ASSESSING THE CAUSES OF LAND DEGRADATION IN LAPAI LOCAL GOVERNMENT AREA OF NIGER STATE

BY

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CERTIFICATION

This is to certify that this project is an original work undertaken by Abdulmalik Hassan PGD/GEO/99/2000/101 and has been prepared in accordance with the regulations governing the preparation and presentation of projects in the Federal University of Technology Minna Postgraduate.

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DEDICATION

This project is specially dedicated to my parents Alhaji Mohammed Nakoji, Hajiya Maimunat M. Nakoji and my wife Aisha Abdulmalik. Also to the entire family.

ACKNOWLEDGEMENT

I have to first of all give thanks to Almighty Allah for making it possible for me to successfully complete my course at this hard time.

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ABSTRACT

ıis thesis focus on assessing causes of land degradation in Lapai Local ɔvernment Area. It was observed that land degradation occurs where soils e poorly manage and devoid of vegetation cover or when the soil is highly odable. Man activities such as farming, earth moving, bush burning, and ndiscriminate grassing are common in the study area, leading to legradation. Proper land management through conservation practices is also dentified as one of the measures to mitigate degradation.

CHAPTER ONE

1.0 INTRODUCTION:

Environmental degradation is the process that may act to follow the condition of a part of the earth surface or its surrounding atmosphere to become unpleasant or less useful to man. The end result of the process might relate to erosion hazards, loss of fertility, drought, deforestation, with respect to land resources and salinisation, alkalinization, coarse and sand sedimentation, toxicity hazards, pollution etc. with respect to water resources (Abdulkadir 1993).

In this project environmental degradation is restricted to vegetation depletion as a result of land management that is gradually leading to desertification. Most of the trees fallen and vegetation cleared are never permitted to grow into their full climax. The lands are subjected to continuous cultivation all year round. The end most result of degradation is desertification.

The term desertification refers to the gradual weakening of the resilience of the agro-ecological system of an area and reduction of biological potential of that system which ultimately leads to desert – like conditions (Pierce, 1992). In a lot of efforts by Nigerian government to reduce there degradation there is the planting of trees to combat deforestation, but Grove (1988) contended that where numerous nurseries to produce tree seedlings have been established successfully, a forestation has difficulty in competing for scarce land with agric and postoralism.

In the northern Nigeria, at the fringe pf the desert, the failure of the afforestation project (Scoging 1991), is leading to increased southward advance of the sahara. Presently, the eastern and western tips of northern Nigeria (i.e. Sokoto and Borno areas) are undergoing the process of desertification (Adefolalu, 1986).

Increase in animal and human population due to migration from the northern part of Nigeria and increase in dependence on agriculture is leading to intensive agriculture. The low standard of leaving and lack of accessibility to modern means of cooking such as kerosene and gas (domestic energy) has led to massive destruction of the forest as alternative sources of domestic fuel. The forest are also used for making drum, axe, hoes, pestles and mortar, chopping board, wooden spoon and plates. The sawmills that send them to the market for furniture, buildings and other utilities also cut down the forest plants.

1.2 STATEMENT OF PROBLEM:

The increasing classification in the northern Nigeria and the land problems associated with it is forcing population migration to the middle belt, adding to the already existing problem of pressure on the land. The land in the middle belt especially in Lapai Local Government is facing the problem of fast deforestation, over grasing, over cultivation and now erosion hazard leading to a process of desertification. This kind of environmental degradation will certainly affect agricultural output in the area. If the trend is allow ontinuing the fertility of the land is going to be depleted and so the soil will be fragile nd proving to be drastic in the face of drought.

1.3 AIMS AND OBJECTIVES:

The main area of the study is to assess the factors that are leading to environmental degradation in the study area. In doing this, the study seek to:

i) Identify the cause of degradation in the study area.

ii) Explain how they contribute to 3 egradation.

iii) Seek alternative means of mitigating environmental degradation.

1.4 JUSTIFICATION

While it is established that degradation is taking place there is no enough information about the cause, types, intensity and socio-economic impacts of the problems.

This study will therefore highlight the causes and even assess the causes so that continuous degradation can be combated. The study will also give suggestive solutions for the problems of degradation.

1.5 SCOPE AND LIMITATIONS:

The area covered by the study is area along Gulu Lapai Road in Lapai Local Government area, mainly Lapai district. The area to be studied does not cover the entire Local Government or extend beyond it. It is restricted to the Lapai districts alone.

CHAPTER TWO

DESCRIPTION OF THE STUDY AREA

1 LOCATIONS AND EXTENT

iger State is located on latitude 8° 30' north and 11° 70' north of the equator and ngitude 4° 60' east and 7°80' east of prime meridian.

's bounded in the south directly by River Niger and Kwara State, in the north by Sokoto tate and Kaduna State. In the west by Sokoto State and Kwara and in the east by Kaduna State and Plateau State (Figure2.1). Niger State has a land area of about 7, 24,000 (ha).

