



*Original Research Article*

# The impact of soil erosion on agricultural land and productivity in Efon Alaaye, Ekiti State

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Soil erosion with its impact on people has been one of the challenges that poses a great threat to man and the socio-economic development of his environment. Prompt, quick and urgent attention is required to overcome and mitigate the effect of this phenomenon to achieve sustainable development. The aim of the study is to assess the impact of soil erosion on agricultural land and its productivity in Efon Local Government Area of Ekiti State with the objectives of investigating the cause and effect of soil erosion, the soil conservation practice applied and recommend possible preventive and control measures of soil erosion for agricultural land uses. Both primary and secondary data were used for the study. One hundred and twenty copies of questionnaires were administered on the respondents for the attribute data required. Efon LGA was zoned into four zones for easy administration of the work. The study reveals that soil erosion has caused disruption on the soil, roads, transport and the farmland in the study area. The study recommends that reforestation of farmland should be embarked upon immediately for more food production. Agro forestry should take care of intensive and sustainable land use practices to achieve bumper harvest. Efon Alaaye should have a comprehensive master plan, refuse disposal van, build sanitary land fill sites for proper hygiene and control to avoid any haphazard development.

**Key words:** Farmland, impact, productivity, soil erosion, sustainability

## INTRODUCTION

Nigeria as one of the developing countries of the world faces a lot of serious environmental problems that requires urgent attention. Some of these problems are associated with lack of economic development, lack of social development, poverty and growth that results into many types of land degradation such as soil erosion and flooding (El-Swaify, 1982; Adegboyega, 2006). Zhang et al. (2009) affirmed that unprecedented increase in soil loss, its economic and environmental impacts have made soil erosion as one of the most serious global problems in the world. Soil erosion is without doubt a subset of environmental degradation in South western Nigeria especially, Efon Alaaye, Ekiti State, as it changes the

landscape of the area and have socio-economic impact on the lives of the people in the area and it endangers the environment. Soil erosion destroys the infrastructures put on the soil such as highways, roads, buildings, wells as well as agricultural land and its productivity in the study area (Jeje, 2005; Adegboyega, 2006).

Soil erosion is a natural phenomenon enhanced by human activities and occurs in all landscapes and under different land uses (Ibimilua and Ibimilua, 2011) and has been identified as a serious environmental problems with multiplicity of social and economic impacts. It is a hazard that is disastrous and traditionally associated with agriculture in the tropical area and has its effect on soil

productivity and sustainable agriculture (Morgans,2005); and it is multidimensional in nature because of its threat to human existence .

The problem of soil erosion affects soil. Byrant and Onibokun(1981) posited that soil is a major natural resource and an important consideration for habitability, agriculture and road capability in any settlement; and that man's misuse of land causes soil erosion because soil losses from farm lands are reflected in the reduced crop production potential, lower surface water quality and damage drainage networks. Soil is a natural resource to man, he depends on it for survival. It is on the soil that man has his being, for soil sustains man and on it he grows his food, and it is the foundation of the worldly goods as it acts as basic wealth upon which his existence as inhabitants of the earth depends (Adebayo, 2005; Adegboyega, 2014). About 75billion tons of soil is eroded from land amounting to 40% of the world agricultural land (FAO,2003). According to United Nations, an area of fertile land in Africa would continue to reduce if the current trends of soil degradation continues, the continent would not be able to survive it, as it would not be able to feed 25% of its populace. Morgan (2005) corroborated that facts that soil erosion in the past has effect on soil erodibility that causes reduction of soil fertility because most of the nutrients that are required to support plant growth are lost to the subsoil thereby resulting to poor mass food production of farm products. He further stressed that aside the removal of top soil, crop emergence, growth and yield are directly affected through the loss of natural nutrients and application of fertilizers to the soil.

