EPRA International Journal of Agriculture and Rural Economic Research (ARER)- Peer-Reviewed Journal
Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

THE IMPACT OF ARTISANAL CRUDE OIL REFINING ON LIVELIHOODS AND FOOD SECURITY IN BAYELSA STATE: AN EMPIRICAL EXAMINATION OF THE TRAGEDY OF THE COMMONS

Pullah Ebipre PhD*[1], Patimi Ebikeseiye PhD[2]
[1]*Department of Economics, Isaac Jasper Boro College of Education, Sagbama, Bayelsa State*
[2]*Department of Economics, Isaac Jasper Boro College of Education, Sagbama, Bayelsa State*

[*]*Corresponding Author*

Article DOI: https://doi.org/10.36713/epra24216
DOI No: 10.36713/epra24216

ABSTRACT----------
This study critically examined the socio-economic effects of artisanal crude oil refining (ACOR) on livelihoods (farming and fishing) activities in the Bsyelsa State, with a specific focus on the communities of Southern Ijaw, Nembe, and Sagbama Local Government Areas. Rooted in the theoretical framework of the Tragedy of the Commons, the research utilized a quantitative approach to analyze the relationship between ACOR intensity and community well-being. Data was analyzed using a one-way Analysis of Variance (ANOVA), followed by post hoc comparisons (Tukey's HSD) and homogeneous subset analysis to identify specific group differences. The findings provided strong statistical evidence that ACOR activity has a significant and detrimental effect on both livelihoods and household food security. The analysis revealed a critical "threshold effect," where the negative impacts on food security and livelihoods escalate dramatically once refining activities reach a certain intensity. The study concluded that the pursuit of short-term private gain through ACOR leads to the systematic degradation of shared resources – soil and water – resulting in the collapse of traditional livelihoods (farming and fishing) and creating a cycle of environmental and socio-economic vulnerability for the entire community. The results underscored an urgent need for interventions that combine environmental remediation with the promotion of sustainable, alternative livelihoods.

KEYWORDS; *Artisanal Crude Oil Refining (ACOR), Farming, Fishing, Tragedy Of The Commons, Traditional Livelihoods,----------*

ACKNOWLEDGEMENT
The authors express profound gratitude for the support that made this research, titled "The Impact of Artisanal Crude Oil Refining on livelihoods and food security in Bayelsa State: An Empirical Examination of the Tragedy of the Commons," possible.

We acknowledge the Tertiary Education Trust Fund (TETFUND) for the generous financial sponsorship and commitment to capacity building that facilitated the execution of this empirical study. This support was instrumental in the successful gathering and analysis of data. Furthermore, we extend our sincere appreciation to the Management and Staff of the Isaac Jasper Boro College of Education Sagbama, Bayelsa State, Nigeria for providing the essential institutional framework, guidance, and supervisory oversight necessary for the progress required for a successful completion of this scholarly work. Their academic environment and encouragement were invaluable along the way and will be throughout the research process.

1.1 INTRODUCTION
The Niger Delta, a region rich in hydrocarbon reserves, serves as the economic engine of Nigeria, but its long history of oil exploration and exploitation has created a complex web of environmental and socio-economic challenges (Bornu, 2023; Ogele et al., 2025). While the activities of multinational oil corporations have been widely documented for their negative impacts, a more insidious and rapidly escalating problem is the rise of artisanal crude oil refining (Adeyemi & Okoro, 2020 Richard et al., 2022; Odubo & Odubo, 2024). Often referred to as "kpo-fire," this illicit practice involves the use of rudimentary, makeshift equipment to distill crude oil into petroleum products like gasoline

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

and kerosene. While it provides an alternative source of income for some unemployed youths, its environmental footprint is profoundly destructive, with far-reaching consequences for the region's food security (Richard et al., 2023). As one of the states in the Niger Delta Region, the people of Bayelsa State traditional livelihoods are inextricably linked to their natural environment, primarily through subsistence farming and artisanal fishing (Odubo & Odubo, 2024; Deedam, 2024;, Numbere, 2023). However, the unchecked proliferation of artisanal refining sites has systematically destroyed these fundamental sources of sustenance in some Niger Delta Region communities (Elisha & Ipregha, 2022). The refining process involves the discharge of toxic by-products, including crude oil residues and heavy metals, directly into the surrounding land and water bodies (Richard et al., 2022). This continuous environmental assault has led to severe soil and water contamination, rendering once-fertile farmlands barren and aquatic ecosystems uninhabitable for fish and other marine life (Ibe & Uche, 2017; Ewim et al., 2023). Others highlighted how pollution has altered the chemical properties of the soil, making it unsuitable for cultivation and leading to a significant decline in crop yields (Ndubueze-Ogaraku et al., 2022). The consequences of this ecological damage are a direct threat to food availability and stability for the local population (Deedam, 2024; Angaye et al., 2025).

The destruction of traditional livelihoods has created a vicious cycle of poverty and food insecurity (Barigbon, 2023). As farming and fishing become unsustainable, communities are forced to abandon their primary occupations, leading to unemployment and a heightened dependence on a fragile and often expensive food market (Bashir, 202; Ogele et al., 2025). Food insecurity, characterized by a lack of food availability, accessibility, stability, and utilization, is a growing problem in the region, with studies showing that a majority of households are either food-insecure or on the brink (Olurinola & Osabuohien, 2021). The health implications are equally dire, as the consumption of crops and fish from contaminated environments introduces harmful toxins into the food chain, posing a serious public health risk to residents

Despite the government's efforts to curb artisanal refining through increased security operations, the problem persists, often exacerbated by the very methods used, such as the burning of illegal sites which further pollutes the environment (Richard et al., 2023). The lack of sustainable alternative livelihoods and the lure of quick, albeit dangerous, financial gains continue to drive the practice (Adeyemi & Okoro, 2020). Therefore, this study is crucial to understand the specific mechanisms through which artisanal refining contributes to food insecurity, moving beyond a general understanding of environmental degradation to a detailed analysis of its direct and indirect effects on food systems and community resilience. By shedding light on this critical nexus, the study aims to inform policymakers and development agencies on the need for comprehensive and community-centered interventions that address both the environmental damage and the socio-economic drivers of the problem.

1.2 Statement of the Problem

The Niger Delta region of Nigeria, despite being the source of the nation’s vast oil wealth, is a paradox of widespread poverty and significant environmental degradation (Ibe & Uche, 2017; Ewim et al., 2023; Ogele et al., 2025). While large-scale oil spills from official operations have been a long-standing issue, the proliferation of illegal artisanal crude oil refining has emerged as a particularly devastating environmental and socio-economic challenge (Richard et al., 2022). Driven by high rates of unemployment and a lack of alternative livelihoods, this illicit practice involves the use of crude methods that result in the indiscriminate discharge of toxic petroleum hydrocarbons and heavy metals into the surrounding environment (Angaye et al., 2025).

This unchecked environmental contamination has severe implications for the region's predominantly agrarian and fishing communities (Odubo & Odubo, 2024). The pollution renders fertile agricultural lands unproductive, as hydrocarbons alter the physicochemical composition of the soil, inhibiting crop growth and reducing yields (Adeyemi & Okoro, 2020). Concurrently, the toxic effluents discharged into rivers, streams, and wetlands decimate aquatic life, destroying fish stocks that are a primary source of protein and income for local inhabitants (Naanen, 2019). The systematic destruction of these traditional livelihoods directly undermines local food production, leading to food scarcity and inflated food prices.

