

Perceived effects of oil spillage on farming activities among smallholder farmers in Udu Local government area, Delta state, Nigeria

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Abstract: This study investigated the perceived effects of oil spillage on farming activities among smallholder farmers in Delta State. A total of 120 smallholder farmers were sampled. An interview schedule was designed and administered to the sampled respondents. Data collected were analyzed with frequency count, percentages, mean, and standard deviation. Findings showed that the topmost ranked perceived effects of oil spillage on farming activities were exposure to oil-contaminated soil and water can pose significant health risks to farmers and communities ($\bar{x}=3.68$), oil spills lead to the contamination of agricultural farmlands ($\bar{x}=3.63$), and financial losses for farmers due to reduced crop yield ($\bar{x}=3.63$). The foremost coping strategies employed by respondents to mitigate the effect of oil spillage were the implementation of water management practices to minimize the use of oil-contaminated water for irrigation ($\bar{x}=3.60$), and diversification of crop cultivation to reduce the risk of complete crop loss due to oil spills ($\bar{x}=3.60$). Based on findings, the study concluded that oil spillage has caused the problems of health hazards, agricultural land contamination and water pollution in the study area. Therefore, concerned government and non-governmental agencies, ministries and departments should formulate policies to reduce oil spillage on agricultural land areas in the study area.

Keywords: Smallholder farmer, oil spillage, health hazard, agricultural land contamination, water pollution.

1. Introduction

In the Niger Delta, Nigeria's oil-producing states, agriculture has played a vital role in the rural population's culture and means of subsistence. The Niger Delta in Nigeria is an oil-rich region of the nation. It is characterized by high crude oil production, the largest wetland and one of the top ten wetland and marine ecosystems in the world (Nwankwoala & Okujagu, 2021). The Niger River splits into several tributaries on the Atlantic Coast of Southern Nigeria, which is where the Niger Delta region of Nigeria is situated. It has a shoreline of over 450 kilometers that finishes at the entrance to the Imo River, and it is the second-largest delta in the world (Adewumi et al., 2018). Crude oil is defined as petroleum in its unrefined state (Gad, 2023).

Crude oil may be found in a variety of forms, including viscous, partly solid and fluid volatile liquid materials. It could appear in a range of colours, including green, pale yellow or black. Regarding oil spillage, an oil spill can be described as the unintended release of hydrocarbons into the soil. Before now, the backbone of the country's economy, agricultural revenue, has been supplanted by crude oil exploration. More than 90% of the country's foreign exchange profits and more than 80% of its yearly government revenue come from the oil industry (Nweze & Edame, 2016).

The region as a whole has been dealing with the detrimental environmental effects of oil-producing activities practically since crude oil was discovered in large quantities (Adeola et al., 2021). Oil spills are

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typically caused by accidents involving pipelines, oil tankers, refineries, barges, and oil storage facilities. In literature, the spill of oil on soil has been reported to have a detrimental impact on human means of livelihood, such as agriculture. Precisely, the ongoing oil spills in Nigeria's oil-producing states have made it more difficult to increase agricultural production, which poses serious challenges to addressing the country's food security, as agricultural water and land resources are not readily available (Sampson & Hillary, 2019; Sandifer et al., 2021). Ayibakari & Ebisine (2022) concluded that the oil spill had resulted in oil-contaminated and unfertile soil, and thus diminished farmers' interest in cultivating arable crops on a commercial scale. Ayibakari & Ebisine further discovered that the oil spill had an impact on people's socioeconomic activities, resulting in a bad interaction between oil firms and host communities in the Niger Delta region of Nigeria. Olaifa et al. (2022) found that oil leakage reduces caught fish productivity, which is one of the primary sources of employment for people in Nigeria's Niger Delta area.

Over 90% of Nigeria's overall foreign exchange earnings come from the petroleum sector, which is the foundation of the country's economy. Slightly more than two million barrels of crude oil are produced every day from more than 240 producing fields and more than 5,284 wells drilled (Anozie & Wingate, 2020). Nigeria has developed a significant hydrocarbon infrastructure with more than 7,000 km of pipes connecting more than 280 producing flow stations, all of which are located in the country's Niger Delta (Nweze & Edame, 2016). This infrastructure is the result of more than 50 years of oil and gas exploration, extraction, and production (Eregha & Irughe, 2009).

