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ASSESSMENT OF TIMBER TREE SPECIES AVAILABILITY IN BAISSA FOREST RESERVE TARABA STATE, NIGERIA

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ABSTRACT

The study area is in Taraba State, Nigeria. Timber tree species available in the reserve were assessed. Simple random sampling technique was adopted in selecting sample plots for data collection Forty (40) hectare plots were demarcated out in the forest. Each hectare plot was re-demarcated into four (4) equal sizes of 50m x 50m (2,500m2) out of which one was randomly selected for the assessment. Timber tree species from ≥ 10cm were selected assessment, their diameter at breast height (dbh at 1.3m) and total height were collected. The result indicates that 23 timber tree species grouped into 11 taxonomic families were identified with a total frequency of 361.Khaya grandifoliola in the family of meliaceae was prevalent with a total of 42 (12.0%) representation out of the total timber species assessed, followed by Cola gigantea in the family of Sterculiaceae 39 (11.0%). Timber tree species of Bosquia angolensis, Sacocephalus probeguini, Quarea thompsonii, Pterocarpus erinaceus,and Berlina confusa were only represented by one each out of the total encountered in the reserve. The total basal area/ha was 12.7652304m2 (0.31913076m2/ha) and a total volume of 209.70436m3 (5.242609m3/ha) recorded in the study area. The low basal area and volume recorded in the reserve was as a result of over exploitation that was carried out in the reserve. However, there is no logging activities going on in the reserve, it should be left for many years to recuperate and be assisted by planting of exotic and indigenous fast growing species.

Keywords: Baissa Forest Reserve, basal area, volume, diameter, height.

1. INTRODUCTION

Timber, being a construction material, has been used for different purposes, including structural and ornamental purposes. It is used throughout the world for many tasks, from simple structural application to highly finished and ornate decoration and it is the dominant industrial material in Nigeria (Fuwape, 2000). There are approximately 200,000 hardwood species and 1000 softwood species in Nigeria, of the total number; only 2,300 tree species are commercially important (Oluyege, 2007). In building and furniture industries, various species of timber are used for different purposes. The choice of wood species used varies, due to different features and characteristics of the wood, some of these features are wood strength, natural durability, colour (appearance), ease of machine and workability, cost, contraction, hardness and availability. In recent years the number of timber species harvested and marketed in production forests in Africa has grown in recent years, especially near seaports or major local markets, where prime species have been largely logged out. However, a handful of species still makes up the bulk of production. In Central African Republic, for example, loggers harvest 15 to 18 timber species, and five species make up 90% of production; in Northern Congo, 18 to 20 species are harvested,

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but five species account for nearly 80% of production (ITTO, 2006). The major timber species exported from Nigeria and some other African countries include Mahogany *(Khaya senegalensis*), Obeche (*Triplochiton scleroxylon*), Afara (*Terminalia superba*), Abura (*Mitragyna ciliate*), Iroko (*Milicia excelsa*), Teak (*Tectona grandis*) (ITTO, 2006). Timber can be described as wood in a form suitable for construction or carpentry, joinery or for reconversion to manufacturing purpose. Timber has been used as a building material for over 400, 000 years and it is very common and best known material for house construction including framing of floors, walls and roofs (RMRDC, 1998). Timber accounts for about half of worldwide wood consumption and this exceeds the use of steel and plastic combined (Cunningham *et al*. 2005). According to Lucas (2006), the preference of timber may not be unconnected to its versatility, abundance, accessibility, renewability, less energy input required for processing and relative cheapness. However, it occurs in low density in most tropical forests, therefore, large areas tend to be exploited diffusely to extract a few prized logs. In the estimation of FAO (2010), Nigeria loses about 3.7 percent of its forest area yearly and this makes it to have the highest net loss from 2000 to 2010, mainly due to overexploitation of wood for timber production. Consequently, yield of the most valuable timber species declined as a result of initial overcutting and failure to leave sufficient seed trees (Kellman and Tackabery,1993) leading to decline in the availability of some tree species like Iroko (*Milicia excelsa*), Opepe (*Nuclea diderrichii*), Teak (*Tectona grandis)* and many other valuable timber species. The scarcity of these fine quality timber species has forced into the markets species that ten to twenty years ago were considered only acceptable for low-end construction type uses. This reflected in the recent patronage given to the use of species such as *Pycnanathus angolensis*, *Triplochiton scleroxylon,* and *Albizia zygia* as general purpose wood in Nigeria (Wood Explorer, 2011). Recently the use has been extended as they are now sought for any end uses including structural and non-structural uses. This is due to scarcity of high quality species in the market. In view of this, the study was conducted to assess the availability and variation of timber species in Baissa Forest Reserve like many other reserves in the world, The Baissa Forest Reserve has not escaped the clutches and continue to suffer from these destructive human forces despite the fact that the reserve is one of the important biodiversity hotspots in Taraba State. It is surrounded by many communities and they all depend on the forest for their livelihoods. However, with the current poor management practices of the forests, its natural resource base is likely to become more severely deteriorated in the near future.

