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SOIL FERTILITY MAINTENANCE IN NIGER DELTA REGION OF NIGERIA: ISSUES, TRENDS AND CHALLENGES

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Abstract

The main occupation of the Niger Deltans in Nigeria is farming follows by fishing. The fragile environment is seriously threatened by oil- spillage as well as indiscriminate deforestation and burning. In addition, increase in population pressure on land and scarcities of land have impacted negatively on soil fertility maintenance in the region. The past practice of 7-10 years bush fallow is now shortening to 3-4 years with attendance poor crop yield; worst still, fertilizer is scarce, costly, unaffordable by resource poor farmers, and timely not available. The paper focuses on soil fertility maintenance as a major problem caused by low level of agricultural technology among the farmers, adoption of inappropriate farming system and land tenure systems among others. It is recommended that the adoption of low inputs technology among others would certainly improve upon the degraded soils in the region.

The Niger Delta region otherwise called oil city of Nigeria is located at the foot of the delta of river Niger and occupies 7.5% of the total landmass of Nigeria. The main occupation of the inhabitants is farming followed by fishing (Okoji, 2000). However, the farmers suffer regularly from environmental pollution caused by incessant oil spillage and gas flaring. The erodible soil is further abused by man through indiscriminate deforestation and burning, deposition of industrial wastes, continuous cropping and other forms of soil mismanagement.

One of the reasons for unprecedented fluctuations in crop yield is the gradual depletion of soil fertility maintenance has been the issue of concerned over the years.

Soil fertility maintenance refers to the sustainable practices rendered to the soil such that nutrients are adequately and timely released to the crops in the right proportion. Soil fertility decline and the consequent problematic food production is the combined effect of increasing land pressure, inadequate compensation of the harvested nutrients with external inputs and lack of careful nutrients management (Vaulauve, 2000).

Several practices to improve upon soil fertility are adopted depending on soil type, climatic conditions and the level of technology acquired by the farmers. In Niger Delta region the nature of the cultivated soils include highly weathered, infertile, commonly suffer multiple nutrients deficiencies and nutrients balance are generally negative (Elusacive and Kingsley, 2014). Crop yield depends on the management of agro ecosystem. An agro ecosystem is an ecological system that is intensively managed for purpose of producing food, feed and fibred.

Increasing population pressure on land, commercialization of agricultural practices (Maingwu, 2013). This implies that in many communities a piece of land is cultivated continuously to partly meet daily food requirement (Obi and Ahmed, 2014). In some communities, despite the large landmass for crop production and increasing food demand; the population growth necessitates the shortening of bush fallow to 3 – 4 years in Imo, Rivers, Balyesa and Akwa Ibom State. Short duration of fallowing compensate lose nutrients of the previous cropping.

Changes on agricultural practices are sometimes necessitated by diversity of soil types in different parts of the region. Rice is the principal crop in the flood plains of Enyong creck , Boko and Bekwara in cross River state and in Ini Local Government Area, Akwa Ibom State. Cocoa production in the dark – red – brown soils of balsaltic organic in Ikon and Ini in Cross River and Akwa Ibom states respectively. Furthermore, yam production in ferrasols soil in Ogoja with sand basement complex, while the lowland areas with low PH are naturally abounded with oil palms. Cultivation of crops of any kind requires fertilizer application which is scarce and currently costly.

Basically, the pressing needs to alleviate poverty of resource poor farmers in the region will certainly centre on soil fertility improvement to maintain increase yield stability and enhance greater income opportunities for farmers. The implications of neglecting the maintenance of soil fertility include perpetual low crop yield and consequent flow income, poor standard of living, makes farm business unprofitable and unattractive.

In view of the fact that Niger Delta region is largely of deep porous brown soils with limited reserves of weather able materials the region in addition suffers from oil –

spillage intensive erosion and leaching; hence intensive fertility maintenance in the region becomes necessary.

Issues on Maintenance of Soil Fertility in Niger Delta Region

Many issues could be advanced to the limited maintenance of soil fertility but the major ones are fragile environment, poverty and ignorance and low level of agricultural technology.

