

VEGETATION COVER AS A PROTECTIVE MEASURE TO  
SOIL EROSION IN BIDA AND IT,S ENVIRONS

*BY*

SANI ABDULLAHI TSWAKO  
PGD/GEO/2005/323

DEPARTMENT OF GEOGRAPHY,  
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PGD/GEO/2005/323**

**DEPARTMENT OF GEOGRAPHY,  
SCHOOL OF POSTGRADUATE STUDIES,  
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA.**

**BEING A THESIS SUBMITTED TO THE POSTGRADUATE  
SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
AWARD OF POSTGRADUATE DIPLOMA IN  
ENVIRONMENTAL MANAGEMENT.**

## DECLARATION

I, Sani Abdullahi Tswako, of the Department of Geography, School of Science and Science Education, Federal University of Technology, do hereby declare that this thesis "Vegetation Cover as a protective measure to Soil Erosion in Bida and its Environs, in Niger State" was wholly and solely written by me under the supervision of Dr. P. S. Akinyeye. No part of this work had either been wholly or partially presented before any degree elsewhere. Information hereby obtained from published works and unpublished works of others have been referred and acknowledge accordingly.

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**Sani Abdullahi Tswako**

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**Date**

## CERTIFICATION

This thesis titled: Vegetation cover as a protective measure to soil erosion in Bida and its environs' by Sani Abdullahi Tswako. (PGD/GEO/2005/323) meets the regulations governing the award of Post – Graduate Diploma (PGD) of the Federal University of Technology, Minna and is approved for its contributions to scientific knowledge and literal presentation.

Dr P. S. Akinyeye  
*Project Supervisor*

 19/11/07  
Signature & Date

DR. P. S. AKinyeye  
*Head of Department*

 19/11/07  
Signature & Date

Prof G. D. Momoh  
*Dean S.S.S.E.*

\_\_\_\_\_  
Signature & Date

Prof. J. A. Abalaka  
*Dean, Postgraduate School*

\_\_\_\_\_  
Signature & Date



## DEDICATION

To my late father, Alhaji Abdulahi Tswako, for his quality in self reliance in which i have inherited. And also to my late Ndagi Kasim Tswako, for his earlier financial support. May God forgive all their sins and grant them paradise..

## ACKNOWLEDGEMENTS

I wish to thank Almighty ALLAH for HIS protection and good health throughout my period of studies which enables me to carry a project of this nature. I also acknowledge with gratitude my unreserved indebtedness to all my lecturers in persons of; Prof. D. O. Adefolalu, Prof. J. M. Baba, Prof. D. G. Nsofu, Dr. M. T. Usman, Dr. H. A. Shaba and Dr. A. S. Abubakar for their invaluable knowledge imparted on me and which contribute in no small measure to the success of studies. May God reward them accordingly.

I owe an intellectual debt to my project supervisor, Dr. P. S. Akinyeye for sparing his time to go through the manuscript despite his tight scheduled. And also for his continuous assistance, useful suggestions and unparallel cooperation given to me throughout my period studies in the University.

My friends and associates were involved in one way or the other toward successful completion of this project. To name them all will be impossible, but mention should be made of Ibrahim Magana, Arc. Taoheed Kutigi, Mr. & Mrs. Aliyu, Mohammed Saidu, Zubairu Lapai, Shehu Ndanusa, Engr, Tayo Ogunkuade, Engr. Kilani Hassan, Arc (Dr) D. K. Aliyu, Yemi, Funke, Ijeoma and Munirat Abu.

My most sincere appreciation goes to Ms Jummai A. Kwanashie, Director General, Abuja Metropolitan Management Agency (AMMA) for giving me opportunity to undertake this studies.

I also seize this opportunity register my sincere gratitude to my wife, Aisha Sani Tswako and all members of my family who were able to preserve during my absence.

Finally, in advance, i apologies to any one group of persons who recognizes a phrase or illustration which they originated and in which i have used in adversely without acknowledgement.

## **ABSTRACT**

In an effort to determine the uses of vegetal cover in soil control in Bida. The field surveys were carried out to obtain information needed. Pictures were taken in some selected areas based on their geographical condition during the Data collection.

The factors responsible for erosion hazards in the study area were Human factors such as over cropping, excessive farming, clearance of vegetation, deforestation and bush burning.

The result were analyzed to see that a good vegetal cover may actually enhance infiltration rate, protected the soil from been losses and reduce the surface run off, impact of splash control. Under the full plant cover almost all the ground and to supply the water table.

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## CHAPTER ONE

### 1.1 INTRODUCTION

Erosion is the displacement of soil material on the ground surface by the action of moving water or wind. Water erosion caused by water movement on the ground surface movement of wind causes wind erosion

Soil erosion is a natural process. A distinction is usually made between geologic and accelerated soil erosion. The former involves the slow removal of soil by various denudation agents such as running water, wind, ice and waves under natural environmental conditions. However accelerated soil erosion mainly occurs where man has tempered with the environment especially through the removal of vegetation.

