

JOURNAL OF ENVIRONMENTAL SCIENCE (JES)



DEPARTMENT OF GEOGRAPHY
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
NIGER STATE, NIGERIA

Maiden Edition

February, 2009



EDITORIAL/ADVISORY BOARD

Journal of Environmental Science
(JES)

Maiden Edition 2009

Professor D. O. Adefolalu
Editor-in-Chief

Professor A.B. Mamman
University of Abuja,
Abuja.

Professor E.A. Olofin
Bayero University
Kano

Dr. Sani M. Abubakar
Dept. of Geography,
University of Abuja,

Professor J.M. Baba
Dept. of Geography,
Federal University of Technology,
Minna.

Dr. P. S. Akinyeye
Dept. Geography,
Federal University of Technology,
Minna.

Nura Maiwada
Dept. of Geography
Katsina State University
Katsina

Dr. A. S. Abubakar
Dept. of Geography
Federal University of Technology
Minna

Dr. Y.M. Ayeseimi
Dept. of Maths/Computer Science,
Federal University of Technology
Minna

Mansur Bako
Dept. of Geography
Federal University of Technology
Minna

TABLE OF CONTENTS

JOURNAL OF ENVIRONMENTAL SCIENCE

MAIDEN
EDITION

Papers in this issue

Page

- Developing an Information System for Rural Water Supply Scheme in Kaduna State, Nigeria - (*L. T. Ajibade*) 1 - 8
- An Investigation and Analysis of Field and Model-based Drainage Channel Flow Velocities in Parts of Phase II, Abuja - (*Ojigi M.L.*) 9 - 22
- Recent Rainfall Fluctuations and Trends in Sokoto and its Environs, North West Nigeria - (*M.I. Abdullahi*) 23 - 28
- Determination of Some Metal Ions in Lettuce (*Lactuca Sativa*) From Farms Around Keteren-Gwari Mechanic Site, Minna Nigeria - (*S.O. Salihu, B.E.N. Dauda, Y.B. Paiko and O.R. Egbeyinka*) 29 - 35
- Role of Local Contractors in Forest Resources Depletion around Bida in Niger State - (*Muhd Ahmed Ewugilati*) 36 - 40
- Comparative Analysis of the Physico - Chemical Parametres of Rivers Challawa and Getsi, Kano, Nigeria - (*M. A. Fntua E.B. Agbaji and V.O. Ajibade*) 41 - 44
- Geotechnical Properties of the Sub-soil for Designing Shallow Foundation in some Selected parts of Chanchaga Area, Minna, Nigeria - (*Oke, S.A, Okeke O.E., Amadi, N.A. & Onoduku, U.S.*) 45 - 54
- Analysis on Manpower Factor in the Development of Nigerian Chemical Industry - (*Salau, Rasaq Bankole*) 55 - 63
- Rainfall Variability and its effects on Land Degradation Processes in some parts of Nigeria - (*Abdulkadir Aishatu*) 64 - 71
- Bacteriological and Physico-Chemical Characteristics of Difference Water Sources in Bida Town, Niger State - (*A. N. Amadi*) 72 - 82

Forest Management and Human Intervention: Case Study of Ruma-Kukar Jangarai Forest Reserve in Katsina State - (<i>Muhammad Mairo</i>)	83 - 91
The Use of Plants in Monitoring Atmospheric Heavy Metal Pollution: A Review - (<i>J. O. Jacob</i>)	92 - 100
Weather Forecasting in Nigeria Using Remote Sensing Techniques - (<i>P. S. Akinyeye</i>)	101-110
Environmental Impact Assessment Practice in Niger State - (<i>Musa Jubril</i>)	112 -116
Production of Bioethanol from Spoilt Fruits - (<i>Oyeleke, S.B., Dauda, B.E.N., Paiko, Y.B. & Lawal, G.O.</i>)	117-121
A Review on Relevance of Tropical Medicinal Plants in African Traditional Healthcare System - (<i>C. F. Essien</i>)	122-128
An Evaluation of Solid Waste Management Option in Some Urban Centres of Niger State - (<i>Muhammad Mairo</i>)	129 -138
Agrometeorological Applications in Agricultural Development) Projects in Nigeria - (<i>P. S. Akinyeye</i>)	139 -144
Factors and Consequences of Land Degradation in Niger State: The Role of Science and Technology - (<i>M usa Jubril</i>)	145 -151
The Domestic Applications of Coals and their Health Implications based on the Trace Elements Content: A Case Study of Okaba Coal - (<i>U.S. Onokuku</i>)	152 -162
Comparison of Methods Used for the Preparation of Moss Samples for Atmospheric Heavy Metal Determination - (<i>J. O. Jacob & S. E. Kakulu</i>)	163 -169
Effect of Video Tape Instructional Strategies on Secondary School Students' Performance in Social Studies (<i>Alabi Thomas Omotayo</i>)	170-178
Comparison of Methods for Determining Evapotranspiration Rate on Cassava Farm in Benue North Central Nigeria - (<i>Yahaya Tayo Iyanda</i>)	179-185
Climatic Variability and its Impact on the Yield of Crops in Nigeria - (<i>Ojoye Samsideen</i>)	186 -198