Fragile Environment

The soils of Niger Delta region are highly erodible because the soil particles are coarse textured and have weak structures. Rainfall is highly erosive in terms of total amount and intensity. The soils are inherently fragile; infertile neglected, misused and mismanaged hence the soil of the region is highly degraded (Babatola, 2000). Furthermore, the soil are low P^H and this is characterized by high level of Aluminium and Iron ions. Particularly in oxizols and ultisols soil types. Lime application needs to be carefully applied in addition to fertilizer. The use of dolomite with high level of Magnessium needs to be blended with fertilizer for proper soil management. Another property of the soils in the region is the phenomenon of leaching, because sandy complex soil is the dominant soil type. Applied fertilizer is always pruned to leaching because of incessant heavy pours. The region is also characterized by rapid mineralization and volatilization of applied fertilizer particularly when broadcasting method is used (Agboola 2000 and Solubo 2000).

Poverty and Ignorance

To Ayakaiye and Adeleye (2001) poverty is defined as inability to have sufficient income for securing basic goods and services. Okpaya (2013) sees poverty as a condition in which an individual or group of persons are unable to meet basic material needs. A farmer who cannot procure basic farm inputs to make increase output is at poverty stage. In this region many farmers over 60% of the population do not apply fertilizer to crops because of cost, transportation and scarcity. They resort to depending on long term bush fallowing particularly in sparsely populated areas. Farmers who practice long term hardly believe that fertilizer application enhances crop yield. The ignorance about usefulness of fertilizer depends on locality and the farming system practiced by the farmers. The level of farmers ignorance also affects the knowledge of treating soils to reduce soil acidity and to reduce leaching of the applied fertilizer through routine cultural practices.

Low Level of Agricultural Technology

The rate of adoption of agricultural technology is directly related with the level of educational background (Ekpo, 2002). Majority of the Local Women who formed the bulk of farming population in the region did not have access to education in Nigeria

because of traditional ideology (Peters and Akpan, 2014). Currently less than 5% of the Niger Delta Farmers are equipped with sufficient technical know how to manage contaminated soil with oil. Spilled for better crop yield. Method, time, amount and type of fertilizer application to kinds of crop and adoption of sustainable soil management require at least rudirnents of technological training. However, farmers in the region have the willingness to protect their crop yields if their agricultural technology is raised beyond their present level.

The Trend of Soil Fertility Maintenance

The majority of farmers adopt vegetative fallow or bush fallow. Vegetative fallow is a practice of allowing the soil to rest and regain its fertility (Webstar and Willson, 2010). The traditional farming system recognizes the implications of continuous cropping through the attendance poor yield particularly when the soil fertility is not restored. They resort to "slash' and burn" agriculture in order to maintain soil fertility. The 'slash and burn' agriculture can only be feasible and rewarding in a bush fallowed for considerable number of years. A soil under long term fallow has its structure, texture, water holding capacity, soil PH and nutrients contents significantly improved.

Ecologically, the function of fallow is the transfer of mineral nutrients from the soil black into the forest biomass that forms the soil layer and it is a recouping period (Agbola, 2000). The practice of 'slash and burn' agriculture results in abundant ash left on the surface of the soil after burning and later return into the soil by manual tillage. The ash replaces lime thus raises the low – acidic soil of humid environment in addition to the extra benefit of Ca, Mg, N,P,K and Sulphur released from the ash.

This long bush fallow approach is a feature of the distant farms located far away from the residential quarters of the farmers in Ondo and Cross River State; instant farms are characterized by slow and low intensely populated areas natural soil fertility restoration farm size, mixed cropping with cash crops like rubber, cocoa and oil palm. The distant farms are not properly managed as compared to compound farm in terms of soil fertility maintenance due to the distance and size.

