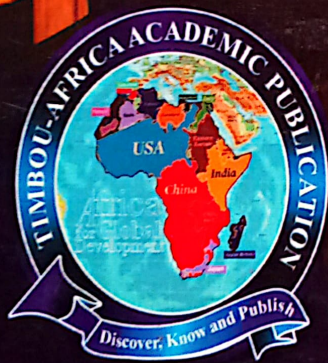


UniMaid - 2023

MULTIDISCIPLINARY ACADEMIC CONFERENCE ON
ACHIEVING NEW SUSTAINABLE DEVELOPMENT,
JULY 28, 2023



EDITORS:
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PUBLISHED DATE: 31ST JULY, 2023
PROCEEDINGS BOOK

ON SHAPING THE FUTURE, TRENDS AND INSIGHTS FOR
DEVELOPING WORLD: INTELLECTUAL RESEARCHES FOR
ACHIEVING NEW SUSTAINABLE DEVELOPMENT



MULTIDISCIPLINARY

ACADEMIC CONFERENCE 2023 VOLUME 7

JULY 28, 2023, UniMaid, BORNO, NIGERIA

PROCEEDINGS BOOK

Volume 7 (1). ISSN: 427-444-3844-1

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Published Date: July 31, 2023

Multidisciplinary Academic Conference 2023 Volume 7

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**THE SOCIOECONOMIC IMPACT OF GULLY EROSION ON RAFIN
GORA COMMUNITY, KONTAGORA LOCAL GOVERNMENT AREA,
NIGER STATE, NIGERIA**

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Abstract

The aim of this study is to examine the socioeconomic impact of gully erosion on Rafi Gora Community of Kontagora Local Government Area, Niger State, Nigeria. The study used both primary and secondary data, frequency percentage statistics was used to analyzed the data. As revealed in the study rainfall/runoff ranked the highest with 47.0%, inadequate drainage system ranked second with 36.0%, human activities ranked third with 17.0% and vegetal depletion ranked the least with 4.0%. This shows that the major cause of gully erosion in the study area were rainfall/runoff and inadequate drainage system. damage to infrastructure ranked the highest with 42.7%. Damage to agricultural lands ranked second with 32.2%, increased surface runoff and degradation ranked third with 15.7% and increased sediment concentration in rivers/stream ranked the least with 9.4%. This shows that the major impact of gully erosion is damage to infrastructure such as houses, roads and bridges as revealed in the study. The social impact of gully erosion in the study area include destruction of ancestral homeland by gully erosion, loss of source of water supply, gully site frightful and loss of lives while the economic impact include loss of building and furniture, loss of farmland, loss of planted crops, loss of economic trees and lost money as a result of community contribution to gully erosion as indicated in the study. The study recommends that drainages

along these paved roads should be cleared sand dislodged of accumulated debris and silt to enhance free flow of storm water and debris from inhabitants. In addition, areas that have no drainages, drainage system should be constructed with width and depth according to the standard to enable it carry debris and sediment loads, this will help to forestall flood in this area during wet season, it is strongly suggested that, there should be strict compliance with building regulations by the community and proper canalization of the River Suka from its source to a single outflow.

Keywords: Gully erosion, Rafin Gora and Socioeconomic

Introduction

Soil is a natural resource that may look robust and endless, but is in fact the fragile product of thousands of years of formation (Vrieling, *et al.*, 2008). Soil is the upper most part of the earth surface and consider as one of the most important natural resources that is available everywhere. It is the major determinant of physical activities, for instance farmers considers its types, fertility and texture among others for site suitability for farming, civil engineers relate soil types to residential development while the availability of some mineral resources also largely depend on the soil types (Vrieling, *et al.*, 2008).

