Asia-Africa Journal of Agriculture A Publication of International Association for the Promotion of Asia-Africa Research Vol. 1, 2022 DOI: 10.5281/zenodo.6258079 ISSN: 2814-0397 Copyright: Author(s) retain the copyright of this article https://journals.iapaar.com/index.php/AAJMR

### A REVIEW ON EFFECTS OF OIL SPILLAGE ON FARMLANDS AND IMPLICATIONS FOR AGRICULTURAL EDUCATION IN AKWA IBOM STATE

### Dr. Uduakobong Aniebiat Okon (Asso. Professor)

Department of Agricultural Education University of Uyo, Akwa Ibom State, Nigeria. uduakobong.aniebiat.okon@gmail.com

&

### **Nse Timothy Ekpo**

Department of Agricultural Education University of Uyo, Akwa Ibom State, Nigeria.

#### Abstract

This paper discusses the effects of oil spills on farmlands in Akwa Ibom State. Basically, it highlights the concept of crude oil spills, causes of crude oil spillage, factors that determine the extent of oil spill damages, and the effects on farmlands. The detestable experiences have various negative effects on farmlands, animals, humans, and aquatic life. Oil spillage should not be compromised. It should not be bargained for and concealed by the government or the elites of the affected communities. It is recommended that the Federal and State governments and oil companies should prevent the occurrence of oil spillage and mount up proper soil bioremediation projects in affected communities for recovery of polluted farmlands.

Keywords: Oil, Spills, Damages, Farmers

### Introduction

Oil production has played a dominant role in the economy and has also served as a source

of energy to run the nation's economy. Industries cannot function properly without the use

of refined petroleum (Baghebo, 2012). Easy and faster means of transportation would have

been impossible if crude oil would have not been discovered and exploited. Nevertheless,

over the years, crude oil has had a profound effect on the farmland especially in the area that is blessed with these natural resources (crude oil). Agricultural produce has been reduced in availability due to the presence of crude oil spills. Akwa Ibom State depends largely on local industrial and manufacturing sectors as well as the exploitation of cash crops like maize, cassava, plantain, melon, cocoyam, banana, and palm fruit which had a positive growth rate for sustainable development of the state. Akwa Ibom state is not only blessed with fertile soil, but with mineral resources such as crude oil.

Ibeno Local Government Area of the State is endowed with this mineral resource which is crude oil, and it is the local government area that is being affected with much oil spillage among others. The people of the Ibeno community depend solely on agricultural activities until the discovery of oil came into existence. The soil supplies the essential mineral nutrient for proper plant growth. These nutrients include both the macro and the micronutrients. The macronutrients are required in large quantities by plants and they are the ones highly needed for plants productions. Plants germinate, develop and grow in soil medium where water, air and nutrient are available for productive growth and profitable agriculture.

#### **Concept of crude oil spillage**

Crude oil is the term for unprocessed oil, the methane that comes out of the ground. Crude oil is a fossil fuel, meaning that is was made naturally from decayed plants and animals living in ancient seas thousands of years ago. Oil spill according to Nwachukwu and Ekanem (2016) is the release of a liquid petroleum hydrocarbon into the environment due to human activities and equipment failure and is a form of pollution. The failure of equipment and human activities bring about this spillage which in return affects the farmland. Oil spillage is the uncontrolled discharge of crude oil or its by-products including chemicals and waste which mainly occurs through equipment failure, operation errors or wilful damage has been

identified as the main source of environmental damage in the area where oil is being exploited (MITEE, 2012).

Oil spills are discharges of oil (crude or refined) into the environment which normally occurs as a result of an accident caused by the malfunctioning of equipment or through human error. (Asoya, 2010) remarks that Oil spillage is a common occurrence in the Niger Delta and is caused by poor infrastructure maintenance, human error, and intentional vandalism or theft of oil resulting in spills or leaks during processing and transportation (Amnesty International, 2009).

Frequent crude oil spillage on farmlands, and the consequent fouling effect in all forms of life, renders the soil especially the biologically active surface layer toxic and unproductive. The oil reduces the fertility of the soil such that most of the essential nutrients are no longer available for plant and crop utilization (Abi and Nwosu 2009). Crude oil spillage is one of the causes of agricultural losses on farmlands. The spills from crude oil are a result of carelessness during drilling, natural factors as well as activities of economic saboteurs. Spillage on farmlands is also caused by oil exploitation, the soil (receptor) is soaked up by the oil-like sponges and prevents the lenticels of crops to absorb carbon dioxide for photosynthesis to take place, thereby causing starvation in plants (Oyedeji *et al*, 2012).

