IDENTIFICATION AND CHARACTERISTICS OF GULLY EROSION IN NORTH CENTRAL NIGERIA: CASE STUDY OF NASARAWA STATE

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ABSTRACT: This study assessed morphometric of gullies in Nasarawa state, Nigeria with a view to ascertain the level of distinction of the phenomenon in the state. Landscape morphology and the process that bring them into being have always been of interest to scholars. Landform evolution is therefore a product of the balancing of these forces in the presence of climatic and endogenic change geomorphic interaction is provided by the sun, geothermal and gravitational energy.Both primary and secondary data source were employed for this study. The primary data were collected from direct field observation and measurements. Secondary data were gathered through the review of relevant literature. A recommendation survey to ascertain the general characteristics of gullies in the state was carried out with the aid of topography map of the study area.The results generated from the field were subjected to statistical and laboratory analysis. The results of the findings revealed that gullies in Lafia and Wamba LGA of Nasarawa state are more affected 80% Kilema gully site in Lafia LGA recorded the highest intern of gully length 315m followed by Traffic in Wamba LGA 303m, UngwaSharu in Lafia LGA recorded the highest figure in term of gully length 325m followed by Traffic in Wamba LGA 285m respectively. In term of gully in the study area, it recorded number 21.2m, traffic in Wamba LGA 20.3m, Gangare wawa in Wamba LGA and Akurba in Lafia LGA recorded the same figure 17.3m, respectively. Gully site in Mama, in Wamba LGA and Uke in Karu LGA of the study area, recorded the last figure 4m in width magnitude. In term of area, gully site in Marhai in Wamba LGA, Mararaba in Karu LGA and UngwaTiv. In Lafia LGA recorded the highest number 0.21m^2 and Adogi gully site in Lafia LGA recorded the last of 0.5m^2. Majority of the gullies in the study area are characterized by U-S shape cross-section 60% and V-shape 30% U and V-shape 10%. The findings also revealed the results of the mean value of volume of soil loss in the study area was 14200.39tonnes/ha in all the gullies in the study area. The mean values of large gullies length were 254.77, depth was 11.86, while that of very small gullies was length 65.16, depth was 4.66 and slope angle was 9.0. Gullies in the area are long- narrow linear to rectangular shaped. 55.6% of gullies are at their continuous stage of development while 44.4% of gullies were at their continuous stage of development.
Keywords: Erosion, Gully Erosion, and Gully Characteristics.

INTRODUCTION

Erosion, a peculiar physical problem and process known to man, is therefore, defined as the gradual wearing of the land surface mainly through the detachment and transport of mineral grains through the action of geologic agents which may be mechanical or chemical (Fairbridge, 2010). This is evident by numerous records of conservation works in different countries particularly in the developed countries. These attempts at conserving the soil are aimed mainly at preventing accelerated soil loss by surface runoff and to some extent

by wind (Faniran&Ojo, 1980). Soil erosion is basically classified into two; the geological soil erosion and the accelerated soil erosion. Geological soil erosion is a natural process of the modification of the earth surface which to a large extent is governed by the nature of soil itself, topography, climate and vegetation. While accelerated soil erosion on the other hand, is the abnormal and hazardous destruction of the outermost layer of the earth mainly by anthropogenic factors which include deforestation, construction, mining, over cultivation and overgrazing (Faniran&Ojo, 1980).

Natural processes such as the formation of soil occur at an alarmingly slower rate than soil can be lost. It is estimated that over 3 billion metric tons of soil are eroded off our field in the world and pasture each year by water erosion alone (Rattan *et al*, 2010). The main variables affecting water erosion are precipitation and surface runoff. Rain drops, the most common form of precipitation, can be very destructive when they strike bare soil. With impacts of over 20mph, raindrops splash grains of soil into the air and wash out seeds. Overland flow, or surface runoff, then carries away the detached soil, and may detach additional soils and then sediment which can be deposited elsewhere (Gill, 2011). The immediate consequences of soil erosion are the loss of soil fertility, decrease in water retention capacity and soil depth, and ultimately a loss in soil stability and loss of biodiversity. Soil is then consequently, deprived not only of its strength but also its capacity to remain in both normal and stable state. In Nigeria, more than 50% (40 million hectares) of cultivable land is under medium to long-term fallows as a result of the ravages of soil erosion (Ibrahim, 2002). The overall cost of construction works increase by up to 30% due to the effective high cost of site reclamation for eroded areas (Ayuba, 2005).

