

# IMPACT OF GULLY EROSION ON SMALL AND MEDIUM FARMS IN PONYAN COMMUNITY, KOGI STATE, NIGERIA

By

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## ABSTRACT

Rural communities within the low-lying contours are often subject to erosion which threatens their lives and properties. Soil erosion is an important socioeconomic problem and an essential factor in assessing functional ecosystem. This necessitated the study of the impact of gully erosion in small/medium farms in Ponyan community, Kogi State, Nigeria. In carrying out this study, questionnaires were distributed to the various groups of farmers and individuals in the community. Descriptive analysis was used for the analysis. It was discovered that 38.46% of the respondents are on lease land, 57.69% are not lease landed property and 3.85% is not lease or lease land property (either inherited or family land).

Keyword: Community, crop production, erosion, farm, soil

## INTRODUCTION

Rural communities are often subject to erosion which threatens their survival. Soil erosion and accompanying land degradation are typical of such stresses, and efforts to incorporate an understanding of the land users' role in soil conservation have been made internationally (Graland et al, 2007).

Soil erosion is an important socioeconomic problem and an essential factor in assessing ecosystem health and function. Estimates of erosion are essential to issues of land and water management, including sediment transport and storage in lowlands, reservoirs estuaries, and irrigation and hydropower systems. Soil conservation specialists have for many years attempted to estimate soil loss. Recent environmental concerns require that soil losses and sediment yield predictions be made to evaluate the extent of non-point pollution sources (Santos *et al.*, 2003).

According to Chinelova *et al*; (2002), in the United State of America (U.S.A.) soil has recently been eroded at about 17 times the rate at which it forms. Ninety percent of U.S. cropland is currently losing soil above the sustainable rate. Soil erosion rates in Asia, Africa and South America are estimated to be about twice as high as in the United States of America estimates that 140 million ha of high quality soil mostly in Africa and Asia will be degraded by 2010, unless better methods of land management are adopted. Chinelova *et al*; (2002), further stated that the global rate of anthropogenic erosion, estimate at 27 billion tons of sediments transported to the oceans every year, is three times the natural rate. In the Czech Republic fifty-four percent of arable land is endangered by water erosion. Considering the various shape categories, e.g. forty-four percent of arable land has from 3° to 7°, 9.8% from 7° to 12° and 0.7% more than 12° "endangered by water erosion".

Soil erosion is an interactive process influenced by both natural and cultural factors. Such as precipitation, relief, geological and soil properties, vegetation cover and Land use (Nyakatawa *et al.*, 2001). Soil erosion is a natural process which is frequently exacerbated by human interventions in the environment. In extreme cases the topsoil can suffer services degradation. Limitations to the ecological function of soils include: human behaviour leading to soil erosion, the degradation or destruction of surface and ground waters, a decline in the water retention of soil, a decline in the regulatory rate of soil in the hydrosphere generally and a decline in soil biomass productivity (Qiangguo, 2002). Important indirect effects include in situation of streams, Lakes or reservoirs and entrophication. The main consequences of soil erosion by water on agricultural production and the environment can be divided into groups: loss of soil, transport and sedimentation of soil particles, and Transport and loss of chemical nutrients.

Accelerated soil erosion by wind or water mainly takes place on Lands used for agriculture. In the context of soil and water protection, the on-site as well as off-site damage needs to be minimized. As soil erosion is highly variable in the spatial as well as temporal domain, processes governing soil loss are different, too. Estimating amounts and processes of soil erosion therefore requires the use of different methods and models. Soil erosion is one form of soil degradation along with soil compaction, low organic matter, loss of soil structure, poor internal drainage, salination and soil acidity problems. This may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of top soil. The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainage networks (Basic *et al.* 2004).

Great deal of finance is been invested in agriculture each year in Kogi State to create and keep favourable-to-plant moisture and nutrient status in soils. Further rise in the efficiency of this investment can be achieved by improving the scientific basis, developing a precise estimation of soil loss, formation and creating a practical technology to reduce soil loss on available lands.

The objectives of this study were to examine effect and impacts of gully erosion to the inhabitants of the community and to determine the long time effect of soil loss on arable farmlands.

