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Deforestation and Agricultural Activities in the Niger Delta Region of Nigeria

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Abstract

The study is on deforestation and agricultural activities in the Niger Delta Region of Nigeria. The study specifically examines the relationship between deforestation and crop production, the relationship between deforestation and fish farming and the relationship between deforestation and livestock production in the Niger Delta region of Nigeria. Farmers in Bayelsa State were sampled for the study. The population comprised 3,399 farmers while a sample of 358 farmers determined with the use of Taro Yamane formula and selected using the purposive sampling techniques. A questionnaire titled the questionnaire is titled "Deforestation and Agricultural Activities Questionnaire" (DAAQ) was the instrument used for data collection while the Pearson

Product Moment Correlation Coefficient was used to determine the relationship and level of significance of the variables. The result indicated that deforestation and crop production had positive relationship and the relationship is significant while deforestation and fish farming had negative but significant relationship. Also, deforestation and livestock production were found to have negative but significant relationship. In view of the findings, it was recommended that resource capacity of the institutions to protect forest be strengthened to enable them function effectively and programmes to slow down the speed of deforestation should be revitalized with aim of curtailing the increasing rate of deforestation amongst others.

Keywords: Deforestation, Agriculture, Nigeria

Introduction

The Niger Delta region has vast natural vegetation which serves as her resource base that includes rainforest, mangrove swamp and associated flora. The forests have provided the base for lumbering, canoe carving and related crafts, traditional medicine, food and food additives, hunting and fibre-related gathering. Thus, livelihoods of the majority of the population will continue to depend on utilization of natural resources. Hence, earth without forests is a picture that most of humankind presently could not conceive. Forests cover much of the planet's land area. They are extremely important to humans and the natural world. For humans they have many aesthetic, recreational, economic, historical, cultural, medicinal and religious values. Non-wood forest products come in the form of medicinal compounds, dyes and fabrics.

Deforestation therefore constitutes one of the threatening global development challenges and also a serious long-term environmental problem facing the world and Nigeria today (Sambe, Adeofun & Dachung, 2018) ^[17]. Deforestation has been defined as the removal of forest and other vegetation from an area without replacement (National Open University of Nigeria (NOUN, 2004) ^[12]. Nigeria has the highest rate of deforestation in Africa, which is increasing due to factors like settlement expansion, industrialization, logging, etc. (FAO cited in Olowoyeye, 2021). Another cause of forest reduction could be attributed to the perception that forest is a free good, a resource that is available for free and can be converted to other uses without paying necessary attention to its environmental usefulness, thereby, leading to degradation of the forest ecosystem to less varied and unwavering one.

According to Ogunwale (2015) ^[15], mankind's activities on the environment and his quest for development have led to continuous and serious degradation of the ecosystem; consequently, posing a threat to both his present and future existence. According to him, destroying the forests endangers the quality of life, gamble with the stability of the climate and local weather, threaten the existence of other species, and undermine the valuable services provided by biological diversity.

One of the major causes of deforestation in the Niger Delta region of Nigeria is the demand for land for cultivation. This has been seen both in the Niger Delta region and other parts of the world especially countries that have Agriculture as the backbone of their economy. Trees have been cut down to obtain land for cultivation of both subsistence and cash crops, both by governments and individuals. Adu and Marbuah (2012) ^[11] allege that the principal agent for the high rate of deforestation,

particularly in the tropics, is agriculture. This is usually the case where there is proliferation of small farm holders. For every land cleared of trees through deforestation land become available for farming by planting crops, raising live stocks among other agricultural activities. On the other hand, deforestation further expose the soil to erosion which in turn destroy land fertility and reduce available farming land.

Statement of the Problem

Rain forest deforestation occurs mainly because of farming. Rooms are given to impoverished and local farmers to provide for their families. Meanwhile, deforestation is a major problem that can lead to global warming, nutrient loss, accelerated soil erosion, desertification and siltation. All these contribute to loss in agricultural productivity, which has the potential future impacts on income, employment and food security to the people of the Niger Delta region and Nigeria at large. Aggregate data for major crops shows decline in agricultural productivity by 25% between 1990 and 2010, the yield level were far below level required for global competitiveness in agriculture (Anna, 2013) [2]. The assertion by Anna, has not changed significantly as food security remains a mirage. With these effects, the potential benefit of agricultural sector in terms of income and employment for majority of Niger Deltans may disappear as a result of deforestation. It is therefore expedient to look at deforestation and agricultural activities in the Niger Region of Nigeria. The outcome will not only close the literature gap, it will also proffer solution to identified problems.