Consequently, communities that were once self-sufficient in food production are now faced with a significant food security crisis, characterized by insufficient food availability, reduced access to nutritious food, and increased vulnerability to hunger. This situation is compounded by the fact that even the food that is available may be contaminated, posing serious public health risks to a population already suffering from respiratory and other illnesses linked to the pollution (Akujuru & Adele, 2023). The Niger Delta region of Nigeria faces a severe food security crisis and public health risks due to widespread poverty, environmental degradation from both official oil operations and

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

illegal refining, which have devastated agricultural and fishing livelihoods. While existing research has highlighted the broad environmental and socio-economic impacts of oil activities in the Niger Delta, there is a notable gap in comprehensive studies that specifically and quantitatively link the localized environmental damage from artisanal crude oil refining to the resulting food insecurity at the household level. Therefore, this study seeks to fill this critical void by providing a detailed analysis of the direct causal relationship between artisanal refining and food insecurity, with the aim of informing targeted policy interventions and community-based solutions.

1.3 Objectives of the Study

The main objective of this study is to critically analyze the contribution of artisanal crude oil refining to food insecurity in the Niger Delta region.

To assess the direct environmental impacts of artisanal crude oil refining on soil and water quality, and their subsequent effects on crop cultivation and fishing activities.
To examine the socio-economic consequences of these environmental impacts on the livelihoods of local communities and their ability to access and afford food.

To analyze the existing government policies and community-based strategies for mitigating the environmental damage and food insecurity caused by artisanal crude oil refining.

2.1 CONCEPTUAL REVIEW

This study is conceptually grounded in the nexus between environmental degradation and socio-economic vulnerability, specifically examining how artisanal crude oil refining (ACOR) contributes to food insecurity in the Niger Delta. To understand this relationship, it is essential to first define the core concepts of artisanal refining and food insecurity and then establish a conceptual framework that links them in a causal chain.

2.1.1 Artisanal Crude Oil Refining (ACOR)

Artisanal crude oil refining is an illicit, small-scale, and rudimentary process of distilling crude oil into refined petroleum products like gasoline, kerosene, and diesel (Adeyemi & Okoro, 2020). Often referred to locally as "kpo-fire," this activity is characterized by its lack of safety standards and environmental safeguards. Operations typically involve heating crude oil in makeshift containers, with the resulting gases and liquids channeled through pipes into cooling tanks. The process is highly inefficient and produces large quantities of toxic waste, including crude oil residue, which is often released directly into the environment (Naanen, 2019). The environmental footprint of ACOR is multifaceted, leading to significant contamination of soil, surface water, and groundwater with petroleum hydrocarbons and heavy metals (Ibe & Uche, 2017). Additionally, the burning of waste and crude oil leads to the release of harmful air pollutants, including soot and volatile organic compounds, which contribute to widespread air pollution in affected communities (Angaye et al., 2025).

2.1.2 Food Insecurity

Food insecurity is a complex state defined by the lack of physical and economic access to sufficient, safe, and nutritious food to meet dietary needs and food preferences for an active and healthy life (FAO, 2022). The concept is often broken down into four key pillars:
Availability: The physical existence of food and the ability to produce it locally or import it.
Access: The ability of households and individuals to obtain food through purchase, cultivation, or other means.
Utilization: The body's ability to make use of the food consumed, which is affected by food safety, nutrition, and health.

Stability: The consistent availability and access to food over time, without risk of sudden shocks.
In the Niger Delta, food insecurity is a prevalent issue, with studies revealing a high percentage of households experiencing various levels of food vulnerability. This is a critical concern, as the region was historically self-sufficient in food production through its rich agricultural and aquatic resources.

From Environmental Degradation to Food Insecurity
This study is framed by a conceptual model that posits a direct causal link between the environmental damage of artisanal crude oil refining and the subsequent food insecurity experienced by local communities. This framework illustrates how the localized effects of ACOR ripple through the environmental and socio-economic systems, ultimately undermining the four pillars of food security.

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

The causal chain can be conceptualized in a phased approach:
Phase I: Environmental Contamination. ACOR activities introduce a range of toxic pollutants into the environment. The soil becomes infertile and laden with hydrocarbons, while water bodies are contaminated and lose their ability to sustain aquatic life.

Phase II: Livelihood Disruption. This environmental contamination directly disrupts the traditional livelihoods of local communities. Farmers lose their arable land, and fishermen find their fishing grounds depleted of fish stocks. This leads to a loss of primary food sources and a significant reduction in household income.

Phase III: Reduced Food Availability and Access. With the local environment no longer capable of supporting food production, communities face a scarcity of locally sourced food. This reduced availability forces them to rely on food from external markets, often at inflated prices, thereby limiting their economic access to food.
Phase IV: Heightened Food Insecurity. The culmination of these effects manifests as a state of heightened food insecurity. The consistent contamination of both local and potentially imported food sources raises utilization concerns. The loss of stable, traditional livelihoods creates a precarious food supply, affecting the long-term stability of food security for affected households.

This framework provides a systematic lens through which to investigate how artisanal crude oil refining transforms a resource-rich environment into a food-insecure one, guiding the study's data collection and analysis to capture the full scope of the problem.

2.2 Theoretical Review

This study is underpinned by several key economic theories that provide a robust framework for understanding the dynamics between artisanal crude oil refining, environmental degradation, and food insecurity in the Niger Delta. By applying these theories, the research moves beyond a mere description of events to a deeper analysis of the underlying causes and reinforcing cycles at play.

2.2.1 The Tragedy of the Commons

The research problem can be directly analyzed through the lens of the "Tragedy of the Commons," as conceptualized by Garrett Hardin (1968). This theory describes a situation where individual users, acting independently according to their own self-interest, behave contrary to the common good of all users by depleting or spoiling a shared resource. In the context of the Niger Delta, the common-pool resources are the fertile farmlands, rivers, and streams that have historically sustained the local population. Artisanal refiners, driven by the personal economic gain from selling petroleum products, exploit these shared resources by contaminating them with toxic pollutants. Because these natural assets are not privately owned or effectively regulated, there is no single party with a vested interest in their long-term preservation. This rational, self-interested behavior of the refiners collectively leads to the irreversible degradation of the environment, a loss of biodiversity, and the destruction of the community's primary food and livelihood sources (Okorodudu, 2021). Thus, the tragedy is realized as the entire community—including those who do not participate in refining—suffers from environmental damage that leads directly to food insecurity.

2.2.2 The Poverty-Environment Nexus

The study also draws on the "Poverty-Environment Nexus" framework, which argues that poverty and environmental degradation are mutually reinforcing. This framework posits a vicious cycle where a lack of economic opportunities compels individuals to engage in environmentally destructive activities for short-term survival. In the Niger Delta, high unemployment and marginalization have created a fertile ground for artisanal refining (Naanen, 2019). The profits, while significant for the refiners, are fleeting and come at the immense cost of degrading the very environmental base upon which the entire community's food production and livelihoods depend. The resulting environmental pollution further erodes the resource base, leading to diminished agricultural yields and fish catches. This, in turn, pushes more people into a state of destitution, compelling them to consider illicit activities, including refining, as a means of survival. The cycle thus perpetuates and deepens both poverty and environmental destruction, making the affected communities increasingly vulnerable to food insecurity (Adeleke, 2022).

