

Assessing the Socio-Economic Impact of Gully Erosion in Chikun Local Government Area, Kaduna State, Nigeria

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Abstract

Soil erosion is the systematic removal of soil including plant nutrients from the land surface by various agents of denudation. The aim of this study is to assess the adverse social and economic implications of gully erosion hazards in Chikun local government area, Kaduna State, Nigeria. The study intends to identify the percentage of the residents according to localities that have suffered socially and economically from gully incidents. It also intends to determine the relationship between adverse social and economic effects suffered by the affected people in the various localities of the study area. The settlements studied are in Chikun local government area, Kaduna State. Simple random sampling was adopted in the course of this research for the purpose of selecting households and respondents affected by gully erosion living at the gully proximate areas. Simple random sampling was adopted in the course of this research for the purpose of selecting households and respondents affected by gully erosion living at the gully proximate areas. Data for the study was collected from two major sources; primary source and secondary source. Primary source of data are direct observation from fieldwork and the use of questionnaire while the secondary source include topographic map and library materials. Descriptive statistical tools were applied to deal with the techniques of summarizing and describing data collected. Percentages, proportion and mean were applied to get other parameters such as expected frequencies. Pearson's co-efficient of correlation was used to analyze the relationship between the social and economic effects of gully erosion in the area. Findings reveal that the solution to gully erosion impacts is to be treated as a vital component of the broad issue of environmental problem management in Kaduna State.

Keywords: *Gully Erosion, Social, Economic, Impacts, Environment, Chikun, Soil.*

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Background to the Study

The biospheric layers of the earth constitute the layer where the activities of both micro and macro organisms take place (Jimoh, 1999; Ofomata, 2010). It is on this layer that the activities of man in his environment take place. These activities undertaken by man include mining, quarrying, agriculture, constructions, lumbering, among others (Geller, 1982; Jeje, 1982). In all these activities, man gives little attention to their implications on the environment, such as soil erosion (Howard and Remson, 1978; Kowal and Kassan, 1988; Hindson, 1983).

The earth's landforms are closely inter-related and some of the observation which has been made with the passing of time shows that these landforms are acted upon by the processes of erosion causing the landforms to undergo a progressive change from initial forms sequentially to ultimate forms (Sparks, 1995). This geomorphic event may degenerate into sheet, rill or gully types of erosion (Cooke and Doornkamp, 1974; Jimoh, 1999). Sheet erosion is essentially a process that involves the uniform removal of soil surfaces, which is when the soil surface is undergoing a uniform degradation. Rills are parallel grooves of little depth covering the land surface which can easily be filled through normal cultivation; formation of rills is one of the consequences of flow water.

Sheet and rill erosion are the fore runners of gully erosion representing the incipient stage of the development of gully erosion (Oyegun, 1980; Bergsma, 1981). Gully erosion is any erosion channel that is so deep that it cannot be crossed by a wheeled vehicle or eliminated by ploughing, unlike rills which can easily be filled through normal cultivation.

Gully Erosion is an obvious and clear form of soil degradation consisting of an open incised and unstable channel generally more than 30 centimeters deep. It occurs where surface water flow has become trapped in a small concentrated stream, and begins to erode channels in the ground surface, making it wider and deeper. Uncontrolled progress of gullies results in 'bad land' topography and destroys the ecology and economy of the affected areas, (Cavey, 2006; Indraratna, 2008; Egboka, 2010; Ibrahim, 2014).

Statement of Research Problem

The major agents of soil erosion in the tropics includes rainfall, while some of the attributes of rainfall are; intensity, duration, drop-size, amount and frequency. other factors that contribute to the occurrence of soil erosion in the tropics includes soil type and its characteristics, topography, geology, cultural practice carried out in the region and conservative practice applied to the land (Faniran and Jeje, 1983; Davies, 2000; Ibrahim, 2014).

However, it is the combined effect of these factors of soil erosion that makes its operation and consequences hazardous and therefore of great relevance to man (Dent and Young, 1981). A case in point is the fact that soil erosion has considerably initiated landscape destructions (Burton *et al.* 1978; Jimoh, 1999; Jimoh, 2003).

Gullies are formed as a result of a combination of climatic and human influences. For instance, over-cultivation of land in certain parts of Kaduna State has resulted in gully erosion and such arrears include the Kakau, Kuriga, Gwagwada, Kujama, and most farmlands in Chikun local government area, Kaduna State such as Kunai and other neighboring villages.

