International Journal of Agronomy and Agricultural Research
ISSN: 2223-7054 (Print); 2225-3610 (Online) | IJAAR |
Website: https://www.innspub.net
Email: info@innspub.net

RESEARCH PAPER
Vol. 29, Issue: 1, 2026
OPEN ACCESS

The role of vegetal cover in soil erosion control in Esan West Local Government Area, Edo State, Nigeria

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DOI: https://dx.doi.org/10.12692/ijaar/29.1.10-20

ARTICLE INFORMATION

RESEARCH PAPER

Vol. 29, Issue: 1, p. 10-20, 2026

Int. J. Agron. Agri. Res.

Ilenre *et al.*

ACCEPTED: 09 July, **2026**

PUBLISHED: 15 July, **2026**

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ABSTRACT

Soil erosion is a major environmental challenge in Esan West Local Government Area (LGA), Edo State, Nigeria, where intense rainfall, vegetation loss, urbanization, and other land-use activities threaten soil stability, agricultural productivity, infrastructure, and sustainable land management. Assessing the role of vegetal cover is therefore important for identifying environmentally sustainable approaches to erosion control. This study examined the types of vegetal cover and soil erosion, factors influencing vegetation development, drivers of soil erosion, inhabitants' awareness, and the role of vegetal cover in erosion control. Primary and secondary data were used. Structured questionnaires were administered to 515 respondents selected through simple random sampling, complemented by personal observations and oral interviews; data were analyzed using frequencies and percentages. Results showed that 69% of respondents identified man-made vegetal cover as predominant, while 31% identified natural vegetal cover. Rill erosion was the most prevalent erosion type (36.70%), followed by sheet (21.55%), splash (17.86%), and gully erosion (10.87%). Intense and erratic rainfall (27.96%) was identified as the leading driver of soil erosion, followed by high temperature (16.70%) and deforestation (14.75%). Most respondents (73.59%) reported very high awareness of the role of vegetal cover in erosion control. Reduction of surface runoff (15.92%) ranked as the most prominent role of vegetal cover, followed by reduction of evaporation (14.76%) and interception of raindrops (13.96%). The study concludes that vegetal cover provides an important and sustainable bioengineering approach to soil erosion control and recommends strengthening vegetation conservation, reforestation, cover cropping, and related soil conservation practices in Esan West LGA.

Key words: Role, Vegetal cover, Soil erosion, Control

INTRODUCTION

Soil erosion is a fundamental geomorphologic process involving the detachment, transport, and deposition of topsoil by natural physical forces: primarily water and wind. While erosion is a naturally occurring phenomenon that shapes the earth's surface over geologic timescales, it has been catastrophically accelerated by human intervention, emerging as a premier global threat to food security and ecosystem stability. The process effectively strips the earth of its most productive layer, the A-horizon, which contains the organic matter and nutrients essential for life (Obatoyinbo and Enoma, 2025). As the global population increases, the pressure on land resources has intensified, leading to a rate of soil loss that far exceeds the natural rate of soil formation, rendering soil a non-renewable resource on a human timescale (World Bank, 2025).

The mechanics of soil erosion are predominantly driven by the erosivity of the agent—such as the kinetic energy of rainfall and the erodibility of the soil, which is determined by its physical and chemical properties. In tropical regions, high-intensity precipitation events can quickly overwhelm the soil's infiltration capacity, resulting in surface runoff that carves rills and gullies into the landscape. This process is significantly mitigated by the presence of dense vegetal cover, which acts as a protective shield, dampening the impact of raindrops and anchoring the soil with complex root systems. However, widespread deforestation and unsustainable agricultural practices, such as overgrazing and mono-cropping, have left vast tracts of land vulnerable to rapid degradation (Ejaz *et al.*, 2025; Oamen, 2026).

The relationship between vegetal cover and soil erosion is a critical environmental dynamic, especially in regions with high-intensity precipitation. In Nigeria, particularly within Edo State, the loss of natural vegetation is a primary driver of land degradation and the formation of destructive gully systems (Oladosu *et al.*, 2022). Vegetation acts as a biological shield, with the canopy intercepting raindrops and dissipating their kinetic energy, thereby preventing the initial detachment of soil particles known as splash erosion. When this protective layer is removed through urbanization, agriculture, or deforestation, the surface of the soil is exposed to the full force of tropical storms, leading to increased runoff and sediment transport (Oladosu *et al.*, 2022).