Compound farms are located within the farmer's residential quarters. Farmers usually make all efforts to maintain and improve upon the soil fertility. Kitchen decomposable organic substances, farm yard manure in the form of poultry droppings and animal wastes are usually used to restore the soils of compound farms particularly in rural areas where fuel wood is the commonest means for cooking and small ruminants like goats and sheep are kept as supplementary income. The soils of the compound farms are also treated with chemical fertilizer or sometimes with poultry dropping and sometimes a mixture of both. This is seldom practiced when the farmers

are limited in terms of organic matter generated from kitchen or pen. The trend of soil fertility maintain in Niger Delta region is shown in figure I.

The Trend of Soil Fertility Maintenance in Niger Delta Region

Farm location	Means of Soil Fertility restoration	Justifications
Distance Farm (10 decades ago)		
↓		
Shifting Cultivation fallowed > 10 years	Efficient nutrients recycling No application of chemical fertilizer except the ashes returnec into the soil.	Less population pressure on l and little farming technolog
↓		
(7 decades ago) and till date land rotation fallowed 5 – 7 years	Moderate nutrients recycling No application of chemical fertilizer except the ashes returned into the soil.	Moderate population pressure land and less technical knowh
↓		
(Current trend) Land rotation fallowed 3 – 4 years	Less nutrients recycling plus chemical fertilizer and the ashes returned into the soil.	Where there is densely popul pressure and scarcity of lan
↓		
(Current trend) Oil spilled arable land	Poultry droppings and animal wastes	Chemical fertilizer is always fi not available to crops. Soil mar is intensively organic agric
Compound Farm		
↓		
Kitchen refuse and Farm Yard Manure	Organic Manure	Where fuel wood remains th source of cooking
↓		
Kitchen refuse, Chemical fertilizer and poultry droppings	Mainly a mixture of organic and chemical fertilizer	Where stove or gas cooker are for cooking

Figure 1: The Trend of Soil Fertility Maintenance in Niger Delta Region

Challenges on Soil Fertility Maintenance

(a) **Oil- Spillage as a Challenge to Soil Fertility Maintenance**

Niger Delta region is the delta of the Niger River at the Gulf of Guinea on the Atlantic Ocean in Nigeria. It is both an oil-rich and palm oil producing region supplying more than 75% of Nigerian's earning and makes up 7.5% of Nigeria's land mass. The region consists of nine states namely Abia, and Cross River (Figure 1.0).