At Chikun local government area, Kaduna State, each rainy season is associated with nightmares, particularly for inhabitants living at the proximity of erosion sites. 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 Kaduna 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 Chikun local government area, Kaduna State. The inhabitants of gully ravaged sites have suffered mishaps ranging from psychological trauma to loss of property and life. Observations show that gullies in Chikun local government area are allowed to advance without adequate control efforts by Government, hence, the affected people watch helplessly while their farmland and homes are destroyed.

The incidence of gully erosion in Chikun local government area, Kaduna State is not new, as it has formed a subject for research. Unfortunately, until now, most researchers are confined only to the factors causing gulling and control measures, keeping the losses sustained and other social and economic effects suffered by the affected people aside. It is of utmost importance to study and document the losses suffered by soil erosion victims in terms of social disruption, psychological effects and economic effects with a view to attracting Government, (State and Federal) to bring lasting solution to Chikun local government area erosion ravaged areas.

Objectives of the Study

The aim of this study is to assess the adverse social and economic implications of gully erosion hazards in Chikun local government area, Kaduna State, Nigeria. The objectives of this study include:

- a. To identify the adverse social impacts that resulted from gully erosion in Chikun local government area, Kaduna State.
- b. To identify the adverse economic impacts that is consequent on gully erosion in the Chikun local government area, Kaduna State.
- c. To determine the size of residents in various localities of Chikun local government area that has suffered adverse social and economic impacts resulting from gully erosion.
- d. To determine the relationship between the social and economic impacts of gully erosion in Chikun local government area, Kaduna State.
- e. To determine the common adaptive measures and their sustainability.



Plate 1: High Wall of Erosion Complex
Source: Field Work, 2016



Plate 2: A House Threatened by Gully Erosion in Chikun LGA.

Materials and Methods

Data Collection

For a reliable and proficient result in this study, structured questionnaires were administered to the gully affected areas by the researcher. Four hundred structured questionnaires were administered; eighty to each of the five erosion areas within Chikun local government area, Kaduna State; they include Kunai, Gwagwada, Kakau, Kujama and Kuriga.

Sampling Method and Sample Size

Simple random sampling was adopted in the course of this research for the purpose of selecting households and respondents affected by gully erosion living at the gully proximate areas. Respondents were also selected from heterogeneous populations that make up gully affected migrants and other unaffected living populations of Chikun Local Government Area.

Respondents comprise only of stakeholders from Kunai, Gwagwada, Kakau, Kujama and Kuriga communities of Chikun local government area, Kaduna State. The instrument used in data collection include, observation, questionnaire and measurements while Descriptive statistical analysis was applied to deal with the methods and techniques of summarizing and describing information (data).

Table 1: Collation of Questionnaire Instrument

Erosion Area	Number Distributed	% of the No. Distributed	Number Collected	Percentage (%) Return Rate
KUNAI	80	20	80	100
GWAGWADA	80	20	80	100
KAKAU	80	20	78	97.5
KUJAMA	80	20	62	77.5
KURIGA	80	20	72	90.0
TOTAL	400	100	372	93

Source: Field Work, 2016

In the course of carrying out this research, 400 (four hundred) questionnaires were distributed to the five gully erosion prone areas of Chikun local government area, Kaduna State, between April, 2015 and August, 2015. The distribution was evenly done, eighty (80) to each of the gully affected areas. The percentage return rate of the questionnaires is 93%, showing that 400 questionnaires were distributed and 372 questionnaires were returned and properly filled.

Results and Discussions

The data collected for this study are presented and statistically analyzed using frequency distributions, proportions, percentages, tables and graphs in the presentations. Data for this study are analyzed and presented based on the research questions and hypothesis that guided the study.

Demographic Structure of Respondents

Table 2 shows the demographic structure of the respondents. At Kunai 38.75% are males, 61.25% are females. At Gwagwada 43.59% are males and 56.41% females. At Kakau, the table shows that 33.75% are males and 66.25% are females. At Kujama and Kuriga 37.10% and 41.67% are males, whereas 62.90% and 58.33% are females respectively.

Table 2: Demographic Structure of Respondents.

