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Impact of Farmland Erosion on Agricultural Development in Rural Area

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Abstract:

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. This study examined the impact of farmland erosion on agricultural development in Ibarapa Central Local Government Area of Oyo State. Data were collected using structural questionnaire, oral interview and personal observation. A total of 200 respondents comprising of farmers were given questionnaire to administer with the help of the researchers. Data collected were analyzed and presented in table. The study revealed that more males were involved in farming in Ibarapa Central Local Government Area. Erosion affected Alabi-illumo farmland than other farmlands. It was also revealed that erosion was wearing farm lands and roads in the study area, and caused low productivity, loss of farm product; loss of soil fertility; water pollution; and damaging of roads. Based on the finding, it was recommended that government and individuals should encourage to supports the control of erosion, transportation facilities should be improved upon; 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. Also alternative means of controlling erosion should be employed by individuals.

Keywords:

Erosion, Farmland, Agriculture Development, Rural Area

1. Introduction

The current food security challenge in Nigeria consists of two dimensions: the first tries to maintain and increase Nigeria's ability to meet its national food requirements, and the second seeks to eliminate inequalities and poverty amongst households that is made apparent by inadequate and unstable food production, lack of purchasing power, poor nutritional status and weak institutional support networks and disaster management systems

Annually, 75 billion tons of soils are lost from farm lands, and 12 million hectares of cropping land which means approximately 1% of the total area is no longer fit for

farming, leading to the degradation of 38% of global cropland since World War II (Dahl, 2013). Soil loss also leads to several other farm challenges, and as these problems increase, there comes a point at which the farm is abandoned (European Cooperation in Science and Technology [COST], [3]; Anthoni, [2]).

All governments, research bodies and international services are instituting 'a wide range of measures to modernize and increase agricultural production. This is because the farmers are consequently faced with new and sophisticated problems of the millions affected by these measures the great majority are individuals.

Agricultural development is a planned process of transforming a subsistence, poverty ridden, over-populated and technological hackwork Agricultural sector into a modern concern. Agricultural development is said to have taken place when there are enough food for people, enough raw materials for industries and reasonable income for the farmer. In a monetized economy, Agricultural development may mean increase in the production of export crops with an improvement in the quality of grades of such exports crops so as to ensure adequate foreign exchange earnings.

Soil erosion is one of the main themes in environmental studies, an unresolved question is whether its relevance is accorded due place in agriculture and related studies. This is of great concern because of all human activities; the agriculture sector is affected the most by erosion. It is considered the most conspicuous and widespread agent of soil/land degradation ever known (Lal, [11]; COST, [3]; Kumar & Ramachandra, 2003). It is estimated that 1/6 of global soils has already been degraded by erosion due to water and wind, resulting in a reduced ability of society to produce sufficient food (agriculture) (COST, [3]). The productive power of some lands (worldwide) has declined by half due to the effect of erosion and desertification (Eswaran, Lal, & Reich, [5]).

According to Ojo and Johnson [16] soil erosion is a dynamic geomorphic event operating on the landscape. Ighodaro, *et. al.* [8] sees erosion as the gradual wearing a wayof land through processes of nature, as by streams and wind. Further, Jones [9] defined soil erosion as "the wearing away of the land surface by physical forces such as rainfall, runoff 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". However, Marsh and Grossa [14] simply define soil erosion as the dislodgement of particles from the soil.

Human activities which includes farming, logging, grazing growing dependence on forest resources, coupled with high population growth rate had to change of the original vegetation cover and further depletion of the soil (Ighodaro, *et. al.* [8]).

The soil erosion reduces the farmland, abates the agricultural productivity, and causes the deterioration of the ecological environment in rural areas; hampering the sustainable development of the rural community and making a growing numbers of rural residents live in poverty.

Erosion occur in all states of the federation between 25-30 million tons of soil loss are recorded annually in Nigeria due to gully erosion Okojie [17] covering between 0.5% - 0.6% estimated land surfaces. The problem is more intense in the eastern parts of Nigeria where the idea to community in Imo State was deserted because of the loss of land for agriculture and residential area Okojie, [17]. In northern states, wind erosion is quite common farmlands and sand dune sites several communities have sadly been displaced from their homes Okojie [17]. Hence the study examined

farmland erosion and agricultural development in Nigeria and its implication of farmland in Ibarapa Central Local Government Area of Oyo State.