Phil-Eze (2010) and Ibimilua and Ibimilua, (2011) ) observed that soil erosion menace is more pronounced in an environment because of the variability of soil properties as related to vegetation cover and landscape and numerous facilitators such as the chain of hills in form of ridges, steep slopes, undulating topography and precipitation that characterize Ekiti State including Efon Alaaye. They discovered that erosion affects several activities such as agriculture, urbanization, construction due to increase in soil loss which consequently leads to gradual destruction of the natural vegetation. Aside these facts, various studies carried out in Nigeria revealed that area with streams of hills and gradient such as Ijero Ekiti (Faluyi, 2001), Efon Alaaye (EKSEPA, 2000) and Akoko South Local Government Area ( Olorunlana, 2014 ) tend to exacerbate the impact of soil erosion ( one of the most widespread forms of land degradation) resulting from changes in land use.

The desire to prevent accelerated soil erosion on soil surface calls for urgent studies and solution, this has led to the construction of both open and covered drains for the rapid evacuation of soil runoff and domestic sewage to the stream in Nigeria. Thus, the effect of soil erosion on man and his environment is enormous and as such needed attention, protection and management; the soil conservation practice and the significant role that surveying and geo informatics play to curb the menace in our land can not be underestimated (Sangodina and

Olaleye, 2000; Olorunlana, 2014).

Studies carried out by Adebayo (1993), Ajewole and Oric (2010) and Gupta et al. (2012, ) concerning the relationship between soil erosion and climate as a predisposing factors, the mechanism of rainfall and the ecological impact of soil erosion in south western, Nigeria and also by Ezezika and Adetoun (2011), and (Igwe, 2015) in south eastern Nigeria revealed the causes, the erosion risks, the vulnerability assessment and the impacts (UNESCO, 2009); and that soil erosion and land degradation are real threats to achieving sustainable agriculture (FAO,2003) .Therefore, there is need for proper solution to be proffered to these problems in our society.

Scholars such as Byrant and Onibokun (1981) and Adebayo(2005) highlighted the importance of inherent resistance of soil to erosion process and that many components of erosion response such as threshold hydraulic conditions of hill erosion, hill network configuration and hill slope sediment delivery, are strongly affected by spatially variable and temporarily dynamic soil properties, erodibility of tropical soil is highly dependent on grain size distribution, clay content and organic carbon content, which influence the stability of soil aggregates.

The types and forms of soil erosion threatening the sustainability of agricultural products in the environment are geological and accelerated erosion. Soil erosion is the process of earth's sculpture by agents of denudation (running water, ice and wind). It is the wearing away, detachment or physical removal and transportation of materials (top soil) from one place and deposit it elsewhere through gravity, thus reduce the nutrients that can support crop growth( Singh and Phadke,2006). The organic matters that suppose to help in maintaining plant nutrients, soil structure and stabilizing soil aggregates are eroded away due to this menace. It is certainly clear that the current events and interplay of forces regionally and globally have proved beyond any reasonable doubt that the present and future calamities will not come only from warfare, insurgence but also from the flagrant abuse of the environment and unsustainable use of the natural resources such as soil resources (Sangodina and Olaleye, 2000). Soil conservation practice through physically and biologically measures (Blanco and Lal,2010) to enhance good agricultural products and maintenance of the soil is required in the study area.

### **Aim and objectives of the Study**

The aim of the study is to assess the impact of soil erosion on agricultural land and its productivity in Efon Local Government Area of Ekiti State. The specific objectives of this study are to:

- (i) investigate the cause and effect of soil erosion on agricultural land uses and its productivity in Efon Alaaye
- (ii) examine the consequences of soil erosion on agricultural land uses and its productivity in the study area.
- (iii) assess the soil conservation practice to curb the

