SOIL EROSION IN AWKA, ANAMBRA STATE (NIGERIA): ASSESSING THE SOCIAL AND ENVIRONMENTAL EFFECTS

ABSTRACT

Soil erosion is a well-known environmental problem in South Eastern Nigeria. It is the removal of soil particles from surface of the earth, transportation and deposition of the particles by the action of wind, heat, and water. Soil erosion encompasses all activities by water in all forms (rain, flood, sea) resulting in soil erosion. Socio-economic problems caused by soil erosion include removal of nutrients from soil leading to low farm produce, destruction of farms resulting in collapse of buildings and homeless inhabitants. Data for this work were obtained through primary sources data which included text books and other articles. People in Awka are affected by soil erosion and therefore, a pressing need to curb the effect of soil erosion in the community. Government should also be involved so as to attract sufficient funds and expertise for achieving effective result.

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Key words: soil erosion, gully erosion, erosion, environment, social activities, economic activities, soil. topography, vegetation, afforestation.

1.1 BACKGROUND OF THE STUDY

Dumitru et al (2010) stated that, soil erosion forms a major threat to European soil resources, soil being a vital and largely non-renewable resource.

Soil erosion, is the removal of rock and soil material by natural processes, principally running water, glaciers, waves, and wind. In geomorphology and geology, erosion is the action of exogenic processes (such as water flow or wind) which remove soil and rock from one location on the Earth's crust, then transport it to another location where it is deposited. Eroded sediment may be transported just a few millimetres, or for thousands of kilometres. Through erosion the surface of the earth is

constantly being sculptured into new forms. The shapes of continents are continuously changing, as waves and tides cut into old land while silt from rivers builds up new land. While erosion is a natural process, human activities have increased by 10-40 times the rate at which erosion is occurring globally. Erosion transports rocky material after the process of weathering has broken bedrock down into smaller, moveable pieces. Excessive (or accelerated) erosion causes both 'on-site' and 'off-site' problems. On-site impacts include decreases in agricultural productivity and (on natural landscapes) ecological collapse, both because of loss of the nutrient-rich upper soil layers. In some cases, the eventual end result is desertification. Off-site effects include sedimentation of waterways and eutrophication of water bodies, as well as sediment-related damage to roads and houses. For example, The Grand Canyon, more than 1500 m (more than 5000 ft.) deep, was produced by erosion probably within the past 5 million years. The overall effect of the wearing down of mountains and plateaus is to level the land; the tendency is toward the reduction of all land surfaces to sea level. (Microsoft Encarta, 2009)

Water and wind erosion are the two primary causes of land degradation; combined, they are responsible for about 84% of the global extent of degraded land, making excessive erosion one of the most significant environmental problems world-wide.intensive agriculture, deforestation, roads, anthropogenic climate change and urban sprawl are amongst the most significant human activities in regard to their effect on stimulating erosion. However, there are many prevention and remediation practices that can curtail or limit erosion of vulnerable soils. Soil erosion can be a slow process that continues relatively unnoticed or can occur at an alarming rate, causing serious loss of topsoil. Soil compaction, low organic matter, loss of soil structure, poor internal

drainage, salinization and soil acidity problems are other serious soil degradation conditions that can accelerate the soil erosion process.

Vincent Ujumadu (2013) made this statement "Umike is village in Awka South Local Government Area of Anambra State. The community is at the brink of becoming extinct, no thanks to the gully erosion that is ravaging the area. Several houses in the area have been swallowed by the erosion and the fear of the people is that if nothing is urgently done, the entire community might soon be washed away". This above statement was made as an effort to sensitize the Government and other related organizations, in the year 2013, with the aim of exposing the deplorable state of the village, being ravaged by gully erosion. The gully in particular, constitutes about 60m deep and 60m wide, and has already sunk buildings of high value and other utilities in the area. The erosion which constitutes a threat to the lives of the inhabitants of the community, has washed away large quantities of arable farm land. It is believed to have developed as a result of massive flood channels coming directly from other parts of the state capital and worsened by the construction of the Awka inner roads.The result of negligence is that the gully has continued to advance at a terrific speed.

1.2. STATEMENT OF THE PROBLEM

Soil erosion is one of the most striking features on the land surface of South Eastern Nigeria, especially in Awka, Anambra State. Several non-responsive human activities by both the Government and the inhabitants have culminated in the devastating soil erosion (gully erosion in particular) in this area. Some of these activities

include, excavation of red earth (laterite) and sand in the process of sand/regolith mining, construction of roads without drainage channels, uncontrolled population growth and poor agricultural practices. Buildings are congested on top of groundwater recharge areas. The geology of the area (Nanka Sandstone) is composed of weak, friable soils which are poorly consolidated.

Each gully incidence is accompanied by landslides and slumping, leaving at the end of each event inhabitants crying and mourning for loss of agricultural lands, ancestral lands, homes and economic trees. The cumulative effect is that the affected inhabitants are left homeless and/or jobless. The threats posed by gaping and daunting large gullies to farmlands, settlements, roads and human are enormous. Most communities in Anambra State have been ravaged by soil erosion of different dimensions. Sheet erosion is common and it has resulted in the reduction of soil fertility. Rill erosion is also common in many communities. However, in these areas they have graduated into gully erosion.

The incidence of gully erosion is a common phenomenon in Awka LGA and surrounding communities. The inhabitants of gully ravaged sites have suffered mishaps ranging from psychological trauma to loss of property and life. Observations show that gullies in these communities are allowed to advance without adequate control efforts by Government, hence, the affected people watch helplessly while their farmland and homes are destroyed.

The major problem of soil erosion in our environment is primarily due to the reckless removal of top soil and activities that tend to concentrate runoff. It is thus

necessarily due to high erodibleness of soils, but rather as a result of our unwillingness to help these soils sustain our development. It is shown that implementation of simple and cost effective designs in our roads layout, and other related civil engineering works can considerably reduce soil erosion problems in the area.

1.3. GOAL OF THE STUDY

The goal of this study is to analyse the effects and consequences of soil erosions in Awka LGA, Anambra State.