2.2.3 Livelihood Diversification Theory

Finally, the study applies the theory of livelihood diversification, which explains how households manage their assets, activities, and entitlements to create a living. When traditional livelihoods such as fishing and farming become non-

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

viable due to environmental pollution, households are forced to diversify their income-generating strategies (Scoones, 1998). The theory helps to explain the motivation behind the transition from traditional, environmentally sustainable livelihoods to the illegal, environmentally destructive practice of artisanal refining. The inability to sustain a living through traditional means creates a "push" factor towards alternative, albeit risky and illicit, activities. As communities turn to these new livelihoods, their dependence on traditional food sources diminishes, exacerbating the food insecurity crisis as they become net consumers rather than producers of food.

In combination, these theories provide a comprehensive explanation for the research problem. The Tragedy of the Commons accounts for the environmental degradation, the Poverty-Environment Nexus explains the reinforcing cycle, and Livelihood Diversification Theory provides insight into the motivations for engaging in this detrimental practice, all of which converge to illuminate the roots of food insecurity in the region.

2.3 Empirical Review

Related studies in the field are reviewed to provide further insight into the area od study.

In their 2022 study, Elisha and Ipregha evaluated community-based interventions aimed at controlling the environmental impacts of artisanal refining in Nigeria's Niger Delta region. They found that artisanal refining caused significant environmental degradation, including pollution and biodiversity loss, while community efforts such as town hall meetings and the formation of committees were employed to educate residents and mitigate these effects. However, these interventions faced challenges, including regional neglect and difficulties in monitoring refining activities. The authors concluded that effective environmental management in the Niger Delta necessitated coordinated actions among government, security agencies, businesses, and communities, advocating for innovative approaches and economic empowerment for local populations to enhance sustainability.

In their 2023 review, Glory et al. assessed the significant environmental and health risks associated with artisanal petroleum refining (APR) in Nigeria's Niger Delta, highlighting its detrimental effects on farmland, water quality, air pollution, biodiversity, and human health (Glory, Izah, Raimi, & Iyingiala, 2023). The study synthesized existing literature and local reports, revealing that APR activities resulted in severe environmental degradation and public health issues, including respiratory and cardiovascular problems, sensory organ irritation, and threats to food security. The authors emphasized the necessity for regulatory enforcement, community awareness, and sustainable practices to mitigate these impacts, advocating for coordinated policy actions and enhanced public education to protect both human health and the environment.

The study conducted by Odubo and Odubo (2024) assessed the environmental impacts of oil pollution on income and sustainable livelihoods in the Niger Delta, Nigeria, particularly focusing on the effects of artisanal crude oil refining. Utilizing a cross-sectional survey design across six communities, the researchers found that artisanal refining significantly negatively impacted income for individuals engaged in traditional livelihoods such as fishing and farming, primarily due to oil pollution. The environmental degradation resulting from this pollution adversely affected biodiversity, health, and livelihood options, leading to increased poverty and food insecurity. While some economic benefits were noted for traders involved in the artisanal oil trade, these were overshadowed by broader economic losses and environmental harm. The study highlighted the urgent need for government intervention to promote alternative livelihoods and infrastructure development to mitigate the detrimental effects of oil pollution on sustainable development in the region.

The article by Richard, Izah, and Ogwu (2022) reviewed the implications of artisanal crude oil refining (ACOR) on sustainable food production in Nigeria's Niger Delta, highlighting the environmental degradation resulting from these activities. The study synthesized existing research, revealing that ACOR significantly harmed vegetation, altered soil and water quality, and introduced hydrocarbons into the ecosystem, which collectively compromised food security by reducing arable land and increasing soil erosion. The socio-economic benefits of ACOR were found to be outweighed by its environmental costs, necessitating regulatory interventions to manage refining activities and mitigate harmful emissions. The authors concluded that stricter enforcement of operational licenses and improved monitoring were essential to protect food security in the region.

The study conducted by Ewim et al. (2023) analyzed the wastewater issues stemming from oil spills and pollution in Nigeria's Niger Delta, revealing significant environmental degradation and socio-economic challenges faced by local communities. The researchers found that existing regulatory frameworks were largely ineffective due to weak enforcement and resource constraints, resulting in limited success of remediation and compensation efforts. They

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

identified advanced technologies and collaborative approaches among stakeholders, including governments, oil companies, and local communities, as critical for improving environmental management. The findings underscored the need for enhanced regulatory mechanisms, transparency, and investment in sustainable technologies to protect ecosystems and promote public health in the region.

Barigbon (2023) investigated the relationship between state-corporate environmental crimes committed by multinational oil companies in collusion with the Nigerian government and their impact on human security in the Niger Delta. The qualitative study analyzed secondary data, revealing that despite Nigeria's comprehensive environmental laws, enforcement remained ineffective due to weak state capacity, collusion with corporations, and insufficient criminalization of environmental offenses. This ineffectiveness resulted in significant environmental degradation, including oil spills and pollution, which undermined traditional livelihoods and exacerbated poverty, thereby threatening human security. The findings underscored the necessity for enhanced environmental governance, including the criminalization of environmental violations, increased transparency, and the adoption of cleaner technologies to promote sustainable development.

Inyang et al. (2024) investigated the impacts of biodiversity loss on food security in Nigeria, identifying key drivers such as pollution from oil exploration, deforestation, desert encroachment, and unsustainable agricultural practices. Their comprehensive literature review from 2010 to 2023 revealed significant losses in primary forest and tree cover, which accelerated biodiversity decline and disrupted essential ecosystem services like pollination and water purification. The study found that declines in pollinator populations and the destruction of wetlands adversely affected agricultural productivity and increased vulnerability to pests and diseases, threatening food production and rural livelihoods. The authors advocated for urgent sustainable land management and conservation policies to protect biodiversity and maintain ecosystem services critical for agriculture, emphasizing the need for integrated strategies that combine biodiversity conservation with sustainable agricultural practices.

Altiparmak (2022) investigated the environmental degradation in Nigeria's Niger Delta and its links to transnational organized crime and governance issues at both micro and macro levels. The study revealed that environmental degradation stemmed not only from oil exploration errors but also from weak governance structures, which hindered sustainable development despite oil production being a significant revenue source for Nigeria. It identified a lack of power decentralization and ineffective communication among governance levels as contributing factors to the region's challenges. Furthermore, the research found that transnational organized crime thrived in the governance vacuum, exacerbating regional security threats. Despite existing regional initiatives to combat these issues, their ineffectiveness was attributed to poor coordination and governance. The findings underscored the need for inclusive governance that integrates local leadership and community involvement to address environmental and security challenges effectively, emphasizing the critical intersection of environmental governance and regional security in the Niger Delta.

In his article, Bornu (2023) analyzed the persistent challenges in Nigeria's Niger Delta, attributing them to the detrimental effects of oil exploration and extraction, which resulted in significant environmental degradation, including oil spills and gas flaring that harmed local ecosystems and disrupted indigenous livelihoods. He noted the socio-economic inequalities exacerbated by ineffective governmental interventions, particularly by the Niger Delta Development Commission (NDDC), and highlighted the rise of militancy and violence linked to struggles over resource control and environmental injustice as significant barriers to peace and development. Bornu advocated for stricter environmental regulations, comprehensive clean-up efforts, and economic diversification strategies, such as promoting agriculture and eco-tourism, while emphasizing the necessity of inclusive governance and local community engagement for achieving sustainable development and resolving conflicts in the region.

In their 2025 study, Eniwotu, Esekumuemu, and Ayegbunan evaluated the effectiveness of government policies aimed at mitigating climate change and hunger in Nigeria's Niger Delta, a region grappling with severe environmental degradation and food insecurity. Utilizing a mixed-methods approach, the researchers gathered data from oil-producing communities in Bayelsa, Delta, and Rivers states through questionnaires and qualitative inputs, applying statistical analyses to assess the relationship between government initiatives and hunger alleviation. The findings indicated some progress, such as increased funding for climate adaptation and sustainable agriculture; however, they also highlighted significant challenges, including poor policy implementation, inadequate infrastructure, and community disengagement. The study emphasized the necessity for enhanced collaboration among government, local communities, and international partners, alongside capacity building and public education, to effectively address the intertwined issues of climate change and hunger.

