AN APPRAISAL ON PROBLEMS OF EROSION IN BIDA LOCAL GOVERNMENT, NIGER STATE

CASE STUDY OF BIDA TOWNSHIP

BY

ZAKARI TSADU ENAGI

DEPARTMENT OF AGRICULTURAL ENGINEERING
(WATER AND SOIL CONSERVATION OPTION)
SCHOOL OF ENGINEERING, FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA - NIGER STATE.

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APPROVE

This project is hereby submitted to be approved by the undersigned persons on behalf of the Department of Agricultural Engineering School of Engineering. The Federal University Technology, Minna in partial fulfilment of the requirement for the ward of the post-graduate Diploma (PGD) in Soil and Water Conservation.

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Mr. Onuachu Date

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Dr. M.G. Yisa Date

....
Project Co-ordinator Date

.....
Presented by Zakari Tsadu
Enagi.

ABSTRACT

The study was conducted to find out erosion problems in Bida Local Government. The methods and steps that were fellowed are reconnaisance Survey, Laboratory analysis of specific gravity determination soil particles and the procedure adopted is according to B.S. 1377 (1975), In-situmoisture content of the soil to dermine weight of water contained in the pore spaces.

The soil profile description of the study sites to determine location , topgraphy, vegetable, land use drainage, horizon depth and description of the soil nature.

The information obtained from the study work can be use to improve on erosion problem in bida Township and proffers possible solution to the problems.

ACKNOWLEDGEMENT

First and for most, I say a big thank to almighty Allah (God for sparing my life since, I was born up to this moment of my research work.

The success of this research work for the award of Post graduate Diploma Agricultural Engineering, Soil and Water Conservation option is as result of often assistance accorded to me by Bida Local Government.

This research work could have been deep cleft without appropriate ralling by my supervisor Mr. Onuachu of the Department of Agricultural Engineering who in addition took pains to read and correct the manuscripts.

His critical assesment is an infinite source to the success of the project. During the course of my project, I was greatly indebted to my wives Zainabu Zakari and Salamatu Zakari and friends.

I am also indebted to my secretary who is by name Abubakar Jibrin who help me in typing out the project work.

Lastly I wish every body especially those coming behind a success in all their understakings.

DEDICATION

This project is dedicated to my beloved wives

(a) Hajiya Zainabu Zakari

(b) Hajiya Salamatu Zakari

and Alhaji Tsadu Bima Gbanchitako Enagi for their morel support.

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CHAPTER ONE

INTRODUCTION

Bida local government lies within southern part of Niger State of Nigeria. It is bounded on the East by Gbako Local Government, North by Katcha Local Government

The proposed topic of the project is the erosion problems in Bida Local Government of Niger State with reference to Bida Township. The problem of erosion has assumed alarming proportion in various ward of Bida Township which has been causing destruction to houses.

Bida township is fast developing town with such facilities as water, electricity, school, roads and hospital etc. The people were observed to be determined trader and farmer who have much to show for their efforts. These studies were conducted to supply all such data that would be required to adequately appreciate the cause of the erosion and flood menace.

Bida local government area of Niger State has been chosen as a pivot of discussion for two reasons.

The researcher is an indegine of the case study settlement and this avails him a some that thorough knowledge of erosion problem in the study area.

Proposed topic of study is one of much interest bound to generate facinating intellectual cross currents. The problems of erosion problem has fired the interest curiosity of the writer because it has been a subject of concern to the nation more than ever before.

1.1. AIM OF RESEARCHER

The aim of the project is to examine the problem of erosion as to profer adequate solution to the erosion problems.

1.2. OBJECTIVES OF RESEARCHER

1. **To** examining the properties of In-situ soil.
2. To determine the strength of the soil of the study area.
3. To determine the profile of the soil.
4. To examining the annual rainfall of the study area
5. Examining major causes and effect of erosion problem on the people of the study area.

1.3. OBJECTIVE AND SIGNIFICANCE OF STUDY

INCLUDE: An enumeration of causes, nature and effect of problems of erosion. The most important aims of this project is to examine the nature causes and consequence of erosion problems.

1. Rectification of the narrow understanding of the concept of erosion problem phenomenan.

Erosion problem started from total neglect of people of the study area and government. These assumption can now be much myopic and the aaim of this project is to present a comprehensive perception of the concept erosion problems.

1.4. SCOPE AND LIMITATION OF THE STUDY

Fundamentarly, the scope and limitation of study of this research drives mainly topic of erosion problems in Bida Local Government with particular reference to Bida township.

