# Perceived effects of water erosion on farming activities in Calabar Metropolis, Cross River State, Nigeria.

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## Abstract

*The study was carried out to assess the perceived effects of water erosion on farming activities in Calabar metropolis, Cross River State, Nigeria. The major causes of water erosion, types of water erosion and their effects were assessed. Strategies used for controlling water erosion in the study area were also identified. The study was carried out in Calabar metropolis which comprises Calabar South and Calabar municipality Local Government Areas. The population of the study comprised of only the community members residing in erosion affected areas as such purposive sampling technique was used for the selection of eighty (80) farmers. Data were collected with the aid of a set of structured questionnaire. Data obtained were analyzed using descriptive statistics. The results from the findings showed that respondents varied widely in their socio-economic characteristics; 55.0% were females, an average proportion (51.3%) were married, 53.8% had tertiary education, 46.3% had monthly income of less than N20,000, 48.8% had household sizes of between 1 and 5. Result further revealed that 42.5% of the farmers practiced trading as a major occupation followed by 23.8% who engaged in farming as their major occupation. The study also revealed that the causes of water erosion were: prolonged or heavy rainfall, poor road construction and deforestation with mean scores of 3.67, 3.42 and 3.18, respectively and gully erosion was the major type. The main effects of erosion were shortage of farmland and removal of top soil with mean scores of 3.83 and 3.55, respectively. To control water erosion, strategies such as afforestation, avoidance of clean clearing, use of cover cropping should be adopted. The study recommended that drainage channels should be constructed and afforestation encouraged in these areas.*

**Keywords:** Perceived Effects, Erosion, Farming activities, Calabar Metropolis

## Introduction

Soil is essential for mankind especially as it provides the fundamental ecosystem services required for human life, primarily for the production of food. Soils according to Powlson, Gregory, Whalley, Quinton, Hopkins, Whitmore, Hirsch and Goulding (2011) provide the pathway through which water and nutrients move to the plant roots. They serve as a matrix for nutrient transformations and environment for micro-organisms and fauna. However, Nigeria as a nation has experienced depletion in soil nutrient and loss of valuable property due to erosion. Erosion can be said to be one of the

most serious natural disasters. Erosion can be defined simply as the loosening and consequent removal of particulate soil materials from one location to another through agents such as water, wind and man (Iwena, 2008; Hammond, 2000; Adeleke and Leong, 2001). The most prevalent type of erosion in the eastern part of the country especially in Cross River State is soil erosion. According to Cutler (2006), soil erosion is a process of detachment and transportation of soil particles from one place to another. Soil erosion is one form of soil degradation and commonly related to other problems such as low levels of soil organic matter, loss of soil structure and acidity. This occurs mainly due to rainfall intensity, poor soil conditions and improper land use (Olaolu, 2011).

Soil erosion comprises sheet, rill, splash, gully or the channel erosion types (Onwuka, 2008). Splash erosion is the first stage of the erosion process. It occurs when raindrops hit bare soil. The explosive impact breaks up soil aggregates so that individual soil particles are "splashed" onto the soil surface. Sheet erosion begins with slow and progressive removal of a thin but fairly uniform layer of topsoil from an area by flood or run-off. Rill erosion occurs when run-off water laden with soil particles and debris erode an area of land surface more than others (Ontario Ministry of Agriculture, Food and Rural Affairs,(OMAFRA), 2003). Repeated rill erosion along a run-off path creates a vertical bank not deeper than three metres producing channel erosion. Gully erosion occurs when deep and large channels assuming great depths are created by run-off water (Abegunde**,** Adeyinka, Olawuni, and Oluodo, 2006). This type of soil erosion is most common in South-eastern Nigeria. Gully erosion isa world-wide phenomenon. It is an enormous type of environmental degradation which leads to loss of valuable land used for agricultural, domestic, industrial and aesthetic purposes, as well as loss of property and even human lives. The formation of gullies has become one of the greatest environmental disasters facing many towns and urban residents in Nigeria (Adekalu, Olrunfemi and Osunbitan, 2007). The menace has taken its toll on the socio-economic well being of the people living in the affected areas and the country at large such that areas used for agricultural and industrial purposes, crops, livestock and other infrastructure are lost to the hazard at an alarming rate (Obiadi, 2010). Mashi, Yaro and Jenkwe (2015) reported that the major types of water erosion that farmers are aware of are gully erosion, splash, stream bank, sheet and rill erosion.