With oil spills on farmlands, the crops wither and die in large numbers thereby leaving the land barren and unproductive. Recent studies have shown that oil spills lower soil fertility and causes poor growth of plants. As the spill occurs, oil-contaminated farmlands may become anaerobic and reduction reaction results in increased solubility of iron (Fe) and manganese (Mn) to the extent that these potentially photo-toxic elements are absorbed by plant roots. High oil concentration in soil not only reduces the amount of water and oxygen available for plant growth but also interferes with soil-plant–water relationships through

direct physical contact (coating of root tissues) thereby adversely affecting plant growth (Abi and Nwosu, 2009).

Ibeno Local Government Area of Akwa Ibom State has crude oil and also is the community that mostly suffer the dilapidating effects of oil spillage which has destroyed most farmlands and reduced the amount of crop yield. It is averred that these spills create unsatisfactory conditions for plants growth due to insufficient aeration of the soil and the increase in the concentration of heavy metals as the oil penetrates the pore spaces of soil, thereby causing soil glot (Oyem, 2013).

Most soils where these spills occur lose soil fertility through loss of soil organic matter, leaching of nutrients, loss of organic topsoil, changes in soil – pH, reduction in cation exchange capacity, waterlogging and other forms of soil degradation. Soil fertility loss and declining crop yield among others are found to be indirect sources of pressure on natural resources and community structure especially among the rural poor (Pyagbara, 2007). In Akwa Ibom State, oil spills have posed a major threat to the environment, which has led to the total annihilation of the ecosystem. Thus, life in this area is becoming increasingly unbearable due to the ugly effects of oil spills (Oyem, 2001). Oil spillages have rendered vast stretches of indigenous farmlands useless.

### **Causes of oil spillage**

According to the United States Environmental Protection Centers (2021), Oil spills may originate from natural or anthropogenic causes.

**Natural Causes:** These refer to such oil that seeps from the bottom of oceans to enter the marine environment. Crude oil is formed during long periods of time through natural processes involving organic matter from dead organisms. Thus, oil exists in many environments and may be naturally spilled due to various factors (including climatic

conditions, disturbance, etc.). Such natural oil spills may occur in oceans, due to eroding of sedimentary rocks from the bottom of the ocean. The effect of the natural cause may still be similar to that of an accidental oil spill from human drilling in oceans, such as the recent BP oil spill from the Gulf of Mexico. Asoya (2010) said that Oil spillage could occur as a result of natural causes; they are causes that are not man-made or induced thus, occurring without any fault of man. These include;

**Anthropogenic Causes:** These are accidental oil spills, leaks and spills due to a large variety of human activities related to oil refining, handling and transport, sabotage, storage, and use of crude oil and any of its distilled products.

Thus, it is evident that a variety of sources for oil spills and a variety of ways the oil could be spilled exist. Various anthropogenic and natural sources and the location of oil spills determine the type and amount of oil spilled. The type of oil spill pollution is important for the fate and transport of the spilled oil and its impact on humans and the environment. For example, a sudden oil spill involving large amounts spilled (thousands or even millions of gallons - such as that from an oil tanker failure or due to accidents in offshore drilling) could have disastrous effects due to the high concentrations of released contaminants and the difficulty to remediate such big spills. At the same time, an oil spill involving small but continuous releases such as those from leaking pipelines or road runoffs may have a little visible effect (they are naturally attenuated usually due to microbial degradation as well as due to many chemical-physical processes. The type, amount of oil discharged and its location will dictate the oil spill cleanup efforts, which could involve the deployment of adsorbent booms, controlled burning, bioremediation, emulsification using detergents for increased degradation. Even though numerous climate factors and natural disturbances can generate oil spills, the main causes of oil spill pollution are usually of anthropogenic origin. The most commonly encountered anthropogenic sources occur during the following;

**Handling and Storage**: Oil and oil products may be stored in a variety of ways including underground and aboveground storage tanks (USTs and/or ASTs, respectively); such containers (especially USTs) may develop leaks over time (Peter, Nkiri & Ebahi (2019). Oil spills could also be caused by their careless handling during transfer operations and various uses.

