



The Effects of Soil Erosion on Food Crop Production in Auchi, Edo State, Nigeria

Dr. Ilenre, A.E., Dr. Okhae, E.S., Dr. Imanfidon, S.E.

Department of Geography and Environmental Management, Faculty of Environmental Studies,
Ambrose Alli University, Ekpoma, Nigeria

DOI: <https://doi.org/10.68050/JAMS.2026.513>

Received: 17 Sept 2026; Accepted: 18 Sept 2026; Published: 23 September 2026

ABSTRACT

This study examines the effects of soil erosion on food crops production in Auchi, Edo State, Nigeria. Soil erosion is the process through which the fertile topsoil is detached and transported by agents such as water, wind, or human activities. This environmental challenge removes the top topsoil, reduces soil fertility, organic matter, and moisture-holding capacity of soil thereby lowering agricultural productivity. The objectives of the study were clearly set out to include to: examine the causes of soil erosion, the major food crops cultivated, the effects of soil erosion on food crop production, the level of food security, and the effective soil erosion control measures suitable in the study area at present. To accomplish the set objectives, the researchers used both primary and secondary research methods to collect the data required for the study. In other words, the data required for this study were collected from both primary and secondary sources of data. At present (2026), the population of Auchi at 2.8% projection growth rate is 255,600 people. Out of this projected population figure, 400 respondents (farmers) which represent 0.16% (zero point one six percent) of the population in the study area were considered. Following the above, four hundred questionnaires only were administered to farmers in the study area. The preliminary and actual field surveys revealed that there are 25 communities in the study area. The recognizance and actual field surveys also affirm that the population is not evenly distributed across the 25 communities in Auchi. The preliminary and actual field surveys revealed that there are 25 communities in the study area, and that the population is unevenly distributed across the study area. Flowing from the above observation, the questionnaires were distributed in the various communities in reflection of their population sizes. The data obtained were analysed using tables, graphs and, percentages. The results depict clearly the causes of soil erosion, the major food crops cultivated, the effects of soil erosion on food crop production, the level of food security, and the effective soil erosion control measures suitable in Auchi, Edo State, Nigeria. Based on the findings of this paper, the following actionable policy recommendations are made: construction of modern drainage channels, construction of local barriers, planting of all-season green tropical tree crops and grasses, planting of all-season green imported trees, application of soil conservation techniques, reforestation, leaving crop residues behind, farmland tillage, application of fertilizers, implementation of green belts initiatives, check dams, bioengineering, runoff diversion structures, environmental sanitation, guided agricultural practices, permeable pavements, reduced tillage, watering and keeping the soil moist during dry spells/seasons and planting of drought resistant crops and grasses in Auchi, Edo State, Nigeria.

Keywords: Effects, Soil erosion, Food crop, Production

BACKGROUND TO THE STUDY

Agriculture remains one of the most important sectors of the Nigerian economy because it provides food, employment, raw materials for industries, and income for millions of households. Crop production depends largely on the availability of fertile soil, adequate rainfall, and sustainable land management practices. Soil is one of the most valuable natural resources because it supplies nutrients, water, and physical support required for plant growth. However, soil erosion has become one of the greatest environmental challenges affecting agricultural productivity in many parts of the world, Nigeria, and Edo State in particular.



According to Lal (2001), soil erosion is the process through which the fertile topsoil is detached and transported by agents such as water, wind, or human activities. The removal of topsoil reduces soil fertility, organic matter, and moisture-holding capacity, thereby lowering agricultural productivity. Similarly, Morgan (2005) observes that erosion accelerates land degradation, reduces nutrient availability, and exposes infertile subsoil, making crop cultivation increasingly difficult and consequently low agricultural yields. Similarly, according to Ezeh *et al.*, (2024), soil erosion refers to the detachment, transportation, and deposition of soil particles from one location to another through natural agents such as rainfall, surface runoff, wind, and human activities. It is one of the most significant forms of land degradation affecting agricultural sustainability globally. Soil erosion becomes a serious environmental problem when the rate of soil loss exceeds the natural rate of soil formation, resulting in declining soil quality and reduced agricultural productivity.

Globally, soil erosion affects approximately one-third of agricultural land and contributes significantly to declining food production (FAO, 2019; 2022). In developing countries such as Nigeria, the problem is aggravated by rapid urban growth and development, deforestation, seasonal bush fires, overgrazing, poor farming methods, construction activities, and inadequate drainage systems. These activities increase surface runoff during heavy rainfall, resulting in severe sheet, rill, and gully erosion.

In Nigeria, soil erosion has become one of the leading causes of land degradation, particularly in the southern and southeastern regions where high rainfall intensity and fragile geological formations prevail. Edo State is among the states seriously affected by soil erosion due to its undulating topography, sandy soils, intense rainfall, and increasing human activities. Communities in Auchi, Edo State have experienced persistent gully erosion, which has destroyed roads, buildings, farmlands, and other public infrastructure (Okeke, *et al.*, 2016; Agbai, *et al.*, 2022).

Auchi, located in Etsako West Local Government Area of Edo State, is recognized as one of the erosion-prone areas in Nigeria. Several studies (some of which were reviewed in this study) have identified both natural and anthropogenic factors responsible for the increasing rate of soil erosion in the area. These include excessive rainfall, poor drainage systems, indiscriminate refuse disposal into drainage channels, deforestation, excavation for construction, road development without adequate erosion control measures, and improper land use planning (Ajayi *et al.*, 2019).

