FEDERAL COLLEGE OF FORESTRY JOS, PLATEAU STATE.
FORESTRY RESEARCH INSTITUTE OF NIGERIA

…….. Plant a tree today

FCFJ TECHNICAL REPORT No.011

LANDSCAPE PLANNING AND SUSTAINABLE DEVELOPMENT FOR AN ACADEMIC ENVIRONMENT IN FEDERAL COLLEGE OF FORESTRY, JOS.

Orewere E., Owonubi A., Joshua V.I., Okeke-Agulu K.I., Chomini M.S., Terzulum J. I., Ogenyi R.A., Dogun O., and Okeke G.C.

…….

PROVOST

October, 2022

ABSRTACT

Landscaping is the creation of functional and aesthetically pleasing environment for living, working circulation, and recreation. The main thrust of this report, is to assess the current environmental quality of the surrounding of two academic departments namely: (Horticulture and Landscape Technology, (HLT) and Crop Production Department CPT), Federal College of Forestry, Jos, in Jos North Local Government Area of Plateau State, Nigeria. Consequently, the objective of this study is to evaluate the various ways through which the environmental quality can be improved upon in other to achieve maximum productivity and a good state of health and wellbeing. The methodology employed for this study is physical observation, case study and the review of related literature. The report submits by way of conclusion that learning in a well landscaped physical environment of an institutional building will impact on staff and students, improve their productivity levels and more attractive to users. Working closely with professionals in landscape planning and other related disciplines (Horticulturists, Soil scientist) would ensure users' satisfaction.

Keywords: Academic, Environment, Learning, Landscape planning, Sustainable

1.0 Introduction

Landscape planning which is an aspect of beautification is a precondition for environmental sustainability. It plays an essential role in the quality of our environment, economic wellbeing of the people, as well as their physical and psychological health (Daniel *et al.*, 2018).It is a process concerned with activities geared toward the articulation of existing open space for the purpose of enhancing the quality of the environment. The articulation process may include the rehabilitation of the open spaces as well as the coordination of existing relationship between and among them (Ibimilua, 2014). Consequently, landscape design is the science and art of organizing and enriching outdoor space through the placement of plants and structures in agreeable and useful relationship with natural environment. (Ayeni, 2012; Igwe *et al.*, 2018; Orewere *et al.,* 2022). Hence, a well-defined landscape space can enhance the quality of living areas which meets people`s preferences. The likely consequences of a poorly landscaped environment are poor productivity output in teaching and learning, discouragements in conducting research activities, productivity loss, distress, emotional instability, fatigue, illness, anger, dullness, increase in urban heat islands etc. (Ayeni *et al.,* 2018). The adverse environmental effects are evident, requiring immediate intervention and control to ensure a sustainable development. This is the area landscaping is relevant.

1.1 Principles of Landscape Design

The goal in developing a landscape plan is to design a plan that will achieve unity and harmony. The principles of landscape design are the building blocks used by designers to create beautiful and functional landscapes. A harmonious composition can be achieved through the principles of proportion, order, repetition, and unity. All of the principles are related, and applying one principle helps achieve the others (Hansen, 2010; Olosunde, (n.d.).).Therefore the following principles should be considered in designing the plan;

i. Proportion
ii. Order
iii. Balance
iv. Repetition
v. Unity

vi. Emphasis or dominance

vii. Simplicity

1.2 The Concept of Sustainability

Sustainable development is the capacity to improve the quality of human life while living within the carrying capacity of supporting ecosystems. Therefore, development is real only if it makes lives better in all respects. Sustainable development must balance the needs of society, the economy and the environment (Ibimilua, 2014; Daniel *et al.,* 2018).

The World Commission on Environment and Development (1987) defined sustainable development as that which meets the needs of the present without compromising the ability of future generations to meet their own needs. This definition makes sustainable development to be relevant in all sectors of the economy-social, cultural, economic, environmental, industrial, institutional, recreational, and agriculture. This study demonstrates with a landscape design model, the sustainable ecological management of the Horticulture and Landscape Technology (HLT) and Crop Production Technology (CPT) building - an effective tool for improving and sustaining the quality of the environment, economic wellbeing of the people, as well as their physical and psychological health.

