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PERCEIVED BENEFITS AND CONSTRAINTS OF URBAN TREE PLANTING IN MINNA, NIGER STATE, NIGERIA

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ABSTRACT

This study assesses the environmental benefits of tree species in Minna, the capital of Niger State, Nigeria. A total of 100 questionnaires were randomly administered across four purposely selected towns within two major local government areas (LGAs): Bosso and Chanchaga. The chosen towns were Tunga and Maitumbi in Bosso LGA, and Tudun Wada and Sabon Gari in Chanchaga LGA. Twenty-five questionnaires were distributed across age and sex in each town, with 92 retrieved for analysis. Data were analysed using descriptive statistics, including frequency distribution tables and percentages. Results indicated that the majority of respondents (45.7%) were aged 21–30 years, with 56.5% male and 43.5% female. Identified tree species include Azadirachta indica, Mangifera indica, Terminalia catappa, Moringa oleifera, and Parkia biglobosa, among others. Preferred characteristics include fast growth (28.1%), deep rooting

systems (23.4%), and aesthetic value (20.3%). Key benefits include erosion control (18.2%), recreation (16.8%), and aesthetic enhancement (15.4%). Constraints include high maintenance costs (18.1%), pest and disease harbouring (16.7%), and litter production (16.7%). Urban tree planting is recommended as a strategy to mitigate ecological challenges, with a call for greater public sensitisation to address environmental hazards driven by urbanisation and industrialisation.

Keywords: tree species, environment, benefits, constraints, characteristics

INTRODUCTION

Urban forestry is a critical strategy for addressing the multifaceted challenges of urbanisation, particularly in rapidly urbanising regions like Niger State, Nigeria, where high temperatures and seasonal variations exacerbate environmental stress (Babalola, 2010). Urban trees provide ecosystem services, including microclimate regulation, air purification, noise reduction, biodiversity conservation, and aesthetic enhancement (Jiang, 2003). In Minna, the capital of Niger State, trees are planted to mitigate heat, reduce evaporation from water bodies, and enhance urban landscapes, aligning with global trends that recognise urban green spaces as vital for sustainable development (Roy *et al.,* 2012). Trees also provide provisioning services, such as shade, fruit, fuelwood, and non-timber forest products, supporting local livelihoods and environmental resilience (Adenle *et al*., 2020).

The importance of urban trees extends to global environmental functions, such as carbon sequestration and mitigation of urban heat island effects (Nowak *et al*., 2013). In Nigeria, rapid urbanisation has intensified the need for urban forestry to address erosion, flooding, and air pollution (Agbelade *et al*., 2016). Studies in North-western Nigeria, such as Zaria, highlight the carbon storage potential of urban trees, with species like *Azadirachta indica* and *Mangifera indica* contributing significantly (Dangulla *et al*., 2021). However, urban forestry faces challenges, including inadequate policy frameworks, limited public awareness, and high maintenance costs (Popoola, 2018). In semi-arid regions like Niger State, climatic conditions and resource limitations exacerbate these issues (Moussa, 2019).

Globally, urban trees improve mental health, reduce stress, and enhance property values (Houlden *et al*., 2018). In African contexts, studies in Lagos and Ibadan show that urban trees provide provisioning and cultural services but are unevenly distributed, reflecting socio-economic inequalities (Adeyemi and Shackleton, 2024a). In Niger State, urban forestry initiatives, such as schoolyard tree planting, emphasise educational and climate resilience benefits (Adamou, 2025). Therefore, the objectives of the study were to assess urban forestry development in Minna, identify prevalent tree species, evaluate their benefits and constraints, and provide recommendations for sustainable management.

METHODOLOGY

The study was conducted in Minna, the capital of Niger State, Nigeria, encompassing Bosso and Chanchaga LGAs. Niger State is located between latitudes 8°20'N and 11°30'N and longitudes 3°30'E and 7°20'E, sharing boundaries with Kaduna, Kebbi, Zamfara, Kogi, Kwara, and the Federal Capital Territory. The mean annual temperature ranges from 24°C to 28°C, with rainfall lasting 150–180 days annually, ranging from 1200 mm to 1600 mm. Relative humidity ranged from 20% to 50% during the dry season. The vegetation is characterised as Guinea savanna, with a mix of grasses, shrubs, and trees (Adenle *et al.,* 2020).