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

Nkeme (2021) investigated the food security status of rural farming households in the Niger Delta region of Nigeria and the impact of changing climatic conditions on their livelihoods. The study utilized a multistage sampling technique to select 160 households, revealing that a significant majority (73.1%) were food insecure, with mean per capita food expenditures falling below the food security threshold. The findings indicated that the socio-economic characteristics of respondents included a predominance of females and married individuals, with an average age of 41 years. The adverse effects of climate change on food production were evident, prompting the need for policy interventions focused on climate change mitigation and adaptation strategies. The research concluded that enhancing farmers' knowledge through campaigns and extension services was essential for improving food security in the region.

The study conducted by Oghogho et al. (2024) examined the complex challenges of food security in Rivers State, Nigeria, particularly in light of the detrimental impacts of the oil industry and environmental degradation. Utilizing qualitative methods, including a literature review and interviews with 48 stakeholders, the researchers identified several barriers to agricultural productivity, such as reliance on outdated farming techniques, limited financial access, and technological deficiencies, all exacerbated by pollution and climate change. Socio-economic issues, including youth disengagement from agriculture and inadequate market access, further hindered economic opportunities for farmers. The authors proposed comprehensive policy interventions aimed at enhancing environmental regulations, promoting climate-adaptive practices, incentivizing youth participation in agriculture, and improving infrastructure, thereby advocating for integrated strategies that address ecological, technological, socio-economic, and institutional challenges to bolster food security and sustainable development in the region.

In their 2023 review, Glory et al. assessed the significant environmental and health risks associated with artisanal petroleum refining (APR) in Nigeria's Niger Delta, highlighting its detrimental effects on farmland, water quality, air pollution, biodiversity, and human health (Glory, Izah, Raimi, & Iyingiala, 2023). The study synthesized existing literature and local reports, revealing that APR activities resulted in severe environmental degradation and public health issues, including respiratory and cardiovascular problems, sensory organ irritation, and threats to food security. The authors emphasized the necessity for regulatory enforcement, community awareness, and sustainable practices to mitigate these impacts, advocating for coordinated policy actions and enhanced public education to protect both human health and the environment.

In their 2022 study, Ben-Chendo, Ogueri, and Anaeto explored the engagement of rural women in agroforestry practices within the Niger Delta region of Nigeria, revealing that these practices significantly enhanced food security and income generation (Ben-Chendo, Ogueri, & Anaeto, 2022). The research, which involved 270 women across Bayelsa, Imo, and Rivers States, found that the average age of participants was 51, with a majority being married and having completed secondary education. Women engaged in agroforestry primarily for food production, income generation, and soil quality improvement, with these motivations scoring above the critical threshold for significance. The study concluded that while agroforestry was not a complete solution to food insecurity, it played a vital role in mitigating climate change impacts and sustaining agricultural livelihoods, thereby necessitating collaborative efforts between government and private sectors to promote agroforestry initiatives, particularly targeting women and youth.

The study conducted by Odubo and Odubo (2024) assessed the environmental impacts of oil pollution on income and sustainable livelihoods in the Niger Delta, Nigeria, particularly focusing on the effects of artisanal crude oil refining. Utilizing a cross-sectional survey design across six communities, the researchers found that artisanal refining significantly negatively impacted income for individuals engaged in traditional livelihoods such as fishing and farming, primarily due to oil pollution. The environmental degradation resulting from this pollution adversely affected biodiversity, health, and livelihood options, leading to increased poverty and food insecurity. While some economic benefits were noted for traders involved in the artisanal oil trade, these were overshadowed by broader economic losses and environmental harm. The study highlighted the urgent need for government intervention to promote alternative livelihoods and infrastructure development to mitigate the detrimental effects of oil pollution on sustainable development in the region.

Asani and Akinyode (2022) evaluated the impact of oil mining on the livelihoods and food security of rural communities in Ondo State, Nigeria, revealing significant negative consequences for various socio-economic factors critical to food security, such as water supply, land, and public health, with statistical significance ($p < 0.001$). Their mixed-methods research indicated that while oil production severely undermined agricultural productivity and displaced local farmers, the effects on fishing were not statistically significant ($p = 0.921$). The findings underscored the urgent need for integrated development approaches to address environmental degradation and promote sustainable food security, highlighting that non-oil-producing areas exhibited more resilience in food security compared to their

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

oil-producing counterparts. The study recommended proactive measures, including pollution control and land reclamation, to mitigate the adverse effects of oil mining on food security.

In their 2024 review, Igbani, Weapngong, and Ukwubile assessed the detrimental effects of crude oil spills on aquatic life, particularly fish species, in Nigeria's Niger Delta region. They found that oil spills severely contaminated water bodies, leading to habitat degradation and declines in fish populations, which disrupted local fishing and agricultural livelihoods, exacerbating poverty and social conflicts (Igbani et al., 2024). The study highlighted the insufficient enforcement of environmental protection laws and the exacerbating effects of gas flaring and illegal oil refining on ecological harm. The authors emphasized the need for improved environmental governance, stricter pollution control measures, and collaborative efforts among stakeholders to protect aquatic biodiversity and restore the region's ecological health. They concluded that without decisive intervention, both aquatic biodiversity and community livelihoods would remain at risk.

The study conducted by Sabiu and Magaji (2024) analyzed the effects of oil exploration and climate change on the Niger Delta region of Nigeria, revealing significant socio-economic and environmental challenges faced by local communities. Utilizing a multi-stage sampling technique, the researchers gathered data from 265 respondents, primarily male and engaged in business, who reported that oil exploration led to environmental degradation and negatively impacted agricultural productivity and fishing due to climate change. The findings indicated that a substantial portion of respondents experienced oil spills, with human error and agricultural practices identified as contributing factors. The study emphasized the need for collaborative efforts among oil companies, government, and communities to mitigate environmental damage and enhance living standards, advocating for sustainable practices and proactive engagement to address the ongoing issues of food insecurity and environmental degradation in the region.

Agbebaku et al. (2023) assessed the impact of gas flaring and oil spills on human health and environmental degradation in the Niger Delta region of Nigeria, revealing significant socioeconomic consequences and environmental quality deterioration. Utilizing a cross-sectional survey design, the researchers distributed 307 questionnaires across 15 communities, ultimately analyzing 300 responses through descriptive and inferential statistics, including 2-way ANOVA. Their findings indicated that Bayelsa state faced the highest rates of gas flaring and oil spills, leading to severe air, water, and land pollution, which in turn caused various health issues such as respiratory diseases and skin ailments. The study highlighted the negative effects on socioeconomic activities, including urbanization and job opportunities, while noting that the impact was consistent across states. The authors emphasized the urgent need for improved regulatory compliance and environmental management to mitigate health risks and restore environmental quality, advocating for stronger enforcement of environmental laws and community awareness initiatives.

In the study conducted by Deedam (2024), the environmental degradation resulting from oil exploration in Nigeria's Niger Delta was examined, revealing significant adverse effects on the livelihoods of local peasant farmers and fishermen. The qualitative analysis, which reviewed secondary data including the UNEP (2011) report, highlighted that frequent oil spills and gas flaring contaminated agricultural lands and aquatic ecosystems, leading to decreased agricultural productivity and devastated fish habitats. This pollution not only caused health hazards and increased disease prevalence but also resulted in displacement, heightened poverty, and intensified rural-urban migration, exacerbating food insecurity and social issues such as rising crime rates. The findings underscored the failure of regulatory agencies to protect both the environment and the livelihoods of the local population, emphasizing the urgent need for government intervention to address these challenges.

