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INVENTORY SURVEY OF SOME GULLY EROSION SITES IN CENTRAL CROSS RIVER STATE, NIGERIA

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Abstract
A research on inventory survey of some gully erosion sites in Central Cross River State of Nigeria was carried out in 2015; Fifteen gully sites were identified in the areas (Ikom, Obubra and Yakurr Local Government Areas). The objective of this research is to identify spectacular gullies and to determine the dimensions, causes and the land use affected. The gullies identified within the Ikom Local Government Area are Enoghi, Ekpokpa, Bokomo, Boarder Road and Atimaka, with Enoghi having the longest gully length. In Obubra Local Government Area are Mile one, Nnukpein, Ohara, Ovonum and Onyadama, while in Yakurr Local Governemnt Area are Njelekoko Ajere, Aduma, Npoli and Ofurekpe. The gullies were caused by uncontrolled overland flow, run-off and poor construction. Land use affected were farmland, residential building and pathway.

Keywords: Gully erosion, land use, run-off, overland flow as shown on the plates below.

Introduction

Soil Erosion is one of the major problems confronting agriculture worldwide, it is a major threat to the soil resources, soil fertility, productivity, and lastly to food and fibre production mainly on farmland and rangelands (MOA, 2010).

Although, the problem is as old as settled agriculture, its extent and impact on human welfare and global environment are more now than ever before. A continuation of high soil erosion will eventually lead to a loss in crop production even though fertilizers and other inputs often result in increased yield in the short while.

Soil erosion is the process of detachment of soil particles from the parent body and transportation of the detached soil particles by wind and/or water and its deposition (Reddy and Sankara, 2010). The agent causing erosion are wind and water, the transporting agents are flowing water, rain splash and wind (Reddy et al, 2010). Depending on the agents of erosion, it is referred to as water erosion or wind erosion or wave erosion. Water erosion causes several types of damages by removing soil gradually, these characterized soil loses as sheet erosion, gully erosion, ravines and landslide (Lal, R 1984).

Gully erosion is geographically a widespread problem and is the worst stage of erosion. It is common in the semi-arid region characterized by denuded landscape and flash flood (Belaynah, 2010). Gully erosion is more difficult and expensive to control than sheet and rill erosions, the damage done to land by gully erosion is permanent. It causes depreciation in land value by lowering water table and depleting the available water reserves (Betru, 1996).

Degradation of the soil, particularly in rain forest zone of Nigeria is mainly manifested as soil erosion. The effect of soil erosion in the rainforest zone of Nigeria is the spectacular gullies. Famesco (1992) stated that four south eastern states of Nigeria, Anambra, Imo, Akwa Ibom and Cross River, accounted for over 74% of the total 1,329 gullies identified and documented in Nigeria. Gully erosion has been recognized as a major source of sediments in USA, Australia, Europe and China (Foster, 1982; Prosser, 1991; and Possen et al, 2003; Zhange et al, 2007). It is an erosion channel which cannot be obliterated by normal tillage operation (Soil Science Society of America, 2001) and has a steep side channel with cross sectional area larger than one square root that is formal due to intermittent flow or run-off after snow melt (Poesen et al 2003).

In humid regions with uniform distribution of rainfall, surface erosion, including gully formation may not be a serious problem because vegetation grows throughout the year. However, areas that do not have uniform rainfall, the vegetation (especially grass) dries up during the prolonged dry season (3 to 5 months or more). If the land is not properly used, or if forest or grasses occur during the dry period, it may not sufficiently hold rainwater and so the increased surface run-off in the rainy season produces large scale land sides and gullies.

It is estimated that over 850,000 hectares of land in Nigeria are badly affected annually by erosion while 700,000 hectares of the Nigeria Delta land has been devastated by Coastal

erosion (Elumoye, 1991). The objectives of this research is to identify spectacular gullies within the study areas and effect cause in Central Cross River State of Nigeria.

