Residents' Perception of the Impact of Crude Oil Spillage on Agricultural Production in Ibeno Community, Akwa Ibom State

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ABSTRACT

As a major contributor to Nigeria's economy, crude oil exploration has brought about severe environmental degradation due to frequent crude oil spills. This study investigates the impact of crude oil spillage on agriculture in the Ibeno, Akwa Ibom State. It highlights the significant environmental and socio-economic challenges posed by oil spillages, which have led to reduced soil fertility, decreased crop yields, and economic instability. The study used a combination of field surveys (semi-structured questionnaires), observations, and interviews to assess the extent of oil pollution and its effects on agricultural productivity. The findings reveal that oil spills are primarily caused by pipeline sabotage, equipment failure, and corrosion. These have substantially reduced agricultural output, leading to increased poverty. The study shows the urgent need for effective spill management strategies, stricter enforcement of environmental regulations, and community engagement to mitigate the adverse effects of oil spills and promote sustainable development in Ibeno, Akwa Ibom State.

Keywords: Crude oil spillage, Agricultural impact, Environmental degradation, Pipeline sabotage, Socio-economic consequences

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Introduction

Crude oil exploration has played a significant role in shaping Nigeria's economic landscape since its discovery in 1956. While the petroleum sector has contributed immensely to Nigeria's foreign exchange, the environmental and socio-economic consequences of oil spills have posed serious challenges, particularly in the Niger Delta region. Communities that traditionally depended on agriculture and fishing have experienced significant hardship as oil spills degrade farmlands, contaminate water bodies, and disrupt local economies. According to The Nigerian Oil Spill Monitor, the oil producing region has experienced roughly 10,870 oilspills between 2013 and 2023, resulting in the release of 450,461.83 barrels of oil.[1]

Research has shown that oil pollution in areas such as **Ibeno, Akwa Ibom State,** and **Gokana Local Government Area (LGA), Rivers State** has severely impacted agricultural productivity and socio-cultural practices.[2] In Ibeno, oil spills have resulted in decreased crop yields, soil infertility, and water contamination, causing increased poverty levels and threatening food security. Similarly, in Gokana, oil spills have contributed to worsening poverty, disrupted traditional fishing festivals, and increased difficulties in meeting nutritional needs.

The root causes of these oil spills often include equipment failure, sabotage, and poor maintenance practices, with the resulting environmental degradation having long-term effects on the well-being of affected communities. Despite cleanup efforts by oil companies, the persistence of environmental pollution underscores the need for improved spill management strategies, sustainable remediation techniques, stricter enforcement of environmental regulations, and investment in alternative livelihoods.[3]

Oil spills in Ibeno LGA, Akwa Ibom State, have caused significant revenue losses through agricultural decline, fisheries collapse, and tourism disruption. Agricultural productivity plummeted due to soil degradation from pipeline vandalism and equipment dumping, forcing farmers to abandon lands and lose income from crops like cassava.[4] Fisheries suffered as spills destroyed boats, nets, and contaminated fishing grounds, reducing catches by 70% and halting daily income for fishermen.[2] Tourism also declined, with Ibeno Beach losing 40–60% of visitors due to oil-polluted coastlines, impacting small businesses reliant on recreational activities. While exact monetary losses per household are unspecified, studies highlight systemic drivers like inadequate compensation (only 12% of affected residents received partial payments) and pipeline neglect.

This publication explores the environmental and socio-economic impact of oil spills on agricultural production and local livelihoods in Nigeria's oil-producing regions. It highlights key findings from studies conducted in Ibeno and Gokana, emphasizes the need for improved response strategies, and advocates for sustainable development initiatives to mitigate the adverse effects of oil pollution.