2.0 Methodology

2.1 Study Location

Jos is the administrative capital of Plateau State, (Figure 1) and lies within latitudes 9°45’00’’N to 09°57’00’’N and longitudes 8°48’00’’E to 8°58’00’’E. The study covered a tertiary institution situated in Jos North Local Government Area (LGAs) with an estimated population of about 3,206,531 (NPC, 2019). This is attributed largely to the unprecedented flux due to rural-urban and urban-urban migration fueled by insecurity in the state and elsewhere in Nigeria in the last two decades (Rikko, *et al.,* 2022).

2.2 Study Area

Federal College of Forestry, Jos was established in 1958 as an educational Centre in Nigeria and one of the seven Colleges owned by Forestry Research Institute of Nigeria (FRIN), Ibadan which is a parastatal of the Federal Ministry of Environment. Geographically, it is located on Latitudes 09° 56'N and 09° 48'N, and Longitudes 08° 53'E and 08° 34' E of the Greenwich meridian (Figure 1) with a total area of 2,612m^2 (Archives of Library and Documentation Unit FCF, Jos, 2019).

The HLT/CPT building of the College was established in the year 1997 Academic session with approval from National Board for Technical Education (NBTE). The sole aim is to train technical staff on sustainable base in horticulture, landscape and crop production at National Diploma (ND) and Higher National Diploma (HND) Programmes (Archives of Library and Documentation Unit FCF, Jos, 2019).

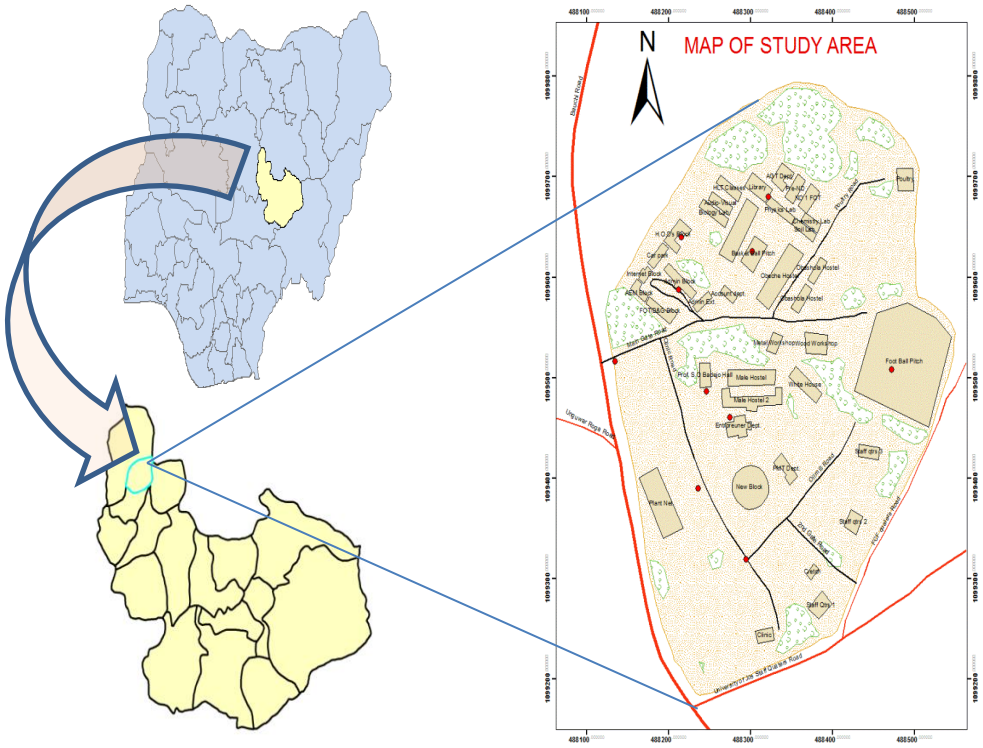

Figure 1: Plateau State in National context and Jos North Local Government Area in State context leading to the study area (FCF, Jos) in Local context.
Source: Archives of Library and Documentation Unit FCF, Jos, 2019. Tertiary.