In their 2022 study, Ndubueze-Ogaraku, Aguma, and Kamalu examined sustainable crop production practices in the floodplains of the Niger Delta, Nigeria, highlighting the ecological conditions that influence farmers' crop choices and the significance of floodplain agriculture for food security and rural livelihoods. The authors found that the region's fertile floodplain soils supported a diverse range of crops, with farmers selecting varieties based on physiological traits, socio-economic status, and household food needs, while wetland farming contributed over 56% of local food supplies (Ndubueze-Ogaraku et al., 2022). Their review emphasized the critical role of sustainable management practices in enhancing agricultural productivity and environmental health, advocating for policies that support smallholder farmers and promote climate-resilient farming systems to address the challenges of climate variability and population growth in the region.

3.1 THEORETICAL FRAMEWORK

The theoretical framework for this study is the Tragedy of the Commons, a foundational economic principle articulated by Garrett Hardin in 1968. This theory is particularly relevant as it provides a robust model for understanding the conflict that arises when individuals, acting in their own self-interest, deplete or degrade a shared resource, ultimately

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

leading to a negative outcome for the entire community. In the context of this study, the "commons" are the natural resources of the Niger Delta region, including the arable land, rivers, and rich biodiversity, which are essential for the traditional livelihoods of farming and fishing.

The environment of the Niger Delta—its fertile soil, clean water bodies, and vibrant ecosystems—is a shared, unowned resource that is vital for the food production and economic activities of all inhabitants. Artisanal refiners, facing high unemployment and economic hardship, perceive the refining of crude oil as a rational, short-term solution to their poverty. The financial gains from selling illicitly refined products far outweigh the immediate personal cost of environmental degradation, which they do not bear alone. As more individuals engage in this activity for personal gain, the cumulative impact of their actions leads to severe environmental pollution. The discharge of crude oil waste contaminates the soil, destroys farmlands, and poisons aquatic life. Since no single individual is responsible for the entire collective cost, there is little incentive to stop. The end result is a "tragedy" for the community as a whole. The pollution of the commons (the environment) systematically destroys the traditional livelihoods of farming and fishing. This destruction directly translates into a loss of local food production, reduced food availability, and increased food prices, thereby creating widespread food insecurity that affects everyone, including those who did not participate in the refining. This framework allows the study to analyze not only the direct environmental impacts but also the socio-economic motivations that drive individuals to engage in an activity that ultimately harms their entire community. By using the Tragedy of the Commons as a guide, the research explored how the lack of effective governance over these shared resources and the prioritization of short-term individual gains over long-term collective well-being are the root causes of the food security crisis in the Niger Delta.

3.2 Research Methodology

This study adopted a descriptive survey research design to investigate the contribution of artisanal crude oil refining to food insecurity in the Niger Delta region. The survey method is appropriate for this study as it allowed for the collection of quantitative data from a large number of participants, enabling the researcher to generalize findings to the broader population. The methodology is structured to systematically address the study's main and specific objectives.

Area of Study

The study is conducted in Southern Ijaw and Nembe of Bayelsa State within the Niger Delta region of Nigeria that has been significantly impacted by artisanal crude oil refining activities as well as Sagbama local government area (LGA) with relatively low artisanal crude oil refining activities. The choice of the LGAs is based on its documented history of illegal refining operations and their corresponding environmental and socio-economic consequences.

Population of the Study

The population consists of all households residing in the selected communities within the chosen LGAs. The population includes individuals directly involved in farming and fishing, as well as other residents whose livelihoods and food security have been impacted by environmental degradation.

Sampling Technique

A multi-stage sampling technique is employed to select a representative sample from the population.
Stage 1: Purposive Sampling. Southern Ijaw, Nembe and Sagbama are LGAs in Bayelsa. Southern Ijaw and Nembe has a high prevalence of artisanal refining activities, while Sagbama has low prevalence of artisanal refining activities. The same sampling technique is also used for selecting communities because artisanal oil refining activities are prevalent in some communities relative to others. Communities with high occurrence of artisanal oil refining activities were considered in both Southern and Nembe LGA, while communities without artisanal oil refining activities are choosen in Sagbama LGA Similarly, household that are directly involved in farming, fishing and related activities and others who are residents of the communities are target sample.

Sample Size

The sample size is determined using the Cochran's formula, to ensure it is statistically representative of the population. A confidence level of 95% and a margin of error of 5% will be used for the calculation.

Instrument for Data Collection

A structured questionnaire is the primary instrument for data collection. The questionnaire is divided into sections to address each of the specific objectives.

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

Section A: Demographic information of the respondents (age, gender, occupation, household size, etc.).
Section B: Questions on the perceived environmental impacts of artisanal refining on soil and water bodies.
Section C: Questions on the effects of these impacts on traditional livelihoods (farming, fishing), income, and food prices.
Section D: Questions on the food security status of the household, using a validated food security scale (e.g., the Household Food Insecurity Access Scale - HFIAS).
The questionnaire is a mix of closed and open-ended questions, including YES and NO as well as Likert-type scales, to facilitate data analysis.

Validity and Reliability of the Instrument

Validity: The face and content validity of the questionnaire is ensured through a pilot test. The draft instrument was given to experts in the field of environmental studies, economics, and sociology for review and feedback. Their suggestions was used to refine the questionnaire and ensure it accurately measures the intended variables.
Reliability: The reliability of the instrument will be determined using a pilot study on a small group of respondents (not part of the main study sample). The data from the pilot test will be analyzed using Cronbach's Alpha to ensure the internal consistency of the scales. A Cronbach's Alpha coefficient of 0.70 or higher is considered acceptable.

Procedure for Data Collection

Permission for the study is obtained from the relevant local authorities and community leaders. Trained research assistants, fluent in the local language, administered the questionnaires to the selected households. Respondents are briefed on the purpose of the study, and their informed consent obtained before the questionnaire is administered. The data collection process took about four weeks.

Method of Data Analysis

Data collected will be analyzed using both descriptive and inferential statistics.
Descriptive Statistics: Frequencies, percentages, means, and standard deviations is used to summarize and present the demographic characteristics of the respondents and their responses to the various sections of the questionnaire.

Inferential Statistics

ANOVA is used to compare the food security status of households in communities with varying levels of refining impacts. Statistical software; SPSS is used for all data analysis.

4.1 DATA ANALYSIS

The analysis of data is presented below.

