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Perception of Urban Trees at Main Campus of University of Ilorin, Ilorin, Kwara State, Nigeria

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ABSTRACT

Trees exist as part of urban setting in different parts of the world; however, there is inadequate information on people's perception about urban trees within their immediate environment. This study therefore assessed perception of people on trees at main campus of University of Ilorin. A stratified sampling technique was adopted to survey trees on the campus, while structured questionnaire was administered on staff and traders on campus. A total of 2,468 trees were surveyed on the campus, comprising of 54 different species. More than half of the respondents indicated their preferences for shade producing trees (59.7%) and trees producing edible fruits (59.7%). Majority of the respondents agreed that they love to be (91.2%) and prefer to work (74.8%) in tree environment. However, less than half (41.3%) agreed that having trees around office environment can improve job satisfaction. On the environmental services provided by the campus trees, 84.8% agreed that the tree can mitigate the effect of climate change; 84.9% agreed that the trees help to purify air quality, 68.7% disagreed or did not know if trees can help to reduce noise pollution, and only 37.7% agreed that tree on the campus can serve as anti-stress. Majority of the respondents (91.7%) agreed to the assertion that trees should be managed to obtain its full benefits ($p=0.03$, $\chi^2=39.05$). For the management of trees on campus to be effective, there is a need for more awareness creation on benefits of trees, and participation of relevant stakeholders in management strategy.

Keywords: Urban trees, Benefits of trees, Preference for trees, environmental services, Tree species

INTRODUCTION

Urban forests include trees and forests located in cities, including ornamental, street and parkland trees, protected forests and green areas (Kuchelmeister, 2000). As one of the major components of urban forests, trees are crucial to maintaining environmental quality (Yanga *et al*., 2005; Nowak *et al.*, 2006a; 2006b; Escobedoa and Nowak, 2009; Escobedo *et al*, 2011). Trees in urban forests have been reported to affect local and regional air quality by removing atmospheric pollutants and chemicals from the vegetation, altering urban microclimates by lowering temperatures through shading and evapotranspiration, changing wind patterns, modifying boundary layer heights, and reducing building energy use and consequent emissions from power plants (Beckett *et al.*, 2000; Singh, 2002). Urban trees also influence global climate change through direct removal of greenhouse gases from the atmosphere and by affecting emissions from energy production (McPherson *et al*., 1999; 2005).

Trees in academic institutions located in cities are part of urban forests. Trees are deliberately spared or planted in academic environments for many reasons including aesthetic and other environmental services (Egunjobi, 1989; Babalola, 2010; Gutscher and Bauer, 2011). However, few studies have been conducted with respect to people's perception and preference for such trees in academic environments. This therefore calls for survey of campus occupants in academic institutions to determine their preferences for trees around them and their perception about tree management strategy. Although trees exist in many different parts of the world, however management strategies for trees may differ widely. According to Dwyer (1992), planning and management of trees should focus on how forests and trees can best meet people's needs. Past planning and management efforts have not been as effective as they might have been because planners and managers have underestimated the potential benefits that urban trees and forests can provide, and have not understood the planning and management efforts needed to provide those benefits, particularly the linkages between benefits and characteristics of the urban forest and its management. For effective management of trees, it is therefore essential to have basic data on tree species composition and perception of people directly interacting with such trees. Such information on trees is useful for tree managers seeking to maximize species diversity and the environmental benefits provided by trees. In the present study, it is envisaged that information generated from the survey will assist in building tree database for the campus, as well as in determining appropriate local management and

conservation strategies from the perceptions of the people on campus.

In another perspective, in as much as tree species diversity are location specific, this may likely influence perception of people on trees around them. Despite this, there is no concrete evidence to link people's perception to environmental services provided by trees within their immediate environment. As revealed from preliminary literature searches, there is no information on perception of people on the campus trees. The study is therefore aimed at addressing two pertinent questions on people's perception of urban trees on the campus: (i) What are the perceptions of people within the academic environment on trees around them? (ii) Is there any linkage between people's perception of trees and the benefits provided by the trees? To answer these questions, we surveyed the perceptions of people at University of Ilorin, and analysed this against the benefits that the trees provide. However, in as much as the study is localised, it is envisaged that the findings could initiate further research in other academic environments and lessons therein could further assist in formulating appropriate management strategy for urban trees especially in academic institutions.