2. MATERIAL AND METHODS

The study area lies between latitudes 6^0 30' and 9^0 39' north and between longitudes 9^0 10' and 11^0 50' east. It covers a total land area of 70km^2 (Fig.2). The topography is mainly dominated by highlands to the Benue River Valley, with elevation ranging from approximately 120m from the Benue River Valley in the west to more than 200m in the Gotel Mountain and mambila plateau in the southern-most part of Taraba State. The reserve is characterized by gently undulating to flat lying. The south east highlands are the headwaters of many tributaries to the Benue River. The dominant northward flowing tributaries are the Donga, Taraba Fan manga, and the Katsina-ala rivers. Wetland soils are prominate and present within the floodplains of the Benue River and its tributaries. The wetland soils have been from alluvium and are deep sandy loam, loamy sand and sandy clay loam (Soil Survey, 1990).Annual rain fall varies from1000mm to 3000mm while, the maximum temperature may rise as high as 35^0c and minimum as low as 11^0c. The

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annual relative humidity of the study area is generally less than 53% at 11:00hr. The vegetation of the reserve falls within the lowland rain forest zone.

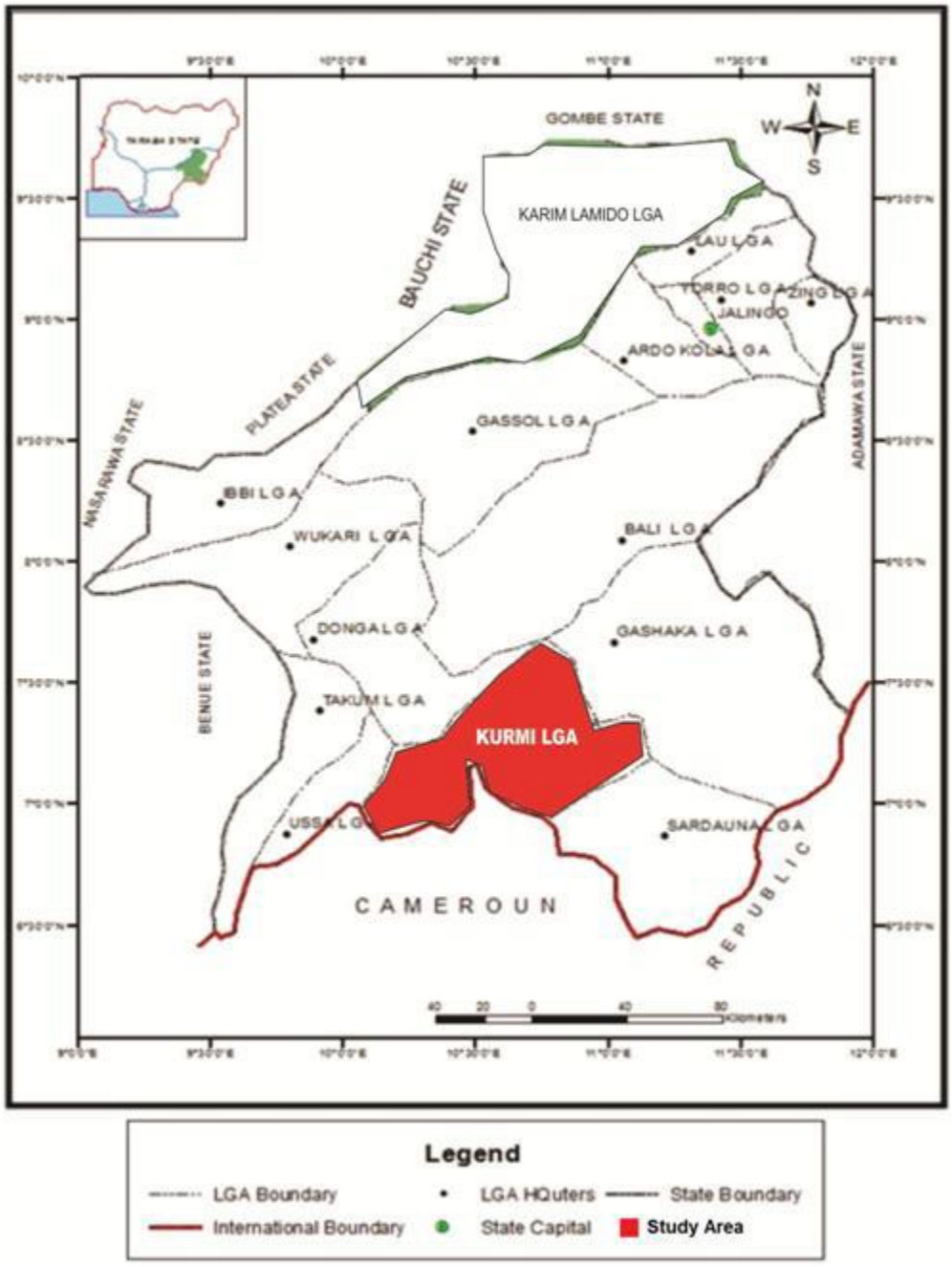

Figure 1: Map of Taraba State showing the study area (Kurmi LGA)

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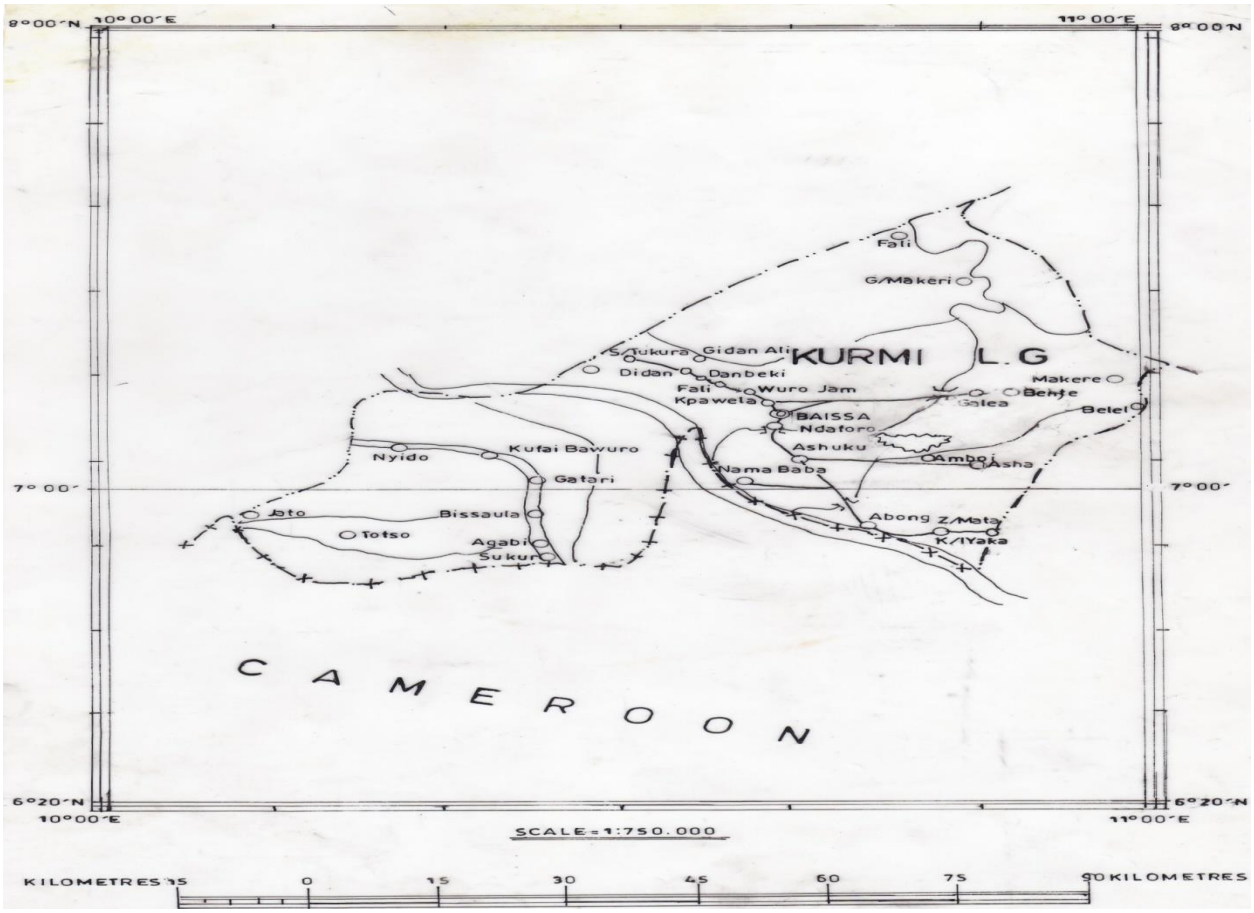

