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Research Article

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Environmental Impacts of Erosion on Agricultural Activities: A Case Study of Igarra, Edo State

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Abstract: This study focused on the impact of erosion on agricultural activities using Igarra, Edo State, as a case study. The specific objectives were to examine the causes of erosion on farmland and its effect on agricultural development in Igarra, Edo State; to identify the types of erosion that occur in the area; to investigate the problem faced by farmers as a result of erosion; and finally, to suggest solutions to the problems faced by farmers in the study area. Soil erosion is a major farming problem in any society, especially for the fact that food, which is chiefly grown on the soil, is the greatest human need. The data generated for the research was from both primary and secondary sources. It used open and close-ended, well-structured questionnaires and interview guides and focused group discussion to obtain primary data. Secondary data include information from government agencies and other published and unpublished documents. Data were collected using a structural questionnaire, oral interview, and personal observation. A total of 90 respondents comprising farmers were given a questionnaire to administer with the help of the researchers. The study revealed that more males were involved in farming in Igarra, Edo State. It was also revealed that erosion was wearing farmland and roads in the study area and caused low productivity, loss of farm products, loss of soil fertility, water pollution, and damaging of roads. Based on the finding, it was recommended that the government and individuals should be encouraged to support the control of erosion, transportation facilities should be improved upon, the government and individuals should search for effective and alternative means of improved agricultural development in order to curb low productivity and loss of soil fertility, and alternative means of controlling erosion should be employed by individuals.

Keywords: Erosion, Agricultural development, Soil, Farmland, Water pollution, Igarra Edo State

1. Introduction

Erosion is arguably the single most serious natural hazard in Nigeria, affecting nearly every part of the country but more aggressively in the southeastern part, where it has killed people, torn roads in shreds, destroyed homes, schools, and farmlands, and displaced poor people. Disasters can result from forces of nature, which may be aided by human actions. Some disasters build up slowly while others may happen suddenly and unexpectedly. Erosion disasters can be classified among the quick and sudden disaster types but are among the few in this category that can be well predicted, anticipated, and controlled to a great extent. Erosion, like other disasters, does not qualify to be labelled 'disasters' by the mere virtue of their happenstances. They do become disasters when they cause damage or adverse effects to human lives, livelihoods, and/or properties. Erosions are probably the most widespread among the various disaster events that occur in most countries and cause the most deaths (Ghapar, Yussof, & Bakar, 2018). Erosion is one of the natural calamities that occur every year, at any point,

and anywhere, causing threats to the livelihoods of smallholder farmers and their food security. Disasters like erosion can cause loss of field crops, stored seeds, agricultural equipment/materials, and their supply systems (e.g., infrastructure) as well as associated indigenous knowledge, thus disrupting not only the immediate growing season but also future seasons (Adubi & Daramola, 2016).

The environmental resources in Igarra, most especially the land and soil resources, are greatly threatened by erosion. Igarra and its environment are covered by beautiful vegetation, naturally checking the menace. Erosion menace has destroyed arable land for agricultural purposes, which are the major socio-economic activities of the Igarra people. The government, in its attempt to curb the situation, has constructed a drainage system some meters away from the major road to redirect and channel all the water flowing to the erosion sites into the drainage system, which is emptied into the river. Despite all this effort, the situation still remains the same (Godson-Ibeji and Jonadab, 2016). Deforestation, unsustainable farming practices, sloppy engineering, and geotechnical works, including road construction and drainage systems, are the dominant factors breeding gully erosion in Nigeria. The environmental impact of erosion in Nigeria is huge, with time running out as climate change and climate-driven changes make matters worse in this West African country. Geomorphological features that were nothing more than cracks a decade ago are today gaping gullies whose sizes and threats are only equivalent to those of canyons. Roads have become death traps. Rivers and groundwater have been contaminated (Abbas, 2010). Soil is a natural resource to man; he depends on it for survival. It is in the soil that man has his being, for soil sustains man, and on it he grows his food, and it is the foundation of worldly goods, as it acts as basic wealth upon which his existence as an inhabitant of the earth depends (Adegboyega, 2014).