Because of the spectacular nature of the accelerated soil erosion and its devastates effect on the environment, it is the types that attracts man's attention. In fact man's activities such as mining, over cultivation and water erosion occur in many areas when the soil is not properly protected. Heavy rainfall can completely wash away the fertile top layer. Tree crown provides adequate protection by reducing the speed with which raindrops hit the soil.

A layer of under growth is necessary because rain which collects on the crown and falls in large drops can cause splash erosion. A small amount of erosion may occur through stem flow.

Vegetable cover pays an important role in erosion control especially trees in hilly areas. Trees help prevent shallow landslide on slope. Tree can be planted in rows following the contour lines.

These rows should contain abundant undergrowth and litter. Eroded materials from higher up will accumulate in the rows eventually leading to the formation of natural terraces.

A part from being effective against erosion deep-rooted trees can penetrate, compact and cause hard soil layers. This increases the porosity thus improving the water holding and infiltration capacity as well as the aeration of the soil. It has become important in maintaining stability in ecosystem.

## **1.2 TYPES OF EROSION**

### **RILL EROSION**

This is the removal of soil by water from small but well-defined channels or streamlets when there is a concentration of overland flow. It occurs conventionally large and stable to be readily seeded. Tillage operations can easily remove rill erosion.

### **GULLY EROSION**

At some point on the slope sufficient overland flow may accumulate to cause a small river let, if turbulence in the flow is strong enough to dislodge particles from the bed and bank of the channel.

### **SHEET EROSION**

This is the relatively uniform removal of soil in thin layers. Sheet erosion is difficult to detect except, as the soil surface is lowered below old soil marks on fences.

## **1.3 PROBLEMS OF SOIL EROSION.**

Some of the problems of soil erosion include the loss of topsoil, sedimentation and siltation of reservoirs, ravines and gullies which threaten lives and properties. For instance, soil erosion leads to loss of



topsoil, the most fertile part of farmland. This incident is responsible for most of the degradation problems in some African countries. All forms of land degradation lead to a decrease in soil fertility and crop production capacity.

In fact Nigerian mean annual loss through erosion is estimated to be about 2 million tones (Salau, 1995). The eroded material from different inter fluvial surfaces are eventually washed off in to various river channels. The end result is that many of the river course become shallow and reduce their water bearing capacity. Sedimentation and siltation of reservoir lead to flood encourage weed problem and Render River useless for navigation. For examples, the collapse of several slams has been attributed to siltation and sedimentation problems.

The severe erosion, which manifested in the ravines and gullies have destroyed the landscape and rendered them almost useless for several valuable uses. For instance, gullies have been responsible for some of the spectacular bed land topographies in Eastern Nigerian e.g. around Nsukka and Awka.

Gully has equally developed on the ridge sides as in the case of Auchi in Edo State. It may also develop on some road sides and may drains valley floor. Gully morphology varies from place to place. In the upper reaches most of the deep gullies are characterized by U-shaped channel cross wall slope. These are exemplified by most of the gullies in Auchi and Effon Alaaye and other towns which soil erosion has manifested in the form of severe sheet and gullies (Jeje, 1996).

Severe erosion have also threatened life and properties. For examples, may houses have collapsed. Roads and communication equipment have been endangered. Also, soil erosion cause many types of serious damage to

farmland and settlement. However, there is the need for soil erosion mitigation.

soil erosion is an expression of stress on the soil masses which as far-reaching consequence on man and his environment. In Niger State of Nigeria soil erosion has ravaged about 120,000km<sup>2</sup> of land area. 8 villages have been destroyed and 30,000 people had to be resettled. Furthermore, recently, erosion caused loss of 20 metric tons of fertile soil which amounted to over 300 million naira per annum with gullies extending to the depth of over 120m deep and up to 2km wide in some places.

The affected areas in state are Baro, Mokwa, Badeggi and parts of Katcha area.

#### **1.4 CONTROL OF SOIL EROSION**

Various conservation measures have been taken at various levels to deal with the problem. Two broad measures of control curative measures and preventive measures. a combination of forestation ridging contour sloughing, bounding (terracing) the construction of side drain to soak -away pits and the construction have usually been applied on sheet erosion . the emphasis is an reducing the extent of Bare soils in any area and by planting trees in such areas, to grasses such as Bahama grass and shrubs, such as Accioa barteri, cover crop as well as other local varieties. In the case of wind erosion emphasis is again on limiting the tress shrubs etc to check process.

Other measures include limitation of the extent of forest degradation by evolving a system of cultivation, which will always ensure that the ground surface is under effective cover of vegetation controlling the extent and timing of bush and effective use of cover crops.

Other measures for controlling erosion problems relate to further research on erosion control especially the monitoring of erodibility ratio of different surface. Also there is a need to document the areas which are prone to erosion and the extent of soil erosion in these area. With this type of effort maps can be produced and proper management techniques devised. Lack of functional and the enforcement of any legislation on land management has aggravated soil erosion.

Legislation will not only check man induced activities leading to erosion, it will also assist in defining the status of different professionals involved in erosion management. In addition, enforcement of legislation is as important as legislation itself. In this regard, when laws are strictly enforced, then soil erosion can be taken seriously.