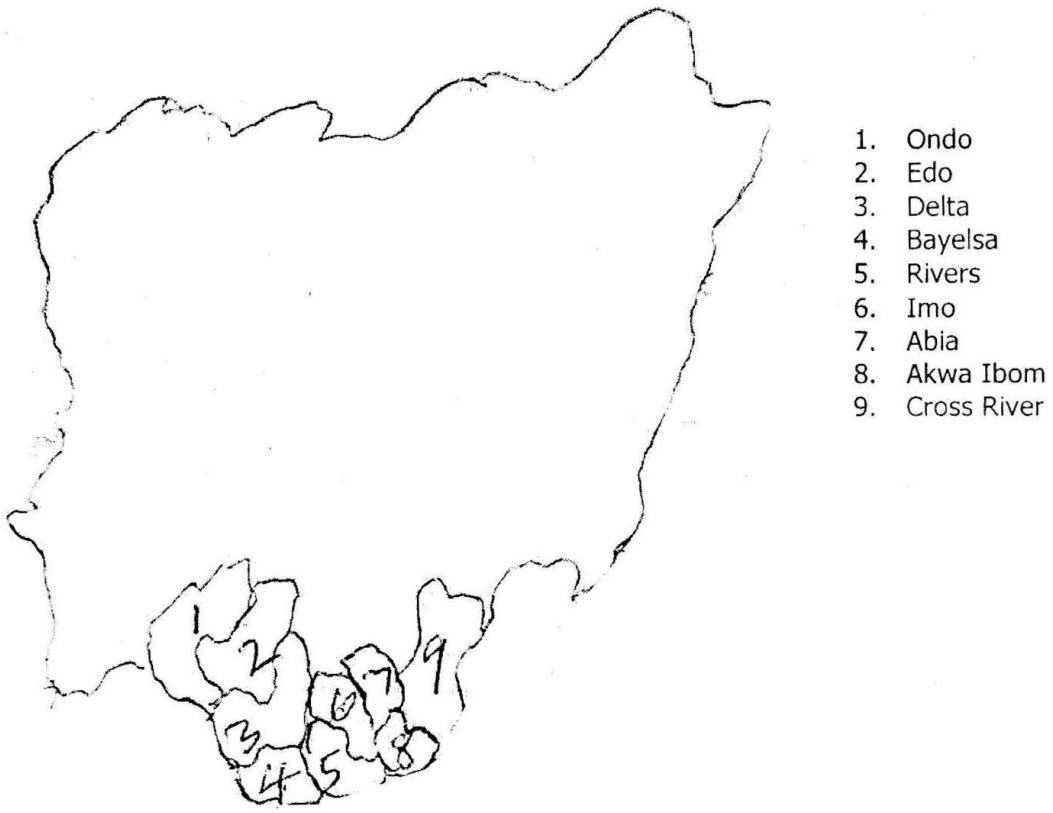

Figure 2.0: Map of Nigeria showing the states of possible oil-spillage in Niger Delta Region.

Oil-spillage has been a major concern of environmental pollution in the core oil producing states namely Delta Bayelsa, Rivers and Akwa Ibom. The effect of oil-spillage Bayelsa, Rivers and in the fragile Niger Delta communities and environment cannot be over emphasized. Local indigenous people are living beyond poverty level particularly where the land is no longer cultivable, water is not longer worths fishing and employment apparently neglected. According to Nigerian federal government Newspaper report (The Observer, 30 May, 2010), there were more than 7000 oil spills between 1970 and 2000. This phenomenon indicates that if one-oil –spilled area covered a

minimum of sohectares a total of 350,000 hectares of farmland are affected. Contaminated soils are not easily managed by the poor and low level technological farmers. Consequently, Federal Government of Nigeria and private sectors initiate the development of the region for sake of compensation which is currently below expectation

(b) **Land Tenure System as a Challenge to Soil Fertility Maintenance**

The manner in which land is owned or possessed either temporarily or permanently affects the attitude of a farmer forwards the maintenance of soil fertility. In rural areas of Africa, indigenous land laws usually provide some restrictions to prohibit land from being permanently transferred to those outside the lineage (Maiangwa, 2013). The inalienability of land has been widely regarded as an obstacle to agricultural development (Izumic, 2001). Agricultural development includes the use of land profitably for agricultural purposes. Crop production needs to be intensified with routine maintenance of soil fertility.

Indigenous land laws provide only temporarily possession is not guaranteed. Farmers whose agricultural land is not secured with formal rights are less likely to be interested in conserving resources or in making investments that improve long-term productivity of resources (Hazell and Lutz, 1999). The retention of some communal land tenure still have limitations to the maintenance of soil fertility. Land tenure and is often a cross between common access to private ownership. The evolution forwards individualization has been in response to changing conditions, principle increasing population and commercialization of agriculture (Maiangwa, 2013). A change in land tenure from communal to individualized tenure is therefore considered to be a pre-requisite for agricultural development and a necessary condition to encourage efficient use of land and to increase agricultural productivity in Africa (Izumi, 2001).

(c) **A Challenge to Soil Fertility Maintenance**

A chemical fertilizer is an inorganic substance added to the soil to improve its fertility. Currently, chemical fertilizer is scarce with attendance high cost between four thousand to six thousand naira per bag (50g) depending on type. I drissa and Ishaya (2011) reported that chemical fertilizer is at present not easily affordable and timely available. This abnormal cost could be attributed to in efficient distribution mechanism created by the middle men and politicians (Obi and Ahmed, 2014). Similarly, rock –phosphate has proved a promising fertilizer source in the humid areas and for ultimo's and oxisols soils with low ph in the Niger Delta region. Rock phosphate will provide phosphorus

and calcium thus reducing acidity in the acid soils by displacement of aluminum by calcium from the soil (Sobulo, 2000) unfortunately, this rock phosphate is also very scare and limited in distributions in the region. Compost manure from farm and animals wastes fortified with rock phosphate is a promising proposition (Solubo, 2000).