Literature Review

Crude oil has had a profound influence on global civilization, surpassing other natural resources in shaping the political and economic landscape of nations.[5] As highlighted in a public lecture titled 'Oil in World Politics' by the late Chief M. O. Feyide, former Secretary of the Organization of the Petroleum Exporting Countries, "All over the world, the lives of people are affected, and the results of oil explorations determine the destiny of nations".[6]

Comparative studies reveal that crude oil spills have caused significant environmental and socio-economic impacts in regions like the Niger Delta, Gulf of Mexico, Alaska, Venezuela, and Angola. In July 2024, a major oil spill from Shell's Trans-Niger Pipeline in Bodo, Nigeria, caused severe environmental damage.[7] Though the exact volume remains undisclosed, it exceeded 250 barrels. The Exxon Valdez spill demonstrated the long-term persistence of oil in sediments despite cleanup efforts. Experiences from Venezuela and Angola

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emphasize the importance of localized response strategies and community engagement.[8] These cases underscore the need for improved spill contingency planning, advanced remediation techniques, and proactive community involvement to mitigate oil spill impacts in Ibeno.

In Nigeria, economic reliance has shifted over the years. Prior to the discovery of crude oil in 1956, the nation's economy was predominantly supported by the agricultural and industrial sectors. Cash crops such as groundnut, millet, maize, cocoa, and palm oil were significant contributors to national income.[9] However, following the discovery of oil, the petroleum sector has dominated the Nigerian economy, accounting for over 95% of the country's international trade.[10] The presence of multinational oil corporations like Chevron, Total, Shell, and ExxonMobil has further expanded oil exploration activities. The privatization of the petroleum industry and the Nigerian Oil and Gas Industry Content Act have also encouraged the emergence of indigenous oil companies.[11]

Recent studies have further illuminated the multifaceted impacts of oil spills on Nigerian communities, particularly in the Niger Delta region. A systematic review by Bashir (2021) identified sabotage (87%), corrosion (62%), and equipment failure (45%) as primary causes of oil spills, leading to significant health, socio-economic, and environmental challenges for residents.[12]

Crude oil, a fossil fuel derived from the decomposition of ancient marine organisms, varies in color and consistency—from clear liquid to thick, tar-black sludge.[13] While oil was initially used to sustain fires in early civilizations, its role in global energy production has grown tremendously since the mid-1950s, serving as a vital resource for fuel and the production of chemicals, fertilizers, solvents, and pharmaceuticals.[14]

Despite its economic significance, crude oil exploration in Nigeria has led to significant environmental damage, particularly in the Niger Delta region. According to the NNPC,[15] Nigeria has approximately 37.2 billion barrels of oil reserves, making it the largest crude oil producer in Africa. However, oil spills are inevitable and have become a major environmental concern. The NNPC estimates that about 2,300 cubic meters of crude oil are discharged into the Nigerian environment daily.[16] The actual volume may be significantly higher due to underreporting of minor spills.

Research by Ayibakari et al.[9] indicates that oil spills have severely affected farmlands, vegetation, and marine life, posing significant challenges to environmental sustainability and agricultural productivity.[17] Oil companies' cleanup efforts have often proved inadequate, as evidenced by the continued decline in crop yields and economic hardship in affected regions.

The negative effects of oil pollution in Nigeria's oil-producing regions have been widely studied, revealing significant socio-economic impacts on local communities. A study by Okoli (2013) on crude oil exploration in Ogba/Egbema/Ndoni LGA of Rivers State provides critical insights into these impacts. The research revealed that oil exploitation and its associated pollution significantly disrupted farming and fishing activities, which previously sustained the majority of residents.

Consequently, many locals adopted trading as an alternative survival strategy. Before oil exploration, 42% of inhabitants were engaged in farming, 38.09% in fishing, and 19.05% in hunting. Following oil spills and environmental degradation, these numbers dropped to 19.05% for farming, 14.29% for fishing, and 11% for hunting, with many residents now combining trading with either fishing (26%) or farming (28.57%) to survive.