1.4. OBJECTIVES OF THE STUDY

a. To examine the effects of soil erosion in Awka.

b. To assess the level of environmental damage of the land area in Awka.

c. To examine the effect of soil erosion on social activities of the residents

d. To examine the effect of soil erosion on economic activities of the residents

e. To examine people's opinion about soil erosion in the area.

f. To identify the factors that facilitate soil erosion.

1.5. RESEARCH QUESTIONS

a. What are the effects of Soil erosion?

b. What are the consequences of soil erosion on the social activities?

c. What are the consequences of soil erosion on the economic activities?

d. What is the level of environmental damage caused by erosion?

e. To examine the extent of Government intervention?

1.6. THE SCOPE OF THE STUDY

This study is concerned with the analysis of the serious development of erosion in Awka, as we have today. With public outcry resounding from the residents in that LGA, it will be insensitive if attention is not propelled towards the direction of the ground eating menace we all know as Soil erosion and its usual follow-up, Land degradation.

1.7. SIGNIFICANCE OF STUDY

This study will be important to the different strata of the society, from the different age classes, economic classes also along with educated classes, on the need for a cleaner environment with prolonged health benefits. This study aims at guiding different agencies, planners and other agents of environmental management on the issue of erosion which is taken occasionally for granted in the course of planning. It would guide the policy makers on the necessary decisions and strategies that would curb the advancement of this menace along with its resultant effect, environmental degradation.

1.8. LIMITATIONS OF STUDY

Below are some of limitations encountered during the course of this study:

I. Insecurity: - Rather, the fear of insecurity. We live in the part of the world, where sentiments and selfishness play the order of the day. People prefer their personal safety, than to assume that their inclusion in this study, can improve the state of events in Nigeria. During the course of this study, individuals- habitants and even, organizations, may fail to release some materials of information for the purpose of this study, thereby hampering the progress of this study.

II. Falsified information/ Data: - This will be on the part on gathering, mostly in the area of secondary data collection i.e. questionnaires, newspapers. Some of the respondents to the research questions may falsify the data, for reasons uncertain, which can be linked further, to the reasons above.

III. Ignorance towards the study/ topic: - Environmental issues in Nigeria as a whole is an item of negligence. This is the major and foundational limitation of the study. With the tampered mindset, that this topic wasn't anchored on the economy or politics, it will not be important to them. This is also a wrong perception about erosion, there is a need for people to be educated on the topic of erosion, because, likened to cancer in the human body, it only presents itself when it is well-spread and almost impossible to cure, so also is erosion to the environment. So, it is for the sake of enlightenment that this study was undertaken. To improve the perception of people, concerning erosion, and its effects.

2.0. LITERATURE REVIEW

2.1. SOIL EROSION

Wikipedia, the free encyclopedia defines Soil erosion as one form of soil degradation. The erosion of soil is a naturally occurring process on all land. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss each year. Soil erosion may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of topsoil. The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainage networks.

While erosion is a natural process, human activities have increased by 10 -40 times the rate at which erosion is occurring globally. Excessive (or accelerated) erosion causes both "on –site" and "off –site" problems. On –site impacts include decreases in agricultural productivity and (on natural landscapes) ecological collapse, both because of loss of the nutrient – rich upper soil layers. In some cases, the eventual end result is desertification. Off – site effects include sedimentation of waterways and eutrophication of water bodies, as well as sediment – related damage to roads and houses. Water and wind erosion are the two primary causes of land degradation; combined, they are responsible for about 84% of the global extent of degraded land, making excessive erosion one of the most environmental problems world – wide.

Intensive agriculture, deforestation, roads, anthropogenic climate change and urban sprawl are amongst the most significant human activities in regard to their effect on stimulating erosion. However, there are many prevention and remediation practices that can curtail or limit erosion of vulnerable soils.

THEORETICAL FRAMEWORK

Soil erosion can be regarded as merely a geomorphological process whereby, the surface layer of weathered rock is detached and carried away by wind or running water and a lower horizon in the soil is exposed. Grove (1956) stated that, erosion occurs when soil profile as a whole shifts downwards and the thickness of the topsoil is maintained and for most purposes, the soil under an undisturbed cover can be regarded as being in a steady state. Stocking (1981) defined gully erosion as the response of natural forces to changing circumstances in such a way that the normal drainage channels such as rivers and streams extend themselves at a rapid rate. Onyegbule (2005) described soil erosion as the process whereby the surface layer of the soil is detached and carried by agents of denudation and a lower layer in the soil is exposed leaving a topographic roughness on the resulting landscape. Igbozurike (1990) reported soil erosion as the removal of soil chiefly by running water and wave.

The Oxford Advanced Learner's Dictionary of current English describes the soil as the ground, earth, especially the upper layer of the earth in which plants, trees grow and Erosion is the process whereby the agents of erosion (wind, water, ice, man) wear away, dislodge, transport and deposit earth materials from one location to another.

Egboka and Okpoko (1984), Egboka (1985), Egboka and Nwankwor (1985), Egboka, Orajaka and Nwosu (1985) and Egboka (1991) gave a clearer and precise classification of erosion types based on pedologic, geologic, geotechnical and geometric (pegeotech) characteristics is recommended. The pegeotech-types of erosion classification is more widely used, because they expose problems of erosion in a definite focus and dimension. Based on this therefore, four types of soil erosion are sheet, rill, gully and channel erosion. According to Egboka and Orajaka (1988), Sheet erosion is the gradual and uniform removal of soil from flat or sloping ground. The removed surface by sheet outwash or overland flow occurs in thin lagers during rainfall and flooding. It is the youngest or first stage of erosion. For rill erosion, soil particles are removed by runoff from small channels or rills that may be parallel to one another or may be connected in a finger like manner. Soils are further eroded from widened flood channels and streams/river banks by channel/bank erosion. The large channels and river banks continuously collapse and the soils eroded away as a result of the instability of the slopes during flooding. The eroded sediments are

then transported away to expose new surface areas for more erosion. Egboka and Orajaka (1988) further explained gully erosion as representing the last or matured stage of erosion before the eroded area attains some degree of stability. The rate of gully erosion depends primarily on the runoff producing characteristics of the water-shed. Heeds (1975) reported that gullies have relatively greater depth and smaller width, carry large sediments loads and display very erratic behaviour so that the relationship between discharge and runoff are frequently poor. As for gully erosion occurs in most parts of the country, although the incidence is greatest in the South-Eastern part.