Map of Nigeria showing Ekiti State

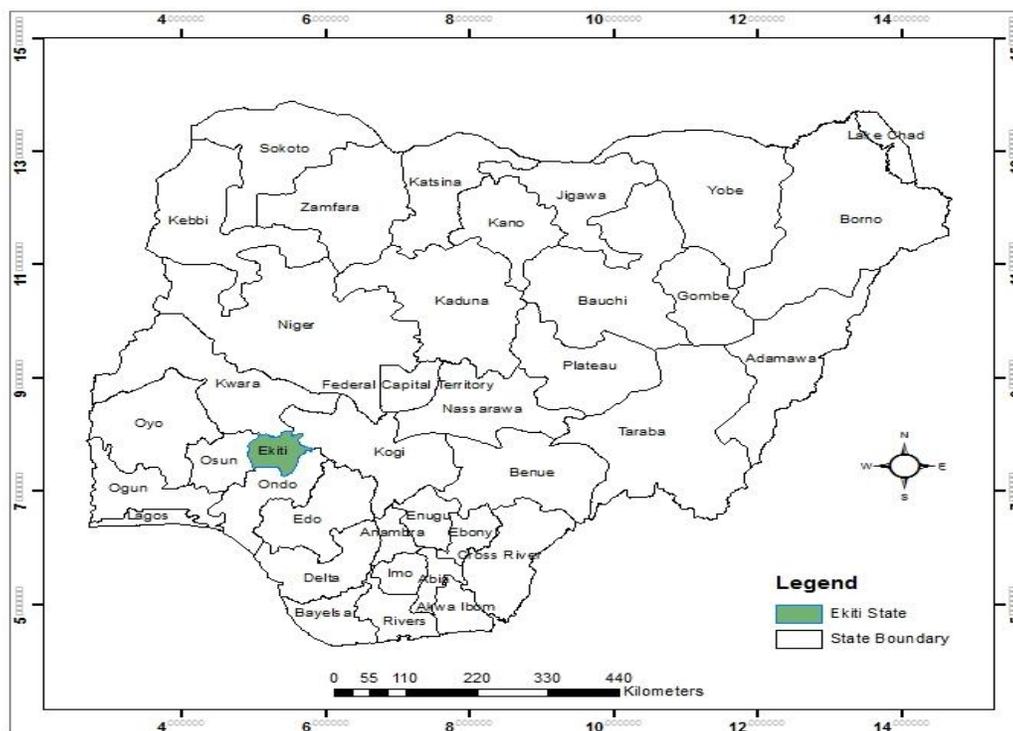


Figure 1: Map of Nigeria showing Ekiti State

Source: Office of The Surveyor-General, 2017

effect of soil erosion on agricultural land uses and its productivity in the study area,

(iv) recommend possible preventive and control measure to minimise the phenomenon in Efon Alaaye.

## MATERIALS AND METHODS

### The Study Area

The study area is Efon-Alaaye in Ekiti State (South-western part of Nigeria). It is located between latitude  $7^{\circ}40'N$  and  $7^{\circ}54'N$  and longitude  $4^{\circ}52'E$  and  $5^{\circ}0'E$  (Figure 1.) with an elevation of 500 meters above sea level. Due to the topography and elevation, Efon-Alaaye enjoys a kind of temperate climate in the tropical zone. It is a large town covering several hills, hill sides, plains and valleys, otherwise known as Efon Ridges in map reading (Figure 2, Figure 3). It has temperature of  $26^{\circ}C$ , Wind W at  $6km/h$  and Humidity 82%. Efon-Alaaye has a population of about 120,000 people; while the total population of Ekiti State stands at 2,212,282 million people (NPC, 2006). As noted earlier, Efon is situated in the tropical zone. During the dry season, the town experience very severe harmattan with

temperatures high in the afternoons but very low in the evenings, just like the characteristics of temperate climate. Until recently it was impossible to experience mosquito bite within the confines of Efon-Alaaye Township, just because the topography makes the environment well drained for the town sits tightly in a valley between two running North-South and therefore leaves no room for stagnant water to settle running North- South and therefore leaves no room for stagnant water to settle South and therefore leaves no room for stagnant water to settle.