Mbaya (2013) viewed that despite the fact that soil is very important to the well-being of the physical and socio-economic activities of man, erosion remains a threat to soil quality and quantity. Soil erosion by water has been recognized as the most severe hazard threatening the protection of soil as it reduces soil productivity by removing the most fertile top soil (Vrieling, *et al.*, 2008). Soil erosion by water is the commonest way in which soils are degraded and many forms of soil loss are easily seen during or shortly after periods of heavy rains (Stocking and Murnaghan, 2000). Human activities disturb the land surface of the earth and thereby induce the significant alteration of natural erosion rates.

Onyegbule (2010) defined soil erosion as a process whereby the surface layer of the soil is detached and carried by agents of denudation and a lower in the soil is exposed leaving a topographic roughness on the resulting landscape. Ogboi and Odeh (2012) observed that erosion problems are more common in cultivated farmland, exposed/bare compounds, on poorly constructed road sites and in places of

concentrated buildings and that area plagued by soil erosion has the vegetation cover removed either by cultivation or construction works or bush burning. Accordingly, the factors of soil erosion in Nigeria resolve into two components: physical (geologic or natural) and anthropogenic (human or accelerated)

Gully erosion is a widespread and often dramatic form of soil erosion caused by flowing surface water. Gullies are perhaps the most devastating and wide spread form of soil erosion (Jibo *et al.*, 2020). Gullies could be considered as signals of disturbances and accelerated erosion brought about by climate or land-use change. Gully erosion can be an acute problem causing high sediment yield, removal of fertile soil, destabilization of hill slopes, and the lowering of water tables in alluvial aquifers.

Gully erosion has become a serious environmental disaster and also a threat to well-being of people. It has threatened and destroyed many of the physical infrastructures, properties, as well as retarding the social and economic growth and development of the inhabitant. (Jibo *et al.*, 2020). Apart from the loss of fertile soil and continuous diminutions of cultivable land, there is additional loss of properties to include losses of homes, household belongings, farm crops and utilities (Danladi and Ray, 2014). It consists of open, unstable channels that have been cut more than 30 centimetres deep into the ground. Gully erosion is a result of the interaction of land use, climate and slope. It occurs on many different soils and landforms in Nigeria.

Gully erosion had several socio-economic and political implications which caused a wide range of complex issues within the study area. Some of the immediate consequences included the displacement of people, the destruction of infrastructure such as houses and roads. The destruction of roads and other infrastructure delayed on-going development initiatives and political processes.

In the long-term, affected areas had to deal with the spread of infections and water borne diseases, cholera, dysentery and diarrhea which increased the need for safe drinking water and the provision of water purification tablets. This study further observed that the displacement of people and damage to infrastructure has disrupts communities precisely Rafin Gora and its environs in their development effects and impact on the achievement of almost every Millennium Development Goal. Rafin Gora is characterized by many unplanned and haphazard development and attitude that calls for great concern in order to halt the potential danger of gully erosion in the area. Gully erosion disaster is on the increase in Rafin Gora and this is due to reckless and unplanned constructions of building which are carried out without regards to rules and

The study respondents were 398 and simple random sampling was used to distribute the questionnaires among the respondents. Two hundred and fifty five (255) questionnaires were returned for data analysis.

Table 1: Summary of Materials and Methods

S/N	Research Objective	Data Required	Data Source	Method of Analysis
1	To identify the causes of gully erosion in the study area	Questionnaire and oral interview	primary source (questionnaire and interview)	Descriptive statistic (frequency percentage)
2	Examine the socioeconomic effect of gully erosion in the study area	Questionnaire, oral interview. Photography taken in the affected areas	primary and secondary source (questionnaire, interview, observation and photography taken from the field)	Descriptive statistic (frequency percentage)
3	Asses the adaptation put in place to reduce the impact of gully erosion in the study area	Questionnaire, oral interview.	primary and secondary source (questionnaire, interview, observation and photography taken from the field)	Descriptive statistic (frequency percentage)

Results and Discussion

Causes of Gully Erosion in the Study Area

Causes of gully erosion in the study area include depletion of vegetal cover, heavy rainfall and poor urban planning. Depletion of vegetal cover was seen in the study area as a result of agricultural activities and human settlement.