Soon after crude oil was discovered and then explored and exploited as a significant source of foreign cash in the 1970s, the importance of the agricultural sector as a food supply in Nigeria began to decline (Egubbe & Urhobot, 2022). A large number of farmers moved from rural settlements to metropolitan regions in quest of white-collar jobs, better employment opportunities, and a higher standard of living as a result of the commercial exploration and exploitation of crude oil. As a result, the agricultural sector was virtually ignored. By using innovations derived from research, agricultural development seeks to increase the production level of specific crops and livestock. But during the latter half of the previous century, environmental concerns have taken center stage. UNDP (2006) reported that over 70% of people living in areas that produce crude oil rely on the environment for their livelihood. As a result, the focus

shifted to ecological harm to the resource base and the health and social risks that farmers face (Adinna, 1994).

Based on literature, Muhammad (2021) proposed that public health, socioeconomic instability, and social insecurity were caused by pollution and spills of crude oil. The detrimental effects of crude oil pollution on agriculture and the environment, along with related consequences centered on farming, fishing, and forestry, have been more apparent in recent years (Muhammad, 2021). The physical and chemical characteristics of the soil, as well as seed germination, plant growth, and yield, are all impacted by crude oil contamination (Emuh, 2010). According to Iyoha (2002), deforestation, air and water pollution by oil spillage, ecosystem deterioration, and land degradation all have an impact on the environment. Environmental degradation is on the rise as a result of the situation becoming so severe that many smallholder farming communities have no choice but to heavily utilize the resources at their disposal (Jomata & Itabita, 2020). Consequently, several studies have been conducted on the influence of the oil spill on arable land and agriculture at large in Nigeria. Specifically in Delta state, studies have examined the effects of crude oil spillage on arable crop yield and production (Emuh, 2010; Egubbe et al., 2021), spatial pattern of agricultural production (Jomata & Itabita, 2020), environmental degradation impact (Eregha & Irughe, 2009; Ukhurebor et al., 2021), public health and socio-economic impact (Ordinioha & Brisibe, 2013; Muhammad, 2021). However, none of the studies explore the effect of oil spillage on smallholder farmers who are the major producers of food crops in Nigeria. It is based on this background that this study investigated the perceived effects of oil spillage on farming activities of smallholder farmers in Udu Local Government Area, Delta State.

The general objective of the study is to assess the small farm holders' perceived effects of oil spillage on agriculture in Udu Local Government Area, Delta State, Nigeria. The specific objectives are to: (i) describe the socio-economic characteristics of smallholder farmers in the study area, (ii) identify the sources of information available to smallholder farmers on oil spillage in the study area, (iii) examine the effects of oil spillage on smallholder farmers in the study area, and (iv) assess the coping strategies employed by smallholder farmers to mitigate the effect of oil spillage in the study area.

household size of respondents was approximately 8 persons. This implies that the respondents have family responsibilities. The average year of experience was 25.7 years. This implies that the farmers had long years of experience in farming. The average farm size was 6.9 hectares. This confirmed that the sampled farmers were smallholder farmers. The average annual income of the respondents was ₦444,166.67. This amount is more than amount found by Oyem et al. (2024).

Table 1: Socio-economic characteristics of respondents

Variables	Mean (Std. Dev.)
Age (years)	51.7(11.99)
Household size (persons)	7.5(2.68)
Farming experience (years)	25.7(11.58)
Farm size (hectares)	6.9(3.26)
Annual income (Naira)	444,166.67(192160.793)

Source: Field survey, 2023

3.2. Source of information on oil spillage

Table 2 presents the sources of information on oil spillage. Results showed that non-governmental organizations (NGOs) agents ($\bar{x}=2.95$) ranked first position, Federal/State Ministry of Environment and State Ministries of Environment ($\bar{x}=2.41$) ranked second position, print media ($\bar{x}=2.30$) ranked third position, NNPC agents ($\bar{x}=1.99$) ranked fourth position, National Oil Pollution Management Agency ($\bar{x}=1.88$) ranked fifth position, National Emergency Management Agency (NEMA) ($\bar{x}=1.76$) ranked sixth position while community leaders ($\bar{x}=1.68$) ranked seventh position of the sources of information indicated by respondents. This finding implies that non-governmental organizations (NGOs) agents, radio/television and print media were the main sources of information utilized by smallholder farmers to access information on oil spillages in the study

area. This shows that non-governmental organizations (NGOs) agents, Federal/State Ministry of Environment and State Ministries of Environment and print media are playing the leading roles in disseminating information on oil spillage in the study area. Findings corroborate the prominent NGOs intervening in the oil spillage matters, preventing crude oil pollution, and advocacy programmes in the Niger Delta region include the Center for Oil Pollution Watch (Anozie & Wingate, 2020), and Clean Nigeria Associates (Olaniyan, 2016).