Soil erosion remains the world's biggest environmental problem, threatening the sustainability of both plants and animals in the world. Over 65% of soil on earth is said to display degradation phenomena as a result of water, salinity and desertification (Okin, 2002).

Nigeria in general and Calabar in particular has experienced obvious soil erosion problem since the last few decades. This menace has caused depletion in soil nutrient, unavailable of cultivated lands and cracking of houses caused by rill or gully erosion. The ecological issues affecting soil erosion in the region are complex. They range from natural climatic to anthropocentric (Egbai, 2002).Therefore the reason for this study to focus on the perceived effects of water erosion on farming activities in Calabar Metropolis.

The general objective of the study examined perceived effects of water erosion on farming activities in Calabar Metropolis, Cross River State.

Specific objectives are to:

1. Ascertain the socio-economic characteristics of farmers in the study area
2. Identify the major types of water erosion in the study area
3. Identify the major causes of erosion in the area
4. Assess effects of water erosion on respondents and identify the strategies used in controlling water erosion.

**Research Methodology**

This study was carried out in Calabar Metropolis. It comprises Calabar Municipality and Calabar South Local Government Areas. The area lies within longtitude $6.5832^0$E and latitude $4.3427^0$N of the Greenwich Meridian. Calabar also referred as "Canaan" city is a city in Cross River State in South eastern Nigeria. It is the capital of Cross River State and has often been described as one of the tourism states in Nigeria. There are two distinct climate seasons in the area: the wet and dry seasons. The wet season lasts between April and October while the dry season is from November to March. Most of the rain here falls in July averaging 426mm. March is the hottest month of the year while August is the coldest with temperature averaging $25.0^0$c (Opihya, Ekpoh, Akangideh and Achi., 2006). Major occupations are trading, farming, fishing and artisan and the major crops grown in the metropolis are vegetables, cassava and oil palm trees. These crops serve as a major source of livelihood for the inhabitants. Their production in the area is mainly for sale and consumption. However, farmers in Calabar Metropolis are constrained by land to increase production due to urban development and loss of nutrients caused by erosion (Christopher and Fink, 2005). A two stage sampling technique was adopted for the study. In stage one, two communities each were purposively selected from the two Local Government Areas(LGAs) because of the intensity of land degradation in the LGAs. The two LGAs comprise ten communities each. Hence, four communities were selected for the study. In the second and last stage, simple random sampling procedure

was used to select 20 respondents from each of the selected communities. This gave a sample size of 80.Objective 2 was measured at nominal level (splash = 1, sheet = 2, rill = 3 and gully erosion = 4) while objective 5 was measured using a four point likert scale on eleven items. Data obtained were analyzed using descriptive statistics such as means, frequency counts, percentages and standard deviation.

**Results and discussion**

Table 1 shows the percentage distribution of the farmers based on their socio-economic characteristics. The results revealed that the majority (55%) were females. The results further revealed that an average of 51.3% were married. Also, it showed that majority (53.8%) of the respondents had tertiary education and that 36.5% of the respondents fall within the age range of 31 to 40 years. The result on farm size revealed that the majority (61.3%) had farm sizes of less than 1 hectare. Findings on monthly income revealed that 46.3% of respondents had monthly income of less than N20, 000. It was also found that 48.8% had between 1 and 5 members in their households and 42.5% of them engaged in trading as a major occupation. Given the fact that women were more than men, it implies that the women were the ones available during the time of the survey since the men were out for business. The fact that most of them residing around the erosion prone areas were married implies that it is easier for a single individual to relocate from an erosion affected area than a married individual. As observed, most of the respondents were people who had tertiary education implying that a large proportion of the respondents were educated. This may be related to the fact that since the area of study is an urban area, most respondents took advantage of the presence of educational institutions to improve on their level of education. Also, since majority of the respondents fall within the age bracket of 31 and 40 years, it means that the respondents were still in their active age. The implication of the small farm size may be that most of their farmlands have been eroded by erosion. The low income from farm produce may also be as a result of poor soil fertility due to erosion. Household sizes between 1 and 5 members may be as a result of adapting to the Federal Government of Nigeria's (FGN) policy on Planned Parenthood of four members per family. The reason why most of the respondents are traders may be for diversification of sources of income since less income is derived from farming probably due to erosion.