## **1.5 OBJECTIVELY OF STUDY**

During the past few decades' interest in vegetal cover practices was increased substantially. This is reflected in rising concern about deforestation and degradation of the environment. The accompanying decrease in land productivity and farm yield is becoming acceptable.

The role of vegetal cover in maintaining stability in ecosystem has become to the fore front in the search for solution to environment degradation. This study is also directed to this end.

The specific objectives are:-

- i. To assess the important of vegetal cover in soil erosion control in the study area.
- ii. To pin point these factors responsible for erosion Hazard in the study area.

## **1.6 JUSTIFICATION**

Ways and manner in which the farmer handles his farm land may lead to low production beyond what is expected, to be achieved, if properly handled by controlling some human factors such as over cropping, excessive farming, clearance of vegetation, deforestation and Bush Burning which may be possible to remove some of the factors that cause soil erosion.

Also the review will serve as source of information to the populace who are interested in farming.

## **1.7 SCOPE OF STUDY**

The study limited to only five areas within Badeggi and where farm degradation occur partially. The areas are N.C.R.I. Chanchaga, Tako Ndajiya, Tako Gbako, Kpantifu and Edotsu.

## **1.8 DESCRIPTION OF EROSION**

On can not speak of erosion in general terms. The site and their environment must be accurately described. Rainfall and growing season need to be examined. Erosion varies with the time of year. Some periods are more susceptible than others. As soon as erosion or runoff is observe in a given place, an attempt must be made to trace problem back to its origin.

The case of sheet erosion is the more or less uniform erosion of the whole surface of a field. The roots of plants, tree and fence posts are increasingly exposed. The top soil are also exposed while in rill erosion is the accentuation of natural depression caused by surface run-off. While normal cultivation often hides the damage, much fertile soil is still lost.

Gully erosion causes deep fissures in otherwise cultivable land. If left unchecked gullies eat their progressively back in to the hill.

Stream bank erosion converts deep fast flowing streams in wide and sluggish meandering watercourse with extensive mud bank. It can cause serious loss of cultivable land.

## **1.9 STUDY AREA.**

Badeggi comprise of four areas in Katcha Local Government area. According to the 1991 census, it is the first most populous district in the local government of about 23,287 people. Badeggi has an area of 98,992sqkm of which about 68,437sq km (69% of the total area are suitable for agriculture with moderate fertility, drainage and soil conservation measures. It is situated and bounded in the North by Lemu, South by Bida East by Agaie and West by Lavun.

The land is a gentle slope, which give moderately movement of run off. The soil features of the area has soil which vary from clay loam, loam and sandy soil. The characteristic features of the vegetation are grasses with scattered tress.

## **1.10 LIMITATION OF THE STUDY**

The research is limited to Badeggi area some parts of farmlands in these areas have been degraded due to human factor. Like over-cropping and excessive farming constructional work clearance of vegetation and deforestation

The problem of the area is lack of reclamation procedures, loss of soil fertility, diminution of cultivable land, water scarcity and farm crops.

In view of the latter gully erosion has caused a tragedy on the environment as result of road construction, many channel for running water blocked and water.

Finds its way piercing through so may ways through some water channels were constructed but erosion still devastate the surface of the constructed channel.

## **1.11 ORGANIZATION OF THESIS**

This is the way of arranging the thesis right from the first page to the last page . the way as follows

CHAPTER ONE includes the introductory part of the thesis, which include the objective of study, justification, scope of study. Description and problem of erosion.

Chapter two is the literature review part of the thesis it comprise the review past work done in past work done on the same or similar problem by other researchers.

Chapter three is the material method used to tackle the work of thesis, method of collecting data direct field survey, using of questionnaires method of sample and site selection.

Chapter four is the result and discussion and the analysis of the data.

Chapter five, This is summary, conclusion and Recommendation based on the whole works.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

A great deal of research has shown how effective vegetation is in controlling the processes of soil erosion by water. However, little regard is given to the important period when vegetation is emerging and establishing on man-made slope. This critical period of low vegetation protection rarely occurs in natural vegetation succession or on agricultural land where mulching of previous crop residuals or cover crops are used.

However, on road construction and urban development site little emphasis is given to this critical time any yet this environment are extremely susceptible to high rate of erosion in excess [Wolman and Schick, 1967]. This is because of the disturb and compacted soil, exposed erodible subsoil's steep slope and lack of vegetation cover. Simulated vegetation in the form of geo-textiles can provide immediate erosion protection on such sites and thus prevent both the on-site and off-site consequence of erosion [Morgan and Rickson, 1988].

A study into the effectiveness of selected geo-textiles in modifying surface hydrology and thereby controlling sediment detachment and transport rates of run-off was done. The study is the second stage of an evaluation of selected geo-textiles in controlling erosion. The experiment looked at how the different geo-textile reduce soil detachment by raindrop impact [splash erosion], [Rickson 1988]. Plant influence erosion is all areas except the glacial. For example is influenced by plant both directly e.g tree fall causing mass movement of soil and indirectly eg through canopy influence on the erosivity of



rainfall. Also the removal or change of vegetation can alter erosion rates [Thornes, 1987].