The study further linked environmental pollution to socio-cultural disruptions, such as increased sexual promiscuity, prostitution, sexually transmitted diseases, school dropouts, broken homes, and unwanted pregnancies. Health issues such as fever (affecting 38% of inhabitants due to gas-flaring heat), gastrointestinal disorders (23.81%), and respiratory ailments like bronchitis, asthma, and asphyxiation (19.05%) were also reported.

Similarly, research by Ekpenyong and Samuel[1] on the impact of oil spillage in Gokana LGA of Rivers State identified significant socio-economic consequences. The study found that poverty has become increasingly common, with a mean score of 3.67 on a Likert scale indicating that many residents now struggle to meet their nutritional needs. Additionally, fishing festivals, a crucial cultural tradition in Gokana, have been adversely affected by oil pollution, with a mean score of 3.24 confirming this impact.[18]

Both studies highlight that crude oil exploration has had far-reaching consequences, disrupting traditional livelihood patterns, degrading environmental resources, and increasing socio-economic vulnerability in oil-producing communities.

Materials and Methods

Researchers' Characteristics and Reflexivities

The researchers are neutral Master's students conducting this study with an objective and academic perspective. While acknowledging the potential for researcher influence in qualitative research, every effort has been made to minimize bias. The researchers have no personal or professional conflicts of interest related to the study and have maintained a strictly objective stance throughout data collection, analysis, and interpretation. Reflexivity has been incorporated through rigorous adherence to qualitative research standards, but this will not in any way interfere with the results or their validity.

Description of the Study Area

Ibeno LGA is situated in the coastal region of Akwa Ibom State, Nigeria. It occupies an extensive landmass of approximately 1,200 km^2, bordered by the Atlantic Ocean to the south, Eastern Obolo LGA to the west, and Onna, Esit Eket, and Eket LGAs to the north. The geographical coordinates of Ibeno are approximately 4.5687° N latitude and 7.9764° E longitude.[19]

The region lies within the transitional zone between the swamp forest and rainforest ecosystems,

experiencing a tropical climate with significant rainfall peaking between May and September. This climatic condition supports agricultural activities, with farming and fishing serving as the predominant occupations of the local population. Additionally, Ibeno is home to Ibeno Beach, the longest beach in West Africa, which serves as a notable tourist attraction.

Economically, Ibeno is significantly influenced by oil exploration activities, primarily conducted by ExxonMobil (now Seplat Energy) and other oil service companies. While these activities provide employment opportunities and contribute to local development, they also pose environmental challenges, particularly through oil spills that impact agricultural productivity and community livelihoods.

Data Collection/Participant Selection Methods

The methods section has been reported in line with the criteria as spelled out in the Standards for reporting qualitative research.[20]

A multistage sampling technique was adopted to ensure the comprehensive representation of participants. The study focused on two major population groups: farmers and market participants, as agriculture remains the predominant economic activity in the area. A total of 1,500 questionnaires (2% of the total population) out of an estimated population of 75,000 (2006 Nigeria Census) were administered through direct contact in this study, employing random sampling to ensure equitable representation of participants across the target population. The response rate was 80%. In-depth interviews were also conducted with key informants, such as community leaders and agricultural experts, to gain deeper insights into the challenges faced by the community.

a. Farmers' Survey:

- The sampling frame was obtained from the All Farmers Association of Nigeria, Ibeno Chapter.
- **200 questionnaires** were administered through simple random sampling from each of the six major agricultural villages: **Ntafre, Mkpanak, Okonutip, Opolom, Atai, and Atabrikang** (Total of 1,200).
- Questionnaires were administered to collect information on agricultural activities, land use, and the impact of oil spills on productivity.

b. Market Participants' Survey:

- A total of **300 questionnaires** were administered to market participants across the six villages.
- The selection was based on stratified sampling to capture traders dealing in agricultural produce and other economic activities influenced by oil exploration.

c. Data Collection Instruments

The primary data collection tools included:

- **Structured Questionnaires**: Designed to capture socio-economic impacts, environmental changes, and adaptive strategies.
- **In-depth Interviews**: Using an audio recorder, interviews were conducted with key informants, including community leaders, agricultural extension officers, farmers, market men and women, and environmental experts, to gain deeper insights into local perspectives on oil pollution and agricultural productivity.
- **Field Observations**: Direct assessments on farmlands, streams, and ponds were carried out to document visible signs of oil contamination, such as damaged crops, oil slicks, and degraded farmland. Pictures and videos were taken with date and time stamps.

d. Data Analysis Techniques

The collected data were subjected to both **quantitative and qualitative analysis** to provide a comprehensive understanding of the impact of crude oil spillage on agricultural production. The techniques used to enhance the trustworthiness and credibility of data analysis include triangulation of data sources, member checking, peer debriefing, maintaining an audit trail, and ensuring reflexivity throughout the research process.

i. Quantitative Analysis:

- Descriptive statistics, including frequency counts, percentages, means, and rankings, were used to analyze survey responses. The questionnaire also employed the Lickert scale of standardized tests (for example, strongly agree 1 2 3 4 strongly disagree), which have been devised by social scientists and psychologists to measure people's abilities, attitudes, and opinions.
- The mean with the highest score was ranked first, followed by the second highest, ensuring a structured prioritization of key findings.
- The quantitative data gathered during this research is statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 11.0 software to establish descriptive statistics. The SPSS software is an effective program for the analysis of each participant's questionnaire, illustrating with the use of both tables and graphs such as bar charts, pie charts, and chi-squares (Bryman, 2008).
- After the data was collated, a coding method was employed to assign categories that represent phrases that were used by the participants to respond to a particular question. Coding is an interpretive technique that seeks to organize the data into categories and provide an easy means of interpretation.

ii. Qualitative Analysis:

- Thematic analysis was applied to interview transcripts to identify recurring patterns in respondents' narratives.
- Observational data were triangulated with survey responses to validate findings.

e. Ethical Considerations

Prior to data collection, participants were briefed on the study's purpose, and informed consent was obtained. Confidentiality was maintained, ensuring that responses were anonymous. The rights and feelings of participants were respected as they willingly participated and signed the consent forms at the bottom of the questionnaire. Additionally, nobody under the age of 18 was interviewed or allowed to fill out a questionnaire.

Result and Discussion

Effect of Oil Spillage on Agricultural Production in Ibeno

The study assesses the impact of oil spillage on agricultural production. Table 1 summarizes the key findings from the questionnaire data.

The respondents identified pipeline sabotage (45.8%), equipment failure (33.3%), and pipeline corrosion (20.8%) as the major causes of oil spills in Ibeno. These findings highlight the need for improved maintenance and security measures to prevent such incidents. A significant majority (83.3%) of respondents reported that oil spillage has generally reduced agricultural production in the area. This reduction is attributed to the contamination of soil and water resources, which are essential for farming activities. The key impacts of oil spills on agricultural production, as reported by the respondents, include reduced crop yields (75%), soil infertility (66.7%), water contamination (58.3%), and loss of livelihood (50%). These impacts have severe socio-economic consequences for the local communities, as agriculture is a primary source of income and sustenance.

Table 1 | Residents perspective on the effect of oil on agricultural production in ibeno

Variable	Response	Percentage (%)
Major Causes of Oil Spill	Pipeline Sabotage	45.8
	Equipment Failure	33.3
	Pipeline Corrosion	20.8
Reduction in Agricultural Production	Yes	83.3
	No	16.7
	Reduced Crop Yields	75
Key Impacts on Agricultural Production	Soil Infertility	66.7
	Water Contamination	58.3
	Loss of Livelihood	50