The aim of this study is to examine the causes of erosion on farmland and its effect on agricultural development in rural area with the specifically objectives of identifying the agricultural practices that exist among the farmers in the areas; to identify crops that are cultivated and offered for sales in the market centers of the zone; to examine the extent of each farmland size in the study area; to identify the types of erosion that occur in the area as well as to examine the causes of erosion of farmland and its effect on agricultural development. Also to investigates the problems faced by farmers as a result of erosion and suggests solutions to the problems faced by farmers in the study area.

1.1. Causes of Soil Erosion

Topography:- Ordinarily in the absence of water, land is exposed to the possible effects of wind and other climatic elements. And the effects are spectacular to an extent. However, when water is introduced the situation bromes highly remarkable. Consider, for example, when drop water hits the surface of land from a height as with raindrop. The drop creates a tiny crater through the losing impact and suspension of the detached particles of soil. With many drops of water and coalescence of the splashes, a mild flooding develops. Depending on the texture of the soil and its permeability soaking or down ward/see page erosion or leaching may set in.

Slope: As the degree of slope increase, erosion by water is geometrically increased. As the gradient or percent of slope increases, the velocity of run-off water increase which increases it erosive power. A doubling of velocity of run-off water increases the kinetic energy or erosion power four times and causes a 32 time increases in the amount of material of a given particles size that can be carried

Rainfall factor: Consider the recent Mozambican climate disaster in which it rained non-stop for days leading to enormous degradation of landscape. The continuous down pour saturated ground water and soil beyond field capacity, causing flooding, runoff and general erosion. Complicating the situation further was the continuous folding from 9 other southern Africans rivers flowing through Mozambique. In the same vein, rapid down pour of large amount of rain (intensity) which leaves little room for percolation through the soil causes the characteristic flash floods and erosion. The rainfall factor is a measure of the erosive force of specific rainfall. The erosive force or available energy is related to both quantity and intensity of rainfall.

De-vegetation:- The causes can be associated as natural phenomena, the singular action of humans which leads to de-vegetation of the landscape aggravate erosion the mos. The cover offered by the vegetation foliage reduces and temper the impact of the beating rain and water drops on the land there by discouraging the loosening and suspension of soil particles. The shear obstruction created by vegetation plant stems and root systems also significantly affects the amount of surface water erosion that could develop. The root system helps to hold water in the soil. Much as the vegetation cover serves as habitat for human and wildlife, its removal through deforestation, clearing, overgrazing or bush burning pose serious threats to life, the soil structure and eventual water and wind erosion.

Soil Factors: The structure and texture of the soil contribute to water erosion that occurs on it. In a soil with large pore air spaces for rapid infiltration and reduces flooding and consequent run-off. Conversely on a poor structured soil which was low

number of crumbs and airspaces, typical of clayey-textured soil erosion is facilitated. At times as a result of direct exposure to a heavy down pour, silt and crumbs are knocked about to plug up air spaces, hampering infiltration and encouraging rapid run-off, flash floods and water erosion. The key physical soil factor which influences water erosion, therefore remains the presence or see pages paths for water, which is the air spaces; they determine the permeability of the soil which in turn affects the level of water erosion.

1.2. Effects of Soil Erosion

Soil attrition can be devastating to agricultural development and food security (Ighodaro, Lategan, & Yusuf, [7]. It leads to productivity or overall farm yield losses, especially because of decreased fertility of the soil due to loss in soil nutrients. Soil erosion has enormous negative impact on agriculture. Research shows that in most developing countries, especially Sub-Saharan Africa 60-70% of the population in the rural areas depends on agriculture to earn a livelihood (Loulseged& McCartney, [12]). It diminishes the quality of soil through the loss of water, soil organic matter, nutrients, biota, and depth of soil, thus reducing the productivity of natural, agricultural and forest ecosystems (Pimentel &Kounang, [18]). Further, eroded sediment contains a considerably higher measure of organic matter and nutrients than that of the topsoil from where it is derived (Young, [19]). In fact, it is perceived that soil attrition is the principal, or largest, environmental problem in South Africa (Muliban, [13]). Compounding the problem is the fact that soil formation rates in the country are thought to be about 30 times slower than rates of soil loss (Hoffman et al., [6]). Thus, to attain food security and improvements in livelihoods, especially in the rural areas of South Africa, soil erosion is no doubt one of the agricultural problems that need to be addressed.