Primary data were collected using structured questionnaires distributed among residents of the selected communities. A reconnaissance survey identified areas with high concentrations of urban trees, guiding the selection of study sites.

A multi-stage sampling technique was employed. Two LGAs (Bosso and Chanchaga) were purposively selected based on urban tree prevalence. Two towns per LGA were chosen: Tunga and Maitumbi (Bosso), and Tudun Wada and Sabon Gari (Chanchaga). A total of 100 questionnaires were randomly distributed, with 25 per town, stratified across age and sex. Ninety-two questionnaires were retrieved for analysis.

Data were analysed using descriptive statistics, including frequency distribution tables and percentages, to summarise socio-economic characteristics, tree species, benefits, and constraints.

RESULTS

Socio-Economic Characteristics

The socio-economic profile of respondents influences their preferences for urban tree planting. Table 1 presents the characteristics of the sampled population. It shows that 45.7% of respondents were aged 21–30 years, indicating an economically active population. Males comprised 56.5%, suggesting greater involvement in tree planting. Education levels were high, with 54.3% having secondary education and 21.7% having tertiary education. Married respondents dominated (67.4%).

Table 1: Socio-Economic Characteristics of Sampled Respondents

Variable	Frequency	Percentage(%)
	Gender	
Male	52	56.5
Female	40	43.5
	Age	
10 – 20	5	5.4
21 – 30	42	45.7
31 – 40	28	30.4
41 – 50	13	14.1
50 - above	4	4.3
	Education	
Primary	14	15.2
Secondary	50	54.3
Tertiary	20	21.7
No formal education	8	8.7
	Marital Status	
Married	62	67.4
Single	24	26.1
Widow	4	4.3
Divorced	2	2.2
Total	92	100.0

Environmental Tree Species and Their Families

A variety of tree species were identified in Minna, including both planted and naturally occurring trees. Table 2 lists the major species and their families and indicates that Azadirachta indica (9.5%) and Mangifera indica (8.2%) were the most common species, likely due to their fast growth and fruit

production (Adeyemi and Shackleton, 2024a). Other prevalent species include Terminalia catappa (7.8%) and Moringa oleifera (7.4%), valued for shade and medicinal uses (Faleyimu, 2014).

Characteristics of Identified Urban Tree Species

Respondents' preferences for tree species were influenced by specific characteristics, as shown in Table 3. Fast growth (28.1%) and deep rooting systems (23.4%) were the most valued characteristics, supporting the preference for species like Azadirachta indica and Gmelina arborea (Faleyimu, 2014). Aesthetic value (20.3%) was also significant, reflecting the cultural importance of trees in urban settings (Adeyemi and Shackleton, 2024b).

Table 2: Identified Tree Species in the Study Area and Their Families

Tree Species	Family	Percentage (%)
Azadirachta indica	Meliaceae	9.5
Mangifera indica	Anacardiaceae	8.2
Terminalia catappa	Combretaceae	7.8
Moringa oleifera	Moringaceae	7.4
Parkia biglobosa	Mimosaceae	6.9
Gmelina arborea	Verbenaceae	6.5
Psidium guajava	Myrtaceae	6.1
Anacardium occidentale	Anacardiaceae	5.8
Adansonia digitate	Malvaceae	5.3
Citrus sinensis	Rutaceae	5.0
Vitellaria paradoxa	Sapotaceae	4.7
Delonix regia	Fabaceae	4.3
Tamarindus indica	Fabaceae	4.0
Carica papaya	Caricaceae	3.7
Ficus sycomorus	Moraceae	3.3
Khaya senegalensis	Meliaceae	3.0
Polyalthia longifolia	Annonaceae	2.8
Borassus aethiopum	Arecaceae	2.5
Persea Americana	Lauraceae	2.3
Gliricidia sepium	Fabaceae	2.0
Eucalyptus camaldulensis	Myrtaceae	1.7
Casuarina equisetifolia	Casuarinaceae	1.5
Balanites aegyptiaca	Zygophyllaceae	1.2
Total	260	100.0