Figure 2: Map of the study area (Kurmi LGA)

Data Collection

Simple random sampling technique was used in selecting plots for assessment. The research was carried out in 2020. Forty (40) hectare blocks were demarcated from the forest. Each hectare was further re-demarcated into four equal sizes of 50m × 50m (2.500m^2), out of which one was randomly selected for the assessment. Altogether, a total land area of 4,000,000m^2 (40 ha) was used for the study. Available known timber tree species from ≥ 10cm in diameter at breast height (dbh) in all the sample plots were considered for enumeration. Data collected were the botanical and family names of the tree species, diameter taken at breast height (dbh) and total height of each tree. An experienced taxonomist and the Nigerian trees volume 1 and 11 were used for the identification of the trees, while diameter tape was used for diameter measurement and haga altimeter for height measurement

Data Analysis

Available timber tree species enumerated were analyzed by grouping them according to their family, frequency and percentage. Basal area per plot was obtained by adding the basal area of all individual trees assessed within each plot. The mean basal area per plot was computed by

adding up the total plot basal areas of each sample plots and dividing it by the number of sample plots and was extrapolated to per hectare.

The formulas used are:

$$BA = \frac{\pi D2}{4} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eqn. 1}$$

Where:

BA = Basal Area (m^2)

π = constant (3.142)

D = Diameter at breast height (dbh)

The total basal area per hectare was extrapolated using Avery and Burkhart (2002) formula.

$$BA = \frac{H}{a \times d} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eqn. 2}$$

Where:

BA = basal area per hectare.

H = One hectare

a = Area of plot in hectare.

d = Basal area in each plot.

Equally, the volume of trees per plot was obtained by adding the volume of all individual trees assessed in each plot. The mean volume was computed by adding up the total volumes from the entire sample plots and dividing it by the number of sample plots. The mean plot was blown up to per hectare. The volume was obtained by multiplying the basal area of each individual tree and its height.

VTH = Basal Area x Height……………………………………….Eqn. 3

3. RESULTS AND DISCUSSIONS

Available Timber Tree Species in Baissa Forest Reserve

Table 1 shows a total of 23 timber species classified into 11 taxonomic families were identified in the study area. *Khaya grandifoliola in the family of* Meliaaceae was more prevalent in the reserve which represent 42 and 12,0% of the total number of timber species assessed. had the highest number of frequency of 42 (12.0%) out of the total number assessed, followed by *Cola gigantea* in the family of Sterculiaceae with a total frequency of 39 (11.0%). *Treculia africana* of moraceae has 37 (10.2%) and *Trichilia preuriana* in the same family has 36 (10.1%). Others are *mammea africana (Guttifereae) Pycnathus angolensis* (myristicaceae) both with 30 (8.3%). *Khaya senegalensis* with 23 (6.4%), *Mitragyna ciliata* 21 (6.0%), and *Antiaris africana* with 16 (4.4%). *Bosquia angolensis* of the family of moraceae, *Quarea thompsonii* of Meliceae and *Pterocarpus erinaceus* in the family of Papilianaceae have 1 (0.3%) frequency each. It was observed that preference for certain wood species in the market due to their high quality, strength and durability has resulted in the over-exploitation of such species. This results of this study agrees with the work of Bunde (2018) and Riki *et al.,* (2021) who also mentioned some of the identified species from this study as woody species in Taraba State.