Present of gullies in the study area

Before knowing the causes of gully erosion, the study asked the respondents about the presence of gully erosion and their responses revealed that the study area has gully erosion sites as indicated in Figure 2 of the study.

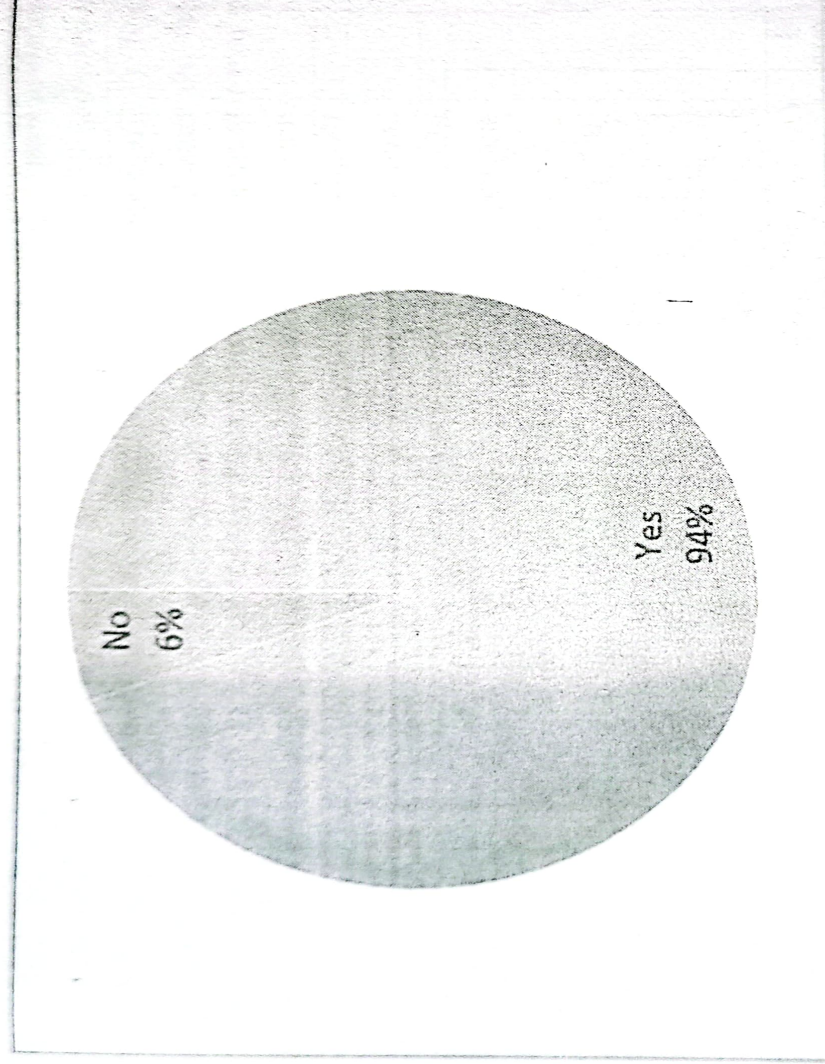
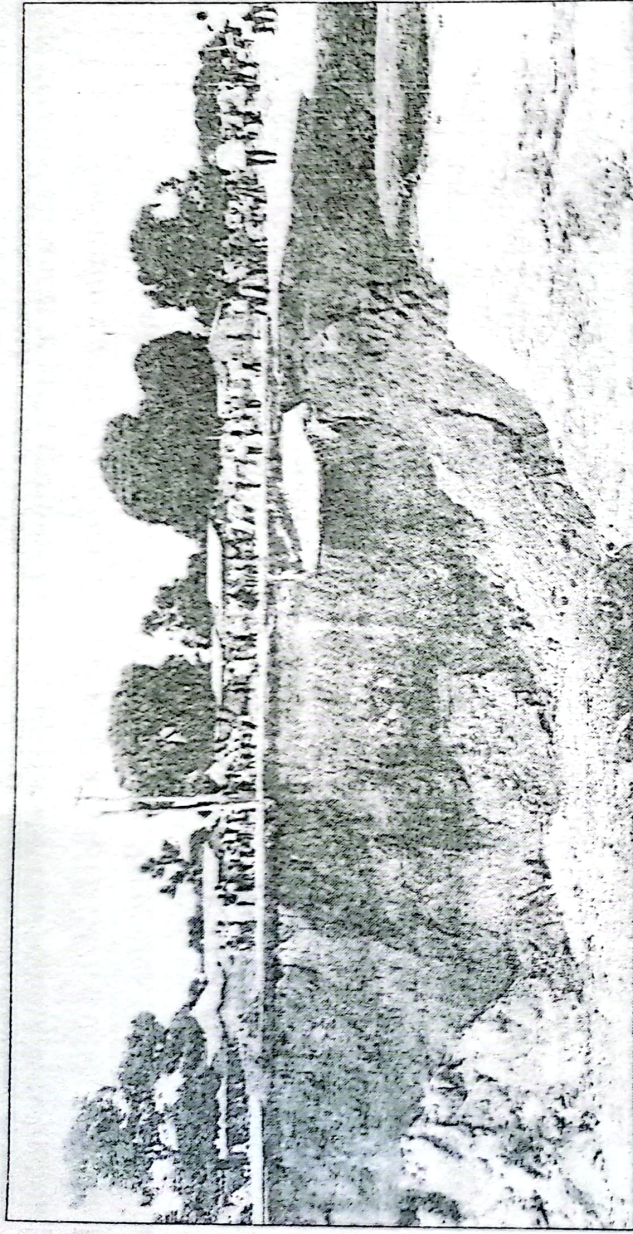