METHODOLOGY

Study area

The study was carried out on the main campus of University of Ilorin. The University is located in the ancient city of Ilorin, the capital of Kwara State. The city is strategically located at the geographical and cultural confluence of the North and South of Nigeria (Wikipedia, 2015). The University is owned by the Federal Government of Nigeria and was established in August 1975. From three faculties in 1976, the University has risen to fifteen faculties by 2015.

Sampling procedure for trees survey

A stratified random sampling technique was adopted to survey trees on the campus. The campus was divided into four strata (academic area, administrative area, business area, student halls, and religious area) and each stratum was further divided into sub-strata for easy sampling of the trees. All the trees within each of the sub-strata were counted and identified to species level with their scientific, local and family names. Species relative frequency (RF) was calculated for each tree species using equation (1):

$$RF = \left(\frac{ni}{N}\right) \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where: N = Total number of species in the sampled area, and *ni* = number of individual species

Survey of the Campus Occupants

Structured questionnaire was administered on the academic staff, non-academic staff and the final year students in twelve departments, as well as to traders to determine their perception and preference for trees on campus. The traders are the people that engaged in selling of products and rendering of services under trees at the University campus. These categories of people were selected because they directly interact with trees on daily basis. Prior to administration of the questionnaire, current list of the faculties in the University were obtained from the 2014/2015 Year Planner. Then, twelve faculties with students in final year were purposively selected out of the fifteen faculties indicated in the Year Planner. The Faculties of Basic Medical Science, Clinical Science and Environmental Science were excluded from the sampling because they were not located on the Permanent Site where the study was carried out. Also, Faculty of Environmental Science was excluded because it has no final year students. The lists of the departments within each of the selected faculties were then collected. New departments without final year students within the selected faculties were also excluded. Twelve departments, one from each of the twelve faculties, were then randomly selected. A total of 190 questionnaires were administered on the respondents, however 153 copies of the questionnaire were retrieved and analysed, giving a percentage retrieval of 83.7%. The questionnaire was designed to assess the people's perceptions on trees on the campus with focus on the following: perception of trees on campus; types of trees preferred; and management strategy for the campus trees.

RESULTS

Sampled tree species on the campus

As presented in Table 1, a total of 2,468 trees were surveyed on campus, consisting of 54 different tree species. *Daniella oliveri* had the highest individual trees with 444 trees, which accounted for 17.99% of the total trees inventoried. This was closely followed by *Gmelina arborea* (10.25%) and *Prosopis Africana* (10.0%). Other trees with more than 100 individual trees include: *Azadiractha indica* (7.29%), *Polyathia longifolia* (4.8%), *Vitellaria paradoxa* (4.3%), *Mangifera indica* (4.2%), and *Parinari polyandra* (4.1%).

Benefits of trees on the campus

From the list of pre-determined significance of trees (Figure 1), more than half of the respondents indicated that trees provide shade (59.7%) and fresh edible fruits (59.7%). However, more than half of the respondents disagreed that trees on campus should be used for activities such as displaying banners and posters (90.9%) and provision of firewood (89.6%). On the other hand, less than half of the respondents indicated that trees on the campus serve the purpose of relaxation (37.7%) and recreation (24.0%), protection of building (29.9%), and provision of materials for herbs and medicines (41.6%).