From the topic itself, it is very envident that, the subject of study is erosion problems and not any other thing. The subject shall be studied within the contest of Nigeria situation data emperical envidence concrete illustration shall be drawn from Bida Local Government of Niger State.

Lastly the study shall be limited to Bida Local Government Area of Niger State alone so as to acquaint and create awareness on public especially Bida Local Government Area indegines on the nature and major causes and solution to the chronic erosion problems in the Local Government.

1.5. RESEARCH PROBLEMS

Ideally, while embarking on a project research work, I was confronted by a number of problems.

Firstly I had the problem of transportation to get to some wards as result of clustered of houses. This is because the research study will involve recognise survey in order to achieve the aim of the research work.

CHAPTER TWO

LITERATURE REVIEW

The need for gully erosion control in Bida and its environs can not be over emphasised. It is evidence by the true and number of areas affect by the gully erosion. The causes of these gullies have been traced principally to be human activities. The conversion of land based resoaurces of minerals and forest land to rural , urban industrial and other uses. Land abandonment after its use lead to the development of gullies from sheet and rill erosion which could have been easily eliminated. Lack of proper drainage channel, which would convey flood during rains, is also a major cause. The most widely used soil prediction is Universal Soil Loss Equation (U.S.I.E.) It includes many factors, which can be expressed in 2 ways The basic and subsidiary factors.

The basic equation expresses and loss, A = RK..1

Where A = soil loss in tonnes per hactare.

R = the erosivity factor - obtainable from computing erosivity index from rainfall figure.

K = specified standard conditions i.e. slope length 22.6 m on a slope of 9%.

A beer cultivated fallow ground ploughing up and down the slope.

The subsidiary factors are K.L.S.C.P (equivalent to K). These are the ration which allow for conditions other than the standard conditions of the basic equation. If subsidiary factors exist, the soil loss will be less because the basic equation provides for the standard condition

of the worst cases of soil loss. Considerable works continue to define the soil erosion process and empirical soil loss estimation of the past are recorded by Hudson, 1985. Also noted that most of the factors affecting soil erosion was developed in 1936. The importance of rainfall impact in the erosion process was not fully appreciated until natural rainfall studies by Annoke (1986) and analysed the mechanical action of the raindrop on soil.

Using plots under stimulated rainfall and field conditions come factors like degree of slope and length of slope, Osuji and Sangodoyin (1986) came forth in comparison of these factors rate with soil loss. Doubling the degree of slope increases the soil loss from 2.6 to 2.8 times the actual soil loss, while doubling the horizontal length of slope increases the soil loss to 3.03 times i.e. greater soil loss in increasing the length of slope than the degree of slope. This relationship was expressed by

$$A = CS'' L''^{1} \quad ..2$$

Where A = Average soil loss per mit area

L = Horizontal length of slope

S = Degree of land slope

C = A constant variation.

And m and n are exponents of degree as i horizontal length of land slope respectively. Usually m = 1.4 and n = 1.6.

Gully erosion is wide spread and is often used by conservationist as one of the most characteristic symptom of erosion. the damages caused by gullies are reduction of agricultural produce, destruction of properties like building roads, electric poles and pipes lines. The best way to combat fully erosion is to prevent the formation of gullies. In other words, gully prevention is better and much easier than their control.

The general principles consider where control measure is established are:-

A Ascertion the cause of the gully

B Set up the measure to use in order to remove the fully

C Restore original hydraulic water movement balance or create a new condition.

D Fencing to prevent animal or human encroachment. This will allow the floorishing of the vegetation around the new accumulation of soil.

However, the major control of gully erosion is classified as temporary control and permanent control methods. The temporary control methods are wire boister, wire netting, da brushwood dams log dams and brick weirs. While permanent structures include silt-trapping dams, gabbious, regulating dams and gullies head dams. Summarily, the major aim of this project is to stop further deterioration of both land and properties cause by gully erosion, good agricultural practices in order to increase the infiltration rate, and progressive filtering of the run-off by the cover crop (ground nut) take place simultaneously. In E2 and E3 sites

the temporary detention of water in the sections between the control structures mean increasing opportunity for infiltration and redeposition of eroded materials.