#### **MATERIALS AND METHODOLOGY**

Kogi State is one of the 36 States of the Federal Republic of Nigeria located within the middle belt of the country. The State is on Latitude  $3^{\circ}$  N and longitudes  $95.3^{\circ}$  E with sixteen (16) Local Government Areas and a total land mass of 32,500 square kilometers. The State shares her boundary with Edo, Ondo and Ekiti States to the South, while in the North with Niger, Federal Capital Territory and Nasarawa, and to the East with Benue and Enugu States. Kogi State is bounded by both Rivers Niger and Benue; thus the name confluence State, which provides fertile land for crop production. Human encroachment into the natural flood plain of River Niger and other rivers in the state has resulted in dire consequences of massive and destructive flooding during the periods of high rainfall.

Ponyan, is located at Yagba East Local Government Area which falls between Latitude  $6.7^{\circ}$  N,  $9.31^{\circ}$  E and longitudes  $5.7^{\circ}$  E. Ponyan is bounded by Irele Local Government Area to the East and Ilae to the West, Ifeolukotun to the south and Agmi town to the North. The community lies

within the transition belt of Nigeria with an estimated population of 7,500 (Census, 2006). The common soil types within this community are loamy soil, clay and sandy-clay-loam.

The wet season usually commences as from April to October and sometimes extending to the month of November with the average annual rainfall ranges from 1000mm to 1500mm (MNAR, 2003). Intensive crop cultivation is often carried out during this harmattan and other dry season covers November to March in recent years. The maximum temperature period in this area is usually between the months of February to April, which gives the minimum average temperature of 30° C and a maximum average temperature of about 35° C (MNAR, 2003).

#### **Method of Data Collection**

The simple random selection method was employed to cover the people residing within the Ponyan community. This involves the use of the questionnaires which were administered to the people concerned and personal interview. This method eliminates discrimination and favouritism of some villages or sets of people. For example, during the market days of Ponyan, people were randomly chosen and the questionnaires administered and interviews conducted. Following this method, farmers in the various villages were chosen and interviewed. The questionnaires were interpreted where necessary and they were prepared to collect information such as type of farming practice, ownership of the land type of crop planted etc.

Descriptive methods were used to analysis the various information obtained from the famers and people of the community.

#### **DISCUSSION**

The result of the data collected from the farmers and the communities were analysed using the descriptive method. A total of twenty six questionnaires were distributed to the various categories of farmers within the community and all were duly answered and returned. Table 1 below shows the various sizes of the farmlands cultivated by the farmers. Though, where necessary groups of farmers came together to provide a relevant information for this study.

**Table 1: Size of the land**

<b>Responses</b>	<b>No of respondents</b>	<b>Percentage</b>
Below 1ha	9	34.62
Below 2ha	5	19.23
Below 3ha	6	23.08
Below 4ha	3	11.54
Above 5ha	3	11.53
Total	26	100%

Most respondents (34.62%) used below 1hectare of land for the purpose of farming, while 19.24% used below 2hectare, 23.08% used below 3 hectares, 11.54% and 11.53% used below 4 hectares and above 5 hectares respectively.

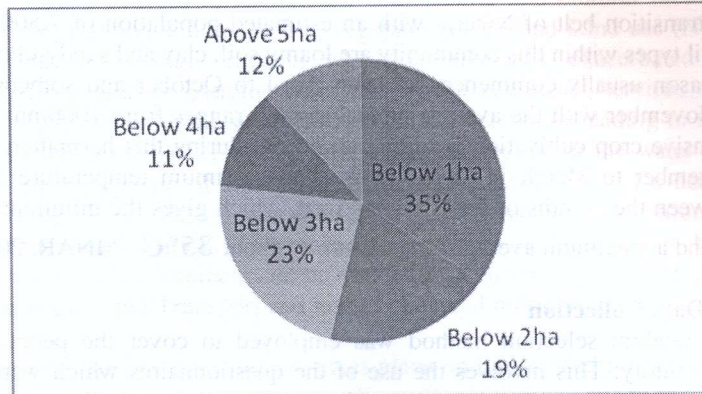


Figure 1: Chart of sizes of farmland in Ponyan community.