Gully erosion is the removal of soil along drainage lines by surface water run-off. According to the Department of Primary Industries and Water – Tasmania, Australia (2008), gully erosion is known to be the most destructive form of soil erosion in Nigeria, which is caused by heavy or sudden rain storms which produce concentrated run-off enlarging rills into cheap channels, the run-off cuts deep gushes or gullies of over 10 meters to 20 meters and in severe situations reaching up to or over 100 meters into the land. It occurs more generally where land slopes are steep and surface run-off is exceptionally heavy. Once started, gullies will continue to move by head ward erosion or by slumping or collapsing of the side walls changing it from V-shape to U-shape

valleys (Abengude*et al.,* 1991). The United States Department of Agriculture (2006) also regards gullies as channels formed by the concentrated flow of water, removing upland soil and parent material and of size too large to be obliterated by normal tillage operations (USDA 2006).Soil erosion is among the most endemic environmental problems of modern times. During the past three decades, numerous studies have been carried out on the different processes of soil erosion as splash (Morgan, 1978; Bryan, 1979; and Luk, 1979) sheet (Kesel, 1977; Bryan &Armon 1984; and Jeje, 1987); and rill erosion by Young and Onstad (1978) Odemerho (1987) and Bryan (1987). Overall, gully erosion is the most widely studied because of the remarkable impression it leaves on the surface of the earth. In Nigeria, accelerated erosion manifesting in the form of severe gullying has been confirmed in Zaria area by Ologe, (1972, 1973, 1987); in Jos area by Grove (1952); in Kano area by Olofin (1987); in south western Nigeria by Areola and Faniran 1974; and Jeje (1988, 1391); in parts of Gongola basin (Ologe, 1988); and in Auchi and Ikpoba slope in Benin City by Jeje (1988:82). The problem of gully erosion in south eastern Nigeria is not new; it was first documented by late Sir Dudly Stamp in 1938. Stamp's review was followed by the special study of the phenomenon by Grove (1951).

In recent times, intense gullying has been reported from different parts of south-eastern Nigeria (see for instance Niger Techno, 1979; Ofomata, 1988 and 2000; Okagbue, 1988; Okoye 1988; Udosen, 1991, 2000, 2002, 2004, and 2006; Udosen& Akintola, 2007; and Igbokwe, 2004). The extent of damage to land by severe gully erosion is documented in the numerous studies by Ofomata (1964, 1965, 1973, 1978, 1981, 1984, 1985, and 1988), Igbokwe (2004), and Ofomata (2000). In fact, gullies of various sizes, appear to be among the most striking geomorphic features on the landscape of eastern Nigeria. Typical examples of gullies in the area include those of Aguiu-Nanka, Orlu, Ozuitem, Abriba, Ohafia, Onitsha, Amucha, Uyo, Itu, Aba Obotme, Arochukwu, Owerri, Aguata, Idemili North and South LGA and Orumba North. In Nasarawa State, gully erosion studies were reported in the work of Anzaku (2015), Shitu 2017, Bulus (2013) and Saheed (2016). Majority of studies in gully erosion in Nigeria focused on human activities as the primary cause of gully development. These studies point to misuse of land resources, in appropriate agricultural practice, ill-aligned road network, sand mining, unplanned and uncontrolled urbanization among others as possible causes of gully erosion. More so, gullies have caused the loss of urban residential lands and have also hampered other land uses. Lafia, Wamba and Karu Local Government Areas

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are some of the areas in Nasarawa State where the menace of gully erosion is very glaring, despite the attempts by government to control the problem. However, no similar study has focused on the morphometric analysis of gullies in the area. It is therefore against this backdrop that the study assessed the Morphometry of gullies in Nasarawa State.