2.3 Method of Data Collection

The research made use of both primary and secondary sources of data. The primary data were obtained by observation, photographic means, soil and field survey to have accurate three dimensional views of the study site. Consulting extensively relevant textbooks, electronic journals, geographical maps of study site and Plateau State, Nigeria were also done as sources of secondary literature.

2.3.1 Case Study

The researchers' used two case studies from Malaysia (Kuala Lumpur) and Federal University of Technology Akure (Nigeria). This provided a large platform of information on landscape design through an insight analysis of before and after design.

2.3.2 Reconnaissance Survey

The research visit and reconnaissance survey were carried out from July 2021.A site study (site inventory and site analysis) was conducted to ascertain the extent of landscape development needed at study site and an analysis chart was developed (Table 1).

Table 1: Summary of Analysis Chart

S/No	Element	Quantity	Function	Opportunity	Constraint	Remark
1.	Main Entrance	1	Entry/Exit	Yes	None	Improve
2.	Pedestrian walkways	-	Circulation	Yes	None	Improve
3.	Rock outcrop	1	Outdoor sitting	Yes	None	Retained
4.	Drainage	-	Channel water	Yes	None	Improve
5.	Tree	-	Provision of shade/Aesthetics/ Erosion control	Yes	None	Retained & Introduced
6.	Shrubs	-	Provision of shade/Aesthetics/ Erosion control	Yes	None	Retained & Introduced

Source: Field work, 2022

2.4 Prevailing Conditions at Inception of Design Intervention

This study has identified the Horticultural Technology (HOT) building and Crop Production Technology (CPT) building as buildings requiring urgent landscape planning attention.

2.4.1 Lack of softscape elements

The building has three open courtyards, which lack shade of colourful plants, outdoor gardens, water features, etc. that can mitigate carbon dioxide emissions and beautify the environment Also, the soil elements around the building are gradually eroding exposing the foundation tree roots.

2.4.2 Lack of hardscape elements

The vistas of the environment still lacks basic amenities and hardscape elements such as outdoor sitting arrangements, bollards, sculptural works, sign posts etc. for outdoor space and to enhance the natural environment.

2.4.3 Dilapidated existing hardscape elements

The existing hardscape elements are dilapidated and need to be replaced.Existing drainages is shallow and can't accommodate large volume of water during heavy rainfall likewise the kerbs are broken an need to be re-installed.

2.5 The Proposal

2.5.1 Site Analysis

A site analysis map was produced considering the on-site and off-site views, weather and climatic elements. The soil type on site is characterized with coarse sandy loam distributed all round.

2.5.2 Topography and Soil

The topographic map reveals the site is a relatively flat strip of land 2-8% (easily accommodates most categories of development) gradient sloping towards the north-south end of the site. The soils (sandy loam) characteristics is a direct product of the underlying geology support plant growth.

2.5.3 Climate and Vegetation

Jos city has an equable climate with average monthly temperatures ranging between 21° and 25° C (69° and 77° F), average humidity of 60% and average annual rainfall of 1,400mm (56"). These average numbers however obscure substantial diurnal and seasonal variations which are of great significance in the design for comfort and energy efficiency (Archives of National Centre for Remote Sensing, Jos, 2007). The site falls largely within the northern guinea savannah zone which consists mainly of shrubs, grasses and the plateau type of mosaic vegetation. Plants identified on the site included: Terminalia (*Terminalia mantaly*), Terminalia (*Terminalia superba*), Acalypha (*Acalypha spp*).

2.5.4 Zoning Concept

The concept derived for this site is based on the concept of zoning the project site into micro spaces. The major criteria considered in evolving the micro spaces concept for the site are Circulation and Activity.

i. Circulation

This addresses the movement of human and vehicular traffic around the site. This is achieved by the use of adequate/functional driveways and walkways.

ii. Activity

Activity determines the function of all the outdoor spaces on the site. Activities present on site are ancillary and passive traffic. The zoning of the site is particularly influenced by various activities present on site. Each zone is characterized by the function of the adjoining facility.