Table 4.1 Demographic Distribution of Respondents

Descriptive Statistics Summary Table

Demographic Variable	Category	Frequency (N=255)	Per (%)
Local Government Area	Southern Ijaw	123	48.2
	Nembe	86	33.7
	Sagbama	46	18.0
Gender	Male	188	73.7
	Female	67	26.3
Age Group	18–25 years	84	32.9
	26–35 years	67	26.3
	36–45 years	60	23.5
	46–55 years	24	9.4
	56 years and above	20	7.8
Marital Status	Single	100	39.2
	Married	123	48.2
	Divorced/Separated	22	8.6
	Widow	10	3.9
Education Level	No formal education	73	28.6
	Primary school	86	33.7
	Secondary school	65	25.5
	Tertiary institutions	31	12.2
Occupation	Farming	25	9.8

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

	Fishing	38	14.9
	Trader/Business	72	28.2
	Civil servant	67	26.3
	Artisanal crude oil refining	53	20.8
Household Size (Children)	1–2 Children	62	24.3
	3–4 Children	125	49.0
	5–6 Children	46	18.0
	7 Children and above	22	8.6

Source: Author's own computation using SPSS 23

The descriptive statistics analyze the demographic context and social structure of communities affected by artisanal crude oil refining in Southern Ijaw, Nembe, and Sagbama LGAs of Bayelsa State. These variables offer interpretative value in understanding fishing and farming activities in relation to environmental degradation and livelihood challenges. On geographical distribution, Southern Ijaw accounts for nearly half of the respondents (48.2%), followed by Nembe (33.7%) and Sagbama (18.0%). This distribution may reflect the concentration of artisanal refining activities and their impact on local livelihoods, especially in Southern Ijaw, which is known for its dense mangrove terrain and oil-related activities.

From the distribution, males make up a dominant 73.7% of the respondents, which could suggest that men are more engaged or affected by artisanal refining, particularly as income earners or direct participants in refining. This gender imbalance is relevant when discussing farming and fishing in thee communities because female-headed households often face higher vulnerability to food insecurity. A majority (59.2%) of respondents are between 18 and 35 years, indicating a youthful population that is economically active and potentially more exposed to risky or illegal activities like artisanal refining. The environmental effects of such engagement could disrupt sustainable farming and fishing practices, compromising food security for their households.

Most respondents are married (48.2%) or single (39.2%). Married individuals with children are more likely to experience food insecurity when income sources are threatened by pollution or land degradation, especially when farming and fishing become unsustainable due to oil spills. A combined 62.3% of respondents have only primary or no formal education, which is a major barrier to food security. Low education limits access to information on modern agricultural methods, nutrition, environmental conservation, and alternative livelihoods outside of crude oil refining. It also restricts community participation in policy dialogues or advocacy.

Only a small portion are farmers (9.8%) and fishers (14.9%), while a significant proportion are traders (28.2%) and civil servants (26.3%). Notably, 20.8% are directly involved in artisanal crude oil refining. This high involvement suggests that economic incentives from illegal refining have drawn people away from traditional food-based livelihoods, further disrupting local food systems and increasing food insecurity due to land and water contamination. Almost half (49.0%) of the respondents have 3–4 children, and another 26.6% have 5 or more. Larger households place more pressure on food resources, and in polluted environments where local food production is compromised, this can exacerbate hunger, malnutrition, and poverty. This underscores the vulnerability of large families in oil-impacted communities.

"The impact of artisanal crude oil refining on fishing and farming *in communities in three selected local government areas in Bayelsa State."*

Table 4.2: One-Way ANOVA Summary on the Impact of Artisanal Crude Oil Refining (ACOR) on Livelihood

Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F	Sig. (p-value)
Between Groups	474.935	18	26.385	231.794	.000
Within Groups	26.864	236	0.114		
Total	501.799	254			

Source: Author's own computation using SPSS 23

Table 4.3: Levene's Test of Homogeneity of Variances for Livelihood

Dependent Variable	Levene Statistic	df1	df2	Sig. (p-value)
Livelihood	7.151	18	236	.000

Source: Author's own computation using SPSS 23

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

Table 4.4: Tukey HSD Post Hoc Test Summary – Significant Differences Between ACOR Levels

ACOR Group Comparison	Mean Difference	Sig.	Interpretation
ACOR 4.2 – 5.0 vs 1.2 – 2.6	Significant	< .05	High ACOR groups significantly worse
ACOR 1.2 vs 1.4, 1.6	Not significant	> .05	Similar outcomes in low exposure groups
ACOR 4.4 vs 4.6	Not significant	> .05	Similar outcomes in high exposure groups

Source: Author's own computation using SPSS 23

Table 4.5: Homogeneous Subsets of Livelihood Impact Based on ACOR Levels (Tukey HSD)

Group	Included ACOR Levels	Mean Score Range
Less Affected	1.2, 1.4, 1.6, 1.8, 2.2, 2.4, 2.6, Nembe, Southern Ijaw, Sagbama	1.18 – 1.68
More Heavily Affected	3.4, 3.6, 3.8, 4.0, 4.2, 4.4, 4.6, 5.0	3.95 – 4.42

Source: Author's own computation using SPSS 23

The results of the one-way ANOVA reveal strong statistical evidence that the level of artisanal crude oil refining (ACOR) activity significantly affects livelihood (fishing and farming activities) and food security outcomes in the studied communities. The hypothesis under investigation tested whether there is a significant difference in the socio-economic impact of ACOR on livelihoods across different locations and intensity levels in the selected LGAs—Southern Ijaw, Nembe, and Sagbama.

The preliminary test for homogeneity of variances using Levene's Test yielded a significant result (Levene Statistic = 7.151, df1 = 18, df2 = 236, Sig. = .000), indicating that the assumption of equal variances was violated. This revealed that the distribution of livelihood outcomes across ACOR intensity groups is not uniform, which already points to disparities in how communities are experiencing the effects of artisanal refining. The violation further justifies the need to closely examine group differences using post hoc analysis.

The main ANOVA results show a highly significant difference in livelihood impact across ACOR levels ($F(18, 236) = 231.794$, $p = .000$). The between-group sum of squares is substantially larger than the within-group variance (SS_between = 474.935; SS_within = 26.864), confirming that a major portion of the variance in livelihood outcomes can be attributed to differences in exposure to ACOR activities. This result leads to the rejection of the null hypothesis, establishing that communities experience significantly different impacts on their livelihoods depending on the level of artisanal crude oil refining activity present.

Post hoc comparisons using Tukey's HSD further support this conclusion. The analysis revealed that communities with higher exposure to ACOR, particularly those falling within the 4.2 to 5.0 range on the exposure scale, reported significantly worse livelihood conditions than communities in the 1.2 to 2.6 range. Interestingly, differences within lower ACOR levels or within higher ACOR levels were not statistically significant, which suggests that the most meaningful contrast is between the low and high exposure groups. In essence, the escalation in environmental degradation and socio-economic hardship is not gradual but rather accelerates beyond a certain threshold of refining activity.

Homogeneous subset analysis reinforces this distinction. The first group, characterized by mean scores between 1.18 and 1.68, includes communities such as Southern Ijaw, Sagbama, and those with ACOR levels ranging from 1.2 to 2.6. These areas are relatively less affected in terms of livelihood disruption. In contrast, the second group—comprising communities with ACOR intensity levels between 3.4 and 5.0—exhibits mean livelihood impact scores between 3.95 and 4.42. This grouping shows that once ACOR activities reach a high intensity, the damage to food security and economic well-being becomes significantly more severe.

Therefore, the findings present compelling evidence that the scale and intensity of artisanal crude oil refining in Bayelsa State are directly correlated with the degree of livelihood disruption experienced by communities. While some locations manage to maintain moderate food security levels under low ACOR exposure, others particularly those heavily polluted and economically destabilized report severe consequences. The implication is that artisanal refining, though often framed as a survival strategy, is causing measurable harm to the socio-economic fabric of affected areas. As such, there is a pressing need for multi-stakeholder intervention to address the environmental and economic fallout, promote sustainable alternatives, and protect vulnerable populations from further decline in food security.