METHODOLOGY

Description of the Study Area

The geographical entity known as Nasarawa State came into existence on the 1st of October, 1996. It has a central location in the middle belt region of Nigeria. The state lies between latitude 7° 45' and 9° 25'N of the equator and between longitude 7° and 9° 37E' of the Greenwich meridian. It shares boundary with Kaduna State in the North, Plateau State in the East, Taraba and Benue State in the South, while Kogi and the Federal Capital Territory flank it in the West (Binbol& Marcus, 2005). The State has a land area of 27, 137.8 square kilometre with a population of 1,863,275 according to 2006 provisional census.

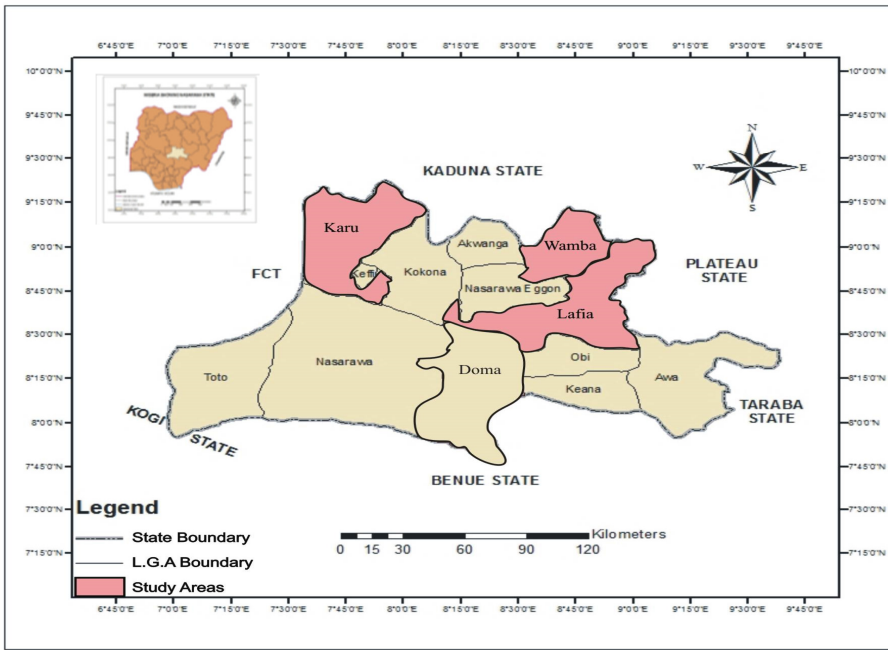

Figure 1: Map of the Study Area

Nature and Source of Data

Both primary and secondary sources of data were employed in this study. Primary data were collected from direct field observation and measurements. Data on particle size were determined. In the same vein, data on gullies morphometric properties, gullies morphology, general characteristics of gullies in the study area were also determined. Secondary data were gathered through the review of relevant literatures such as textbooks, journals, encyclopaedia and information from unpublished research findings with respect to morphometric analysis of gullies.

Method of Data Analysis

Field survey, measurement and observation were carried out to know the general characteristics of gullies in the study area. Soil samples were collected from the field and subjected to laboratory analysis to determine the particle size of each identified gully sites in the study area. The method was described by Young (1999) was applied in the study.The data extracted from field work laboratory analysis of particle size was processed using SPSS statistical software package (version 17.0).

RESULTS AND DISCUSSION

General Characteristics of Gully System in Nasarawa State

The morphological expression of gullies depends on the landscape unit, stages of development of the gullies, the characteristics of the soil profile, the slope position on which they develop and the dominant processes of the gully deepening and widening. Two criteria are generally employed in the classification of gully system; topographic location in relation to an established drainage system, and the nature of the material in which they are formed (Brice, 1966, and Ebisemiju, 1979). Brice (1966) argued that the depth of a gully, its real pattern and its growth are more closely related to the topographic position of the gully head than any other single factor. Generally, incipient gullies in the study area have deep and narrow channels with sharp pointed head scarp, while mature gullies are deep, wide and are characterized by broadly-lobed heads.

