



PERCEIVED ENVIRONMENTAL IMPACT OF TREE PLANTING IN FEDERAL COLLEGE OF EDUCATION, GIDAN MADI, SOKOTO STATE, NIGERIA

SALAAM, Q.A¹, MUSA U², SANI, A.S³, ALABI, A.A⁴, OLADELE, B⁵ AND YUSUF, M. A⁶

^{1, 2, 4 & 5} Federal College of Education, Gidan Madi, Sokoto.

³ National Population Commission, Abuja.

⁶ Federal University of Technology, Minna.

*Corresponding author: abdulsalaamadebisi@gmail.com

ABSTRACT

The study assessed perceptions of students, academic staff, and non-academic staff on the environmental impact of tree planting in Federal College of Education, Gidan Madi, Sokoto State, Nigeria. It specifically examined perceptions of environmental benefits, effects on air quality improvement and temperature regulation, role in wind erosion control, challenges affecting tree planting, and measures for enhancing sustainability. A descriptive survey design was adopted. The population consisted of 100 respondents (students, academic staff, and non-academic staff), and a census approach was used. Data were collected using a structured questionnaire titled “Perceived Environmental Impact of Tree Planting Questionnaire (PEITPQ)”, oral interviews, and field observation. The questionnaire served as the main instrument, while qualitative inputs supported interpretation. Data were analyzed using frequency tables, percentages, and Chi-square (χ^2) at 0.05 significance level. Findings showed that respondents had positive perceptions of tree planting, with 85% reporting improved air quality, 82% reduced temperature, 80% wind erosion control, and 88% environmental beautification. Chi-square results indicated that these perceptions were statistically significant, leading to rejection of all null hypotheses. The study concluded that tree planting is widely perceived as beneficial to environmental sustainability in the college. It recommended sustained tree planting programmes, proper maintenance, and increased environmental awareness among stakeholders.

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INTRODUCTION

Environmental sustainability has become a major global concern due to increasing environmental challenges such as climate change, biodiversity loss, land degradation, and desertification. These problems threaten ecological stability and human well-being in both urban and rural environments.



Sustainable management of natural resources is therefore essential for maintaining environmental quality and ensuring that future generations can meet their needs. Among the various environmental conservation strategies, tree planting is widely recognized as a practical and cost-effective approach for environmental protection and ecosystem restoration (Adekunle, 2019).

Trees perform numerous ecological functions that contribute significantly to environmental sustainability. They absorb carbon dioxide, release oxygen, improve air quality, regulate temperature, conserve soil, and provide habitats for wildlife. These functions help create healthier environments and support ecological balance. Studies have shown that trees reduce atmospheric pollutants and contribute to improved environmental conditions and public health (Ojeh et al., 2020; Nowak et al., 2018). The growing concern over climate change has further increased the importance of tree planting programmes across the world. Consequently, tree planting has become an important climate change mitigation and adaptation strategy, especially in developing countries such as Nigeria (Anabaraonye et al., 2022; Apeh et al., 2023). Another important environmental benefit of trees is temperature regulation. Through shading and evapotranspiration, trees help reduce heat accumulation and improve thermal comfort within their surroundings (Yang et al., 2023; Escobedo et al., 2009).

Gidan Madi is a rural settlement in Tangaza Local Government Area of Sokoto State, northwestern Nigeria, located within the Sudan Savanna zone near the Sahel transition belt. The area has a tropical continental climate characterized by high temperatures, low and seasonal rainfall, and Harmattan winds, with vegetation dominated by scattered drought-resistant trees such as Acacia and Neem. The terrain is largely flat to gently undulating with sandy soils prone to erosion. Agriculture is the main economic activity, with residents engaged in crop production and livestock rearing, making the area suitable for studies in environmental management and sustainability.