Figure 2: Presence of Gully Erosion Sites observed by the Respondents

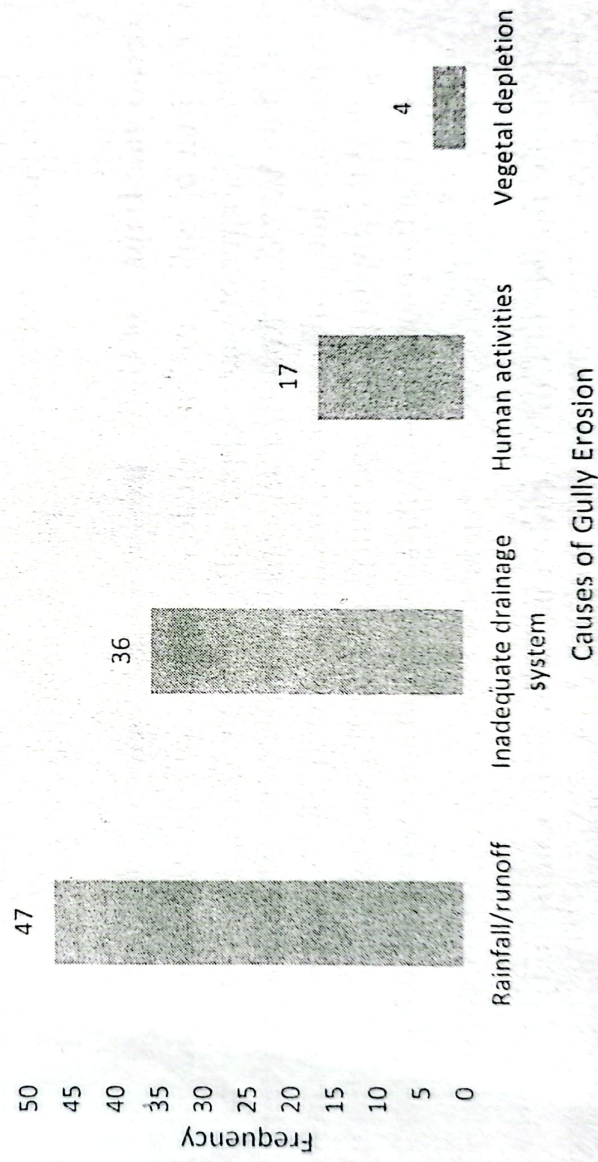
Source: Field Survey, 2022

Figure 2 revealed that 94% of the respondents affirmed the gullies in the area while 6% answered in the negative. By implication therefore, most parts of the area are affected by gully erosion. The result obtained indicated that respondent's opinions as to the causative agents of the gullies in the area were of the opinion that the gullies were caused by rainfall. Plate I revealed the presence of gully erosion in Rafin Gora Community.



**Plate 1: Gully Erosional Site in Rafin Gora Community
Source: Field Survey, 2022**

As revealed in Figure 3 of the study, rainfall/runoff ranked the highest with 47.0%, inadequate drainage system ranked second with 36.0%, human activities ranked third with 17.0% and vegetal depletion ranked the least with 4.0%. This shows that the major cause of gully erosion in the study area were rainfall/runoff and inadequate drainage system.



**Figure 3: Causes of Gully Erosion in the Study Area
Source: Field Survey, 2022**

The detailed of causes of gully erosion in some part of Rafin Gora community include;

- i. **Rainfall/runoff:** - This is one of the most active cause that wash down soil surface easily and rapidly especially when associated with sloppy land with poor soil infiltration capacity.
- ii. **Inadequate drainage system:** - Inadequate drainage outflow to carry out mixed water from buildings and roads has accelerated gully erosion in the study area. This water flow out to any catchments, it is this concentrated runoff or water body that erodes the soil easily. This however impinges unfavorable upon other infrastructures like roads and houses making the former to develop erosion features while the latter leads to collapse and dilapidation of walls.
- iii. **Human activities:** - These are changes inflicted on soil by human induced gully erosion over many years. These human activities involved sand mining of soil for brick making and plastering of building. This however, makes the sand loosed and easily washed away by agents of erosion.