<i>"Towards Improving Dam Design in Nigeria: the Need for Micro-Studies on Rainfall Effectiveness" - (Abubakar A.S.)</i>	199-203
Environmental Impact of Lower Usuma Dam, Federal Capital Territory, Abuja-Nigeria) - (Mohammed B. Yunusa)	204 -218
Micro-Climatic Impact of The Tiga Dam on Locations Upstream in Kano State - (A.S. Abubakar)	219-222
The Degradation of Bosso Dam and its Implication on the Neighboring Communities in Minna Niger State - (Mohammed B. Yunusa)	223-321
Vulnerability Analysis of the Effects of Climate Change in some Parts of Sudano-Sahelian Nigeria - (*Mansur Bako Matazu)	232-241
The Impact of Social Sustainability, Religion and Global Ethics on Man: A Review - (Alabi T.O.)	242-248

FOREST MANAGEMENT AND HUMAN INTERVENTION: CASE STUDY OF RUMA-KUKAR JANGARAI FOREST RESERVE IN KASTINA STATE

By

Muhammed Mairo
Department of Geography
Federal University of Technology,
Minna, Nigeria
ummubahiyya@yahoo.com

Abstract

The tree is an extra ordinary plant. It produces leaves, fruits and nuts year after year, season after season. Because of its deep root, it can do so at times when annual plants are either dead or scarcely germinated. It accumulates its productivity in the form of wood that, if not harvested one year, is safely preserved for another. This study deals essentially with the impact of man's activities on vegetation with special reference to the RUMA-KUKAR JANGARAI FOREST RESERVE in the north-western part of Katsina state. The study is concerned with such human interventions as grazing, farming, deforestation and burning. The methodology adopted here involves reconnaissance survey; sampling procedure as well as library research. There are exactly 29 identified tree species in the reserve. The most predominant species are piliostigma thoningii, Diospyrus mespiliformis, and Anogeissus leiocarpus. From the study, it is evident that there are negative human incursions in the forest reserve. This can be seen from the different types of land use the forest reserve is subjected to. For instance 13% of the fringing population are engaged in fire wood extraction that is, illegal felling of trees in the forest reserve. Based on the findings of this research the following recommendation are given; There should be more enlightenment campaigns on the importance of the forest reserve and the dangers posed by lack of it a More lands should be recruited for effective and management of the forest reserve by this; I mean the fringing communities conservation should be involved in the patrol and policy of the forest reserve.

Key words: forest management, human intervention, forest reserve.

1.1 Introduction

As forest and trees resources becomes scarcer, the balance between what people need and what they can obtain shifts for rural families, the struggle to survive becomes even harder.

The tree is an extra ordinary plant. It produces leaves, fruits and nuts year after year, season after season. Because of its deep root, it can do so at times when annual plants are either dead or scarcely germinated. It accumulates its productivity in the form of wood that, if not harvested one year, is safely preserved for another. Its size, above and below ground, allows it to provide shade and to increase soil fertility. Once established, it can do all these with little or no human attention.

Trees also provide an extra- ordinary variety of products for human use; fruits and nuts for nourishment, leaves and pods for fodder, bark for medicine, resins for chemicals, root for flavorings, fibers for making ropes and cloths, twigs for kindling, wood for burning and fencing-to mention just a few.

