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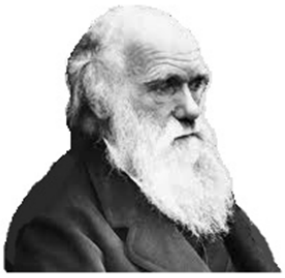

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Problems and Prospects of Tree Planting in Kano Metropolis, Kano State, Nigeria

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ABSTRACT

The study assessed the problems and prospects of tree planting in Kano metropolis, employing a mixed-methods approach utilizing both primary and secondary data sources. Simple random sampling was used in selecting LGAs, 180 questionnaires were administered and retrieved using proportional allocation. Data screening, organization, and analysis, including descriptive statistics and Chi-square test were conducted using SPSS version 23. The result revealed demographic characteristics of the respondents, indicating that the age group between 20-30 years had the highest response rate, with 64% of respondents being male and 36% female. Additionally, singles constituted the majority of respondents (64.91%), while urban dwellers accounted for 76.61%. The occupational distribution showed that 39% were business people, with farming and civil service having the lowest representation at 15%. In terms of educational qualifications, HND/BSc holders comprised 38% of the respondents, while FSCL had the lowest representation at 4.7%. The research also identified challenges in tree planting among urban dwellers, including inadequate land, tendering to maturity, lack of public enlightenment, low private

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involvement, poor government policy, poverty, and insufficient funding and planting materials. These challenges were emphasized with a Likert mean score of 3.025. Solutions include initiatives such as tax breaks, subsidies, and green space regulations can incentivize tree planting, while collaborative efforts involving public-private partnerships and community-based education campaigns are vital for widespread awareness and active involvement. Adequate funding remains a linchpin, and its securement through diverse channels ensures the long-term success of tree planting programs. Effective land use planning, incorporating zoning regulations and strategic establishment of nurseries, further contributes to a resilient and green urban environment. By addressing these facets comprehensively, cities can navigate challenges and cultivate thriving urban forests that benefit both the environment and the well-being of their residents.

***Keywords*:** Urban Forestry, Trees, Planting, Ecosystem, Micro-climate

1. INTRODUCTION

The urban forest is poised to be the most influential forest in the 21st century (Nowak et al., 2016). Defined as the natural and planted trees, their forest cover, and associated elements within urban areas (Ordóñez and Duinker, 2010), it encompasses a broad spectrum of spaces in and around densely populated areas – from rural communities to metropolitan regions (Nowak et al., 2016). This includes tree-lined streets, parking lots, school yards, parks, riverbanks, cemeteries, freeway interchanges, transportation and utility corridors, and watershed land. Beyond trees, urban forest areas comprise various components such as green spaces and related abiotic, biotic, and cultural elements in and around cities and communities. Unique characteristics like structure, connectedness, and values distinguish urban forests significantly from hinterland forests (Ordóñez and Duinker, 2010).

The interplay of trees with urban infrastructure and daily human activities adds complexity and dynamism to urban forest management. Urban forests facilitate ongoing interactions between anthropogenic and natural systems, shaping the daily experiences of residents (Nowak et al., 2016). Combining human development and natural ecosystems within city limits, urban forests have a profound impact on decisions, activities, actions, and overall well-being of residents who predominantly live, work, and leisure within urban settings (Ordóñez and Duinker, 2010; Nowak et al., 2016).

These influential forces can modify urban forests through both direct and indirect human actions. The study's central focus is on understanding human values concerning nature and urban forests, recognizing the powerful influence of values on people's ideals, acceptable activities, and their consequential impact on urban forest management – including the development of bylaws.

According to Nowak et al. (2016), the term "Urban Forest" refers to an ecosystem characterized by the presence of various tree types and their associated vegetation, forming a plant community. Urban forests offer a myriad of benefits, including several engineering functions. The ecosystem values attributed to urban forests encompass the removal of air pollution, carbon capture (sequestration), maintenance of the hydrological cycle, microclimate improvement, and the provision of wildlife habitat (McPherson et al., 2007; Ordóñez and Duinker, 2010). Trees play a crucial role in mitigating environmental factors by absorbing solar radiation through photosynthesis, reducing air temperature, increasing humidity, lowering wind

speed, absorbing air pollutants and particulate matter, decreasing carbon dioxide levels, and diminishing noise levels (Streiling and Matzarakis, 2003). Termed as 'green infrastructure' (McPherson et al., 2007; Carlyle-Moses et al., 2020), urban forests yield numerous ecosystem benefits.

They contribute to the modification of urban microclimates, influencing human comfort and the energy budgets of surrounding buildings. Notably, large, healthy trees exhibit the capacity to remove 60 to 70 times more pollutants than smaller ones, thereby enhancing air quality for residents. However, it is crucial to recognize that trees may sustain damage due to these pollutants. Additionally, trees and shrubs act as natural barriers to reduce unwanted sound (noise) (Arenas, 2008). In urban centers, the prevalence of smooth, light-colored surfaces and artificial lighting can be bothersome to urban dwellers, and urban vegetation plays a vital role in mitigating these issues.