- iv. **Vegetal depletion:** majority of the people in the selected areas are observed to be poor and so, they go out to strip fuel wood for domestic cooking and for agricultural activities. This is observed to be the commonest cause influencing gully erosion. This nonchalant attitude tenders the soil loose and unable to infiltrate excess rainfall and thus result to gully formations.

Socioeconomic Impact of Gully Erosion on Rafin Gora Community

Social impact of gully erosion include destruction of ancestral homeland by gully erosion, loss of source of water supply, gully site frightful and loss of lives as indicated in Table 2 of the study. Loss of lives ranked the highest with 36.9%, destruction of ancestral homeland by gully erosion ranked second with 29.4%, loss of source of water supply ranked third with 19.2% and gully site frightful ranked the least with 14.5%. This revealed that the major social impact was loss of lives which include children and adult of the study area.

Table 2: Social Impact of Gully Erosion in Rafin Gora Community

S/No.	Options	Number of Respondents	Percentage (%)
A	Destruction of ancestral homeland by gully erosion	75	29.4%

B	Loss of source of water supply	49	19.2%
C	Gullysite frightful	37	14.5%
D	Loss of lives	94	36.9%
	Total	255	100%

Source: Field Survey, 2022

The economic impact include loss of building and furniture, loss of farmland, loss of planted crops, loss of economic trees and lost money as a result of community contribution to gully erosion as indicated in Table 3 of the study. Loss of farmland/planted crops ranked the highest with 36.9%, loss of building and furniture ranked second with 33.3%, loss of money ranked third with 23.1% and loss of economic trees ranked the least with 6.7% of the total sampled population. This revealed that the major economic impact of gully erosion in Rafin Gora community was loss of farmland/planted crops.