The topography of the town (Figure 3) makes the area vulnerable to the effect of soil erosion and rapid deposition of weather materials in the built up areas. This is as a result of wearing velocities that are high, top soil vegetation cover is low, and a well defined natural or constructed drainage networks are virtually not in existent. The Efon-Alaaye gully erosion has become monstrous in dimension and is causing fear and panic among the people living in the area to the degree of dangers it had exposed them to and their farmlands with the level of the farm outputs, especially on the ecosystem of the area. The gully system which was probably initiated more than four decades as a result of interrelated natural and adverse anthropogenic activity is still on the increase. The gullies are still expanding at the

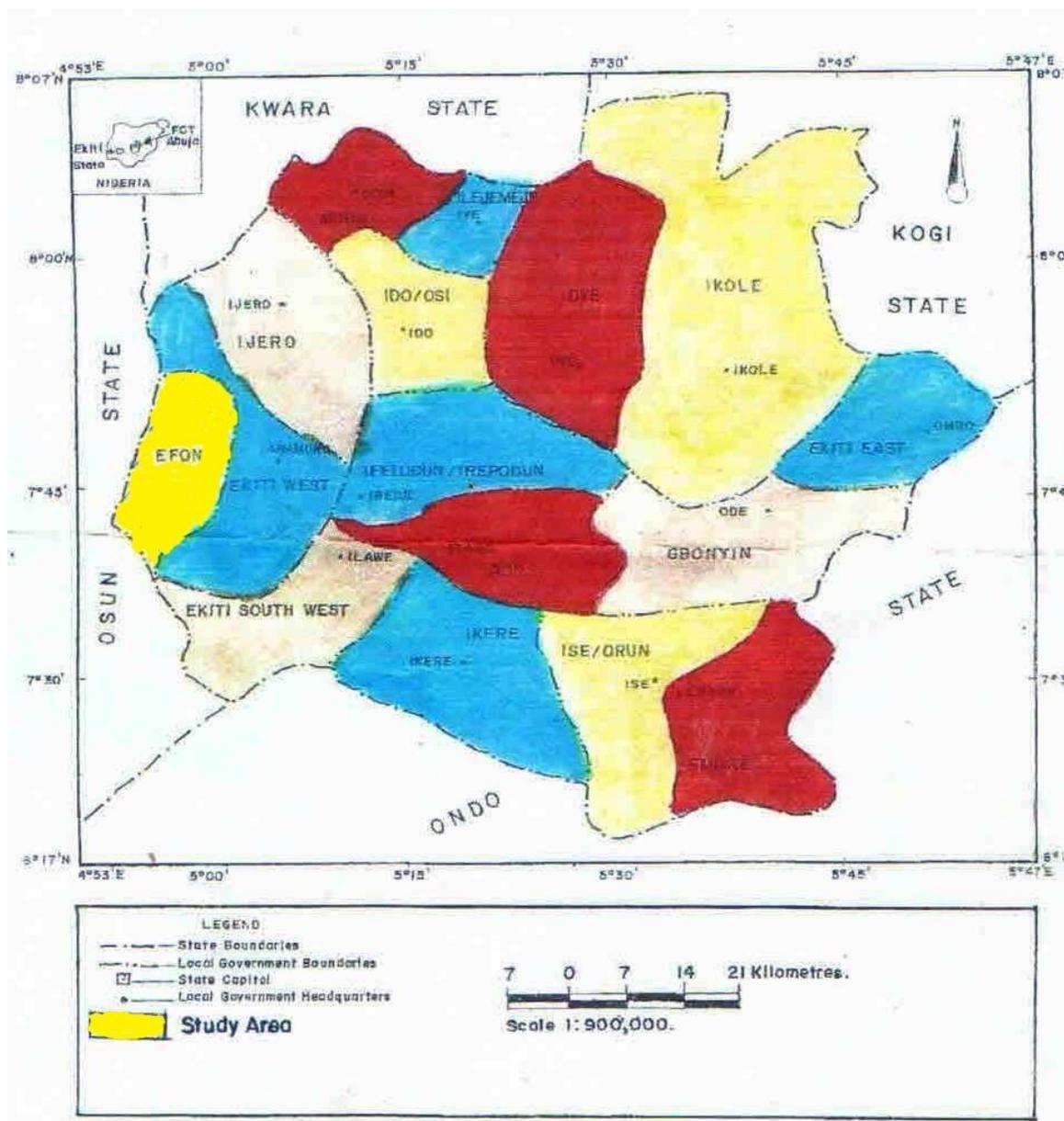


Figure 2: Map of Ekiti State and its Local Government Areas

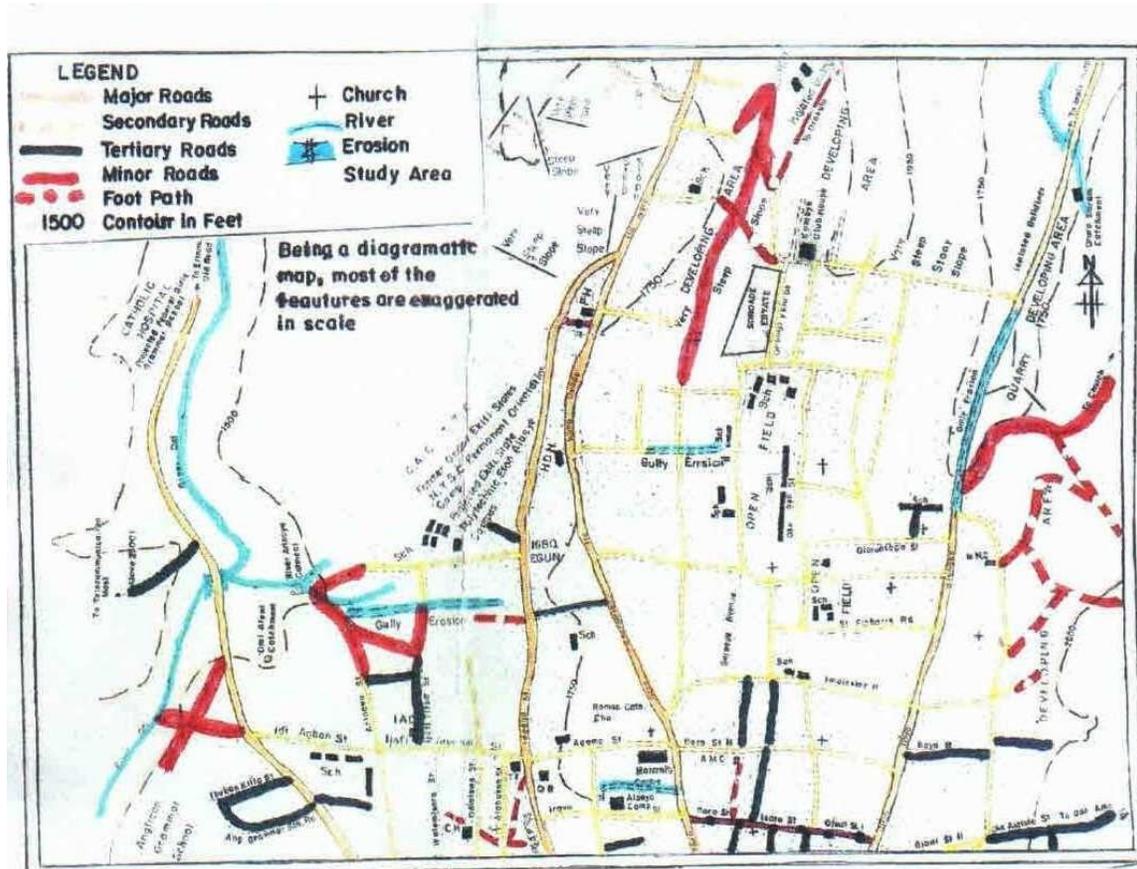
Source: Department Of Geography And Planning Science, Cartographic Unit, Ekiti State University, EKSU, Ado – Ekiti (2019)

expense of valuable land resources and other infrastructural facilities are affected to that effects. Therefore, erosion’s impact in Efon-Alaaye is becoming something else on the agricultural land, agricultural productivity and socio-economic lives of the people.