Table 1: Identified tree species on the University of Ilorin campus

S/N	Scientific Name	Family	Common Names	Freq	Relative Frequency (%)
1.	*Daniella oliveri*	Fabeaceae	Ilorin balsam	444	17.99
2.	*Gmelina arborea*	Verbenaceae	Melina	253	10.25
3.	*Prosopis africana*	Fabeaceae	Iron wood	249	10.0
4.	*Azadiractha indica*	Meliacea	Neem tree	180	7.29
5.	*Polyathia longifolia*	Annonaceaea	Masquerade tree	119	4.8
6.	*Vitellaria paradoxa*	Sapotaceae	Shea tree	106	4.3
7.	*Mangifera indica*	Anarcardiacea	Mango tree	104	4.2
8.	*Parinari polyandra*	Chrysobalanaceae	Abere tree(Y)	100	4.1
9.	*Parkia biglobosa*	Fabeaceae	Locust bean tree	83	3.4
10.	*Anarcadium occidentale*	Anarcadiacea	Cashew nut	67	2.7
11.	*Termilania catapa*	Combretaceae	Almond tree	67	2.7
12.	*Pterocarpus erinaceous*	Fabeaceae	African teak	65	2.6
13.	*Parinari macrophylla*	Chrysobalanaceae		59	2.4
14.	*Delonix regia*	Fabeaceae	Flambouyant tree	44	1.8
15.	*Albizia lebbeck*	Fabeaceae	East indian walnut	42	1.70
16.	*Termilania mantaly*	Combretaceae	Madagascar almond	42	1.7
17.	*Acacia auriculariformis*	Fabeaceae	Ear leaf tree	40	1.6
18.	*Vitex doniana*	Verbeneaceae	Black plum	39	1.58
19.	*Ficus spp*	Moraceae	Ficus	34	1.4
20.	*Bauhinia monandra*	Fabeaceae	Orchid tree	33	1.3
21.	*Termilania ivorensis*	Combretaceae	Black afara	31	1.3
22.	*Eucalyptus camedulensis*	Myrtaceae	Eucalypt	29	1.2
23.	*Bridelia ferruginea*	Euphorbiacea	Iralodan (Y)	26	1.05
24.	*Casuarina equisetilifolia*	Casuarinaceae	She oak tree	26	1.1
25.	*Afzelia africana*	Fabeaceae	African mahogany	24	0.97
26.	*Burkea africana*	Ceasalpinaceae	Wild syringe	16	0.65
27.	*Detarium microcarpon*	Ceasalpinaceae	Tallow tree	16	0.65
28.	*Anogeissus leiocarpa*	Combretaceae	African birch	14	0.57
29.	*Plumera alba*	Apocynaceae	Pigeon wood	14	0.57
30.	*Citrus sinensis*	Rutaceae	Orange	13	0.53
31.	*Acacia spp*	Fabeaceae		9	0.36
32.	*Hildegardia barteri*	Malvaceae		9	0.36
33.	*Hura creiptans*	Euphorbiacea	Monkey no climb	9	0.36
34.	*Cassia fistula*	Fabeaceae	Golden shower tree	8	0.32
35.	*Pilostigma thoningii*	Fabeaceae	Wild bauhinia	6	0.24
36.	*Pilostigma reticulate*	Fabeaceae	Abefe (Y)	6	0.24
37.	*Acacia nilotica*	Fabeaceae	Gum arabic	5	0.20
38.	*Elaeis guineensis*	Aracaceae	Palm tree	5	0.20
39.	*Cocos nucifera*	Arecaceae	Coconut tree	4	0.16
40.	*Ficus thonnigia*	Moraceae	Ficus	4	0.16
41.	*Bligha sapida*	sapindaceae	Ackee apple	2	0.41
42.	*Daniella ogea*	Fabeaceae		2	0.08
43.	*Ficus exasperata*	Moraceae	Ficus	2	0.08
44.	*Gliricidia sepium*	Fabeaceae	Quick stick	2	0.08
45.	*Moringa olivera*	Moringaceae	Moringa	2	0.08
46.	*Newbouldia laevis*	bignoniaceae	Tree of life	2	0.08
47.	*Psidium guajava*	Myrtaceae	Guava	2	0.08
48.	*Adasonia digitata*	Bombacacea	Baobab	2	0.08
49.	*Tectona grandis*	Verbenaceae	Teak	2	0.08
50.	*Annona senegalensis*	Annonacea	Wild custard apple	2	0.08
51.	*Crescenta cujeta*	Bignoniaceae	Calabash tree	1	0.04
52.	*Jathropha curcas*	Euphorbiacea	Physic nut	1	0.41
53.	*Termilania gluascences*	Combretaceae	Idi odan tree (Y)	1	0.04
54.	*Grewia mollis*	Malvaceae		1	0.04
		Grand Total		**2468**	**100.67**