The continuous development, construction, and resource overuse in urban areas expose soils to wind and water erosion. However, the appropriate cover of vegetation can significantly reduce erosion problems (Arenas, 2008). In summary, urban forests not only contribute to the aesthetic appeal of cities but also play a crucial role in enhancing environmental quality, human well-being, and the overall sustainability of urban ecosystems

Urban forests are ecosystems distinguished by the presence of trees and other vegetation interwoven with human developments. Although city tree inventories are routine for municipalities, they traditionally focus on public street and park trees, often neglecting the urban forest on private land (Roman et al., 2018). Urban ecosystems present a intricate mosaic of vegetative land cover and diverse land uses. While land cover pertains to the physical surface of the Earth, land use is shaped by human, socio-economic, and political influences on the land (Pickett et al., 2011).

Land use serves as the link between land cover and the human activities that mold the landscape. The distinct combination of buildings, impermeable cover (such as asphalt and concrete), and vegetation complicates classification methods, posing challenges for assessing the urban forest (Bokaie et al., 2019).

Furthermore, gradients in ecological, sociological, and land uses along urban-to-rural transects add complexity to defining the extent of the urban forest. Achieving valid and replicable estimations of the urban forest resource demands a robust sampling approach and a well-defined spatial definition regarding the extent of the urban forest (Konijnendijk et al., 2013).

In essence, understanding and accurately assessing urban forests require a comprehensive approach that encompasses both public and private lands, considering the intricate interactions between natural elements and human activities within urban landscapes. The social values associated with urban forests encompass positive psychological effects, aesthetic quality, and emotional and spiritual benefits (Ordóñez and Duinker, 2014).

These values can be categorized into four overarching groups: social benefits, communal benefits, recreational benefits, and health benefits, with each category influencing the others in a complex interplay. Social benefits involve the architectural and aesthetic advantages that are easily noticeable to residents and passers-by. Urban dwellers generally appreciate the presence of trees, finding them not only visually pleasing but also contributing to a sense of restfulness and tranquility, enhancing the overall quality of life. Urban forests, serving as green havens in the midst of grey cityscapes, bring positive impacts to individuals as well as groups or communities (Jones and Instone, 2016).

Urban trees, whether publicly or privately owned, become integral parts of the community due to their size (Moffat, 2016). The communal benefits of large urban trees are often associated with their leaf area, and careful planning is crucial to ensure that each tree benefits all stakeholders. The structure of the urban forest refers to the three-dimensional spatial arrangement of vegetation in urban areas, encompassing factors like species composition, tree size and health, and the number and location of trees. Quantifying this structure serves as the foundation for understanding the functions of urban forests that impact urban inhabitants, facilitating improved management practices aimed at maximizing environmental and social benefits.

Essential data for this quantification includes tree species, diameter breast height (DBH), health, structural integrity, and site factors like location, soil condition, and competition. These details provide insights into the potential productivity of the urban tree population, allowing for estimations of their overall value (Amini Parsa et al., 2020). In essence, recognizing and quantifying the social values of urban forests contribute to effective management strategies that enhance the well-being of both individuals and the broader community.

2. MATRIALS AND METHODS

2. 1. Study Area

Kano metropolis is the capital city of Kano state, Nigeria. It is located between latitude 11°59’59.57”N to 12°02’39.57”N and longitude 8°31’19.69”E to 8°33’19.69”E, with a total land area of 636 km^2 area. It is made up of six Local Government Areas (Dala, Fage, Gwale, Kano municipal, Nasarawa, and Tarauni) and some parts of Kumbotso, and Ungogo local government area. Kano metropolis has an estimated population of over 4 million people as of 2021 Population Projection (National Population Commission) (Ibrahim, 2014). Over 70% of the adult workforces draw their livelihoods off agriculture. Kano is the biggest commercial and industrial center in Northern Nigeria. It has 43 existing marketplaces and over 400 privately owned manufacturing industries.

The environment is conducive to different species of livestock production such as cattle, sheep, goat, rabbit, horses and poultry. The crops grown in the zone includes; cowpea, groundnut, soya beans and a number of cereals like millet, maize, sorghum e.t.c. The people of Kano meteropolis are traders, civil servant and politicians (Ibrahim, 2014). Kano metropolis is about 481 meters (1580 feet) above sea level. The climate is hot, semi-arid with an average annual rainfall of about 690 mm (27.2 in) majority of which falls from June through September. The temperature is generally very hot throughout the year, though from December through February, the city is relatively cool. The average night time temperatures in the cold months range from 11° to 14 °C.