Recent studies have further demonstrated the cooling effects of trees in urban environments. Research conducted across hundreds of European cities revealed that areas with tree cover were considerably cooler than comparable areas without vegetation cover. Trees can substantially reduce land surface temperatures and mitigate the urban heat island effect. These results highlight the importance of increasing vegetation cover in environments exposed to excessive heat especially in semi-arid regions such as Sokoto State. Apart from temperature regulation, trees also play a critical role in controlling soil erosion and combating desertification. In northern Nigeria, where strong winds and sparse vegetation contribute to land degradation, tree planting serves as an effective environmental protection measure. (Hassan 2021) observed that afforestation programmes have contributed significantly to reducing desert encroachment and stabilizing fragile soils. (Anabaraonye et al. 2022) also emphasized that trees act as natural windbreaks that reduce wind velocity and protect soil from erosion. The contribution of trees to



biodiversity conservation is equally important. Trees provide habitats for birds, insects, and other wildlife species, thereby supporting ecological stability. (Odum 2019), observed that vegetation forms the foundation of many ecosystems and plays a crucial role in maintaining ecological balance. Through the provision of food, shelter, and breeding sites, trees help sustain diverse biological communities and promote ecosystem resilience.

Educational institutions have increasingly embraced tree planting as part of sustainable campus management. Trees improve campus aesthetics, enhance environmental quality, reduce heat stress, and provide conducive environments for learning and recreation. Green spaces within educational institutions have also been associated with improved mental well-being, concentration, and academic performance among students (Oladele et al., 2021; Abimbola et al., 2023; Basu et al., 2024). Moreover, exposure to green environments has been associated with improved mental health and academic performance. (Basu et al. 2024) reported access to green spaces contributes to reduced stress levels, improved concentration, and enhanced psychological well-being among students. (Lanza et al. 2021) also observed trees and green spaces help reduce heat exposure and create healthier educational environments.

Tree planting additionally contributes to environmental beautification. Well-planned landscapes improve the visual appearance of institutions and create a pleasant atmosphere for academic and social activities. (Achoja et al. 2021) noted that many educational institutions undertake tree-planting initiatives to enhance campus aesthetics while promoting environmental sustainability. (Gbegbelegbe 2019) in the same way emphasized that urban forestry contributes significantly to environmental quality and landscape improvement. Tree planting and afforestation have become globally recognized strategies for addressing environmental degradation, climate change, and biodiversity loss. Forest ecosystems play a critical role in carbon sequestration, climate regulation, and soil conservation, making them essential components of sustainable environmental management (Lal, 2004). In recent decades, increasing urbanization and deforestation have intensified environmental challenges, particularly in developing countries, where land-use changes continue to reduce vegetation cover. In Africa, tree planting initiatives are increasingly being promoted as part of environmental sustainability programs. (Shackleton et al. 2017) noted that urban tree planting in African cities contributes to climate adaptation and improves livelihood opportunities through ecosystem services. Despite these benefits, many urban areas still experience inadequate tree cover due to poor planning, limited awareness, and weak environmental policies.

In Nigeria, environmental degradation and rapid urban expansion have heightened the need for sustainable afforestation strategies. Studies have shown that tree planting plays a significant role in



restoring degraded land and improving environmental quality in urban and peri-urban areas (Odey & Agboola, 2021). However, challenges such as inadequate funding, lack of public participation, and insufficient policy enforcement continue to hinder effective tree planting programs. At the global level, international organizations such as the Food and Agriculture Organization (FAO) have consistently emphasized the importance of forest conservation and restoration. The FAO (2016, 2020) reports highlight declining forest resources in many regions and stress the need for large-scale tree planting and sustainable forest management as key strategies for environmental resilience. Similarly, the United Nations Environment Programme (UNEP, 2021) advocates ecosystem restoration as a foundation for achieving sustainable development and combating climate change.

Tree planting remains a vital environmental intervention for addressing deforestation, climate change, and urban ecological degradation. Its effectiveness, however, depends on proper planning, community involvement, and strong institutional support. Federal College of Education, Gidan Madi, has undertaken tree planting initiatives aimed at improving environmental conditions within the campus. However, limited empirical evidence exists regarding the actual environmental impacts of these efforts. This study therefore seeks to assess the environmental impact of tree planting within the College environment and provide recommendations for enhancing environmental sustainability.

This gap in knowledge creates the need for a systematic assessment of the environmental of tree planting within the institution. Such an assessment will provide valuable information for environmental planning, sustainable campus management, and future afforestation programmes. Therefore, this study seeks to assess the environmental impact of tree planting within the Federal College of Education, Gidan Madi, Sokoto State, Nigeria, with a view to providing evidence-based recommendations for improving environmental sustainability within the institution.

PROBLEM STATEMENT

Environmental degradation has become a major concern in many educational institutions in northern Nigeria due to increasing temperatures, poor vegetation cover, wind erosion, and air pollution. Despite efforts toward tree planting in schools and public institutions, many campuses still experience inadequate shade, excessive heat, and poor environmental quality.