S/No	Response	Kunai		Gwagwada		Kakau		Kujama		Kuriga	
		No.	%	No.	%	No.	%	No.	%	No.	%
1.	Male	31	38.75	34	43.59	27	33.75	23	37.10	30	41.67
2.	Female	49	61.25	44	56.41	53	66.25	39	62.90	42	58.33
Total		80	100	78	100	80	100	62	100	72	100

Source: Field Survey, 2016

Table 2 shows that on the whole 38.98% (approximately 39%) males and 61.02% (approximately 61%) females comprise the gender structure of the respondents.

Age Structure of Respondents:

Table 3 shows the age distribution of the respondents. The table shows that at Kunai age below 25 years constitutes 3.75% of the respondents while 26-45 years make up 25%. 46-65 years comprise 71.25% of respondents. At Gwagwada 2.6% is below 25years, while those between the ages of 26-45 years and 46-65 years make up 23% and 74.4% respectively.

Table 3: Age Structure of Respondents.

S/No	Response	Kunai		Gwagwada		Kakau		Kujama		Kuriga	
		No.	%	No.	%	No.	%	No.	%	No.	%
1.	Below 25yrs	3	3.75	2	2.60	2	2.50	5	8.00	4	5.56
2.	26-45yrs	20	25.00	18	23.00	23	28.75	14	22.60	17	23.61
3.	46-65yrs	57	71.25	58	74.40	55	68.75	43	69.40	51	70.83
Total		80	100	78	100	80	100	62	100	72	100

Source: Field Survey, 2016

2.5% of respondents are below 25 years. 28.75% and 68.75% are between the ages of 26-45 years and 46-65 years respectively. At Kujama, those below 25 years are 8%, those between 26-45 years are 22.6% and those between 46-65 years are 69.4%. At Kuriga, 5.5% make up those below 25years, while those between the ages of 26-45 years and 46-65 years make up 23.61% and 70.83% respectively.

On the whole, about 4.3% are below 25 years, 26-45 years constitute 24.73% while respondents between the ages of 46-65 years make up 70.97%. This shows that ages 46-65 have more knowledge of erosion in the area and has been greatly affected over the years.

Social Impacts of Gully Erosion in Chikun Local Government Area

Table 4 shows the social effects of gully erosion in Chikun Local Government Area, At Kunai 65% of respondents are affected by destruction of ancestral homeland by gully erosion. 100% are affected by loss of source of water supply. 72.5% find the gully site frightful. 92.5% experience trauma as a result of gully erosion in the area and 57.5% lost relatives.

At Gwagwada 71.25% of respondents constitute those that suffered from destruction of ancestral homeland. 100% comprise those that lost source of water supply. 68% 75% and 90% are those that find the gully sites frightful and those that experienced trauma respectively as a result of gully erosion.

Table 4: Social Effect Responses

Items	Kunai		Gwagwada		Kakau		Kujama		Kuriga	
	Resp.	%	Resp.	%	Resp.	%	Resp.	%	Resp.	%
Destruction of ancestral homeland	52	65.0	57	71.25	5.3	67.95	10	16.13	8	11.11
Loss of source of water supply	80	100	80	100	78	100	62	100	72	100
Frightful scenic environment	58	72.5	55	68.75	56	71.79	43	69.35	50	69.44
Experience of Trauma	74	92.5	72	90.0	71	91.03	55	88.71	65	90.28
Loss of Relatives	46	57.5	52	65.0	40	51.28	36	58.06	32	44.44

Source: Field Survey, 2016

67.95% affected by loss of ancestral homeland in Kakau, All the respondents are affected by loss of source of water supply, while 71.79% and 91.03% find gully sites frightful and experience trauma respectively. 51.28% lost relatives in Kakau. In Kujama 16.13% agree to have lost ancestral homeland, while 100% of respondents lost sources of water supply. 69.35% find gullies frightful, 88.71% experienced trauma as a result of gully erosion in the area, and 58.06% lost relatives. At Kuriga, 11.11% are affected by destruction of ancestral homeland, 100% lost source of water. 69.44% are frightened by the erosion, 90.28% experience trauma and 44.44% lost relatives.

Economic Impacts of Gully Erosion in Chikun Local Government Area

Table 5 shows the economic effects of gully in the study area. 38.75%, 30%, 61.54% suffered from loss of building and furniture in Kunai, Gwagwada and Kakau respectively. 92.5%, 87.5%, 80-77%, 24.19% and 11.11% are affected by loss of farmland in Kunai, Gwagwada, Kakau, Kujama and Kuriga area respectively.

