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Environmental Benefits of Urban Trees: A Case Study of Gwagwalada Town in the Federal Capital Territory of Nigeria

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ABSTRACT

The study examined the importance of urban trees in Gwagwalada town in the Federal Capital Territory of Nigeria. Purposive sampling technique was used to select thirty respondents for the study. Data obtained for the study were collected in the months of June and July of 2021 and descriptive statistics was used to analyze the data collected. The findings of the study showed what residents of the town value most about urban trees is the natural ventilation that they provide as indicated by nearly 67% of the respondents (73%) also indicated that it is very important to them to protect mature trees from being cut down either on private or public property; 90% of the respondents indicated that they will support one-way street and creative design in order to protect mature trees. In spite of the benefits of urban trees, 53% of the respondents revealed that they will support removal of trees from public property if they constitute threats to life and property. It is recommended that rural and urban dwellers should promote trees planting and protection as they play significant roles in providing natural ventilation, fruits and also help in pollutants removal, rain water interception and erosion prevention.

Keywords

Nigeria.

Fruits, Trees, Ventilation, Shade, Urban.

Introduction

Due to increasing population, urban areas are becoming increasingly choked up with little or no consideration for the environment. Municipal authorities face difficulties in developing regulations to protect the environment and the ecosystem services that it provides in order to ease demands on built infrastructure while creating a sustainable, healthy and livable environment for their citizens [1]. The significance of trees and the ecosystem services that they provide cannot be over-emphasized. Trees are regarded as "decentralized green infrastructure" and can be essential instruments for managing water, especially in an urban ecosystem [2]. Trees help in intercepting rain water and thereby help in preventing runoff that would have destroyed houses and infrastructure. Trees are of immense benefits as some of them produce valuable and health enriching fruits. They come in different sizes, heights and colours. They serve as wind breaks, protect the soil structure and help in beautifying the environment. They also help to provide shade during hot weather and cool the environment.

Heat stress is a major concern in urban areas due to the urban heat island (UHI) effect and this refers to elevated surface temperatures present in cities compared to their rural surroundings [1]. The UHI effect is a result of solar radiation being first stored as heat in paved surfaces, buildings, and other components of the built environment, and then re-radiated back into the atmosphere; the presence of additional heat sources in urban areas, such as internal combustion engines, and reduced cooling from evapotranspiration due to the relative lack of vegetation also contribute to the UHI and this effect is particularly pronounced at night [1]. The health effects of elevated temperatures are clear: increased risk of death from cardiovascular, respiratory, and related disease [3]. For urban residents in developed societies, the major environmental sources of negative health effects are air pollution (in form of ozone (O3), nitrogen oxides (NOx), sulfur dioxide (SO2), and particulate matter (PM)) [4,5]. Trees can filter gaseous pollutants from the air through stomatal uptake, while airborne PM is generally reduced through deposition onto leaves and other plant surfaces [1]. [6] reported that air pollution removal by urban trees resulted in the avoidance of 670,000 incidences of acute respiratory symptoms, 430,000 incidences of asthma exacerbation, and 850 incidences of mortality. A similar study conducted in Portland, Oregon, United States of America by [7] estimated that annual NO2 removal by trees was responsible for 21,000 fewer incidences of asthma exacerbation in children, 54 fewer emergency room visits, and 46 fewer hospitalizations, with an economic value of \$7 million. According to a study by [8], it was reported that in the United States alone, trees provide \$18.3 billion in annual value due to air pollution removal, carbon sequestration, reduced building energy use and avoided pollutant emissions. With increasing urbanization come the problem of environmental pollution and other problems. It is against this backdrop that this is being conducted in order to highlight the benefits of urban trees and also to promote tree planting and to protect them not only for today's need but also for the use of future generations.

Materials and Methods

Study Area

The study was carried out in Gwagwalada town in Gwagwalada Area Council which is one of the six area councils within the Federal Capital Territory of Nigeria (FCT). The climate of the FCT is basically controlled by inter-tropical convergence zone and rain normally occurs south of the zone; the mean annual rainfall ranges from 1145mm-1613.7 mm [9]. The FCT records its highest temperatures and greatest diurnal ranges during the dry season months when the maximum temperature is between 30.4°C-35.1°C, and during the rainy season, the maximum temperature ranges between 25.8°C and 30.2°C [9]. Gwagwalada is a cosmopolitan town where people of different ethnic groups with diverse culture reside. It is also where many civil servants, farmers, business men and business women dwell.

Sampling Technique and Sample Size

Gwagwalada town was purposively chosen for this study because it is one of the hottest towns in north central Nigeria and the residents know how essential trees are under such hot climatic condition. Thirty respondents were purposively selected for the study.