Jakara, Kano and Challawa rivers are the major water bodies that drained the metropolitan area. The soils are mostly sandy-loam with little clay content, the vegetation is mainly savanna, climatically defined into Northern guinea savanna and Sudan Savanna. Northern guinea savanna is characterized by woodland or bushes with shorter grasses while the southern guinea savanna has taller grasses. The Sudan savanna has scattered trees in grassland. Common trees found in this region are; *Azadirachta indica, Mangifera indica, Ceiba pentandra, Adansonia digitata, Parkia biglobosa, Tamarindus indica, Anarcadium occidentale, Ziziphus spina-christi, Diospyros mesopilformis* etc.

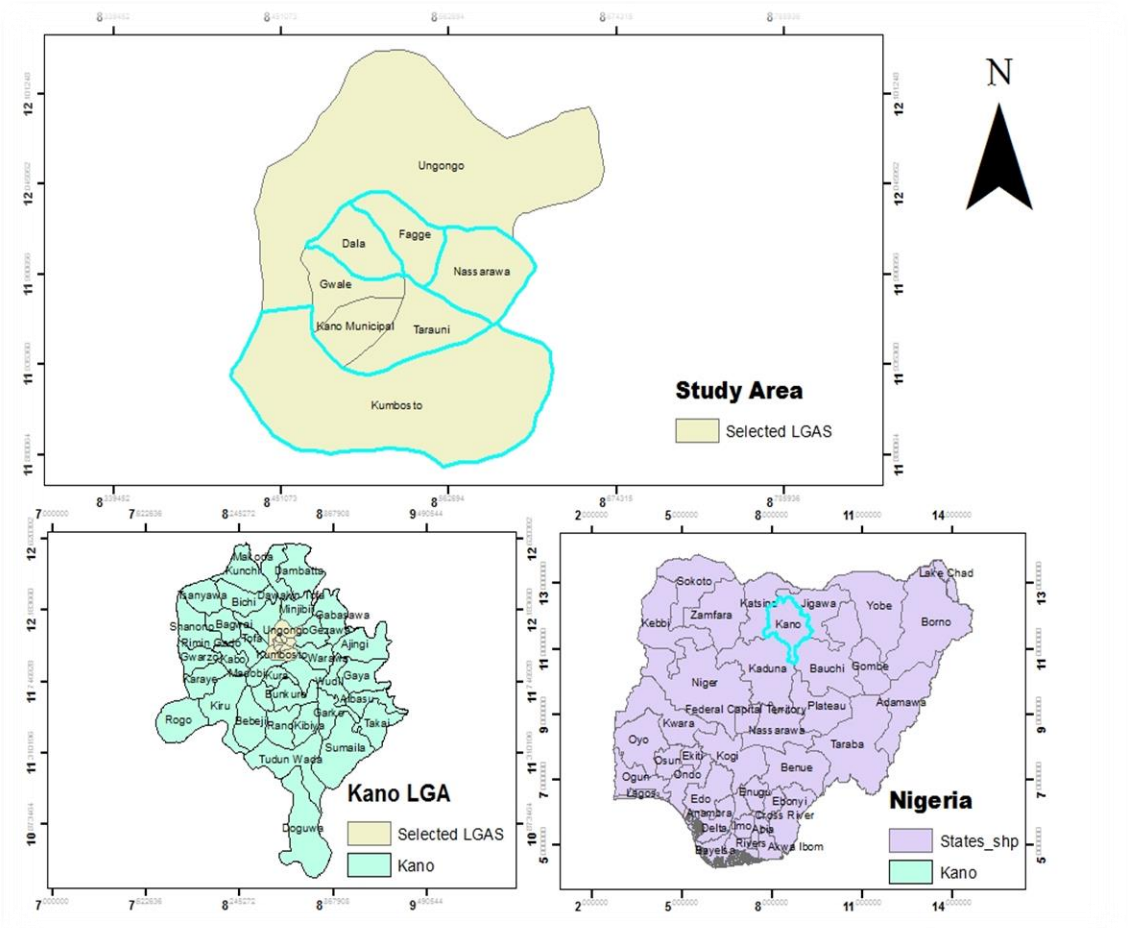

Fig. 1. Map of Kano State Showing Study Area

Table 1. Kano metropolis by local government and their populations

S/N	Local Governments	Population
1.	Fagge	278,300
2.	Gwale	497,700
3.	Nasarawa	829,600
4.	Kano Municipal	516,400
5.	Tarauni	308,600
6.	Ungogo	508,700
7.	Kumbotso and	409,500
8.	Dala	582,500

Sampling Procedure and Sampling Size

Simple ransom sampling was used to select four local governments. Questionnaires were allocated proportionally based on the population.