Table 3: Economic Impact of Gully Erosion in Rafin Gora Community

S/No.	Options	Number of Respondents	Percentage (%)
A	Loss of building and furniture	85	33.3%
B	Loss of money	59	23.1%
C	Loss of economic trees	17	6.7%
D	Loss of farmland/planted crops	94	36.9%
	Total	255	100%

Source: Field Survey, 2022

Adaptation strategies put in place to reduce the effect of gully erosion in the study area

The loss due to gully erosion in the study area has increased demand on the land for housing, agriculture and other human activities. This calls for the application of landscaping and other measures such as channelization of floodwater, Geoinformation – Based Early Warning System (GEOBEWS), tree planting and erection of concrete breakers to mention a few in protecting and preserving the environment. The adaptation strategies put in place include gully lining, gully plugs with sand bags and gully plugs with big stones as its shown in Figure 4 of the study.

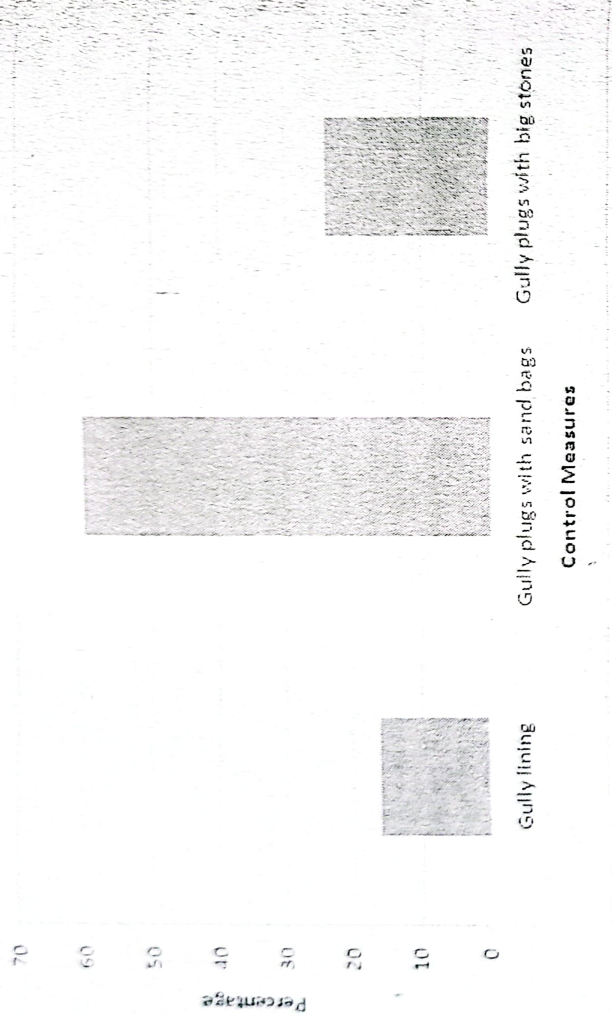


Figure 4: Adaptation Strategies in the Study Area

Source: Field Survey, 2022

The analysis in Figure 4 shows the respondents use adaptation strategies to reduce the impact of gully erosion in the study area. The use of gully plugs with sand bags constitute 60% of the control measures adopted, the use gully lining constitute 16% and the use of gully plugs with big stones constitute 24% of the respondents'.



Plate II: Rehabilitated road in Rafin Gora

Adaptation Strategies put in place by government to reduce the Impact of Gully Erosion in the Study Area