2.6 Plant Selection

Different plants are used in various courtyards depending on the aim/purpose of such development i.e. Sit-out spaces will need canopy trees for shade and good micro space alienation. Plants are selected according to their structural character, its structural roofing system, screening effects, greenery effects, and fragrances.

Catalogue of the proposed Landscape development at the office buildings from Inception till date

Phase One – Open Courtyards (September 2021)

Plate i a & b: Site clearing, weeding and disposal (before and after)
Source: Field photograph, 2022

Plate ii: Application of Pesticides and organic manure

Plate iii: Laying of gravels and stone pebbles For demarcation and emphasis

Source: Field photograph, 2022.

Plate iv: Planting of exotic plant species Such as Crown of Thorns (*Euphorbia milii*) And Chinese grass (*Ophiopogon japonicas*) etc.

Plate v: Watering of plants with water hose

Source: Field photograph, 2022.

Plate vi: Mulching for turfs

Plate vii: Growing and maturing plants

Source: Field photograph, 2022.

Phase Two – Green Area and Outdoor sitting (January 2022)

Plate viii: Site clearing, weeding and disposal

Plate ix: Application of pesticides

Source: Field photograph, 2022.

Plate x: Laying of concrete floor slabs, stone Chippings (Gravel) and rock boulders As pedestrian walkway to sit-outs

Plate xi: Sowing of Carpet grass (*Axonopus compressus*) and manure application

Source: Field photograph, 2022

Plate xii: Mulching for turfs and introducing exotic plants species within **Plate xiii:** Watering of plants

Source: Field photograph, 2022.

Plate xiv: Installation of concrete table and chairs **Plate xv:** Laying of kerbs to define pedestrian walkway

Source: Field photograph, 2022.


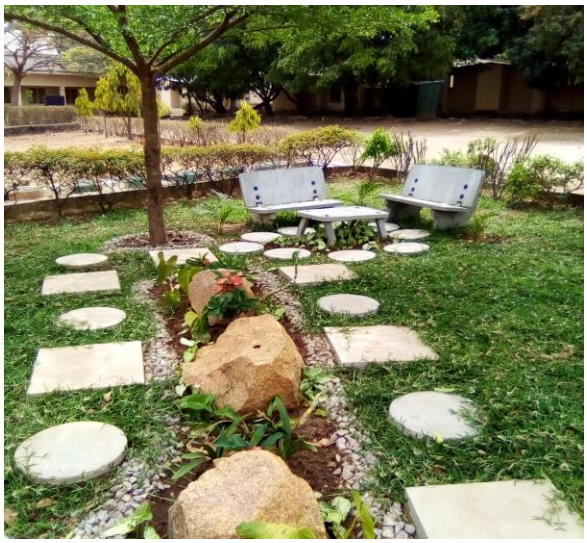

Plate xvi Maturing exotic plants species and Carpet grass (*Axonopus compressus*)
Source: Field photograph, 2022.

Phase Three – Rock Garden (May 2022 – till date)


Plate xvii: a & b: Site clearing, weeding and disposal (before and after)
Source: Field photograph, 2022.

Plate xviii: Well established rock garden with variety of plants
Source: Field photograph, 2022

Plate xix: Well established rock garden with cacti plants
Source: Field photograph, 2022

2.7 Planting Scheme and Specifications

Planting scheme is the art of installation and spacing of luscious array of colorful flowers around the centre, (Acquaah, 2009) this is meant to provide an aesthetical appeal and enhance circulation within the environment (Table 2). At this stage, plants are introduced to their

appropriate locations based on the planting scheme. Watering is done afterwards and carried out during the dry season.

