

# Assessment of Avenue Trees in Oyo State Secretariat, Ibadan, Oyo State Nigeria

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## Abstract

This research was aimed to assess and analyze the status of avenue trees in Oyo State Secretariat, Agodi Gate, Ibadan, Oyo State. The trees were identified, enumerated, and measured. Parameters measured were diameter at breast height (DBH) and total height (TH). DBH was measured at 1.3m above the ground level, using measuring tape while the total height was measured with Spiegel relaskop. Data were analyzed for species composition, stand structure, and species diversity using percentage, frequency, diameter, and height class distribution, Shannon-Wiener diversity index, Simpson's Diversity index, and Shannon's equitability. A total number of 154 avenue trees were identified with 11 tree species in all, the trees species that significantly dominate the Oyo State Secretariat Agodi Gate, Ibadan, Oyo State are *Casuarina equisetifolia* with 86 stands and *Elaeis guineensis* with 39 stands other tree species are averagely less than 15 stands. The dominant trees have the frequency and average diameter at breast height of 86 and 54.6 cm respectively and 39 and 66.1 cm respectively, the maximum DBH and height were obtained in *Azadirachta indica* (72.9 cm) and *Newbouldialaavis* (14.3 m). The diversity index revealed that the study area was not diverse.

Keywords: Avenue trees, Urban areas, diversity

## Introduction

Trees are an important component of any environment because of their economic values, ecological functions, genetic resources, and influence on the physiognomy of the forest and environment. Trees exist to serve man even as their products play critical roles in human needs as well as protecting the environment against degradation and providing genetic material for the improvement of cultivated tree crops (Adeyoju, 2001).

Avenue trees are trees that grow or are intentionally planted along public road right-of-ways and are controlled by the relevant authority. They make up a small percentage of the total urban forest, but they have a significant visual and physical impact on the quality of urban life (McPherson *et al.*, 2005; Oyerinde *et al.*, 2018). It may be a single line of trees that plays a vital role in maintaining the

ecological balance of a crowded and polluted environment. They are most effective in providing true shade and a commanding visual contrast between dense landscaping and open space when planted in a group. Moreover, avenue trees are part of the urban forest and in terms of atmospheric carbon reduction, avenue trees proffer the advantage of shortest carbon storage to sustain ecological stability in a teeming and polluted environment (Kiranet *al.*, 2011). In most cases, the trees planted in an avenue will be all of the same species or cultivar to give a uniform appearance along the full length of the avenue (Wallace, 2009).

Trees assessment helps to measure, monitor, and improve tree cover time and combat threats that can lead to tree canopy loss. The goal of tree assessment is to provide decision-makers with detailed metrics regarding the tree canopy that exists in the urban forest. The metrics allow them to not only understand the urban forest in its current form but to plan feasible approaches to increasing urban tree canopy (USDA, 2018). In tree assessment variety of parameters such as DBH, total height, and so on can be assessed for each tree but it is usually based on the aims and objectives of the research or investigation. For each tree, it is important to ensure a good view of the tree.

The avenue trees of Oyo State Secretariat, Ibadan have been established over the years without any substantive record about biometric, management activities, and plans despite diverse benefits such as shade provision, recreation, and opportunities that are derived from them. This perhaps has affected the long-term input of these trees. Assessing these trees will help to establish baseline information about the trees, to improve the sustainable management of the trees. Therefore, the objective of this research is to assess the composition and species diversity of avenue trees in the Oyo State Secretariat, Ibadan, Oyo State.

## **Materials and Methods**

### **Study Area**

The study was conducted in the Oyo State Secretariat Agodi Gate, Ibadan. It is located in latitude 7.4111<sup>0</sup>N and longitude 3.9088<sup>0</sup>E.

### **Data Collection**

The avenue tree diameter at breast height was selected at enumeration. The species and families of the trees to be enumerated were identified through the assistance of a taxonomist. Also, parameters such as DBH and the total height (TH) of each tree would be measured.

### Highlights of Tree Parameters Measured

Measurements were carried out on all the tress stands in the selected areas. Trees in each stand were measured to obtain some variables such as diameter at the breast height (DBH) and the total height. The variables measured are:

- **Total height:** this is the vertical distance between the ground level and the tip of the tree. The height of individual tree stems was categorized into height classes and classified with their percentage frequency
- **Diameter at Breast Height (DBH):** This is the diameter measure taking for a standing tree at height 1.3m above the ground level. This tree variable was taken for trees within the department. If we make use of the diameter tape, the value obtained gives the diameter reading but normal tapes are used, which means we are measuring only the tree circumference. Hence, the DBH is calculated as:

$$DBH = \frac{\text{Tree circumference}}{\pi}$$

### Tree Species Diversity

The following indices were employed following Magurran (2004) and Lu *et al.* (2010) Shannon Weiner Diversity Index:

$$H = \Sigma[(Pi) \times \ln (Pi)]$$

Where,

$p_i$  = proportion of total sample represented by species  $i$ .