Erosion is endemic in Nigeria. There are prominent erosion sites in Nigeria, especially in the east and south-south. Nnebedum (2013) attributed the genesis and growth of gullies to human activities and geomorphologic processes; most of the activities could have been averted by humans, but either by commission or omission, they are not taken care of. To be successful in the fight against erosion, the factors, causes, and consequences must be well understood so as to manage it effectively. There is a need to understand how the soil responds to use and management over time. This study, therefore, becomes imperative as it intends to reveal the environmental impact of erosion on agriculture with the hopes also that the findings will be to enhance good agricultural products and maintenance of the soil is required in the study area (Abua et al., 2009).

2. Research Methodology

Study Area

This research is carried out in Igarra town, in Akoko, Edo Local Government Area of Edo State. The main activity indulged in by the populace is agriculture, which is practiced at both the subsistence and commercial scale. Food crops are mainly yams, cassava, and plantains, while cash crops include cocoa and palm produce. The local people are also gainfully employed in the quarrying of rocks in the area. The climate is tropical, that is, warm and humid climatic conditions. Vegetation is the guinea savanna, with denser forest fringing some of the rivers and steeper slopes formed by the ancient sedimentary rocks in areas where they overlie the basement. There are variable species of animals that inhabit this environment. They include mammals, reptiles, birds, rodents, crickets, and insects. Grazing of cattle such as cows, sheep, and goats is carried out mostly by the nomadic fulanis (Sebastian et al., 2014).

Igarra is derived from Igala, the original ancestor who inhabited the union of Igala/Okpoto and eventually migrated to the present Kogi State between the 13th and 16th centuries. The Igarra area lies within latitudes 7000'N-7030'N and longitudes 6000'E-6030'E at the northern fringe of Edo State, Nigeria as shown in Figure 1. It is underlain in the north by Precambrian Basement Complex and in the south by Cretaceous and Tertiary sediments. The study area is rich in carbonate rocks, especially marble, which have high economic value depending on the specific usage. The vegetation here is prominently made up of sparsely distributed trees, herbs, shrubs, and grasses. The trees (mango and orange) help check the activities of erosion. Trees in this area are mostly concentrated along fracture zones within the plutonic bodies and on the quartzite ridges where adequate soil cover has resulted and there is adequate groundwater retention. The vegetation in this area is mostly secondary, i.e., the natural vegetation is being altered, and such agricultural crops as maize, yam, cocoa, cassava, pineapple, cashew, mango, and sugar cane are grown.