Purpose of the Study

The main purpose of the study is to examine deforestation and agricultural activities in the Niger Delta Region of Nigeria. Specifically, the study seeks to:

1. To ascertain the extent to which deforestation affects crop production in the Niger Delta region of Nigeria.
2. To determine the extent to which deforestation affects fish production in the Niger Delta region of Nigeria.
3. To examine the extent to which deforestation affects livestock production in the Niger Delta region of Nigeria.

Research Questions

1. To what extent does deforestation affects crop production in the Niger Delta region of Nigeria?
2. To what extent does deforestation affects fish production in the Niger Delta region of Nigeria?
3. To what extent does deforestation affects livestock production in the Niger Delta region of Nigeria?

Research Hypothesis

Three null hypothesis were formulated to guide the study
 H_{01} : There is no significant relationship between deforestation and crop production in the Niger Delta region of Nigeria?

H_{02} : There is no significant relationship between deforestation and fish production in the Niger Delta region of Nigeria?

H_{03} : There is no significant relationship between deforestation and livestock production in the Niger Delta region of Nigeria?

Significance of the Study

The study on deforestation and agricultural activities in the Niger Delta region is significant to government, the farmers and policy makers. The government of the region is expected to get first hand information on the relationship existing between deforestation and agricultural activities in the region and this will enable formulate programmes that will alleviate whatever negative impact arising from the relationship in order to boost agricultural production and improve food security.

The farmers are expected to benefit from the result and recommendations of this study as it will expose them to the negative impact of deforestation and also how to mitigate such impact.

Finally, policy makers will see the outcome of this study as a tool or piece of vital information to draw up policy that will reduce excessive deforestation and improve farming and food production simultaneously. The study will further serve as reference point for others scholars who which to undertake research in similar field thereby benefiting the academic community.

Conceptual Clarification

Concept of Deforestation

Deforestation in a clear term could be defined as indiscriminate purging of a tree without adequate replacement thereby leading to loss of biodiversity. According to Ogundele, Oladipo, and Adebisi (2016) [13], the conversion of forest to another permanent non-forested land use such as agriculture, grazing, or urban development is termed deforestation. He further noted that deforestation over time has been associated with distortion of forestry issues. Mfon (2014) [11] in a similar manner defined deforestation as any activity that uses the forest, this could be actions associated with the temporary removal of forest covers such as slash and burn (a major component of shifting cultivation in an agricultural system), felling of wood for fuel, and commercial logging. On the contrary, Food and Agricultural Organization (2015) considers a plantation of trees established primarily for timber production to be forest and therefore does not classify natural forest conversion to the plantation as deforestation (but still records it as a loss of natural forests). However, the Food and Agricultural Organization (2011) [7] does not consider free plantation that provides non-timber products to be forest although they do classify rubber plantations as forest (2012). With the aim of reducing all forms of ambiguity, many specific terms like forest decline, forest fragmentation and degradation, loss of forest cover and land use conversions are referred to as deforestation.

Various policies and programmes have been put in place in order to curtail deforestation in Nigeria. These policies and programmes include ban on logging of 1975, Annual Afforestation (AP) of 1988, National Forest Action Plan (NFAP) of 2005, educating farmers about danger of environmental degradation, providing farmers with high yielding varieties of crop and irrigation equipment. But inspired of these programmes, deforestation continues to increase at alarming rate. For instance, between 2000 and 2005, Nigeria lost 5.7 percent of its primary forest as a result of deforestation and the rate continues to increase by 3.8 percent, which is equivalent to 4,000 hectares per annum (Ibrahim, 2014).