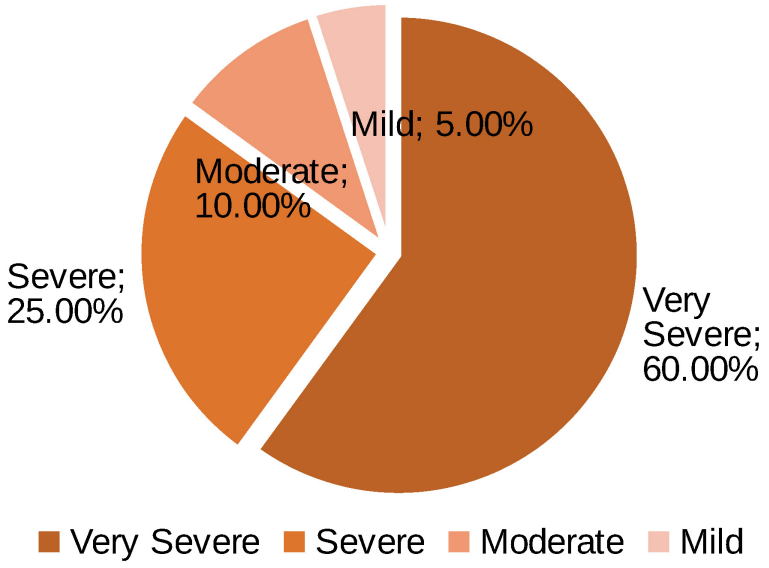

Fig 1 | Perception of oil pollution severity in Ibeno

Extent of Oil Pollution in Ibeno

The extent of oil pollution in Ibeno, Akwa Ibom State, was assessed through questionnaires administered to local farmers and residents. The data collected provides insights into the perceived levels of oil contamination and its impact on the community. The questionnaire indicates that most respondents perceive oil pollution as a major issue in Ibeno. Figure 1 gives a summary of the responses regarding the perceived severity of oil pollution in the area.

The results (Figure 1) from the questionnaire indicate that 85% of respondents perceive oil pollution as either very severe or severe. This high level of concern reflects the widespread impact of oil spills on the environment and the daily lives of the residents. The perception of oil pollution severity is likely influenced by visible signs of contamination as observed during the field survey, such as oil slicks on water bodies and damaged vegetation.

The perceived severity of oil pollution has substantial implications for agricultural productivity. Many respondents reported that oil spills have led to reduced crop yields and poor soil quality, which directly affect their livelihoods. The contamination of water resources further exacerbates environmental degradation, impacting both agriculture and fishing activities.

The findings align with a study by Okoli (2013) on crude oil exploration in Ogba/Egbema/Ndoni, Rivers State. Similar to Ibeno, the area experienced severe environmental degradation linked to oil spills. In Okoli's study, farming participation dropped from 42% to 19.05%, while fishing fell from 38.09% to 14.29%, forcing many residents to adopt alternative livelihoods such as trading.

Both Ibeno and Ogba/Egbema/Ndoni reported significant social and health impacts, including economic hardship, school dropouts, and increased cases of waterborne diseases. In Okoli's study, 38% of respondents reported fever due to gas flares, while gastrointestinal disorders and respiratory illnesses were common due to exposure to contaminated resources—patterns similarly observed in Ibeno.

In Ogba/Egbema/Ndoni, oil exploitation was linked to increased cases of sexual promiscuity, prostitution, sexually transmitted diseases, school dropouts, broken homes, and unwanted pregnancies. Similarly, in Ibeno, community members reported economic hardships, which may contribute to social instability.

The health impacts observed in Ogba/Egbema/Ndoni also resonate with conditions reported in Ibeno. In Okoli's study, 38% of respondents reported fever due to gas flares, while 23.81% and 19.05% experienced

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gastrointestinal disorders from consuming contaminated water and seafood. Respiratory illnesses such as bronchitis, asthma, and cough were also common. These health concerns mirror complaints in Ibeno, where residents expressed concerns about polluted air and contaminated water sources.

Both case studies emphasize that the adverse impacts of oil pollution significantly outweigh any economic benefits derived from oil exploration activities. The situation highlights the urgent need for improved environmental management strategies, effective remediation efforts, and community engagement to mitigate the long-term consequences of oil pollution in affected regions like Ibeno and Ogba/Egbema/Ndoni.