Table 2. Selected local government and their populations

S/N	Local Governments	Sample Frame	Sample Size
1.	Fagge	278,300	24
2.	Nasarawa	829,600	72
3.	Kumbotso and	409,500	35
4.	Dala	582,500	49

Therefore, as described above, four local government were selected i.e. Kumbotso, Nassarawa, Fagge, and Dala Local Government Area of Kano. A sample size of 180 is enough to represent the whole population. Therefore, using a simple percentage, the following will represent the quota of questionnaire to be distributed in each local government;

$$Dala = \frac{582{,}500}{2{,}099{,}900} X\ 100 = 27.74 \qquad Fagge = \frac{278{,}300}{2{,}099{,}900} X\ 100 = 13.25$$

$$Kumbotso = \frac{409{,}500}{2{,}099{,}900} X\ 100 = 19.50 \qquad Nassarawa = \frac{829{,}600}{2{,}099{,}900} X\ 100 = 39.51$$

2. 2. Data Collection and Analysis

Primary and Secondary data will be used for this study. 180 questionnaires will be administered, retrieved and analyzed. Secondary source of the information will be obtained 1from relevant literatures, textbooks, journals, conferences, past projects as well as internet. The data obtained were screened, organized and analyzed, descriptive statistics was used to present demographic information using frequency, percentages and pie/bar chart. Chi-square will be used to test for the socio-economic characteristics of dependent variables. SPSS version 23 will be used for the analysis.

3. RESULTS OF THE STUDY

Socioeconomic Characteristics of the Respondents

Fig. 1 above shows the age distribution of the respondents, where the age group between 20-30years has the highest frequency of 95 (55.56%) and age group of 31-60years and above 61years has the lowest responses of 4 (2.34%).

Fig. 2 above shows the sex distribution of the respondents, where the male respondents have the highest response of 110 (64%) and female 60 (36%) with least the response.