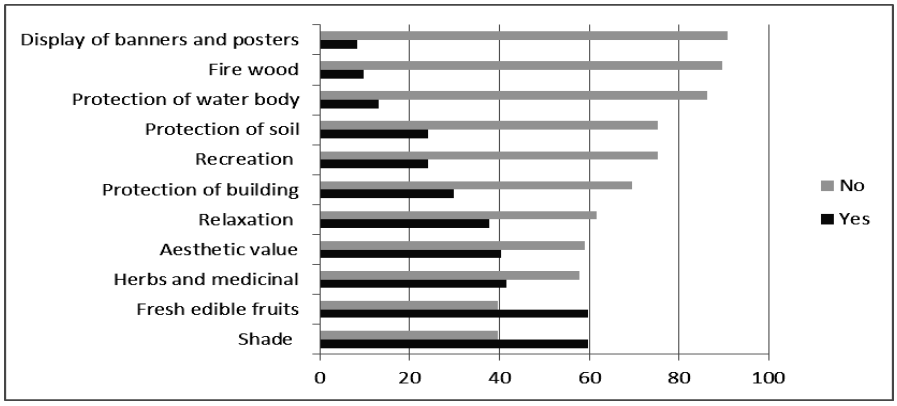

Figure 1: Benefits of trees at main campus of University of Ilorin as indicated by the respondents

Table 2: Perceptions of trees at main campus of University of Ilorin, Nigeria

Perception Statements	Agreed	Disagreed	Did not know	Chi-square (χ^2)	p-value
I love to be in trees environment	91.2	4.8	4.1	33.54	0.09
I prefer to work in environment with trees	74.8	12.6	12.6	29.03	0.23
Trees around office environment can improve job satisfaction and enhance job productivity	41.3	26.6	32.2	29.07	0.22
Reading under a tree can enhance better comprehension and understanding	56.2	18.5	25.3	26.34	0.34
Tree can mitigate the effect of climate change	84.8	3.4	11.7	38.38	0.03*
Trees help to purify air quality	84.9	6.2	8.9	19.92	0.70
Trees help to reduce noise pollution around campus buildings	31.3	40.1	28.6	23.90	0.47
Trees are dangerous to lives and properties	23.9	64.2	11.9	16.18	0.88
Fallen tree leaves and branches can cause fire hazard	66.0	22.4	11.6	26.70	0.32
Medicines produced from tree parts (leaves, bark, root, etc.) are effective in treatment of sickness	75.0	25.0	0.0	43.89	0.01*
Trees can serve as anti-stress	37.7	21.2	41.1	24.06	0.46
Tree can increase value of property such as a building	45.1	25.7	29.2	23.91	0.47
Trees needed to be managed to obtain its full benefits	91.7	2.10	6.20	39.05	0.03*
I am aware of management strategy of trees on University campus	41.9	16.20	41.90	31.77	0.13
Management of trees on the University campus is effective	54.1	15.8	30.1	39.05	0.03*

*Significant at $p<0.05$

People's perceptions of trees on the campus

The respondents were requested to respond to a number of pre-determined questions to assess their perceptions on the campus trees (Table 2). Majority of the respondents agreed that they love to be (91.2%) and prefer to work (74.8%) in tree environment. However, less than half of the respondents (41.3%) agreed that having trees around office environment can improve job satisfaction. On the contributions of trees to climate and air quality, 84.8% of the respondents (with significant $p=0.03$ and $\chi^2 = 38.38$) agreed that tree can mitigate the effect of climate change. In addition, 84.9% agreed that the campus trees help to purify air quality. However, 68.7% disagreed or did not know if trees can help to reduce noise pollution around campus buildings.

With respect to the danger that trees can pose to life and property, more than half of the respondents (64.2%) disagreed that trees on campus are dangerous to life and property. However, 66.0% of the respondents agreed that fallen tree leaves and branches can cause fire hazard. Less than half of the respondents (45.1%) agreed that having trees around property (such as building) can increase its value. It has been documented extensively that tree parts are used to produce medicines used to cure sicknesses and ailments. About 75.0% ($p=0.01$ and $\chi^2 = 43.89$) of the respondents agreed to the assertion. However, only 37.7% of the respondents agreed that tree on the campus can serve as anti-stress while 54.9% disagreed or did not know that the trees can serve this function.