Lapai is located in the south-eastern part of the state on latitude 8° 21' north and ongitude 6°56' east to 6°76' and bounded by Paiko in the north, Agaie in the west, River Niger in the south and Abuja in the east (Figure 2.2). The study covers about 28.800,00 m²)

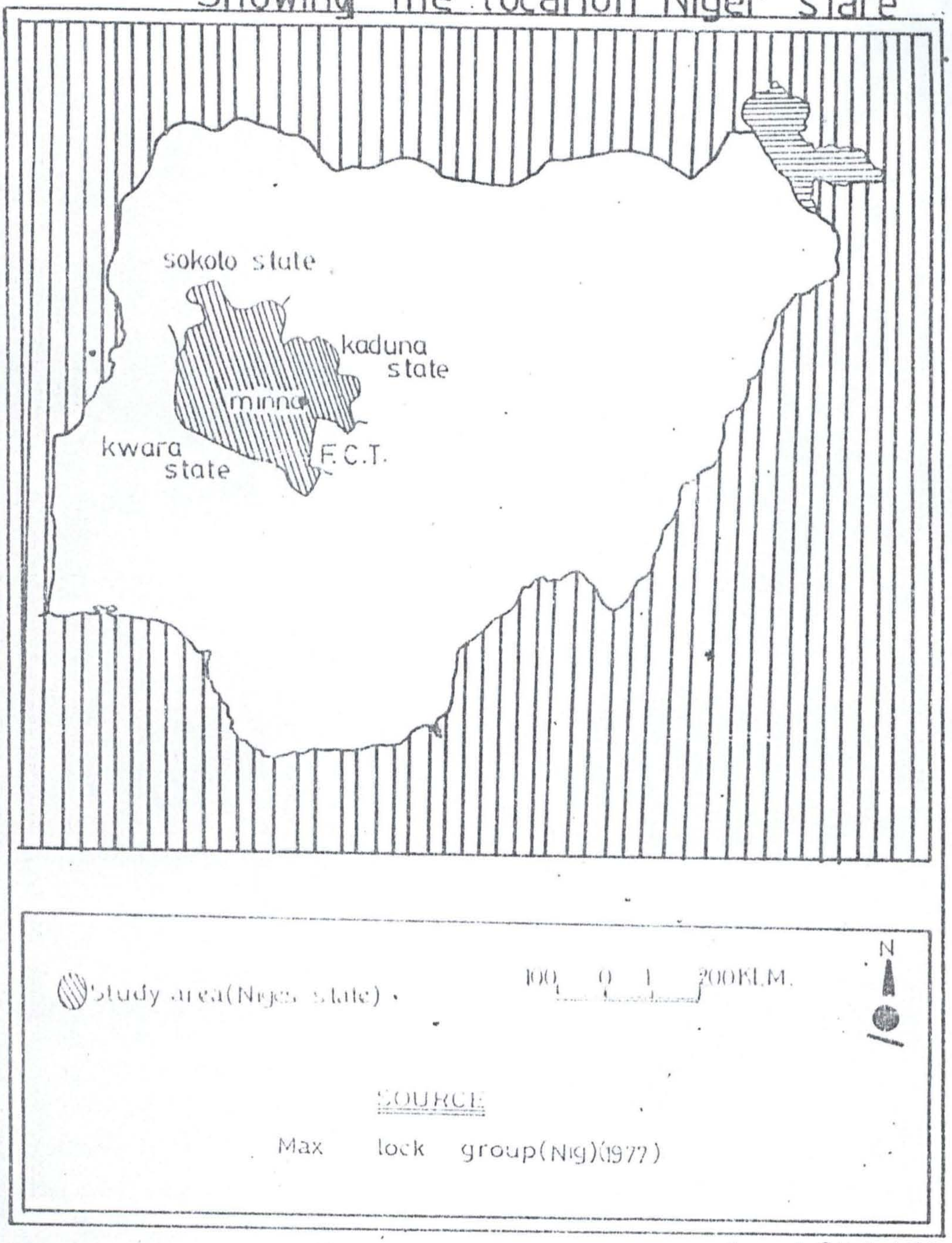
2.2 CLIMATE

Like most parts of the state, Lapai lies within the tropical hinterland climatic region. This limatic region is characterised partly by double and single maxima rainfall pattern, with out four months of dry season and eight months of wet season. The relative humidity