(d) Farming System as a Challenge to Soil Fertility Maintenance

Farming system encompasses the arrangement crops in time and space as dictated by the prevailing ecological factors. Currently, farming systems adopted by the farmers have insignificant role to play in the improvement of soil fertility. This is due to unscientific approach to the system. Mixed farming is not properly integrated into the farming system; hence the animal wastes are not properly utilized in distant farms. The wetland farming depends on sediments and alluvial materials left for crop use after the flood is subsided or the body of water is receded. There is no intensive soil management other than strict dependant on natural sediments.

So far, the farmers are yet to adopt appropriate farming system like alley cropping. This practice would address the increasing ecological stress imposed by population pressure and rapid mineralization. (Audu, Abakura and Daniel, 2009). Poor attitude of farmers in the region to animal husbandry ranging from small ruminants to cattle. Humped cattle in the forest zone are facing with deadly disease called trypanosomiasis. Commercial farmers resort to keeping large plantation of oil palm, cocoa and rubber without integrating it with animal husbandry. The integration of crop and animal enterprise increases, the soil fertility raises total productivity of small holder resources and improves welfare (Obi and Ahmed, 2014).

Generally, bush fallow system guarantees sound ecological stability and has been found to be adapted to the biophysical environment of the tropical ecosystem, because the transfer of organic matter and nutrient across boundaries is relatively small compared to internal influxes between the plant and soil pool. The magnitude of nutrient loss by runoff and leaching is considerably negligible. Certainly the ecological sustainability and fertility restoration potentials of the fallow depend on its age and prevalent edaphic factors peculiar to an area (Agbooia). Unfortunately, the short fallow system (3-4years) practice in the densely populated areas in the region does not initiate decoupling of the system and hence results in a lot of ecological disasters leading to relatively poor crop yield.

Future Trend

Scientists are making effort to reducing fertilizer cost by using sources of organic fertilizer and agrominerals or combination of organic fertilizer and agrominerals. Similarly, rock phosphate (P) and calcium (Ca) have been manufactured and distributed for sale but currently very limited in distribution. This approach will contribute in reducing the acidity during the cropping season. Attempt to commercialize organomineral fertilizers is in progress in Nigeria (Solubu, 2000 and Lucas 2000).

Enlightenment on the advantages of organic manure over chemical fertilizer has been intensified through Agricultural Extension officers in Niger Delta region. Several researches on the management of oil-spilled soils for crop production are available and some in progress. The need to practice alley cropping in the region is on-going. The combined growing of leguminous trees and food crops has a future prospect in humid rain forest. The tress are pruned as and when due to ensure sufficient organic matter. Some farmers in western Nigeria have already practiced this cropping system (Brader, 2000). The ever increasing population and pressure on land and the on-going training by hence tension officers would certainly make the farmers realize that continuous cropping should be replaced by proper crop rotation in the nearest future in the region.

Conclusion

Soil fertility maintenance in the Niger Delta Region is a major problem caused by soil abuse by man, environmental degradation caused by oil-spillage, low level of agricultural technology, land tenure system and inappropriate farming system.

Recommendations

(i) There is need to adopt low input technology to improve soil quality in the region such as crop rotation incorporated with leguminous food crops.

(ii) Organic agriculture should be encouraged as it is relatively cheaper and easier to reach than chemical fertilizer.

(iii) Bottle- necks should be removed in the distribution and procurement of chemical fertilizer by getting rid of the so called 'middle men' to make chemical fertilizer affordable to all farmers.

(iv) Formulation of organic- mineral fertilizer to meet the ecological zone is long overdue.

(v) Long duration of bush fallow- agriculture should be replaced by quality alley-cropping in crop rotational manner.

(vi) Individualized land tenure system should be encouraged. This certainly encourages individual farmer to make serious effort to improve upon the long-term fertility restoration on their respective farmland.