**Method of Data Collection**

Data was collected through both primary and secondary sources. The primary sources involved a reconnaissance survey to identify the number of areas affected by soil erosion. Ten gully sites were identified to enable designing

the drainage channel and construct the soil erosion channel in the town. These Ten Gullies need protection, preservation and management. The town was divided into four zones, and for easy administration,120 copies of questionnaire were administered to respondents to get the attribute data from them. This was randomly done with samples population comprising men, women ,youth and the aged ones. The secondary data was collected from the archives. The rainfall data for Efon-Alaaye was collected from Oshodi Metrological Station, and the Ministry of Agriculture, Ado-Ekiti, map of Efon Local Government was obtained from the Local Government Council, Efon –Alaaye,



**Figure 3:** Topographical map of Efon-Alaaye: Effect of soil erosion on agricultural productivity within the environ

Source: Efon Local Government Secretariat, Efon-Alaaye/Department of Geography and Planning Science, Cartographic Unit, Ekiti State University, EKSU, Ado-Ekiti(2018)

in Ekiti State.

**Data Analysis**

The descriptive statistical method was adopted using charts, tables, frequency and percentage to describe the phenomenon in Efon-Alaaye,

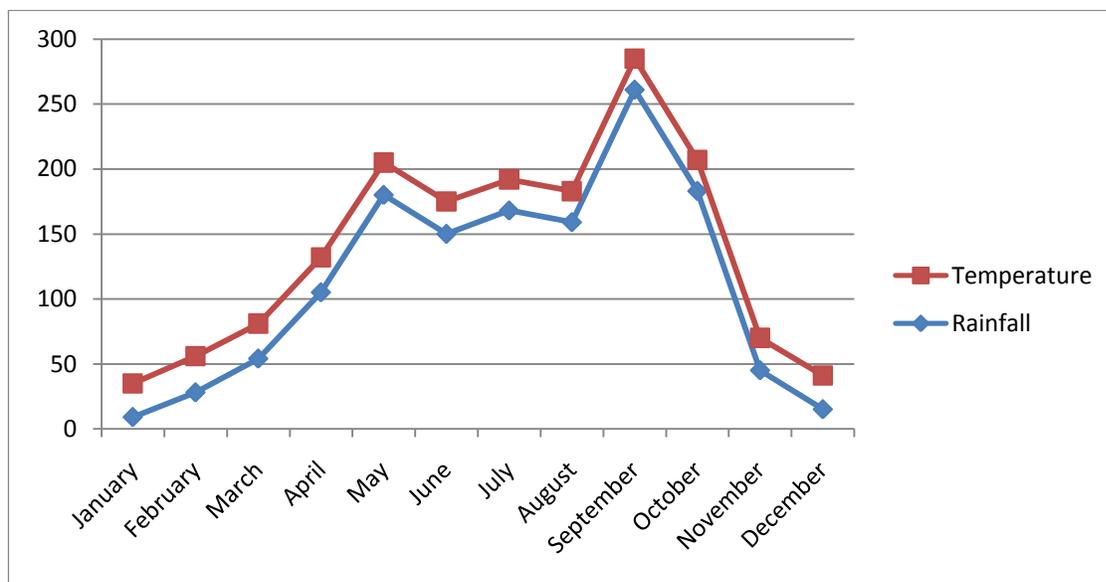
**RESULTS**

The effect of rainfall and temperature can be brushed aside in this discourse. Figure 4 above shows the relationship between annual rain fall and annual temperature in the study area. The peakest rainfall data recorded was at September when we had 261mm the lowest period was at January when the reading was 9mm whereas, that of temperature shows that February recorded the mean monthly 28°C and 24°C from July to October consistently and respectively.This information would go a long way in combating this menace in Efon-Alaaye.

Table 1 shows the anthropogenic causes of soil erosion aside the natural causes mentioned in this discourse . 55%

of the respondents mentioned that lack of proper land use planning in the study area has resulted to flouting the law of the land. 17.5% of the respondents supported that improper land use development usually be the cause of soil erosion in the area as many till the land any how and plant crops at variance to land use design and proposition. 17.5% of the respondents again saw refuse disposal along the drains, deepens the channels resulting to gully erosion as identified in the study area. Only 10% of the respondents do agree to flouting of laws as major cause of soil erosion. That is, people deliberately do contrary to the extant laws. This inevitably has repercussion on the socio-economic lives in the town, for instance, deliberate disposal of refuse on the drains and river channels affect the people in the end. idea of improper land use and refuse disposal as the sources of the problem of erosion in the study area.