**Transportation:** These could be large oil spills (up to millions and hundreds of million gallons) on water or land through accidental rupture of big transporting vessels such as tanker ships or tanker trucks. For example, the Exxon Valdez spill was a massive oil spill off the Alaskan shoreline due to ship failure which happened in the late 1980s and the oil spill pollution residuals from that spill are still affecting our environment. Smaller oil spills, through pipelines and other devices also happens and their impact is mainly due to a large number of usually minor spills

**Offshore Drilling:** We have recently experienced the massive oil spill in the Gulf of Mexico, with its terrible consequences on the environment, marine life and humans as the spill continues since April 22, 2010, and it may take a while until a solution is implemented. **Routine Maintenance Activities:** Routine cleaning of ships may release oil into navigable waters. This may seem insignificant; however, due to the large number of ships even a few gallons spilled per ship maintenance could build up to a substantial number when all ships are considered

**Road Runoff:** Oily Road runoff adds up to farmlands contamination, especially on crowded roads. With many precipitation events, the original small amounts of oil from regular traffic would get moved around and may build up in an environment.

**Intentional Oil Discharges:** Intentional oil discharges are not necessarily malevolent. Most of them occur in the following circumstances:

These happen through drains or in the sewer system; these include any regular activities such as changing car oil, if the replaced oil is simply discharged into a drain or sewer system or indirectly, through the burning of fuels and vehicle emissions. These all-release various individual components of oils and oil products, such as a variety of hydrocarbon, out of which benzene and PAHs could pose serious health risks.

**Sabotage:** A high percentage of oil spillage results from sabotage. Sabotage is a major cause of oil spillage in the country, especially in Ibeno L.G.A of Akwa Ibom State. Some of the citizens of this country in collaboration with people from other countries engage in oil bunkering. The damage and destroy oil pipelines in their effort to steal oil from them (Asoya, 2010).

#### Determinants of extents of damage of oil spillage

They are certain factors that determine the extents to which oil spills affect the environment. The knowledge of these factors is relevant for planning remediation or simple clean-up of unsafe farmlands. The factors are;

**Amount spilled:** The amount of oil spilled is also an important factor in determining the extent of damage done, thus given no variation other factors, the 100.00-ton spill will result in far wider contamination as well as causes greater damage than 10,000 tons.

Location and Pattern of Oils Spillage: The location, as well as the pattern of a spill, can have a considerable bearing on the extent and cost of an incident since it determines the degree of damage to the environment and economic resources. The physical characteristics of the spill site (prevailing winds, tidal rang current water depth, sea bottom topography, and density of the oil) as well as its distance from the coast are important factors that influence spill dispersal. They have a considerable bearing on the feasibility of mounting a clean-up response at sea and a successful salvage operation. They also in part determine the

extent of shoreline contamination. It is also important that the seasonal difference will also occur in the sensitivity of these resource toil pollution and therefore the economic impact of a spill.

### Effect of crude oil on farmlands

Some toxic substances in an oil spill may evaporate quickly. Therefore, plant exposure to the most toxic substances is reduced with time and is usually limited to the initial spill area. Although some organisms may be seriously injured or killed very soon after contact with the oil in a spill, nonlethal toxic effects can be more subtle and often longer-lasting. For example, aquatic life on reefs and shorelines is at risk of being smothered by oil that washes ashore. It can also be poisoned slowly by long-term exposure to oil trapped in shallow water or on beaches. Both petroleum and non-petroleum oil can affect the environment surrounding an oil spill. All types of oil share chemical and physical properties that produce similar effects on the environment. In some cases, non-petroleum oil spills can produce more harmful effects than petroleum oil spills (understanding oil spillage and oil respond, The peasant farmers are very reactive to farmland pollution because of the unavailability of modern farming techniques to meet the challenges of declining soil resources. In other words, the drastic fall in output of the agricultural product leads to intensive exploitation of other fertile lands.