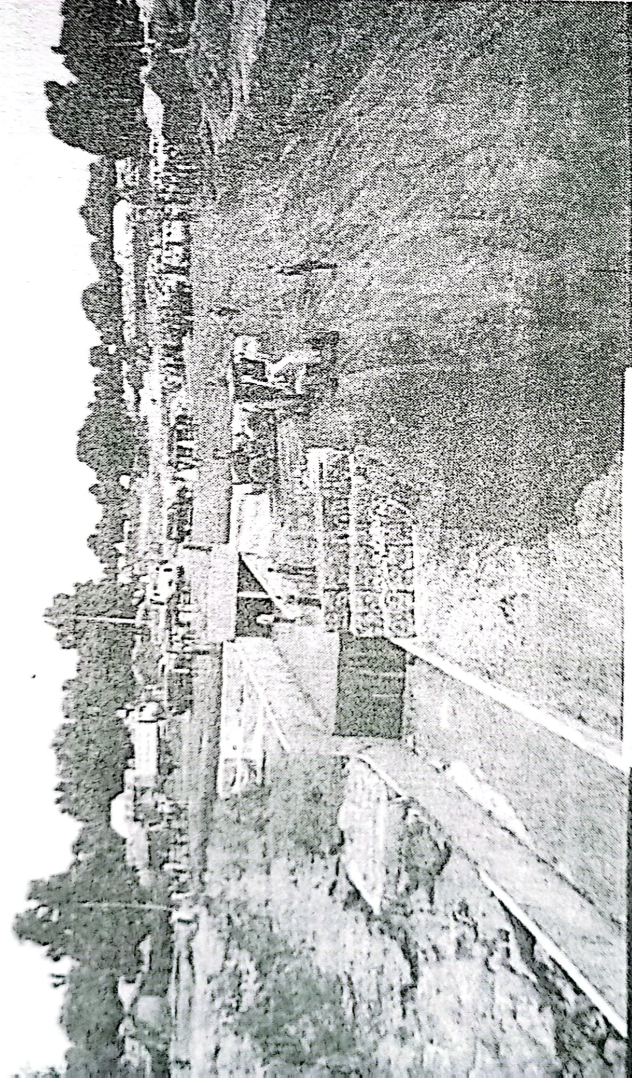
Another adaptation strategies of minimizing the impact of gully erosion in Rafin Gora community as indicated in Table 4 include reclaiming of gully through proper construction of drainage channels, planting of carpet grass on the reclaimed land, eliminating of grazing along the reclaimed land, maintaining remnant vegetation along drainage lines, avoid excessive cultivation along the upstream of the gully erosional sites and installation of gradient control structures in drainage lines. All these alternative strategies will reduce erodibility of soil, reduce velocity of run-off and flow and reduce run-off volume in the study area.

As indicated in Table 4 of the study, reclaiming of gully through proper construction of drainage channels ranked the highest with 25.5%, planting of carpet grass on the reclaimed land ranked second with 23.1%, maintaining remnant vegetation along drainage lines ranked third with 17.3%, eliminating of grazing along the reclaimed land ranked fourth with 14.5%, avoid excessive cultivation along the upstream of the gully erosional sites ranked fifth with 12.9% and installation of gradient control structures in drainage lines ranked the least with 6.7% of the sampled population. This revealed that the major adaptation strategy in minimizing the impact of gully erosion in Rafin Gora community was reclaiming of gully through proper construction of drainage channels which is already taking place in the study area as depicted in Plate III of the study.

Table 4: Adaptation Strategies put in place by government to reduce the Impact of Gully Erosion

S/No.	Options	Number Respondents	of Percentage (%)
A	Reclaiming of gully through proper construction of drainage channels	65	25.5
B	Planting of carpet grass on the reclaimed land	59	23.1
C	Eliminating of grazing along the reclaimed land	37	14.5

D	Maintaining remnant vegetation along drainage lines	44	17.3
E	Avoid excessive cultivation along the upstream of the gully erosional sites	33	12.9
F	Installation of gradient control structures in drainage lines	17	6.7
	Total	255	100



II: Reclaiming of gully through proper construction of drainage channels in Gora

sion

e analysis on the social and economic impact of gully erosion in Rafin Gora nity, the study concludes that our environment is a part of our social and c survival and what happen within the environment we live can impact y to our survival. More so, for greater effectiveness, the solution to gully mpact is to treat. Gully erosion menace is one phenomenon to which the v stitch in time saves nine” is most applicable. A number of the severe and