FIGURE 1

NIGERIA

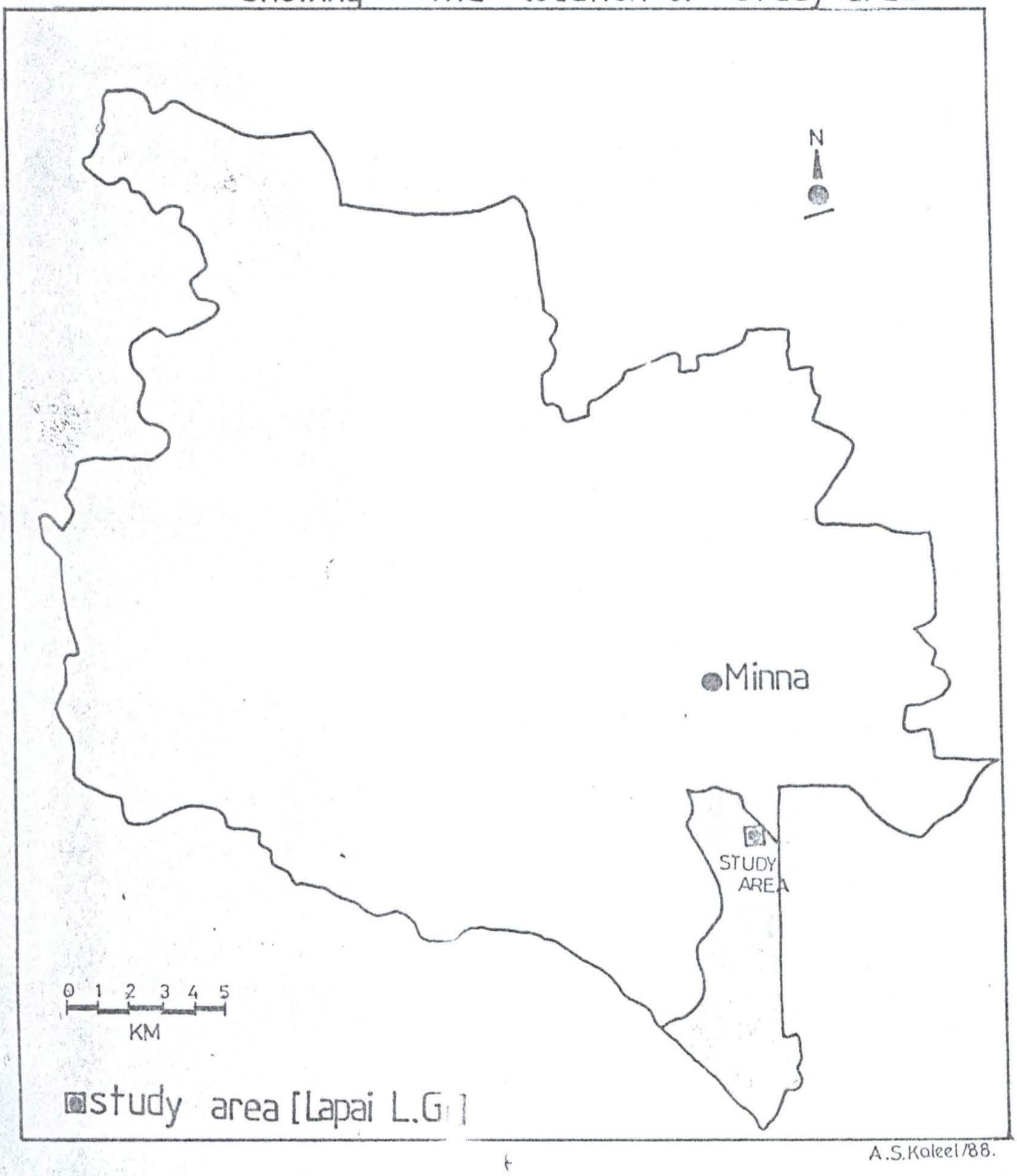
Showing the location Niger state



A.S.Kaleel '88.

FIG.2

NIGER STATE
showing the location of study area



A.S.Koleel/88.

generally rises to over 80% in the morning and falls to between 50% and 70% in the afternoon during wet season (Iloeje 1981).

The dry and wet seasons in this area as in other parts of the country are greatly controlled by annual migration of intertropical zone of convergence (ITZC). This is the meeting point of the dry harmattan laden tropical continental air mass which originates from the Euro-Asia-Arabian high pressure belt and the wet moisture laden tropical maritime air mass (south west trade wind) which emanates from the south high pressure belt.

The dry tropical continental air mass (TC) arrives the country from the north in October and by January its effect is felt in almost every part of the country as the dry and cold harmattan season. It retreats in March and by July it is completely out of the country.

The tropical maritime air mass (TM) on the other hand picks up moisture from the Atlantic Ocean and enters Nigeria from the south. This air mass warms and wets the country with its peak of influence in July. By January its effects are felt only in the southern coastlines.

The dry season are characterised by the dry dust laden harmattan winds coming across the Sahara desert. This occurs between November and February, during which the relative humidity is low, high temperature is cool, vegetation growth decreases to minimum, the soil solum dries out and pedogenetic process slowed down.

The wet season set in by May and lasts till September in the northern part of the state while the period is between April to October in the southern part of the state, Federal Department of Agricultural Land Resources 1983). The wet season, which is characterised by frequent storms, coincides with the planting season. During this period the moist southwesterly winds brings rains and increase in vegetation growth. The mean annual rainfall for Yelwa (1006mm) Mokwa (1123mm), Bida (1230mm) and Minna (1338mm) gives a general impression of the spatial variation of total annual rainfall of the state. The mean annual rainfall in particular is about 1230mm while the rainfall last for about 200 days.

2.2.1 TEMPERATURE

The average air temperature of this area is about 28.0°c with the temperature range being about 5°c (Table 2.1).

The months of February to May are generally the hottest period with air temperature of about 30.0°c and its peak in March and April (about 31.1°c and 30.4°c respectively). The air temperature drops during the peak rainfall period of July to September to about 26.0°c. During the period from January until the onset of the rains both daily maxima and minima are at their highest peak.

During the rainy period, daily maximum temperature is lower with the lowest figure being recorded in August. Seasonal variation of air temperature is fairly constant over the whole surface of the earth (Kowal 1972).