The effect of running water over soil surface is little realized until significant damage has occurred. Generally the first effect which affects the integrity of the soil and land is the loosening of soil particles followed by their suspension in the initial flood water which soon gains momentum in the presence of a slope, to become runoff water. As the run off continues down in the slope, loss or soil, soil fertility and land itself occur. It proceeds in stages now used to describe the effect of water erosion, that is, from sheet erosion to rill erosion and finally as gully erosion while gully erosion is the most spectacular, and observed in a fairly defined location, sheet erosion gradually degrades the top soil (the main medium for agriculture productivity) with negative implications on soil fertility and crop yields. After the sheet erosion must have continued for some time, tiny funnels of furrows are observed, signaling the beginning of rill erosion through the tiny funnels, the runoff water gains velocity and erosive power which widens the furrows, dislodging more soil particles.

1.3. Methods of Controlling Soil Erosion

Vegetation Establishment: Vegetation may be very effective in controlling erosion. This is primarily due to the facts that the practices involved are aimed at reducing detachment of soil particles or the movement of soil particles or both. Among the most important vegetative methods of controlling erosion is the choice of cropping programme which will keep the vegetation cover on the land for as long as possible. Planning and carrying out a good crop rotation will go long way towards accomplishing this.

Mahdi-Al-Kaisi [15] saw trip cropping is another technique which is general effective in controlling soil erosion. This establishment of spreading types of vegetation of crop in a strip which is at right angles to the flow of crops or fallow land. There are many different ways of using strip cropping techniques, among which are the following field strip cropping and win strip cropping Mahdi-Al-Kaisi [15]. Establishment of cover-crops or mulching aids gradual introduction of water into the soil which in turn sips down without causing run off. Other practices which control soil erosion include organic manuring, crop rotation, afforestation and planned construction activities devoid of long exposure of bare land (Ighodaro, *et. al.* [8]).

Mechanical Method: Is usually involves a structure of one kind or another and are applied to area which has eroded beyond the state where the use of a vegetation cover alone is inadequate. In some cases, mechanical and vegetation cover methods are combined to control erosion. The following are the mechanical method; Building of dams (small and large), the use of terraces and the construction of diversion ditches.

1.4. Soil Erosion and Impoverishment on Agricultural Farmlands

Soil is fundamental to all agricultural practices and great care has to be taken to ensure that it is not misused or destroyed under natural conditions; soil fertility is replenished by such process as leaf fall organic decomposition and animal decay (Adigun and Olaniyan, [1]). There are some agricultural practices in the area that make their soil to be impoverishment. They include; over cropping, over grazing, deforestation, slope wise cultivation. Etc.

The Local Government Area, land users for the purpose of its study involve farmers, the interventionist agent from the local, State Ministry of Agricultural and Environment such as extension agents and other official including the consumers of farm products. Erosion is removal of top soil caused by wind, water ice, animal and human activities. The types of erosion caused by many factors include splash erosion, sheet erosion, rill erosion, and gully erosion. These types of erosion have implication of farmland such as destruction of top soil, which is good for agricultural practice, loss of crop and or pasture during fresh erosion, loss of nutrients (including fertilizer) with the eroded soil, downstream damage to channels or rivers flats, by sentiment and flood water and lowering the quality of water available to downstream users. The control measures of erosion in Ibarapa Central Local Government Area are: Avoiding overgrazing, bush burning and removal of soil cover, application of time so as to help loss soil from aggregate and good farm structure. Erection of barriers and construction of water channels. Also the used of improved agricultural practices e. g. terracing making contour bund, ridges and cross ridges, practicing strip cropping. The control/measure varies from place to place depending on various factors.

2. Materials and Methods

This study analyzed and investigated farmland erosion and agricultural development in Nigeria. In realization of this aim, this study was investigative in its approach. Attempts was made to analyze the effect of erosion on agricultural development and farmlands identified, causes and measures of controlling erosion in the study area. The population of this study consist of selected the farmland in Igbo-ora, Ibarapa Central Local Government Area form the study population of this research. There are over sixty farm lands in Igboora, which is the headquarters of Ibarapa Central Local government Area. Due to many isolated farmlands in Igboora,

all the farmlands cannot be sampled; hence this study was carried out in five selected farmlands in Igboora. The farmland is located on Alabi-ilumo, Babanla, Babaode, Obatade and Okewusi.