This study deals essentially with the impact of man's activities on vegetation with special reference to the RUMA-KUKAR JANGARAI FOREST RESERVE in the north-western part of Katsina state. The study is concerned with such human interventions as grazing, farming, deforestation and burning.

Man has always played a major role in altering of the vegetation cover of the earth surface. The stability of the ecosystem is determined by its vegetation cover which unfortunately has suffered considerably from human modification as Goudie (1981) puts it: Man has possibly had a greater influence on plant life than any other of the components of the environment.

1.1 Research Problem

Vegetation as against the popular belief that it is to ensure the steady supplies of fuel wood, fodder, timber and minor products is so very important, it forms the backbone of the ecosystem which man depends on for survival. Unfortunately, the Vegetation of Ruma-Kukar Jangarai Forest Reserves has been subjected to destructive changes.

The study therefore, strives to find solution to this problem. This form the rationale in bringing back the lost glory of the reserve by taking good management and conservation measures, this way, the livelihoods of the forest poor groups in the fringing communities could be improved.

1.2 Aim and Objectives

The main aim of the study is to determine the role of human activities in causing changes in composition, structure and biomass of the forest reserve.

This would be achieved through the following objective;

- 1) To take inventory of existing land use practice taking place within the reserve.
- 2) To establish a reference data base through observation on some vegetation parameters such as species, type, frequency etc.
- 3) To examine the relationship between land use activities and the vegetation within the reserve.
- 4) To determine and priotise management problems facing the reserve and to suggest solution.

1.3 Justification of Study Area

The study area, RUMA-KUKAR JANGARAI FOREST RESERVE was specifically selected because it is located in an ecologically "dry area" and fairly close to dense human population concentrations thereby making it susceptible to destruction and degradation.

Already, a number of environmental problems most of which were induced by man are evident in the reserve. In fact, substantial portion of the reserve is no more a forest but a mere-derived savanna thereby undermining the current drive towards environmental preservation.

1.5 The Study Area

1.5.1 Brief Historical Background

In 1959, two forest reserve in the then Katsina province known as Ruma and Kukar Jangarai lying to the west and east respectively were merged. There after, the whole reserve was divided into 10 ranges and a cattle grazing scheme was introduced in 1962. Edible grasses were planted and small earth dams constructed to create water holes for cattle. Herd men were only allowed to enter the reserve at controlled rate. Near Ruma village, a veterinary clinic and dairy plant were established close to the reserve. The veterinary department and forest department of the state Ministry of Agriculture and Natural Resources are responsible for activities of the grazing scheme.

The katsina state EEC arid zone Afforestation programmed also help in educating local people on the need of afforestation and the danger of deforestation through various programs. It has also contributed to the establishment of trees seedlings and the production of the first and most recent air photo coverage of the reserve.

1.5.2 Physical Background

The reserve covers an area of about 800Km² (now considerably reduced). Located in the South-western part of Kastina state, it lies about 80km south of kastina city. A greater part of the reserve falls within Safana Local government area of kastina state.

The mean annual rainfall varies from less than 800mm in the northern tip to close to 900mm in the southern part of the reserve. The temperature is comparable to that of Kastina where the mean annual value is 27°C ±2°C. The general climate is that of the tropical dry and wet type.

Vegetation in the area is of the savanna woodland type with fairly closed canopy. The fringing areas adjoining the reserve have farmed parkland savanna vegetation. Both the reserve and the adjoining areas have such species as *Anoeissus leiocarpus*, *Tamarrindus indica*, *Schlerocarya birrea*, *Khaya senegalensis*, and *Accaciaspp*. In addition grasses and legumes abound.

According to the National Atlas the Federal Republic of Nigeria (1978), a greater portion of the soils in the reserve belongs to the tropical ferruginous type. The soils have developed mainly from sandy drift parent materials.

Geologically, the reserve is underlain by crystalline basement complex rocks of the Precambrian era. Relief features from where these rocks have exposed by erosion. For example, in the northern and eastern portion of the reserve, granitic hills or inselbrges abound. Drainage relates with the relief nature of the area and so most of the rivers and streams crossing the reserve flow westwards

2.1 Methodology

The methodology adopted here involves reconnaissance survey, sampling procedure as well as library research.