Study Area

The study area is located in the Central Senatorial District of Cross River State, Nigeria. The state is bounded in the north by Benue state in the south by the Atlantic Ocean, in the west by Ebonyi and Abia States, south west by Akwa Ibom State and by the Cameroun Republic in the East. The three local government areas chosen for the survey are Ikom, Obubra and Yakurr.

The mean annual rainfall of the study area is 2250 – 2500mm per annum and an annual temperature between 21^0C – 29^0C (CRADP, 1992). The soil type of the area is predominantly sandy loam with an undulating topography and a slight slope. Ikom is a local government area of Cross River State, Nigeria with headquarter been in the town of Ikom in the east of the area on the Cross River and has an area of 1961km^2 with a 162,383 based on the 2006 census. It lies between latitude of $5^0.6^0$N and latitude 8.12^0E.

Obubra is located about 177 kilometers from the state capital and lies within the rainforest of south-east Nigeria. It covers an area of 1.115km^2 with a population of 172,549 in the 2006 census.

Yakurr is a local government area of Cross River State, Nigeria. It lies between latitude 5^04^0N and longitude 8^0Z^1E and 150km northwest of Calabar. Preliminary studies were first conducted by locating and documenting landsides erodible sites within the three local government areas in different five locations in each local government area. In addition to the visit, interviews were made of the local residents to acquire more knowledge of the sites before actual field work commences. The gully sites located were cleared using cutlass (area around the gully) after which measurements done using the measure tape to get the dimensions (the length, the width and the depth) and ladder was used in going down and coming out of the gullies.

Results:

Ikom Local Government Area

(i) **Enoghi**: This area was observed to have scanty vegetation cover with sloppy land close to a farm land. It has the dimensions of 26m long, 1m wide and a depth of 1m and showed the longest gully length within the Ikom local government area.

(ii) **Ekpokpa**: The gully is located along Ikom – Ogoja Highway, few kilometers away from Ekereson Filling Station, it has a gully length of 8m, a width of 2m and a depth of 1m. the land use affected was a pathway leading to a proposed medical centre and Saint Paul Primary School. The land lacks shrubs and trees.

(iii) **Bokomo**: This site is located in Bokomo village of Ikom Town (UAC Road) it has a length of 7m, a width of 1m and a depth of 1m. The land use affected is a farm land with less dense vegetation and the soil is made of hard pan.

(iv) **Boarder Road:** The fourth site in this area was located at boarder road, the site had a gully length of 10m, a width of 1m and a depth of 2m, it had a sloppy terrain and the area made up of hard pan materials, with the land having no trees on it. This pathway leads to farmland and is usually referred to as farm road by residents in the area.

(v) **Atimaka:** this is located at Atimaka Village along Ogoja Road. The site measured to have a gully length of 9m, a width of 2m and a depth of 1m. it also leads to farmlands.

Obubra Local Government Area

(i) **Mile One:** This area is located in Obubra main town few meters away from First Bank Nig. Plc, Obubra Branch. The site was measured to have gully length of 25m, a width of 2m and a depth of 2m. The area has a steep slope found in front of an uncompleted building directly opposite Destiny Revival Church (DRC) and extends toward Saint Vincent Nursery and Primary School.

(ii) **Nnukpein**: This site is located in Apiapum along the Ikom-Calabar Highway, Opposite Okosisi bus stop. The site had a gully length of 22m, a width of 8m and a depth of 2m. It was suspected to have occurred from uncontrolled run-off from the highway.

(iii) **Ohana**: This site is located near Ohana playground were they have their daily market. It had a gully length of 13m, a width of 1m and a depth of 1m. it has no vegetative cover and therefore gives room for rain to have direct contract to the soil which result to detachment thereby enhancing easy run-off.

(iv) **Ovonum**: This site is opposite the junction, it is found along the farm road, measuring 7m long, 1m in width and 1m deep. The portion around the gully was devoid of vegetation and have affected the pathway.

(v) **Onyadama**: The area is located at Onyadama opposite Saint Patrick Catholic Church. The land use affected was a farmland. The topography of the area was slightly undulating. It had a length of 12m long, 1m wide and a depth of 1m. Land use affected was a pathway.

