualization of their conservation and protection. This study therefore identified timber trees producing valuable fruits and seeds in Cross River State and their population density with a view to making suggestions for conservation and protection of the endangered species.

MATERIALS AND METHODS

Study Areas: The study was carried out in Afi River Forest Reserve and Oban West Forest Reserve in Cross River State, Nigeria. Afi River Forest Reserve is located between latitudes 6° 08' and 6° 26' North

and longitudes 8° 50' and 9° 05' E. It covers a total land area of 383 Km². Annual rainfall and average temperature in the area are about 3,500 mm and 27°C (Balogun, 2003). The mean annual relative humidity is 78% at 7.00 hrs, while the soils vary from clayey-loam to loamy-clay. Oban West forest Reserve is located between latitudes 4° 44' and 5° 45' North and Longitudes 8° 18' and 8 50' E. It covers an area of 1,042 Km² with an annual rainfall of about 4,073mm and an average temperature of 25°C (Balogun, 2003). The average annual relative humidity is 80% at 7.00 hrs. The soils range from loamy sand to clayey-loam. The two forests have been subjected to timber exploitation over the years.

Data Collection: Three 500m line transects were laid into the core areas of each forest, with the first transect starting 20m away from the access route. Each transect was separated from the other by a distance of 330m. Timber tree species within 10m on both sides of each transect that produce valuable non timber products (fruits and seeds) were identified and enumerated by numbering them with enamel paint. Thus, the total sample area assessed in each forest equated 3 hectares. All trees known to have timber and fruit/seed value were identified counted and their frequency of occurrence recorded. All the trees recorded in this survey were species mentioned by Alexander and Effa (1994) in a participatory rural appraisal (PRA) survey of NTFPs in Cross River State.

DIVERSITY OF TIMBER TREES PRODUCING NON-TIMBER FOREST PRODUCTS (NTFPs)

Table 1: Timber trees producing valuable NTFPs in Afi River Forest Reserve, Cross River State

S/NO	TREE SPECIES	VLUABLE NTFP		POP. DENSITY/HA
		Fruit	Seed	
1	<i>Allanblakia floribunda</i>	-	Edible seed	2
2	<i>Baillonella toxisperma</i>	-	Edible seed	2
3	<i>Brachystegia eurycoma</i>	-	Edible seed	5
4	<i>Canarium schweinfurthii</i>	Edible fruit	-	
5	<i>Dacryodes edulis</i>	Edible fruit	-	1
6	<i>Garcinia kola</i>	-	Edible and medicinal seed	1
7	<i>Irvingia gabonensis</i>	Edible fruit	Edible seed	1
8	<i>Parkia bicolor</i>	-	Edible seed	1
9	<i>Pentaclethra macrophylla</i>	-	Edible seed	1
10	<i>Ricinodendron heudelotii</i>	-	Edible seed, vegetable	1
11	<i>Tetrapleura tetraptera</i>	Edible fruit	-	1
12	<i>Vitex spp</i>	Edible fruit	-	1

Table I shows that only *Brachystegia eurycoma* does not seem to be endangered and is recorded as most dominant compared to other species in Afi River Forest Reserve. Most of the species that have timber and fruit value were exploited for timber. The regeneration of most timber and non-timber value

species did not show great ability due to anthropogenic activities even though the species diversity in Afi is high. This calls for more conservation campaign activities in the area especially as eleven (11) species have shown great signs of endangerment.

Table 2: Timber trees producing valuable NTFPS in Oban West Forest Reserve, Cross River State.

S/NO	TREE SPECIES	VLUABLE NTFP		POP. DENSITY/HA
		Fruit	Seed	
1	<i>Allanblakia floribunda</i>	-	Edible seed	11
2	<i>Brachystegia eurycoma</i>	-	Edible seed	1
3	<i>Chrysophyllum albidum</i>	Edible fruit	-	1
4	<i>Coula edulis</i>	-	Edible seed	3
5	<i>Irvingia gabonensis</i>	Edible fruit	Edible seed	2
6	<i>Parkia bicolor</i>	-	Edible seed	10
7	<i>Pentaclethra macrophylla</i>	-	Edible seed	9
8	<i>Ricinodendron heudelotii</i>	-	Edible seed	1
9	<i>Tetrapleura tetraptera</i>	Edible fruit	-	1
10	<i>Vitex spp</i>	Edible fruit		2
11	<i>Xylopia aethiopica</i>	-	Edible seed	1