Management is vital to keeping trees in good and healthy status, as well as preventing them from constituting danger

to lives and properties. With significant level of p=0.03 and corresponding χ^2 = 39.05, majority of the respondents (91.7%) agreed to the assertion that trees should be managed to obtain its full benefits. Despite this response, more than 58.1% of the respondents disagreed or did not know about the management strategy of trees on the campus. However, more than half of the respondents agreed that management of trees on campus is effective (with p=0.03 and χ^2 = 39.05).

DISCUSSION

Being a dominant life form, trees are easy to locate and count, and are also relatively better known, taxonomically (Sagar *et al*., 2003). The results of tree survey on the main campus of University of Ilorin indicated that the University has different species of trees. The abundance and diverse of trees in the academic area may be as a result of the need to provide aesthetic environment and beautiful landscape for the University as well as provision of shade for student and staff. Furthermore, urban trees have been reported to provide benefits such as contribution to aesthetic value (Schroeder, 1989); increase property values (Anderson and Cordell, 1988; Rodriguez and Sirmans, 1994; Crompton, 2001; Wolf, 2005), control rainfall runoff and flooding (Sanders, 1986), reduce cancer risk (Heisler *et al*. 1995), increase rate of recovery and reduce pain (Ulrich *et al.*, 1991), and improve concentration of children with attention deficits (Taylor and Kuo, 2009). Heisler (1986) and Heisler *et al*. (1995) have documented that shade provided by trees reduces summer energy use by 20-25%. Also, Akabari (2002) discovered that trees reduce energy consumption while McPherson (1998) concluded that trees reduce the need for air conditioning.

In the present study, quite a number of the respondents have little or no understanding of these intangible or indirect benefits that the trees provide. This was also reported in a study conducted at University of Ibadan (Babalola 2010). The level of understanding about services provided by trees could be link to available information or awareness created about such services and benefits to the people. In most cases, people take environmental services provided by trees for granted and give more focus on the direct benefits such as timber, fruits and other tangible products (Wolf, 2005).

A considerable number of the respondents sampled on campus did not recognize the benefits that trees can provide in increasing job satisfaction and productivity. The study conducted by Kaplan (1989, 1993) on the role of nature in the context of the workplace reported that trees around office environment provide psycho benefits and these influence job satisfaction, initiate more production, and lead to fewer illnesses. In the present study, more than half of the respondents did not agree that trees can contribute to job satisfaction while quite a number did not know about this contribution of trees around them. In other studies, trees have also been reported to reduce human stress levels (Ulrich, *et al.*, 1991; Hull, 1992) and overall improvements in human well-being and vitality (Wolf, 2005). Invariably, these capabilities of trees have the potential to contribute to productivity and job output.

On the contrary, majority of the respondents were aware that trees can mitigate climate change and remove air purification. This awareness may be attributed to public sensitization that trees can provide these environmental services. Other studies have also revealed the contributions of trees to climate mitigation and carbon sequestration (Nowak *et al.*, 1993; Nowak, 1993; Nowak and Crane, 2002). Furthermore, the significance of trees in creating microclimatic and cool environment in cities and urban settings has also been documented. In a study conducted by Akabari (2001) on the contribution of cool surfaces and shade trees to improvement of air quality in urban areas, trees were discovered to account for a 5-degree Celsius reduction in city temperatures, and were involved in transpiration cooling which reduces solar heating of dark surfaces. It has been reported that existence of trees in residential areas is responsible for annual energy reduction and that urban tree planting accounted for 25% reduction in net cooling and heating energy usage in an urban landscape (Akabari, 2001). Thus, street trees have significant contributions to energy savings as well as control of heat in urban areas.