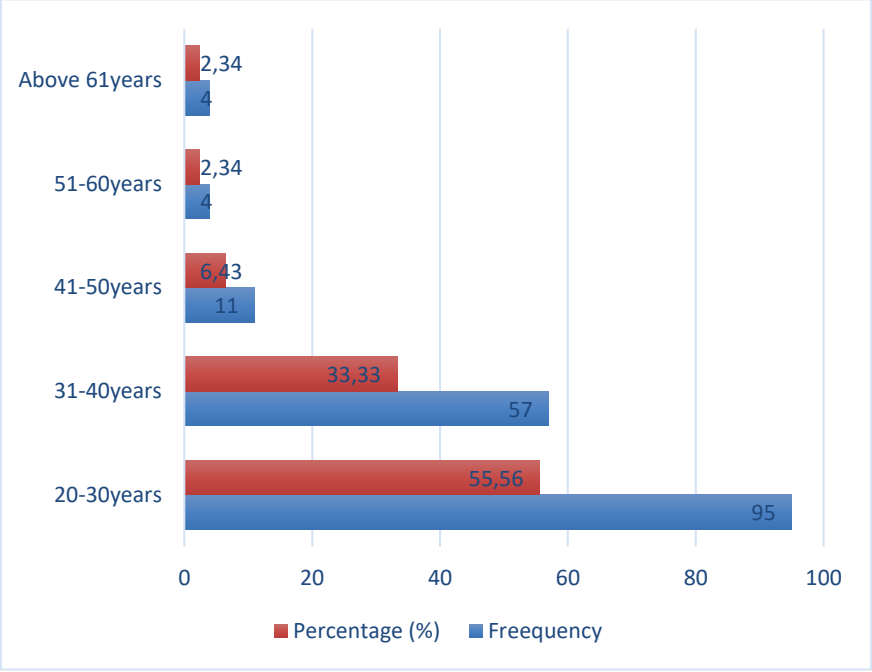

Fig. 1. Age of the Respondents

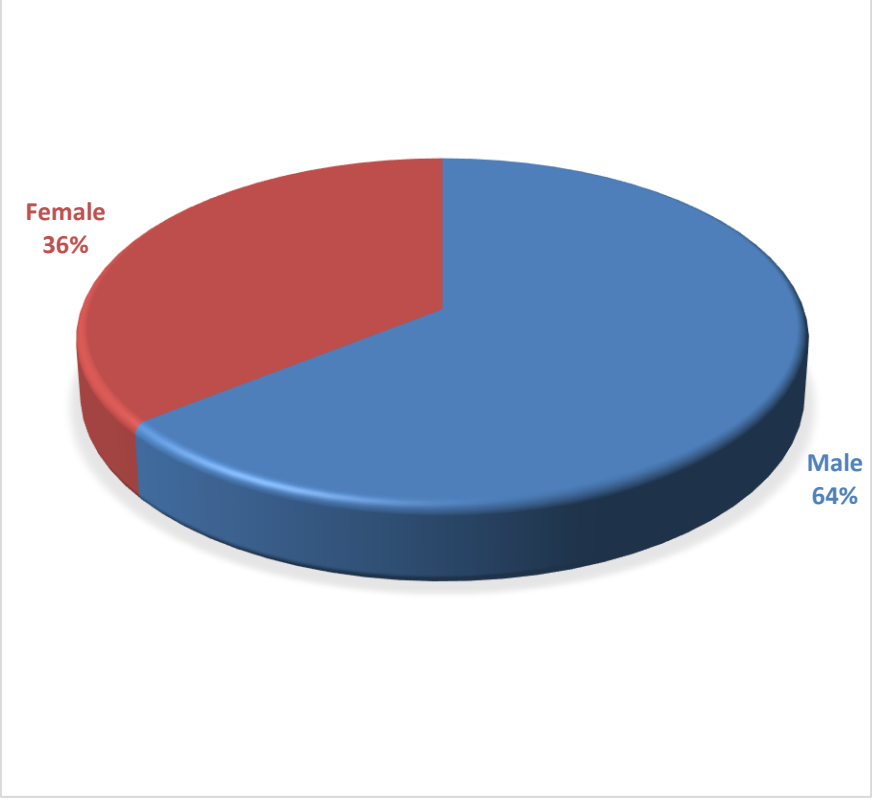

Fig. 2. Sex Distribution of the Respondents

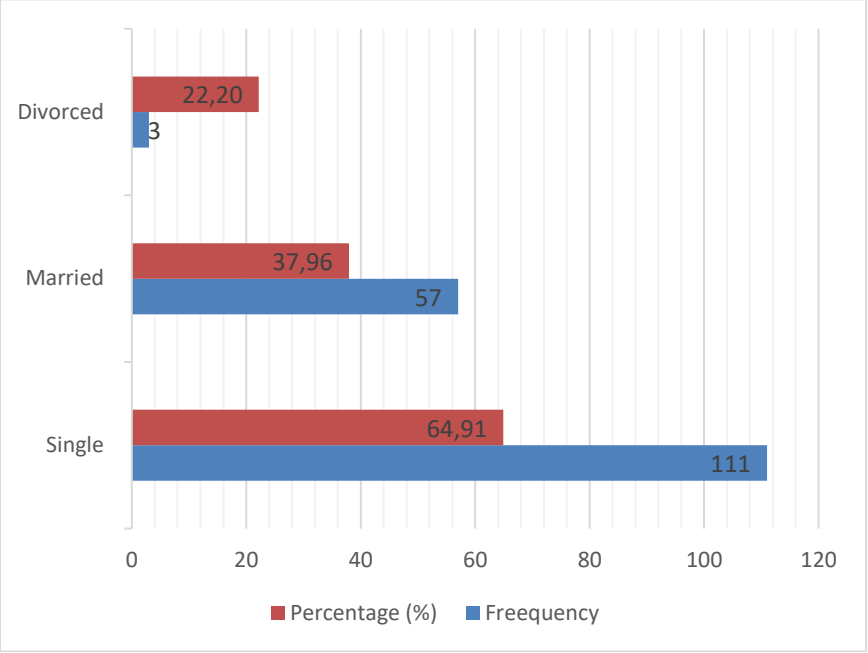

Fig. 3. Marital Status of the Respondents

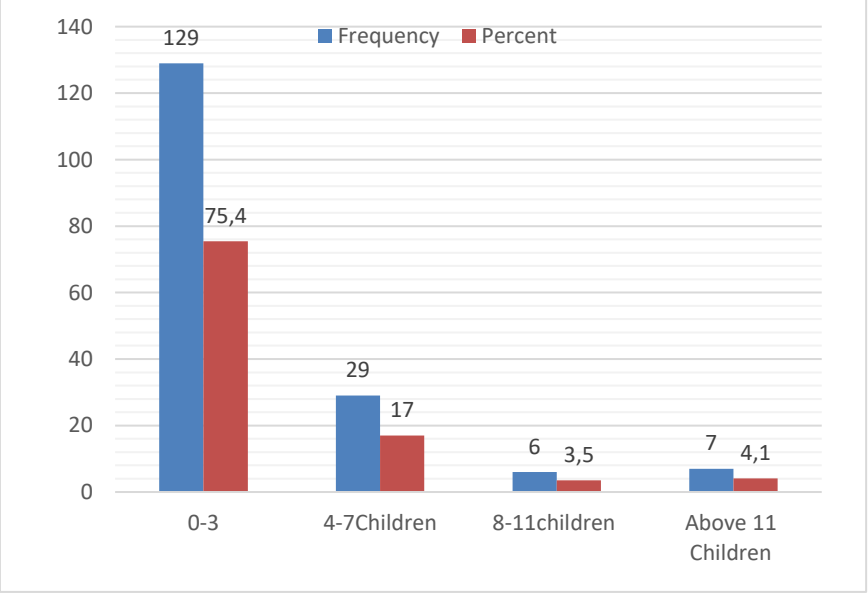

Fig. 4. Number of children of the respondents

Fig. 3 above shows the marital status of the respondents, those who are single have the highest frequency of 111 (64.91%) and those who are divorced constitutes the lowest frequency of 3 (22.20%). Fig. 4 above shows the number of children of the respondents, where respondents with 0-3 children has the highest respondents of 129(75.4%) and respondents with children above 11 has the least responses of 7(4.1%).