NIGER STATE

STATION	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	TOTAL ANNUAL MEAN.	YEARS OF RECORD
MINNA	27.1	29.3	30.5	29.6	27.9	26.1	25.4	25.0	25.5	26.3	26.7	26.9	27.2	54
BIDA	27.5	30.0	31.1	30.4	28.7	27.1	26.3	26.0	26.1	27.3	27.6	27.5	28.0	19
MOKWA	25.1	29.3	30.4	29.3	28.5	26.8	25.9	25.5	25.8	26.6	26.1	25.0	27.1	18
YELWA	25.7	2.6	31.2	32.2	30.3	28.0	26.8	26.1	26.4	27.5	26.2	25.2		

FDALR 1985

Table 2.1 above shows the mean monthly and annual air temperature for selected towns representative of Niger State. The mean monthly and annual air temperature for Bida is chosen to be representative of the air temperature value for Lapai.

2.2.2 RAINFALL

The mean annual rainfall for areas representing the state is indicative of high variability in the monthly total rainfall characteristic of the entire region (Udo 1981).

Rainy season occurs between April and October and reaches its peak in September. Taking the mean of places like Mokwa, Yelwa, Kontagora and Bida (which are representative of Niger State) for several years, stations like Mokwa shows a double maxima in June and September while Yelwa and Kontagora have a single August peak and Bida single September peak.

Extreme variation in total rainfall for July and August is also a general characteristic of the rainfall regime in the state.

There is also a general decrease of rainfall from east to west. As a result of that dry season is longer in the upper middle Niger valley than in the section below Jebba.

Lapai in particular is having mean annual rainfall of about 1230mm and mean monthly rainfall total of ranging from 1.5 to 256.5mm (Table 2.2). It is also having one-peak maxima in September, while the rain also last for about 200 days.

TABLE 2. 2: RAINFALL DATA FOR STATION REPRESENTATIVE OF NIGER STATE

STATION	LONG OE	LAT ON	APPROX. ELEVIATION M	LENGTH OF RECORD (YEARS)	AVERAGE ANNUAL RAINFALL (mm)	EFFECTIVE LENGTH OF WET SEASON (DAYS)	LENGTH OF DRY SEASON
MINNA	6.32	9.37	258.5	55	1338	190	5
BIDA	5.59	9.04	185.0	45	1230	200	4
MOKWA	5.04	9.18	150.0	11	1123	197	4
YELWA	4.45	10.50	244	19	1006	161	6

FDALR 1985

Table 2.2 shows that there is generally an increase in total rainfall with increase in latitude. Mabogunje (1977) attributed this to the location of the state in the windward side of Jos.

2.2.3 EVAPOTRANSPIRATION

The maximum evanpotransipration values correspond with the period of highest temperature (February to May) while the lowest values are recorded during the peak of the rains between July and September.

The total mean annual evanpotransipration rates of about 1236.5 to 1332.5 (recorded for 3 years) are in all excess of the total annual rainfall. So actual evanpotransipration over the years always less than the potential value of evanpotransipration (Knabe 1972). This results in severe moisture deficit for portion of the year. Rainfed agriculture is therefore limited to less than half of the year with irrigation required to augment the water deficit during the dry period of October to May. It may therefore be said that evanpotransipration take place at potential rate when water is sufficient in the soil to satisfy evanpotransipration demand, while in the dry season when water is limiting evanpotransipration takes place at a much reduced rate (Maxilock,).

There are only six months (May to October) in the year when rainfall exceeds evanpotransipration in Minna and Bida while it is five and four months respectively for Mokwa (June to October) and Yelwa (June to September).

Throughout the state, seasonal variation in potential evanpotransipration shows two peaks. The peaks occur before starting in March) and after rain starting from September.

2.4 RELATIVE HUMIDITY

There is considerable decrease in vapour pressure during the dry season/harmattan period, giving a marked drop in humidity with average relative humidity values ranging from 33% to 49% for December to February.

During the peak of the season (July to September) relative humidity ranges from 82 to 86%, while the mean annual relative humidity ranges from 60 to 68%.

2.3 GEOLOGY AND PARENT MATERIAL

The study area is under lain by Nupe sand stone or the Nupe Group (Adeleye, 1971). This sand stone also constitute the gently down warped and basal sediments of probable alluvial fan origin (Figure 2.3).

The Nupe sandstone formation consists of cretaceous sedimentary rocks consisting mainly semi-consolidated grits, fine grained sandstones, silt stones, clays, shales and at localised areas, a mixture of all (Du Preez, 1947, Jones, 1953, Hills 1976). This sandstone formation is overlain by post-cretaceous Ironstone (Falconer 1911, Klunkenberg 1965, Valette and Higgin 1977).

'he basal sediments, which are probably of alluvial fan origin, are conformably overlain y lithology comprising mainly sandstones and subsidiary clay stones, fine onglomerates and siltstones (Adeleye 1976). The sandstones are generally angular, well o poorly sorted and very fine to very coarse pebble Aikoses and feldspathic sand stones re common in the basal areas while quartzose sandstones dominates the upper parts.

The basal beds are succeeded by dominantly geothic and pisolthic ironstone of about 5m thicknesses. Where the lower ironstones are absent, the argillaceous beds conformably overlie are the basal sandstones bed. The upper ironstone succeeds the argillaceous strata with a thickness of about 15m.