In Federal College of Education, Gidan Madi, trees have been planted in various locations within the campus, but the extent to which these trees contribute to environmental improvement has not been fully assessed. There is inadequate information regarding the effectiveness of tree planting in reducing temperature, improving air quality, preventing erosion, and enhancing environmental aesthetics within



the institution. This lack of information creates a gap in environmental planning and sustainable campus management.

OBJECTIVES OF THE STUDY

The study sought to:

1. Assess respondents' perceptions of the environmental benefits of tree planting in Federal College of Education, Gidan Madi.
2. Examine respondents' perceptions of the effects of tree planting on air quality improvement and temperature regulation in Federal College of Education, Gidan Madi.
3. Determine respondents' perceptions of the role of tree planting in controlling wind erosion in Federal College of Education, Gidan Madi.
4. Identify respondents' perceptions of the challenges affecting tree planting and maintenance in Federal College of Education, Gidan Madi.
5. Determine respondents' perceptions of measures for improving tree planting and environmental sustainability in Federal College of Education, Gidan Madi.

RESEARCH QUESTIONS

The study sought to answer the following questions:

1. What are respondents' perceptions of the environmental benefits of tree planting in Federal College of Education, Gidan Madi?
2. What are respondents' perceptions of the effects of tree planting on air quality improvement and temperature regulation in Federal College of Education, Gidan Madi?
3. What are respondents' perceptions of the role of tree planting in controlling wind erosion in Federal College of Education, Gidan Madi?
4. What are respondents' perceptions of the challenges affecting tree planting and maintenance in Federal College of Education, Gidan Madi?
5. What are respondents' perceptions of measures for improving tree planting and environmental sustainability in Federal College of Education, Gidan Madi?



RESEARCH HYPOTHESES

The study tested the following null hypotheses:

H₀ 1: There is no significant difference in respondents' perceptions regarding the contribution of tree planting to air quality improvement in Federal College of Education, Gidan Madi.

H₀ 2: There is no significant difference in respondents' perceptions regarding the contribution of tree planting to temperature regulation in Federal College of Education, Gidan Madi.

H₀ 3: There is no significant difference in respondents' perceptions regarding the role of tree planting in controlling wind erosion in Federal College of Education, Gidan Madi.

H₀ 4: There is no significant difference in respondents' perceptions regarding the contribution of tree planting to environmental beautification in Federal College of Education, Gidan Madi.

METHODOLOGY

Research Design

The study adopted a descriptive survey research design.

Population of the Study

The population of the study comprised all students, academic staff, and non-academic staff of Federal College of Education, Gidan Madi, Sokoto State, Nigeria. This population represents the entire community within the institution in relation to the study on tree planting and environmental sustainability.

Sample and Sampling Techniques

A sample of 100 respondents was used for the study, comprising 40 students, 30 academic staff, and 30 non-academic staff of Federal College of Education, Gidan Madi, Sokoto State, Nigeria. Stratified sampling technique was first employed to divide the population into three distinct groups: students, academic staff, and non-academic staff. This ensured that all relevant categories within the college community were properly identified. After stratification, quota sampling technique was used to assign specific numbers of respondents to each group (40 students, 30 academic staff, and 30 non-academic staff), ensuring balanced representation across the strata. Finally, within each quota group, convenience sampling technique was used to select respondents who were readily available and willing to participate.



during the period of data collection.

Instruments for Data Collection

The study employed a structured questionnaire titled Perceived Environmental Impact of Tree Planting Questionnaire (PEITPQ), oral interviews, and field observation. The questionnaire was designed to obtain respondents' perceptions on environmental benefits of tree planting, including air quality improvement, temperature regulation, wind erosion control, beautification, challenges, and improvement measures. Oral interviews provided additional qualitative insights, while field observation was used to assess the condition and distribution of trees within Federal College of Education, Gidan Madi. The validity of the instruments was ensured through face and content validation by experts in Environmental Science and Educational Research, who reviewed the items for clarity and relevance. The reliability of the questionnaire was established through a pilot test, and Cronbach's Alpha yielded a coefficient of 0.78, indicating acceptable reliability.

Method of Data Analysis

Data were analyzed using frequency tables and percentages to summarize responses, while Chi-square (χ^2) statistical analysis was used to test the hypotheses at 0.05 level of significance.

