

# Survey of Tree Species Used in Erosion Control and their Characteristics in Kaduna Metropolis

Ogunkalu, O. A<sup>1</sup>, Adedapo J.O<sup>2</sup>, Osunsina O<sup>3</sup>

<sup>1</sup>Department of Forestry Technology, Federal College of Forestry Mechanization, Afaka, Kaduna, Kaduna State, Nigeria

<sup>2</sup>Department of Horticulture and Landscaping, Federal College of Forestry Mechanisation, Afaka Kaduna State

<sup>3</sup>Department of Basic Sciences, Federal College of Forestry Mechanisation, Afaka Kaduna State

**Abstract:** *This study was used to assess the trees species used for erosion control in Kaduna Metropolis, Kaduna state. A total of one-hundred (100) questionnaires were randomly administered among the four purposively selected four towns within the two major local governments in the study area. The two (2) towns selected in the two Local Government Area were Angwa-Rimi and Kawo new extension in Kaduna North and Bar'nawa and Sabo respectively Kaduna South. Twenty five (25) questionnaires each were randomly distributed across age and sex in each of the four (4) selected towns while only ninety were retrieved for analysis. Data analysis was achieved through descriptive analyses which include frequency distribution table and percentage. Results show that majority of the respondents that plant trees around their resident are male which represent (62.0%), while their female counterpart are (42.2%). Also, based on marital status, majority of the respondents are married (66.7%), (3.3%) of respondents are widow, while (27.8%) of the surveyed population are single, while educationally, majority of the respondent are secondary (53.3%), followed by the tertiary which is (20.0%), respondents with primary education represent (16.7%) of the total population of respondents surveyed. The trees species identified in the study area include *Eucalyptus spp*, *Azadiracta indica*, *Psidium guajava*, *Terminalia catapa*, *Mangifera indica*, *Anacardium occidentale*, *Khaya senegalensis*, *Gmelina arborea*, *pinus spp*, *Carica papaya*, *Moringa olifera*, *Gliricidia sepium*, *Ficus spp*, *Azalia spp*, *Balanite egyptiaca*, *Borassus aethiopum*, *Persae americana*, *Polyantha longifolia* etc. According to the respondents, the following characteristics make these tree species the preferred environmental trees for erosion control: Their fast growing ability, deep rooting pattern coppicing ability, ability to produce large crown size, tolerance to adverse weather condition, ability of trees to produce broad leaves for shade production, erosion protection, and their ability to provide fruits among others. In conclusion, urban tree planting is a potential strategy to check water, wind erosion and other ecological problems; thus, there is need for the dwellers in the study area to intensify efforts towards planting tree around their houses, without this, the influx of people, urbanization as well as industrialization will create deleterious environmental hazard in the study area. It is recommended that shelter belt should be established in area where menace of erosion and other environmental problems were identified, sensitization of the populace on the importance of urban trees particularly in combating environmental problems must be intensified.*

**Keywords:** Tree Species, Erosion Control, Urban Forestry, Characteristics

## 1. Introduction

Urban forestry is one of the promising strategies to address the multifaceted problems associated with urbanization, although the planting of trees have been an integral and important part of human settlements in Nigeria and most importantly in Northern region where there is extreme temperature during the dry season. Trees provide enormous benefits locally in terms of provision of fruits, seeds, leaves, fodder and plank for furniture making and designs it also serve micro-climate and global environmental functions. This is why indigenous people plant trees or leave trees on their on their farmland to providing shade during hot weather, fuel wood provision, fruits and nuts etc. They also plant trees along rivers and stream banks to reduce its rate of evaporation due to excessive sunlight radiation, and along major path. Therefore, tree planting and management around settlements in Nigeria particularly in the study area is functions of many factors which include their environmental, nutritional, social, and beautification or aesthetic importance.

Urbanization and growing urban population necessitate urban forestry practices to cushion the negative effects of urbanization, industrialization and enhance the benefits of tree planting even in highly industrialized cities like Kaduna metropolis in order to providing essential goods and services. The current urban forestry practices are services and amenity

oriented. Urban green spaces with trees are important roles player for healthy, livable and sustainable cities. Trees and green spaces help keep cities cool, act as natural purifier and noise absorbers, improve microclimates, conserve biodiversity, protect and improve the quality of natural resources, including soil, water, vegetation and wildlife. Trees contribute significantly to the aesthetic appeal of cities, thereby helping to maintain the psychological health of their inhabitants. Consequently, urban forestry management is an important strategy to improve urban living and working environments (Jiang, 2003). Thus, this necessitates the following objectives:

To study assessed development of urban forestry, identified different urban trees species in the study area, to identify the characteristics exhibited by the choice species and other benefits of urban trees in the study area.