According to Okeke, *et al.*, (2016), and Agbai, *et al.*, (2022), the agricultural sector in Auchi is dominated by smallholder farmers who cultivate crops such as cassava, corn, yam, vegetables, cocoyam, plantain, and rice. These farmers depend heavily on fertile topsoil for sustainable production. Unfortunately, continuous soil erosion removes nutrient-rich topsoil, decreases water infiltration, increases soil compaction, and reduces the productive capacity of farmland. Consequently, farmers experience lower crop yields, increased production costs due to fertilizer application, loss of cultivable land, and reduced household income.

According to Brady and Weil (2017), erosion reduces soil organic matter, weakens soil structure, decreases microbial activity, and limits root penetration. These changes negatively influence crop growth and productivity. Similarly, Pimentel and Burgess (2013) argue that soil erosion threatens food security because it reduces the long-term productive capacity of agricultural land.

Studies conducted in Auchi further indicate that the rapid expansion of gullies has destroyed agricultural lands and displaced farming activities. Remote sensing assessments revealed that erosion continues to spread into new areas due to inadequate control measures and increasing urban development (Afegbua, *et al.*, 2016; Okeke, *et al.*, 2016).

Considering the importance of agriculture to the socio-economic development of Auchi and the increasing incidence of soil erosion, there is a need to investigate how soil erosion affects crop production and identify sustainable strategies for minimizing its impact. Findings from such studies would provide useful information for farmers, policymakers, environmental agencies, and agricultural extension workers in promoting sustainable land management and improving food production.



STATEMENT OF THE PROBLEM

Soil erosion has become one of the most serious environmental problems confronting agricultural production in Auchi, Edo State. Despite various government interventions and community efforts, erosion continues to expand rapidly, destroying farmlands, reducing soil fertility, reducing crop yields, and therefore, threatening agricultural sustainability,

The removal of fertile topsoil through water erosion deprives crops of essential nutrients required for healthy growth. Consequently, farmers experience declining crop yields, poor crop quality, increased dependence on chemical fertilizers, and reduced farm income. In severe cases, large portions of agricultural land become unsuitable for cultivation because of deep gullies and extensive land degradation. (Okeke, et al., 2016; Agbai, et al., 2022).

Several studies have investigated the causes of erosion in Auchi and its environmental consequences. For instance, Ajayi et al., (2019) identified poor drainage, deforestation, bush burning, construction activities, and improper waste disposal as major contributors to erosion in the area. However, relatively few studies have focused specifically on the direct effects of soil erosion on food crops production among farming households in Auchi. Furthermore, although farmers adopt indigenous soil conservation practices such as mulching, contour farming, planting cover crops, and constructing local drainage channels, the effectiveness of these measures remains uncertain due to increasing rainfall intensity, population pressure, and expanding urban development. Thus, the major problem addressed by this study is the increasing rate of soil erosion and its adverse effects on food crops production in Auchi. Specifically, the study seeks to determine the causes of soil erosion, the major food crops cultivated, the level of food security due to soil erosion, the effects of soil erosion on food crops yield, and the effective soil erosion control measures suitable in the study area.

AIM AND OBJECTIVES

The overall aim of this research is to examine the effects of soil erosion on food crops production in Auchi, Edo State, Nigeria. The specific objectives are to:

- (i) examine the causes of soil erosion in Auchi, Edo State, Nigeria;
- (ii) examine the major food crops cultivated in the study area;
- (iii) examine the effects of gully erosion on food crops production in the study area;
- (iv) determine the level of food security in the study area; and
- (v) evaluate the effective soil erosion control measures suitable in the study area.

THE STUDY AREA

The study area is Auchi and it comprises of all the 25 communities of Auchi. According to Ogboi, & Odeh, (2012), and Ajayi, Ibrahim, Brai, & Seghosime (2019), the Communities are: Usogun, Akpekpe, Igbei, Ikelebe, Oshiomole, Ughidane, Egelesor, Osomeke, Oki, Idaniyeluwa, Oluedide, Omemi, Idanilesi, Isami, Aleogbomi, Osuali, Oguokhai, Akharuma, Ozomode, Okilokhai, Igieboi, Aimanesi, Utsokwili, Imeke, and Iyakpi. Auchi is a very important settlement in Edo State, Nigeria. It is the administrative headquarters of Etsako-West LGA, Afemai Ethnic group and Edo North Senatorial District. The town of Auchi is located within Latitudes 6°48'N and 7°12' of the Equator and Longitudes 6°11'E and 6°24'E of the Greenwich Meridian. It is bordered by; Uzauire (Imeke and Jattu); Ibie-Nafe; Sabo-Iyakpi; Aviele; Ivbiaro; Warrake and Ikpeshi (Orji & Ologunorisa, 2016; Ajayi, Ibrahim, Brai, & Seghosime, 2019). The study area serves as a strategic gateway between Southern and Northern Nigeria. Its topography is characterized by the rugged Kukuruku Hills, which contribute to high velocity runoff during rainfall events. Historically, the region was dominated by lush rainforests; however, it has transitioned into a derived savanna characterized by sparse tree cover and dominant grass species, a primary indicator of land degradation and encroaching aridity (Orji & Ologunorisa, 2016; Ajayi, Ibrahim, Brai, & Seghosime, 2019).

CONCEPTUAL, AND THEORETICAL FRAMEWORKS AND EMPIRICVAL LITERATURE REVIEW

This section presents the theoretical and conceptual frameworks and a review of related and relevant literature.