The composition of the rocks is that of coarse grits. Clear grain quarts and some clay materials (Du preez 1947, Jones 1953).

2.4 TOPOGRAPHY AND DRAINAGE

Elevation of the landscape features within the state is about 100-500 metres above sea level (Pugh and King 1952), Velatte 1973, Adeleye 1975).

The geomorphic units representing Nupe sandstones lithology and structure underlying the geology are of three types. They are the plain land, mesas and the river flood plains.

The Nupe sandstones are plains covered by flat lying to gently rolling plains. The monotony of the landscape of this region is sometimes broken by residual flat hills, which are either conical or flat – topped. The elevation of the plains around the study area is 150 – 135 metres (Adeleye, 1975)

A discontinuous belt of mesas runs from an area about 16km east of Mokwo, through areas south of Bida to Baro and continues southwest to Lokoja beyond the state boundary (Adeleye, 1975). The mesas tops lie between 290 and 150 metres around Niger confluence areas, south –east of the state.

These mesas are irregular dissected by the River Niger and its distributaries, with their walls becoming precipitous, especially along the Niger facing scarps. Intermediate breaks of slopes are sometimes present along the mesa walls indicating the occurrence of relatively resistant beds.

The flood plains are marked by series of elongated ponds running parallel to the rivers channels (fadamas).

Rivers in the regions flow in the north-south direction into the River Niger. The direction of flow of all major rivers in the area and the extent and shape of their flood are highly influenced by the geology of the area. This accounted for why rivers in Nupe sand stone areas are down warped in the cretaceous period and filled mostly with sandstone sediments of the Upper Cretaceous age. This also accounts for the widely spaced dendritic drainage pattern and seasonal flood plains (fadamas) with sand bars on the riverbeds, which are exposed during dry season.

The surface flows of the rivers reduced in volume while the ground water intake is correspondingly high due to the permeability of the Nupe\ sandstone. The streams in these areas are usually perennial in their middle and lower courses, but their headwaters and minor tributaries are seasonal.

2.5 VEGETATION AND AGRICULTURAL LAND USE

The area of study lies within the Guinea Savannah vegetation belt (Keay, 1959). This vegetation zone is a by-product of centauries of tree destruction by man. In the process of adaptation, the trees have developed long and extensive root systems and thick bark to enable them survive the long dry season and annual bush fires.

The main tree species in this belt run up to 15 metre high, occasionally more and there is a dense grass layer of which Andropogon gayamus is the most abundant. Isoberlina doka and Isoberlina tomentasa are among the commonest trees. Guinea Savannah vegetation has a general floristic (uniformity due to narrow range of moisture condition variation within the zone.

Most part of the study area is covered by mixed leguminous woodland while the south-eastern part is mostly covered by semi-deciduous forest. The artificial forest reserves found in these areas also form a significant vegetation feature.

Farming systems and crop options in Lapai are detected by its climatic conditions. Both short season and long season crops such as tubers (yams, sweet potato, cassava), melon and grains (Sorghum and Maize) are produced annually. The crops are either grown alone or in rotation with each other. Presently about 51% of cultivable land is under grains production. The fallow period ranges from two to four years (Halilu, 87). However, in the fadama (flood plains) and valley bottom Lands, cultivation is often continuous without any appreciable depression in the yield of crops.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

The literature review is made on environmental degradation and contribution of remote sensing to environmental degradation.

3.1 CAUSES OF ENVIRONMENTAL DEGRADATION:

Environmental degradation has various causes, which could be broadly grouped into natural causes and man-made causes. Some of the natural causes include volcanic eruptions, land slide, earthquake and change in the atmospheric circulation. The man-made causes include; over-cropping which give rise to infertility of the soils, misuse of water and soil resources giving rise to high salinity status of both soil and water; release of solid, liquid and gaseous wastes leading to pollution of the atmosphere, surface and beneath (Abdulkadir, 1993).

Due to some meteorological factors (see Balogun, 1987) the climate varies, changing from wet-dry-wet, in a cyclical manner. The dry spells are taken as the periods, which include desertification on desert margins, and degrade land in other neigbouring areas. The problems with this are the inability to determine the exact period between each cycle.

Scientists like Warren (1984) have attributed land degradation to man-included climatic effects sometimes known as the 'charney' effect, after one of the meteorologists who investigated it in the contest of the Sahara. Simply put, the Charney effect begins when there is gradual depletion of the vegetation cover, due to bad land management practices like bush burning, over cultivation and overgrazing. Loss of vegetation cover brings about an increase in albedo (i.e. the amount of the sun's energy reflected by the earth's surface). There is thus a net lose of heat reaching the earth surface at that area. The air above such a surface cools and subsides, making the creation of clouds over that area impossible. With the absence of clouds, rainfall becomes scarce, and with dwindling rainfall drought resistant plants take the place of the previous vegetation. As the quantity of the dwindling rainfall approaches naught, vegetation ceases to exist.