### Damage to the Ecosystem

The effects of oil pollution on the marine ecosystem can be categorized into long-term and short-term effects. Suffocation caused by oil spills and oil poisoning are among the first group. Oil spills reduce oxygen absorption of the water, causing oxygen dissolution under oil spills to be even less than the deep sea levels. The oil penetrates and opens up the structure

of the plumage of birds, reducing its insulating ability, making the birds more vulnerable to temperature fluctuations and much less buoyant in the water (Digha, Ambah, & Jacob (2013). It also impairs birds' flight abilities, making it difficult or impossible to forage and escape from predators.

It is a known fact that heavy metal is present naturally in the soil but in low concentrations. Crude oil spills increase the concentrations of these elements to such quantities that are harmful to plants and crop production. The implication of this is the reduction in crop yield which can lead to food insecurity in the area. Iron (Fe), manganese (Mn), and zinc (Zn), as well as chromium (cr), are observed to form part of the micro-nutrient needed in small quantities by plants. The comparison of the mean values of both oil-polluted soils and control soils shows an increase in the number of heavy metals in the oil spilled areas. This is the major reason for nutrient imbalance. The high concentration of iron (Fe) for instance brings about yellowing of leaves. Excessive accumulation of heavy metals such as chromium, iron, manganese and zinc as observed in the areas due to oil spillage, may not only result to soil contamination but also affect food quality and safety.

#### **Effect on Vegetation**

Oil pollution in many intertidal creeks has left mangroves denuded of leaves and stems, leaving roots coated in a bitumen-like substance sometimes 1 cm or thicker. Mangroves are spawning areas for fish and nurseries for juvenile fish and the extensive pollution of these areas is affecting the fish life-cycle Digha, Ambah, & Jacob (2013). Any crops in areas directly affected by oil spills will be damaged, and root crops, such as cassava, will become unusable. When farming recommences, plants generally show signs of stress and yields are reportedly lower than in non-affected areas Asoya (2010). When an oil spill occurs on land, fires often break out, killing vegetation and creating a crust over the land, making remediation or revegetation difficult. Channels that have been widened and the resulting

dredged material are clearly evident in satellite images, decades after the dredging operation. Without proper rehabilitation, former mangrove areas which have been converted to the bare ground are being colonized by invasive species such as nipa palm (which appears to be more resistant to heavy hydrocarbon pollution than native vegetation). In some communities, an increase in artisanal refining has been accompanied by a 10% loss of healthy mangrove cover. If left unchecked, this may lead to irreversible loss of mangrove habitat in this area. Apart from the loss of farms, oil spills have led to extensive deforestation with no adequate replanting practices. This in effect has shortened fallow periods, compounded land-use degradation, and led to a loss of soil fertility and consequently erosion of the topsoil. The spillage has reduced soil fertility resulting in poor quality and decreased quantity of output. So farming on this type of soil is practically impossible. This appears to be a result of soil

deterioration and impoverishment caused by noticed and/or unnoticed oil spills in the community.

Asoya (2010) considers this occurrence as being due to a change of soil properties, as the usual happening when the soil is polluted by oil and the soil properties undergo some changes. Such changes include an increase in water holding capacity, loss of soil structure, the introduction of reduced conditions by exclusions of air from the soil, and production of hydrogen sulphide, among other changes. Most of the changes that adversely affected the Plants and plant growth are considerably retarded in oil-polluted soils, the severity increases with the level of oil in the soil. Seeds planted in oil-polluted soils generally absorb the oil and get destroyed.

In the worst affected area of such a spillage, oil could penetrate the soil up to a depth of 0.65m, thus destroying farm crops and interfering with plant growth. For instance, some plants and fruit trees could be covered by crude oil which might affect normal photosynthesis and transpiratory processes leading to chlorophyll deficiency and quick death. Numerous ASIA-AFRICA JOURNAL OF AGRICULTURE | 38

field and laboratory studies have revealed that oil on landing on the leaves of plants, penetrates the leaf and interferes with its functioning chiefly by reducing transpiration and photosynthesis. Where oil pollution is light, the leaves become yellow and drop soon after, but under heavy contamination, the complete shedding of leaves takes place. The detestable experiences have various detrimental effects on farmlands, animals and humans

#### **Implication for agricultural education**

The implications of oil spillage on educational development tend towards negative influences. It has not only robbed the farmers of the healthy and natural land to cultivate crops or raise animals but has also deprived the learners of agriculture in affected of the suitable land-space for school farms, School farm is an earmarked are of land-space kept for demonstration and practical lessons in agricultural subjects. The academia in agricultural disciplines belonging to such communities has difficulties in accessing good and suitable soil for research analysis and for soil development.