In the specific context of Benin City and its environs, the geological and soil properties significantly influence erodibility. Research into the Iguosa-Oluku and University of Benin gullies indicates that poor land-use management and the removal of topsoil protection lead to rapid gully development (Oladosu *et al.*, 2022). Historical assessments in Edo State have identified that the subsoil in many erosion-prone areas consists of acid clay and silty gravelly sand, which are easily washed away by runoff once the vegetal cover is compromised (Omon and Ojeifo, 2012). Furthermore, the lack of adequate drainage systems often exacerbates the erosive power of runoff on bare surfaces, highlighting the necessity of maintaining forest fragments and riparian vegetation to stabilize the terrain (Jibril *et al.,* 2022).

Beyond physical protection, the root systems of indigenous and planted species provide mechanical reinforcement to the soil matrix. In Nigerian afforestation and agricultural projects, the integration of diverse plant species has been shown to check erosion while simultaneously increasing organic matter and improving soil structure (Jibril *et al.*, 2022). Studies have demonstrated that unsustainable human activities, including logging and unregulated crop cultivation, remain the leading causes of forest loss and subsequent soil degradation in the region (Jibril *et al.*, 2022). Addressing these challenges requires a combination of nature-based interventions such as reforestation and strict land-use regulations to protect the fragile topsoil from irreversible loss.

Beyond the immediate loss of arable land, the impacts of soil erosion extend to off-site environmental crises. Sediments carried by runoff often end up in aquatic ecosystems, causing the siltation of reservoirs, the destruction of fish habitats, and the contamination of water supplies with agricultural chemicals. In West African sub-regions, particularly within the varied topographies of Nigeria, these erosive processes have led to the total collapse of critical infrastructure and the

displacement of entire communities (Kayode-Ojo *et al.*, 2019). So, addressing soil erosion requires an integrated approach that combines engineering solutions with biological conservation strategies to restore the delicate balance between land use and environmental resilience.

Soil erosion remains one of the most significant environmental challenges in the humid tropical regions of Southern Nigeria, particularly within the Esan West Local Government Area (LGA), Edo State. Characterized by undulating topography and high-intensity rainfall, this region is increasingly susceptible to various forms of land degradation, ranging from sheet and rill erosion to catastrophic gully formations. In Esan West, the acceleration of these processes is often linked to the rapid depletion of vegetal cover, which serves as the primary natural defense against the erosive forces of water. As urbanization and agricultural expansion such as those surrounding the Ekpoma axis continue to alter the landscape, the loss of protective biomass has led to severe socio-economic consequences, including the destruction of infrastructure and the loss of arable farmland (World Bank, 2025; Oamen, 2026).

Vegetal cover acts as a critical biological buffer by intercepting raindrops, thereby reducing their kinetic energy and preventing the detachment of soil particles. According to Oamen (2026), vegetation dynamics in Edo State are under significant pressure from logging, shifting cultivation, and urban development, which weakens the ecological stability of the soil. When the natural rainforest or secondary regrowth is removed, the infiltration capacity of the soil decreases, leading to increased surface runoff. In areas like Egoro, Ukpenu, Adima, Ilenloa, Ikhirolo, Emuhi, Iruekpen, Ujemen and other parts within the Esan West LGA, this imbalance has triggered the development of deep gullies that are difficult to remediate through mechanical means alone (Kayode-Ojo *et al.*, 2019; Oamen, 2026). The transition from natural forest to anthropogenic land uses has exacerbated erosion rates across Esan West. Recent assessments by the World Bank (2025) through the Nigeria Erosion and Watershed Management Project (NEWMAP) highlight that infrastructure development without adequate drainage systems often directs concentrated runoff into vulnerable sub-watersheds.

Furthermore, the socio-economic impacts of deforestation in Edo State are profound; research indicates that the rate of forest loss is strongly correlated with significant economic losses and a decline in soil fertility (Amanesi, and Ikhuoria, 2021) The destruction of soil microbes and the reduction of water absorption capacity due to practices like bush burning, further render the Esan landscape more susceptible to u-shaped gullies that expand rapidly during the peak of the rainy season (Ejaz *et al.*, 2025). According to Oladosu *et al.* (2022), the anthropogenic removal of topsoil protection in Edo State is driven by construction and intensified land use, this is the primary precursor to the rapid volumetric loss of soil in gully systems. While mechanical interventions such as backfilling and the construction of drainage channels are frequently employed in Edo State, their success is often limited without the integration of biological controls. Recent studies emphasize that afforestation and the reintroduction of vegetative cover are essential for long-term sustainability. For instance, in the urban catchments of Edo, the use of the Revised Universal Soil Loss Equation (RUSLE) has shown that soil loss often exceeds tolerance values, necessitating a shift toward "green" engineering (Obatoyinbo, and Enoma, 2025).