## 2. Methodology

### The study area

The study was carried out in Kaduna metropolis consist of Kaduna-north, Kaduna South, part of Chikun and Igabi local government area of Kaduna state. The state is located between 9<sup>0</sup> and 2<sup>1</sup> north of the equation and longitude 6<sup>0</sup> and 9<sup>1</sup> east of the prime meridian. The state shares boundary with Abuja in south east, Katsina, Kano, and Zamfara state in the

North West. The mean annual temperature varies between 24<sup>o</sup>c and 25<sup>o</sup>c. the length of the rainfall varies from 150 days to 190 days with an annual rainfall ranging between 1500mm and 2000mm north and south respectively, relative humidity is low ranging between 20 and 40 percent in July. The vegetation is divided into the northern guinea savannah in the north and southern guinea savannah in the south.

**Data collection**

Majorly, primary data was used for this study, these data was generated through the use of well-structured questionnaires. These questionnaires were distributed among the dwellers of the selected communities.

**Sampling Techniques**

Multi stage sampling techniques was used for this study. The choice of the study area was due to the concentration of urban trees in the selected locations, this resulted from the recognizance survey prior data collection. On this criterion, two (2) LGA (Kaduna North and Kaduna south) were selected out of the four (4) local governments (LG) within the study area. Two towns each were purposively selected within each LGA based concentration of urban trees, making a total of four (4) towns. One-hundred (100) questionnaires were randomly distributed for the study, such that twenty-five (25) questionnaires each were randomly distributed across age and sex in each of the four (4) selected towns.

**Data analysis**

Data were analyzed through descriptive analysis which includes frequency distribution table, percentage.

**3. Results and Discussions**

**Socio-economic characteristic**

Some socio-economic characteristic are known to influence tree species use for erosion control in Kaduna Metropolis, Kaduna State. The variables analyzed in the study include gender, age education and marital status.

**Table 1:** Socio-economic characteristics of sample respondents

S/N	Variable	Frequency	Percentage (%)
1	<b>Gender</b>		
	Male	52	57.8
	Female	38	42.2
2	<b>Age</b>		
	10 – 20	6	6.7
	21 – 30	40	44.4
	31 – 40	27	30
	41 – 50	14	15.6
	50 – Above	3	3.3
3	<b>Education</b>		
	Primary	15	16.7
	Secondary	48	53.3
	Tertiary	18	20
	No formal education	9	10
4	<b>Marital status</b>		
	Married	60	66.7
	Single	25	27.8
	Widow	3	3.3
	Divorce	2	2.2
	<b>Total</b>	<b>90</b>	<b>100</b>

Sources: field Survey, 2017

Table 1: revealed that 44.4% of sampled respondents were between the age brackets of 21 – 30years. This implies that they were at middles and economically active age. 57.8% are male and 42.2% are Female. Their shows that male counterpart are more involved in planning of tree species for erosion control in the study area. 53.3% of sampled respondents had secondary education and 20% had tertiary education while 10% had no formal education. However, 66.7% of the sample respondents are married and 27.8% are single. This implies that majority of the sampled respondents in are married.

**Tree species used for erosion control and their families**

Various tree species were used for erosion control either directly planted or indirectly planted. However, below shows the major tree species used for erosion control and families in the study area.

**Table 2:** Tree species for erosion control and their families in the study area

S/N	Tree species	Family	Frequency	Percentage %
1	<i>Azadirachta indica</i>	Meliaceae	10	3.58.
2	<i>Gmelina arborea</i>	Meliaceae	28	10.04
3	<i>Mangifera indica</i>	Anacardiaceae	10	3.58.
4	<i>Khaya senegalensis</i>	Meliaceae	4	1.43
5	<i>Tectona gradis</i>	Bignoniaceae	2	0.72
6	<i>Psidium guayava</i>	Dipterocarpaceae	7	2.51
7	<i>Parkia biglobosa</i>	Mimosaceae	5	1.79
8	<i>Anacardium occidentale</i>	Anacardiaceae	9	3.23
9	<i>Eucalyptus sp</i>	Myrtaceae	8	2.87
10	<i>Terminalia catapa</i>	Combretaceae	20	7.17
11	<i>pinus spp</i>	Pinaceae	15	5.38
12	<i>Carica papaya</i>	Caricaceae	20	7.17
13	<i>Moringa olifera</i>	Moringaceae	18	6.45
14	<i>Gliricidia sepium</i>	Leguminosae	10	3.58.
15	<i>Callotropis procera</i>	Asclepiadaceae	8	2.87
16	<i>Azalia spp</i>	Fabaceae	15	5.38
17	<i>Balanite egyptiaca</i>	Zygophyllaceae	7	2.51
18	<i>Citrus sinensis</i>	Rutaceae	7	2.51
19	<i>Borassus aethiopum</i>	Arecidae	10	3.58.
20	<i>Persae americana</i>	Lauraceae	17	6.09
21	<i>Polyantha longifolia</i>	Annonaceae	20	7.17
22	<i>Ficus pilota</i>	Moraceae	19	6.81
23	<i>Tamarindus indica</i>	Meliaceae	7	2.51
24	<i>Delonix regia</i>	Fabaceae	10	3.58
25	<i>Jatrova caucus</i>	Euphorbiaceae	7	2.51
26	<i>Citrus limon</i>	Rutaceae	8	2.87
	<b>Total</b>		<b>279</b>	<b>100</b>