Another fact is the poverty this predicament has brought on the farming communities. The situation directly and negatively affects the economy of the people and the resources needed for the sustenance of their wards in schools and the education system as a whole.

Another educational impact of the spillage is its pollution of natural resources. There are also health concerns for the consumption of crops planted in the oil-polluted farmlands. Healthy living for the people is vital for educational development. Affected communities are deprived of healthy air and water which constitutes health hazards to humans. Stakeholders in education in such communities including Teachers, Students and Parents may fall sick due to the air, water, and soil pollution and this, of course, undermine their physical activities and contributions to educational development.

### Conclusion

Oil spillage occurs in Akwa Ibom state and other parts of the nation. This involves the release of a liquid petroleum hydrocarbon into the environment due to human activities and equipment failure. They have identified factors that cause the oil spillage. This has been known to cause soil and air pollution and consequent agricultural losses. The effect of crude oil spillage in some parts of Akwa Ibom is of increasing concern in some parts of the states. The spillage has gone beyond degrading farmlands to constituting health hazards to dwellers in oil-producing communities. The educational implication of these obnoxious occurrences is numerous including economic setback on educational development

### Recommendation

Based on the discourse, the following contributions are made.

- 1. Oil spillage should not be compromised or bargained for nor concealed by the government or the elites of the affected communities.
- Research should be continuously undertaken in search for proper means of eliminating this mess for the farmers.
- The government should undertake proper soil bioremediation projects regularly on affected soils to avoid soil degradation.
- 4. Preventive measures should be adopted and enforced by oil drilling companies during the course of oil drilling and oil transportation to avoid its harmful effects on farmlands and to reduce agricultural losses.
- Members of the affected communities should 'Keep Not Silent' until their lands are remedied. The attention of the State government should constantly be brought to the sufferings wrought on them by oil spillage.

#### References

- Abi T. A and Nwosu P. C. (2009). The effects: oil spillage on the soil of elements in Rivers State of the Niger Delta of Nigeria Resj Environment pp 316-320.
- Amnesty International (2009). Nigeria petroleum pollution and poverty in the Niger Delta. London, UK: Amnesty international publications.
- Asoya S. I. (2010). The impact of oil spillage on agricultural productions: A case study of Ibeno Local Government Area, Akwa Ibom State, Nigeria.
- Baghebo, M. (2012). The impact of petroleum on the economic growth in Nigeria, *Global Business and Economic Research Journal*.
- Digha O. N., Ambah B. & Jacob, E .N.(2013). The effects of crude oil spillage on farmland in Gokana Local Government Area of Rivers State.
- Nwachukwa, I. and J. Ekanem (2016). Oil exploration environment degradation and sustainable agriculture in the Niger Delta. Lambhouse: Umuahia.
- Oil Exploitation: The MITEE, M, (2012) environment and crimes against nature. Vanguard, 26<sup>th</sup> March, retrieved www.vanguardngr.com
- Oyedeji, A. A. (2012). Effect of crude oil contaminated soil on germination and growth performance of a belmoschus esculentus L. Monech- *A widely cultivated vegetable crop in Nigeria American journal of plant science*, 3: 1451-1454.
- Oyem, A. (2001). Christian call for action on Nigeria oil spill. Sage Oxford's Christian environmental group. Pandey, K. 2009 "oil spill effects " (online).
- Oyemi, I. M. (2013). Effects of crude oil spillage on soil pschyo-chemical properties in Ugborodo community. *International Journal of Modern Engineering Research* (*IJMER*), issue(3):336-3342.
- Peter, B. J. E. Nkiri, A & A. O. Ebahi (2019). Effect of oil spillage cost on profitability of oil companies in Nigeria (international institute of Academic research and development. *Journal of Accounting and Financial Management*, 4: 3-4.
- Pyagbara S. (2007). The adverse impact oil spillage on the environment and well-being of a local indigenous community: The experience of ogoni people of Nigeria.
- United States Environmental Protection Agency. (1999). Understanding oil spills and oil spills response, EPA 540-K-99-007:6-7.