Concept of Soil Erosion

Soil erosion refers to the detachment, transportation, and deposition of soil particles by agents such as water, wind, gravity, or human activities (Lal, 2001). It is a major form of land degradation that reduces soil quality and agricultural productivity. Soil erosion refers to the detachment, transportation, and deposition of soil particles from one location to another through natural agents such as rainfall, surface runoff, wind, and human activities. It is one of the most significant forms of land degradation affecting agricultural sustainability globally. The major forms include: sheet erosion, rill erosion, gully erosion, stream-bank erosion, and wind erosion. Soil erosion is increasingly recognised as one of the major processes responsible for agricultural land degradation and declining soil productivity in many parts of sub-Saharan Africa. The process involves the detachment, transportation, and deposition of soil particles by agents such as rainfall, surface runoff, wind, and gravity. Of particular concern in humid and sub-humid environments is water erosion, which can remove nutrient-rich topsoil, reduce soil depth, expose less productive subsoil, and eventually create rills, and gullies. These processes have direct implications for agricultural production because crop growth depends substantially on adequate soil depth, nutrient availability, soil structure, organic matter, and water-holding capacity. Specifically, in Auchi, gully erosion is the dominant form due to steep slopes, highly erodible sandy soils, and intense rainfall (Afegbua, et al., 2016; Okeke, et al., 2016). Soil erosion becomes a serious environmental problem when the rate of soil loss exceeds the natural rate of soil formation, resulting in declining soil quality and reduced agricultural productivity (Ezeh et al., 2024)..

In Nigeria, soil erosion is predominantly caused by water, especially in humid regions where high-intensity rainfall interacts with fragile soils and poor land management practices. The southern parts of Nigeria, including Edo State, experience considerable rainfall that increases the vulnerability of cultivated lands to sheet erosion, rill erosion, and gully formation. The removal of fertile topsoil reduces soil organic matter, nutrient availability, water-holding capacity, and root development, thereby negatively affecting crop growth (Akinbile et al., 2020; Ezeh et al., 2024).

Types of Soil Erosion

Soil erosion can occur in several forms:

a. Sheet erosion:

This involves the uniform removal of a thin layer of surface soil by flowing water. Although it may appear less destructive, prolonged sheet erosion gradually removes nutrient-rich topsoil and reduces soil fertility.

b. Rill erosion:

Rill erosion occurs when runoff concentrates into small channels on farmland. These channels interfere with farming activities and may develop into larger erosion features.

c. Gully erosion:

Gully erosion is the advanced stage of erosion where deep channels are created by concentrated runoff. It is common in areas with poor drainage systems, exposed soils, and intensive land use.

d. Wind erosion:

Although less dominant in southern Nigeria, wind erosion occurs where vegetation cover is removed and soils become exposed.



According to Ezech, et al., (2024), soil erosion assessment in Nigeria has increasingly relied on models such as the Revised Universal Soil Loss Equation (RUSLE), which evaluates erosion risk using factors such as rainfall erosivity, soil characteristics, slope, vegetation cover, and land management practices.

Concept of Crop Production

Crop production refers to the cultivation of crops for food, industrial use, livestock feed, and income generation. According to Brady and Weil (2017), successful crop production depends on soil fertility, water availability, climatic conditions, farm management practices, and technological inputs. In a similar vein, Lal, (2015), and Nwosu *et al.*, (2024) conceive of crop production as the cultivation and management of crops for food, income generation, and industrial purposes. Agricultural productivity depends largely on soil quality, climate conditions, farming practices, availability of inputs, and environmental stability.

Soil serves as the foundation of crop production by providing nutrients, water storage, physical support, and a biological environment for plant growth. When erosion removes the fertile upper soil layer, essential nutrients such as nitrogen, phosphorus, and potassium are lost, resulting in poor crop performance and reduced yields (Lal, 2015; Nwosu et al., 2024).

In Auchi, Edo State, where farming activities include the cultivation of crops such as cassava, maize, yam, vegetables, and plantain, soil degradation caused by erosion can reduce agricultural output and threaten farmers' livelihoods.

Relationship Between Soil Erosion and Crop Production

The relationship between soil erosion and crop production is largely negative. Soil erosion affects agricultural production through several pathways:

Loss of fertile topsoil:

The upper soil layer contains most soil nutrients and organic matter required for plant growth. Its removal reduces soil fertility.

Reduction in soil moisture retention:

Soil erosion reduces soil depth and affects the capacity of soil to store water, causing crops to experience moisture stress.

Nutrient depletion:

The removal of nutrients reduces crop growth and increases farmers' dependence on fertilizers.

Damage to farmland infrastructure:

Severe soil erosion, especially gullies, may destroy farmland, roads, and irrigation structures.

Reduced crop yield:

Continuous soil erosion lowers agricultural productivity by reducing the ability of soils to support healthy plant growth.

Studies in Nigeria show that land degradation caused by soil erosion, nutrient depletion, and soil compaction has contributed significantly to declining agricultural productivity and food insecurity (Oluwatosin & Adekunle, 2021; Osabohien *et al.*, 2024).



Effects of Soil Erosion on Crop Production

Soil erosion affects agriculture in several ways and they include but not limited to: loss of fertile topsoil; reduction in soil nutrients; decrease in organic matter, poor water retention, destruction of farmland, lower crop yield, increased fertilizer requirements, reduced farmers' income, and food insecurity. Pimentel and Burgess (2013) estimated that soil erosion substantially reduces agricultural productivity worldwide through nutrient depletion and land degradation.

Theoretical Framework

This study is anchored on the following theories: Soil Conservation Theory, Soil Loss Theory, Sustainable Land Management Theory, and Production Function Theory.

Soil Conservation Theory

This study is anchored on the Soil Conservation Theory, developed by Hugh Hammond Bennett (1939), widely regarded as the father of soil conservation. The theory states that: soil is a valuable but finite natural resource; improper land use accelerates erosion; conservation practices maintain soil fertility; sustainable land management enhances agricultural productivity. Recommended conservation practices include: contour farming; terracing; cover cropping; mulching; afforestation; strip cropping; and proper drainage systems. The theory is relevant in this study because it explains how conservation practices can reduce soil erosion and improve food crops production in Auchi.