Agriculture Activities

Agriculture in Nigeria involves four broad systems of land use: crop production, animal husbandry, fishery and forestry. Crop production involves three types of farming in the country: rotational fallow; semi-permanent or permanent cultivation; and mixed farming. There are variations of each type. For example, the permanent cultivation may be under rain-fed system, or irrigated system. Rotational fallow, land rotation type is common in sparsely populated areas. The system allows a cultivated field to rest for a few years (known as fallow years) before it is cultivated again. However, as the population of a place increases, the fallow period becomes shortened until a permanent cultivation is enthroned. It is an irony of fate that the dry land of Nigeria is where permanent cultivation, as a result of pressure of people on the land, is practiced more than in other areas.

Animal husbandry in Nigeria is mainly the pastoral type. This is a nomadic system under which the herdsman, usually the Fulanis, move with the seasons, southwards as far as the deciduous forest during the dry season and northwards as far as the Sahel during the wet season. The system also has international dimensions as herders from the neighboring countries infiltrate into Nigeria during the dry season. Mixed farming, that is, a mixture of crop and animal production, is also practiced on a permanent basis. This system combines semi-permanent crop farming with grass fallow for grazing. The plots are then rotated after one or two years. The combination varies. Where crop production predominates, the farmer keeps only a few animals. Where livestock dominates, crop production will be a minor activity, and the rangeland type of agriculture is practiced.

Monocultural forestry simplifies the ecosystem, leaving it vulnerable to disease and other environmental factors (EPA, 1999). In the tropical forests of the world, the clearing of land for agriculture and livestock are the primary activities resulting in deforestation. The main cause is unequal distribution of land (Anderson, 1990). In many countries in Asia and Africa, where family farms are still prevalent, the breakdown of large joint-families is causing uneconomic divisions to existing farms. These inefficiencies, in turn, put pressure on farmers to sell their land for development, and it turns whole farming communities into new developments (Bhasin, 1991).

Relationship between Deforestation and Agricultural Activities

In the tropics, fertile land can be scarce, and the forest frontier offers untapped agricultural potential. The forest frontier is populated by poor and displaced people (UNFCCC 2006)^[23], and increasing population pressure on the forest boundary-from urban unemployment, for example- increases the pressure for agricultural expansion and deforestation. Agricultural expansion is a major cause of tropical deforestation around the world and was a cause in 96 percent of the 152 cases of deforestation examined by Geist and Lambin (2002)^[8]. Agricultural expansion includes establishing permanent crops, cattle ranching, shifting cultivation, and colonization and resettlement on the forest frontiers. Although shifting cultivation is often identified as a major cause of deforestation, found that permanent cropping and cattle ranching are equally influential. Cultivation of subsistence food crops dominates the forest clearing that is done for permanent agriculture (Geist and Lambin, 2002)^[8].

The most immediate social impact of deforestation in Nigeria occurs at the local level with the loss of ecological services provided by the forests. Forests are valuable to humans; it helps in preventing erosion, control of flood, water management, fisheries protection and pollination functions that are of importance to the poor farmers who rely on the natural resources for their daily survival (Chakravarty, Ghosh, Suresh, Dey & Shukla, 2012)^[4].

Oguntala, Soladoye, Ugbogu, and Fasola (1996)^[14] surmised the adverse effects of deforestation in Nigeria under three main headings as follows: (a) effect on agriculture which revealed that with the removal of forest cover, the land is deprived of protection that is, predisposing the land to climatic agents such as rainfall, wind, sunshine and its heating effect. The result is that soil organic matter is rapidly mineralized and nutrients are leached, leading to the destruction of the soil structures; (b) Soil erosion: in which exposure of the soil to sun, rain, and wind lead to soil erosion, thus decreasing further productivity; and (c) Impact on water resources: it was observed that deforestation adversely impact water resources through a reduction in the amount of water that is intercepted by vegetation and evaporated back to the atmosphere. The lower portion of rainwater that infiltrates the soil adversely affects groundwater recharge and storage, ultimately turning perennial rivers into seasonal or ephemeral streams. The following water resources elements are said to be affected by deforestation; drinking water, fisheries, and aquatic habitats, flood/drought control, and damage to crops and irrigation systems from erosion and turbidity (Bruijnzeel, Bonell, Gilmour & Lamb, 2005)^[3].