3.3. Societal problems caused by oil spillage

Problems caused by oil spillage in the study area were indicated by respondents in Table 3. Findings showed that oil spillage had caused health hazards ($\bar{x}=2.88$) which ranked first position. This implies that oil spills pose serious threats to health of the smallholder farmers because toxic chemicals from spilled oil can cause skin ailments, difficulty breathing, and other health-related difficulties. The second ranked problem was land contamination ($\bar{x}=2.80$), this problem can negatively affect the soil fertility, leading to low yields and economic losses on farm investments. The third ranked problem was water pollution ($\bar{x}=2.49$). In the dry season or drought, water contaminated with oil will not be good for irrigation, feeding livestock and also for human consumption, this may have resulted to the next ranked problem indicating loss of crops and livestock ($\bar{x}=2.44$) which ranked fourth. The least problem of oil spillage indicated by respondents was lack of compensation ($\bar{x}=2.28$) which ranked ninth. This indicates that health hazards, agricultural land contamination and water pollution were the main problems caused by oil spillage among smallholder farmers in the study area. Combinations of these problems are expected to

Table 2: Respondents sources of information on oil spillage

Sources	Always	Sometimes	Rarely	Never	Mean	SD	Rank
Non-governmental organizations (NGOs) agents	114(95.0)	6(5.0)	0	0	2.95	.219	1
Federal/State Ministry of Environment and State Ministries of Environment	49(40.8)	71(59.2)	0	0	2.41	.494	2
Print media	47(39.2)	63(52.5)	9(7.5)	1(0.8)	2.30	.643	3
NNPC agents	53(44.2)	16(13.3)	48(40.0)	3(2.5)	1.99	.974	4
National Oil Pollution Management Agency	21(17.5)	67(55.8)	29(24.2)	3(2.5)	1.88	.712	5
National Emergency Management Agency (NEMA)	38(31.7)	18(15.0)	61(50.8)	3(2.5)	1.76	.935	6
Community leaders	15(12.5)	52(43.3)	52(43.3)	1(0.8)	1.68	.700	7

Source: Field survey, 2023

Table 3: Problems caused by oil spillage in the study area

Problems	VS	S	NS	Mean	SD	Rank
Health hazards	106(88.3)	13(10.8)	1(0.8)	2.88	0.37	1
Land contamination	96(80.0)	24(20.0)	0	2.80	0.40	2
Water Pollution	59(49.2)	61(50.8)	0	2.49	0.50	3
Loss of crops and livestock	53(44.2)	67(55.8)	0	2.44	0.50	4
Reduced income	51(42.5)	69(57.5)	0	2.43	0.5	5
Limited government support	48(40.0)	70(58.3)	2(1.7)	2.39	0.54	6
High rate of unemployment	48(40.0)	66(55.0)	6(5.0)	2.36	0.59	7
Social disruption	40(33.3)	75(62.5)	5(4.2)	2.29	0.54	8
Lack of compensation	37(30.8)	80(66.7)	3(2.5)	2.28	0.51	9

VS- Very Severe, S- Severe, N-Not Severe

increase food insecurity, and endanger sustainability of the livelihood activities of smallholder farming households. Findings on health hazard as the leading problem confirm studies that earlier reported that oil spillage adversely caused health hazards to rural people (Sandifer et al., 2021; Ukhurebor et al., 2021).

3.4. Effects of oil spillage on farming activities

The perceived effects of oil spillage on the farming activities of respondents were illustrated in Table 4. Findings showed that the majority of respondents agreed that oil spillage affected agricultural activities and thus oil spillage was considered to have high effects on agriculture in the study area. The ranking order of the effects indicated that exposure to oil contaminated soil and water can pose significant health risks to farmers and communities ($\bar{x}=3.68$) ranked first, Oil spills leads to the contamination of agricultural farmlands ($\bar{x}=3.63$) ranked

second, financial losses for farmers due to reduced crop yield ($\bar{x}=3.63$) ranked third, while Oil spillage damages the ecosystem ($\bar{x}=3.36$) ranked the seventh as the least high effects of oil spillage on farming activities reported by respondents. This implies that health risks to farmers and communities, contamination of agricultural farmlands, and financial losses for farmers due to reduced crop yield were the leading perceived effects of oil spillage on agriculture in the study area. This finding confirms previous studies that found that crude oil spillage adversely affected crop production (Egubbe & Urhobot, 2022; Amusa et al., 2021).