2.1.1 Reconnaissance Survey

The reconnaissance survey was carried out to provide insight into how to organize the actual fieldwork. In so doing, the nature of vegetation, its aerial coverage, plants sampling as well as the people's socio-economic background and land use activities were ascertained.

2.1.2 Sampling Technique

Vegetation is complex and diverse, as such specifically for tree species a 50m x50m size sample quadrants as the basic sample unit was adopted. On the other hand, systematic method was employed for the survey of people living in the fringe of the reserve. Using this method 50 people living in communities bordering the reserve was interviewed through a checklist. A sample fraction of 1/5 and a sample of every 5th person with a random start were used. Should the 5th person fail to respond, the 6th person was interviewed.

2.1.3 Field Work

Field work forms a very important part of a research work because it is the source of data and so a good fieldwork ensures good collection of data for analysis. The field work was divided into two parts - physical survey for vegetation analysis and socio-economic survey for the fringing communities.

2.1.4 Statistical Analysis

The student's -t- test and descriptive analysis were employed for some of the vegetation parameters as well as for the socio- economic survey

3.0 PRESENTATION OF RESULTS

3.1 VEGETATION CHARACTERISTICS

3.1.1 TREE SPECIES LIST AND COUNT

Plant specie is the basic unit in the classification of plants. The distinguishing characteristics in tree species include morphological physical, physiological, ecological and behavioral changes.

There are exactly 29 identified tree species in the reserve. The most predominant species are *piliostigma thoningii*, *Diospyrus mespiliformis*, and *Anogeissus leiocarpus*. The least numerous species includes *darberjia sossoo*, *combretum glutinosus* and *khaya senegalensis* (see table -1).

Out of the least numerous tree species, *Darberjia Sissoo* stands unique as it is not an indigenous species but rather an exotic one believed to have sprouted from seeds dropped by birds. For *khaya senegalensis*, it might have been long under the pressure of felling by man due to its multiple uses in the communities.

(Table - 1 Tree species in the forest reserve)

S/NO	BOTANICAL NAME	FAMILY NAME	HAUSA NAME
1.	Acacia Sieberiana	Leguminosae (mim)	Farar Kaya
2	A nilotica	//	Bagaruwa
3	A Senegal	//	Tsakwara
4	A seyal	//	Dushe
5	Adansonia digitaata	Bombaceaceae	Kuka
6	Anogessus leiocapus	Annonaceae	Marke
7	Balanites aegyptiaca	Bolanitaceae	Aduwa
8	Bauhinia rufescens	Leguminosae(els)	Tsattsagi
9	Borassus aethiopumat	Plamae	Giginya
10-	Bridelia ferruginea	Euphobiaceae	Kizni
11	Ceiba pentandra	Cecropideae	Rimi
12	Combretum glutinosum	Combretaceae	Taranmiya
13	C micranthum	//	Geza
14	C molle	//	Wuyar damo
15	Derbergia sissoo	Leguminoceae	Darbejiya
16	Dictrostachy cineria	//	Dundu
17	Diapyrus mespiliformis	Ebenoaceae(mim)	Kanya
18	Faidherbia canthiodes	Leguminoceae	Gawo
19	Ferejia canthiodes	Rubiaceae	Kurukuru
20	Khaya senegalensis	Miliaceae	Madachi
21	Lannea acida	Anacardiaceae	Faru
22	Magitero indica	//	Mngwaro
23	Parkia bioglobosa	Leguminoceae(mim)	Dorowa
24	Piliostigma thoningii	//	Kalgo
25	Slerocarya birrea	Anacardiaceae	Danya
26	Senna singuena	//	Runhu
27	Tamarindus indica	Leguminoceae	Tsamiya
28	Terminalia macroptera	Combretaceae	Kandare
29	Vitellaria paradoxum	Burseraceae	Kandaya

Source: fieldwork (2007)

3.2 TREE DENSITY

The Ruma Kukar Jangarai forest reserve has a savanna woodland vegetation type. In this place, wood forms the bulk of the forest biomass. The density of trees varies considerably within the reserve.