One effect of deforestation is climate change. Climate change is a major challenge to agricultural development in Africa and the world at large. Ziervogel, Nyong, Osman, Conde, and Dowing, (2006)^[20] noted that climate change, which is attributable to natural climate cycle and human activities, has adversely affected agricultural productivity in Africa. This is particularly because African agriculture is predominantly rain-fed and hence fundamentally dependent on the vagaries of weather (Watson, Zinyowera & Moses, 1997)^[19]. Zoellick (2009)^[21] stated that, as the planet warms, rain fall patterns shift, and extreme events such as droughts, floods, and forest fires become more frequent. This results in poor and unpredictable yields, thereby making farmers more vulnerable, particularly in Africa (UNFCCC, 2007). Climate change affects agriculture in several ways, one of which is its direct impact on food production. Besides, almost all sectors in agriculture (crop, livestock, pastoralism, fishery, etc) depend on weather and climate whose variability have meant that rural farmers who implement their regular annual farm business plans risk total failure due to climate change effects (Ozor, Madukwe, Onokala, Enete, Garforth, Eboh, Ujah & Amaechina 2010)^[16]. The risk from climate in Africa, and the rest of the world, includes, rising temperatures and heat waves, shortfalls in water supply/increasing floods arising from shortage/excessive rainfalls, sea level rise, increasing likelihood of conflict and induced environmental and vector borne diseases. These conditions emanating from climate change are bound to compromise agricultural productions (crop, livestock, forest and fishery resources), nutritional and health statuses, trading in agricultural commodities, human settlements (especially of agricultural communities), tourism and recreation among others (Tollogbonse, Auta,

Bidoli, Jaliya, Onu & Issa, 2010)^[18]. Climate change has serious implications for global fisheries and aquaculture. Besides the physical and financial drivers, climate is a major driver that enhances the aquaculture sector growth and sustainability. The variability of temperature, air humidity and total rainfall shows negative signs to aquaculture production in ponds system. These problems have contributed to major loss of production and increase in socio-economic and income vulnerability among farmers. The small scale or individual farmers are among the highest vulnerable to climate change (Tan, 1998).

Theoretical Review

The Land rent theory for deforestation is considered suitable for the study. The land rent approach for deforestation is deeply rooted from the land value framework developed by von Thunen in 1826. The core idea of this spatial economic theory of land use is that a piece of land should be allocated to the use that would generate the highest potential rent (Chomitz & Gray, 1996; von Amsberg, 1994). Spatially, distance or transportation cost has important position in this land use competition. In summary, by assuming profit maximization motivation, competition among land uses will be determined by which land use that yields the highest land rent/value.

This theory is applicable to this study because farmers believe that they have more to benefit when they pull down the forest and plant crop, carry out fish farming or livestock than allowing the forest to keep developing. However, they fail to see that converting the forest to farmland has its own cost on the environment.

Empirical Studies

Uguchi, Obenade, Ogungbemi and Bubou (2020)^[22] examined deforestation and environmental degradation in the Niger Delta Region of Nigeria. The 2013 Landsat TM Satellite Remote Sensing data was used to identify and classify forest area in five Local Government Areas (Brass, Ekeremor, Nembe, Ogbia, and Southern Ijaw) of Bayelsa State covering a period of 26 years, from 1987 to 2013. These include Area calculation, overlay and image differencing. The result showed that built-up area which was 16.68 percent of the study area in 1987, increased to 34.96 percent of the study area in 2013. Vegetation cover which was 50 percent of the study area in 1987 decreased to 38.5 percent in 2013. Water body decreased from 33.32 percent of the study area in 1987 to 26.54 percent in 2013. The magnitude and rate of deforestation occasioned by development projects, agriculture, seismic operations, oil theft and artisanal refining, among others is substantial, unsustainable, and environmentally devastating and could be attributed to rising population and unsustainable consumption patterns that threaten forest and other natural resources in the State. The implications of this on climate change, flooding, and food security among other effects cannot be over-emphasized.