Yakurr Local Government Area

(i) **Njele Koko:** This site is located in Ugep Town along Ediba Road. The site measuring gully length of 23m, a width of 4.5m and a depth of 2m. The land use affected was pathway.

(ii) **Ajere**: This area is located at Yoli-Ajere Mkpani, the land use affected was a residential building and the erosion was suspected to have occur from an uncontrolled run off and had a length of 17m, 1.2m wide and a depth of 1m.

(iii) **Aduma**: This area is located at Lebolkam in Mkpani, it has scanty vegetation and close to the road. It measures 5m in length, 2m in width and a depth of 3m.

(iv) **Npoli**: The site is found at Npoli-Okpirike in Nko Town. The land use affected is a pathway, the gully, extends to the right into a farm having numerous trees. It had the measurement of 10m in length, 1m in width and 1m deep. The terrain of the land is sloppy with scatter vegetation cover.

(v) **Ofurekpe**: This site is located at Ofurekpe-Kokamplo in Ekori, the land use affected is a pathway close to a residential building. It measures a length of 13m, 2m wide and a depth of 1m.

Table 1: Some Gully Erosion Sites in Ikom LGA

S/NO	LOCATION	LENGTH(M)	WIDTH (M)	DEPTH (M)	LAND USE AFFECTED
1	Enoghi	26	1	1	Farmland
2	Ekpokpa	8	2	1	Pathway
3	Bokomo	7	1	1	Farmland
4	Boarder Road	10	1	2	Pathway
5	Atimaka	9	2	1	Farmland

Field Survey: 2015

Table 1: Some Gully Erosion Sites in Obubra LGA

S/NO	LOCATION	LENGTH(M)	WIDTH (M)	DEPTH (M)	LAND USE AFFECTED
1	Mile One	25	2	2	Residential
2	Nnukpein	22	8	2	Pathway
3	Ohana	13	1	1	Pathway
4	Ovonum	7	1	1	Pathway
5	Onyadama	12	1	1	Pathway

Field Survey: 2015

Table 1: Some gully Erosion Sites in Yakurr LGA

S/NO	LOCATION	LENGTH(M)	WIDTH (M)	DEPTH (M)	LAND USE AFFECTED
1	Njele Koko	23	4.5	2	Pathway
2	Ajere	17	1-2	1	Residential
3	Aduma	5	2	3	Farmland
4	Npoli	10	1	1	Pathway
5	Ofurekpe	13	2	1	Residential

Field Survey: 2015

Discussion

Table 1, 2 and 3 shows gullies surveyed in Ikom, Obubra and Yakurr Local Government Areas respectively of Central Cross River State. The high rate of erosion in this location has been attributed to factors such as rainfall (Aina et al, 1983, Chijioke 1992), Soil type (Chijioke 1992).

The major causes include uncontrolled overland flow, poor construction work, uncontrolled run-off and the land use affected includes highway, farmland, and residential buildings.

Conclusion

Soil erosion is one of the major problems confronting agriculture worldwide, it is a major threat to the soil resource, fertility and productivity. Some gullies in Ikom, Obubra and Yakurr Local Government Area of Central Cross River State investigated were highly influenced by rainfall, soil type and wrong use of land by farmers. Due to dynamic nature of gullies, only few as tabulated above were considered. In some cases, it was observed that uncontrolled run-off from uncompleted drainage also causes severe washing of soil particles.

Recommendations:

Result indicates that gully erosion, has been on the increase and advancing at alarming rates over the past few decades causing major losses of agricultural land, destruction of pathways and also affecting residential buildings. The following recommendations are therefore suggested. Government should have regulations on awarded contracts and close monitoring of awarded contract to uphold specification, awareness of soil advocated for at all level within the State. Tree planting should be more emphasis by all stakeholders and above all farmers should be educated through extension agents on modern technique of farming to reduce the high rate of bush burning , tillage methods, clean weeding and planting should be encourage across slope rather than along slope