Table - 2 Tree Density in the forest reserve (per hectare)

Sample quadrant in area (A)	Density per hectare	Sample quadrant in area (N)	Density per hectare
A1	68	N1	20
A2	25	N2	19
A3	90	N3	31
A4	87	N4	33
A5	81	N5	21
A6	70	N6	23
Average =	70.1	Average =	24.5

It can be concluded that there are more dense vegetation in area (A) than in area (N). This difference in density of trees means that the reserve is now in danger of total degradation. It also indicates that deforestation is high in area (N) as it is easily accessible.

3.3 Land - Use Indicators in the Reserve

In the sample quadrant found in area (N), there are more evidence of human interference than in area (A) which posses more tree species ,higher density, wider distribution of species and larger number of dominant trees Evidence such as tree stump, back-stripping or collection, lopping and presence of sapling shows human interference. Tree stumps show relatively recent felling, which is more dangerous in area (N) where as many as 33 stumps were counted within a single quadrant.

4.0 FOREST RESERVE MANAGEMENT

4.1 Land -U se

Land use is a primary indicator of the extent and degree to which people have made impression on the land surface. Different land uses are practiced by the people in the fringing communities.

4.1.1 Grazing

Grazing is practiced by 44% of the people and is the most common land use This is because it is the only activity allowed by law to operate within the reserve The reserve posses' excellent pasture land utilized by the high concentration of resident Fulani's to feed their cattle. In addition to this, there is absence of tsetse fly (glossina spp)

It has been estimated that about 30,000 herds of cattle graze in the reserve Livestock holdings per person range from 4-123 cattle. Other animals such as sheep and goats are also reared. Forage grasses such as *ennisetum pedicellatum* and *Andropogon gayanus* are abundantly found.

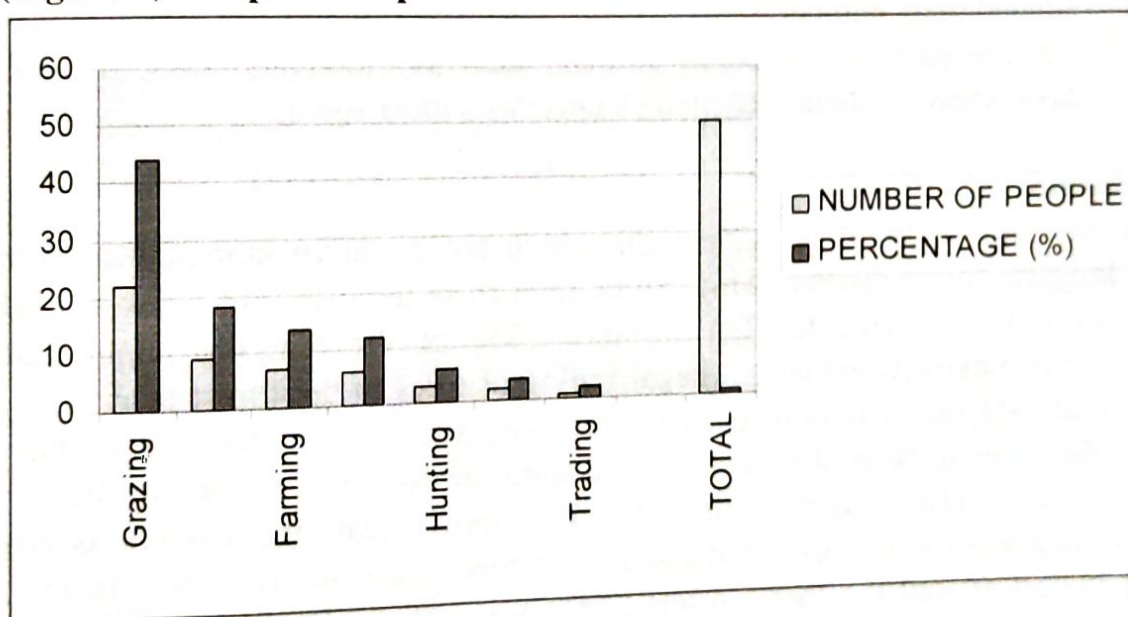
However, grazing has drastically decreased due to reduction of rangelands reduced vegetation cover and drying/silting of existing earth-dams in the reserve.

(Table-3) Percentage (%) Land use Practices in Fringing Communities of Ruma-Kukar Jangarai Forest Reserve.