Table 1: Available Timber Tree Species in Baissa Forest Reserve

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S/N	Name of Species	Family	Frequency	Percentage
1	*Treculia Africana*	Moraceae	37	10.2
2	*Antiaris Africana*	‘’	16	4.4
3	*Bosquia angolensis*	‘’	1	0.3
4	*Treculia heudelotii*	‘’	3	1.3
5	*Sacocephalus probeguini*	‘’	1	0.3
6	*Khaya grandifoliola*	Meliaceae	42	12.0
7	*Khaya senegalensis*	‘’	23	6.4
8	*Tirchilia preuriana*	‘’	36	10.1
9	*Milicia excels*	‘’	6	2.1
10	*Quarea thompsonii*	‘’	1	0.3
11	*Mitragyna ciliate*	Rubiaceae	21	6.0
12	*Mammea Africana*	Guttiferae	30	8.3
13	*Mansonia altissima*	Sterculiaceae	2	1.1
14	*Cola gigantean*	‘’	39	11.0
15	*Pterrygota macrocarpa*	‘’	11	3.0
16	*Pterocarpus mildbraedii*	Papilianaceae	7	2.0
17	*Pterocarpus erinaceus*	‘’	1	0.3
18	*Syncephalum stipulatum*	Sapotaceae	5	1.4
19	Berlina confuse	Caesalpiniaceae	1	0.3
20	Brachystegia eurycoma	,,	13	6.3
21	Ceiba pentandra	Bombacaceae	31	9.1
22	Alstonia boonei	Apocycaceae	4	1.1
23	Pycnathus angolensis	Myristicaceae	30	8.3
Total			361	100

Source: Field Survey (2020).

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Basal Area of available Timber Species in Baissa Forest Reserve

Table 2 shows the total basal area recorded in the study area. The results indicated that the total basal area per plot is 3.1913076m^2 and 12.7652304m^2 per hectare with an average of 0.0797826m^2 and 0.31913076m^2 per plot and per hectare respectively. Plot 21 has the highest basal area of 0.829468m^2 (3.317872m^2/ha), followed by plot 15 with basal area of 0.141351m^2 (0.565404m^2/ ha). Plot 37 has the least basal area of 0.004582m2 (0.018328m^2/ha). No timber tree species was found in plots 7, 8, 13, 34, and 39. The total volume of timber species as contained in Table 3 indicated that the total per plot is 52.42609 m^3 with a mean of 1.310652 m^3 while, the total volume per hectare was 209.70436 m^3 with an average of 5.242609 m^3 per hectare .Plot 29 has the highest volume of trees with 4.52291m^3 (18.09164m^3/ha). Plot 35 has the least volume of trees with 0.00376m^3 (0.01504m^3/ha).

Baissa Forest Reserve has an average basal area of 0,31913076m^2 per hectare. This cannot be compared with the total basal area required for a well- stocked tropical rain forest in Nigeria as reported by Abayomi(1994) and those of some tropical forests of the world by Adekunle et al,(2004) and Kumar et al,(2002). The reason is because only available tree species use for timber production were assessed for the purpose to know whether there are left over of such species in the reserve. The low basal area/ha recorded in the reserve could be as result of a long time unregulated excessive timber operation. Total volume ranged between 0.01504m^3 and 18.09164m^3 with a mean of 5.242609m^3 per hectare was recorded. Most of the tree species dbh in the forest are in the lower classes. Presently no logging activity is going on in the forest. As a result the reserve is undergoing natural regeneration and recruitment which are vital indicators of forest health and vigour (Jimoh *et al.*, 2012).