Soil Loss Theory

The Soil Loss Theory is associated with the Universal Soil Loss Equation (USLE) developed by Wischmeier and Smith (1978). The theory explains that soil erosion is a function of rainfall erosivity, soil erodibility, slope characteristics, vegetation cover, and land management practices. The theory suggests that erosion increases when rainfall energy exceeds the protective capacity of vegetation and soil management systems. In agricultural areas, poor vegetation cover and intensive cultivation expose soils to erosion, causing nutrient losses and declining productivity.

The Revised Universal Soil Loss Equation (RUSLE) has been widely applied in Nigeria to estimate erosion risk and understand the relationship between land characteristics and soil degradation (Ezeh *et al.*, 2024). This theory is relevant to this study because it helps to explain how rainfall patterns, farming practices, and land characteristics in Auchi contribute to soil erosion and how such erosion affects crop production.

Sustainable Land Management Theory

The Sustainable Land Management (SLM) Theory emphasizes the need to balance agricultural production with environmental conservation. It argues that agricultural systems must maintain soil resources while meeting human needs. According to this theory, practices such as mulching, crop rotation, agro-forestry, contour farming, cover cropping, and reduced tillage can minimize soil loss and improve agricultural sustainability. The theory is relevant to this study because farmers in erosion-prone areas require conservation strategies that maintain productivity without degrading natural resources.

Production Function Theory

The Production Function Theory (PFT) explains the relationship between agricultural inputs and outputs. In agriculture, soil quality is considered a major production input. A decline in soil fertility caused by erosion reduces the efficiency of other inputs such as seeds, labour, and fertilizer.

Mathematically it is represented as:

$$Y=L+K+S+T$$



Where:

Y = Crop output

L = Labour

K = Capital

S = Soil quality

T = Technology

A decline in soil quality (S) caused by erosion leads to reduced crop output.

This theory is relevant to this study because it throws light on why farmers experiencing soil degradation may obtain lower yields despite maintaining other production inputs.

Empirical Literature Review

Pimentel and Burgess (2013) reviewed global evidence on soil erosion and concluded that erosion significantly reduces crop productivity by removing fertile topsoil, lowering nutrient availability, and decreasing soil moisture retention. Brady and Weil (2017) emphasized that sustainable crop production depends on maintaining soil quality through conservation practices, improved nutrient management, and proper land-use planning.

Soil degradation affects crop productivity through changes in soil physical, chemical, and biological properties. Loss of organic matter reduces soil structure, nutrient availability, and microbial activity. According to studies on Nigerian agricultural soils, continuous erosion reduces effective rooting depth and water availability, leading to lower crop yields (Lal, 2015; Adebayo et al., 2022).

Okeke, et al., (2016) assessed gully erosion progression in Auchi using remote sensing and GIS techniques. The study revealed rapid expansion of gullies, resulting in the destruction of farmlands, roads, and residential buildings. The researchers emphasized the need for continuous monitoring and effective erosion control strategies. Afegbua, et al., (2016) examined the causes and impacts of gully erosion in Auchi. Their findings showed that heavy rainfall, weak geological formations, poor drainage, deforestation, and inadequate government intervention contributed significantly to erosion. The study concluded that erosion had severe environmental, agricultural, and socio-economic consequences.

Ajayi, Ibrahim, Brai and Sule (2019) investigated anthropogenic causes of soil erosion in Auchi, Edo State. The study noted that poor drainage, indiscriminate refuse disposal, excavation, bush burning, road construction, and deforestation were major causes of erosion. The authors recommended environmental education, proper drainage, vegetation restoration, and improved waste management. Agbai, Tate and Efenudu (2022) evaluated the erodibility of soils in Akoko-Edo Local Government Area. The researchers observed that soil texture and organic matter strongly influenced erosion susceptibility and recommended improved soil conservation practices to maintain agricultural productivity.

Ezeh et al., (2024) observed that soil erosion affects agricultural production by reducing soil fertility through topsoil removal and deterioration of soil quality. Their review of erosion modelling studies in Nigeria highlighted the need for improved soil conservation strategies and more localized erosion studies. Finally, Osabohien et al., (2024), noted that human activities such as deforestation, bush burning, excessive cultivation, overgrazing, and poor drainage management accelerate soil erosion. Population growth and increasing demand for farmland have increased pressure on land resources in many parts of Nigeria. Poor farming practices expose soil surfaces, allowing rainfall runoff to detach and transport soil particles. Conservation agriculture and improved land management practices have therefore been recommended as solutions for reducing erosion impacts.



In the Nigerian scene, recent literatures indicate that erosion remains a significant threat to agricultural productivity. For instance, Ezech et al., (2024), in their review of soil-erosion modelling in Nigeria, observed that erosion contributes to soil fertility decline through the removal and redistribution of topsoil and consequently threatens agricultural production and the achievement of sustainable development objectives. Furthermore, recent research within Etsako West by Okoeka et al., (2025) shows that soil texture and slope are among the major factors controlling gully-erosion susceptibility. Similarly, recent research on agricultural practices and food security in Nigeria emphasizes the interconnected nature of agricultural productivity, environmental conditions, and food availability (Eneh & Eneh, 2025).

Evidence from Edo State also demonstrates this connection. Adegun et al. (2024), studying the Iwogban gully area, reported that erosion-related land degradation had implications for home gardening, an activity contributing to household food security. Their soil analysis indicated a predominantly sandy soil composition and characteristics associated with susceptibility to water erosion. The researchers recommended measures including cover crops, local drainage management, and sandbagging to limit further gully development and agricultural land loss. More recent is the modelling work of Alonge, et al., (2026). The research has similarly demonstrated that areas under cultivation can experience substantial soil-loss rates where steep terrain, erosive rainfall, erodible soils, and inadequate protective vegetation occur together.