Innovative Contribution of the Study

This study uniquely combines local community perspectives with empirical data to assess the impact of oil spillage on agricultural production in Ibeno. By directly engaging affected farmers and residents, it captures both environmental and socio-economic consequences, including reduced crop yields, livelihood loss, and health concerns. The research also offers a comparative analysis with similar oil-impacted regions, highlighting common challenges and the need for tailored interventions. Importantly, it links residents' perceptions of pollution severity with observable environmental damage, providing actionable insights for effective environmental management and policy-making. This integrative, community-focused approach offers a comprehensive understanding of oil spill impacts that advances both academic knowledge and practical solutions.

Limitations of the Study

This study primarily relied on self-reported data from questionnaires, which may introduce some degree of respondent bias or inaccuracies due to recall errors or personal perceptions. Additionally, while the sample size provided useful insights, it may not fully represent the diversity of experiences across all communities in Ibeno affected by oil spills.

Another limitation is the lack of scientific environmental testing, such as laboratory analysis of soil, water, or air, which would have validated the perceived impacts more objectively. The study also did not account for seasonal variations or the frequency and timing of oil spill incidents, which could influence agricultural outcomes. Nonetheless, the findings serve as a meaningful starting point for more comprehensive, multidisciplinary research in the future.

Conclusion

The findings from this study on crude oil spillage in Ibeno, Akwa Ibom State, reveal significant impacts on agricultural production and the socio-economic well-being of the local community. Oil spills have contributed to a substantial decline in crop yields, directly affecting farmers' livelihoods and increasing poverty levels. The primary causes of these spills were identified as sabotage of oil pipelines, often driven by dissatisfaction with community leaders and oil companies. The resulting environmental degradation has led to soil infertility and contamination of water resources, compounding the difficulties faced by those who rely on agriculture and fishing for livelihood.

These findings align with insights from Okoli's (2013) study on crude oil exploration in Ogba/Egbema/Ndoni LGA of Rivers State, Nigeria. Similar to Ibeno, oil exploration in Ogba/Egbema/Ndoni resulted in a sharp decline in agricultural and fishing activities, compelling many residents to adopt alternative income-generating strategies such as trading. The socio-economic consequences were severe, including increased school dropout rates, broken homes, and the spread of health conditions such as respiratory issues, gastrointestinal disorders, and fever linked to environmental pollution.

Both case studies highlight that the adverse impacts of oil exploitation greatly outweigh any economic benefits derived from these activities. This underscores the urgent need for comprehensive and sustainable strategies to mitigate the effects of oil pollution in Ibeno and similar communities.

To address these challenges, a multifaceted approach is required. Strengthening the enforcement of environmental regulations is crucial to ensure oil companies adopt best practices and are held accountable for spills. Investing in advanced technology for pipeline monitoring and maintenance can help reduce incidents of equipment failure and sabotage.

Furthermore, community engagement and educational programs are essential to raise awareness about the environmental and health risks associated with oil spills. Empowering residents with alternative livelihood opportunities such as sustainable agriculture, aquaculture, and eco-tourism can reduce the community's dependence on oil-related activities and enhance economic resilience.

Remediation efforts should prioritize restoring contaminated soil and water bodies using environmentally friendly techniques such as bioremediation. A collaborative approach involving government agencies, oil companies, non-governmental organizations, and local communities is vital to developing and implementing effective spill response and recovery plans.

Modern oil spill remediation technologies suitable for Ibeno include bioremediation, which employs microorganisms to degrade hydrocarbons, and phytoremediation, using plants like Vetiver grass to absorb pollutants. Soil rehabilitation methods such as nutrient amendments and biochar application further enhance soil recovery. These strategies, combined with community engagement and policy support, offer sustainable restoration solutions.

By adopting these measures, it is possible to mitigate the long-term consequences of oil pollution, restore environmental integrity, and promote sustainable development in Ibeno and other oil-producing communities in the Niger Delta region.

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