In Igboora (Ibarapa Central Local Government Area) of Oyo State, Nigeria random sampling technique was used to ensure that every farmland stands a chance of been selected. This study adopted the use of questionnaire as the primary tool for gathering data. The questionnaire was administered on a randomly selected farmers found in the farmlands. Two hundred (200) questionnaires were administered in the five selected farmland owners of farmers in each of the location to identify their perceptions on the problem and recommendations in the study areas. A well developed and self-employed question was carefully formulated to solicit correct responses from the respondents. Question items in the questionnaire related to bio data of respondents, perception of erosion, methods of controlling erosion and agriculture were interpreted to the respondents in local language when necessary, because most of the farmers are illiterates. Also, the researcher filled out the questionnaire himself were the respondent cannot write.

Oral interview and observation techniques were also used to bring out relevant information that was needed for this research study. Simple percentage, frequency count and cross tabulations were used for data analysis and presentation.

3. Results

Bio-data of the Respondents

Table 1. *Age Distribution of Respondents*

Age class	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
19-25 yrs	6	9	6	7	6	34	17%
24-40 yrs	8	6	12	8	10	44	22%
41-55yrs	16	14	18	16	16	80	40%
56 above	8	8	10	8	8	42	21%
Grand Total						200	100%

Source: Author's Analysis, 2017.

Above table indicated that 80 (40%) of the respondents had their age range between 41 and 55 years, while 44 (22%) for 24 – 40years, 42 (21%) and 34 (17%) and their age range between 56 above and 19-25 year respectively.

Table 2. *Sex Distribution of Respondent*

Sex	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
Male	24	30	28	34	26	142	71%
Female	16	10	12	6	14	58	29%
Grand Total	40	40	40	40	40	100	100%

Source: Author's Analysis, 2017.

Table 2 indicates that 142 (71%) of the respondent were male, while 58 (29%) of the respondent were female. Its shows that male formed the majority of the respondents.

Table 3. *Educational Qualification of respondents.*

Qualification	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
Non formed	12	12	20	4	20	68	35%
Primary	4	12	0	28	4	48	24%
Secondary	16	16	12	4	12	60	30%
Tertiary	8	0	8	4	4	24	12%
Total	40	40	40	40	40	200	100%

The table above indicated that respondent with non-formal education formed the majority with 68 (34%) followed by secondary school leavers with 60 (30%) while 48 (24%) and 24 (12%) each were primary school leavers and tertiary institution graduates respectively.

Table 4. *Farm Size of Respondents.*

Farm size	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
1-5 plots	36	4	24	16	28	108	44%
1-10 acres	0	28	12	16	12	68	34%
11 and above	4	8	4	8	0	24	12%
Grand Total	40	40	40	40	40	200	100%

Source: Author's Analysis, 2017.

Table 4.6 According to the distribution above, the farm size ranged from 1-5 plots 108 (54%) while 1-10 acres are just 68 (34%) and 10 acres and above are only 24 (12%) of the farm size.

Respondents Perception on Erosion.

Table 5. *Type of destruction erosion causes to farmland.*

Types of destruction	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
Loss of farm	40	40	20	40	40	180	90%
Low productivity	0	0	20	0	0	20	10%
Grand Total	40	40	40	40	40	100	100%

Source: Author's Analysis, 2017

Table above, indicated response about destruction erosion brings to farmland. It is obvious that the area witnessed excessive erosion and consequently the loss of farm products had a share of 180 (90%) while 20(10%) respondent experienced the fact that erosion led to low productivity.

Table 6. *Farmers perception on vehicular transportation of Good Difficulty*

Damage	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
Gullies along the road	20	12	16	6	18	72	36%
Erosion wearing of soil	12	12	8	16	6	54	27%

Impassable road	4	16	0	6	0	26	13%
Excessive pot hole	4	0	16	12	16	48	24%
Grand Total	40	40	40	40	40	200	100%

Source: Author's Analysis, 2017

The table shows that 72 (36%) respondents indicated that gully along the road were a serious threat to transportation of farm products. Another 54 (27%) said erosion causing wearing of road while excessive pot-holes, impassable road were other threats to transportation of farm products in the study.

Table 7. *Dominant Erosional types Affecting farmland productivity.*

Type(s)	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
Gully Erosion	20	24	24	28	24	120	60%
Rill Erosion	16	16	8	4	12	56	28%
Sheet Erosion	4	0	8	8	4	24	2%
Grand Total	40	40	40	40	40	200	100%

Source: Author's Analysis, 2017

In the table above, it was obvious that gully erosion affected most farmlands as it shared of percentage was 120(60%) while rill erosion responses percentage was 56 (28%) when sheet erosion took 24 (12%) of the total percentage distribution of responses on dominated erosional type(s) affecting farmland productivity in the study area.