The results on Table 2 show the mean distribution of respondents based on types of water erosion. The most popular types of water erosion observed by the respondents were: gully erosion with percentage score of 33.8%, followed by rill erosion with 25.5% while sheet

erosion came last with 20.0%. From the results it can be inferred that most of the people in study area are affected by gully erosion followed by rill, splash and sheet erosion. This finding is in line with Abegunde *et al.* (2006) who stated that gully erosion is most common in south eastern Nigeria. They also noted that gully erosion is a worldwide phenomenon and it is an enormous type of environmental degradation which leads to loss of valuable land used for agricultural, domestic, industrial and aesthetic purposes as well as loss of property and even human lives.

The results on Table 3 show the mean distribution of the respondents according to causes of water erosion. The result revealed that all the causes identified recorded mean score values above the cut-off mean of 2.50, which suggests that the respondents agreed that all the variables listed were responsible for water erosion. In particular the most popular causes of erosion were heavy or prolonged rainfall which ranked first with a mean score of 3.67, poor road construction ranked second with mean score of 3.42 while continuous cropping and bush burning ranked least with mean score of 2.76. These findings are in line with studies conducted by Carey (2006) and Olaolu (2011) which reported that the major causes of water erosion were heavy rainfall, increased runoff from land use changes such as free clear in a catchment area, runoff concentration caused by furrows and contour bank, poor vegetative cover, overgrazing, improper design construction or maintenance of water ways in cropping areas, and diversion of drainage lines to areas of high risk erosion. They also reported that the mismanagement of agriculture, deforestation, overgrazing and unmanaged construction activities have offset the balance between formation and removal causing immense loss of fertile top soil.

Results on effects of water erosion on farming activities as presented on Table 4. The results revealed that water erosion mostly led to shortage of farm land, removal of top soil and depletion of soil nutrients as they ranked first, second and third respectively. These findings are closely related to the study carried out by Ezeigwe (2015) who examined the effect of soil erosion using field survey. The author observed that the main onsite impact of soil erosion is the reduction in soil quality resulting from loss of the nutrient rich upper layer of the soil thereby leading to inadequate land for farming activities.

Results on Table 5 show the mean distribution of respondents according to the strategies used for controlling water erosion. The results revealed that all the strategies identified recorded mean score values above the cut-off mean of 2.50 suggesting that the respondents accepted or agreed to the strategies. Table 5 also shows that the most used strategies for controlling water erosion were afforestation

(3.83) and avoidance of clean clearing (3.55). The least used strategy was strip cropping (2.82). These findings are similar to those of the research carried out by Yaro and Jenkwe (2015) which revealed that in other to control erosion, strategies such as avoidance of cultivating steep slopes, contour ploughing across slopes, crop rotation, bush burning control, fallowing and strip cropping, terracing, afforestation and planting of cover cropping need to be adopted.

## Conclusion

Water erosion has been the world's biggest environmental problem, threatening the sustainability of plant, animal and human life. Numerous research investigations have recognized and confirmed that erosion has caused a serious damage to both plants and animals; as such it is necessary to control erosion affected areas.

## Recommendations

The following recommendations were made based on the findings of the study:

Since deforestation was one of the major causes of water erosion, afforestation should be encouraged especially in erosion affected areas of the study area. Poor road construction was one of the causes of erosion; therefore drainage channels should be constructed in erosion affected areas of the study area