According to Ofomata (2011), Soil erosion - a systematic removal of soil, including plant nutrients, from the land surface by the various agents of denudation occurs in several parts of Nigeria under different geological, climatic and soil conditions. But the degree of occurrence varies considerably from one part of the country to the other. Thus, while it is true to observe that soil erosion is one of the most striking features on the land surface of South-Eastern Nigeria, especially in Awka (Anambra) and Imo State, only rare occurrences of the phenomenon are recorded in some other States of the Federation. Equally varied are the factors responsible for the inception and development of erosion, as well as the types that exist in several parts of the country.

Although soil erosion is long-term, it is also a natural process that has been largely responsible for shaping the physical landscape through distribution of the weathered materials produced by geomorphic processes (HUBER et al, 2008). It is the wearing off of material on the surface of the land by wind, water, or gravity. In nature, erosion occurs very slowly, as natural weathering and geologic processes remove rock, parent material, or soil from the land surface. Human activity, on the other hand, greatly increases the rate of erosion. Soil erosion may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of topsoil.There is an increasing awareness that erosion, which is primarily responsible for the severe degradation occurring in topographically complex landscapes, is caused not only by wind and water, but also by tillage, mainly due to the use of heavy powerful tillage machinery (GOBIN et al, 2002). But it is necessary to understand the nature of the agents involved in this discussion: Soil and Soil Erosion

Soil erosion, has still been given different definitions by various researchers, some of the arguments include:

a. Robinson and Hudson (1973) state that generally, the wearing away of the land surface by external forces or agencies is called denudation. Denudation engages the services of the wind, sun, rain, forest, water, and transportation.
b. Uchegbu (2004) sees erosion as "a dynamic process which involves the wearing away of the earth's surface by such natural agents as running water, ice, wave-action, wind, and corrosive actions, as well as the movements of the rock debris that results".
c. The ENVASSO Glossary of Key Terms defines soil erosion as: "The wearing away of the land surface by physical forces such as rainfall, flowing water, wind, ice, temperature change, gravity or other natural or anthropogenic agents that abrade, detach and remove soil or geological material from one point on the earth's surface to be deposited elsewhere" (based on Soil Science Society of America, 2001).
d. Erosion is the process by which the agents of soil erosion wear away, eat into, loosen, or carry away soil material and transport it from one locality to another where it is eventually deposited (Egboka, 1991).
e. Igbozurike (1990) defined soil erosion as the removal of soil chiefly by running water and wave.

f. Onyegbule (2005) described soil erosion as the process whereby the surface layer of the soil is detached and carried by agents of denudation and a lower layer in the soil is exposed leaving a topographic roughness on the resulting landscape.

From the given definitions above, it can be distilled from these definitions that soil erosion is an unprovoked attack on soil by wind, water, man, etc., resulting in detachment and removal of the earth's surface.

2.2. FACTORS THAT DETERMINE SOIL EROSION

Ofomata (1978), resolved factors of soil erosion in Nigeria into two components; physical (Geologic or Natural) and Anthropogenic (Human or Accelerated) factors.

Igbozurike (1990) observed that in South-Eastern Nigeria soil removal occurs primarily during the rains between March and October and secondarily in Northern Nigeria by wind during the dry season.

Zing (1940) stated that topography as well as the nature of the soil contributes to speedy formation and spreading of gullies in the area. In South Eastern Nigeria, erosion widens, deepens and extends head wards during the wet season. The rate being influenced by soil type and extent of vegetal cover (Stocking, (1981)).Described below are some factors that facilitate the onslaught of soil erosion.

i. Slope: - The steeper the slope, the greater the erosion, as a result of the increased velocity (swiftness) of water-flow. The length of the slope is very important, because the greater the size of the sloping area, the greater the concentration of the flooding water.

ii. Soil texture: - Soil texture is the size distribution of soil particles. The size of particles never changes. A sandy soil, therefore, remains sandy and a clayey soil remains clayey. The three main particles are sand, silt and clay. The more sandy a soil the easier it will erode.

iii. Soil structure: - The term soil structure means the grouping or arrangement of soil particles. Over cultivation and compaction cause the soil to lose its structure and cohesion (ability to stick together) and it erodes more easily.

iv. Organic material: - Organic material is the "glue" that binds the soil particles together and plays an important part in preventing soil erosion. Organic matter is the main source of energy for soil organisms, both plant and animal. It also influences the infiltration capacity of the soil, therefore reducing runoff.

v. Land use: - Grass is the best natural soil protector against soil erosion because of its relatively dense cover. Small grains, such as wheat, offer considerable obstruction to surface wash. Row crops such as maize and potatoes offer little cover during the early growth stages and thereby encourage erosion. Fallowed areas, where no crop is grown and all the residue has been incorporated into the soil, are most subject to erosion.

vi. Vegetation cover: - The loss of protective vegetation through overgrazing, ploughing and fire makes soil vulnerable to being swept away by wind and water. Plants provide protective cover on the land and prevent soil erosion for the following reasons:

a. Plants slow down water as it flows over the land and this allows much of the rain to soak into the ground.

b. Plant roots hold the soil in position and prevent it from being blown or washed away.

c. Plants break the impact of a raindrop before it hits the soil, reducing the soil's ability to erode.

d. Plants in wetlands and on the banks of rivers are important as they slow down the flow of the water and their roots bind the soil, preventing erosion.

Mentioning the natural agents of soil erosion is not enough for clarification. Much emphasis has to be laid on the human activities, in the area of study and generally, which in turn facilitate erosion at a much faster rate.

NEST (1991) listed human activities that have contributed immensely to soil erosion, including gully erosion, problems in Nigeria to include:

a. Wrong farming practices, ranging from improper tillage and ridge making across the contour or monoculture.

b. Quarrying and some other mining operations including the removal of building materials such as laterites, sand and stones.

c. Road construction without adequate attention to the provision of safe side drains or any drains at all.

d. Faulty channelization of storm runoff, especially in built-up areas.

e. Indiscriminate destruction of vegetation cover or reckless selective removal of plant species, through bush burning, lumbering, fuel wood collection and establishment of construction sites.

f. Use of poorly located footpath to streams, markets, farms, schools etc.

g. Overgrazing, path creation and trampling by livestock vibration on land caused by the passage of poorly made road surface by some vehicles.