The data presented in Table 1 and 2 were obtained from Lafia, Wamba and Karu Local Government Area of Nasarawa state respectively. Generally, the gullies in these areas are characterized by streams, dense vegetation and terrain-steep slopes. From the data presented in the Table 4.1 and Table 4.1.1, it will be observed that gullies in Nasarawa State are characterised with either

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U-shape, V-shape or V and U-shape cross sections. Similarly, the data present in both tables shows that the magnitude of gullies found in Nasarawa State are either small, very small, medium or large gullies. Hence, the peculiar characteristics of the sampled thirty-six gully sites in the study area gives a true picture of the general characteristics of gully in Nasarawa State.

Table 4.1: General Characteristics of Gully System in Nasarawa State

S/N	Gully Site	Length (m)	Area (m^2)	Width (m)	Depth (m)	Cross Section	Particle Size (%)		
							Sand	Silt	clay
	Lafia LGA								
1	Adogi	256	153.6	6	5.3	V and U Shape	90.2	3.4	6.4
2	Akunza	88	44.0	5	6	U-Shaped	84.2	5.4	10.4
3	Akurba	285	493.05	17.3	12	U-Shape	86.2	5.4	8.4
4	Bukan-kwato	111	66.6	6	5	U and V Shape	86.2	4.4	9.4
5	Danka	78	39.0	5	5.7	U-Shape	92.2	2.4	5.4
6	Gandu	123	676.5	5.5	7	U-Shape	87.2	3.4	9.4
7	Gimare	127	101.6	8	6	U-Shape	88.2	5.4	8.4
8	Kilema	315	667.8	21.2	8.2	U-Shape	91.2	3.4	5.4
9	Kwandere	112	78.4	7	6.5	U-Shape	91.2	3.4	5.4
10	Tudun-Allu	252	277.2	11	7	V-Shape	90.2	3.4	6.4
11	Ung. Shawu	298	554.28	18.6	14	U-Shape	88.2	4.4	9.4
12	Ung. Tiv	154	254.1	16.5	10	V-Shape	91.2	3.4	5.4
	Wamba LGA								
13	Abu	92	524.4	5.7	6.5	U-Shape	84.0	5.4	12.6
14	Agamati	95	76.0	8	5	U-Shape	86.2	5.4	8.4
15	Arum	221	335.92	15.2	15.3	U-Shape	84.0	5.4	12.6
16	Farinruwa	110	77.0	7	7.5	U-Shape	84.0	5.4	12.6
17	Gangare Wawa	277	479.21	17.3	9	U and V Shape	86.2	5.4	8.4
18	Mama	64	32.0	5	4	V-Shape	86.2	4.4	9.4
19	Marhai	67	462.3	6.9	4	V-Shape	84.0	5.4	12.6
20	Nakere	97	58.2	6	7	V-Shape	84.0	4.4	13.6
21	Sisimbaki	87	52.2	6	5	U-Shape	84.0	4.4	13.6
22	Traffic	303	615.09	20.3	16	U-Shape	88.2	3.4	8.4
23	Ung. Giya	111	66.6	6	9	V-Shape	86.2	5.4	8.4
24	Ung. Kasa	121	992.2	8.2	7	V-Shape	86.2	4.4	9.4
	Karu LGA								
25	Ado	184	277.84	15.1	17	U-Shape	88.2	4.4	9.4
26	City College	74	525.4	7.1	6.9	U-Shape	87.2	3.4	9.4
27	GidanZakara	83	66.4	8	8	U-Shape	84.2	5.4	10.4
28	Karshi	66	396.9	6	5	U-Shape	84.0	5.4	12.6

29	Mararaba Karu	50	26.0	5.2	4	V-Shape	86.2	5.4	8.4
30	Massaka	82	65.6	8	6.3	U-Shape	87.2	3.4	9.4
31	NTA quarters	52	26.0	5	5.2	U and V Shape	84.2	3.4	12.4
32	One-man Village	114	68.4	6	8	U and V Shape	86.2	5.4	8.4
33	Sabon Gari	94	65.8	7	5	U and V Shape	84.2	3.4	12.4
34	Sharp-corner	47	277.3	5.9	5	V-Shape	84.2	4.4	11.4
35	Uke bridge	52	280.8	5.4	4	V-Shape	86.2	5.4	8.4
36	Ung. Yerima	98	68.6	7	7.2	U-Shape	86.2	4.4	9.4

Source: Field and laboratory work.