Table 2 reveals the socio-economic impact of soil erosion on the residents of Efon-Alaaye. The largest was noted with agricultural activities with 47.5% impact. As such erosion seriously affects the productivity of the soil for land are worn away by the menace, thus, most of the nutrients that should be supportive to the plant growth are leached down or loss to the soil. and eventually affect the



**Figure 4:** Rainfall and Temperature Distribution in Efon Alaaye

Source: Ministry of Agriculture and Rural Development,1999

**Table 1.** Causes of Soil Erosion

S/N	Items	Zone1	Zone 2	Zone 3	Zone 4	TOTAL	%
1	Lack of proper planning	24	12	12	18	66	55
2	Flouting of law	-	-	12	-	12	10
3	Land use	3	12	3	3	21	17.5
4	Disposal of Refuse	3	6	3	9	21	17.5
	Ttotal	30	30	30	30	120	100

Authors Field work,2018.

**Table 2.** Socio- economic impact of Soil Erosion on the People

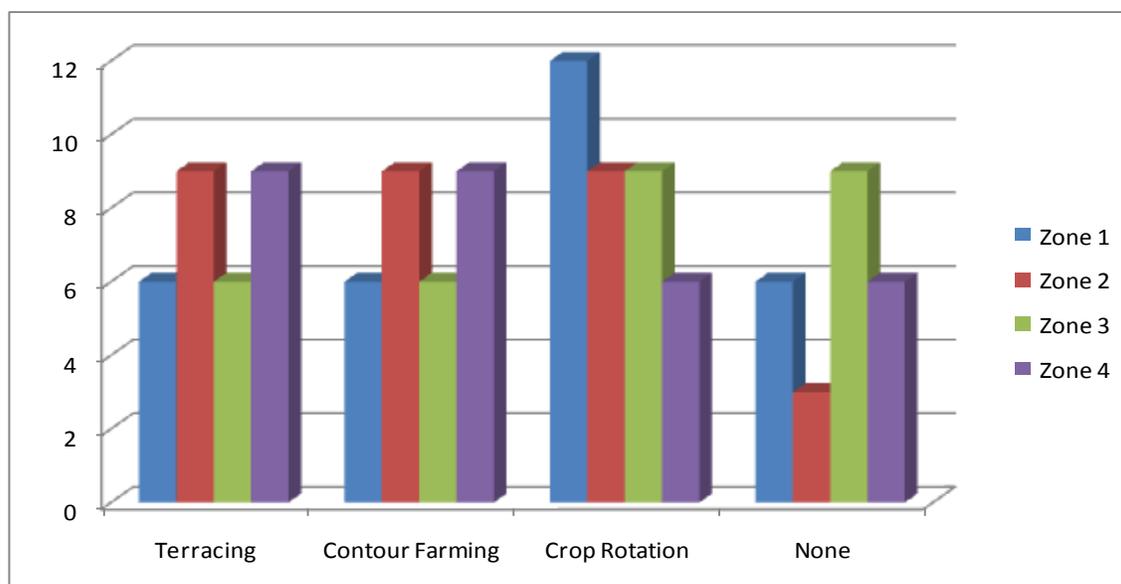
S/N	Variables	Zone1	Zone 2	Zone3	Zone4	Total	Percentage
1	Wells	6	3	6	9	24	15
2	Agriculture	18	18	12	9	57	47.5
3	Foundation/Houses	3	6	6	-	15	12.5
4	Topography	3	3	6	12	24	20
	Total	30	30	30	30	120	100

Field work, 2018

income of the farmers. The second largest is the effect of erosion on the residents for, 20% of the people relocated due to the roads that were badly affected by the menace. 15% of the people were affected in the area of drinkable water for the wells dug were badly affected. The people relied on well water for there is no adequate pipe borne in the area 12.5% of the foundations/ houses are seriously impaired thus give room for re-settlement, relocation and abandonment of some houses along the hilltops