$S$  = number of species, = species richness

$H_{\max} = \ln(S)$  = Maximum diversity possible

$E$  = Evenness =  $H/H_{\max}$

Where:

$H$  is Shannon-wiener diversity index;

$S$  is the total number of species in the study area;

$P_i$  is the proportion of  $S$  made up of the  $i$ th species;

Simpsons Diversity index:

$$D = 1 - \frac{\Sigma n(n_i - 1)}{N(N - 1)}$$

Where;

D is Simpson's diversity,

$n_i$  is the abundance of the  $i$ th species and

N is the abundance of the total stand

### Results and Discussion

**Table 1: Species composition and Growth Parameters of the Trees in the Study Area**

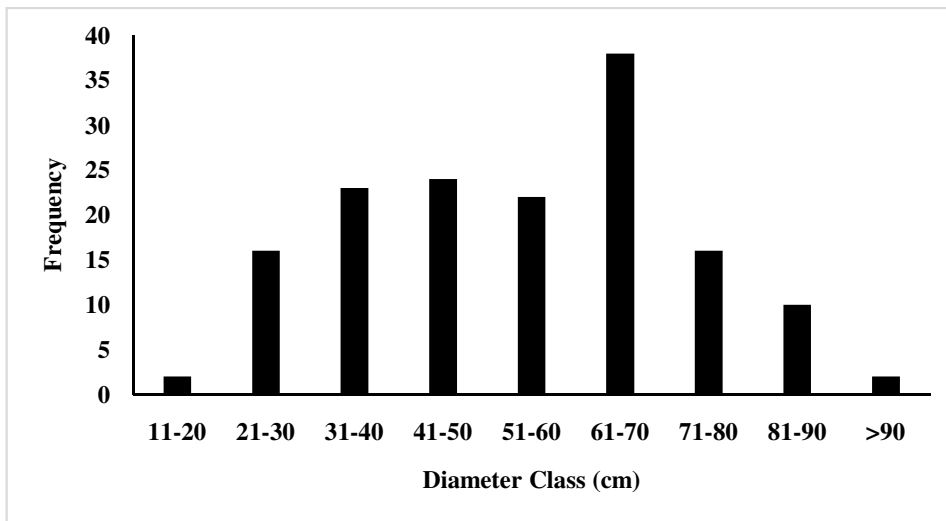
Species	Freq.	DBH (cm)	Height (m)	B.A. (m <sup>2</sup> )	Vol. (m <sup>3</sup> )
<i>A. lebeck</i>	9	51.5	13.3	0.2	3.3
<i>A. indica</i>	1	72.9	12.7	0.4	5.3
<i>C. equisetifolia</i>	86	54.6	13.1	0.3	3.6
<i>E. guineensis</i>	39	66.1	9.6	0.3	3.4
<i>Ficusspp</i>	1	43.5	13.1	0.1	1.9
<i>G. arborea</i>	1	41.6	9.7	0.1	1.3
<i>M. indica</i>	1	50.8	9.7	0.2	1.8
<i>N. laevis</i>	2	38.1	14.3	0.1	1.8
<i>P. guajava</i>	2	45.4	10.4	0.2	3.5
<i>S. mombin</i>	1	71.9	13.5	0.4	5.5
<i>T. radii</i>	11	29.9	9.2	0.1	0.7
Total	154	566.4	127.7	2.6	32.0

Table 1 above showed the species composition and growth parameters of the study area. It was revealed that *Casuarina equisetifolia* is the dominant tree species in the study area with 86 individuals, *Elaeisguineensis* followed by 39 trees. *Azadirachtaindica*, *Ficusspp*, *Gmelinaarborea*, *Mangiferaindica* and *Spondiasmombin* have one individual each. The maximum dbh and height were obtained in *Azadirachtaindica* (72.9cm) and *Newbouldialaevis* (14.3m) respectively. The least was recorded in *Terminaliaradii* (29.9cm) and *Mangiferaindica*(8.7m) respectively. *Azadirachtaindica* and *Spondiasmombin* had the highest basal area with 0.4m<sup>2</sup> and *Ficusspp*. *Gmelinaarborea*, *Newbouldialaevis*, and *Terminaliaradii* had the least basal area with 0.1m<sup>2</sup>. *Spondiasmombin* had the highest volume of 5.5m<sup>3</sup> and *Terminaliaradii* had the least volume with 0.7m<sup>3</sup>.