RESULTS

Research Question 1

What are the environmental benefits of tree planting within the college?

Table 1: Environmental Benefits of Tree Planting (N = 100)

Environmental Benefit	F	P (%)
Improves Air Quality	85	85.0
Reduces Temperature	82	82.0
Controls Wind Erosion	80	80.0
Beautifies Environment	88	88.0

Source: Field Survey, 2026

The results in Table 1 show that respondents generally hold positive perceptions of the environmental benefits of tree planting in Federal College of Education, Gidan Madi. The highest proportion (88%) indicated that tree planting enhances environmental beautification, followed by 85% who reported



improvement in air quality. In addition, 82% believed that tree planting reduces environmental temperature, while 80% acknowledged its role in controlling wind erosion. Therefore, the findings suggest that respondents strongly perceive tree planting as beneficial to environmental quality and sustainability within the college.

Research Question 2

What effects does tree planting have on temperature reduction and air quality?

Table 2: Effects of Tree Planting on Temperature Reduction and Air Quality (N = 100)

Effect	Frequency(f)	Percentage (%)
Reduces Heat	82	82.0
No Effect on Temperature	18	18.0
Improves Air Quality	85	85.0
No Improvement in Air Quality	15	15.0

Source: Field Survey, 2026

Table 2 shows that respondents generally perceive tree planting as having positive environmental effects in Federal College of Education, Gidan Madi. A majority (82%) reported that tree planting reduces heat, while 18% believed it has no effect on temperature. Similarly, 85% indicated that tree planting improves air quality, whereas 15% felt there is no improvement in air quality. Therefore, the results suggest that most respondents perceive tree planting as effective in both reducing temperature and improving air quality within the college environment.

Research Question 3

What role do trees play in controlling soil erosion and wind effects?

Table 3: Role of Trees in Controlling Wind Erosion (N = 100)

Response	Frequency(f)	Percentage (%)
Helps Control Wind Erosion	80	80.0
Does Not Control Wind Erosion	20	20.0
Total	100	100.0

Source: Field Survey, 2026

Table 3 shows that most respondents perceive tree planting as effective in controlling wind erosion in Federal College of Education, Gidan Madi. Specifically, 80% of the respondents indicated that trees



help in controlling wind erosion, while 20% believed that trees do not have such an effect. Thus, the findings suggest that the majority of respondents recognize tree planting as an important strategy for reducing wind erosion within the college environment.

Research Question 4

What challenges affect tree planting and maintenance in the college?

Table 4: Challenges Affecting Tree Planting (N=100)

Challenge	Frequency(f)	Percentage (%)
Lack of Water	40	40.0
Poor Maintenance	25	25.0
Animal Destruction	20	20.0
Lack of Awareness	15	15.0
Total	100	100.0

Source: Field Survey, 2026

Table 4 indicates the challenges affecting tree planting in Federal College of Education, Gidan Madi. The most frequently reported challenge was lack of water (40%), followed by poor maintenance (25%). In addition, 20% of respondents identified destruction by animals as a constraint, while 15% pointed to lack of awareness. Thus, the findings suggest that inadequate water supply and maintenance practices are the major factors limiting effective tree planting and sustainability within the college environment.

Research Question 5

What measures can improve tree planting and environmental sustainability within the college?

Table 5: Measures for Improving Tree Planting and Environmental Sustainability (N=100)

Measure	Frequency (f)	Percentage (%)
Regular Watering and Maintenance	35	35.0
Provision of Additional Seedlings	25	25.0
Environmental Awareness Programmes	20	20.0
Protection from Animals and Vandalism	12	12.0
Government/NGO Support	8	8.0
Total	100	100.0

Source: Field Survey, 2026



Table 5 presents respondents' views on measures for improving tree planting and environmental sustainability in Federal College of Education, Gidan Madi. The most preferred measure was regular watering and maintenance (35%), followed by provision of additional seedlings (25%). Furthermore, 20% of respondents supported environmental awareness programmes, while 12% suggested protection of trees from animals and vandalism. The least mentioned measure was government or NGO support (8%). Thus, the findings indicate that respondents prioritize practical on-campus maintenance strategies as the most effective way of improving tree planting and sustainability within the college environment.