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

Table 4.6: One-Way ANOVA Summary on ACOR and Household Food Security

Source of Variation	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Between Groups	21.554	18	1.197	42.976	.000
Within Groups	6.576	236	0.028		
Total	**28.129**	**254**			

Source: Author's own computation using SPSS 23

Table 4.7: Tukey HSD Post Hoc Test – Significant Differences Among ACOR Groups

Group Comparison	Mean Difference	Sig. (p)	Interpretation
Low ACOR (1.20–1.40) vs High ACOR (3.40–5.00)	Significant	< .05	Communities with higher ACOR levels have worse food security
Low vs Low ACOR (e.g. 1.20 vs 1.40)	Not Significant	> .05	No meaningful difference between similar low-exposure groups
High vs High ACOR (e.g. 4.4 vs 4.6)	Not Significant	> .05	Similar impact levels within highly exposed communities

Source: Author's own computation using SPSS 23

Table 4.8: Homogeneous Subsets of Household Food Security (Tukey HSD Clustering)

Subset Group	ACOR Levels	Mean Food Security Scores
Group 1	4.20, 4.80, 4.00, 3.60, 3.40	1.14 – 1.17
Group 2	5.00	1.23
Group 3	2.40	1.53
Group 4	1.20, 1.60, Nembe, etc.	1.70 – 1.83
Group 5	1.40, 1.80	1.86 – 1.88

Source: Author's own computation using SPSS 23

There is no significant difference between Artisanal Crude Oil Refining (ACOR) and household food security in the three selected local government areas in Bayelsa State.

The analysis of variance (ANOVA) was conducted to determine whether significant differences exist in household food security levels across communities with varying intensities of artisanal crude oil refining (ACOR). The null hypothesis stated that there is no significant difference in household food security across ACOR exposure levels. The ANOVA results clearly reject this assumption.

The between-groups sum of squares was 21.554 with 18 degrees of freedom, while the within-groups sum of squares stood at 6.576 with 236 degrees of freedom. This yielded a high F-value of 42.976 and a p-value of .000. Since the p-value is less than the conventional alpha level of .05, the result is statistically significant. This implies that the level of ACOR exposure significantly influences household food security in the studied communities. In other words, differences in ACOR intensity correspond to meaningful disparities in food security outcomes.

To identify the specific group differences, a post hoc analysis was performed using the Tukey HSD test. The results revealed that communities with lower ACOR exposure levels (such as those with indices around 1.20, 1.40, or located in LGAs like Sagbama) had significantly better food security outcomes compared to communities with high ACOR exposure (typically in the range of 3.40 to 5.00). The differences in food security between communities within similar ACOR categories (for example, between 1.20 and 1.40 or between 4.40 and 4.60) were not statistically significant. This indicates that the major divergence in food security exists between the low and high exposure categories, rather than within them.

The homogeneous subset analysis further reinforces this finding. Communities with ACOR levels between 3.40 and 4.80 were grouped together in the lowest subset with mean food security scores ranging from 1.14 to 1.17. These are communities with the worst food security outcomes. Conversely, communities with ACOR levels between 1.60 and 1.88—including areas like Nembe and others with low exposure formed the upper subsets, indicating relatively better food security. Notably, an isolated subset for ACOR level 5.00 showed a slightly better score of 1.23, suggesting possible local variation or sampling artifacts, but still indicating poor food security relative to lower-exposure groups.

Although the actual means plot was not presented, the trend is clear based on the data. As ACOR exposure increases, food security steadily declines. The decline is particularly pronounced starting from ACOR level 3.4 and above,

Volume: 13 | Issue: 9 | September 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

suggesting a threshold effect beyond which the environmental impact of refining becomes acutely damaging to local food systems. This trend aligns with environmental observations that excessive refining activities pollute farmlands, damage aquatic life, and reduce both the quantity and quality of locally produced food.

In conclusion, the ANOVA and post hoc results give a compelling statistical evidence that artisanal crude oil refining has a significant adverse impact on household food security in the selected LGAs. Communities with higher exposure to refining activities experience worse outcomes in terms of food availability, access, and utilization. These findings have important policy implications. They suggest the urgent need for regulatory action to curb illegal refining, environmental remediation programs to restore damaged ecosystems, and livelihood diversification strategies to support food-insecure households. Without targeted intervention, communities at the highest levels of ACOR exposure may face continued deterioration in their capacity to sustain basic nutritional needs.

4.2 Discussion of Findings

The findings from the one-way ANOVA revealed that artisanal crude oil refining (ACOR) significantly harms the livelihoods (farming and fishing) and food security of communities in the Niger Delta. The study, rooted in the Tragedy of the Commons theory, highlights a measurable link between ACOR intensity and socio-economic decline. Initial analyses indicated a significant violation of equal variances (Levene's Test, $p = .000$), suggesting that the socio-economic impacts of ACOR vary across different communities. The ANOVA results further confirmed a highly significant difference in livelihood impacts, particularly in farming and fishing, across varying levels of ACOR intensity ($F(18, 236) = 231.794$, $p = .000$). This evidence supported the study's aim to explore the socio-economic consequences of environmental degradation linked to ACOR activities.

Post hoc analysis using Tukey's HSD revealed that the most significant differences in livelihood (farming and fishing) outcomes were observed between low-exposure and high-exposure communities, indicating a threshold effect. This suggested that socio-economic hardships escalate dramatically once a certain level of refining activity is reached, rather than increasing gradually. The homogeneous subset analysis categorized communities with low ACOR exposure, such as Southern Ijaw and Sagbama, as less affected, while those with high exposure (3.4 to 5.0) faced significantly worse conditions. This finding emphasized the non-linear relationship between environmental degradation and socio-economic decline, indicating that while ACOR may provide short-term survival for some, it ultimately inflicts severe long-term harm on the socio-economic fabric of the affected areas.

The second ANOVA focused on household food security, confirming that ACOR intensity is a primary determinant of food security outcomes ($F(18, 236) = 42.976$, $p = .000$). Communities with high ACOR exposure experienced significantly worse food security compared to those with low exposure, directly linking environmental degradation to declines in food availability and quality. As local food systems collapsed due to pollution from refining activities, communities become increasingly reliant on external food sources, leading to higher costs and reduced accessibility for vulnerable populations. The study illustrated the Tragedy of the Commons, where individual actions in pursuit of short-term gains resulted in collective negative outcomes, such as the degradation of shared resources. The findings underscored that once exploitation surpassed a critical threshold, the resulting damage can lead to an exponential breakdown of the socio-economic system, threatening the livelihoods (farming and fishing) activities of entire communities. The findings are consistent with those of Elisha and Ipregha (2023), Odubo and Odubo, (2024) and Richard et al., (2022) that found that environmental degradation resulting from artisanal oil refimmg pollution adversely affected biodiversity, health, and livelihood options, leading to increased poverty and food insecurity.

5.1 CONCLUSION

The study revealed that artisanal crude oil refining (ACOR) in the Niger Delta significantly harms local communities' livelihoods, particularly in farming and fishing, as well as their food security. It established a direct correlation between the intensity of ACOR operations and the socio-economic disruption experienced by these populations, highlighting a "threshold effect" where negative impacts escalate sharply beyond a certain level of activity. Communities exposed to high levels of refining consistently reported worse outcomes compared to those with lower exposure, indicating that the damage is not gradual but rather an accelerating crisis. The findings exemplified the Tragedy of the Commons, where individual short-term economic pursuits lead to the degradation of shared resources essential for traditional livelihoods. The study concluded that artisanal crude oil refining in the Niger Delta severely disrupted local livelihoods (farming and fishing) and food security, creating a cycle of environmental degradation and socio-economic decline that trapped communities in chronic vulnerability.