Table 4.2: General Characteristics of Gully System in Nasarawa State

S/N	Gully Site	Latitude			Longitude			Magnitude
		Degree	Minutes	Seconds	Degree	Minutes	Seconds	
Sites in Lafia LGA								
1	Adogi	8	29	46.6584	8	30	2.21	Large gully
2	Akunza	8	28	6.4704	8	36	14.465	Very small gully
3	Akurba	8	29	29.6268	8	30	25.258	Large gully
4	Bukan-kwato	8	28	16.662	8	35	14.208	Small gully
5	Danka	8	29	16.2492	8	30	56.412	Small gully
6	Gandu	8	29	19.8132	8	30	42.214	Small gully
7	Gimare	8	29	45.884	8	30	7.085	Medium gully
8	Kilema	8	29	34.1448	8	30	19.397	Large gully
9	Kwandere	8	29	23.3736	8	31	16.878	Small gully
10	Tudun-Allu	8	29	44.4732	8	32	9.611	Medium gully
11	Ung. Shawu	8	29	43.4256	8	32	5.622	Large gully
12	Ung. Tiv	8	29	31.2396	8	31	31.588	Large gully
Sites in Wamba LGA								
13	Abu	8	56	43.1808	8	36	19.271	Small gully
14	Agamati	8	56	7.9296	8	36	31.788	Medium gully
15	Arum	8	55	57.2268	8	36	42.376	Large gully
16	Farinruwa	8	55	55.6392	8	36	49.547	Medium gully
17	Gangare wawa	8	56	21.966	8	36	35.471	Large gully
18	Mama	8	56	14.8308	8	36	0.67	Small gully
19	Marhai	8	56	58.8768	8	36	20.761	Very small gully

20	Nakere	8	56	1.3668	8	36	14.8	Small gully
21	Sisimbaki	8	56	23.1576	8	36	21.683	Very small gully
22	Traffic	8	57	6.1884	8	36	7.067	Large gully
23	Ung. Giya	8	56	34.5192	8	36	19.411	Medium gully
24	Ung. Kasa	8	56	15.8856	8	36	11.902	Medium gully
Sites in Karu LGA								
25	Ado	8	53	38.2656	34	52	19.063	Large gully
26	City College	9	2	10.266	7	37	34.374	Small gully
27	GidanZakara	8	53	51.4788	7	43	21.313	Medium gully
28	Karshi	8	53	53.6532	7	43	0.257	Small gully
29	Mararaba Karu	9	2	1.6728	7	37	35.324	Very small gully
30	Massaka	8	53	37.1724	7	42	39.1	Small gully
31	NTA quarters	8	53	57.9948	7	42	45.346	Small gully
32	One-man Village	9	0	10.026	7	37	3.23	Medium gully
33	Sabon Gari	8	53	32.5716	7	42	35.975	Medium gully
34	Sharp-corner	8	54	1.1196	7	42	44.91	Very small gully
35	Uke bridge	8	54	11.3076	7	42	43.988	Versy small gully
36	Ung. Yerima	9	1	43.6944	7	36	58.19	Medium gully

Source: Field and laboratory work.

From the data presented in Table 1 and 2, it can be observed that in Lafia Local Government Area, Kilema site recorded the high gully erosion, with gullies in this site covering an area of 667.8m^2, with length of 3154m and a width of 21.2m. The depth of gully in this site was recorded at 8.2m. In terms of cross section, gullies found in this site were U-shaped gullies, and large in terms of magnitude. The particle size distribution for the underlined gully site were; sand 91.2%, silt 3.4% and clay 5.4%. Gully in this site are typically characterized by terrain-step slope.

Plate 1: A typical gully cross-section in Kilema, Lafia LGA
Source: Field work.

Plate 2: A typical gully cross-section in Kwandere*, Lafia LGA*
Source: Field work.