Table 2: Planting Scheme and Specification

S/N	Common name	Botanical name	Hight (m)	Spread	Spacing	Qtty	Use
1	Barbed wire cactus	*Acanthocereus tetragonus*	2 – 7	6 – 8cm diameter	6 – 12 inches	1	Display
2	Eve's pin	*Austracylindrepuntia subulate*	4	6 – 10cm diameter	13 – 25mm apart	3	Display
3	Indium spurge tree	*Euphorbia neriifolia*	3 – 5			3	Shrub
4	Prickly pear	*Opuntia humifusa*				3	Display
5	Abyssinian euphorbia	*Euphorbia trigona*	8		13 – 25mm apart	3	Display
6	Twisted spurge	*Euphorbia viresa*	3	5m		3	Display
7	Spineless butchers' broom	*Ruscus hypoglosum*	46cm	9 –120cm		3	Display
8	Frangi pani	*Plumeria spp*	8	1 – 8m	4m	2	Large shrub
9	Moss rose	*Pertulaca grandiidlora*	1.5	1.2m	1m	20	Display
10	Heart of Jesus plant	*Caldium bicolor*	40 – 90cm tall		20cm	25	Ground cover
11	Chinese privet	*Ligustrum sinense*	2 – 7m	0.4m	1.5m	30	Hedge
12	Weeping fig	*Ficus benjamina*	7m	5m	4m	4	Large shrub
13	Yellow blush	*Duranta*				4	Shrub/hedge
14	Big leaf hydrangea	*Hydrangea macrophylla*	2m	2.5m	3 – 10ft apart		Display
15	Korean lawn grass	*Zoysia japonica*	0.1m			20	Lawn
16	Royal palm	*Roystones regia*	10m	2m	5m	5	Avenue
17	Masquerade tree	*Poliyalthia longifelia*	20m		4m	4	Shrub
18	Pipa	*Eriobotra japonica*	5 – 10m	30 – 40ft	3 – 5m apart	4	Ground cover
19	Purple heart	*Tradescantia pallida*	30 – 60m	30 – 60m	45cm	5	Shrub
20	American arborvitae	*Thuja orcidentalis*	15m	10 – 12ft	2 ft	5	Shrub
21	Golden dew drop	*Duranta erecta*	6m	6m	3 – 5ft apart	30	Shrub
22	Fire bush plant	*Hamelia patens*	15ft		5 – 6ft apart	20	Shrub
23	Australian pine tree	*Casuarina equiseti folla*	5 – 20m	12 – 15ft	6 – 10ft apart	4	Shrub
24	Dumb ear	*Dieffenbachia seguine*	10ft	2 – 3ft		10	Display
25	Money plant	*Epipremnum aureum*	20m		2 – 3ft	20	G. C
26	Nata lily	*Clivia miniate*	45 – 60cm	60 – 90cm	45 – 60cm	3	G. C
27	Zebra plant	*Geopportia zebrina*	2ft		1m apart	8	G. C
28	Blushing philodendron	*Philodendron eruboscens*	3 – 6cm		20cm	9	G. C
29	Crown of thorns	*Euphorbia milii*	1.8m	3ft	2ft apart	14	Display
30	Blue bugle	*Ajuga genevensis*	6 – 9inch	6 – 12 inches	8 – 15 inches apart	24	Ground cover

31	Buffalo grass	*Batelova dactyloides*	2.1 – 5.1m	30cm			Lawn
32	Arrow head plant	*Syngonium podophyllum*	1.5m	1 – 2ft		20	G. C
33	Yellow butterfly palm	*Dypsis lutescens*	6 – 12m		3 – 6ft apart	18	Accent
34	Coastal sheoak	*Casvarina equisetifola*	35m	20m	4m	4	Tree

2.8 Landscape Maintenance Plan

Maintenance is the work undertaken in order to keep, restore or improve a facility. Lack of proper maintenance of a facility or building leads to rapid dilapidation of the facility or building (Acquaah, 2009). Maintenance activities are activities meant to keep the environment beautiful and pleasing. These activities include: watering, mowing, fertilizer application, staking, weeding, pesticide application, mulching and provision of mechanical support.

Table 3:

	October				November				December				January				February				March			
Operations Month week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Irrigation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lawns Mowing																								
Shrubs weeding				x				x				x				x								
Blooms replanting																								
Hedge pruning																								x

	April				May				June				July				August				September			
Operations Month week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Irrigation	x	x	x																					
Lawns Mowing				x				x				x				x				x				x
Shrubs Weeding								x								x								x
Blooms replanting																								
Hedge pruning								x								x								x

X= For irrigation it denotes three times a week, while for lawn mowing and shrub weeding it is once

2.9 General maintenance

Landscape maintenance is the basic upkeep of an already installed landscape, to keep a landscape healthy, clean, safe and attractive. The need for maintenance cannot be over emphasized.