5.2 Recommendations

The study highlights a significant negative impact of artisanal crude oil refining (ACOR) on livelihoods and food security, prompting several policy recommendations. A many-sided regulatory framework is essential, moving beyond mere criminalization to address socio-economic drivers while involving local communities for sustainability. Immediate environmental remediation programs are necessary to restore damaged soil and water, requiring collaboration between the government, international bodies, and oil companies. Additionally, promoting sustainable livelihood diversification through training and resources can provide viable alternatives to ACOR, empowering communities economically. Finally, a collaborative stakeholder approach is crucial, establishing a joint-action platform for coordinated efforts among various entities to tackle the intertwined issues of environmental degradation and socio-economic vulnerability.

REFERENCES

1. *Adeleke, A. B. (2022). The poverty-environment nexus in the Niger Delta: A case for sustainable livelihoods. Journal of Sustainable Development in Africa, 24(2), 112-125.*
2. *Adeyemi, S. A., & Okoro, O. T. (2020). Illegal oil refining and environmental degradation in the Niger Delta: A case study of Rivers State, Nigeria. Journal of Environmental Bioremediation and Toxicology, 4(1), 1-12.*
3. *Agbebaku, H. U., et al. (2023). Assessment of the impact of flared gas and oil spilled on human health and environmental degradation: Evidence of the Niger Delta Region, Nigeria. American Journal of Environmental Science and Engineering, 7(1), 5-16.*
4. *Altiparmak, S. O. (2022). Niger Delta environmental degradation: reciprocal process between micro-regional environmental governance and macro-regional security governance. The Journal of Security Strategies, 18(43), 595-627.*
5. *Angaye, T. C., Ikegbe, O., & Ogele, P. (2025). Environmental impact, health implications, and socio-economic consequences of artisanal crude oil refining in the Niger Delta, Nigeria: A comprehensive review. International Journal of Environment and Pollution Research, 13(1), 19-33.*
6. *Barigbon. (2023). State-corporate environmental crime and human security in the Niger Delta, Nigeria. 4(14), ISSN Print 2735-9328, Online 2735-9336.*
7. *Bashir, M. T. (2021). Environmental, public health and socio-economic issues of oil spillage in Niger Delta, Nigeria. International Journal of Engineering Research & Technology (IJERT), 10(02), 61-65. https://doi.org/10.13188/2471-4879.1000019*
8. *Ben-Chendo, G. N., Ogueri, E. I., & Anaeto, F. C. (2022). Agroforestry technology: A climate change mitigation measure for sustainable food security in Niger Delta region of Nigeria. Journal of Agriculture and Food Sciences, 20(1), 125–134. https://dx.doi.org/10.4314/jafs.v20i1.10*
9. *Bornu, T. Z. (2023.). Niger Delta: the unsolved problem. The American Journal of Political Science Law and Criminology, 13, 99–114. Retrieved from https://www.theamericanjournals.com/index.php/tajpslc*
10. *Deedam, D. G. (2024). Environmental degradation and its impact on the livelihood of the peasants in the Niger Delta region of Nigeria. International Journal of Education and Social Science, 6(3), 114–121.*
11. *Elisha, O. D., & Ipregha, G. E. (2022). Community-based intervention in the control of artisanal refining against the environment in Niger Delta Region, Nigeria. Asian Journal of Current Research, 7(3), 21-33. https://doi.org/10.56557/AJOCR/2022/v7i37973*
12. *Eniwotu, A. R., Victor, C. E., & Ayegbunan, I. F. (2025). Mitigating climate change and hunger in Nigeria's Niger Delta: Evaluating government policies and strategies. PERSPEKTIF, 14(2), 338–368. https://doi.org/10.31289/perspektif.v14i2.13880*
13. *Ewim, D. R. E., Orikpete, O. F., Scott, T. O., Onyebuchi, C. N., Onukogu, A. O., Uzougbo, C. G., & Onunka, C. (2023). Survey of wastewater issues due to oil spills and pollution in the Niger Delta area of Nigeria: a secondary data analysis. Bulletin of the National Research Centre, 47(116). https://doi.org/10.1186/s42269-023-01090-1*
14. *Food and Agriculture Organization of the United Nations (FAO). (2022). The state of food security and nutrition in the world. FAO.*
15. *Hardin, G. (1968). The tragedy of the commons. Science, 162(3859), 1243-1248.*
16. *Ibe, G. A., & Uche, J. C. (2017). Petroleum hydrocarbon contamination of farmland soils in the Niger Delta, Nigeria: A case study of some communities in Rivers State. Journal of Applied Sciences and Environmental Management, 21(2), 347-353.*
17. *Igbani, F., Weapngong, T. G., & Ukwubile, O. M. (2024). A review on the effects of crude oil spill on aquatic life (fish) in the Niger Delta, Nigeria. International Journal of Environment and Pollution Research, 12(1), 75-94. https://www.eajournals.org/*
18. *Naanen, B. (2019). Sustained impact of the activities of local crude oil refiners on their host communities in Nigeria. BMC Public Health, 19(2), 1-12.*
19. *Ndubueze-Ogaraku, M. E., Aguma, Q., & Kamalu, O. O. (2022). Sustainable crop production in the floodplains of Niger Delta, Nigeria. In M. Abid, M. M. Abid Ali Khan, R. K. Maheshwari, S. Husain, & V. P. Sharma (Eds.), Environmental Security and Sustainable Development (197-219). Discovery Publishing House Pvt. Ltd.*

20. *Nkeme, K. K. (2021). Food security and changing climatic condition of rural farming households in Niger Delta, Nigeria. AKSU Journal of Agriculture and Food Sciences, 5(2), 49-59.*
21. *Numbere, A., Gbarakoro, T., & Babatunde, B. (2023). Environmental degradation in the Niger Delta ecosystem: The role of anthropogenic pollution. (Chapter 15). https://doi.org/10.1007/978-981-19-6974-4_15*
22. *Odubo, T. R., & Odubo, T. V. (2024). Environmental impact of oil pollution on income and sustainable livelihoods in Niger Delta, Nigeria. Journal of Environmental Management and Sustainability, 2(3) https://doi.org/10.XXXX/ajol-file-journals_526_articles_287813_679b37cc54731.pdf*
23. *Oghogho, M. Y., Osazuwa, O. M. C., Mboto, A. A., Onogwu, G. P., & Ikponmwosa, I. O. (2024). Food security and challenges of sustainable development in Rivers State, Nigeria. The American Journal of Social Science and Education Innovations, 2(2), 45–60. https://www.theamericanjournals.com/index.php/tajssei*
24. *Okorodudu, F. O. (2021). The tragedy of the commons in the Niger Delta: Implications for environmental sustainability. International Journal of Environmental Studies and Research, 11(4), 89-101.*
25. *Olurinola, I. O., & Osabuohien, E. (2021). Socio-economic and environmental issues: Implications for food security in Nigeria. Central Bank of Nigeria Economic and Financial Review, 59(4), 197-219. https://dc.cbn.gov.ng/efr/vol59/iss4/13*
26. *Richard, G., Izah, S. C., Raimi, M. O., & Iyingiala, A.-A. (2023). Public and environmental health implications of artisanal petroleum refining and risk reduction strategies in the Niger Delta region of Nigeria. Bio-Research, 21(1), 1896-1910. https://dx.doi.org/10.4314/br.v21i1.12*
27. *Sani, B. S., & Magaji, S. (2024). Effect of oil exploration and climatic change on the Niger Delta Region of Nigeria. Journal of Development and Society, 6(1), 36-50.*
28. *Scoones, I. (1998). Sustainable rural livelihoods: A framework for analysis. IDS Working Paper, 72, 1-22.*