From the above data, it can be seen that even though diversity is higher in Afi River Forest Reserve (12.75), the species occurrence is higher in Oban West Forest Reserve which has a diversity index of 6.11 with less indication of endangerment of species. Eight species out of eleven that occurred in transects. have shown signs of endangerment. Forest exploitation seems to be lower and regeneration potentials higher in Oban West Forest Reserve. The area also demands more work toward forest conservation.

$$DI = \frac{N(N-1)}{q}$$

$$\sum_{i=1}^{q} n_i(n_i - 1)$$

Where

Di = Simpson's diversity index

N = Total number of individual trees counted

Ni = Number of individuals of each species enumerated for

i = 1 ----- q

q = Number of different species enumerated

Table 3: Diversity index of Timber trees producing valuable NTFPS in Afi River and Oban west forest reserves, Cross River State

Forest Reserve	Diversity Index
Afi River	12.75
Oban West	6.11

RESULTS

A total of 12 tree species were counted in Afi River Forest Reserve (Table 1). Out of these species *Brachystegia eurycoma* had the highest mean population of 5 per hectare. *Allanblakia floribunda* and *Baillonella toxisperma* each had 2 per hectare, while each of the remaining nine species had one tree per hectare (Table 1). As shown in Table 1, 11 out of 12 timber trees in Afi river forest reserve produce edible fruits except for *Ricinodendron heudelotii*, in which leaves and seeds are edible. *A. floribunda* and *B. toxisperma* produce seeds from which edible oil is extracted. On the other hand, *Garcinia kola* produces seeds that are eaten as

Data Processing and Analysis: The frequency of occurrence of a tree species in each forest was determined in order to estimate its population per hectare by dividing the total population in the sampled area by 3.

To be able to explore the heterogeneity of the species, diversity index was calculated for the two forest locations (Afi and Oban-in the north and south) using Simpson's diversity index. This is expressed as follows:-

snacks and medicine. *B. eurycoma* is used as a soup thickener while *Pentaclethra macrophylla* seeds are used as spice in soups and as medicine.

In Oban West Forest Reserve, out of 11 tree species, *A. floribunda* had the highest mean population of 11 per hectare while the lowest occurrences of one each per hectare, was recorded for the following species - *B. eurycoma*, *Chrysophyllum albidum*, *R. heudelotii*, *Tetrapleura tetraptera* and *Xylopia aethiopica* (Table 11).

A Simpson's diversity index of 12.75 was calculated for Afi River Forest Reserve while 6.11 was obtained for Oban West Forest Reserve. The diversity exhibited in Afi is denoted by the presence of four

species that are not recorded in Oban. These are - *Baillonella toxisperma*, *Canarium schweinfurthii*, *Dacryodes edulis* and *Garcinia kola*. The diversity of the species in Oban is denoted by the presence of *Chrysophyllum albidum*, *Coula edulis* and *Xylopia*

DISCUSSION

The presence and population density of a tree species in a tract of rainforest is greatly influenced by the microclimate within the forest and the quantity of viable seeds produced by the tree concerned (Olajide, 2004). For instance a shade intolerant species will find it difficult to regenerate in a rainforest with closed canopy. Thus, the population density of such a species would be low in that forest while adult trees will hardly survive. The low population of tree species in, the study area may be due to unfavorable microclimate and the absence of viable seeds on the forest floor. Low population densities of a number of economic species due to dearth of viable seeds and poor microclimate was reported by Christie and Armesto (2003). Also, abundance or rarity of timber trees of economic value in an area of rainforest is a function of the intensity and pattern of its exploitation (Olajide, 2004).

Therefore, the fewer population of individual tree species observed in the study area can be linked to over exploitation of the trees for timber. Olajide (2004) established a positive relationship between poor population densities of some tree species and the mortality of their old mother trees. Parthasarathy and Karthikeyan (1997) reported of poor population density of timber trees producing economically valuable non-timber forest products in a tropical forest subjected to timber exploitation in Western Ghats, India. The low diversity indices of 12.75 and 6.11 recorded for the two forest areas attest to their over exploitation.