Attractive external space is a core contributor to the health and wellbeing of workers and visitors. The landscape is a valuable asset requiring as much attention as the buildings within. Maintenance activities range from mowing, pruning, watering, weeding, pest control and herbicide application, fertilization application, over seeding, spiking.

2.10 Watering

Acquaah (2002) simply defined watering as wetting of the soil surface. Watering is a landscape maintenance activity that is frequently performed improperly making the aim not to be achieved. Effective watering requires that water be delivered inn adequate amounts to the root zone of plants. The following are the ways of watering that will be applied efficiently in maintaining the plants in the museum of traditional Nigerian architectures landscape.

i. Hand watering, using a watering can

ii. Sprinklers

iii. The use of hoes

For effective result after watering all planted elements is to be watered at early stage at an interval of one day, before 10 a.m. and at about 6 p.m. when temperatures are cooler and the air is calmer so that evaporation is kept to a minimum.

2.11 Key points to put in mind when watering

a. Wet soil thoroughly to a depth of 8 to 10 inches. Light watering encourages shallow root development. Then, if the shallow watering is neglected a day or so in a sudden period of hot weather, plants may be damaged.

b. Avoid too much water; it leaches plant nutrients from the soil and may drown the plant's root system.

c. Avoid setting plants so close to a wall that the gutter or over hanging roof blocks natural rainfall.

2.12 Mulching

Mulching offers several advantages over clean cultivation (no mulch). The greatest is conservation of soil moisture. Evaporation of water from the soil is greatly reduced when the soil is protected from direct rays of the sun and moving air. Also, rain falling on the mulch does not pack the soil surface, thus erosion is eliminated.

Choosing a good mulch material is very important. The mulch material to be used for this project is sugarcane and grass straw. As the mulch decomposed, it adds to the fertility of the soil, organic reaction and composition. Place mulch around the new plant in a circle that is 18–24 inches diameter and 2–3 inches thick. Pull the mulch away from direct contact with the trunk of any trees to prevent decay. If plantings are placed in a bed, mulch the entire bed to a depth of 2–3 inches, also keeping mulch away from the trunk of trees and larger shrubs. And pruning is the pathway to long life for most plants.

2.13 Fertilizing

Ornamental plants require nutrients for healthy growth. Soils that are not well fertilized contain sufficient plant nutrients. The recommended nutritional value for the plants in this environment is either cow dung or poultry waste (inorganic fertilizer) knowing that nutrients are a major environmental requirement necessary for the survival, growth and development of all plants this inorganic fertilizer is the major nutritional substance that will be added to the plant in a space of 2 – 3-months interval.

2.14 Pruning

Pruning is practice involving the selective removal of parts of plant, such as branches, buds, or roots. Reasons for pruning include deadwood removal, bloom, shape and size, to encourage growth etc. Shrubs often cannot go without pruning if they are to serve their intended purpose in the landscape. Except for a few dwarfs or extremely slow-growing plants, prune all shrubs regularly or as needed usually every year or two.

2.15 Pest control and herbicide application

Insects and diseases must be controlled to grow trees and shrubs successfully. Some pests attack roots; others feed on leaves and stems or damage flowers. One of the most important steps in the control of insects and diseases is to prevent infestation in the beginning. Inspect plants frequently for signs of diseases and insects. Pesticide is to be used for control, according to infestation.

2.16 Mowing

Proper mowing is one of the most important practices in keeping the lawn healthy. Mowing height and mowing frequency determine how healthy and attractive the lawn can be. Height of lawn is very important, and for the two different turfs to be used on this project, a height of 2 inches is to be maintained respectively.

Edging and trimming are the finishing touches of mowing, kind of like getting a shave after a haircut.

2.17 Spiking

Aerating is the procedure of getting air into lawn soil. De-compaction is relieving the pressure between soil particles so they are less dense. Aeration also allows rain and nutrients to penetrate a hard surface, improves bacterial activity and helps reduce thatch. It also improves drainage from the surface, increases the water holding capacity and therefore stimulates rooting and root depth giving a more drought tolerant lawn.