There is also the neo-Malthusian view that increasing demographic pressure results in overuse of reasonable quality land and/or the misuse of marginal often easily degraded land. The net effect is a rapidly degraded land. To this view Barrow (1991) warns:

> There is a need to treat the argument that environmental degradation arises whenever population grows, even when it exceeds a regions' carrying capacity, with caution for there are areas with large numbers of people and relatively little damage and there are areas with very few people, a short settlement history and much damage. (Barrow 1991 p.13).

Other models have also been made explaining how degradation is initiated by continuous removal of plant cover by man. However these models only succeed in explaining isolated cases. When applied to all the other areas experiencing degradation, they fall short of desired results.

It is clear from the foregoing that meteorologists agree only to the point that environmental degradation is caused mainly by climatic variation and landuse abuses by man. The sequence of events that finally results into the lands being degraded still remains in the realms of controversy. No satisfactory model has yet successfully given an adequate answer to the causes of degradation, the world over. Rather it does appear that each degraded area has its own unique variables, which act, in isolation or with other variables to cause degradation.

Erosion has been linked with such factors as human activities, precipitation, run-off, vegetation cover, biological processes in the soil and inherent inability of soil to resist erosion (Tee, 1988). It has also been linked with the factors such as geologic (Sparks, 1960) and geomorphic characteristics of an area.

The destruction of the natural vegetation in a given basin may increase flood peaks and sediment load. This may convert narrow, sinuous channels with low sediment transport into a very wide and straight bed load channel (Schumm and Lichty, 1963).

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Because of the interest offered about environmental degradation recently the latest states of art are used to study environmental degradation. The most notable is remote sensing.

Also Patrick (1987; reported in Abdulkadir 1993) used aerial photographs and rainfall data to assess the impact of gully erosion in parts of Gongola (now Adamawa and Taraba States) and Bauchi State. He concluded that aerial photographs are useful tools for monitoring erosion hazard and land cover.

Remote Sensing techniques has been applied to various management issues and soil degradations especially erosion (Howard, 1977, Rap et al, 1977, Rodsiques Raja Ram et al, 1978 Hunting Technical Service Limited, 1979). Remote Sensing can provide classifications of landscape, identifying areas susceptible to erosion (Townshend, et al 1987).

Suspended sediment is a major problem in streams, lakes and estuaries. Such sediments carry absorbed chemical (Romkens et al, 1973), affect aquatic Eco-system (Ritchie, 1972) and the recreational potential of many water bodies (Bondurant and Livesey, 1965). The muddy waters of streams provide evidence, even to the un-informed, that erosion is occurring upstream and sediment is being transported (Vanoni, 1975).

Various forms of Remote Sensing platforms, ranging from photographs to sophisticated Radar, spanning over various bands, have been in use for soil moisture, erosion and deposition studies. The most common use of remote sensing in soil studies is in soil moisture content (Harris, 1992) which relates to run-off and erosion directly. Microwave emission, both passive and active (Radar) has great potentials for the study of soil moisture content and degradation (Cibula et al, 1992, Roa et al, 1995).

Pacheco (1977) produced a soil degradation map of Morocco using band 7 (0.8 - 1.1mm) of Landsat imagery. The choice of this band was informed by the fact that land and water boundaries are clear and bare soils contrasted with cultivated and vegetated lands accurately in band 7. Mitchell (1981) also used Landsat imagery of the Middle East and North Africa to map soil degradation at 1:5m million scales. Fagbami (1986) assessed the use of digitized Landsat (digital) imageries in quantitative and qualitative separation of soils and characteristic erosion of southeastern corner of Lafia. Fagbami (1986) in Makurdi area, Nigeria, used Landsat and aerial photographs to map and assess the condition of soils including their physical limitations such as erosion as well as flood hazard problems.

In the studies of some effect of Tiga dam in Kano State, on the environment downstream, Olofin (1980) identified erosion and flood plain formations that resulted in landuse changes from aerial photographs. He also observed channel erosion in the river storm channel leading to a replacement by a more suitable narrower channel with perennial discharge and gullies incision on the low terrace.

Areas of gully erosion can be identified in high-resolution imagery (Aranuvachapun and Walling, 1988) and aerial photographs (Abdulkadir, 1986). The use of aerial photograph in mapping and predicting erosion risk has been discussed in the works of Abdulkadir, 1986 and Jones and Wilds (1975). Dwivedi (1985) revealed useful information about the manipulation of Landsat and false colour aerial photographs for assessing erosion in bands 5 and 7.

On the ground, the spatial extents of gullies are not readily apparent to the visual observer. However on the aerial photographs they are apparent and can fully be investigated (Patrick, 1993). This is because gulled areas are distinguishable even on non-stereoscopic photographs by their tonal expression or rendition due partly to lack of vegetation and the irregularities of their edges (Patrick, 1993). On stereoscopic photographs most gullies are easily identified even under ground cover because of their distinctive morphological expression especially their sharp and clear cut head scarps and side scarps (Ologe, 1971).

Carter (1958) used photographs to study sheet erosion and gully erosion in eastern Nigeria around River Njaba and attributed the degradation of the agricultural land to the nature of the slope, run-off and human activities. Garland (1982) used panchromatic black and white and infrared photographs to map erosion in some agricultural land in South Africa and noted a high spectral sensitivity of panchromatic photographs for cultivated and uncultivated area variation. Akinyede (1993) used SLAR in conjunction with aerial photographs to map geologic characteristics of Biu in Plateau and found that remote sensing techniques has the ability for easy and quick production of geology map.