Several attempts have been made to include vegetation in mathematical models of soil erosion [Thornes, 1985 and Naele, 1987]. The importance of tree fall to erosion was indicated forcefully in the great storm where some 15 million trees were brought down over a large area of south eastern England. A large amount of soil may be disturbed, depending upon the interplay of soil condition {Witness, etc}, tree characteristics {root network} and the external conditions {wind direction etc} mounds of soil are often produced by tree fall {Hamann, 1984} and these, as well as the pits created, will be subject to subsequent erosion.

Initially, tree fall causes a mass movement of soil, thereby directly influencing erosion. Tree fall also exposes soil to further erosion, thus indirectly increasing erosion and potentially influencing soil profile development {Schaetszel, 1986}

There has been considerable recent work on the role of vegetation in slope stability for example, the review of Selby, {1982} and Greenway, {1987}.

Vegetation may both encourage and discourage slope instability. For example, DePuy and Cruz {1979} illustrate how on steep slope with shallow soils tree channel may encourage rapid inter-flow and land sliding. The stabilizing effect of vegetation may last for several years after clearance Corzier, {1986}.

In most environments fire leads to an increase in erosion as protective vegetation cover is removed, and chemical and physical changes are made to the soil {Chinen, 1987}.



Vegetation communities play a range of roles in reducing and occur together and vegetation change will disturb both of these substantial progress has been made in measuring some vegetation and effects, but an assessment of the overall situation is more difficult. Ecologists have made particular progress in this field and the framework of Bormann, and Likens {1979} has much to offer.

Carter and Stone {1989} have studied the indirect effect of vegetation on sand dune erosion processes.

Where plants reduce erosion they often also act to aid sedimentation. Key areas for such sedimentation processes are dunes, swamps and marshes. Vegetation plays two main roles in promoting physical sedimentation, trapping mineral sediments in both root network and above ground structures, and producing sediment through the buildup of dead plant material {Erikson et al 1989}.

Recent work has focused on clarifying and quantifying the relationship between desposition and biological processes. For example, studies have been movements over dunes {Buckley, 1987} Wasson and Nanninga, 1986}.

Vegetation cover may be altered radically within a short time, but bio-physical changes within the soil which also affect erosion rate may take long periods of time. Soil under the condition of good plant cover and stable conditions may material, increasing floral and sound activities with possible microprobe formation, undergoing structural improvement with corresponding decrease in bulk density, increase of infiltration capacity and water- transmission capacity and decrease of erosion potentials {Trainable, 1976, 1988}.

Borst, Mccall and bell {1945} studied the effect of crop rotations on soil erosion and runoff in ohio.

For the condition where land reverts from tillage to forest. Dissmeyer and fosten {1986, 1981} point out that soil reconsolidation particles regain cohesion over a period of six years so that erosion is reduced.

In Luxemborg, Imeson and jungerius {1974} found that soil under forest cover had more aggregate stability than the soils of nearby areas which had been cultivated for the farmland samples there was resistance to splash erosion.

With regard to infiltration alone, incorporating crop residues in the soil over 10- 15 years period reduced run off by almost one-hald.

Walling {1983} stated that when vegetation cover is poor and upland erosion supplies streams with more sediment than they can transport sediment is stored as collurium and allurium. Since storage opportunity generally increase as a power function of basin size, so may storage increase under the above condition.

The establishment of a good vegetative cover on disturbed land may led to downstream sediment yield being augmented from storage. If vegetative cover curtails upland erosion without commensurate decrease of storm runoff than downstream colluvium and alluvium may become unstable and be eroded, maintaining downstream sediment yield at high levels. This principal is identify as potential problem by Happ Rittenhouse and Dobso {1940}and shown to be operating on regional bases by tremble {1979, 1977}.

The influence exerted by vegetation over the intensify and frequency of over land slow production and surface wash erosion in semi-arid areas is well documented {Bryan and Campbell, 1986}.

Musgrave and Holtan, {1964} have demonstrated that infiltration rates are dramatically improved for soils with a significant humic horizon. Vegetation in reducing effective rainfall intensity at the ground surface. Runoff is less likely to be generated when cover is dense in catchment with cover, these effect may vary seasonally with differing patterns of plants growth and evapotranspiration less, and also spatially, because of slope angle and aspect effect, Hack and Goodlett, {1960}.

A variety of vegetation-based models are available for assessing runoff production outside semi-arid areas {Gurnell and Gregory, 1987}. Of his infiltration theory in particular has been criticized for sites with a locally dense cover {Brayan and Lair, 1982}.

In fact, it has argued [ Hallsworth, 1987], that the problems of accelerated soil erosion almost entirely post-date the rise of agriculture, and it is now realized that important organic bonding agents such as the polysaccharide are rapidly decomposed once the soil has been disturbed by ploughing. So that soil structure is at risk {Greenland, Linstone and Quick, 1962}, Tisdall and Oades, 1982}.

However, modification of the soil profile extend beyond inversions of the topsoil. It as long been recognized that crop productivity can be increased by controlling the soil water regime {Trafford and Oliphant, 1977}.

Trimble and Lund {1982} have established the relationship of downstream sediment accumulation to land used in the coon creek

basin of Wisconsin. They found that, with an increase of poor vegetative cover and management, there was a strong lag in downstream rate of sediment accumulation, which was partially a function of the lag in erosion rate and partially the result of upstream sediment accumulation.