Spiking is a common method of lawn aeration. Spiking can be done anytime of the year, soil needs to be slightly moist to get the full benefit from aeration. Avoid shallow spiking.

3.0 Difficulties/Challenges encountered

The following challenges were encountered while executing the project:

i. Lack of constant water supply to maintain the established plants has been a great source of concern especially during the dry seasons.
ii. It was observed that the existing drainages are too shallow to carry large volume of water during heavy rainy season which leads to flooding of the area.
iii. Insufficient funds to purchase other items

4.0 Conclusion and Recommendations

Understanding the unique nature of the Departmental courtyard landscape and its characteristics, is key to promoting its uniqueness and enhancing the quality of the surrounding environment and as an ameliorative intervention to environmental problems'. These necessitates the following recommendations.

i. The design guidelines discussed in this article could be replicated to other departments of the college.
ii. The construction of a concrete retaining wall will reduce the impact of flooding as well as constructing a bore hole to serve for water supply during the next dry season.
iii. Improving vegetative cover "surface cover" with lawns, shrubs should be used in mitigating erosion where human traffic and even grazing is much.

5.0 Acknowledgement

Acknowledgement goes to DG, FRIN, and the Provost of the College (FCF Jos) and all other management staff for the support and enabling environment to work and learn. Our gratitude also goes to the students of HLT department: Gabriel C. Okeke, Rukaiya and Emmanuel for their support and commitment.

References

Acquaah, G. (2009). *Horticulture – principles and practices* (4th ed.). New Jersey: Pearson Education Inc.

Adekunle, O.J. & Basorun, J.O. (2016). The Evolving Roles of Landscaping in Campus Space Manage- ment: Ekiti State University, Ado-Ekiti, Nigeria in Focus. *Journal of Environmental Protection.* 7, 1380-1388

Archives of Library and Documentation Unit Federal College of Forestry, Jos, 2018.

Archives of National Centre for Remote Sensing, Jos, 2007.

Ayeni, D. A. (2012). Emphasizing Landscape Elements as Important Components of a Sustainable Built Environment in Nigeria. Developing Country Studies *2*(8), pp.33-42

Ayeni, D. A., Olanrewaju, S. O., & Fadairo, G. (2018). *Restructuring the Landscape of the School of Environmental Technology, Federal University of Technology, Akure to Enhance User Satisfaction.* In Sagada, M.L. and Maina, J.J. Proceedings of the Association of Architectural Educators in Nigeria (AARCHES) National Conference: Trends in 21st Century Architecture and Sustainable Built Environment. 21-24 February, 2018, Zaria, Nigeria pp. 316-326.

Daniel, F.M. & Favour, M. (2016). Rising Insecurity in Nigerian Campuses and the way forward Retrieved March 16, 2020 from www.nairaland.com

Hansen, G. (2010). *Basic Principles of Landscape Design.* Retrieved May 13, 2020 fromhttp://edis.ifas.ufl.edu.

Ibimilua, A.F. (2014). Key Issues on Landscape Planning in the Context of Environmental Sustainability. *European Scientific Journal, 10*(2), 143-156.

Igwe P.U., Chinedu O.C., Nlem E.U., Nwezi C.C., & Ezekwu J.C., P. (2018). A Review of Landscape Design as a Means of Controlling Gully Erosion. *International Journal of Environment, Agriculture and Biotechnology* (IJEAB) *3*(1), 103-111.

Orewere, E., Mustapha, F., Ibrahim, I. I., & Edom, A. (2021).Sustainable Landscaping of Horticulture and Landscape Technology (HLT) Building in Improving Users' Productivity Levels at Federal College of Forestry, Jos. *Archiculture, Journal of the Department of Architecture, University of Jos, Nigeria. 4*(2): 45-53; ISSN (Print) 2636-6747

Rikko, L. S, Pwajok, N. R., Namo, J. A., & Habila, S. K. (2022).Depletion of Urban Green Spaces in Jos Metropolis, Nigeria. *Sahel Journal of Geography, Environment & Development*, 3(2), 67-77.