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**Table 1: Distribution of the respondents by socio-economic characteristics**

| Variables | Frequency | Percentage |
|---|---|---|
| **Sex** | | |
| Male | 36 | 45 |
| Female | 44 | 55 |
| Total | 80 | 100 |
| **Marital status** | | |
| Single | 25 | 31.3 |
| Married | 41 | 51.3 |
| Divorced | 5 | 6.3 |
| Widowed | 9 | 11.3 |
| Total | 80 | 100 |
| **Educational level** | | |
| No formal education | 11 | 13.8 |
| Primary | 7 | 8.8 |
| Secondary | 19 | 23.8 |
| Tertiary | 43 | 53.8 |
| Total | 80 | 100 |
| **Age (Years)** | | |
| <20 | 2 | 2.5 |
| 20 – 30 | 26 | 32.5 |
| 31 – 40 | 29 | 36.5 |
| 41 – 50 | 17 | 21.3 |
| >50 | 6 | 7.5 |
| Total | 80 | 100 |
| **Farm size( hectares)** | | |
| < 1 | 49 | 61.3 |
| 1-2 | 20 | 25.0 |
| >2 | 11 | 13.8 |
| Total | 80 | 100 |
| **Monthly income (₦)** | | |
| <21,000 | 37 | 46.3 |
| 21,000 – 50,000 | 32 | 40.0 |
| 51,000 -100,000 | 7 | 8.8 |
| 101,000 – 150,000 | 1 | 1.3 |
| >150,000 | 3 | 3.8 |
| Total | 80 | 100.0 |
| **Household size** | | |
| 1 – 5 | 39 | 48.8 |
| 6 – 10 | 31 | 38.8 |
| < 10 | 10 | 12.5 |
| Total | 80 | 100.0 |
| **Major occupation** | | |
| Farming | 19 | 23.8 |
| Fishery | 4 | 5.0 |
| Artisan | 10 | 12.5 |
| Trading | 34 | 42.5 |
| Civil servant | 13 | 16.3 |
| Total | 80 | 100.0 |

Source: Field survey (2019)

**Table 2: Distribution of respondents on causes of water erosion**

| Variables | Total score | Mean score | Rank |
|---|---|---|---|
| Heavy or prolonged rainfall | 294 | 3.67 | 1 |
| Continues cropping | 221 | 2.76 | 6 |
| Deforestation | 235 | 3.18 | 3 |
| Poor tillage practice | 249 | 3.11 | 4 |
| Surface water run off | 230 | 2.87 | 5 |
| Poor road construction | 274 | 3.42 | 2 |
| Bush burning | 221 | 2.76 | 6 |

Source: Field survey (2019) Note: N = 80, decision rule = 2.50

**Table 3: Distribution of respondents based on types of water erosion**

| Variables | Frequency | Percentage |
|---|---|---|
| Erosion type | | |
| Splash | 17 | 21.3 |
| Sheet | 16 | 20.0 |
| Rill | 20 | 25.0 |
| Gully | 27 | 33.8 |

Source: Field survey, 2019

**Table 4: Distribution of respondents based on the effect of water erosion on farming activities**

| Variables | Total | Mean score | Rank |
|---|---|---|---|
| Removal of top soil | 284 | 3.55 | 2nd |
| Depletion of nutrient | 255 | 3.18 | 3rd |
| Low yield | 253 | 3.16 | 4th |
| Death of seedlings | 212 | 2.65 | 9th |
| Stunted growth of crops | 247 | 3.08 | 6th |
| Shortage of farm land | 307 | 3.83 | 1st |
| Increase in cost of production | 249 | 3.11 | 5th |
| Enhancement of pest/disease spray | 227 | 2.83 | 7th |
| Destruction of plant, animal or human life | 226 | 2.82 | 8th |

Source: Field survey (2019)

**Table 5: The mean distribution of respondents based on strategies used for controlling water erosion**

| Variables | Total score | Mean score | Rank |
|---|---|---|---|
| Afforestation | 307 | 3.83 | 1st |
| Avoidance of clean clearing | 284 | 3.55 | 2nd |
| Prohibition of bush burning | 255 | 3.18 | 4th |
| Contour farming | 252 | 3.15 | 6th |
| Terracing | 247 | 3.08 | 8th |
| Strip cropping | 226 | 2.82 | 11th |
| Mulching | 249 | 3.11 | 7th |
| Provision of drainage channels | 227 | 2.83 | 10th |
| Building of watershed | 253 | 3.16 | 5th |
| Use of cover cropping | 260 | 3.25 | 3rd |
| Crop rotation | 234 | 2.92 | 9th |

Source: Field survey (2019)