D	Maintaining remnant vegetation along drainage lines	44	17.3
E	Avoid excessive cultivation along the upstream of the gully erosional sites	33	12.9
F	Installation of gradient control structures in drainage lines	17	6.7
	Total	255	100

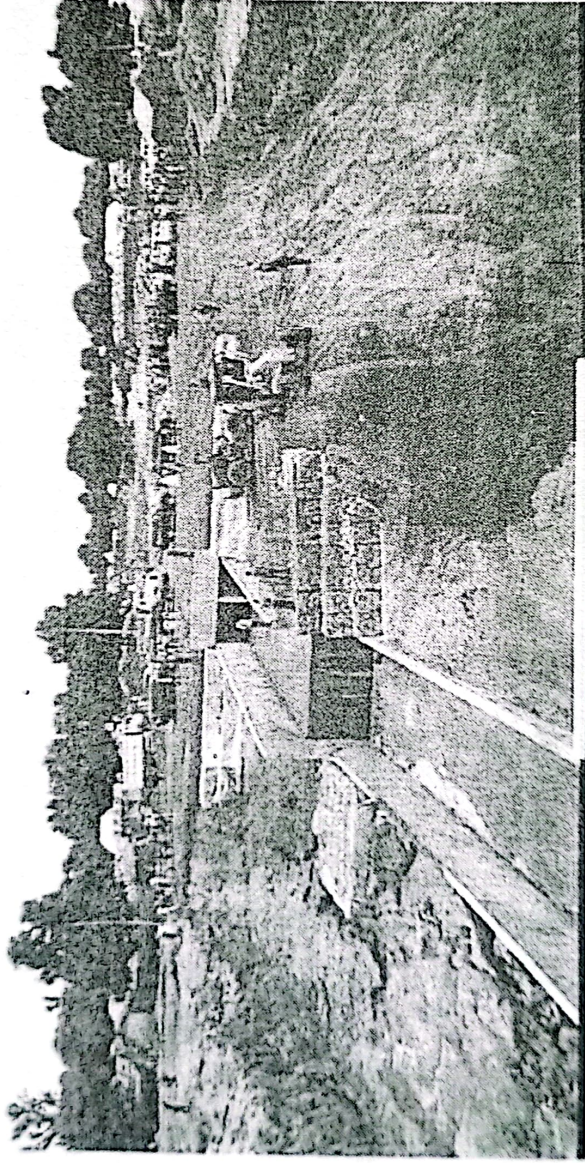


Plate III: Reclaiming of gully through proper construction of drainage channels in Rafin Gora

Conclusion

From the analysis on the social and economic impact of gully erosion in Rafin Gora community, 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. 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 recommended that 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. That 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 and tree planting campaigns should be intensified and there should be legislation/laws for afforestation and against deforestation.

It has been observed that for decades, the people of study area have been facing the threat of gully erosion as one of the most environmental problem. The erosion at this site first appeared as rill and because it has not been checked, it transformed into deep gullies especially, along the river channel that kept increasing every wet season. And if this erosion features are not checked, it will reduce the workable land units and fragment it into smaller parcels that could be of no valuable use. It also breaks up biogeographical environment. Inadequate drainage system and heavy rainfall were the major causes of gully erosion, as people fetch fuelwoods or cut down trees for housing and farming development, the soil become loose and easily dislodge by rain drops as erosion.

From the investigations, most of the paved roads in the study area are eroded by concentration of surface runoff. The drainages along these paved roads should be cleared sand dislodged of accumulated debris and silt to enhance free flow of storm water and debris from inhabitants. In addition, areas that have no drainages, drainage system should be constructed with width and depth according to the standard to enable it carry debris and sediment loads, this will help to forestall flood in this area during wet season. From the observation of dilapidated and collapsed buildings, it is strongly suggested that, there should be strict compliance with building regulations by the people. Proper canalization of the River Suka from its source to a single outflow. This will help to divert the flow of river from areas that are prone to erosion.

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