Recent local evidences in Auchi confirm that erosion is a significant environmental concern in Auchi and Etsako West. Okoeka et al., (2025) developed a geospatial susceptibility map for gully erosion in Etsako West LGA using satellite imagery, a digital elevation model, soil data, and several terrain-related variables. Their analysis incorporated slope, altitude, curvature, slope-length factor, topographic wetness, stream-power index, and soil texture. Soil texture and slope degree emerged as particularly important explanatory factors, while the susceptibility model achieved an area-under-the-curve value of 76.47%. The authors identified parts of northern and southern Etsako West as highly susceptible and recommended improved drainage and tree planting as measures for reducing erosion risk. The 2025 study by Babaiwa and Airen provides additional evidence from Auchi itself. Their investigation in Abotse quarters used three-dimensional electrical resistivity tomography to examine subsurface materials and assess their implications for soil erodibility. The researchers reported the predominance of sandstone and lateritic sand and concluded that the subsurface characteristics help explain the persistence of erosion in the locality. The significance of these findings is that erosion vulnerability in Auchi is not attributable solely to human activities. Rather, natural characteristics such as geology, soil texture, and topography interact with rainfall and land-use practices. This interaction is important when examining effects on food crops because farms located on more erosion-prone soils or slopes may experience greater production losses than farms situated on relatively stable terrain.

More directly, recent research on rice production in Edo State compared loamy-sand soil at Auchi with silty-loam soil at Agbede. The study found differences in available moisture, infiltration rate, and rooting depth between the two soils, demonstrating that soil characteristics influence crop-water relationships within Edo State (Nwabuogo et al., 2025). The Etsako West susceptibility study provides recent evidence that some areas of the LGA have high susceptibility to gully formation (Okoeka et al., 2025). In Auchi, the local geological and subsurface conditions further contribute to erosion vulnerability (Babaiwa & Airen, 2025). Okoeka et al. (2025) focused primarily on spatial susceptibility, while Babaiwa and Airen (2025) investigated subsurface materials and erodibility in Abotse. Neither study directly establishes the percentage reduction in maize, cassava, yam, rice, beans or vegetable yields attributable to erosion.

In all, the empirical literature review demonstrates that soil erosion has severe negative impacts on crop production through loss of fertile soil, declining yields, reduced farm income, and increased food insecurity. However, there remains a need for location-specific studies focusing on farmers in Auchi to better understand the magnitude of these effects and identify locally appropriate prevention and control strategies. The reviewed literature also demonstrates that soil erosion is a major environmental challenge affecting agricultural yields. Specifically, evidence from Nigeria indicates that erosion reduces soil fertility, damages farmland, reduces cultivable lands, decreases crop yields, and threatens sustainable food production. Existing studies have examined soil degradation at national and regional levels, but limited or no empirical researches have focused specifically on Auchi, Edo State. Thus, this study contributes to existing knowledge by investigating the



specific effects of soil erosion on food crops production among farmers in Auchi and formulating possible control measures for sustainable agricultural development.

MATERIALS AND METHODS

The data required for this study were obtained from primary and secondary sources of data. The primary source formed the major source of data needed for this paper. The primary data were collected by the use of structured questionnaire administration, personal observation and oral interview in the field. At present (2026), the population of Auchi at 2.8% projection growth rate is 255,600 people (after, NPC, 2006). Out of this projected population figure, 400 farmers which represent 0.16% (zero point one six percent) of the population in the study area were considered. The sample size of 400 farmers was used because it gave a fair representation of the total population of the study area.

Following the above, four hundred (400) questionnaires only were administered to farmers in the study area. The preliminary and actual field surveys revealed that there are 25 communities in the study area. The recognizance and actual field surveys also affirm that the population of farmers is not evenly distributed across the 25 communities in Auchi. Consequent upon the above observation, the questionnaires were distributed to farmers in the various communities in the order of their population: Usogun (20), Akpekpe (18), Igbe (18), Ikelebe (28), Oshiomole (20), Ughidane (14), Egelesor (14), Osomeke (14), Oki (16), Idaniyeluwa (14), Oluedide (12), Omemi (14), Idanilesi (14), Isami (16), Aleogbomi (14), Osuali (16), Oguokhai (18), Akharuma (18), Ozomode (14), Okilokhai (12), Igieboi (14), Aimanesi (16), Utsokwili (14), Imeke (18), and Iyakpi (22). All the four hundred (400) questionnaires were retrieved with patience, passion and perseverance and used for the study. The multi-stage and simple random sampling techniques were used to select the respondents (farmers) for the administration of questionnaires and the conduct of interviews. The sampling techniques required approaching the whole study area (Auchi) as a single unit, then down to the respective communities, and finally the individual farmers in the respective communities at random.

Questions were asked on the major causes of soil erosion, the effects of soil erosion on food crop production, the food crops produced, the level of food security, and the effective soil erosion control measures suitable in the study area.

The secondary data used in this study include textbooks, students' projects, dissertations, and theses, internet, journal publications, newspapers, magazine, gazetteers, conference papers, and inaugural lecture pamphlets. The data collected were carefully collated and analysed using apt tables, frequencies and percentages.

RESULTS AND DISCUSSIONS

Crop production in any environment is highly dependent on a plethora of natural and anthropogenic factors. Some of these factors are soil, climate, topography, crop variety, management, and amongst others. Prominent among these factors is the nature of soil in general and soil erosion in particular. Soil erosion poses profound and threatening effects on food crops production and food security in the study area and other areas having or experiencing the same or similar environmental factors.