The interpretation of the infiltration data in column 6 these were taken about 24 hours after the control measure run-off. Soil moisture values were in the order E1 > E2 > E3. The explanation offer for this trend is as a result of the steepest slope (7.0%) of E3 site despite the amount of high run off water retained. The salt free water has run down the slope, leaving behind salt water which can not be infiltrated because of the clogged soil and sub-soil under the run off water (see figure 2). The E3 moisture content (m.c) is lost by evaporation through the sun, which makes the situation worst while the soil fairly, burn to brick. The force of water is becoming higher because cracks or breaches may form as a result of contraction and expansion of the soil brick (laterite). The water falling in a little stream into the crack acquires more force and moves faster. The improved new slope being formed begins to be undermined. This is the beginning of regressive erosion, which is immediately stopped by the structure at the up-stream. Common to both E1 and E2 the m.c. profiles show a transmission layer with little water content (21-40m) and moisture accumulation about 60-80cm which responsible for fast growth of plants.

However, the breakdown from distributed questionnaires shows that over 80% of gullies have been existing for more than 10 years without any control. The gullies have been abandoned becuase no body wants to be responsible for the repair or total control. The community thinks that it is the responsibility of the government, while the government blames it on the over population of the people in the areas. Actually bad environmental attitude like dubbing of refuse into the run off water or streams is the problems nearly in all the areas. Hence, the most bastardise gully vicinities are the road side ones (70%). No wonder, not less than 60% of the bridges have collapsed just from the last 5 years and result to crater gullies on Bida roads. In fact, the gullies are death traps to the vehicles. Presently, there is low record of accident of vehicle end up in gully. But for how long we shall continue to jeopardise the road users and even vehicles while the drivers try to avoid these gullies in our roads. It tells on the life span of the vehicles no motor is made for the Nigerian roads. However, the increasing number of of farm produce, properties and domestic animal being washed away by run off water are 10%, 38% and 51% respectively. The lowest record from produce loss shows farmers are much concerned of gully control. Nevertheless, 15% of the concerned people mainly farmers)

control their gullies by either temporary wire setting or brushwood (mechanical roles) or vegetative cover (plant roles) controls. Judging the effectiveness (especially fallow ground) of the temp orary control, which can only prevent further deterioration, but not to cure gully completely is inadequate. The only permanent control like concrete channel gibbon and stone embankment are mainly to protect the standard of hydraulic channels, roads and bridges from further widening of the streams and rivers. Already, the provoked human beings because of gully appearance as described it as deadly, ugly, and non-advanturous pits just to mention a few. Over 85% blame the cause of gully erosion on human activities while run off is about 15%. Natural land given by God is free from erosion, but when man start to farm, collect sand / stones for structure, increasing number of dams, etc, we are bound to continue to experience gully erosion here and there.

CHAPTER THREE

METHODOLOGY AND PROCEDURE

In other to achieve the success of this project as well as to meet the short time given for completion of this project or study. To easy access to readily available information I shall resort to the following sources.

(a) The Local Government Headquarter

(b) Various ward in Bida Township

(c) Federal Polytechnic Library and State Library.

All these materials were given through to obtain facts and provide theoretical and practical background on the subject of the study.

(a) Observation

(b) Interviews

(c) Reconnasance survey

(d) Laboratory analysis

(e) Vusual Examination

OBSERVATION.

This was a direct observation by the researcher so as to obtain data or information on the practical aspect of problems of the erosion in Bida township.

The researcher was therefore involved in observing the various affected wards in order to identify the major causes of the erosion and also to find ever lasting solution to the problem.

INTERVIEWS

This was conducted orally. In other words it consist of scheduled interviews with wards, community that the problem of erosion affects. The interview was conducted in order to have a balanced and unprejudised conception of the problem of erosion in Bida township.

Among of the questions include

(a) What are the major cause of the factor responsible for problem of erosion in Bida township?

(b) What are the effect of erosion in the various ward?

(c) Where are the most affected wards?

(d) What can you say about population density?

(e) What suggestion would you proffer for solving the erosion problem?

(f) For how long have you been here with this erosion problem

DATA PRESENTATION AND ANALYSIS

Data gathered from all wards of the Local Government are analysed.

METHOD OF SOIL SURVEY

The reconnasance survey procedure was adopted for this study. This is because they show broad soil groups at the higher categories of classification usually related to geological formation or topographical wards of the study area.

Soil profile investigation was limited to specified horizons or depth below the surface and the following carefully chosen properties

(i) Testure

(ii) Structure

(iii) Colour

(iv) Consistence

(v) Stoniness.

A. reconnaisance soil survey gives reliable information on the relationship between soil and other environmental factors such as slope and landforms.