Table 2: Land used

Responses	No of respondents	Percentage
Farming	21	80.78
Housing	3	11.54
Others	3	7.69
Total	26	100

From the Table 2 above, most respondents 80.78% used the land for farming, 11.54% used land there for housing, while 7.69% used their land for other purpose such as business office.

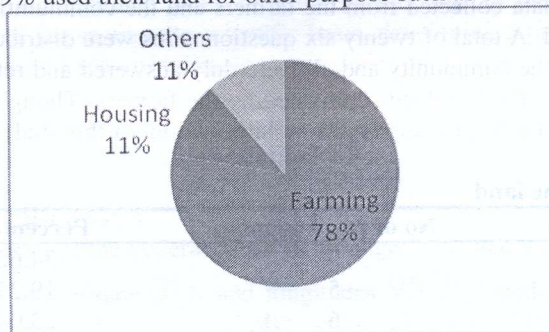
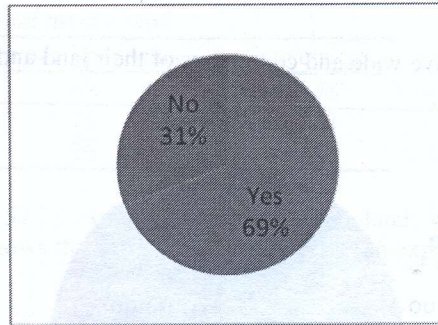


Figure 2: Chart for which land is used for

Table 3: Is the land your personal property

Responses	No of respondents	Percentage
Yes	18	69.23
No	8	30.77
Total	26	100

In the Table 3 above, 69.23% chose yes which shows that they are the owner of their landed property, 30.77% chose no, which shows that they are not the owner the landed property.

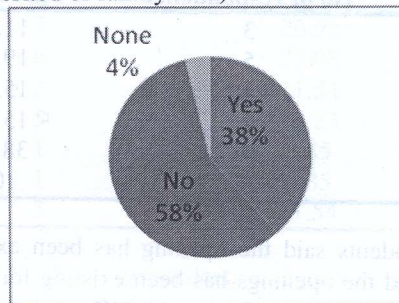


**Figure 3: Land ownership type**

**Table 4: Is the land on lease to you**

Responses	No of respondents	Percentage
Yes	10	38.46
No	15	57.69
None	1	3.85
Total	26	100

Table 4 shows the number of respondents that use lease land in Ponyan. 38.46% of the respondents are on lease land, 57.69% are not lease landed property and 3.85% is not lease or lease land property (either inherited or family land).



**Figure 4: Land on lease to respondent**

**Table 5: Type of openings on the land**

Responses	No of respondents	Percentage
Narrow and continuous	11	42.31
Point source opening	7	26.92
Wide and continuous	5	19.23
None	3	11.54
Total	26	100

From the Table 5, the respondents describe the type of openings on their farmland, 42.31% of the respondents have narrow and continuous, 26.92% of the respondents have point source opening,

19.23 % of the respondents have wide and continuous of their land and 11.54% of the respondents did not chose any option.

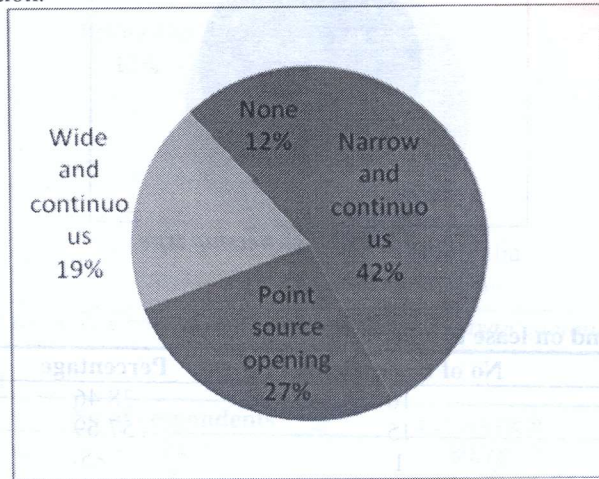


Figure 5: Type of opening on farm land.