Statement of the problem

The ecological integrity of Esan West LGA is currently threatened by an unprecedented rate of land degradation, primarily manifested through expansive gully erosion systems. Despite various state-led interventions, the fundamental problem lies in the rapid conversion of natural forest and secondary vegetation into impervious urban surfaces and degraded agricultural lands. This loss of vegetal cover has removed the critical biological shield that once dissipated the kinetic energy of rainfall, leading to a massive increase in surface runoff and soil detachment (Obatoyinbo and Enoma, 2025). Within communities in Esan land such as Ekpoma, Ibore, and Ewu, the resulting gully complexes have reached depths that compromise local geological stability, yet current control measures often prioritize expensive, short-term engineering structures over sustainable biological reclamation (Kayode-Ojo *et al.*, 2019; World Bank, 2025).

In a concordant tune, Eseigbe and Osawe (2016) studied the impact of climate change on landforms in Nigeria and noted that soil erosion is not merely a natural phenomenon but a climate-driven hazard worsened by anthropogenic activities such as deforestation, poor land use practices, and unregulated urban expansion. They further noted that the growing frequency of high-intensity rainfall events has overwhelmed the existing drainage systems, resulting in accelerated topsoil loss and sediment accumulation in low-lying areas. This phenomenon reduces agricultural productivity and contributes to downstream flooding and water pollution.

The core of the problem is further exacerbated by a lack of localized data regarding the specific efficiency of indigenous plant species in stabilizing the highly erodible soils of the Esan plateau.

While deforestation is recognized as a driver of erosion, the socio-economic pressures including unsustainable logging and unregulated infrastructure expansion around Ambrose Alli University, Ekpoma continue to outpace conservation efforts (Amanesi and Ikhuoria, 2021). Consequently, the region faces a double trajedy: the loss of productive topsoil essential for food security and the physical destruction of residential and transport infrastructure (Ejaz *et al.*, 2025). Without a comprehensive evaluation of how varying degrees of vegetal density influence soil loss rates in this specific topographic context, erosion control efforts in Esan West LGA, Edo State, Nigeria remain reactive rather than proactive, leading to a recurring cycle of environmental and economic loss (Oamen, 2026). Owing to the above, this scholarly inquiry seeks to evaluate the specific role of vegetal cover in soil erosion control within Esan West LGA, Edo State, Nigeria providing a framework for sustainable land management that balances developmental needs with ecological preservation.

Conceptual framework

Soil erosion is conceptually understood as the systematic displacement of the upper layer of soil by physical agents, primarily water and wind. A central concept in this study is vegetal cover, which refers to the biological layer of trees, shrubs, and grasses that serves as a protective interface between the atmosphere and the lithosphere. Conceptually, vegetation acts as a "biological armor" through three distinct mechanisms: the canopy intercepts raindrops to dissipate kinetic energy, the surface litter layer reduces the velocity of runoff, and the subterranean root systems increase the soil's shear strength. The depletion of this cover, often termed "land stripping," creates a conceptual vacuum where the soil is exposed to direct hydraulic forces, leading to the rapid transition from sheet erosion to deep gully formation (Ikhile, 2016; Eze, and Chigbu, 2023).

Furthermore, bio-engineering emerges as a critical conceptual framework, advocating for the use of living vegetation as a structural component in erosion control. Unlike purely mechanical solutions such as concrete drains, biological controls are conceptually self-augmenting, as their

Theoretical framework

This study is theoretically anchored on the Revised Universal Soil Loss Equation (RUSLE) and the Threshold Theory of Geomorphic Change. The RUSLE theory provides a mathematical foundation for predicting soil loss by integrating five key environmental variables: rainfall erosivity, soil erodibility, slope length/steepness, cover management and support practices This theory is pivotal to the study because it identifies the C-factor (vegetal cover) as the most significant variable that can be manipulated through human intervention to mitigate soil loss. Complementing this is the Threshold Theory of Geomorphic Change, which posits that landforms remain in a state of equilibrium until a critical physical threshold is breached. In Esan West, the removal of indigenous forest cover for urbanization or farming represents the crossing of a "stability threshold," where the soil's infiltration capacity is overwhelmed by surface runoff, triggering the sudden and irreversible incision of the landscape into u-shaped gullies (Oamen, 2026; Kayode-Ojo *et al.,* 2019).