John and Kaech (1966) carried out a study in Rhodesia Chilimanzi Tribal Trust Land to locate African huts in a relationship existing between gully intensity and population. Heush (1977) used aerial photograph to investigate soil erosion in Sefid Rue Basin of Iran and classified erosion according to severity. Colwel (1985) used SPOT, Landsat MSS and infrared photographs to monitor erosion, flood and heat problems in California and concluded that SPOT was overall better a tool than Landsat MSS and that it is close to infrared photography.

The study of vegetation from remotely sensed data gives a lot of information about erosion as it indicates decreased run-off due to interception and evaporation, increased infiltration, and increased stream flow due to decreased evapo-transpiration and interception. Again streamside vegetation slow down floodwater passage and retard stream-bank erosion due to root binding (Edward, 1992).

Though conventional photographs are very useful in interpretation and monitoring vegetation and it changes (Dowling, 1964; FAO/UNDP, 1979; Vink, 1982), satellite images have proved to be a very valuable tool for studying various aspects of vegetation such as vegetation character (Tarpley et al 1984 and Heldeu, 1985), vegetation changes (Hayes and Cracknel, 1984), vegetation degradation (NOAA, 1984 Khouria, 1993 and Onyebuchi, 1985) and percentage cover of vegetation.

Satellite sensors are capable of discerning many of the changes in the physiognomic characteristics of vegetation through spectral radiance measurement. The visible infrared bands on the satellite multispectral sensors allow monitoring the greenness or vigor of the vegetation. The green vegetation is highly absorbing in the visible part of the spectrum (Halilu, 1993) and low absorbing in the near infrared part (Roughgarden et al, 1991) due to chlorophyll, water content and scattering caused by the leaf's internal spongy mesophyll layer (Myers, 1983). This therefore is relevant to the study of the depletion of the vegetation in the study of erosion and other factors prominent for degradation.

Lauver and Whistler (1993) used Landsat TM data in Kansas USA to separate high quality grasslands with a high number of plant species from low quality grassland with low species diversity and found it to be 80% accurate in relation to field checks. This is an important step in the study of land degradation study using remotely sensed data

Verstappen (1977) observed that Land System Mapping, which can form an important input to degradation studies, could be derived from small-scale imageries such as Landsat and Radar. This is a bit contrary to Jeje's (1986) assertion that while Band 5 of Landsat imageries appears to be very useful for landuse mapping purposes, Radar is less suitable for the purpose.

CHAPTER FOUR

MATERIALS AND METHODOLOGY:

4.1 INTRODUCTION:

This chapter deals with the materials and methods used for the studies, starting with material collection to the analysis.

4.2 MATERIAL COLLECTION:

Before the research was embarked upon, a lot of books were used to see the viability of the project. Materials for the research were sorted out. It was ascertained that there were necessary materials to be used for the research before it was fully embarked upon.

The material collected were;

i) The map of the Local Government and the study area.

ii) Journals and magazines were also collected for literature review.

iii) Projects written on the study area.

The study also wanted to use multi-temporal aerial photographs to identify changes in the land management but the photographs were not available and the time was not adequate.

4.3 PRE-FIELD WORK:

Before going to the field, the maps of the study area, Local Government, State and country were collected and drawn to scale so that they can be more thematic and filed into the project pages. The maps were all presented in the previous chapters. Journals, textbooks and other research projects were read and the references were extracted for literature review. The relevant literatures were cited from these sources.

4.4 FIELD STUDIES:

The pilot used for the study was about 25 hectares along Gulu – Lapai road, having a transects of about 8km squares. Here the factors causing land degradation and land management types were identified and recorded. A through reconnaissance survey of the farm was carried out in December 2000. The survey helped in the assessment of the management and factors that caused the degradation and to what extent it is contributing to the degradation. The types of the degradation and there causes were also observed.

CHAPTER FIVE

RESULT AND DISCUSSION

5.1 INTRODUCTION:

This chapter discusses the result of the observations made in the field at the time of the study. The chapter set out to out live causes of environmental degradation in light of the oral interviews conducted.

5.2 LAND USE MANAGEMENT:

It was observed that the localities in and around the study area are predominantly farmers. Most of the fishermen in the areas alternate fishing with farming. The agrarian settlement depends so much on land thereby causing more pressure on the cultivable lands. It is apparent that this pressure determines land management in the localities.

In the past five to ten years, intensive cultivation had been embarked upon. This is why so many parcels of lands cannot be left for more than two to four years to fallow. The fallow period is not enough for the soil fertility to be replenished and thus the fertility of the soil is depleted. With the depletion of the soil, the soil colloid and humus is reduced thereby increasing the incidences of erosion.

The agricultural lands are increasing daily as the events from ten years back witnessed the increase of mechanical farming this increment has tremendously transferred the vegetation of the area into farmlands that are prone to erosion and fertility depletion.

Heavy machineries break the soil, track roads are compacted by the heavy machineries and more chemicals are added to the soil through pesticides usage. Al these would or are leading to environmental degradation because after harvest it would be discovered that the soil is left exposed while in the rainy season the chemicals are washed into the rivers.