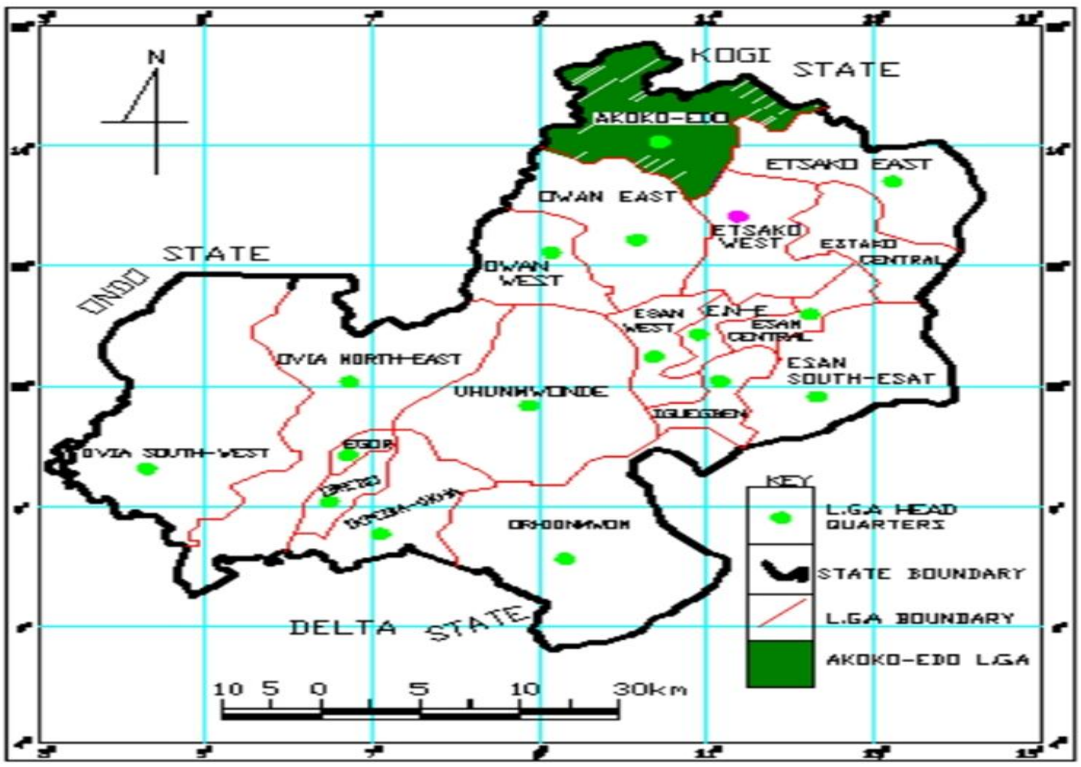

Figure 1: Location of Map of Study Area (Northern Part of Edo State, Nigeria)

Research design

Quantitative research design is a survey technique used to measure specific characteristics through structured questionnaire from a representative sample so that the result can be generalized to the entire population. As it applied to the present study, the researcher used a structured questionnaire to measure the environmental erosion on agricultural activities in Igarra, Edo State. This design was used for the present study as it enables the researcher to obtain information from respondents considered to be representatives of the entire population.

Population of the study

Population, according to Stocking & Murnaghan (2012) is the limits within which the research findings are applicable. It is defined in such a way that the results of the investigations are generalized". Tang (2014) defined population as a group or class of subjects, variables, concepts or phenomena. Tang (2014) define population as a theoretically specified aggregation of survey elements. Therefore, the population used for this study is residents of Igarra. The population is estimated at 14,602 (National Population Commission, 1991). The justification for using this figure as the population of the study is due to the fact that the figure was arrived at during the census held in 1991. The population is therefore projected to 2024 using growth rate of 2.8% which was estimated as 36,212.

Sources of Dataset

The data used for this research work are from two (2) sources: primary and secondary sources.

Secondary Sources

The secondary data were obtained from the library, and available literatures. The secondary sources of data used include research journals, text books, newspapers, and magazines, published and unpublished articles.

Primary Sources

This is the data collected directly from the field. The major instruments used in primary data collection were the use of questionnaire, physical observation and interview method.

a. Questionnaire: Questionnaire was administered to generate information for data analysis, this questionnaire contained series of questions (question statement) which were used to induce answers or information about environmental impacts of erosion on agricultural activities from respondents. The questions were divided into two (2) sections. Section one illicit demographic information about respondents such as age, sex, and

educational qualification, while section two provides general information on impacts of erosion on agricultural activities. Respondent were to provide answers to the questions by ticking (√) wherever is applicable to them.

b. Oral Interview Method: Oral interview was used to get information from the non-educated respondents among the respondent who cannot read and understand the questions.

Sample Size and Sampling Techniques

Sample must be representative of the population from which it is drawn. In other to determine the sample size, the study adopted the theory of Taro Yamane. The calculation was done at 0.10% level of significance and the relevant figure is 99.63 approximately 100. Therefore 100 respondents were selected and investigated as the sample to represent the entire population of the study and the respondents were picked randomly. The study adopted simple random techniques to select respondent at random for investigation. The sample size is calculated as follows:

$$n = \frac{N}{1+Ne^2} \quad (1)$$

Where;