Table 2: Summary of basal area of available timber species in Baissa Forest Reserve

Plot No	Basal area per plot (m^2)	Basal area per hectare (m^2)
1	0.093612	0.374448
2	0.098587	0.394348
3	0.059295	0.23718
4	0.066614	0.266456
5	0.085731	0.342924
6	0.032658	0.130632
7	-	-
8	-	-
9	0.118906	0.475624
10	0.071715	0.28686

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11	0.060027	0.240108
12	0.016962	0.067848
13	-	-
14	0.088118	0.352472
15	0.141351	0.565404
16	0.010785	0.431416
17	0.091620	0.36648
18	0.037313	0.149252
19	0.017725	0.0709
20	0.054193	0.216772
21	0.829468	3.317872
22	0.040623	0.162492
23	0.076288	0.305152
24	0.067923	0.271692
25	0.020733	0.082932
26	0.096745	0.38698
27	0.017098	0.068392
28	0.051386	0.205544
29	0.126210	0.50484
30	0.014678	0.058712
31	0.012068	0.048272
32	0.042300	0.16292
33	0.020024	0.080096
34	-	-
35	0.00796	0.03184
36	0.053712	0.214848

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37	0.004582	0.018328
38	0.065506	0.262024
39	-	-
40	0.015283	0.061132
Total	3.1913076	12.7652304
Mean	0.0797826	0.31913076

Source: Field Survey (2020)

Volume of Available Timber Tree Species in Baissa Forest Reserve

Results in Table 3, reveals the estimated volume of timber tree species found in the study area. The results indicated that the volume per plot is 52.42609 and 209.70436 m^3 per hectare with an average of 1.310652 and 5.242609m^3 per plot and per hectare respectively. Plot 29 has the highest volume per plot area of 4.52291 (18.09164m^3/ha) followed by plot 9 with a volume of 3.60483 (14.419332 m^3/ha) and the least was obtained in plot 35 with a volume of 0.00376 (0.01504 m^3/ha). No timber tree species was found in plots 7, 8, 13, 34, and 39. This could be due to logging or farming activities. The overall timber volume per unit area of this species is generally low, and thereby necessitating logging over large area to meet the ever increasing demand. In view of the great value of woody species and the grave consequences of unregulated logging activities and over exploitation, adopting effective management principle has become imperative for its sustainability (Aigbe *et al.*, 2012).

Table 3: Estimated Volume of Available Timber Tree Species in Baissa Forest Reserve

Plot No	Volume per plot (m^3)	Volume per hectare(m^3)
1	2.31064	9.24256
2	3.0046	12.0184
3	1.20023	4.80092
4	1.88093	7.5236
5	2.30113	9.20452
6	0.86521	3.46084
7	-	-
8	-	-
9	3.60483	14.419332

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10	2.03967	8.15868
11	1.64031	6.56124
12	0.43136	1.72544
13	-	-
14	2.47884	9.91536
15	2.54589	10.18356
16	1.54493	6.17972
17	2.51716	10.06864
18	1.34834	5.39336
19	0.45067	1.80268
20	1.58693	6.34772
21	0.84849	3.39396
22	0.98820	3.9528
23	2.41820	9.6728
24	1.80878	7.23512
25	0.58144	2.32576
26	2.55087	10.20348
27	0.43054	1.72216
28	1.55915	6.2366
29	4.52291	18.09164
30	0.39640	1.5856
31	0.20353	0.81412
32	1.17280	4.6912
33	0.46762	1.87048
34	-	-
35	0.00376	0.01504

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36	1.51806	6.07224
37	0.11914	0.47656
38	0.77476	3.09904
39	-	-
40	0,41075	1.643
Total	52.42609	209.70436
Mean	1.310652	5.242609

Source: Field Survey (2020).

4. CONCLUSION AND RECOMMENDATIONS

The study has revealed that timber species stocking in the reserve is quite encouraging and holds good potential for the future. Further logging and other activities that will degrade the forest be halted and controlled. The local communities should be encouraged to depend more on non-timber forest products than logging. The forest needs restocking with fast growing indigenous and exotic tree seedlings. This will enable the regeneration of the forest and prevent extinction of some tree species families.

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