The hysteresis effect was enhanced late in the deterioration phase by increased runoff from overgrazing which increased stormflow and help transfer sediment downstream, Tribble and Hund,[1982].

The different responses to rainfall, both in the generation of overland and erosion, can be explained by base soil and vegetation characteristics and their condition immediately before, during and after the rainfall events Sevinla,[1988]. Dunne, [1978], Anderson and Burt, [1978]. Because of higher water retention of its thicker regolith and soils throughout the season, a more regular overland flow respond to rainfall and consequent effectiveness in the washing of materials results.

According to Faniran and Ojo, [1980], the history of soil conservation or the reclamation of gullies in south eastern Nigeria began in 1911, when some forestry official visited part of the Udi plateau. During that visit, the officials who led group remarked, 'This plateau erosion [Udi plateau] offers one of the finest example of hill erosion in the tropics and furnishes a good object lesson of what results are and what is to be expected from unrestricted destruction of forest vegetation.

According to Caldwell {1991}, all forms of land degradation lead to a decrease in soil fertility and crop production capacity. In this

regards soil due to soil erosion activities occurs across the continent of Africa and other regions of the World { see table 2.1}.

Name of countries	EXTENT OF DEGRADATION					
	Table Degradation area		Moderate, severe and Extreme		Light	
	Total Million hectare	% degradation area % vegetal	Total million hectare	% degrade area vegetal	Total million hectare	% degrade area vegetal
Europe	218.9	23.1	158.3	16.7	60.6	6.4
African	494.2	22.1	320.6	14.4	173.6	7.8
Asia	102.9	13.1	6.2	0.8	96.6	12.3
Oceania	102.9	13.1	6.2	0.8	96.6	12.3
North America x Mexico	62.8	24.8	60.9	24.1	1.9	0.7
South America	243.4	14.0	138.5	8.0	104.8	6.0
World	1964.4	17.0	1215.4	10.5	749.0	65

Source oldman, engelen, engelen and pulles (1990)

From the table 2.1 in absolute terms, the continent of Africa among other continents of the world comes second to Asia in terms of term of total degraded areas but, has a higher proportion of degraded land to vegetated land than Aisa. The main source of soil in Luxembourg. Imeson and

jungerius (1979) found that soil under forest cover had more aggregate stability than the soils of near by areas which had been cultivated for farmland samples there was a good correlation between organic matter and resistance to splash erosion.

With regard to infiltration alone, Wischmeier and Manning (1995) found that incorporating crop residues into soil over a 10-15 year period reduced runoff by almost one-half.

Walling (1983) found that when vegetation cover is poor and upland erosion supplies streams with more sediment than they can transport sediment is stored as colluvium and alluvium. Since storage opportunity generally increases as a power function of basin size, so may storage increase under the above condition.

The establishment of a good vegetative cover on disturbed land may lead to downstream sediment yields being augmented from storage. If vegetative cover curtails upland erosion without commensurate decrease of storm runoff then downstream colluvium and alluvium may become unstable and be eroded, maintaining downstream sediment yield at high levels this principle was identified as a potential problem by Happ. Riffenhouse and Dobson (1940) basis by Trimble (1974,1977)

The influence exerted by vegetation over the intensity and frequency of land slow production and surface wash erosion in semi-arid areas is well documented (Bryan and Campbell,

Musgrave and Holtan, (1964) have demonstrated that infiltration rates are dramatically improved for soils with a significant humic horizon. Because of the protective role of vegetation in reducing effective rainfall intensity at the surface, runoff is less likely to be generated when cover is dense. In catchments area cover these effects may vary



seasonally with differing patterns of plants growth and evapotranspiration loss, and also spatially, because of slope angle and aspect effect, lack and Goodlett, 1960).

A variety of vegetation-based models are available for assessing runoff production outside semi-arid areas (Gurnell and Gregory, 1987).

Horton is still relevant, but the applicability of his infiltration theory in particular has been criticized for states with a locally dense cover (Brayan and Yair, 1982).

In fact, it has been argued (Hallsworth, 1987), that the problems of accelerated soil erosion almost entirely post-date the rise of agriculture, and it is now realized that important organic boundary agents such as the polysaccharide are rapidly decomposed once the soil has been disturbed by ploughing. So that soil structure is at risk (Greenland, Linstrom and Quirk, 1962; Tisdall and Oades, 1982)

However, modification of the soil profile degradation in Africa is the loss of productivity topsoil due to soil erosion. According to Salau (1995), the severity of erosion problems has led to parts of Africa. For example in an assessment by UNEP in 1984, it was found that in the arid semi-arid and sub-humid regions of Africa, some 6,900 million hectares including approximately 80% of the crop land regions have, lost between 25 and 100% of their productive capacity.

In fact, Nigeria's mean annual loss through erosion is estimated to be about 25 million tones. A shelterbelt is a wind barrier of living trees and shrubs maintained in order to protect farm field from adverse effect of wind-speed like wind erosion and moisture loss. A windbreak is defined as a wind barrier more specifically used for the protection of farms and the environment in generally.