Empirical literature review

Empirical studies within Edo State provide localized evidence of the devastating impact of vegetation loss on soil stability. Kayode-Ojo *et al.* (2019), investigated "Gully

Erosion Problems in Selected Areas of Edo State: Factors and Control," with the aim to evaluate why many control measures fail. Using geotechnical analysis, they found that mechanical drainage systems in the Esan plateau were frequently undermined by "scouring" at their exit points because they lacked the supplementary biological stabilization provided by vegetal cover. In a similar vein, Amanesi and Ikhuoria (2021), conducted a study titled "Evaluation of Socio-Economic Impacts of Deforestation in Edo State," with the aim of identifying the drivers of forest loss. Their methodology involved a descriptive survey and satellite imagery analysis, revealing that commercial logging and shifting cultivation had rendered 70% of the sampled lands in the region susceptible to rill and sheet erosion.

Obatoyinbo and Enoma (2025), in their study titled "Estimation of the Volume of Soil Loss Due to Erosion in Iwogban Urban Catchment Area, Edo State," sought to quantify soil displacement in urbanized catchments. Using a methodology that integrated direct field measurements with GIS-based RUSLE modeling, the study found that soil loss in areas stripped of vegetation exceeded 30 tons per hectare annually, which far surpasses tolerable limits for tropical soils.

Furthermore, Ejaz *et al.* (2025), explored the "Influence of unwholesome practices as precursor of gully erosion" in the Esan environs. Their aim was to assess how anthropogenic activities like bush burning influence gully initiation. Through laboratory analysis of soil samples, they found that the destruction of vegetal cover via bush burning reduced soil organic matter by 45%, making the soil particles three times more likely to detach during rain events. Finally, Oamen (2026) provided a temporal perspective in "Spatio-temporal change detection analysis of vegetation cover in Edo State." The study aimed to map vegetation shifts using Normalized Difference Vegetation Index (NDVI) mapping. The methodology revealed that Esan West LGA lost approximately 15% of its dense vegetation cover over a ten-year period, a trend that directly correlated with a 25% increase in visible gully scars.

The aim of this study is to evaluate the role of vegetal cover in soil erosion control in Esan West LGA, Edo State, Nigeria. The specific objectives in line with the identified statement of the problem are to:

1. Examine the types of vegetal cover in Esan West LGA;
2. Examine the types of soil erosion in Esan West LGA;
3. Examine the natural and man-made factors encouraging the growth and development of vegetation in Esan West LGA;
4. Examine the natural and anthropogenic drivers of soil erosion in Esan West LGA;
5. Examine the level of awareness of the inhabitants on the role of vegetal cover in soil erosion control in the study area;
6. Examine the role of vegetal cover in soil erosion control in Esan West LGA.

MATERIALS AND METHODS

The data used in this study were collected from both primary and secondary sources. The primary data collected from the field were through the administration of questionnaires and personal observations and interviews. The population of the study area was projected to be 257,821 persons in 2025 at 2.8% growth rate. Out of this population figure, 515 respondents which represent 0.2% of the total population were reached via the use of structured questionnaires, personal observations and oral interviews. More than half of the population of Esan West LGA of Edo State, Nigeria is found in Ekpoma Kingdom. Owing to that, more than half of the questionnaires (285) were administered at Ekpoma kingdom. The others were administered based on the population sizes of the other communities in this order: Ogwa (65), Ukhun/Idoa (60), Ujogba (40), Urhohi (35) and Egoro (30). All the questionnaires administered were painstakingly, passionately and conscienciously retrieved by the researchers and their assistants and they were used to examine the objectives of the study. Personal observation was used to verify the data collected through the secondary sources with particular reference to the people's perception on the impact of vegetal cover in soil erosion control in the study area. The secondary data needed were collected from related and relevant textbooks, articles in journal publications, students' original essays, dissertations, theses, magazines, newspapers, and internet. Others include the data generated by Esan West Local Government Council and

the National Population Commission. Simple random sampling techniques were used to select the respondents in each of the Kingdoms. Questions were asked relating to the objectives of the study and other relevant areas that helped to achieve the aim of the study. The data collected from the field were carefully and patiently analyzed using frequency tables and percentages.