For the field studies, a free survey method was employed and observation taken at few metres from the access routes. For a full description of the soil characteristics, a mini pit was dug at each designated sampling point. In all there were three sampling point at

(i) Dokodza ward

(ii) Masabah ward

(iii) Majigi ward

For the field studies a free survey method was employed and observation taken at few metres from the access routes. For a full description of the characteristics, a mini-pit was dug at each designated sampling point. In all there were dug to a a minimum depth of 60cm in order to sufficiently expose the A and B horizones. The following paramentres were therefore determined - Horizon depth soil colour, testure consistence concretion and drainage condition. These were determined using standard field study procedures.

CHAPTER FOUR

ENGINEERING PROPERTIES OF IN-SITU SOILS

The arrangement of soil grains and particles forms the soils structure or micro frabric and this depends on the shape, size gradation and mineralogy of the particle present. The mode and rate of deposition and environmental condition under which the soil was formed also affect it. These factors influence to a great extent, the physical properties.

Representative random samples of soil were taken from both gully bases and sides for laboratory analysis. These samples were taken from critical gullies were erosive and sedimentation activities were most critical and where heavy engineering structures are likely to be recommended for the control of the erosion.

PHYSICAL PROPERTIES

The physical properties of the soil considered in this study include

(i) Colour

(ii) In-situ moisture content

(iii) Alterberg limits

(iv) Specific gravity

These physical properties are particularly useful in the classification of the soil. The BS code of practice CP 2001 (1975) state that for purposes of identification it is sufficient to consider two essential characteristics.

Firstly the size and nature of the particle composing the soil and secondly the density or other property resulting from the arrangement of those particles. They are also useful for the initial estimation of the strength parameter.

VISUAL EXAMINATION

Visual examination of the soil was conducted on the soils removed from trial pit dug on all the gullies and also on the soils removed from the three test pits dug on critical gullies.

COLOUR TESTURE

Generally, the soil within the study zone could be described as sandy with the sand fraction decreasing with depth. The colour range from dark brown top soil to yellowish brown soil.

IN-SITU MOISTURE CONTENT

The BS code of practice CP 2001 defines the natural on in-situ moisture content of soil as the weight of water contained in the pure spaces, expressed as a percentage of the dry weight of the solid matter in the soil. The procedure adopted for the determination of the In-situ moistu: content of sample during this work is in accordance with BS 1377 (1975).

Samples carefully preserved from the site were weighed in moisture content tins and left in the oven for 24 hours at a temperature of between 105°C to 110°C. They were reweighed to determine their losses in weight.

CALCULATION

$$M.C = \frac{\text{Mass of water}}{\text{Mass of solid particle (g)}}^{X} \quad \frac{100}{1}$$

$$M.C. \quad \frac{M2 - M3}{M_3 - M_1} \times \frac{100}{1}$$

Where M - C Moisture content (%)

M1 = Mass of M.C tin (g)

M2 = Mass of moisture content tin-wet soil (g)

M3 = Mass of Moisture content tin-dry soil (g)

RESULTS

Average value of moisture content

SAMPLE LOCATION	Efu Nkochi 1	Efu Nkoch 2	Efu Nkochi 3	Dokodza 1	Dokodza 2
DEPTH	3.5	2.5	1.5	2.5	1.2
ALL M.C. %	8.69	2.56	4.16	9.55	8.74

SPECIFIC GRAVITY DETERMINATION

The specific gravity of soil particle is defined as the ratio of the weight of a given volume of soil particle to that of an equal volume of water at 20°C.

The specific gravity of soil particle is a very important parameter used as an auxillary factor in computing other properties of the soil. For example, the porosity of the

and void ratio of a soil, its unit weight, the degree of saturation, dychometer analysis and consolidation.

The procedure adopted for the determination of the parameter is according to BS 1377 (1975) At least two determination of specific gravity were made for each sample and the average determined. The specific gravity of the soil particles is given as

$$Gs = \frac{W2 - W1}{(W4 - W1) - (W3 - W2)}$$

Where Gs = specific gravity of soil particle

W1 = Wt of bottle stopper (g)

W2 Wt of bottle stopper+ soil (g)

W3 = wt of bottle + stopper + soil water

W4 = wt of bottle + stopper + water (g)

RESULT OF SPECIFIC GRAVITY DETERMINATION

SAMPLE	Efu Nkochi Bida 1	Efu Nkochi Bida 2	Efu Nkochi Bida 3	Dokodza Bida 1	Dokodza Bida 2
DEPTH	3.5	2.2	1.5	2.5	1.2
ALL SP. GRAVITY	2.57	2.64	2.38	2.63	2.50

MECHANICAL PROPERTIES

The characteristics that govern the magnitude and rate of determination of soil when loaded are known as the mechanical properties of the soil. The most important of these properties are the compressibility and shear strength.