Multiple responses\*\*

Sources: field Survey, 2017

Table 2: revealed that majority (10.04%) of the respondents' plant *Gmelina arborea* around their resident, (7.17%) of the respondents also plant *Terminalia catapa*, *Carica papaya*, *Polyantha longifolia* in their surrounding, (6.81%) of them grow trees like *Ficus pilota*, (6.45%) plant *Moringa oleifera*, which belong to the family Moringaceae, (5.38%) of the respondents plant *Azalia spp* around their houses. Other species identified by the respondents in the study area includes: *Tamarindus indica* (2.51%), (3.58%) of the respondents plants *Borassus aethiopum*, *Mangifera indicia*, *Delonix regia*, *Gliricidia sepium*, *Azadirachta indica*, *Khaya senegalensis*, *Tectona gradis*, *Psidium guayava*, *Parkia biglobosa*, *Anacardium occidentale*, *pinus spp* etc. Though, majority of the respondents plant these trees together that is,

in combination of two or three in their compound. The choice of species is determined by house owner objective and desires.

(Babalola, 2010) reported that urban forestry goals most be suited to their city’s social, economic and geographical context. (Faleyimu, 2014) documented in his report that the respondents in Okitipupa do not just want trees of any kind in their environment, but have specific preference for the trees. The diversity, stability, and functionality of urban forests are directly influenced by the type of trees selected to plant. Such individual desire or objectives include: shade provision, erosion control, aesthetic value medicinal and fruits production, and some non timber forest products of paramount importance among others. *Gmelina arborea*, *Terminalia catapa*, *Carica papaya*, *Polyantha longifolia* are the most preferred which might be due to their ability to satisfy their objective of establishment. (Carter, 1994) documented in his summation that urban forestry includes the management of individual as well as groups of trees and is not restricted to planted trees alone, but also includes naturally grown trees within urban areas for their multiple benefits

**Characteristics of tree species for erosion control**

Trees species exhibit various characteristics both physically and chemically. This however depends on the usage the tree species. The result revealed some of the characteristic exhibited by the tree species in the study area.

**Table3:** Characteristic of tree species in the study area

S/N	Characteristic exhibited	Frequency	Percentage %
1	Rooting system	25	27.78
2	Fast growing	30	33.33
3	Coppicing ability	15	16.67
4	large crown size	10	11.11
5	Evergreen ability	10	11.11
	<b>Total</b>	<b>90</b>	<b>100</b>