**Table 2: Diversity Indices of the Trees in the Study Area**

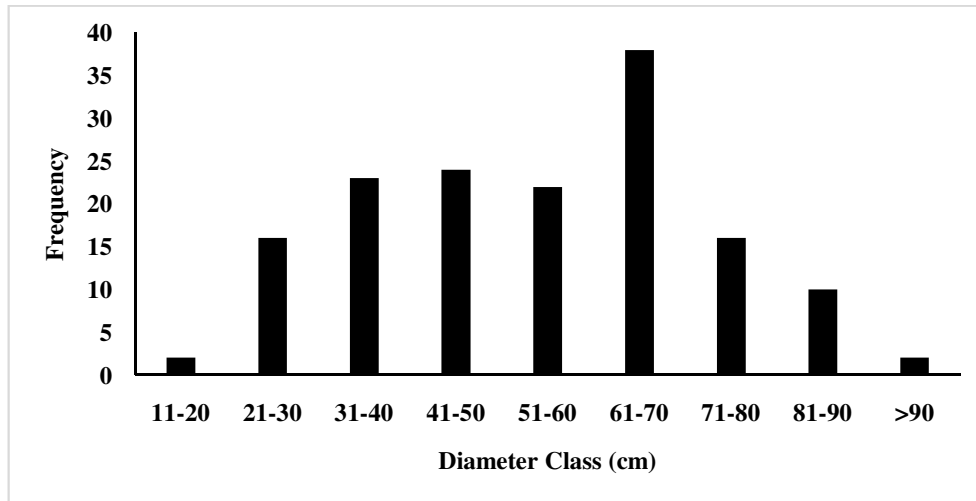
Diversity Index	Values
Richness	11
Individuals	154
Dominance	0.3851
Shannon-Weiner	1.304
Evenness	0.3349

Table 2 presented the diversity indices for the trees in the study area. One hundred and fifty-four (154) individuals belonging to 11 species in 10 families. Shannon Weiner index revealed that the species diversity in the study area is poor with 1.304. Simpson Dominance (1-D) is 74% and evenness is low with 33.49%.



**Figure 4: Diameter Class Distribution of Tree in the Study Area**

The result presented in figure 4 showed that the trees in the diameter class of 61-70cm are dominant with 38 individuals while the least was found in the diameter of 11-20cm with 2 individual tree species.



**Figure 5: Height Class Distribution of Trees in the Study Area**

The result obtained in Figure 5 showed that the trees in the height class of 7-12m are dominant with 78 while the least was found in the height class of 1-6m with 9 individuals.

### Discussion

The study records composition, structure, and species diversity in State Secretariat, Oyo State. One of the most important characteristics of tropical rainforest ecosystems is species richness. Regardless of the plot size, the number of tree species in this tropical ecosystem is far greater than any other forest environment and surroundings (Adekunle, 2006; Adeduntan and Olusola, 2015). This result indicated that in Oyo State secretariat tree species like *Albizialebeck*, *Casuarina equisetifolia*, *Elaeisqueensis*, *Newbouldialaevis*, *Psidiumguajava*, and *Terminalia radii*. This negates the findings of Oyerinde et al. (2018) who reported *Gmelinaarborea*, *Delonixregia*, *Acacia auriculiformis*, *Terminalia mentally*, *Leucaenaleucocephala* and *Azadirachtaindicato* be the dominant trees on the Federal University of Technology Akure campus. Acheneje and Olorunmaiye (2015) also reported different species from those found within the study area. This could be attributed to the uniqueness of the study area in terms of the choice of the government or those in the management. According to Agbeja and Akindele (2016), the species of trees in Ibadan primarily provide environmental services such as improved quality of air, shade, and esthetic values. The availability of these species in the study area could also be to the qualitative benefits. Also, the presence of *Elaeisqueensis*, *Newbouldialaevis*, *Psidiumguajava* is in line with Kohliet al. (1998) that the concept of urban forestry includes not only aesthetics but also functions for environmental and socio-economic uplift including serving as a seed source.

Biodiversity indices are useful tools to compare forest composition and similarities of different species. The higher the value of an ecological index, the higher the species richness (IIRS 2002). Shannon-Weiner index revealed that the species diversity in the study area was 1.304. This negates the findings of Adekunle (2006) and Onyekwelu *et al.* (2008) who reported the range of Shannon–Wiener diversity to be between 1.5 and 3.5. Also, it negates the findings of Oyerinde *et al.* (2018) who reported Shannon–Wiener diversity index in the Federal University of Technology (FUTA) campus to 1.97 while it was 2.50 in Adekunle Ajasin University, Akungba Akoko (AAUA). But the result of this study falls within the range of 1.2–1.4 reported for sacred groves in Tanzania (Mgumia and Oba, 2003).

According to Pretzsch (2014), the dominance of a tree species in an environment is greatly influenced by its structural value and functions. The result obtained showed that the trees in the height class of 7–12m are dominant while the least was found in the height class of 1–6m. The trees in the diameter class of 61–70cm were dominant while the least was found in the diameter of 11–20cm. This contradicts the findings of Adeyemi and Adesoye (2012) who reported that the avenue trees comprise significant large trunks, indicating that most of the avenue trees have been planted over some years. The results also negate the findings of Olokeogun *et al.* (2020) who reported higher values both in diameter and height class distribution for avenue trees in the Polytechnic Ibadan. Kohli, *et al.* (1998) reported that avenue trees with a long lifespan are usually characterized by large trunks.

### **Conclusion**

Some of the avenue trees in the study area include but are not limited to *Albizia lebeck*, *Azadirachta indica*, *Casuarina equisetifolia*, *Elaeis guineensis*, and *Ficus spp.* A total of one hundred and fifty-four (154) individuals were found in the study area. The Shannon–Weiner species index in the study area was 1.304. Trees with the height class of 7–12m were the most dominant and the trees with 61–70cm diameter class distribution were also the most dominant.

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