LAND USE TYPE	NUMBER OF PEOPLE	PERCENTAGE (%)
Grazing	22	44
Fuel wood collection	9	18
Farming	7	14
Minor products collection	6	12
Hunting	3	6
Recreation	2	4
Trading	1	2
TOTAL	50	100%

Source: Field work (2007)

(Figure 1) Graphical representation of table 3.



4.1.2 Firewood Extraction

Woods form the bulk of the forest reserves biomass. Fuel wood extraction despite being outlawed, is still common in the reserve as 18% of the people living in the fringing communities practiced it, as well as outsiders (specifically from kano state). The law however allows for selective cutting of trees especially dead ones, but this arrangement is no more being observed as such trees are indiscriminately felled for fuel wood.

As the fuel wood demand increased over the years as a result of population explosion and lack of alternative cheap energy for use by the rural poor. The reserve has been estimated to supply as much as 90 lorry loads of fuel wood per day (Ministry of Agriculture Katsina State).

4.1.3 Farming

Table-3 shows that 14% of the fringing communities practiced farming. Mixed cropping is practiced and crops grown includes millet, sorghum, beans, g/nut etc. These products are consumed by the farmers households and only small quantity is sold to provide money for social/domestic needs.

With the current increasing population and recession of the forest reserve, more land is expected to be put into farming unless measures are taken.

4.1.4 Minor Product Collection

This is practiced by 12% of the people which involves non timber tree products such as fruits, seeds, and roots, leaves, fibers, bark and gums. Because of the decreasing biomass in the reserve, the demand on these products is fast declining. However, as people now resort to traditional medicine, the demand on these products for this purpose has increased.

4.1.5 Hunting

Hunting has reduced in importance in the reserve because of the following reasons; first, the activity has been prohibited, secondly, the vegetation which harbors the wild animals is being rapidly lost and thirdly, massive killing of these animals has drastically reduced their number.

The reserve in the past has harbored animals such as elephants, lion, hyenas etc. Gone were days when elephants reached as close as safana town.

5.0 Conclusion

From the case study, it is evident that there are negative human incursions in Ruma-kukar Jangarai forest reserve. This can be seen from the different types of land use the forest reserve is subjected to. For instance 13% of the fringing population are engaged in fire wood extraction that is, illegal felling of trees in the forest reserve. These felled trees are not just only used as domestic fuel within the locality but also transported to the cities to be sold so as to derive some income to feed the family.

Also going by observation in the table 2 it shows that, the reserve is now in danger of total degradation because of the rate of deforestation in area "N". In fact, the people living in and around the forest reserve are aware of the importance of the forest reserve to their immediate environment and they also know the danger of loosing the forest reserve by their action or in action. But alas, it is for them "the devil's alternative" They needed the forest reserve and also needed to sell/fall this wood/trees to have some earning/income to be able to sustain the family.

Recommendation

Based on the findings of this research the following recommendation are given

- There should be more enlightenment campaigns on the importance of the forest reserve and the dangers posed by lack of it
- More lands should be recruited for effective conservation and management of the forest reserve by this; I mean the fringing communities should be involved in the patrol and policy of the forest reserve.

- Stiffer penalties should be prescribed or awarded to offenders/violators of the forest reserve rules and regulations.
- Since the most devastation carried out in the forest reserve is felling for fuel wood. Therefore, an alternative source of fuel wood should be provided.

REFERENCES

- Adeyeju, S.K. (1995); *Forest and the Nigerian economy*. Ibadan Press Ltd.
- Chapman, G.P. (1970); *Pattern of Change in Tropical Plants*. University of London Press. Ltd
- Dawson, J.A. and Domnkamp, J.C (1973); *Evaluating the Human Environment*. Edward Arnold, London.
- Huston M. A. 1994. *Biological Diversity: The Coexistence of Species on Changing Landscapes*. Cambridge University Press, Cambridge.
- Lapin M., Barnes B. V. 1995. Using the landscape ecosystem approach to assess species and ecosystem diversity. *Cons. Biol.* 9: 1148.1158.
- Martin M. E., Newman S. D, Aber J. D., Congalton R. G. 1998. Determining forest species composition using high spectral resolution remote sensing data. *Rem. Sens. Env.* 65: 249.