Table 3: Characteristics of Tree Species in the Study Area

Characteristic Exhibited	Frequency	Percentage (%)
Fast growing	36	28.1
Rooting system	30	23.4
Aesthetic characteristics	26	20.3
Coppicing ability	18	14.1
Large crown size	14	10.9
Evergreen ability	10	7.8
Total	128	100.0

Benefits Derived from Urban Tree Species

Urban trees provide multiple ecosystem services, as illustrated in Figure 1. Erosion control (18.2%) and recreation (16.8%) were the most cited benefits, aligning with Kaduna's findings (Ogunkalu *et al*., 2015). Trees like Mangifera indica and Parkia biglobosa provide fruits and seeds, while Terminalia catappa enhances aesthetics (Rouchiche, 2009).

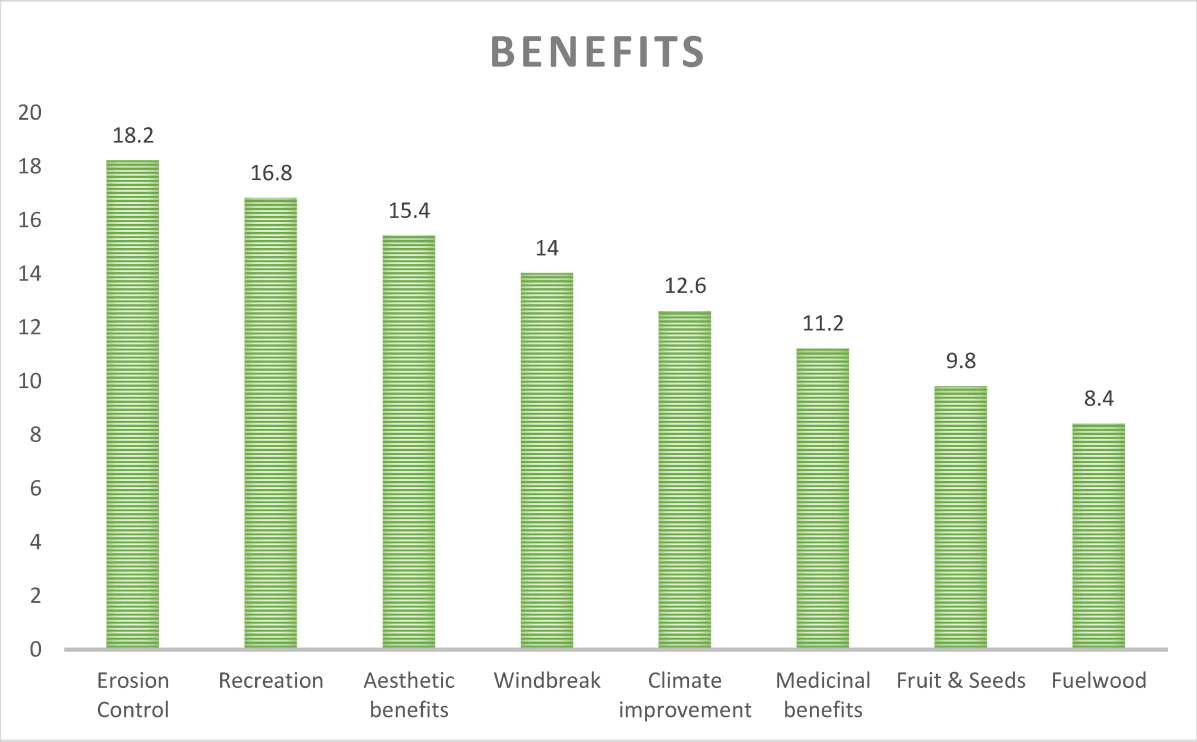

Figure 12: Distribution of Perceived Benefits of Urban Trees

Constraints of Urban Trees

Table 4 highlights the constraints associated with urban trees in Minna. High maintenance costs (18.1%) and pest/disease issues (16.7%) were the primary constraints, consistent with findings in other Nigerian cities (Popoola, 2018). Litter production (16.7%) was also a significant concern, particularly in densely populated areas.