The term shelter belt, refers to all types of living wind barriers whose main objectives is to reduce wind-speed, resulting in the protection of Agriculture lands people, animals and infrastructure.

Shetrbelts are a common feature in arid and semi-arid areas, Big systems of shelterbelts can be found in the USA, the former USSR, China and Australia,

In tropical countries, the knowledge of shelterbelt establishment and management is growing. During the last secennia shelterbelt studies have carried out in several tropical countries including Niger, Nigeria, India, Burkina. These have lead to an increasing use of shelterbelts in these countries.

The best result from shelterbelt can be seen in areas where higher wind-speed are present where there prevailing winds for long period, where the soil is dry for many months and loose structured soils occur.

Early basin studies produced conclusive data on the influence of forest on runoff and sediment load of river (Bales and Henry, 1982) Subsequently other studies have considered the variation of sediment load with respect to vegetation and land use management changes.

In addition, rapid removal of vegetation by deforestation or fire has been used to emphasis the protective role of vegetation covers. (Imeson, 1971 and Saplaco, 1983). Although the results of deforestation tend to produce the most extreme sediment yields, the effect of land use management changes are far more relevant to a much wider area. In cultivated areas, soil compaction from farm machinery has an important influence on infiltration increased surface runoff and hence soil erosion (fullen, 1985, chernyshev, 1972). Similarly compaction can also occur in



densely stocked grassland areas as a result of poaching which reduce infiltration, especially during the wet season.

In a study of range land in Colorado, Lusby {1970}, found that runoff and sediment yield from ungrazed catchment were 30 percent and 45 percent less respectively than from grazed catchments. In addition, poaching by cattle in the vicinity stream channels was found to be a significant source of available suspended sediment in the farlow catchment {Mitchell, 1972}.

Although it is widely accepted that vegetation cover is a significant factor in the erosion and sediment yield of drainage basins, numerical parameters have been poorly developed, especially for larger catchments.

Detailed vegetation and land use variables are used in mathematical models for predicting sediment yield in plot studies and small catchment surveys. But the application of vegetal factors in the analysis of larger catchments becomes exceedingly vague and generalized. The use of vegetation and land use factors in empirical equations for the prediction of sediment yield have been dominated by the cropping management factor, and the conservation practice factor from the universal soil loss equation.

An extension from plot studies to small catchment seems a reasonable progression but the application of the above techniques to larger catchment becomes more difficult.

The application of these two parameters from USLE to drainage basin in the United Kingdom does not seem very practicable data from plot studies of contrasting crop types and management techniques. Therefore, some other methods may be more appropriate. Examining the concept of competition between erosion and vegetation growth Torne {1985} reviewed the contemporary approaches to modeling. He worked on the idea of ecological models to evaluate the existing complex relationships.

Vegetation and land use changes within the way catchment have been extremely important factors in determining the variation of erosion during the holocene as shown by rates of sedimentation (Chamber, 1985 and Bartley, 1960).

An examination of contemporary effects of vegetation cover on sediment yield cannot easily be used to reconstruct influences of man's impact on the basin sediment system. Example of present land use changes and land management can be used to suggest possible effects of changes in the vegetal cover, but it is important to consider that technological changes in equipment and techniques can present unrepresentative results.

The progressive decline in forest cover from more than 90 percent during the Atlantic period to less than 10 percent at present has been instrumental in the erosion history because of the influence of trees on the water balance of the catchment and the protective role of the canopy cover and root system. Re-afforestation and more recently monitored deforestation of extensive areas in central Wales have provided a unique opportunity to assess the relative effect of tree and grass land on water yield and catchments erosion.

As a consequence of afforestation, erosion of suspended sediments and bedload on the upper river is greater than in the upper way, (Newson, 1967, 1980 and 1985).

Vegetation communities are not static and change to vegetation (especially caused by human interference) often lead to spectacular changes in erosion rates. Heede (1987) however found that erosion only increased markedly in harvested forest areas in Arizona. Where disturbance had been severe vegetation changes occur because of either biological factors (e.g. succession, disease, fire, human planting) or external factors (e.g. climatic

change, volcanic eruptions). In the first case geomorphological processes are affected through vegetation change along, in the second case they are also directly influenced by the external event itself. Recently, various palaeological studies have revealed the history of vegetation geomorphological interactions with lake deposit providing particularly useful evidence. Stott (1987), for example, used mineral magnetic studies of reservoir sediment to infer that in a northwest England catchment increased erosion occurred through tree fall and gully development when canopy closure occurred in a managed forest.

The above review has given information on various ways different authors have tried to tackle the problem of soil erosion in various parts of the World. Our little contribution here draws from those experiences to understand the problem of soil erosion in Badeggi area. Some of these experiences have been translated into methodology discussed in the next chapter.

## **CHAPTER THREE**

### **3.0 RESEARCH METHODOLOGY AND PROCEDURE.**

This study was carried out to find out the use of vegetal cover in soil erosion control in Bida are of Niger State for systematic collection and analysis of necessary data towards the study the following procedure was employed.