2.3. FORMS OF EROSION

a. Water erosion- The implications of soil erosion by water extend beyond the removal of valuable topsoil. Crop emergence, growth and yield are directly affected by the loss of natural nutrients and applied fertilizers. Seeds and plants can be disturbed or completely removed by the erosion. Organic matter from the soil, residues and any applied manure, is relatively lightweight and can be readily transported off the field, particularly during spring thaw conditions. Pesticides may also be carried off the site with the eroded soil.

The off-site impacts of soil erosion by water are not always as apparent as the on-site effects. Eroded soil, deposited down slope, inhibits or delays the emergence of seeds, buries small seedlings and necessitates replanting in the affected areas. Also, sediment can accumulate on down-slope properties and contribute to road damage. Sediment that reaches streams or watercourses can accelerate bank erosion, obstruct stream and drainage channels, fill in reservoirs, damage fish habitat and degrade downstream water quality. Pesticides and fertilizers, frequently transported along with the eroding soil, contaminate or pollute downstream water sources, wetlands and lakes. Because of the potential seriousness of some of the off-site impacts, the control of "nonpoint" pollution from agricultural land is an important consideration.

b. Wind erosion- Wind erosion damages crops through sandblasting of young seedlings or transplants, burial of plants or seed, and exposure of seed. Crops are ruined, resulting in costly delays and making reseeding necessary. Plants damaged by sandblasting are vulnerable to the entry of disease with a resulting decrease in yield, loss of quality and market value. Also, wind erosion can create adverse operating conditions, preventing timely field activities. Soil drifting is a fertility-depleting process that can lead to poor crop growth and yield reductions in areas of fields where wind erosion is a recurring problem. Continual drifting of an area gradually causes a textural change in the soil. Loss of fie sand, silt, clay and organic particles from sandy soils serves to lower the moisture-holding capacity of the soil. This increases the erodibility of the soil and compounds the problem.

c. Tillage erosion- Tillage erosion is the redistribution of soil through the action of tillage and gravity. It results in the progressive down-slope movement of soil, causing severe soil loss on upper-slope positions and accumulation in lower-slope positions. This form of erosion is a major delivery mechanism for water erosion. Tillage action moves soil to convergent areas of a field where surface water runoff concentrates. Also, exposed subsoil is highly erodible to the forces of water and wind. In extreme cases, tillage erosion includes the movement of subsurface soil. Subsoil that has been moved from upper-slope positions to lower slope positions can bury the productive topsoil in the lower-slope areas, further impacting crop development and yield.

2.4. EROSION CONTROL MEASURES

To illustrate the point of erosion control, we take a look at a village ridden with soil erosion and its aftermath and what measure(s) were taken to combat it, according to their perception: -

Soil erosion in Ora-Eri is a very well-known problem in the community. It is perceived as a natural result of living on a hill. The town is situated on top of one of the hills in the present Aguata LGA in Anambra State. In the olden days, there were long stretches of mounds at about every 100 meters supposed to have been erected around 150 BC. It was believed to have been constructed for inter town battles. But somehow the mounds helped check erosion menace seriously. Today, most of the mounds have disappeared due to population increase, expansion of the town, and increased farming activities. This gave rise to very severe sheet erosion, but no gullies. The people are predominantly farmers and erosion by action of water has had much negative impact on farms and compound walls. Strict measures have been put in place to check phenomenon in the town. There are five villages in Ora-Eri:

- Obi-Nri,
- Obiuno,
- Ebenato,

  Umudike and
- Umunriofia.

The town has a standing committee for controlling erosion. Each village has its own erosion sub-committee whose term of office expires after every three years. The town committee usually goes around to monitor erosion activities and where there is a fault (breach) the village subcommittee is held responsible. The village sub-committee in turn

holds the family in breach accountable. The steps taken to fight soil erosion include;

• Digging of deep wells (i.e. umi) within the compound walls

• Digging of deep wells along the roads.

• Digging of ditches (ogwugwu or mgbo-mmili) outside the compound walls.

•Planting of new trees (economic or otherwise) to check flooding.

Every family must dig deep well (s) inside the compound to arrest all flood waters generated within it. The number of wells depends on the size of the compound and nature of surfacing on it. All flood waters that may escape from the compound are collected in the ditches or wells dug outside the compound. Each village must dig ditches along its roads. The number and depth depends on the length, width and surfacing of the road. Usually depth of 4m – 9m and a diameter of about 6m – 12m are common. A distance of about 50m intervals is recommended for every other ditch which are usually located alternately on either sides of the road, or as situation dictates.

For erosion to be curtailed, adequate research has to be embarked on and taken into consideration. In the course of providing such relief, without adherence to caution, the remedial might result into worse development. Take for instance, different observations regarding erosion control: -

a. NEST (1991) recommended research before engaging in any erosion control measure as some attempts at solving erosion problems have, in fact, precipitated even worse erosion disasters, as was in the case at Ihioma-Orlu South-Eastern Nigeria.

b. Rapp (1976) reported that researches are necessary for a meaningful control of any gully erosion to be achieved. Such researches will include soil type,

topography of area involved, vegetation and activities (natural or human) that brought about the erosion.

There are some views on the methods and procedures that can serve as remedial towards the development of erosion: -

Okorie (1997) reported effective reforestation/afforestation of gully erosion prone areas using trees such as *pinus caribaea*, *Gemelina arboea*, food/fruit trees like, *treculinaAfricana*, *IrvinigaSpp*, *Penaclethra macrophyla* and shrubs like, *AlchorneaCordifolia* and *Dactyladeniabartieri*. He also showed that afforestation improves the floral development of gullies; enhance soil fertility and stability, increase organic matter content, increase macro and micro-organisms, including earthworms, biomass production of the trees and increased food production.