In preparation of the lands for cultivation, a lot of harm is done to the environment. The farmers set the stalk on fire. This lead to bush burning that goes beyond the farm into the fallow lands and cultivated land. The vegetation is thereby subjected to annual bush burning. The bush burnings are done even after harvest or during harvest. This can also lead to loss of yield by some farmers in the nearby land. Burning of vegetation on the farms leas to fertility depletion because when early rain set in, the released nutrient from the burning are easily washed away. This is done by traditional farmers mostly in few areas there are evidence of cultivation along the slopes of the rolling land. This includes erosion and washing away of the soil nutrient with the topsoil. The ridges are supposed to be across the slope so as to serve as a break to surface flow.

In most part of late, farmers are also growing so much concern for the environment that they are now encouraging each other to embark on inter cropping so as to increase yield and lessen their demands for fertilizer. This is not because they realized that fertilizers can be so harmful to the soil and water but because the cost of fertilizer was increasing annually and becoming unaffordable. Some also embark on crop rotation since pressure on land does not give enough room for bush fallow.

Fertilizers that were used by the local farmers, are usually washed into the rivers, thereby polluting the water and making it unfit for direct consumption. Thanks to the flow of the rivers that are only stagnant during the dry season. Must of the washing of clothes and other farm produce like melons are taking to the rivers and washed directly into the rivers making it harmful to the aquatic life in the stream and for people living down stream.

The activities of man such as water fetching, washing by the river side and fishing has also deprived the river sides their vegetation (riparian), this is leading to bank erosion and depositions. The rivers are widening and reducing in depth as time goes on.

5.3 OTHER USAGES:

Bush burning is not only embarked upon in a process of clearing. There are other events of bush burnings are mostly embarked upon by hunters who chased animals in the bush. This is done to set the animals out of their hidings. This is more dangerous because it knows no boundary and is mostly carried out during the harmattan when the wind is fierce and when some of the trees even in the forest are dry and easily exposed. This type of fire is highly damaging to the vegetation.

The whole families in the locality exploit the forest for their domestic uses such as firewood, pestles, and medicinal herbs. It is apparent that no family in the localities visited was using any other alternative source of energy like stoves and gas cookers. They depend wholly on the firewood for cooling and warming of their homes during harmattan. The hick bark that is developed by the plant for adaptation and resistance to fire and harmattan are continuously under attack for medicinal purposes, the trees are also cut down for furniture, pestles and log for sitting. The grasses are used as thatches in roofing the homes.

Animal rearing in the localities also leave some of the areas under study, open to erosion both by wind and surface water. The animals were discovered to compact the soil they trample on and also remove the vegetation cover of the grazing land leaving the soil so exposed and vulnerable to agents of erosion. The totality, of all these will result into deforestation.

Most of the muds used for the buildings in the areas studied were dug from the ground. This had made the places a sore to the eyes, as they have turned into dirty ponds collecting water and garbage's. The ponds are today sources of foul smell in the area and are also serving as latrines to the villagers. This could also lead to cholera and other diseases. The ponds are also used for collecting refuse that serves as landfills except for the fact that they are too close to the settlements and are potential zones of toxic concentration in the near feature. Toxics are harmful to both man and the soil and water it flows into either through the under ground or surface flow.

It was also observed that the roads along Lapai – Gulu and some minor roads are constructed without drainages. This is leading to drainage problems and increase erosion by the roadsides. Further away from the roads or away from the erosion spots are deposited soils that are highly sterile in nature, thus harmful to agricultural lands.

There are other evidences of indiscriminate dumping of refuse in the streams and other areas of the settlements studied. The ditches create by digging for building materials are also used by some individuals. The spread of the dumps are not only a sore to the eyes but also carried by the wind and dump in places far from the settlements.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 INTRODUCTION

This chapter focuses on summary of the major findings, conclusion of the formal observation and recommendations to usage and further study.

6.2 SUMMARY

It was observed that the localities in the study are agrarian societies that depend solely on farming. This causes a lot of pressure on the land, thus influencing the management of the land.

The management of the land such as intensive cultivation, mechanization, types of clearance, and direction of ridge are prominent causes of environmental degradation (land).

Though land degradation is apparent the farmers are becoming increasingly aware of this degradation due to reduction in yields and other environmental consequences. The few that are aware of method to mitigate environmental consequences are trying to encourage others to adopt crop rotation and mixed cropping to buffer yields.

The activities of farming are not the only culprit in degradation. Hunters and wood cavers are deploring the state of vegetation in the face of fuel wood, grazing and use of thatches for roofing.

5.3 CONCLUSION

It could be concluded that land degradation in the study area is triggered to land use and management. The area is subject to land use and management of the area is impoverishing the land of it natural state and ecological balance.

5.4 RECOMMENDATIONS:

Based on the study carried out, the following recommendations are made:

- The Government should try and enlighten people about landuse management and if implication.

- The government should make a legislative policy to conserve and manage the environment.

- The government should take inventory of the environment and monitor the use of environment.

- The government should undertake a land suitability study of the area with the aim of participating in its management by stipulating what should be planted, which year, what time and how.

- A further study should be carried out to determine degradation for various land use patterns so as to quantify the rate of degradation taking place. This will enhance choice of appropriate technology and management.

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