LIST OF PLATES

SOME GULLY EROSION SITES SURVEYED IN OBUBRA L.G.A

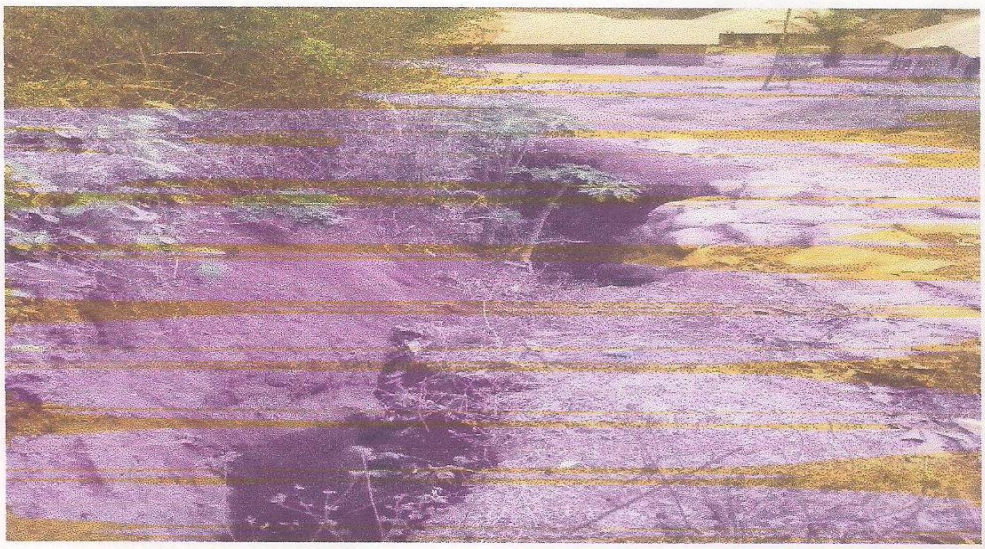

Plate 1: Mile 1 Obubra

Plate 2: Nnukpein in Apiapum

Plate 5: Onyadama

SOME GULLY EROSION SITE SURVEYED IN IKOM L.G.A

Plate 1: Enoghi

Plate 2: Ekpokpa

Plate 3: Bokomo village

Plate 4: Border Road

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Plate 5: Atimaka

SOME GULLY EROSION SITE SURVEYED IN IKOM L.G.A

Plate 1: Enoghi

Plate 2: Ekpokpa

Plate 3: Bokomo village

Plate 4: Border Road

Plate 5: Atimaka

SOME GULLY EROSION SITES SURVEYED IN YAKURR L.G.A

Plate 1: Njelekoko-Ugep

Plate 2: Ajere-Mkpani

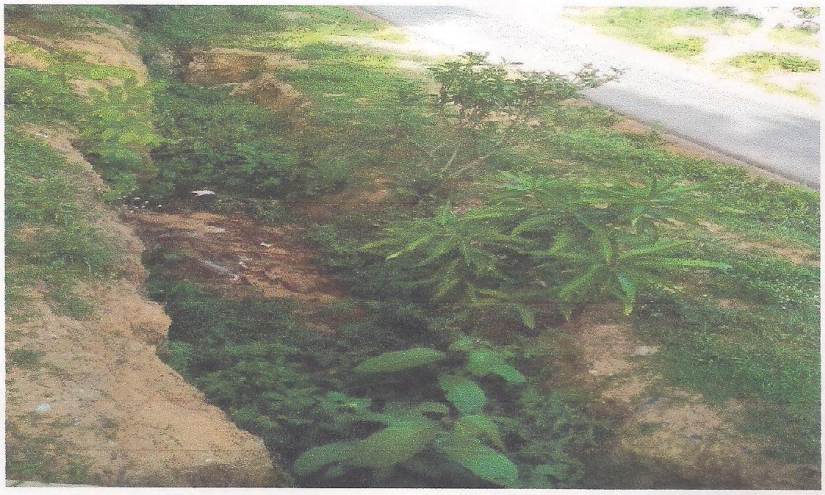

Plate 3: Aduma-Mkpani

Plate 4: Npoli-Nko

Plate 5: Ofurekpe-Ekori

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