Study area

Esan West Local Government Area is one of the 18 Local Government Areas of Edo State, Nigeria. It is also one of the five Local Government Areas that constitute Esanland. The Local Government Area was created in 1991 with Ekpoma as its Administrative Headquarters. The LGA is located within Latitudes 6° 44[I] and 6° 45[I]N of the Equator and Longitudes 6° 06[I] and 6° 08[I]E of the Greenwich Meridian (Ojiefo, 2005 and Eseigbe, 2011; Ehisuoria and Ilenre, 2018). The LG is bounded in the north by Esan Central LGA, Owan West LGA on the North West, on the West, it is bounded by Uhunmwode l GA, and to the south by Igueben LGA (Fig. 1).

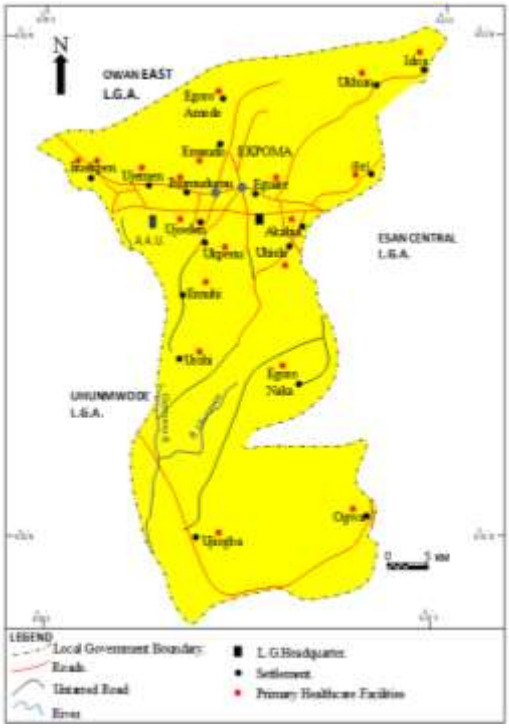

Fig. 1. Location: Esan West Local Government Area (Source: Cartography studio, A. A. U. Ekpoma, 2017)

Esan West LGA is situated on the Esan Plateau. The entire region is made up of lignite group of rocks consisting of clays, fine grained sands and carbonaceous shale clays (Omofonmwan, 2006). The relief of the area varies considerably from between 150 and 430 meters above mean sea level. The LGA has no major rivers. The major water bodies in the study area include streams such as Ibiekuima, and Ogidekpe that drain northwest of Ekpoma (Eseigbe, 2011; Ehisuoria and Ilenre, 2018). The streams in the study area are the Mobalo Stream at Urohi, which drains into Orhiomwon River, and the Olelo Stream in Ora-Ede. The other water bodies are the Amahama mysterious seasonal lake, the Egoro Springs at Emuhi, Urohi and Egoro Na-Oka axis. Water supply in the LGA is a critical challenge during the dry season particularly in Ekpoma Kingdom.

The study area has a sub–humid tropical climate characterized by wet and dry seasons (Ojeifo, 2005; Eseigbe, 2011; Ehisuoria, 2012). The climate regime is controlled by the position of the Inter Tropical Convergence Zone (ITCZ). The variation between the seasons is caused by the latitudinal migration of the tropical convergence zone (ITCZ). The mean annual rainfall in Esan West LGA is about 1,900mm to 2,000mm. The wet season lasts between March and November while the dry season is from November to March. The rainfall is highest in the months of June/July and September and lowest in the months of December to February. The annual mean temperature is between 25°C and 36°C. The current global climate change has altered the age-long known climate of the study area.

The study area is located within the tropical rain forest region. The forest consists of hard and soft woods which include Iroko, Mahogany, Africa Walnut, Black and White Afara, Obeche and Masonia (Ojiefo, 2005 and Eseigbe, 2011; Ehisuoria and Ilenre, 2018). These tress are currently more dominant at Ukhun, Idoa, Urohi, Ujiogba, Ogwa, and Iruekpen forests. Human activities in the forest for agriculture (crop cultivation and animal grazing) and other economic activities have reduced the forest nature of the area. Following the above, derived savannah vegetation plants are common in most settlements such as Emuhi, Ukhun, Idoa and farm settlement.

The population of the LGA in 2006 population census was estimated at 122,719 people at growth rate of 2.8% per annual. The projected population in 2026 is 201,423 persons. The economic activities of the people of Esan West LGA include agriculture, hunting, entertainment and cottage, small and medium scale industrial activities. These economic activities are limited by poor transportation, flooding, low capital, seasonal bush fires, overgrazing, rural urban migration by the youths and most recently, insecurity.