Lal, (1994) recorded that tree cover protects the soil from erosion by intercepting raindrops and absorbing their kinetic energy. Igbozurike (1977) and Okorie (1995) recommended the planting of seeds, rhizomes, roots and stem cuttings of rapid growing grasses and herbs, along with structural alteration and earth dam construction, on both the exposed surfaces and the untouched surrounding land, including the gully floor.

Miler, Woodburn and Turner (1962) stated that a combination of trees, grasses and mulch greatly reduces runoff at slopes.

All these views have the cumulated view of applying afforestation as a medium of curbing the menace of erosion, in Awka. The process of remedying soil erosion is termed "soil conservation" and the adoption of various soil conservation measures reduces soil erosion by water, wind and tillage. For example, tillage and cropping practices, as well as land management practices, directly affect the overall soil erosion

problem and solutions on a farm. When crop rotations or changing tillage practices are not enough to control erosion on a field, a combination of approaches or more extreme measures might be necessary. For example, contour ploughing, strip-cropping or terracing may be considered.

3.0. BACKGROUND LOCATION OF STUDY

3.1. HISTORY

Awka being one of the oldest settlements in Igbo land, was established at the Centre of the Nri civilization which produced the earliest documented bronze works in Sub-Saharan Africa around 800 AD and was the cradle of Igbo civilization. The earliest settlers of Awka were the Ifiteana people which translates into people who sprouted from the earth. They were farmers, hunters, and skilled iron workers who lived on the banks of the Ogwugwu stream in what is now known as Nkwelle ward of Awka. The deity of the Ifiteana was known as Okika-na-ube or the god pre-eminent with the spear and the Ifiteana were known as Umu-Okanube or "worshippers of Okanube", which eventually became shortened to Umu-Oka and eventually Oka and its revised version "Awka". (Wikipedia Encyclopedia, 2015).

In ancient times, Awka was populated by elephants with a section of the town named Ama-enyi (haunt of elephants) and a pond Iyi-Enyi where the elephants used to gather to drink. The elephants were hunted for their prized ivory tusks (okike) which was kept as a symbol to the god Okanube in every Awka home with hunting medicine stored in the hollow of the tusk. Over time, the town become famous for metal working

of a high level and its blacksmiths were prized throughout the region for making farming implements, Dane guns and ceremonial items such as Oji (staff of mystical power) and Ngwuagilija (staff of Ozo men). (Wikipedia Encyclopedia, 2015).

In pre-colonial days Awka also became famous as the home of the Agbala Oracle a deity that was said to be a daughter of the great Long Juju shrine of Arochukwu. The Agbala Oracle was consulted to resolve disputes far and wide until it was finally destroyed by colonial authorities in the early part of the 20th century. Before the inception of British rule, Awka was governed by titled men known as Ozo and Ndichie who were accomplished individuals in the community. They held general meetings or Izu Awka either at the residence of the oldest man or at a place designated by him. He was the Nne Uzu or master blacksmith, whether he knew the trade or not, for the only master known to Awka people was the master craftsman, the Nne Uzu. In modern times Awka has adapted to the republican system and is currently divided into two local government areas, Awka North and Awka South with local representatives. However, it still preserves traditional systems of governance with the respected Ozo titled men often consulted for village and community issues and a paramount cultural representative, the Eze Uzu who is elected by all Ozo titled men by rotation amongst different villages to represent the city at state functions. Awka should not be confused with Awka-Etiti which is a town in Idemili South local government area that is often mistaken for the main capital. Today it is the capital of Anambra state of Nigeria. (Wikipedia Encyclopaedia, 2015).

3.2. THE PEOPLE OF AWKA

Awka comprises seven Igbo groups sharing common blood lineage divided into two sections. Ifite Section, the senior section, comprises four groups, Ayom-na-Okpala, Nkwelle, Amachalla, and Ifite-Oka followed by Ezinator Section, which consists of three groups, Amikwo, Ezi-Oka and Agulu. Each of these groups has a number of villages. Altogether, Awka comprises 33 villages. Awka people today as in traditional times are well travelled. In ancient times demand for their skills as blacksmiths had Awka people travelling throughout Nigeria making farming implements, household tools and guns. Each village had clearly defined trade routes. For example, people from Umuogbu village plied their trade in Benin and in the Urhobo and Itsekiri areas, Umubele were stationed in the Igala areas in modern day Kogi state, Umuike and Umuonaga in present day Abia and Rivers State, Umuenechi in the Kwale and Isoko area of Delta state, and Umudiana, Okperi, Ugwuogige stationed in Calabar area of today's Cross Rivers state. (Wikipedia Encyclopedia, 2015).

The people of Umudioka and Ezioka wards specialized in carving of wood, and ivory and arts designs including elegantly carved tools, door shutters and door panels, chairs, vessels for presentation of kola nuts, and idols. The ivory carvers produced elegant designs on “odu okike” (ivory trumpet) for ozo titled men and other items as part of the paraphernalia for titled men. Today, Awka people can be found all across the globe many working as skilled professionals in a wide range of fields. As a result, there is a large Awka diaspora located primarily in the UK and in the USA. There, they have formed social clubs like Awka Union USA and Canada, Awka Town Social Community UK and Ireland and other community associations. These associations have been a way

for people to enjoy their culture as well as to engage in community self-help projects. Over the years Awka Town has attracted people from other states in Nigeria and has a significant number of immigrants from northern Nigeria, Delta and Enugu states, Cameroon and Ghana now comprising more than 60% of residents in the town. (Wikipedia Encyclopedia, 2015).

TABLE 3.1: - TABLE SHOWING VILLAGE DISTRIBUTION

Group	Villages
Ayom-na-Okpala	Umuayom, Umunnoke, Umuoramma and Umuokpu.
Nkwelle	Achallaoji, Umunamoke, Agbana, Umudiaba
Amachalla	Amachalla, Amudo, Umuzocha
Ifite-Oka	Enu-Ifite, Ezinato-Ifite, Agbana-Ifite
Amikwo	Umudiana, Okperi, Igweogige, Isiagu, Obunagu
Ezi-Oka	Omuko, Umueri, Umuogwal, Umuogbunu 1, Umuogbunu 2, Umudioka, Umukwa.
Agulu	Umuogbu, Umubele, Umuanaga, Umuike, Umujagwo, Umuenechi, Umuoruka.