77.5% Respondents in Kunai suffered from loss of planted crops, and 97.5% lost of economic trees 81.25% and 90% of respondents lost planted crops and economic trees in Gwagwada respectively. In Kakau 80.77% lost planted crops and 82.05% lost economic tress while 64.52% and 96.77% suffered the lost of planted crops and economic trees respectively 100% of all respondents from Kunai, Gwagwada, Kakau, Kujama and Kuriga lost money as a result of community contribution to gully erosion in the area. In Kuriga 44.44% lost planted crops and 97.22% lost economic trees.

Table 5: Economic Impacts Responses

Items	Kunai		Gwagwada		Kakau		Kujama		Kuriga	
	Resp.	%	Resp.	%	Resp.	%	Resp.	%	Resp	%
Loss of building and furniture	31	38.75	24	30.0	48	61.54	-	0	-	0
Loss of farmland	74	92.5	70	87.5	63	80.77	15	24.19	8	11.11
Loss of planted Crops	62	77.5	65	81.25	70	89.74	40	64.52	32	44.44
Loss of economic Trees	78	97.5	72	90.0	64	82.05	60	96.77	70	97.22
Loss of monetary contributions to	80	100	80	100	78	100	62	100	72	100

Source: Field Survey, 2016

Null Hypothesis (Ho) I:

Objective 4, which was derived from research question 4 and translates to null hypotheses. It states “There is no significant relationship between the social and economic effects of gully erosion in Chikun Local Government Area”. The Ho attempts to compare the difference that exists between the adverse social and economic impacts of gully erosion in Chikun Local Government Area.

Table 6: Summary of correlation analysis for social effects of gully erosion in Chikun Local Government Area

Statistical Technique	Number of Cases	X ² Value	df	Level of Significance	Critical Value	Decision
Person’s product correlation coefficient	372	0.2573	n-2=3	0.10	1.638	Accept
				0.05	2.353	Ho

Source: Researchers Computation, 2016

The correlation analysis computed for the relationship in the extent of the adverse social and economic impacts is 0.2573. The critical values at 0.10 and 0.05 are 1.7638 and 2.353 respectively. The decision rule is, reject Ho if the calculated value of chi-square (0.2573) is greater than the critical values at 0.05 which is 2.353; also at 0.1 the critical value 1.638. Therefore, Ho is accepted since the calculated value is less than the critical values. Hence it is concluded that “There is no significant relationship between the social and the economic impacts of gully erosion in Chikun Local Government Area”.

Remediation Measure for Gully Erosion Menace

The menace of gully erosion in Chikun Local Government Area has called for urgent remedies in order to arrest further loss of arable land, buildings and other properties, transportation and communication links. The long term weapon in controlling gully erosion is vegetation but structures may be required to stabilize a gully head or to promote

siltation and vegetative growth in the gully floor. A good reason for this is that while structures may be subjected to decay and become less effective over time, vegetation can multiply and thrive and improve over the years. For a long term success of gully stabilization, a good vegetative cover has to be established on the gully floor. This will prevent further gullying and allows the gully floor to gradually silt up reducing the fall over the gully head. Using wire netting, logs or concrete a series of small weirs can be constructed to trap sediment as well as encourage vegetative growth.

Conclusion

From the analysis on the social and economic effects of gully erosion in Chikun Local Government Area, the study concludes that our environment is a part of our social and economic survival and what happen within the environment we live can impact negatively to our survival. More so, for greater effectiveness, the solution to gully erosion impact is to treat.

Recommendations

Gully Erosion menace is one phenomenon to which the adage, “A stitch in time saves nine” is most applicable. A number of the severe and devastating gullies would not have resulted had they been attended to at their incipient stages. It is against this background and based on the findings of this study that the following recommendations have been made:

- i. The effects due to gully erosion and other natural environmental disasters make the need for an integrated environmental planning and studies very important and urgent.
- ii. An integrated catchments drainage system is lacking in the study area and this can be controlled. The control is surface run off and maintenance of stable soil slopes in gullies involves engineering schemes.
- iii. Most of the human activities observed during the study portrayed lack of awareness by the generality of the populace, of the nature and action of erosion as well as of the consequence of their activities.
- iv. Tree planting campaigns should be intensified and there should be legislation/laws for aforestation and against deforestation. Enlightenment and consciousness in erosion control should include land use habits of the people in their agricultural practices and care vegetation.

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