In Kwandere site, the gully size in the area are small gully with a length of 112m, covering an area of 78.4m^2, with a width of 7m and depth of 6.5m. The cross section of the underline gully is V-shaped, with particle distribution of sand 91.2%, silt of 3.4% and clay size of 5.4%. Akunza site on the other hand has a particle distribution size of sand 84.2%, silt 5.4% and clay 10.4%. The

cross section of the underline gully site is U-shaped, while gully sizes are very small gully. In the same vein, the geometric characteristic of Akunza site has a depth of 6m, width of 5m, covering an area of 44.0m^2 with a length of 88m. Adogi site was characterized by large gully size, with a length of 256m, covering an area of 153.6m^2, with a depth of 5.3m and a width of 6m. The particle size distribution in the underline gully site consist of; sand 90.2%, silt 3.4% and clay 6.4%, while the cross-section of the gully site of the area of study is V and U-shaped. In Gundu site of the study area the cross-section of gully is U-shaped, with particle size distribution of clay 9.4%, silt 3.4% and sand 87.2%. In terms of size, the gully size of Gandu site is a small gully, covering an area of 676.5m^2, with a depth of 7m and a width of 5.5m, while the length of the gully site is 123m.

Plate 3: A typical gully cross-section in Adogi*, Lafia LGA*
Source: Field work.

The characteristics of gully system in UngwanTiv site of the study area has V-shaped cross section and is a large gully in terms of size. The gully in the underline site covers an area of 254.1m^2, with a depth of 10m, width of 16.5m and a length of 154m. The gully in the site has a particle size distribution of the material underlying the gully as follows: sand 91.2%, silt 3.4% and clay 5.4%. In the same vein, Ungwan Shawu site of the study area has a particle size distribution of clay 9.2%, sand 59% and silt 33.6%. The underline gully is a large gully, with a U-shaped cross section. The gully in Ungwan Shawu

covers an area of 554.28m², with a depth of 14m, a width of 18.6m and a length of 298m.

In Tudun-Allu site of the study area, the general characteristics of gully are not farfetched from the above discussed characteristics. However, the gully size of this site is a medium sized gully, covering an area of 277.2m², with a depth of 7m, width of 11m and a depth of 252m. in terms of particle size distribution, Tudun-Allu site has the following underlying material; sand 90.2%, silt 3.4% and clay 6.4%. Danka site on the other hand had a particle size distribution of; sand 92.2%, silt 2.4% and clay 5.4%.

Plate 4: A typical gully cross-section in Tudun-Allu, *Lafia LGA*
Source: Field work.

In Bukan-kwato site in Lafia Local Government of Nasarawa State, gullies located in the area are U and V-shape gullies, with length of 111m and a width of 6m, covering an area of 66.6m² and depth of 5m. The particle size of materials in the area are; sand 86.2%, silt 4.4% and clay 9.4%. Similarly, gullies in Gimare site in Lafia Local Government Area covered are U-shape, covering an area of 101.6m². In terms of length, width and depth, gullies in this area recorded a length of 127m, width of 8m are were 6m deep. The particle size in of gullies in this were sand; sand 88.2%, silt 5.4% and clay 8.4%.

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Plate 5: A typical gully cross-section in Gimare, *Lafia LGA*
Source: Field work.

Gullies found in Wamba Local Government Area are typically characterised by stream and dense vegetation. It can be observed from a critical look at the data presented in Table 4.1 and 4.1.1 that the sites that recorded the work gully are Traffic and Farinruwa sites. It is important to point out that these sites recorded the most destruction caused by gully erosion among the entire sampled sites in the study. In traffic, the effect of gully erosion result to the destruction on houses, while in Farinruwa, the effect was the destruction of Access Bridge in the area. In cross section of gullies in Traffic are U-shaped gully and large in magnitude. the gully in this site covered and area of 615.09m^2 with a length of 303m and a width of 20.3m, recording a depth of 16m. The distribution of particle in the underlined gully site include; sand 88.2%, silt 3.4% and clay 8.4%. In the same vein, the cross section of gully in Farinruwa are U-shaped gullies. Gully in this site recorded a length of 110m, a width of 7m, and a depth of 7.5m, covering an area of 77.0m^2. In terms of particle size distribution, the underlined gully recorded sand at 84.0%, silt 5.4% and clay 12.6%.