Source: Wikipedia Encyclopedia (2015).

3.3. LOCATION AND BOUNDARIES

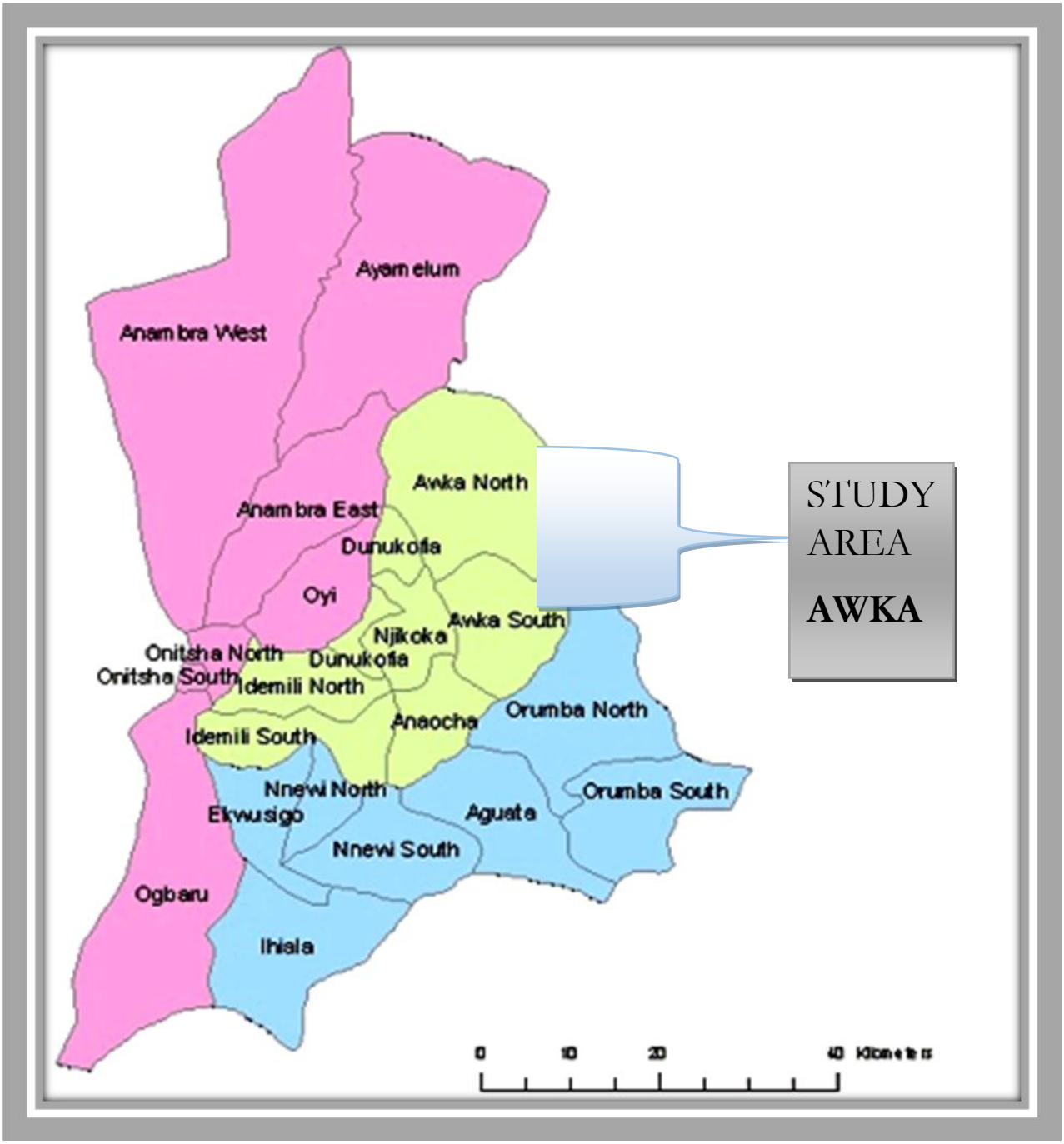
Awka is the capital of Anambra state. It is a town situated in the South Eastern part of Nigeria under Awka South local government area in Anambra state. The town lies along roads leading from Owerri, Umuahia, Onitsha, and Enugu. The area is bounded by latitudes $6^{0}9^{1}$N, $6^{0}19^{1}$N and longitude$7^{0}11^{1}$E, $7^{0}12^{1}$E (Enete et al, 2014). The city centre is traversed by the old Enugu road (Zik's avenue). Awka is bounded with

Nibo, Amawbia in the South West, Mgbaku and Okpuno in the North West, Mgbakwu and Okpuno in the North West, Amansea in the North East and Umuawulu, Isiagu, Ezinato in the South East (Enete et al, 2014). The town stretches to over a distance of 26 kilometers (UN-HABITAT, 2007 in Enete et al, 2014).

PLATE 3.1: - MAP SHOWING NIGERIA

Source: Google Map, 2015

PLATE 3.1: - MAP OF ANAMBRA STATE, SHOWING AWKA LGA



Source**: Google Maps, 2015**

3.4. GEOGRAPHY

Awka lies below 300 metres above sea in a valley on the plains of the Mamu River. Two ridges, both lying in a North-South direction, form the major topographical features of the area. The ridges reach the highest point at Agulu just outside the Capital Territory. About six kilometers east of this, the minor cuesta peaks about 150 metres above sea level at Ifite –Awka. (Wikipedia Encyclopedia, 2015).

Awka is sited in a fertile tropical valley but most of the original rain forest has been lost due to clearing for farming and human settlement. A few examples of the original rain forest remains at places like the Ime Oka shrine. Wooded savannah grassland predominates primarily to the north and east of the city. South of the town on the slopes of the Awka-Orlu Uplands are some examples of soil erosion and gullying. (Wikipedia Encyclopedia, 2015).