A tree species with less than 10 individuals per hectare is regarded as a rare species (Parthasarathy species in Afi River Forest Reserve are rare and endangered while only *A. floribunda* and *Parkia bicolor* are not endangered in Oban West Forest Reserve. All other trees recorded in the survey are endangered.

The tree species identified and enumerated in the two forests are of economic importance to the people as they produce edible fruits and seeds on which the people depend for food and medicines. Okigbo (1975), analyzed *C. albidum* to contain 8.8% protein, 17.1% oil, 20% sugar, 11% starch and other minerals of nutritional value. A recent study by Onabu *et al*, (2006) has shown that the aqueous extract of *G. kola* may have biochemical significance in the treatment of some liver disease.

CONCLUSION

From oral interactions with some community members, the timber trees producing valuable fruits and seeds found in the study area are important especially to the immediate communities as they sustain the economic well-being of the people. The value of these trees in terms of their NTFPs may outweigh the value of the trees during their life span in comparison with the sawn timber value (Alexander & Effa, 1994). In order to prevent their extinction, government should out-law their exploitation for timber from the forest estates. The people living close to these forest should be incorporated into a conservation program to prevent their timber exploitation and ensure conservation and sustainable production of valuable NTFPs. Clusters of these trees could be preserved through establishment of Strict Natural Reserves (SNR). Conservation and management of these species can also maintain the forest diversity act as a gene pool and improve stocking.

REFERENCES

- Addai, E. K., Tulashie, S. K. Annan, J. and Yeboah, L., 2016. Trend of fire outbreaks in Ghana and ways to prevent these incidents. *Safety and health at work*, 7(4), 284 – 292.
- Andel T.V., 2006. Non-timber forest products: the value of wild plants. Retrieved from; <https://bit.ly/2JvTu1R>. Accessed 16 May, 2021.
- Balogun, O. Y., 2003. Senior Secondary School Atlas, 2nd edition, 19, Longman Publishers, Lagos.
- Chritie, D. A and Armesto, J. J., 2003. Regeneration at micro site and tree species co existence in temperate rainforest of chilue Island, Chile J: *Ecol*, 91,776-846.
- Canadian International Development Agency (CIDA)., 2003. Forestry Issues, Non-wood forest products. <http://www.rcfa-cfan.org/English/issues.3.htmf>.
- Dunn, R., Otu, D. O and Wong, J. L. G., 1994. . Reconnaissance Inventory of High Forest and Swamp Forest Areas of Cross River State. Cross River State Forestry Project (ODA Assisted) 1-30.
- Ford Foundation., 1998. forestry for sustainable Rural Development, 58. A review of ford foundation, New York.

- Forest Management and Environmental Co-ordinating Unit (FORMECU), 1999. Forest Resources Study, Nigeria, Revised National Report, (2): 224 prepared for FORMECU by Beak and Geomatics International.
- Okigbo, B. N., 1975. Neglected plants of horticultural and Nutritional importance in traditional farming systems of tropical Africa, *Acta Hort*; (53): 131.
- Olagide, O., 2004. Growth performance of trees in Akure Forest Reserve, Ondo State, Nigeria. Unpublished Ph.D thesis, University of Ibadan, Ibadan, Nigeria. 44.
- Onabu, C., Anosike, E. O and Ibeh, G. O., 2006. Effect of aqueous extract of *Garcinia kola* on some liver enzymes of rats with carbon tetrachloride induced liver damage. *Global J. Pure Applied Science*, (12): 343-6.
- Parthasarathy, N and Karthikayan, R., 1997. Biodiversity and population density of wood species in a tropical evergreen forest in Courtallum reserve forest, western Ghats, India. *Trop. Ecol.*, (37): 297-306.
- Turner, I. M., 2003. The ecology of trees in the tropical rainforest, Cambridge University Press, Cambridge, UK. 298-310.
- Udo, E. S., 2002. Forestry for economic development. Proceedings of national workshop organized by FANCONSULT and Edo State FAN, Benin City. 51-63 editor Labode Popoola.