Figure 5 shows the individual and collective effort taken in the time past to prevent soil erosion. 30% of the

respondents adopted crop rotation system to reduce the spread of erosion down the slope. The crop rotation system involves using different crops for various reasons to prevent and control soil erosion. For instance, deep rooted crops should follow shallow rooted crops while the leguminous crops should follow nitrogen depleting crops by adding nutrients to the soil. Having understood this system of cropping they used it instead of mono cropping. 25% used terracing being an ancient technique worldwide in the hilly area to prevent soil erosion due to the topography of the study area. It involves ditches and



**Figure 5:** Preventive and control measures of soil erosion in Efon Alaaye

Source: Field work, 2018

embankment to direct over land flows on low gradient path. 25% used contour bunds as a method of preventing the menace in the area. This involves planting cultivation and furrowing along the natural contour line of sloping land, while the remaining 20% of the people did not involve any of the method or technique above for combating the problem in Efon-Alaaye.

## DISCUSSION

### Protection of agricultural land

The most effective control practices good for soil erosion control in Efon Alaaye are provision of contour bunds, terracing, crop rotation and strip cropping. For contour bunds, it involves ploughing, planting, cultivating and furrowing along the natural contour lines of sloping land. The practice creates obstacles that greatly reduce the velocity of downhill flow, which would otherwise be rapid on a smooth slope. Crop rotation reduces the impact of rain drops, breaking up the soil particles and reduces the erosion rates, it is a practice whereby a given soil belt is planted with different crops in each year of a cycle of rotation that includes legumes to increase nitrogen content of the soil, a grass crop to improve tilth (ease of cultivation) and a clean-cultivated crop such as corn. This might probably be the reason why the farmers use the system for both preventive and control measures for more productivity in the study area. Strip cropping controls erosion, it is the planting of different crops side by side in narrow belt parallel to each other, it allows close growing

crops to catch soil particles picked up by run off from up slope strip of cultivated crops. The practice inhibits soil loss through wind action. Terracing is an ancient technique in the world that can significantly slow the rate of water erosion on the cultivated slopes. It is the system of constructing ditches and embankment along the contour so as to direct overland flow on a low gradient path to the edge of the field where it is drained off to control run off channels. These practices provide an important measure of water conservation (by increased infiltration) and for local flood control.

The erstwhile shifting cultivation practice had actually affected the land and its productivity badly. It involves bush burning, this alters the vegetation cover of Efon-Alaaye. Thus, the changes have negative impact on the town because they are in chain form, that is, the land that started initially as forest has turned to woodland-savannah-grassland-semi desert. Aside this, it also kills the bacterial activity that suppose to bind the soil together, provide aeration to the soil has turned to expose the laterite soil to rain wash and freeing large quantities of silica which are swept easily by wind due to careless cultivation techniques. It then destroys soil and lay bare the re-growth forest to further removal.

### Conclusion

The problem of soil erosion and general land degradation in Efon Alaaye are due to human impact in the town. The land is tilled for farming for food production, thus, this has a lot of impact on the agricultural land and its productivity

in the town. The impact could be easily corrected by implementing good and sustainable agricultural system that the farmers were used to in the time past and let all farmers employ the same along the slope to correct the anomaly of land uses and agricultural practices on land because of its naturally hilly topography. The farmers on the hill slopes should leave un sustainable farming methods they were used to that caused soil loss for sustainable agricultural practices such as terracing and crop rotation system; and ensure environmental possibilism and not environmental determinism. This could serve as beacon to other users of hilly areas of the world.

### Recommendations

The following recommendations are made based on the study, they are:

(i) The vegetation cover that had been seriously impacted negatively should be reforested, by planting trees to replace the felled ones on the developed properties and farms, and this action should be embarked upon immediately for more food production.

(ii) The Local Governments Council in Efon-Alaaye should establish soil and water conservation unit

in Agricultural department of the council to take care of soil erosion in the area.

(iii) Agro forestry should take care of intensive and sustainable land use practices to achieve bumper harvest, and ensure harmony between the environment and the land use system.

(iv) Efon Alaaye should have comprehensive master plan in conjunction with the street- guide map of the town to avoid haphazard development as witnessed during the course of this research.

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