#### **3.1 RESEARCH METHOD**

To obtain information, which allowed for in-depth study of the use of vegetal cover in soil erosion control, the researcher employed descriptive survey methods only. This method allowed for informative to be source concerning the current status or happenings. Descriptive survey method is used to describe and interprets the conditions or relationship that exist.

#### **3.2 SAMPLE TECHNIQUE.**

As all inhabitants of Bida can not be reached, the researcher selected some people randomly, photographs were taken within the area.

The photographs were taken within the area.

#### **3.3 PROCEDURE FOR DATA COLLECTION**

In collection of information and necessary data, two principles were used which are primary and secondary data in addition to other research instruments used in the descriptive survey.

##### **3.3.1 PRIMARY DATA**

In primary data the use of questionnaires here is very important and administered. But in thesis the primary data questionnaire is not applicable here.

##### **3.3.2 THE SECONDARY DATA**

In secondary data were scored from textbook, thesis, journals, seminar paper, newspaper report and other published and unpublished material on the use of vegetal cover in soil erosion control.

### **3.3.3 RECONNAISSANCE SURVEY**

An extensive personal observation was under taken with a view to making inventory of existing condition and assesbling of back ground data of the sampling area in Bida. Thesis include the assessment of gully erosion sites which affect the farming activities around the site.

### **3.3.4 INTERVIEW**

Interview were conducted with the people of Bida area directly involved in the management of our environment. The people interviewed were staff of the National Cereal Research institute Chanchager Badeggi (N.C.R.I) concerned with environment problem. Others are staff of government Day Secondary School Bida environmental Club village heads and many others

The people interviewed were carefully chosen in stratified from to ensure a reliability of information received. During the reconnaissance survey people found cutting down the tree were also dialogued with such people were adult.

## CHAPTER FOUR

### 4.0 DATA ANALYSIS AND PRESENTATION.

This study is concerned with the study of use of vegetal cover in soil erosion control problems and prospect with Badeggi as the case study.

These chapters deal with results, analysis and discussion of findings. The photographs were taken in different areas of Badeggi.

Photograph 1 is taken in National Research Institute Badeggi (N.C.R.I) Chanchaga in Badeggi with a well develop protected ground cover which allows the infiltration of water easily and it reduces the run off.

Erosion first appears in the form of splash, which lead to the formation of hard, impermeable soil layer. If the ground is protected by any kind of cover, this reduce the impact of the rain drops and the water reaching the ground surface no longer has the force to sort the soil parts when the kinetic energy of rainfall dissipated by the material covering the ground, the dropping water loss its erosive force. When no beating crust is formed on the soil, infiltration can still take place.

If the land is flattened with little vegetation cover the run-off may occur and maximum infiltration may take place even where there plant cover. There may be little splash and runoff in the area of the study.

Cover sowing can sometime reduce the intensify of soil erosion during the early stage of the rainy season. Even though the plant may be seasoned and unable to withstand the dry season. It will leave protective mulch on the ground. Mulching protect the soil from the effect of splash and preserves soil porosity and infiltration capacity.

Photographs II is taken in Tako Ndagijiya area of Badeggi which shows the place with think forest, tree and which protects the soil from the

impact of rain drop directly on soil. It reduces the soil temperature and act as wind break, reduce the soil erosion.

Trees can play an important role in erosion control especially in hilly areas. Trees help prevent shallow landslides on slope . tree can be plated in row following the contour lines. These roes should contain abundant undergrowth and litter. Eroded materials from higher well accumulate in the eventually leading to the formation of natural terraces.

Trees in plants association also an efficient ways of checking the beating action of tornadoes at the on set of the rainy season. Trees like herbaceous plant are able to provide a great deal of cover, which depends directly on the density of their foliage at every stage of the rainy season. The mango tree keeps its leaves all the year round amply protecting the soil from the rain but creating dense shade, which prevent plant from thriving underneath. It improves the soil structure and encourages infiltration.

In the case of every fall trees the impact of large raindrops falling from their crown can be considerable. The advantage of tall trees as regard protection from hard crust lies more in the litter they deposit than indirect soil protection from beating rain drops.

Every tree inter planted with seasonal crops be looked at to see how it helps to control erosion and encourage infiltration.

Photographs III is taken Tako Gbako area of Badeggi where there is over cropping and other farming activities like deforestation and bush Burning which leaves the land Bare ground without cover which give way to erosion.

The way in which the farmer or the cattle owner treat his fields during the year has and important impact on erosion and some practices cause fearful erosion damages. Bush burning every year at the same period which



plant residue is at there driest and the heat is intense the chances of soil erosion are high at the no-set of the rainy season.

Bare ground beaten by run fall especially where there is impermeable rock, the hard rock impedes infiltration. About 90 percent of the rainwater run off towards the stream leading the soil erosion. In other words, this can lead to rill erosion, which is the accentuation of natural depression caused by surface run off. Although normal cultivation often hides the damage done, but much fertile soil lost. On the soil cultivatable land if left unchecked gullies eat their way progressively back in to the hill.

Photograph IV is taken in Kpantifu area of Badeggi where the land is bare ground of cover which allows easy run-off of water leading to flooding and gully erosion.