n = Sample size

N = Population of the study

E = Level of significance/Error estimate at 0.10%

3. Results and Discussion

Results

Table 1 shows that 57 respondents representing 63.33% are male, while 33 respondents representing 36.67% are female. Table 2 shows that 8 respondents representing 8.89% are less than 20 years of age, 29 respondents representing 32.22% are 21–29 years of age, 19 respondents representing 21.11% are 30–39 years of age, 20 respondents representing 22.22% are 40–49 years of age, while 14 respondents representing 15.56% are 50 years and above. Table 4 shows that 30 respondents representing 33.33% are SSCE holders, 37 respondents representing 41.11% are ND/HND holders, 15 respondents representing 16.67% are B.Sc holders, while 8 respondents representing 8.89% are M.Sc holders. Table 5 shows that farming is the source of income for 25 respondents, representing 27.78%; self-employment is the source of income for 27 respondents, representing 30%; and trading is the source of income for 32 respondents, representing 35.56%. 6 respondents representing 6.67% were underemployed. Table 6 shows that 37 respondents representing 41.11% agreed that erosion has affected their income level, 25 respondents representing 27.78% strongly agreed that erosion has affected their income level, and 28 respondents representing 31.11% strongly agreed that erosion has not affected their income level, while there was no response from the respondents if they strongly disagreed that erosion has affected their income level. Table 7 shows that 37, 57 respondents representing 63.33%, said Yes, that human activity is a major cause of erosion; 13 respondents representing 14.44% said No, that human activity is not a major cause of erosion, while 20 respondents representing 22.22% were not sure of their response. Table 8 shows that 10 respondents representing 11.11% agreed that the government has done a lot to reduce damage potential and loss of life from erosion, 21 respondents representing 23.33% strongly agreed that the government has done a lot to reduce damage potential and loss of life from erosion, 40 respondents representing 44.44% disagreed that the government has done a lot to reduce your damage potential and loss of life from erosion, while 19 respondents representing 21.11% strongly disagreed that the government has not done a lot to reduce damage potential and loss of life from erosion. Table 9 shows that 12 respondents representing 13.33% strongly agreed that erosion has affected the transportation of agricultural products in the community, 60 respondents representing 66.67% disagreed that erosion has not affected the transportation of agricultural products in the community, 18 respondents representing 20% strongly disagreed that erosion has not affected the transportation of agricultural products in the community, while there was no response from respondents if they agreed that erosion has not affected the transportation of agricultural products in the community. Table 10 shows that 33 respondents representing 36.67% agreed that erosion has affected farm harvest yield in the community, 15 respondents representing 16.67% strongly agreed that erosion has affected farm harvest yield in the community, 39

respondents representing 43.33% disagreed that erosion has affected farm harvest yield in the community, while 3 respondents representing 3.33% strongly disagreed that erosion has affected farm harvest yield in the community. Table 11 shows that 25 respondents representing 27.78% said yes, they have noticed changes in soil quality due to erosion; 59 respondents representing 65.55% said no, they have not noticed any changes in soil due to erosion, while 6 respondents representing 6.66% were not sure of their response.

Table 1: Gender of Respondents

Option	Frequency	Percentage
Male	57	63.33
Female	33	36.67
Total	**90**	**100**

Source: Field Survey, 2024.

Table 2: Age of Respondents

Option	Frequency	Percentage
Less than 20 years	8	8.89
21-29	29	32.22
30-39	19	21.11
40-49	20	22.22
50 and above	14	15.56
Total	**90**	**100**

Source: Field Survey, 2024.

Table 3: Marital Status of Respondents

Option	Frequency	Percentage
Single	15	16.67
Married	67	74.44
Divorced	-	-
Widow/widower	8	8.89
Total	**90**	**100**

Source: Field Survey, 2024.

Table 4: Educational Qualification of Respondents

Option	Frequency	Percentage
SSCE	30	33.33
ND/HND	37	41.11
BSc	15	16.67
MSc	8	8.89
Total	**90**	**100**

Source: Field Survey, 2024.

Table 5: What is your primary source of income?

Option	Frequency	Percentage
Farming	25	27.78
Self employed	27	30
Trading	32	35.56
Employment	6	6.67
Total	**90**	**100**

Source: Field Survey, 2024.

Table 6: Has erosion affected your income level.