The Causes of Soil Erosion in Auchi, Edo State, Nigeria

The recognizance and actual field surveys conducted on the effects of soil erosion on food crops production in Auchi, Edo State, Nigeria reveals the causes of soil erosion. From Table 1, it is crystal clear that intense humid tropical rainfall, urbanization, high humid tropical temperature, severe deforestation, seasonal bushfires, unsustainable agriculture, construction activities and over cultivation are the causes of soil erosion in the study area. The result specifically reveals that intense humid tropical rainfall with 87 (21.75%) respondents had the highest response and it is followed by urbanization with 61(15.25%) respondents, high tropical temperature with 52 (13.00%) respondents, severe deforestation with 45 (11.25%) respondents, and seasonal bushfires with 41 (10.25%) respondents of the sample population in the study area. Others are strong winds and unguided agriculture with 32 (8.00%) respondents each, construction activities 27 (6.75%) and over cultivation 23 (5.75%) in the study area. This finding is in concord with the earlier findings of Ajayi et al., (2019), and FAO,



(2019; & 2022), who identified poor drainage, deforestation, bush burning, construction activities, improper waste disposal as major contributors to erosion in the area. In Nigeria, soil erosion is predominantly caused by water, especially in humid regions where high-intensity rainfall interacts with fragile soils and poor land management practices. The southern parts of Nigeria, including Edo State, experience considerable rainfall that increases the vulnerability of cultivated lands to sheet erosion, rill erosion, and gully formation. The removal of fertile topsoil reduces soil organic matter, nutrient availability, water-holding capacity, and root development, thereby negatively affecting crop growth (Akinbile et al., 2020; Ezech et al., 2024). Table 4 further elucidates the above finding.

Table 4: The Natural and Anthropogenic Causes of Soil Erosion in Esan West LGA

The Causes of Soil Erosion in Auchi,	Frequency	Percentage (%)
intense humid tropical rainfall	87	21.75
Urbanization	61	15.25
humid tropical temperature	52	13
Severe deforestation	45	11.25
Seasonal bushfires	41	10.25
Strong winds	32	8
Unguided agriculture	32	8
Construction activities	27	6.75
Over cultivation	23	5.75
Total	400	100

Source: Fieldwork, 2025.

The Major Food crops Cultivated in Auchi

Table 7.2 shows clearly the major food crops produced in Auchi (the study area). From the table, it is crystal clear that cassava is the most cultivated food crop in the study area. This is because, it recorded 124 respondents which represents 31.00% of the sample population in the study area, it is followed by corn with 111 respondents which represents 27.75%, groundnut with 63 respondents which represents 15.75%, and yam with 56 respondents which represents 14.00 % of the sample population in the study area. The other major food crops in the study area (albeit of lesser production) are rice with 26 respondents which represents 6.50%, plantain with 26 respondents which represents 3.50%, cocoyam with 10 respondents which represents 2.50% , and lastly, vegetables with 06 which represents 1.50% of the sample population in the study area. This finding aligns with the earlier researches of Okeke, et al., (2016), and Agbai, et al., (2022), that farming activities in Auchi include the cultivation of crops such as cassava, maize, yam, vegetables, and plantain.

Table 7.2: The Major Food Crops Produced in Auchi

The major staple crops produced in Epoma	Frequency of Respondents	Percentage response (%)
Cassava	114	28.5
Corn	111	27.75



Groundnut	63	15.75
Yam	56	14
Rice	26	6.5
Plantain	14	3.5
Cocoyam	10	2.5
Vegetables	6	1.5
Total	400	100

Source: Field survey, 2024

The Level of Food Security Due to Soil Erosion in the Study Area

Table 3 depicts the level of food security in Auchi, the study area. Specifically, the table reveals that the level of food security in Auchi due to soil erosion is low with 160 respondents which represent 40.00% of the sample population and it is followed swiftly by average food security in Auchi due to soil erosion. Table 3 also depicts that 42 respondents which represent 10.50%, high food security with 36 respondents which represents 09.00% and lastly, very high food insecurity with 27 respondents which represents 06.75% are of the opinion that food security in Auchi is due to soil erosion. This result is in agreement with the earlier finding of Pimentel and Burgess (2013), that soil erosion threatens food security because, it reduces the long-term productive capacity of agricultural land.

Table 3; The Level of Food Security Due to Soil Erosion in the Study Area

Level of food security due to soil erosion	Frequency of respondents	Percentage (%)
Very High	27	6.75
High	36	9
Average	135	33.75
Low	160	40
Very low	42	10.5
Total	515	100

Source: Fieldwork, 2026

The Effects Soil Erosion on Food Crop Production in Auchi

The pre and actual field surveys carried out by the researchers reveal that food crops production in the study area is plagued by soil erosion in multifarious ways. Table 4 explicitly reveals these effects of soil erosion on food crop production in the study area in their order of magnitude. From Table 4, decline in crop yield with 63 (15.75%) respondents is the most serious effect of soil erosion on food crops production in the study area. Next in the ranking is increased cost of farming with 54 (13.05%) respondents, and it is followed closely by reduction in soil nutrients with 52 (13.00%) respondents, poor crop growth and development, and direct damage to crops with 48 (12.00%) respondents each, and loss of cultivable land with 39 (9.75%) respondents. Other effects of soil erosion on food crop production in the study area include decline in soil moisture and retention with 32 (8.00%) respondents, loss of beneficial soil organisms with 28 (7.00%) respondents, threatened food security with 23 (5.75%) respondents and finally, the last in the ranking, which is decline in the variety of crops cultivated with 13 (3.25%) respondents of the sample population in the study area. This finding sits conveniently with the earlier findings of Okeke, et al., (2016), Oluwatosin & Adekunle, (2021), Agbai, et al., (2022) & Osabohien et al., (2024), that farmers experience declining crop yields, poor crop quality, increased dependence on chemical fertilizers, food insecurity and reduced farm income. They added



that, in severe cases, large portions of agricultural land become unsuitable for cultivation because of deep gullies and extensive land degradation.