STRENGTH CHARACTERISTICS

The shear strength of a soil is the maximum available resistance that, the soil can offer to shear at a given point within itself. When this resistance is reached displacement between two parts of the soil body takes place along a well define single rupture plane or across a wide zone containing a zone of soil stressed to its available resistance. The magnitude of this resistance (Km/m^2. The soil mobilizes in the zone of shear stress in defined by the Columb Moh's equation.

$$l = dn\ tem\emptyset\ tc$$

dn = normal stress component in kN/m^2

where $\emptyset$ = angle of internal friction of soil in degrees

C = cohesion in KN/m^2

l = Shear stress in KN/m^2

Direct shear analysis using the shear box method was conducted in the following four samples.

(a) Efu Nkochi Bida 1: Collected from Efu Nkochi (Pit 1) at depth 3.5m

(b) Efu Nkochi Bida 2: Collected from Efu Nkochi (pit 2) at a depth of 1.5m

(c) Dokodza 1: Collected from Dokodza (pit 1) at depth of 2.5m

(d) Dokodza 2: Collected from Dokodza (pit 2) at a depth 1.2m.

RESULTS MECHANICAL PROPERTIES

SAMPLE	ANGLE OF INTERNAL FRICTION (Ø) IN DEGREES	COHESION (KN/m^2)
Efu Nkochi 1	10.5	35.5
Efu Nkochi 3	21.5	24.0
Dokodza 1	11.5	40.4
Dokodza 2	15.6	32.0

CHARACTERISTICS OF THE SOILS OF THE SITES

(a) Depth

Field investigation reveal that the soils of the study sites are very deep. These could be observed from the depths of the gullies. Unlike soil formed on basement complex parent materials that, have concretion encountered in both study sites which is indicative of deep soil on the average. The A horizon has depth of 180m at Dokodza while at Masab B the A horizon has depth of 16cm. The A horizon otherwise known as top soil.

(b) **Textural Classification**

This is to determine the relative proportion of sand silt and clay seperates and thus the textural class. The feel method was employed in this method. The results show that, the soil at Dokodza erosion site are principally sands since they give gritly feel.

However, as you go down the profile, the testure changes to a loamy sand texture in the B horizon. Soil at at Masaba B have a sandy loamy texture in the A horizon, while the B horizon has clay loam texture. The textural classification of these soils reveal that the soils have a high proportion of sand separates hence the ease of dislodging by running water and also the high incidence of deep gullies erosion. This also gives the picture of a soil with low water holding capacity and also low fertility status.

(c) **Consistency**

Soil consistence was determined under moist condition when moist, soils tend to break down in to smaller masses that can be pressed together again after disturbance. The following observation were made at each location. Dokodza ward: At all the sampling points, the top soil have a loose consistence. This is because the soil mass is not coherent. However, deep down the profile, the soils have a friable consistence. This shows at Dokodza soil crumbles easily under gentle to moderate pressure. This detachability is very high making the soil highly prone to erosion.

Masaba B ward:- The soils are more form and compact. They exhibit afriable consistence at both A and B horizon. Although the soils are also highly prone to erosion like the Dokodza ward soils ease of detachment of soil peds is lower than for the soils encountered at Dokodza.

SOIL PROFILE DESCRIPTION

1.1 Profile pit No. 1 at Masaba B (Efu Nkochi)

Location Behind Etsu Musa Central Market Bida.

Topography - Gently undulating plain

Vegetation - Southern Guinea savana

Land use - Fallow

Drainage - Well drained
Date of Description - 10/4/2000

Horizon	Depth	Description
A	Cm 0.16	Dark brown simply loamy moderate medium crumb structure with friable consistence. No stoniness and concrections.
B	Cm 15.55	Redish brown sandy clay loam with loose consistence. No concretion and mottles.

PROFILE PIT NO. 1 DOKODZA WARD

Location Site 1 Dokodza

Topography Gently slopping terrain

Vegetation Southern Guinea Savana

Land Use For errection of structures buildings

Drainage Well drained

Date of description 10/4/2000

Horizon	Dept	Description
A	0.18	Dark Brown with loose consistence mottles weak fine crumbo structures
B	18.50	Yellowish red loamy sand with friable consistence. Structure is weak and crumbly.