Option	Frequency	Percentage
Agreed	37	41.11
Strongly Agreed	25	27.78
Disagreed	-	-
Strongly Disagreed	28	31.11
Total	**90**	**100**

Source: Field Survey, 2024.

Table 7: Is human activities a major cause of erosion?

Option	Frequency	Percentage
Yes	57	63.33
No	13	14.44
Not sure	20	22.22
Total	**90**	**100**

Source: Field Survey, 2024.

Table 8: Government has done a lot to reduce damage potential and loss of life from erosion

Option	Frequency	Percentage
Agreed	10	11.11
Strongly Agreed	21	23.33
Disagreed	40	44.44
Strongly Disagreed	19	21.11
Total	**90**	**100**

Source: Field Survey, 2024.

Table 9: Has erosion affected the transportation of agricultural products in your community?

Option	Frequency	Percentage
Agreed	-	
Strongly Agreed	12	13.33
Disagreed	60	66.67
Strongly Disagreed	18	20
Total	**90**	**100**

Source: Field Survey, 2024.

Table 10: Has erosion affected farm harvest yield in the community?

Option	Frequency	Percentage
Agreed	33	36.67
Strongly Agreed	15	16.67
Disagreed	39	43.33
Strongly Disagreed	3	3.33
Total	**90**	**100**

Source: Field Survey, 2024.

Table 11: Have you noticed any changes in soil quality due to erosion?

Option	Frequency	Percentage
Yes	25	27.78
No	59	65.55
Not sure	6	6.66
Total	**90**	**100**

Source: Field Survey, 2024.

Discussion

The study revealed that most farmers in the area are within the working age and are mostly males. The effect of erosion was also examined as it affected the integrity of the soil when the soil was loosening its particles, followed by their suspension in the initial erosion water, loss of soil fertility, and land itself. It also destroyed the topsoil, which is the main medium for agricultural productivity. The environmental effects of erosion and agricultural development were also examined. The study revealed that erosion caused water pollution and loss of farm products. Furthermore, erosion of farmland could be controlled by applying mechanical methods and vegetation establishment practices of terrace farming. It also revealed that there are some agricultural practices that reduced the rate of erosion on farmland, like shifting cultivation, monocropping, and plantation agriculture.

Also, many problems confronting agricultural development in the study area were examined. Such problems include the use of crude implements, poverty, illiteracy and ignorance, poor transportation, and problems of the land tenure system. Also, the solution to the problems of the land tenure system is that more loans should be granted to the farmers and chemicals should be used to control pests and diseases. Finally, the study also showed that farmers need education on new farming techniques. This should be vigorously perused by agricultural extension officers; lastly, government interventions can reduce the effects of erosion on agricultural development.

4. Conclusion

It has been seen clearly that the trend of farmland erosion should be curbed. There should be a management organ that will campaign on effects of erosion on our environment. The management can also assist individual farmers and other stakeholders to look for convenient ways of controlling erosion on farm land. It was even revealed that provision of fertilizer and infrastructural facilities can improve agricultural development. Also, the introduction of improved crops and modern agriculture in the study area.

Recommendations

After the data collected has been analyzed and carefully interpreted, the following recommendations were made in order to alleviate problems of farmland erosion on agricultural productivity at Igarra, Edo State.

i. The government should provide a motorable road for easy transportation of farm produce.
ii. Provision of fertiliser for crop yield.
iii. Provision of funds for those engaged in farming for the development of agriculture. This can be in the form of loans or grants from banks, individuals, or governments.
iv. Government should impose policy interventions such as the provision of extension workers.
v. The local, state, and federal governments should be encouraged to establish suitable programs that would lead to measured agricultural productivity.
vi. Institutes such as the Cocoa Research Institute of Nigeria (CRIN) and Nigerian
vii. Institute for Oil Palm Research (NIFOR) should carry out research relating to farmland erosion.
viii. Nigeria's farmers and Nigerians as a whole need to see agriculture as a compulsory economic activity by all and sundry.
ix. The development of agriculture and its sustainability should be seen as a new paradigm in the agricultural productive area as a nation at large.

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