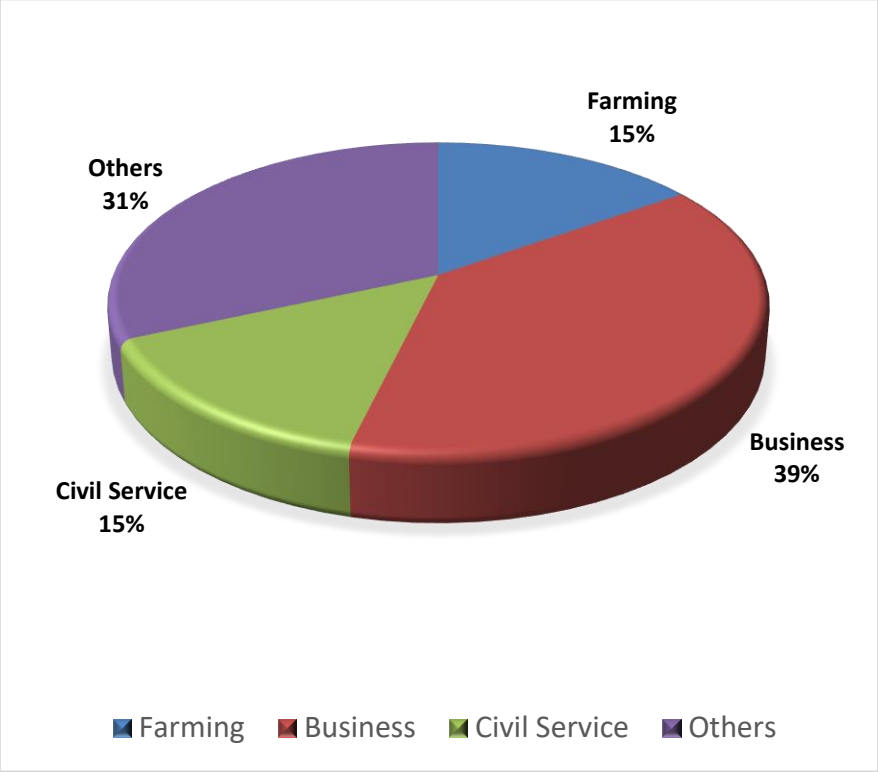

Fig. 5. Occupation of the Respondents

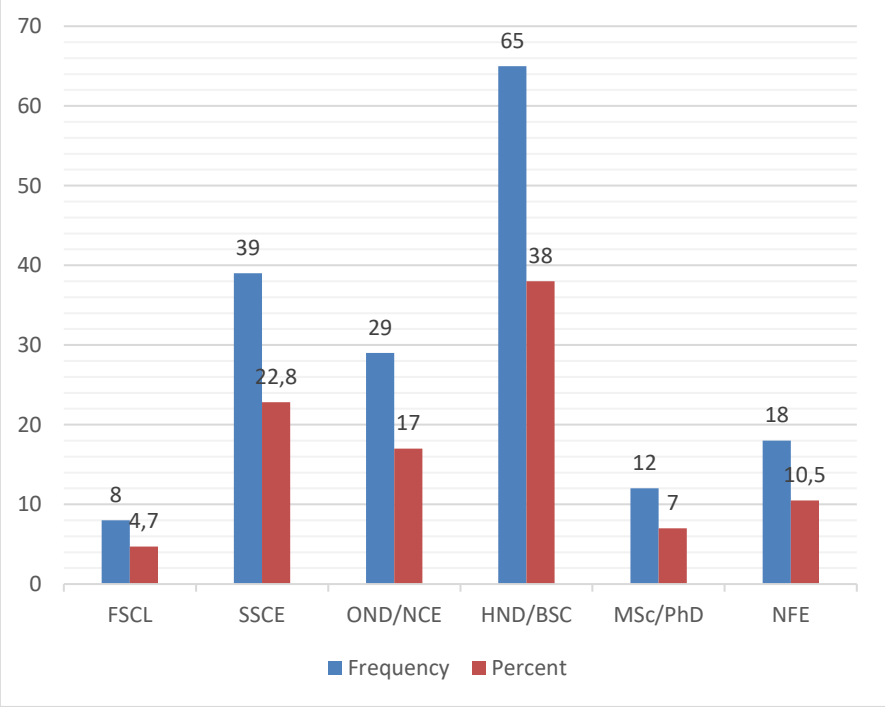

Fig. 6. Educational Status of the Respondents

Fig. 5 above shows the occupational status of the respondents, where 39% which is the highest percentage are business men, while farming and civil service share the same percentage of 15% represent the least responses. Fig. 6 above shows the educational status of the respondents, where the respondents with the highest respondents is HND/BSc with 65(38%) and FSCL has the lowest respondents with 8(4.7%).

Table 3. What is your opinion about tree planting in urban areas?