PROFILE PIT NO. 2 DOKODZA

Location - Dokodza ward

Topography - Lower slope

Vegetation - Southern guinea savana

Land use - Fallow

Drainage - Well drained

Date of description - 10/4/2000

Horizon	Dept	Description
A	Cm 0.18	Dark brown sandy with loose consistence weak. Fine crumb structure No mottles and concretion
B	18-60	Yellowish Red loamy sand with friable consistence. No mottles and concretion.

CHAPTER FIVE

CAUSES OF EROSION PROBLEMS

Having discussed, engineering properties of In-situ soil, characteritic of the soil and soil profile description. It is need to render explanation on the causes of erosion in Nigeria with particular reference to Bida Township Niger State.

We need to inquire, into the fundamental causes of the problems with view to find solution to it. The erosion problems in Bida Township is mainly caused by water erosion. Basically these two types of erosion
(i) Accelerated erosion which is caused by man's activities.
(ii) Geological erosion which is the process of soil formatio as well as soil eroding.

SOIL EROSION Includes the removal of individual particles
Types of erosion identified in the study area.

1. Sheet eroion
2. Rill erosion
3. Gully erosion

Sheet Erosion: The uniform removal of soil in this layers from sloping land, resulting from sheet or over land flow occuring in thin layer. Small rilling takes place almost at the same time with the first detachment and movement of soil particle.

Rill Erosion:- Is the removal of soil by water from small but well define channels or streamlets when there is a concentration of overland flow. Rills are small enough to be easily removed by normal tillage operations. The soil erosion of the study area occurs in the form of rill erosion.

Gully Erosion:- Gully erosion produces channels larger than rills. Gullies can not be remove by tillage. It is an advanced stage of rill erosion, just as rill erosion is an advanced stage of sheet erosion.

FAIN FALL OF THE AREA

Soil moisture content 10.5% and annual rainfall of ranges 88-120mm from 20 years (1973-1973) rainfall date having average annual rainfall of 108mm (NCRI 98).

The basic investigation of the run off and the soil loss aspect was carried out using a run off collection system comprising of multidivisional rectangular channel of 550mmx 450mm x 450mm. A rubber horse positioned near the bottom of channel was connected with 120 litre plastic covered drum placed in 2m deep trench. The run off experiment were performed during rain fall event. The volume of run off fluma instrument. The distance covered per second for run off water in the channel was recorded.

The estimation of the soil mass in each run off sample. The following sequence of operation has been employed. A 500ML sample bottle was used to collect sample immediately after run off from 120 L container and sediment was allowed to settle. Water was filter out whilst the sediment was washed on the filter. The filter later dried in an oven, cooled indesicator and weighted. Hence, the estimated soil loss could be obtained using mass load method.

The analysed soil samples of moisture content were taken from 20-20cm depth which is the average rating zone for most erosion and 24 hours after the run off.

MAJOR CAUSES OF EROSION PROBLEMS IDENTIFIED

HUMAN ACTIVITIES

The population of the Bida Local Government area is concentrated within a small land area.

Further more with the advant of the Local Government system and its rural development strategy the population of these areas further increased. Consequent to this increase population density is the increase in human activities. The population of Bida in 1995 to 1997 was 384,000 and 1998 to date 480,000 respectively. In the analysis of increase of population the human activities is hereby blame to be the cause of erosion poblem. Most of these human activities tend disrupting the natural ecological equilibrium such activities as indiscriminate and unorganised refuse disposal excalation and others such abuse of terrain form the major core of the mance of

accelerated erosion within Bida Local Government. Crop and animal forming are special human activities that have in no small measure contributed to the erosion menace in Bida Local Government.

There is abundant evidence of over cultivation of the land within the immediate environ of Bida township as the diminishing arable land is been required to support an over increasing population. Further more there is the absence of good farming techniques that would have helped the soil under such a heavy pressure.

The impact energy is dissipated by vegetation and the size of the rain drops reduced. Base on the method of farming and land usage observed in the bIda Local Government Area of Niger State. It is evident from analysis that agricultural land usage is contributory factor to the erosion menace in Bida.

5.2. **INFRASTRUCTURAL DEVELOPMENT.**

erosion process is as old as rain and wind on the earth surface, but the genesis of accelerated erosion the resulting menace could be traced to the begining of infrastructural development in the Bida Local Government.