#### **4.1 EROSION AND RUN OFF: A SERIOUS ECONOMIC PROBLEM.**

Slash, run off and erosion are ecological problem consequently leading to economic problems. Erosion causes huge economic losses, which manifest themselves on several levels, loss of cultivable land as a result of Run-off.

Soil nutrient is lost for cropping when the soil is clogged crused over land surface as a result of the funn off. Crops such as maize require about 600 millimeters of rain for growth but as a result of the run off, only between 150mm to 200mm is absorbed by soil, which may inevitable leads to poor yield.

**LOSS OF FERTILITY:** T his also affect production and yield. When chemical or organic fertilizer is applied and the land is subjected to run off the fertilizer is also carried away to the gullies and this again lead a consideration economic loss. In the same way farmer



often find it impossible to level gullied area, given the high cost of the operation. A part from the losses due to the removal of mineral arable land is lost and large areas may be affected. Flooding of valley bottoms and silting of lakes. As run off worse on the slope it caused devastation in the valley both in the field and on the infrastructure. After heavy rain, any destroyed Garden in a near by valley are usually covered with a 30 to 50 centimeter layer of silt and clay. Destruction is some time on a vast scale and some areas are completely flooding after excessive rainfall. The formation of a crusted soil layer just after sowing may hamper or even stop seeds emerging. This in turn leads to productivity and production losses

#### **4.2 HUMAN, ORIGIN OF EROSION.**

The economic problem linked to run off and erosion can be attributed to human behaviour. For instance, the excessive felling of trees inappropriate farming practices. The absence or inadequacy of land development or land use system.

Wanton fires.

The abandoning of pastoral custom and consequent overgrazing. All these can bring about excessive run off leading to soil erosion as it relates to human behaviour in the area of study. All farmers the authorities facing problem of erosion should take a close look at every aspect of human responsibility.

Lack of functional and the enforcement of any legislation on land management has aggravated both soil erosion and the politics introduced into it, legislation will check man-induced activities leading to erosion. It will also assist in defining the status of different professionals involved in erosion management. In addition

enforcement of legislation is as important as registration itself. In this regard, when laws strictly enforced then politics on soil erosion can be disregarded. erosion control measure range from channelization which encourage the growth of short cover on all surfaces to planting of trees as wind breaker as well as environmental education with emphasis on the manner of man environment interaction among others.

## **CHAPTER FIVE**

### **5.0 SUMMARY AND RECOMMENDATION**

#### **5.1 SUMMARY OF FINDING**

As from the study and analysis of data collected it show that a number of factor usually determine the importance of vegetal cover to soil erosion control. The study of Bush Burning, deforestation, over-cropping, over grazing and excessive farming on soil erosion. From the study it show that area with bare land are TakoGbako due to the excessive farming and other activities of man.

About 50 percent of the area of National Cereal Research Institute (N.CR.I) Chanchaga in Badeggi are well protected with the ground cover which reduce the run off allows good infiltration.

About 30% percent of the Tako Ndijiya is think forest which reduce the splash of rainfall in the soil and also reduce the soil temperature as well as checking the effect of soil erosion.

#### **5.1 RECOMMENDATION AND CONCLUSION**

Erosion control is not a matter of only one method. It should involve multiple dimensional approach. The farmer should be enlightened on the need for proper erosion control.

Where erosion and water management are concerned the whole cropping system must be studied. The farmer mentality must be anti-erosion and this technical skill must not leave any chinks, which would open the door to erosion. The farmers should bear in mind that, particular land of farming practice which is beneficial on a particular site may not suit another one. Heavy, compact soil does not reach like sandy, free draining ones.

Crop association right for one area are not necessary so else where in some place, it is possible to mechanize field work in other. It is more

difficult. Where such problem occur, the farmer should lay emphases on cultivation of covering crops example leguminous crops, soil depth desired crop, rainfall, maintenance of plot, relief, financial resources available labour, opportunities for combining farming and livestock are all factors which have to be taken in to account when choosing an anti erosive cropping system and its related practices.

Protecting land and managing its water reserves is a problem associated with the exploitation of farm and settlement as a whole people must understand the comprehensive nature of problem and realize that Farming practices and land improvement are complementary. Their diversity leads to the conservation and improvement of law assets. Land development of natural soil fertility and structure.

Bush burning practices should be evaluated and if burning can not avoided, it follows these roles.

- burn as little as possible
- Burn before plants and plant litter are too dry.
- Burn with, not against the wind so speed up the passage of the fire
- Burning against the wind always burn more deeply and more devastating and heat the ground more. So the farmer must know how to demarcate the area he intends burnings
- Only burn the land area trickily needed.

Farmer should practice inter- cropping which is an efficient way of providing plant cover on tilled land.

Maize and bean should be sown in the plot. After three floor week 90 percent of the soil surface enjoyed protective plant cover and would no longer suffer from rain splash.

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The choice of plant association is important because some species protect against hard crust better than others for example the protection given by millet, maize and been leaves. The number of leaves, their shapes, rigidity and distribution are all factors affecting their covering capacity.

The government should come out with a define policy on environment conservation. There is need for more research in soil conservation and awareness.

The government to set up an independent body saddled with the responsibility of erosion monitoring and control.

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