3.5. Coping strategies employed to mitigate the effect of oil spillage

Table 5 presents the coping strategies employed by respondents to mitigate the effects of oil spillage. Findings showed that interventions by private and

Table 4: Perceived effects of oil spillage on farming activities of respondents

Effects	SA	A	D	SD	Mean	SD	Rank	Decision
Exposure to oil contaminated soil and water can pose significant health risks to farmers and communities.	83(69.2)	35(29.2)	2(1.7)	0	3.68	0.50	1	High
Oil spills lead to the contamination of agricultural farmlands.	75(62.5)	45(37.5)	0	0	3.63	0.49	2	High
Financial losses for farmers due to reduced crop yield.	78(65.0)	39(32.5)	3(2.5)	0	3.63	0.54	3	High
Agricultural activities are disrupted due to the loss of farmlands and reduced crop yields.	71(59.2)	48(40.0)	1(0.8)	0	3.58	0.51	4	High
Contamination of water bodies including rivers and ponds.	58(48.3)	62(51.7)	0	0	3.48	0.50	5	High
It directly damages crops by smothering and killing vegetation.	53(44.2)	67(55.8)	0	0	3.44	0.50	6	High
Oil spillage damages the ecosystem.	46(38.3)	71(59.2)	3(2.5)	0	3.36	0.53	7	High

SA-Strongly Agree, A- Agree, D- Disagree, SD- Strongly Disagree

Decision rule: Mean ≥ 2.5 =High effect, mean < 2.5 = Low effects

Table 5: Coping strategies employed to mitigate the effect of oil spillage

Strategies	SA	A	D	SD	Mean	SD	Rank
Interventions by private and non-government organisation.	74(61.7)	44(36.7)	2(1.7)	0	3.60	0.53	1
Diversification of crop cultivation to reduce the risk of complete crop loss due to oil spills.	75(62.5)	42(35.0)	3(2.5)	0	3.60	0.54	2
Exploring alternative income-generating activities outside of agriculture to cope with the long-term impacts of oil spills.	69(57.5)	48(40.0)	2(1.7)	1(0.8)	3.54	0.58	3
Collaboration and advocacy on the awareness about the impacts of oil spillage in Agriculture.	63(52.5)	53(44.2)	4(3.3)	0	3.49	0.57	4
Use of organic amendments like manure to improve soil structure and fertility.	53(44.3)	63(52.5)	4(3.3)	0	3.41	0.56	5
Participating in training and capacity building programs focused on sustainable agriculture and environmental management.	47(39.2)	72(60.0)	1(0.8)	0	3.38	0.51	6
Crop rotation	28(23.3)	88(73.3)	3(2.5)	1(0.8)	3.19	0.51	7

Key: Strongly Agree, A- Agree, D- Disagree, SD- Strongly Disagree

non-government organisations ($\bar{x}$ =3.60) ranked first, diversification of crop cultivation to reduce the risk of complete crop loss due to oil spills ($\bar{x}$ =3.60) ranked second, exploring alternative income-generating activities outside of agriculture to cope with the long-term impacts of oil spills ($\bar{x}$ =3.54) ranked third while crop rotation ($\bar{x}$ =3.19) ranked the seventh as the least coping strategies indicated by respondents. This implies that interventions by private and non-government organisations, crop diversification and exploration of alternative income-generating activities outside of agriculture were the main coping strategies employed by smallholder farmers to cope with the long-term impacts of oil spills in the study area.

4. Conclusion and recommendations

This study investigated the perceived effects of oil spillage on farming activities among smallholder farmers in Delta State, Nigeria. Based on major findings, the study concluded that oil spillage has mainly caused the problems of health hazards, agricultural land contamination and water pollution in the study area. These problems escalated to high adverse effects on crop production and farmers, causing health risks to farmers and communities, contamination of agricultural farmlands, and financial losses for farmers due to reduced crop yield in the study area. Water management practices, crop diversification and exploration of

alternative income-generating activities outside of agriculture were the main coping strategies employed by smallholder farmers with the long-term impacts of oil spills in the study area. Based on the conclusions, the following recommendations were drawn:

- i. Concerned government and non-governmental agencies, ministries and departments should formulate policies to reduce oil spillage on agricultural land areas in the study area. Government intervention programmes to increase compensation to owners of affected farmland are necessary.
- ii. Agricultural extension organisations in the study area should implement a training programme and capacity building that focuses on environmental management for sustainable agriculture in the oil spillage area. Such a programme and training can be disseminated through radio, television and print media.

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