The Local Government system footed accelerated rural developments accross the country. When Bida become a local Government Headquarter its development rate accelerated resulting to the construction of many more buildings, roads other such infrastructures.

Similarly, the Local Government system coupled with the enterprising and self help attitude of the Bida people resulted to rapid infrastructural development of Bida Town more buildings and roads were constructed and such facilities as electricity and water were provided.

The sequel to these, is that the hitherto open spaces were utilized for the various constructions and the run off that freely found its way unbindered into surrounding low lands was constricted. The vestricted flow resulting from these scores the friable solid and gullies are formed. This is simply the cause of the accelerated erosion within the area.

5.3. DRAINAGE FACILITY

Good drainage facility is an indispensable compliment to efficient infrastructural development. It was observed in the Bida Local Government that poor drainage facility form a major factor that enhance the menace of accelerated erosion most of the township drain constructed in Bida Township are indequate in capacity and such unable to contain the volume of run off resulting from any average rain fall.

Secondly these drains were constructed without relevance to the natural slope of the terrain. Consequent from these various locations within the Bida Local Covernment children Primary School Bida at Efu Inkochi as heartly flooded whenever it toll of valuable properties.

It is necessary to mention here that some evisting culverts are inadequate. Some in capacity and yet others in construction. In all these cases, turbulent flows have resulted especially at the out-let structure causing seners securing of the culverts.

5.4. TOPOGRAPHY AND SOIL NATURE

The teopography of the study of the area is a primary contributory factor to the menace of the accelerated erosion within the towns. A range of hill about 40m above ground level running East-West lies North of Bida. The general slope of the terrain within Bida could be described as gently sloping toward the south.

Therefore in Bida, the hills provided a steep slopic for run off into the town resultantly the velocity of the run off becomes excessive his lodging and transporting soil materials away creating gullies.

5.5. SOCIO-ECONOMIC IMPACT OF THE MENACE ON THE PEOPLE.

In both Efu-Nkochi and Dokodza, bouses were found to be clustered together in the beart of the town while the forms border on the periphery of towns. The menace of erosion however bas not spared the cattlement or the famlands. In Dokodza houses were found to have been destroyed especially where they existed near fullies or

blocked channels. the name were found to be of Efu Nkochi channels. These create severe hardship for the people whom are forced to move away to new location. Those that have not moved are however subjected to high risk as their building may collapse. A great exparse of arable land is continously destroyed and vendered uncultivable. Thus is a source of a great hardship as the community depends to a large extent on the produce of their farms for subsistence.

Finally, adverse effect of the menace on such infrastructures as roads and borehole water pipe lines has reached a crisis level.

The menace of erosion can be said in conclusion to be gradually destroying the socio-economic life of the people in the Bida Local Government.

5.6. EFFECT OF THE PROBLEMS

1. The people of the area became discouraged with communnal efforts as result of constant destruction caused by water erosion.
2. It destroyed some essential facilities like electricity poles roads, laying pipes etc.
3. A lots of gullies erosion has been serious developed in the township which has caused socio-economic impact of the menace on the people.
4. Most of the affected people became homeless. They can no longer maintain their houses.

5.7. RESULT

From the analysis of findings in the study area, it has been observed that open spaces were utilized for various construction and run off that freely filled its way unhindered in to surrounding low land constricted from these scours, the friable soil gullies were formed.

The drainage were constructed without relevance to natural slope of the terrain. Consequent from these various location within Bida township,.

The hill provided a steep slopic for run off becomes excessive lodging and transporting soil materials away creating gullies.

The increase of human activities was as result of increase in population density from 384,000 to 480,000. The soil of the study area was sandy soil which can easily be re-eroded by water erosion.

5.8. SOLUTION TO PROBLEMS

To aid the achievement of erosion problem, the present activitiees of environmental protection agency should be strengthen by provision of adequate fund, so that the control measure would done at ease.

Provision of good drainages and re-construction of collaps bridges and culverts and also to rehabilitate the roads that one already affected by the water erosion.

5.9. SUMMARY

So far thoroughly analysis has been done on the topic, as far as this project is concern. All important aspect of the project from what say above, the topic literature review to erosion problem have been analysed.

The project therefore looked in to reconnaisance survey of the study area characteristics of the soil of the study site, soil profile description physical properties of the soil in the study area. Insitu moisture content, specific graveling of soil particles, mechanical properties that given the magnitude and rate deformation of soil. The rain fall of the area and causes of accelerated erosion were fully discussed. As far as the topic of this project is concern there is much that can be done by the government as well as individuals.