RESULTS AND DISCUSSION

The field survey carried out on the role of vegetal cover in soil erosion control in Esan West LGA, Edo State, Nigeria, shows that vegetal cover plays a very vital role in soil erosion control in the study area. It further shows that vegetal cover (biological control of erosion) is the most apt and environment friendly among all the soil erosion control techniques and technologies in place in the study area. Finally, it shows that the impact of vegetal cover in soil erosion control in the study area has critical implications on land, infrastructure, settlement, agricultural yields, and the overall socioeconomic development of the people and the general environment of Esan West LGA, Edo State, Nigeria.

Types of vegetal cover in Esan West LGA

Table 1 shows clearly that there are two (2) different types of vegetal cover in the study area. Table 1 further shows that the two types of vegetal cover in Esan West LGA< Edo State, Nigeria are the natural and man-made cover. The man-made vegetal cover occupies more than half of the study area as 356 (69%) of the sample population are of this opinion while 159 (31%) of the sample population are of the opinion that natural vegetation is more in study area.

Table 1. Types of vegetal cover in Esan West LGA

Types of vegetal cover in Esan West LGA	Frequency	Percentage (%)
Natural vegetal cover	159	31
Man-made vegetal cover	356	69
Total	515	100

Field Work, 2026

Types of soil erosion in Esan West LGA

The recognizance and actual fieldwork conducted clearly reveal the types of soil erosion in Esan West LGA, Edo State, Nigeria. From Table 2, splash, sheet, rill, gully, streambank riverbank, wind erosion and mass movement erosion were indentified. Table 2 further places them in their order of prevalence and widespread in the study area. Below is a presentation of the opinions of the inhabitants of the sample population via structured questionnaire, personal observation and interviews on the types of soil erosion in Esan West LGA, Edo State, Nigeria in Table 2. From Table 2, it is obvious that 189 (36.70%) respondents are of the opinion that rill erosion is a type of soil erosion and the most prevalent and widespread. Followed by rill erosion is sheet erosion with 111 (21.55%) respondents and it is qickly followed by splash erosion which recorded 92 (17.86%) of the sample population in the study area. Others are gully erosion with 56 (10.87%) respondents, mass movement with 43 (8.35%) respondents, wind erosion with 17 (3.30%) respondents, and finally, streambank erosion, which is the least in the ranked opinions recorded 7 (1.36%) respondents of the sample population in the study area. This result shows that rill, sheet, splash and gully erosion (in that order) are the most common and widespread in the study area.

Table 2. Types of soil erosion in Esan West LGA

Types of soil erosion in Esan West LGA	Frequency	Percentage (%)
Splash	92	17.86
Rill	189	36.70
Sheet	111	21.55
Gully	56	10.87
Streambank	7	1.36
Wind erosion	17	3.30
Mass movement	43	8.35
Total	515	100

Field Work, 2026

The natural and man-made factors encouraging the growth and development of vegetation in Esan West LGA

Table 3 shows that humid tropical climate, fertile rain forest soils, energetic rain/high forest vegetation, topography, importation of foreign species, large market, forest conservation laws, capital, entrepreneurship/management, and reforestation are the natural and man-made factors encouraging the growth and development of vegetation in Esan West LGA, Edo State, Nigeria.

Table 3 further reveals that humid tropical climate ranked first and it recorded 89 (17.28%) respondents of

the sample population in the study area. Fertile rain forest soils ranked second and it recorded 79 (15.34%) respondents, topography which ranked next recorded 70 (13.59%) respondents, energetic rain/high forest vegetation recorded 66 (12.82%) respondents, large market 66 (11.65%) respondents, importation of foreign species recorded 44 (8.54%) respondents, reforestation recorded 39 (7.57%) respondents, capital recorded 27 (5.24%) respondents, forest conservation laws recorded 23 (4.47%), and entrepreneurship/management (the last in the ranking of the opinions of the respondents) recorded 18 (3.50%) respondents in the study area. Table 3 further reveals that humid tropical climate, fertile rain forest soils, topography, and energetic rain/high forest vegetation (which are natural factors), are the most influential/exerting factors encouraging the growth and development of vegetation in Esan West LGA, Edo State, Nigeria.