What is your opinion about tree planting in urban areas?	**Frequency**	**Percent**
Good	140	81.9
Bad	13	7.6
No Idea	18	10.5
Total	**171**	**100.0**
What is your view on massive cutting of Trees?	Frequency	Percent
Good	20	11.7
Bad	131	76.6
No Idea	20	11.7
Total	**171**	**100.0**

Table 3 above shows the opinion of the respondents on planting in urban areas, where 140 (81.9%) perceived it as a good idea and 13 (7.6%) which represents the lowest category though as bad idea. It also shows the view of the respondents on massive cutting of trees in urban areas, where 131(76.6%) perceived it as some bad idea and remains of the two categories of the respondents which represents the lowest category have the same responses of 20 (7.6%) perceived it as good and remains with no idea.

Table 4. Tree planting by the respondents

Have you ever planted a tree?	**Frequency**	**Percentage**
Yes	50	29.2
No	121	70.8
Total	171	100.0

Have you ever planted a tree?	Frequency	Percentage
Yes	50	29.2
No	121	70.8
If yes, how many?		
1-5	9	18
6-10	20	40
11-15	13	26
16-20	5	10
Above 20	3	6
Total	50	100

Table 4 above shows that 121(70.8) of the respondents has never planted a tree(s) and representing the highest responses while 50(29.3%) of the respondents they planted had planted a tree(s) in their life. It also shows the distribution of the respondents on how many ever planted; where the highest category is 20 (40%) planted trees between 11-15, while those planted trees above 20 has the lowest respondents of 3(6%).

Table 5. Problems encountered in tree planting

S/NO	Statements	SA	A	D	SD	Likert Score
1.	Space (Inadequate Land)	42	68	51	10	2.8
		24.6%	39.8%	29.8%	5.8%	100%
2.	Tendering to maturity	77	70	19	5	3.3
		45.0%	40.9%	11.1%	2.9%	100%
3.	Lack of public enlightenment	60	70	28	13	3.0
		35.1%	40.9%	16.4%	7.6%	100%
4.	Low private involvement	64	64	28	15	3.0
		37.4%	37.4%	16.4%	8.8%	100%
5.	Poor government policy	48	55	42	26	2.7

		28.1%	32.2%	24.6%	15.2%	100%
6.	Poverty	54	67	35	14	2.9
		31.6%	39.2%	20.5%	8.2%	100%
7.	Lack of funding	58	71	28	14	3.0
		33.9%	41.5%	16.4%	8.2%	100%
8.	Planting materials	94	69	7	1	3.5
		55.0%	40.4%	4.1%	0.6%	100%
	Likert Mean					**3.025**

Table 5 above, revealed some of the challenges of urban forestry as perceived by respondents with a Likert mean of 3.025, which shows a strong agreement of the respondents on the issue.

Table 6. Solution to the problems in tree planting

S/NO	Statements	SA	A	D	SD	Likert Score
1.	Land use planning	109	51	11	0	3.6
		63.7%	29.8%	6.4%	0.0%	100%
2.	Public enlightenment	85	65	19	2	3.4
		49.7%	38.0%	11.1%	1.2%	100%
3.	Involvement of private organization	102	60	7	2	3.5
		59.6%	35.1%	4.1%	1.2%	100%
4.	Good government policy	82	66	19	4	3.3
		48.0%	38.6%	11.1%	2.3%	100%
5.	Funding	100	55	12	4	3.5
		58.5%	32.2%	7.0%	2.3%	100%
6.	Provision of planting materials	54	69	48	0	3.0
		31.6%	40.4%	28.1%	0.0%	100%
	Likert Mean					**3.38**

Table 6. Shows some of the measures as a solution to the urban forestry, and respondents show their agreement with a Likert mean of 3.38.

4. DISCUSSION OF THE RESULTS

4. 1. Demographic Nature of the Respondents in Kano Metropolis.

The result found out that; age group between 20-30years has the highest response of 95(55.56%) and age group of 31-60years and above 61years has the lowest responses of 4(2.34%) in the study area where 110(64%) are male and female 60(36%) and the marital status shows that singles has the highest respondents of 111(64.91%) and divorced has the lowest respondents with 3(22.20%). It also shows that 131(76.61%) of the respondents are urban dwellers followed by semi-urban dwellers with 25(14.62) and rural dwellers with least respondents of 15(8.70%) and the same time its shows the occupational status of the respondents, where 39% which is the highest percentage are business men, while farming and civil service share the same percentage of 15% which represent the least respondents and finally it has shown that HND/BSc with 65(38%) has the highest respondents and FSCL has the lowest respondents with 8(4.7%).

4. 2. Problems encountered in Tree Planting among urban dweller

The study findings revealed various challenges faced by urban dwellers in tree planting, aligning with the outcomes of David Etim et al. (2012) research on Awareness and Perception of Urban Forestry among Urban Dwellers in the Sahel Savannah Region of Nigeria. Challenges identified included inadequate space, the time required for trees to mature, insufficient public awareness, limited private involvement, ineffective government policies, poverty, lack of funding, and scarcity of planting materials.