Table 4: The Effects Soil Erosion on Food Crop Production in Auchi

The Effects Soil Erosion on Food Crop Production in Auchi	Frequency of respondents	Percentage (%)
Decline in crop yield	63	15.75
Increased cost of farming	54	13.5
Reduction in soil nutrients	52	13
Poor crop growth and development	48	12
Direct damage to crops	48	12
Loss of cultivable land	39	9.75
Decline in soil moisture and retention	32	8
Loss of beneficial soil organisms	28	7
Threatened food security	23	5.75
Decline in the variety of crops cultivated	13	3.25
Total	400	100

Source: Fieldwork, 2026

The Effective Soil Erosion Control Measures Suitable in the Study Area.

In the study area, Auchi, Edo State, Nigeria several strategies are put in place to control and combat soil erosion. These soil erosion control strategies include but not limited to bush fallowing and farmland abandonment, mulching, terrace farming, cover cropping, contour farming, sand bagging, construction of local drainage channels, and afforestation. From the survey conducted, these soil erosion control strategies are currently on ground but grossly inadequate, and inefficient to control and combat the effects of soil erosion on food crop production in the study area given the current trend. Owing to the aforementioned, the following effective soil erosion control measures were found to be suitable for use in the study area and they include: construction of modern drainage channels, construction of local barriers, planting of all-season green tropical tree crops and grasses, planting of all-season green imported trees, agro-forestry, practicing soil conservation, reforestation, leaving crop residues behind, farmland tillage, implementation of green belt initiative, check dams, bioengineering, runoff diversion structures, environmental sanitation, guided agricultural practices, permeable pavements, reduced tillage, and planting of drought resistant crops and grasses.

CONCLUSION.

Soil erosion, as a global phenomenon poses significant threats across various sectors, with food crop production being particularly vulnerable. Precisely, Auchi with its unique geographical, climatic, edaphic characteristics and rapid urbanization faces significant threats to its present and future food cop production. These attributes, unarguably, make food crop production in Auchi highly at the mercy of the effects of soil erosion. In order that the effects of soil erosion on food crop production are averted or at least alleviated, various soil erosion control measures have been put in place or on ground but not suitable in the study area given the current trend. Following the aforesaid, construction of modern drainage channels, construction of local barriers, planting of all-season green tropical tree crops and grasses, planting of all-season green imported trees, application of soil conservation techniques, reforestation, leaving crop residues behind, farmland tillage, implementation of green belts initiatives, check dams, bioengineering, runoff diversion structures, environmental sanitation, guided agricultural practices, permeable pavements, reduced tillage, watering and keeping the soil moist during spells/seasons and planting of drought resistant crops and grasses in Auchi, Edo State, Nigeria. This paper concludes by advocating strongly for the apt implementation of the recommendations, policy interventions and carrying out further researches that are apt, timely, and would



ensure the resilience of the locals in the face of the effects of soil erosion on food crop production in Auchi, Edo State, Nigeria.

RECOMMENDATIONS

This paper examined the effects of soil erosion on food crop production in Auchi, Edo State, Nigeria. Based on the findings of this paper, the following actionable policy recommendations are made: creating and promoting effective and efficient community awareness and advocacy on the effects of soil erosion on food crop production in Auchi, Edo State, Nigeria, communal labour and cooperation, construction of modern drainage channels, construction of local barriers, planting of all-season green tropical tree crops and grasses, planting of all-season green imported trees, practicing soil conservation, reforestation, leaving crop residues behind, farmland tillage, implementation of green building initiatives, implementation of green belts, check dams, bioengineering, runoff diversion structures, environmental sanitation, guided agricultural practices, permeable pavements, reduced tillage, and planting of drought resistant crops and grasses, effective and regular inspections and monitoring of drainage channels to prevent dumping of wastes should be religiously enforced and appropriately. The concerned authorities, bodies, and organizations should ensure that these self-help, communal labour and cooperation programmes, policy recommendations, and interventions are implemented accordingly.

LIMITATIONS

This study, the effects of soil erosion on food crops production in Auchi, Edo State, Nigeria is a questionnaire-based research. Questionnaire-based perception data may be subjective. For instance, 2026 population data used in this study is a projection, not actual population figures from real population census. Furthermore, no soil erosion site sample or remote sensing data were collected and analyzed independently to substantiate the validity and authenticity of the perceived effects of soil erosion on food crops production in Auchi, Edo State, Nigeria. Finally, no inferential statistical technique was adopted or used as no hypothesis was stated and analyzed in the course of this study.