Table 3. The natural and man-made factors encouraging the growth and development of vegetation in Esan West LGA

The natural and man-made factors encouraging the growth and development of vegetation in Esan West LGA	Frequency	Percentage (%)
Humid tropical climate	89	17.28
Fertile rain forest soils	79	15.34
Energetic rain/high forest vegetation	66	12.82
Topography	70	13.59
Importation of foreign species	44	8.54
Large market	60	11.65
Forest conservation laws	23	4.47
Capital	27	5.24
Entrepreneurship/management	18	3.50
Reforestation	39	7.57
Total	515	100

Field Work, 2026

Table 4. The natural and anthropogenic causes of soil erosion in Esan Wesst LGA

The natural and anthropogenic causes of soil erosion in Esan Wesst LGA	Frequency	Percentage (%)
Intense and erratic humid tropical rainfall	144	27.96
High humid tropical temperature	86	16.70
Strong winds	50	9.71
Deforestation	76	14.75
Wildfires	42	8.16
Urbanization	51	9.90
Unsustainable agriculture	38	7.38
Construction activities	12	2.33
Over cultivation/over grazing	16	3.11
Total	515	100

Source: Fieldwork, 2025

The natural and anthropogenic drivers of soil erosion in Esan West LGA

The recognizance and actual field surveys conducted reveal the natural and anthropogenic causes of soil erosion in Esan West LGA. Table 4 shows clearly that intense and erratic humid tropical rainfall, high humid tropical temperature, strong winds, wanton deforestation, wildfires, urbanization, unsustainable agriculture, construction activities and over cultivation/over grazing are the natural and anthropogenic drivers of soil erosion in the study area. Out of the 515 structured questionnaires administered in the study area, 144 (27.96%) respondents towed the line of intense and erratic humid tropical rainfall, 86 (16.70%) respondents are for high humid tropical temperature, 76 (14.75%) respondents are for deforestation, 51 (9.90.36%) respondents are for urbanization, 50 (9.71%) respondents are for strong winds, 42 (8.16%) respondents are for wildfires, 38 (7.38%) respondents are for unsustainable agriculture, 16 (3.11%) respondents are for over cultivation/over grazing, and 12 (2.33%) for construction activities in the study area.

This finding aligns with the earlier findings of Eseigbe and Osawe (2016) and Akanwa *et al.* (2024), which identified climatic factors as the major environmental

challenge with profound impacts on soil stability and land productivity, especially in vulnerable regions. Climate change, characterized by high humid tropical temperatures, intense and erratic humid tropical rainfall patterns, and increased storm intensity, accelerates soil erosion through intensified surface runoff, reduced vegetation cover, and altered hydrological cycles. Soil erosion in Esan West is not merely a natural phenomenon but a climate-driven hazard stultified by anthropogenic activities such as deforestation, poor land use practices, and unregulated urban expansion.

The level of awareness of the inhabitants on the role of vegetal cover in soil erosion control in Esan West LGA

Table 5 reveals the level of awareness of the inhabitants in Esan West LGA, Edo State, Nigeria on the role of vegetal cover in soil erosion control. From Table 5, it is crystal clear that 379 (73.59%) respondents of the sample population have a very high level of awareness on the role of vegetal cover in soil erosion control in Esan West LGA, Edo State, Nigeria. Similarly, 109 (21.17%) inhabitants of the sample population revealed that they have high level of awareness on the role of vegetal cover in soil erosion control in Esan West LGA. Furthermore, 14 (2.72%) respondents of the sample population in the study area are of average level of awareness, 10 (1.94%) respondents have very low level of awareness, and lastly, 3 (0.585%) respondents only of the sample population in the study area are of very low level of awareness on the role of vegetal cover in soil erosion control in Esan West LGA, Edo State, Nigeria. From the available result, it is unarguably clear that a very high percentage of the sample population is aware of the role played by vegetal cover in soil erosion control in Esan West LGA, Edo State, Nigeria.

Table 5. The level of awareness of the inhabitants of Esan West LGA on the role of vegetal cover in soil erosion control in Esan West LGA

Level of awareness	Frequency	Percentage (%)
Very High	379	73.59
High	109	21.17
Average	14	2.72
Low	10	1.94
Very low	3	0.58
Total	515	100

Source: Fieldwork, 2026

Table 6. The role of vegetal cover in soil erosion control in Esan West LGA

The role of vegetal cover in soil erosion control in Esan West LGA	Frequency	Percentage (%)
Reduction of surface runoff	82	15.92
Binding soil particles together	44	8.54
Interception/interruption of raindrops	72	13.96
Acts as a windbreak	51	9.90
Improves soil structure	48	9.32
Protects slopes and streambanks	31	6.02
Improves the ability of water to sink into the soil	54	10.49
Maintaining soil moisture content	57	11.07
Reduction of evaporation	76	14.76
Total	515	100