Data Collection and Analysis

Cross-sectional data were collected through the use of wellstructured questionnaires distributed to the residents of the town. The data gathered through the use of questionnaires include socioeconomic characteristics of the respondents, importance of urban trees, conditions for removal of trees from public property, the importance of having trees on private property, saving mature trees from being cut down on public and private property etc. Data obtained from the study were analyzed using descriptive statistics.

Results and Discussion

Socio-economic characteristics of the respondents

According to the results in Table 1, 60% of the respondents were male while 40% were female. A further break down of the results shows that 83% of the respondents were between 20-49 years of age, an economically active age group which also signifies productivity. [10] observed that respondents within this age bracket are innovative individuals who will support and promote the importance of urban trees as there is an increasing awareness on the need to have a greener city where there is cleaner air and less pollution.

Fable 1	l:	Socio-e	economic	charac	teristics	of the	respondents.
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Variables	Frequency	Percentage
Sex		
Male	18	60
Female	12	40
Total	30	100
Age		
<20	2	7
20-29	10	33
30-39	9	30
40-49	6	20
50-59	3	10
Total	30	100
Marital status		
Single	13	43
Married	17	57
Total	30	100
Level of education		
Primary school	1	3
Secondary school	6	20
University undergraduate	6	20
Tertiary education	17	57
Total	30	100

Source: Field survey, 2021.

Significance of urban trees

Trees play pivotal roles not only in natural environment but also in-built environment. About 67% of the respondents indicated that what they value most about urban trees is the natural ventilation they provide especially in a hot environment like Gwagwalada town. This is in consonance with the findings of [11] that strategic placement of trees in urban areas can cool the air by between 2 °C and 8 °C. Provision of fruits is another factor that the respondents noted that actually endear them to urban trees as indicated by nearly 47% of them. This is in tandem with [11] that trees can provide food such as fruits, nuts and leaves. Other benefits of urban trees indicated by the respondents as shown in Table 2 include aesthetic benefit, provision of shade, serving as wind break, rain water interception and erosion prevention, carbon storage, removal of pollutants etc.

Variables	Frequency*	Percentage
Natural ventilation	20	66.67
Aesthetics	13	43.33

5	16.67
14	46.67
9	30.00
11	36.67
5	16.67
10	33.33
1	3.33
	5 14 9 11 5 10 1

Source: Field survey, 2021.

*Multiple responses

The relevance of having trees on private property

Having one's property is what a lot of people desire whether it is land or residential building. As shown in Table 3, 80% of the respondents revealed that it is very important for them to have trees on their private property. This is in agreement with the work of [12] that planting trees especially large species of trees and maintaining them till they reach maturity results in a lot of benefits. [11] also noted that landscaping, especially with trees, can increase property values by 20%.

Table 3: The importance of having trees on private property.

Variables	Frequency	Percentage
Very important	24	80
Somewhat important	4	13
Not very important	2	7
Total	30	100

Source: Field survey, 2021.

Protection of mature trees

Protecting mature trees either on public or private property should be of great importance to everyone going by the roles that trees play in the environment. The results from Table 4 show that 73% of the respondents indicated it is very important to them to protect mature trees from being cut down either on private or public property. This agrees with the work of [13] that it is important to protect trees from damage. As further shown by Table 5, 90% of the respondents revealed that they will support one-way street and creative design in order to protect mature trees from being cut down.

Table 4: Saving mature trees from being cut down.

Variables	Frequency	Percentage
Very important	22	73
Somewhat important	2	7
Not very important	5	17
No opinion	1	3
Total	30	100

Source: Field survey, 2021.

 Table 5: One-way Street and creative design in order to protect mature trees.

Variables	Frequency	Percentage
Yes	27	90
No	3	10
Total	30	100

Source: Field survey, 2021.

Removal of trees from public property

Based on the results in Table 6, 53% of the respondents revealed that they will support removal of trees from public property if they are threats to life and property. This is in tandem with the work of [13] that tree removal is suggested only in cases of extreme hazard. Also, 43% of them indicated that they will support trees removal from public property if criminals are using them as their hide-out as [14] found out that smaller, view-obstructing trees are associated with increased crime.

Variables	Frequency*	Percentage
Criminals hide-out	13	43.33
Invasion by animals	6	20.00
Threat to life and property	16	53.33
No opinion	2	6.67

Source: Field survey, 2021.

*Multiple responses

Conclusion

Urban trees have numerous advantages such as natural ventilation that they provide, aesthetic benefit, shade provision, carbon storage, fruits provision etc. as indicated by the respondents interviewed for the study. Also, from the findings of the study, it is clearly seen that the residents of the town attach so much importance to urban trees as 80% of them revealed that they will like to have trees on their private property and 90% of them also indicated that they will support one-way street and creative design in order to protect mature trees. It is therefore recommended that rural and urban dwellers in Nigeria should promote trees planting and protection in order to promote environmental sustainability.

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