3.5. CLIMATE

Awka is in the tropical rainforest zone of Nigeria and experiences two distinct seasons brought about by the two predominant winds that rule the area: the South-Western monsoon winds from the Atlantic Ocean and the North - Eastern dry winds from across the Sahara desert. The monsoon winds from the Atlantic creates seven months of heavy tropical rains, which occur between April and October and are followed by five months of dryness (November - March). The Harmattan, is a particularly dry and dusty wind which enters Nigeria in late December or in the early part of January and is characterized by a grey haze limiting visibility and blocking the

sun's rays. The temperature in Awka is generally 27-30 degrees Celsius between June and December but rises to 32-34 degrees between January and April, with the last few months of the dry season marked by intense heat. (Wikipedia Encyclopedia, 2015).

TABLE 3.2: - TABLE SHOWING CLIMATIC CONDITION

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	33 (91)	34 (93)	33 (91)	33 (91)	32 (90)	30 (86)	29 (84)	28 (82)	29 (84)	30 (86)	31 (88)	32 (90)	31.2 (88)
Average low °C (°F)	24 (75)	25 (77)	25 (77)	25 (77)	24 (75)	24 (75)	23 (73)	23 (73)	23 (73)	23 (73)	23 (73)	23 (73)	23.8 (74.5)
Precipitation mm (inches)	3 (0.12)	35 (1.38)	17 (0.67)	100 (3.94)	150 (5.91)	78 (3.07)	125 (4.92)	80 (3.15)	50 (1.97)	222 (8.74)	106 (4.17)	0 (0)	966 (38.04)
Avg. rainy days	2	2	4	5	5	5	10	7	5	12	6	0	63

Source: **Sunmap.Eu, 2015.**

3.6. ECONOMY

The economy of Awka city revolves primarily around government since many state and federal institutions are located there. Awka hosts the State Governor's Lodge, State Assembly and State Ministries for Health, Education, Lands, and Water. The Anambra Broadcasting Service (ABS) a TV and radio station are located in the city centre. A number of federal institutions including the Central Bank of Nigeria (which has a currency centre in Awka), the Nigeria Television Authority (NTA) Awka media station, and branches of the Federal Inland Revenue Service, Federal Road Safety Commission, Nigerian Immigration Service, and Corporate Affairs Commission are also present in the city.

In recent years, several new businesses have erected fascinating new buildings that have largely changed the face of Awka city. The partly state-owned Orient Petroleum Resources Ltd has the headquarters in Awka. The company is poised to set up a refinery at Igbariam to jump-start the exploitation of the huge crude oil deposits in the Anambra River basin. Also Juhel Nigeria has constructed a manufacturing plant for parenteral drugs in the city. Major Nigerian Banks such as Access Bank, Bank PHB, Diamond Bank, Eco bank, First Bank, Intercontinental, Oceanic Bank, United Bank for Africa (UBA), Union Bank and Zenith Bank have opened branches in the city.

3.7. POPULATION DISTRIBUTION OF AWKA

The Population distribution of 1991 Census was projected using the Thomas Malthus Exponential Model;

$Pt + n = Pt (1+r)^n$

Where Pt = population of Base Year (1991)

N= Number of units of time in 24 years.

Pt + n = Population of projected year 2015.

r = Rate of population changes in percent/population growth rate (3.2)

TABLE 3.3. : POPULATION DISTRIBUTION OF AWKA NORTH

LOCALITY	1991 MALES	1991 FEMALES	TOTAL POPULATION	2015 PROJECTED POPULATION
Mgbaku	3354	3645	6999	14906
Isuanaocha	2273	2274	4547	9684

Urum	2091	2408	4499	9582
Amanuke	2419	2643	5062	10781
Achalla	6823	7017	13840	29475
Owba Ofemili	3055	2909	59644	127024
Ugbene	1200	1304	2504	5333
Ugbenu	2122	2127	4239	9028
Ebenebe	4629	5122	9751	20767
Amansea	1381	1584	2965	6315
Total	**29337**	**31033**	**60370**	**242895**

SOURCE: NATIONAL POPULATION COMMISSION AWKA – FINAL RESULTS OF 1991 POPULATION CENSUS OF NIGERIA

TABLE 3.4.: POPULATION DISTRIBUTION OF AWKA SOUTH

LOCALITY	**1991 MALES**	**1991 FEMALE**	**TOTAL POPULATION**	**2015 PROJECTED POPULATION**
Isiagu	2186	2077	4263	9079
Umuawulu	3373	3724	7097	15114
Mbaukwu	7205	7412	14617	31130
Nibo	8277	9343	17620	37525
Nise	5121	5834	10955	23331
Amawbia	7448	6941	14389	30644
Awka	28335	29890	58225	124002
Okpuno	1712	1786	3498	7450

Ezinator	181	177	358	762
Total	**63838**	**67184**	**131022**	**279037**

SOURCE: NATIONAL POPULATION COMMISSION AWKA – FINAL RESULTS OF 1991 POPULATION CENSUS OF NIGERIA

3.8. URBAN PLANNING AND INFRASTRUCTURE

Prior to the Nigerian Civil War, Awka towns people maintained the city on their own. Market traders cleaned around their stalls; streets and pathways and compounds were swept. Blocked storm drains would be cleared by residents. Yet now Awka is often seen as the state capital with the worst infrastructure in Nigeria (a country sharing the same state of infrastructure) with less than 10% of its roads paved, inadequate storm drainage, poor public water supply, garbage dumped on the sides of roads and a nonexistent sewage system. This has been because Awka has suffered from decades of neglect and poor urban governance in Anambra State due to corruption and deception from many of the State Governors. The last significant attempt to address the urban decay was made by the Government of Peter Obi who forged a technical cooperation agreement with UN-HABITAT in 2007 to provide technical assistance in the preparation of a structure plan for Awka Capital Territory. The Structural Plan of Awka Capital Territory (2009–2028) is designed as a Core-Multi-Nuclei urban design with Awka, Amawbia and Umuokpu serving as the core of the city with linkages to the major towns of Adazi-Nnukwu, Agulu, Abba, Abagana, Agukwu-Nri, Amansea, Enugwu-Ukwu, Enugwu-Agidi, Isiagu, Isu-Aniocha, Mgbakwu, Nawfia, Nawgu, Nibo, Nimo,

Nise, Okpuno and Umuawulu. However, despite launching the master plan to great fanfare and public goodwill and despite having adequate funds with around $2.5 billion / 375 billion naira oil earnings received from the Federal Government of Nigeria during his tenure, Governor Peter Obi has resoundingly failed to implement 95% of the UN-HABITAT's recommendations having managed to build just one road in central Awka and laid less than 3 kilometres of water pipes. The Eke Awka market which was to be relocated and fenced elsewhere continues to create chaos in the middle of the city, public buses add to the mess due to non-existent bus parks and parking spaces.