Table 8. *Responses on prominent method of farming.*

Responses	Alabi-illumo farmland	Babanla farmland	Babaode farmland	Obatade farmland	Okewusi farmland	Sub No	Total%
Mixed farming	12	10	8	14	10	54	27%
Crop rotation	6	4	10	6	4	30	15%
Subsistence	10	12	10	8	12	52	26%
Plantation	6	8	4	2	8	28	14%
Bush fallowing	6	6	8	10	6	36	18%
Grand Total	40	40	40	40	40	200	100%

Source: Author's Analysis, 2017.

From table 8, 54 (27%) respondents believed mixed farming as a prominent method of farming followed by 30 (15%) crop rotation another 52 (26%) practiced subsistence farming and 28 (14%), 36 (18%) respectively practiced plantation farming an bush fallowing.

Table 9.*Method of Controlling Erosion.*

Response	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
Planting of cover crops	24	20	12	16	8	80	40%
Construction	12	12	8	12	12	56	28%

of diversion ditches							
Practicing terrace farming	4	8	20	12	20	64	32%
Grand Total	40	40	40	40	40	200	100%

Source: Author's Analysis, 2017

From table 9, a total of 80 (40%) respondents agreed that planting of cover crops, 56 (28%) saw construction of diversion ditches and 64 (32%) opined that practicing of terrace farming are effective methods of controlling erosion.

Table 10.*Fertilizer supply for development of agriculture.*

Response	Alabi-illumo	Babanla	Babaode	Obatade	Okewusi	Sub No	Total%
Adequate	8	0	12	16	0	36	18%
Inadequate	32	40	28	24	40	164	82%
Total	40	40	40	40	40	200	100%

Source: Author's Analysis, 2017

Interestingly 164 (82%) of the respondents said that the supply of fertilizer for agricultural development was not adequate while 36 (18%) of the respondents said that was adequate fertilizer supply.

4. Discussion

The discussions of the findings from the study area are listed below: The areas have witnessed excessive erosion and consequently the loss of farm products, this led to low productivity. It also witnessed that gullies along the road was a serious threat to transportation of farm products.

Through the findings, it was obvious that gully erosion affected most farmlands in the study area. It was also revealed that most farmers employed mixed farming as a method of farming system and farmer apply the planting of cover crops as a method of controlling erosion in many farmlands.

The findings of agricultural development in the study area revealed that fertilizer supply is not adequate for agricultural development and many farmers considered shifting cultivation as a useful system in fertilizing the soil.

This study examined farmland erosion and agricultural development in Igboora, Ibarapa Central Local Government Area of Oyo State, Nigeria. The study revealed that most farmers in the area within the working age and are mostly males. It was also observed that gully erosion was the major erosion type that affects the farmland; this is caused mainly by topography, rainfall factor; de-vegetation and soil factors. Effect of erosion was also examined as it affected the integrity of the soil, when the soil is loosening it particles followed by their suspension in the initial flood water, loss of soil fertility and land itself. It also destroyed the top soil which is main medium for agricultural productivity. The environmental effects of erosion an agricultural development were also examined. The study revealed that erosion caused water pollution and loss of farm product.

Furthermore, erosion of farmland could be controlled by applying mechanical methods, vegetation establishment practicing of terrace farming. It also revealed that

there are some agricultural practices that reduced the rate of erosion on farmland like shifting cultivation, mono cropping 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 land tenure system. Also, the solution to the problems of land tenure system, more loans should be granted to the farmers and using of chemicals to control pests and diseases.

Finally, the study also showed that the 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.

5. Conclusions

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.

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 Igboora in Ibarapa Central Local Government, Area of Oyo State;

a. Government should provide motorable road for easy transportation of farm procedure.

b. Provision of fertilizer for crop yield.

c. Provision of funds for those engaged in farming for the development of agriculture. This can be in form of loans or grants from banks, individuals or governments.

d. Government should impose policy interventions such as provision of extension workers.

e. The local, state and federal governments should be encouraged to establish suitable programme that would led to measured agricultural productivity.

f. Institutes such as Cocoa Research Institute of Nigeria (CRIN) and Nigerian Institute for Oil Palm Research (NIFOR) should carry out researches relating to farmland erosion.

g. Nigeria farmers and Nigerians as a whole need to see agriculture as a compulsory economic activity by all and sundry.

h. The development of agriculture and it sustainability should be seen as a new parading in agricultural productive area as a nation at large.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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