Source: Fieldwork, 2026

The role of vegetal cover in soil erosion control in Esan West LGA

Table 6 shows clearly that reduction of surface runoff, binding soil particles together, interception/interruption of raindrops, acts as a windbreak, improves soil structure, protects slopes and streambanks, improves the ability of water to sink into the soil, maintains soil moisture content, and reduction of evaporation are the roles of vegetal cover in soil erosion control in Esan West LGA, Edo State, Nigeria. Specifically, the table shows that reduction of surface runoff with 82 (15.92%) respondents of the sample population in the study area ranked highest and it is followed by reduction of evaporation with 76 (14.76%) respondents. Others are interception/interruption of raindrops with 72 (13.96%) respondents, maintaining soil moisture content with 57 (11.07%) respondents, improves the ability of water to sink into the soil with 54 (10.49%) respondents, acts as a windbreak with 51 (9.90%) respondents, improves soil structure with 48 (9.32%) respondents, binding soil

particles together 44 (8.54%) respondents and lastly, protects slopes and streambanks with 31 (6.02%) respondents of the sample population ranked last in the study area. Following the above result, it is crystal clear from the opinions of the respondents that vegetal cover plays a very significant role in the control of soil erosion in the study area.

CONCLUSION

Across the globe, one of the most disturbing environmental challenges of the 21st century, exerting recurring profound effects on physical and biological systems is soil erosion. Specifically, Esan West LGA, Edo State, Nigeria faces significant and wanton havoc wrecked by soil erosion. This is due to the unique and peculiar topographic and climatic characteristics and rapid urban expansion. Unequivocally, these unique and peculiar characteristics exhibited by Esan West LGA, Edo State, Nigeria make it highly vulnerable and susceptible to soil erosion and its attendant effects. The effects of soil erosion have implications on, landscape, settlements, farmlands, agriculture, food security, infrastructure, transportation, psychology, and the overall well-being of the inhabitants. Over the years, non-bioengineering technologies and techniques have been used to control this menace. The results have not been encouraging or satisfactory.

Therefore, to mitigate or at least reduce the effects of soil erosion to the barest minimum in Esan West LGA, different approach which involves the use of vegetal cover (bioengineering) is seen as the most sustainable. Following this, these control strategies have been put in place and they include effective, efficient, and efficacious continuous creation and promotion of community awareness; monitoring of climatic conditions to help predict potential climate change-related hazards that can harm vegetation and how to avert them; planting of cover crops; planting of all-season green tree crops; practicing soil conservation technologies and techniques, regulated agriculture; reforestation, bush fallow/agricultural land abandonment, farmland tillage, terrace farming, environmental sanitation, bioengineering; green building initiatives, laws against unregulated bush fires, enhancement of humid tropical climate, importation of adaptable foreign species; and forest conservation laws. This paper concludes by advocating for the implementation of the actionable policy recommendations, policy interventions, and further research that would ensure the resilience of the locals in Esan West LGA, Edo State, Nigeria in the face of the effects of soil erosion.

RECOMMENDATIONS

Soil erosion is gradually becoming a threat to the landscape and the locals of Esan West LGA, Edo State, Nigeria. The growing awareness on the role of vegetal cover in soil erosion control notwithstanding, localized data and targeted interventions addressing its specific impact in Esan West LGA, Edo State, Nigeria are perhaps few, if not completely absent. Most existing studies focus on broader regional trends, leaving a gap in understanding the micro level interactions between vegetal cover variables and soil erosion (land degradation) in Esan West LGA, Edo State, Nigeria Without a clear assessment of these dynamics, policymakers and stakeholders are ill-equipped to implement effective coping and mitigation strategies, thereby exacerbating further environmental degradation and socioeconomic losses. Therefore, this study examined the role of vegetal cover in soil erosion control in Esan West LGA, Edo State, Nigeria. Based on the findings of this paper, the following actionable policy recommendations are made: effective, efficient, and efficacious continuous creation and promotion of community awareness; monitoring of climatic conditions to help predict potential climate change-related hazards that can harm vegetation and how to avert them; planting of cover crops; planting of all-season green tree crops; practicing soil conservation technologies and techniques, regulated agriculture; reforestation, bush fallow/agricultural land abandonment, farmland tillage, terrace farming, environmental sanitation, bioengineering; green building initiatives, laws against unregulated bush fires, enhancement of humid tropical climate, importation of adaptable foreign species; timely completion of construction works and forest conservation laws. It is hoped that the concerned authorities will ensure that the above actionable policy recommendations are aptly implemented.

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