Table 6: Notice of opening

Responses	No of respondents	Percentage
6months ago	3	11.54
1year ago	5	19.24
2yrs ago	4	15.38
3yrs ago	4	15.38
Above 3years ago	10	38.46
Total	26	100

From the Table 6, the respondents said the opening has been existing not less than 6months. 11.54% of the respondents said the openings has been existing for past six months, 19.24% said the openings has been existing for the past 1years, 15.38% have the openings for past 2years and 3years respectively and 38.46% notice the openings since past 3years.

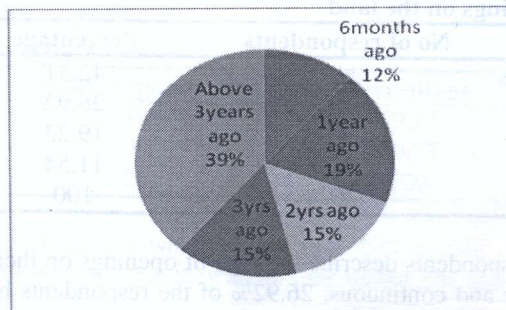
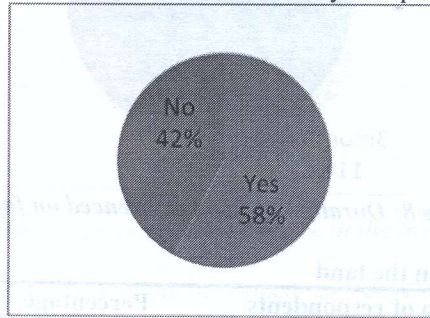


Figure 6: Notice of opening on farm land.

**Table 7: Experience of flood on the land**

Responses	No of respondents	Percentage
Yes	15	57.78
No	11	42.31
Total	26	100

From the Table 7, above 57.78 experience flood on their land, while 42.31 did not experience flood on their land. This shows that most of the land in Ponyan experience flood on their land.



**Figure 8: Experience flood on farm land**

**Table 8: Duration of the flood**

Responses	No of respondents	Percentage
1month	7	26.92
2months	6	23.08
3months	3	11.54
4months	5	19.23
6months	1	3.85
1year	1	3.85
Others	3	11.54

From Table 8 above, 26.92% of the respondents experience flood for month, 23.08% of the respondents experience flood for 2months, 11.54% of the respondents experience flood for 4months, 3.85% of the respondents experience flood for 6months and 1year, and 11.54 did not experience flood at all.

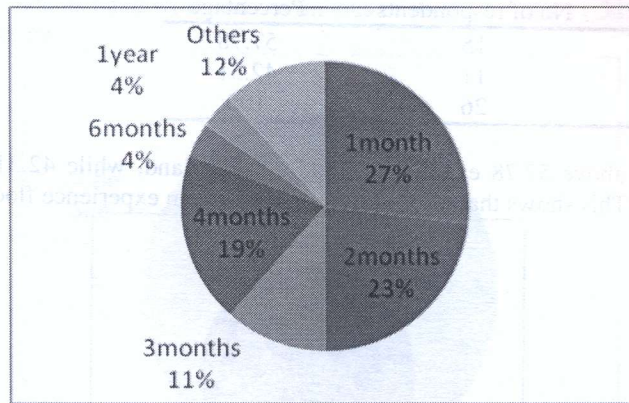


Figure 8: Duration of flood expienced on farm land

Table 9: Types of plant on the land

Responses	No of respondents	Percentage
Tuber crops	12	46.15
Cereal crops	9	34.62
Vegetables	2	7.69
Mixed crops	2	7.69
Cash crops	1	3.85
Total	26	100

From Table 9 above, 46.15% of the respondents' plant tuber crops, 34.62% of the respondents' plant cereals crops, 7.69% plant both vegetables and mixed crops, and 3.85% plants cash crops on their land in Ponyan, Yagba East Local government of Kogi State.