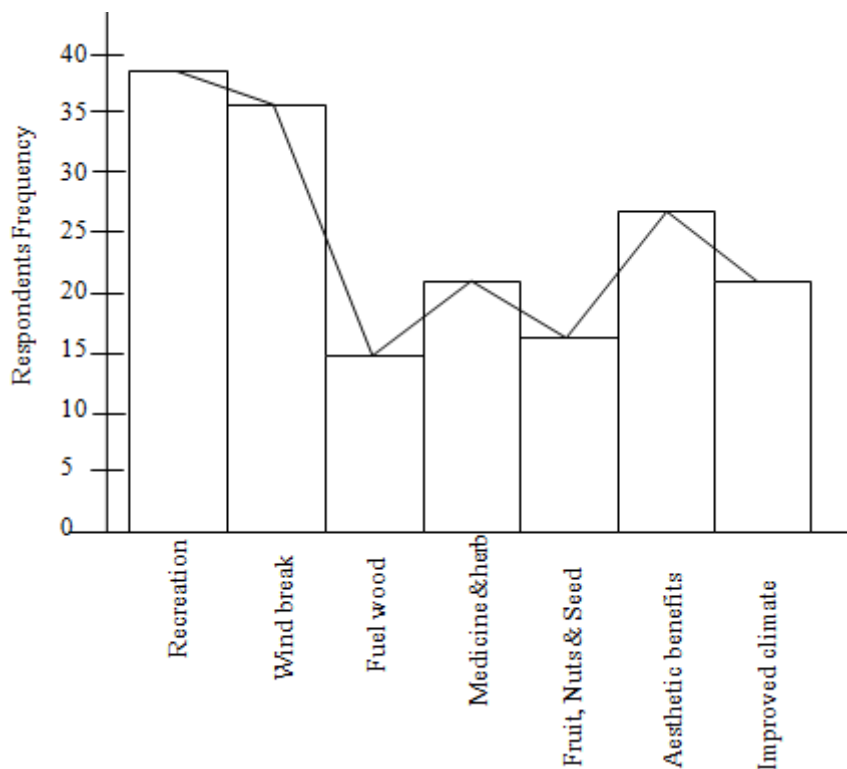
Sources: field Survey, 2017

Table 3: revealed that the major (33.33%) characteristic exhibited by the trees species used for erosion control in the study area is the fast growing characteristic which is closely followed by rooting system (27.78%), Coppice ability (16.67%) while the evergreen ability and large crown size are the least (11.11% each) characteristic.

These revealed while *Gmelina arborea* is the most preferred species for erosion control in the study area because the species possess partially all the characteristic in the table. This agrees with (Faleyimu, 2014) who reported that the respondents in Okitipupa do not just want trees of any kind in their environment, but have specific preference for the trees.

**Other benefit derived from the tree species in the study area.**

Despite the function of these identified species in erosion control. There are other benefits of urban plants as identified by the respondents, such benefits include: provision of fruits and seeds, medicine, poles, fuel wood, micro-climate amelioration and honey. The figure below reveals the level of benefits derived from urban trees in the study area.



**Figure 1:** Other benefits derived from the tree species

Figure1: shows that recreation is highest benefits derived from urban trees followed by windbreak, aesthetic benefits, improve climate, medicinal benefits, fruits & seeds, while

fuel wood is the least benefits of urban trees in the study area. All these benefits are attribute of urban trees, though majority of the respondents identified the highest benefits of

urban trees serving the purpose of recreation and this is followed by windbreak, aesthetic benefits, This is in line with (Rouchiche, 1999) who defined urban forestry as an integrated citywide approach to the planting, care, and management of trees in the city to secure multiple environmental and social benefits for urban dwellers. (Carter, 1994) viewed urban forestry as the management of trees for their contribution to the physiological, sociological and economic well being of the urban society. According to (Babalola, 2010) and (Nowak *et al*, 2001), a prime focus in the past for developed countries was the management of urban forest for aesthetic purposes, whereas now, as urban population have grown, intensified, and expanded, it has shifted to management for enhancing ecosystem services. In developing countries, a more important focus may be managing vegetation to provide materials such as firewood, fruits and timber at local scale. Over time, each city and region may manage its urban forest for an increasingly broader and more inclusive range of benefits. Faleyimu, (2014)

#### Identified Constrain Associated with Urban trees in the study Area

The constrains of urban trees as identified by the respondents in Kaduna metropolis includes: harbors pest and diseases, harbors dangerous animals, expensive to maintain, difficult to get desired species, Seasonal variation(Weather), they constitute threat later in life, they serve as hide out to thieve, and their litters constitute dirt to the environment

S/n	Constraints	Frequency	Percentage %
1	Harbors pest and diseases	30	16.13
2	Harbors dangerous animals	24	12.90
3	Expensive to maintain	32	17.20
4	Difficult to get desired species	10	5.38
5	Seasonal variation(Weather)	28	15.05
6	They constitute threat later in life	20	10.75
7	They serve as hide out to thieve	12	6.45
8	Their litters constitute dirt to the environment	30	16.13
	Total	186	100

#### Multiple response\*\*

The table above shows that (16.13%) stated that urban trees harbors pests and diseases, (12.90%) of respondents identified that urban trees harbors dangerous animals, (17.20%) of them said that urban trees are expensive to manage and maintain, (15.05%) of the respondents attributed the problems of urban trees their seasonal variation (weather), (10.75%) of the respondents attributed the constraint of urban trees to constitution of threat to life and properties later, (16.13%) of the respondents said that urban trees produces litters or dirt to the environment, (6.45%) traced the problems of urban trees to serving as hide out to thieve. Hence, from the result, it was observed that majority of the respondents relate the constraints of urban tree to harbors pests and diseases, it harbors dangerous animals, expensive to manage and maintain, seasonal variation (weather), and that urban trees produces litters or dirt to the environment.

#### 4. Conclusions and Recommendations

Tree planting in urban cities is a prospective strategy to check soil, wind erosion and other ecological problems of possible deleterious effects such as: desertification, erosion, flooding, wind storm etc on the inhabitant of such community. Thus, there is need for the dwellers in the study area to intensify efforts towards tree planting around their houses, without this, the rate of influx of people, urbanization as well as industrialization will create deleterious environmental hazard in the study area. It is recommended that shelter belt should be established in area where the menace erosion and other environmental problems are identified, sensitization of the populace on the importance of urban trees particularly in combating environmental problems should be intensified.

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