5.10. CONCLUSION

The study has brought into focus the effectiveness of erosion control in the localities of Bida Township. No need of sophisticated equipment like earth mover to form terraces terraces formed on the slope as result of accumulation of soil within the central system therefore land should note abandomed to further deterioration. The following conclusion has been drawn from the field studies reported.

1. All drain ditches should be monitored from time to time and all the obstruction that will stop the flow of wate

2. The studies of detachment and transportation of soil material, which is a complex process accross the slope

not necessarily required complex removal of earth making terraces.

3. Run off and rate of soil loss from the experim ental and soil condition encountered in the study were much lower under the erosion control methods compered with the soil condition before control.

4. Loastly every attempt should be made not to destroyed the soil or reduced it by erosion because it will eventually result in to food shortage

5.11. RECOMMENDATION

Base on my site findings and experience in the works department on erosion con trol measures I hereby recommend the following envisaged measures adequate to forestall erosion menace in Bida township.

(a) Construction of reinforced concrete channels. This is expected to serve a dual purpose

(i) as a drainage system channelling the present unchannel-led run off to approved water courses, thereby forestalling overflow of run off in to form lands and houses and their inherent damages and

(ii) As a retaining structure to the adjoining eatth which has been rendered unstable by the development of a gully.

(b) The provision of flexible channels lined with gabions and the "Rew" type mattresses these channels are proposed to principally rectangular flexible channels are suitable for control works on friable soil as it permits differentia

settlement without fracture.

(c) Construction of box and pipe culverts at strategic locations. From my finding in the study, many of existing culverts are grossly indequate in capacity as they are unable to carry the volume of tlow that finds their way into them. This had led to overflow of run off into houses and farmlands. Therefore I recommend the construction of adequate and properly aligned culverts to forestall future damage.

(d) Other comestic measures like grassing, tree planting, and campaign against indiscriminate bush burning. Felling of trees and other abuse of natural environment are expected to contribute immensely to controlling erosion menace. These measures have been found to be of immense help in checking erosion and its menace.

In view of this therefore, I recommend that an erosion control public enlightment commission be organised in local governmnt areas to carry out house to house campaign and education of the local populace on the need to press preserve the nautral environment.

REFERENCES

ANNEKE D.O. 1986 Coping with Accelerated Soil Erosion in Nigeria . Journal of Soil and Water Conservation 41 (3) p.68.

BROWN M.J. 1974 Sedment in Irrigation and Drainage Water and Sediment Input and Output of 2 Large Trade in Southern Lake Journal of Environmental Quality 3 P.347-351.

ELLISION, W.D. 1947 Soil Erosion Studies Journal of Environmental Quality 28, p.45.

MAMEED K.K. 1987 Recidue Management to Reduce Farrow Errosion Project Report of Agricultural Engineering Department, University of Ibadan, Ibadan.

Hudson N. 1985 Soil conversation Detosis Printer Ltd Bardfed. London 2nd Edision.

JOSEPH. H.B. 1982. Foundation Analysis and Design Mt. Grey Hill B. Co 3rd Edition.

National Cereal Research Institute 1998 Metrological data Centre, Badeggi.

OSUJI G.E. & Sangodoyin A.Y. 1986. Zero Tillage for Erosion Control and Maize Production in the Humid Tropics. Journal of Environmental Management 23 p. 192. 201.

REFERENCES

ANNEKE D.O. 1986 Coping with Accelerated Soil Erosion in Nigeria . Journal of Soil and Water Conservation 41 (3) p.68.

BROWN M.J. 1974 Sedment in Irrigation and Drainage Water and Sediment Input and Output of 2 Large Trade in Southern Lake Journal of Environmental Quality 3 P.347-351.

ELLISION, W.D. 1947 Soil Erosion Studies Journal of Environmental Quality 28, p.45.

MAMEED K.K. 1987 Recidue Management to Reduce Farrow Errosion Project Report of Agricultural Engineering Department, University of Ibadan, Ibadan.

Hudson N. 1985 Soil conversation Detosis Printer Ltd Bardfed. London 2nd Edision.

JOSEPH. H.B. 1982. Foundation Analysis and Design Mt. Grey Hill B. Co 3rd Edition.

National Cereal Research Institute 1998 Metrological data Centre, Badeggi.

OSUJI G.E. & Sangodoyin A.Y. 1986. Zero Tillage for Erosion Control and Maize Production in the Humid Tropics. Journal of Environmental Management 23 p. 192. 201.