Trees and other vegetation can play an important role in attenuating noise through reflecting and absorbing sound energy (Bolund and Hunhammar, 1999). Quite a number of the people sampled on campus did not know that trees can also perform this function. Aylor (1972) stated that leaves and stems scatter sound and absorb noise. Appropriate designed and planting of trees and shrubs have been discovered to significantly reduce noise (Dwyer *et al.*, 1992, 2002). Cook (1978) also discovered that wide belts of tall dense trees combined with soft ground surfaces can reduce apparent loudness by 50% or more. Also, trees are significant in providing a buffer to aid in noise control (Reethof and McDaniel, 1978). Contrary to the view expressed in the highlighted studies, the results of the present study showed that majority of the people sampled on campus disagreed that tree helps to reduce noise pollution. As earlier stated, this may be due to lack of adequate information and awareness of this benefit to the respondents.

Due to their proximity to traffic and consequently to higher loads of atmospheric pollutants, street trees have been reported to capture particulate matter, carbon dioxide, and other air pollutants, thus contributing more significantly in reducing atmospheric pollution in the city (Nowak, 1995; McPherson *et al.*, 1999; Beckettet *et al.*, 2000). In the same vein, trees on the campus have the potential to purify air thereby improving the air quality for the people and other life on the campus. Quite a number of the people on campus are aware of this contribution of trees to air purification.

Less than half of the respondents on campus agreed that trees can increase value of property. Robinson (2009) developed a theme that shows that trees have a significant effect on choice of residence and property value. It has been demonstrated that the loss of tree resulted in a large decrease in property value (Robinson 2009). Robinson (2009) further explained that most residents agreed that, although they may not have bought their house specifically for the trees, the neighborhood selection and country feel subconsciously played a large part in their decisions. A number of residents opined that because so many trees were lost in a short period of time, there was rapid change and disruption in the ecosystem (Robinson, 2009). Dombrow (2000) stated that the presence of trees is attributable to a 2% increase in home value. Crompton (2001) added that residence in proximity of a park increases home value (8-20%). Schroeder (2004) validates that tree provide an experience that fosters spiritual and cultural attachment. Most importantly, gathering information on preferences of people on environmental services provided by forests and trees are crucial in designing sustainable management strategy. In a study carried out by Ja-Choona *et al*. (2013) on the preferences of urban forest recreational services by urban dwellers in South Korea, majority of the respondents were sensitive to the presence of environmental education programme in urban forests, and their visitation to the forest was influenced by the abundance biodiversity.

In addition, it was discovered that the urban dwellers prefer having information on cultural and natural urban forest recreation resources. These are some of the information that are assisting the concerned authorities in making appropriate plan to sustain the services provided by the forests as well as meeting the people's needs. It is therefore necessary that concerned authority in charge of tree management should take information on people's preference for trees very important as they design management strategy. This will also encourage people's involvement and participation in protection and sustainable management of trees around them.

CONCLUSIONS AND RECOMMENDATIONS

This study has shown that the main campus of University of Ilorin is diverse in tree composition, and that the respondents have different perceptions about trees around them. Furthermore, this study also showed the unique ways that urban trees are valued for a variety of uses. These findings have also added to the existing knowledge and broaden our understanding of the people's perception as well as significance of trees around them. Many of the respondents preferred shade casting and fruit producing trees. Hence, to encourage people's involvement in tree management, the trees to be planted on the campus under study should possess the ability to cast shade and produce edible fruits.

For effective management of urban trees, especially on campus, there is a need for more awareness creation on benefits of the trees, and participation of relevant stakeholders in management strategy. From the results on the awareness of tree management on campus, majority of the respondents were not aware of the available tree management strategy on the campus. This therefore calls for appropriate and adequate awareness creation on the tree management strategy. Furthermore, a Campus Tree Management Committee should be constituted for effective management of trees on the campus.

Moreover, frequent inventory and survey should be conducted for trees on campus to note their abundance, distribution and density as well as structural and physical changes necessary for management practices. Threatened and endangered tree species on campus should be properly protected to maintain urban tree diversity and prevent their total removal as a result of development and expansion process. There is also the need for survey of tree preferences by the campus occupants when planning for protection and tree planting programme. This is to encourage people's participation in management strategy. Furthermore, a Campus Tree Management committee with involvement of professionals, carefully selected from disciplines working directly with trees, is highly recommended for the studied University.

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