3.9. MARKET

Awka like most Nigerian cities is defined by large rudimentary open-air markets where everything from basic food produce to clothes, cosmetics and household items are sold. The largest market in the town is Eke Awka, named after one of the four market days. Located on a former community burial ground in the center of the city, Eke Awka has grown from a small market serving the needs of residents of the Agulu, Ezi-Oka and Amikwo sections of Awka to functioning as the main retail outlet for the city and neighboring towns. It houses an estimated 5,000 lock-up shops and stalls all tightly packed into less than 35,000 square meters of space and has become infamous for causing tremendous traffic chaos with a medley of shoppers, buses, wheel barrows all jostling for the limited amount of space available. The second largest market in Awka is Nkwo Amaenyi located further down on the busy Zik Avenue business district artery. It is far smaller than Eke Awka with less than 100 market stalls in an area estimated at around 3,000 square meters.

3.10. RELIGION

Christianity is the main religion of Awka people although many also retain belief in their traditional religion which encompasses many similar traditions and values as noted by G.T. Basden. The Church Missionary Society (CMS) of the Anglican Church was instrumental in bringing Christianity into Eastern Nigeria through Reverend Samuel Ajayi Crowther who founded the Niger branch in 1857. A teacher's training college in Awka was created in 1904. Its oldest church in the town is believed to be the Church of the Holy Spirit which was completed in 1930. Its largest church today is the Cathedral Church of St. Faiths with a typical Sunday attendance of 1,200. The Roman Catholic Church lagged behind the Anglican Church in entering Awka but it has built a larger presence ever since. The Catholic faith has two large cathedrals - St. Patrick's and St. Mary's Catholic Church in Awka as well as four smaller churches such as SS John and Paul's, St. Anthony's, St. Peter's and St. John's spread around the town. Administratively, since 1977 Awka has served as a diocese for the Roman Catholic Church serving 107 parishes and five chaplaincies.

4.0. RECOMMENDATION AND CONCLUSION

4.1. RECOMMENDATIONS

This research on the social and economic effects of soil erosion in Awka, concludes that, the natural environment we live in is a part of our social and economic continued

existence and whatever happens adversely can affect us negatively to our detriment. However, for greater efficiency, the curative to soil erosion effect(s) is to treat it as a crucial part of the concept of environmental control. This may be achieved requiring an adequate knowledge of the environment. The consequences of soil erosion and other natural environmental disasters posits the dire need for a cohesive environmental planning and management. The requirement for this is the formulation of medium where ideas would be consistent and an adequate strategy formulated to manage, direct and control environmental issues. This is because of the necessity to help with the effects of soil erosion in the area. I recommend strongly the creation of a forum for environmental problems. This can be as coordinating Consultants. I also recommend that Government, Non-Governmental Organizations, Cooperate Organizations, Federal Emergency Relief Agency and spirited individuals should get closer to the affected settings and assist the casualty of this problem and it requires very urgent response.

An alternative is Erosion control which is the practice of preventing or controlling wind or water erosion in agriculture, land development, coastal areas, riverbanks and construction. Effective erosion controls are important techniques in preventing water pollution, soil loss, wildlife habitat loss and human property loss. Erosion controls are used in natural areas, agricultural settings or urban environments. In urban areas erosion controls are often part of storm-water runoff management programs required by local governments and other tiers. The controls often involve the creation of a physical barrier, such as vegetation or rock, to absorb some of the energy of the wind or water that is causing the erosion. On construction sites they are often implemented in conjunction with sediment controls such as sediment basins and silt fences. Bank erosion is a natural process: without it, rivers would not meander and

change course. However, land management patterns that change the hydrograph and/or vegetation cover can act to increase or decrease channel migration rates. In many places, whether or not the banks are unstable due to human activities, people try to keep a river in a single place. This can be done for environmental reclamation or to prevent a river from changing course into land that is being used by people. Another process is the use of Reforestation: is the natural or intentional restocking of existing forests and woodlands that have been depleted, usually through deforestation. Reforestation can be used to improve the quality of human life by soaking up pollution and dust from the air, rebuild natural habitats and ecosystems, mitigate global warming since forests facilitate bio sequestration of atmospheric carbon dioxide, and harvest for resources, particularly timber.The term *reforestation* is similar to afforestation, the process of restoring and recreating areas of woodlands or forests that may have existed long ago but were deforested or otherwise removed at some point in the past. Sometimes the term *re-afforestation* is used to distinguish between the original forest cover and the later re-growth of forest to an area. Special tools, e.g. tree planting bar, are used to make planting of trees easier and faster.

4.2. CONCLUSION

Nigeria and elsewhere in the world suffer from the havocs of gully erosion. The cause of gully erosion in Awka and even Nigeria includes both natural and anthropogenic sources. The impacts include loss of human and animal lives, loss of properties and land resources. Some of the solutions that are proffered include

improved farming techniques, cultural method of erosion control- gully erosion, and enactment of laws against any activities that favor gully growth. The government at all levels in Nigeria and the stakeholders in environmental management such as State Ministry of Environment and Federal Ministry of Environment should also sensitize Nigerians on the causes, impacts and problems of gully erosion and soil erosion in general. However, poor or lack of implementation of research findings and recommendations seem to hinder complete evaluation of proposed solutions. For instance, in some cases where an effort is made, poor quality of work usually lead to even greater erosion, as in the case of road construction probably due to poor supervision, poor funding and corruption. Though we have little or no control on the natural causes of gully erosion especially those related to the underlying geology, the individuals and relevant stakeholders should discourage all practices that are capable of initiating or speeding the phenomenon in Nigeria. If all the suggested solutions are carefully looked into, it is believed that the incidence of gully erosion in Nigeria would be drastically reduced and the security of the lives of the people and their properties will be guaranteed.

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