Plate 6: A typical gully cross-section in Traffic, Wamba LGA
Source: Field work.

Plate 7: A typical gully cross-section in Traffic, Wamba LGA
Source: Field work.

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Plate 8: A typical gully cross-section in Farinruwa, Wamba LGA
Source: Field work.

Gully found in Gangare Wawa was the most peculiar of all the gullies encountered in the study area. This is because the gully in this area was rectangular, and somewhat U and V-shaped in terms of cross section. The gully in the area covered an area of 479.21m^2 with a length of 277m, width of 17.2, and a depth of 9m. The magnitude of the gully is large, and characterised by stream and dense vegetation.

Plate 9: A typical gully cross-section in Gangare Wawa, Wamba LGA
Source: Field work.

Gully sites in Karu Local Government Area are typically characterised by dense vegetation and streams. Unlike that of Lafia and Wamba Local government Area, gullies in Karu are less in terms of terrene steep slope. Large gullies were only found in Ado, with a coverage of length of 184m, and area of 277.84m^2, with a width of 15.1mand a depth of 17m. in terms of cross section, this gullies found in the site are U-shaped, with particle size properties of; clay 9.4%, sand 88.2% and silt, 4.4%.

Plate 10: A typical gully cross-section in Ado, Karu LGA
Source: Field work.

Gullies found in both Sabon Gari and One-man Village were both medium gullies, with a cross section of V and U-shape. in terms of particle size distribution, Sabon Gari recorded; clay 12.4%, silt 3.4% and sand 84.2%, while One-man Village recorded clay 27.4, silt 29.9% and sand 43%. Furthermore, gullies found in One-man Village covered and area of 68.4m^2, with a width of 114m, width of 6m and a depth of 8m. In the same vein, gullies found in Sabon Gari covered and area of 65.8m^2, with a depth of 5m, width of 6m and a length coverage of 94m.

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Plate 11: A typical gully cross-section in Sabon Gari, Karu LGA
Source: Field work.

The findings of the researcher in respect to the general characteristics of gullies in the study area are in agreement with Patrick (1999), Kurar and Jung (2005), Booldel*et al.* (2010), Kappel (1996) and Horton *et al.* (1996) who developed a scheme to classify water erosion hazard severity from vision erosion feature base on the destruction and intensity of erosion damage. Equally, Kappel and Horton *et al.* (1996) use the procedures of measurement of gullies in assessing erosion hazard classification. Plamental (2005) stated that, average erosion rate in India was 25-30 tones/ha per year and about 40-1000 tones descend. Evans and Cooke (1986) stated that, in the late 1970's and early 1980's there was a sharp rise in the number of recorded cases of erosion in Britain.

CONCLUSION

The Nigerian environment is degraded through the menaceof soil erosion in several parts of the country. Part of theresult is the creation of Badlands condition in many areasof the country. The menace posed by soil erosion has beendocumented by many authors in many works includingOfomata (1965, 1978, 1981 and 2001), in the southeastern part of the Nigeria, Jeje (1997) Asiabaka andBoers (1988), Igbokwe, Ojiako and Nnodo (2003), Egboka(2004) in the south-western part and Ologe (1971, 1972),Bello (1983), Olofin (1987), and

Patrick (1987) mentioningjust a few in northern part of the country. People's life waslost to erosion, equally an average of 14862.8m^3 volume ofsoil between 1992 to 2002 were lost to erosion (Shu'aibu,2002; Suraj, 1998; and Buwa, 2003).Nasarawa State is facing severe problem of gully erosioncausing untold hardships and depression on the lives ofthe people. Complex interdependent mechanisms betweenrainfall characteristics, soil erodibility, land use, topographyhas reduced infiltration, which caused a higher surfacerunoff. This has increased deep cutting, take up valuableland, raised the cost of building and sinking of well waterThis chain of cause and effect hits most of the low-incomegroups of the community, where the population density ishighest and where the worst damages of gully erosion arefound.

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