TESTING OF HYPOTHESES

TABLE 6: CHI-SQUARE ANALYSIS OF THE IMPACT TREE PLANTING WITHIN THE FCE, GIDAN MADI

No.	H ₀	Response Category	Calculation					X ² Calculated	X ² Critical (0.05)	df	Decision	Interpr.
			O	E	O-E	(O-E) ²	(O-E) ² /E					
1	Tree planting has no significant effect on air quality improvement within the Federal College of Education, Gidan Madi.	Improves Air Quality	85	50	35	1225	24.50	49.00	3.84	1	Reject H ₀	Tree planting contributes significantly to air quality improvement within the college environment.
		No Improvement	15	50	-35	1225	24.50					
		Total	100	100	-	-	49.00					
2	Tree planting has no significant effect on temperature reduction.	Reduces Heat	82	50	32	1024	20.48	40.96	3.84	1	Reject H ₀	Tree planting significantly contributes to temperature reduction within college environment.
		No Effect	18	50	-32	1024	20.48					
		Total	100	100	-	-	40.96					



3	Tree planting has no significant effect on wind erosion control.	Controls Wind Erosion	80	50	30	900	18.00	36.00	3.84	1	Reject H_0	Tree planting plays a significant role in controlling wind erosion within the study area.
		Does Not Control	20	50	- 30	900	18.00					
		Total	100	100	-	-	36.00					
4	Tree planting has no significant effect on environmental beautification.	Beautifies Environment	88	50	38	1444	28.88	57.76	3.84	1	Reject H_0	Tree planting contributes significantly to the beautification of the college environment.
		No Improvement	12	50	- 38	1444	28.88					
		Total	100	100	-	-	57.76					

DISCUSSION OF FINDINGS

The finding that tree planting improves air quality agrees with (Ojeh et al., 2020), who reported that trees contribute significantly to environmental quality. The result on temperature reduction also supports (Yang et al., 2023), who observed that trees provide cooling effects through shading and evapotranspiration. Similarly, the finding on wind erosion control is consistent with (Hassan, 2021), who reported that afforestation reduces environmental degradation in northern Nigeria.

The Chi-square analysis further confirmed that the observed environmental benefits were statistically significant. The calculated Chi-square values for air quality improvement ($\chi^2 = 49.00$), temperature reduction ($\chi^2 = 40.96$), wind erosion control ($\chi^2 = 36.00$), and environmental beautification ($\chi^2 = 57.76$) were all greater than the critical value of 3.84 at the 0.05 level of significance. Consequently, all the null hypotheses were rejected. This confirms that tree planting has made a significant contribution to environmental sustainability in Federal College of Education, Gidan Madi.

Thus, the findings demonstrate that tree planting is an effective environmental management strategy capable of improving environmental quality, promoting ecological sustainability, and creating a healthier and more conducive learning environment within the institution.



SUMMARY/CONCLUSION

The study investigated the perceived environmental impact of tree planting within the Federal College of Education, Gidan Madi, Sokoto State, Nigeria. Data were collected from 100 respondents using a questionnaire, interviews, and field observations and were analyzed using frequencies, percentages, and Chi-square (χ^2) statistical analysis. The results revealed that 85% of respondents perceived improvements in air quality, 82% reported temperature reduction, 80% recognized the role of trees in controlling wind erosion, and 88% agreed that tree planting enhanced the beauty of the college environment. The Chi-square analysis further showed that the calculated values for all tested variables exceeded the critical value at the 0.05 significance level, leading to the rejection of all null hypotheses. The study therefore established that tree planting has made a significant contribution to environmental sustainability within the Federal College of Education, Gidan Madi, particularly in the areas of air quality improvement, temperature regulation, erosion control, and environmental beautification.

RECOMMENDATIONS

Based on the study, the following suggestions were made:

1. The college management should continue to support tree planting by encouraging the planting of local and drought-resistant tree species across the campus.
2. Adequate maintenance measures such as regular watering, pruning, and protection of trees should be implemented.
3. Awareness programmes should be organized from time to time to help students and staff understand why trees are important for the environment and daily life.
4. Government bodies and non-governmental organizations should support college by providing seedlings, funding, and technical assistance for tree planting projects.
5. Measures should be taken to protect planted trees from animals and unnecessary human interference so that more of them can survive and grow properly.
6. Tree planting activities should be included in environmental studies and student community service programmes to encourage active participation.
7. The college management should undertake periodic monitoring and evaluation of tree planting programmes.



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