Etim et al. (2012) highlighted that respondents perceived inadequate funding of the forestry sector by the State government as a significant hindrance to urban forestry growth, followed by a shortage of trained personnel (17.66%) and inadequate public enlightenment on the importance of urban forestry (16.85%). Dankani (2018) emphasized the ongoing global urbanization trend driven by natural population increase, migration, and economic activities' redistribution.

The world's urban population has surged from 750 million in the 1950s to over half of the 7.6 billion global population in 2015, projected to reach 60% by 2030. Nearly two-thirds of the world's economy currently originates from urban areas, expected to rise to over three-fourths by 2030, contributing close to $90 trillion annually. However, this urban growth has come at a significant cost, with adverse environmental impacts, air and water pollution, and unsustainable forest management.

Cities concentrate risks from natural and technological hazards, posing threats such as earthquakes, hurricanes, and industrial accidents. Preparing cities for disasters and reducing vulnerability by enhancing housing and services can safeguard lives, improve livelihoods, and enhance the overall quality of life for millions globally. In both developing and developed nations, urban growth has given rise to severe social and economic challenges, with the likelihood of exacerbation as overall population growth coincides with the increasing trend of urban expansion (Beauregard, 2001). Recognizing and addressing these challenges is crucial for sustainable urban development and effective urban forestry practices.

4. 3. Solutions to the Challenges

Addressing challenges in tree planting necessitates the development and implementation of government policies that foster and incentivize such initiatives. This can involve providing tax breaks for tree planting activities, offering subsidies for planting materials, and enacting regulations mandating green spaces in urban development plans. Additionally, encouraging the active participation of private organizations through partnerships, sponsorships, and incentives aligns with the integrated management approach recommended by Fuwape and Onyekwelu (2011). Collaborating with all stakeholders, including the public, private sector, academic institutions, and local communities within urban settings, is vital for effective planning, establishment, and maintenance of urban forests. Intensifying education campaigns about urban forests is crucial to garner public support and participation in tree planting initiatives. Public awareness programs and educational initiatives can inform residents about the numerous benefits of tree planting. Workshops, seminars, and community engagement activities play a vital role in fostering a sense of environmental responsibility and encouraging active involvement. This echoes the observations made by Faleyimu (2014) on the importance of informed communities actively participating in sustainable urban forestry programs.

Securing adequate funding is essential for the success of tree planting programs. Public-private partnerships, grants, and budget allocations can address financial challenges. The findings of Straka et al. (2005), Lewis (199), and Faleyimu (2014) emphasize that financial assistance is a key driver for promoting urban forestry programs. Collaborative efforts between governments, non-governmental organizations (NGOs), and private entities allow the pooling of resources to fund comprehensive tree planting initiatives, ensuring sustainable and impactful outcomes. Implementing effective land use planning is crucial for designating and preserving areas suitable for tree planting. Zoning regulations should be established to allocate space for green belts, parks, and urban forests, safeguarding areas conducive to tree planting. Governments and organizations should consider establishing nurseries or partnering with existing ones to ensure a consistent supply of quality planting materials. Providing subsidies or supporting local businesses engaged in the production of tree saplings helps create a robust supply chain for sustainable tree planting endeavors. This comprehensive approach ensures systematic addressing of challenges associated with tree planting, fostering a resilient and green urban environment.

5. CONCLUSION AND RECOMMENDATION

The study conducted in Kano Metropolis underscores the dynamic demographic characteristics of respondents, with a notable concentration of younger individuals, predominantly male, and a majority of singles. The urbanization trend, exemplified by 76.61% of respondents residing in urban areas, is indicative of the broader global shift towards urban living. The occupational diversity highlights the prevalence of business-related activities, while educational qualifications vary, with HND/BSc holders being the majority. The study identified substantial challenges in urban tree planting, including land constraints, insufficient public awareness, and inadequate funding, emphasizing their significance with a Likert mean score of 3.025. The suggested solutions advocate a comprehensive strategy involving regulatory frameworks, educational campaigns, public-private collaboration, and financial support, underscoring the crucial role of sustainable practices in mitigating the environmental impacts

of rapid urban growth. Implementing these solutions can enhance tree planting efforts, contributing to the improvement of the micro-climate and fostering a more sustainable and resilient urban environment in Kano Metropolis. The findings of this research point to a number of recommendations based on values hold in relation to the urban forest.

i) Adequate funding by the state government should be provided to the sector for enhanced and sustainable projects implementation including the establishment of woodlots in the state metropolis would help in ameliorating the environmental hazards occasioned in the metropolis.
ii) Tree nurseries should also be established across the state where seedlings could be produced at large quantities for projects implementation and public procurement to enhance private participation.
iii) Increase the dialogue among residents, academics, and professionals to encourage improvements to the quality and sustainable management of the urban forest.
iv) Provide learning experiences for residents of all ages regarding the roles, values, and benefits of the urban forest.
v) Incorporate priority values of residents in urban forest management. Values are a reflection of what really matters to society, while sensitivity to values provides insights for setting goals by identifying areas of priority, gaining stronger public support for policies, and allowing decision-makers to discover opportunities and new ideas.

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