Table 4: Identified Constraints Associated with Urban Trees

Constraints	Frequency	Percentage (%)
Expensive to maintain	30	18.1
Harbors pests and diseases	28	16.7
Litter constitutes dirt	28	16.7
Seasonal variation (weather)	25	15.1
Harbors dangerous animals	22	13.3
Constitutes threat later in life	18	10.8
Serves as hideout for thieves	15	9.0
Difficult to get desired species	10	6.0
Total	100.0	166

DISCUSSION

The findings from this study highlight the critical role of urban trees in enhancing environmental quality and urban livability in Minna, Niger State. The demographic profile of respondents, dominated by young adults aged 21–30 and individuals with secondary and tertiary education, points to a potentially responsive and informed population that can be actively engaged in future urban forestry initiatives. This aligns with Agbelade *et al*. (2016), who emphasised the importance of demographic and educational factors.

The dominance of species such as *Azadirachta indica*, *Mangifera indica*, and *Terminalia catappa* suggests a preference for trees that provide multiple ecosystem services, including shade, fruit yield, aesthetic appeal, and rapid growth. These species have been widely acknowledged in Nigerian urban forestry studies (Dangulla *et al*., 2021) for their resilience, economic value, and capacity to thrive in tropical urban conditions. Respondents' emphasis on desirable characteristics

such as fast growth (28.1%) and deep-rooting systems (23.4%) further underlines the functional priorities of urban dwellers, especially in regions prone to erosion and flooding. These preferences align with previous findings by Faleyimu (2014), who reported that urban populations in southwestern Nigeria prioritised trees with physical traits that provide both ecological stability and rapid greening. The benefits derived from urban trees in this study, ranging from erosion control and recreation to aesthetic and nutritional values, highlight the multi-dimensional utility of urban forestry in developing contexts. Similar patterns have been observed in studies across Africa, including Lagos and Ibadan (Adeyemi and Shackleton, 2024b), where urban trees were found to support food security, temperature regulation, and social cohesion.

However, the study also revealed several constraints to urban tree sustainability in Minna, notably high maintenance costs (18.1%), pest and disease incidence (16.7%), and litter production (16.7%). These constraints are typical of unmanaged urban green spaces and are corroborated by findings in Akure and Kaduna (Popoola, 2018; Ogunkalu *et al*., 2015). They point to the need for targeted interventions such as selecting low-maintenance species and promoting biological pest control.

Seasonal variation (15.1%) was also identified as a constraint, reflecting the vulnerability of urban vegetation to climatic extremes in semi-arid regions such as Niger State. As emphasised by Moussa *et al*. (2019), this challenge requires selecting drought-tolerant native species and integrating tree watering schemes during dry spells to ensure survival and continuity. In addition, socio-political factors, including limited government investment and weak enforcement of urban greening policies, may compound the physical constraints reported by respondents. Strengthening municipal frameworks, incentivising community participation, and integrating urban forestry into broader land-use planning are therefore essential for overcoming these barriers.

Overall, the study underscores the dual nature of urban forestry in Minna as both an opportunity for environmental enhancement and a domain requiring strategic planning and investment. Public awareness campaigns, participatory tree-planting programs, and integration of indigenous knowledge could further enhance tree survival, reduce conflict, and promote sustainable urban environments.

CONCLUSION

Urban tree planting in Minna is a viable strategy to mitigate ecological challenges such as erosion, heat, and flooding, exacerbated by rapid urbanisation. The study identified diverse tree species, with *Azadirachta indica* and *Mangifera indica* being the most prevalent due to their fast growth and multiple benefits. However, constraints like maintenance costs and pest issues hinder adoption. To enhance urban forestry, establish shelterbelts in erosion-prone areas, intensify public sensitisation about the ecological and economic benefits of urban trees, and promote low-maintenance, native species to reduce costs and pest risks.

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