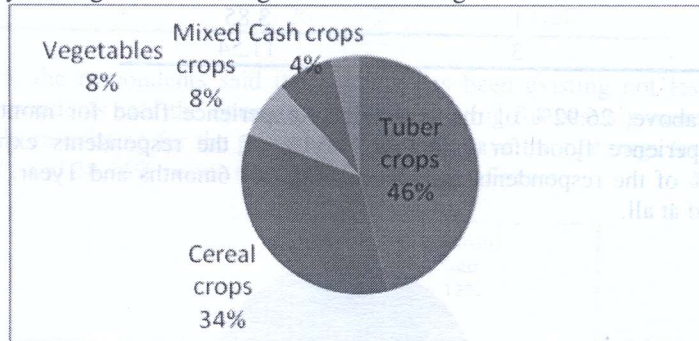


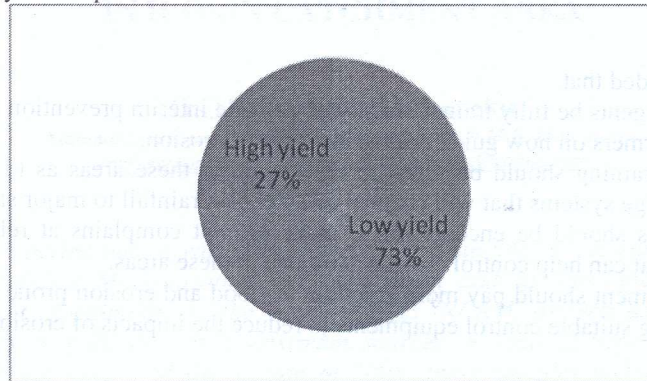
Figure 9: Types of crops planted on the farm land.

Table 10: Quantity of farm produce for past 5years

Responses	No of respondents	Percentage
Low yield	19	73.08
High yield	7	26.92
Total	26	100



From Table 10 above, 73.08% of the respondents have low yields of plant on their farmland and 26.92% have high yield of plants on the farmland.



*Figure 10: Quantity of farm produce in the last 5 years*

Gully erosion is a major problem both in developed and developing countries especially in Nigeria. Gully erosion has caused serious effect in the eastern part of Nigeria which include eroding away houses, farm plants and products, by making roads inaccessible which links rural and urban together (Owoade, 2006; Gupta, 2007). Gully erosion is one of the major factors that cause low crops yields in Nigeria today, since Ponyan is part of Kogi State in Nigeria. The gully erosion renders the top soil infertile by exposing the subsoil which is not fertile in minerals that will benefits the plants.

#### **CONCLUSION**

Erosion in all its forms involves the dislodgement of soil particles, their removal and eventual deposition away from the original position. This natural process is fundamental in landscape and soil development. Susceptibility to erosion and the rate at which it occurs depend on land use, geology, geomorphology, climate, soil texture, soil structure and the nature and density of vegetation in the area.

Generally mass movement occurs when the weight (shear stress) of the surface material on the slope exceeds the restraining (shear strength) ability of that material. Factors increasing shear stress include erosion or excavation undermining the foot of a slope, loads of buildings or embankments, and loss of stabilizing roots through removal of vegetation. Vegetation removal and consequent lower water use may increase soil water levels, causing an increase in pore water pressure within the soil profile. Increased pore water pressure or greater water absorption may weaken inter-granular bonds, reducing internal friction and therefore lessening the cohesive strength of the soil and ultimately the stability of the slope. In rural areas mass movement inhibits farm production and land use by loss of accessibility, exposure of infertile subsoil and loss of stock and capital items.

- Soil erosion also reduces the ability of soil to store water and support plant growth, thereby reducing its ability to support biodiversity.
- Erosion promotes critical losses of water, nutrients, soil organic matter and soil biota, harming forests, rangeland and natural ecosystems.

- Erosion increases the amount of dust carried by wind, which not only acts as an abrasive and air pollutant but also carries about 20 human infectious disease organisms, including anthrax and tuberculosis.

### Recommendations

It is there recommended that

1. Extension agents be fully trained on how to provide interim prevention measures to assist the local farmers on how guide against any type of erosion.
2. Adequate training should be given to the people in these areas as to how to construct local drainage systems that will channel away excess rainfall to major streams and rivers.
3. The farmers should be encouraged to make prompt complains at relevant offices and agencies that can help control erosion activities in these areas.
4. The government should pay more attention to flood and erosion prone areas with a view of providing suitable control equipments to reduce the impacts of erosion in the society.

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