REFERENCES

1. Adebayo, A. A., Oladimeji, Y. U., & Abdullahi, M. (2022). Soil degradation and agricultural productivity challenges among smallholder farmers in Nigeria. *Journal of Agricultural Sustainability*.
2. Adegun, O.E. Eremen, P. E., & Odunuga, S. (2024). Characteristics of soils of Iwogban Gully in Edo State and their implications for household food security. *Book of Proceedings of the 14th Nigeria Association of Hydrological Sciences Conference, 2024*.
3. Alonge, T. A., Kabo-bah, A. T., Yevugah, L. L., & Iddrisu, A.-K. (2026). Quantifying soil erosion rate in Kampe Omi Dam Basin, Nigeria, through integrated geospatial and RUSLE modelling. *Discover Soil*, 3, 15. <https://doi.org/10.1007/s44378-026-00175-3>.
4. Afegbua, U. K., Uwazuruonye, J., & Jafaru, B. (2016). Investigating the causes and impacts of gully erosion in Auchi, Nigeria. *Journal of Geography, Environment and Earth Science International*, 4(4), 1-13.
5. Agbai, W. P., Tate, O. J., & Efenudu, I. U. (2022). Erodibility status of some soils in Akoko-Edo Local Government Area of Edo State, Nigeria. *Bulgarian Journal of Soil Science*, 7(1), 13–23.
6. Ajayi, A. S., Ibrahim, R., Brai, M. A., & Seghosimen, S. (2019). Overview of the anthropogenic causes of soil erosion in Auchi, Edo State, Nigeria. *Journal of Environment and Earth Science*, 9(8), 9–17.
7. Babaiwa, D. A., & Airen, O. J. (2025). Volumetric analysis of predominant subsurface earth materials and 3D tomography for predicting soil erodibility in Abotse Quarters, Auchi, Etsako West LGA, Edo State, Nigeria. *Dutse Journal of Pure and Applied Sciences*, 11(1c), 271–277. <https://doi.org/10.4314/dujopas.v11i1c.27>.
8. Bennett, H. H. (1939). *Soil conservation*. McGraw-Hill.
9. Brady, N. C., & Weil, R. R. (2017). *The nature and properties of soils* (15th ed.). Pearson.



10. Ezech, C. U., Igwe, O., Asare, M. Y., Ndulue, D. C., Ayadiuno, R. U., & Preko, K. (2024). A review of soil erosion modeling in Nigeria using the Revised Universal Soil Loss Equation model. *Agrosystems, Geosciences & Environment*, 7(1), e20471.
11. Eneh, C. A., & Eneh, O. C. (2025). A system dynamics analysis of agricultural practices and food security in Nigeria. *Journal of Health, Population and Nutrition*, 44, 285.
12. FAO, (2010). *Forests and landslides: An introduction to the role of forests and trees in the prevention of landslides and rehabilitation of landslide-affected areas in Asia*. FAO.
13. FAO, (2019). *Status of the world's soil resources*. FAO.
14. FAO, (2022). *Climate-smart agriculture: Building resilience in rural communities*. Food and Agriculture Organization of the United Nations. <https://www.fao.org/3/cb9976en/cb9976en.pdf>
15. Kumari, V., Balloli, S. S., Kumar, M., Ramana, D. B. V., Prabhakar, M., Osman, M., et al. (2024). Diversified cropping systems for reducing soil erosion and nutrient loss and for increasing crop productivity and profitability in rainfed environments. *Agricultural Systems*, 217, 103919. <https://doi.org/10.1016/j.agsy.2024.103919>.
16. Lal, R. (2001). Soil degradation by erosion. *Land Degradation & Development*, 12(6), 519–539.
17. Morgan, R. P. C. (2005). *Soil erosion and conservation* (3rd ed.). Blackwell Publishing.
18. Nnabude, P. C., Onunwa, A. O., & Madueke, C. O. (2022). Management of erosion ravaged soils of Southeastern Nigeria. *Agriculture, Food and Natural Resources Journal*, 1(1), 31–42. <https://doi.org/10.5281/zenodo.22369346>.
19. Nwabuogo, E. O., Oluwakunmi, A. C., Rasheed, I., Yahaya, O., & Muhammed, A. L. (2025). Impact of effective rainfall on crop and irrigation water requirements of FARO-59 rice in Edo State, Nigeria. *Path of Science*, 11(11), 7019–7026.
20. Nwosu, C., Nwakuba, N. R., Osuagwu, C. O., et al. (2024). Agricultural and environmental sustainability in Nigeria: A review of challenges and possible eco-friendly remedies. *Environment, Development and Sustainability*.
21. Ogboi, E., & Odeh, R. B. (2012). Assessment of the impacts of gully erosion on Auchi settlement, Southern Nigeria. *Journal of Geography and Regional Planning*, 5(15), 415–422.
22. Okeke, U. H., Alaga, A. T., & Eguaroje, O. E. (2016). An assessment of gully erosion progression and vulnerability in Auchi Area in Edo State. *Journal of Geography, Environment and Earth Science International*, 8(2), 1–14.
23. Okoeka, G. E., Oladosu, S. O., & Alademomi, A. S. (2025). Geospatial mapping of gully erosion susceptibility in Etsako West Local Government Area, Edo State, Nigeria. *Dutse Journal of Pure and Applied Sciences*, 11(2a), 399–415. <https://doi.org/10.4314/dujopas.v11i2a.34>.
24. Olumba, C. N., Garrod, G., & Areal, F. (2025). Investigating the constraints and mitigation strategies for the adoption of sustainable land management practices in erosion-prone areas of Southeast Nigeria. *Environmental Management*, 75, 1504–1519.
25. Orji, R., & Ologunorisa, T. E. (2016). Assessment of the impacts of gully erosion on Auchi settlement, Southern Nigeria. *Journal of Geography and Regional Planning*, 9(7).
26. Osabohien, R., Jaaffar, A. H., Matthew, O., Osabuohien, E., Adeleke, O. K., & Olonade, O. Y. (2024). Soil management practice and smallholder agricultural productivity in Nigeria. *Discover Sustainability*, 5, 283.
27. Pimentel, D., & Burgess, M. (2013). Soil erosion threatens food production. *Agriculture*, 3(3), 443–463.
28. Tripathi, V. V., et al. (2025). Resilience to climate-induced food insecurity in Nigeria: A systematic review of the role of adaptation strategies in flood and drought mitigation. *Frontiers in Sustainable Food Systems*, 8, 1490133. <https://doi.org/10.3389/fsufs.2024.1490133>.
29. Wischmeier, W. H., & Smith, D. D. (1978). *Predicting rainfall erosion losses: A guide to conservation planning*. Washington, DC: United States Department of Agriculture.