Ibrahim, Bila and Sulumbe (2016)^[9] analyzed the impacts of deforestation on agricultural productivity in Nigeria. The study specifically assessed the trend of deforestation and the impact of deforestation on agricultural productivity. Time series data on all the variables in the study spanning from 1975 to 2010 were used. Descriptive statistic and Error Correction Model were the analytical techniques used for the study. The Unit root test results reveal that all the

variables of deforestation, agricultural productivity, average rainfall and number of tractors were found to be non-stationary at 5% level but stationary at first difference, which give way for long-run co-integration. Analysis of Error Correction Model (ECM) results indicated an inverse long-run relationship between deforestation and agricultural productivity. The result reveals that 1% increase in deforestation will result in 1.7% decrease in agricultural productivity. The result of the short-run analysis shows positive relationship between previous year's agricultural productivity and rainfall on current agricultural productivity with elasticity of 0.9 and 0.2, while deforestation portrayed a negative effect on agricultural productivity with elasticity of -0.7. Error Correction Model shows a permanent impact of deforestation and agricultural productivity.

Adu, Marbuah, and Mensah, (2012)^[1] compares the deforestation path taken by profit maximizing agricultural firms in tropical regions to the path that will maximize social welfare based on optimal control techniques. A theoretical problem was set up where the socially optimal deforestation path that maximizes the discounted sum of net benefit of forest land use to society diverges from that of a farmer. The scholars concluded after solving for the optimal choice of deforestation for both the private farmer and a social planner. The key source of this divergence in deforestation path is that the cost of deforestation is external to the farmer. The paper concluded that the farmer's deforestation path leads to socially suboptimal outcome.

Methodology

The study design is a correlational survey. A correlational survey is a research design in which the investigator sets out to find the extent to which variation in one factor corresponds with variation in one or more factors based on correlation co-efficient. This type of study seeks to establish relationship existing between two or more variables, in this instance, it deforestation and agricultural activities.

The population of the study is made up 3,399 farmers in Bayelsa State (Ministry of Agriculture and Natural Resources (2021). The population comprised 1,333 fish farmers, 900 rice farmers and 1,166 cassava farmers scattered across the state. The sample of the study was determined using Taro Yamane's formula. A total 358 respondents were selected using purposive sampling technique. The research instrument used for data collection in this study is a self-designed questionnaire. The questionnaire has two sections (section A, B). Section A contains the questions to elicit response on demographic data while section B contains items to elicit response on the area of interest. The questionnaire is titled "Deforestation and Agricultural Activities Questionnaire" (DAAQ). Respondents were expected to tick one of the following options:

Very high extent (VHE) = 4 points; High extent (HE) = 3 points; Moderate extent (ME) = 2 point; and Low extent (LE) = 1 point. The responses were scaled in the likert format.

For face and content validity of the instrument, copies were given to two experts and their inputs and comments formed the final draft of the instrument.

On the other hand, the test re-test method of reliability was used to determine the reliability of the instrument. Copies of the instrument were administered on farmers who were no part of the study sample, at two different intervals and the

results of the two test were correlated and the r-value was 0.77 confirming there reliability of the instrument.

The instrument for data collection was personally administered to the respondents selected from the various farming settlement with the help of three research assistants. The questionnaires were retrieved three days after administration and 351 were successfully retrieved while 7 were lost or damaged. The 351 retrieved questionnaire was used for data analysis.

Data collected from the field were carefully analyzed using frequency count and percentage was for the bio-data while Pearson Product Moment Correlation Coefficient was used to determine the relationship and level of significance of the variables at 0.05 Alpha.

Results

Analysis of Demographic Data

Table 1: Distribution of Respondents by Gender

Gender	Frequency	Percentage
Male	153	43.6
Female	198	56.4
Total	351	100

Source: Field Survey Data, 2021

According to Table 1, distribution of respondents by gender shows that out of the 351 respondents, 153 (43.6%) were male while 198 (56.4%) were female. This is an indication that more female farmers participated in the study than their male counterpart.

Table 2: Distribution of Respondents by Age

Age	Frequency	Percentage
Below 25	26	7.4
26 – 30	47	13.4
31 – 35	105	30.0
Above 36	173	49.2
Total	351	100

Source: Field Survey Data, 2023

Table 2 above indicate that 26 or 7.4% of the respondents were age 25 years and below, 47 or 13.4%, respondents were in the age bracket of 26 – 30 years, and another 105 (30.0%) respondents were aged between 31 and 35. Finally, those who are 36 years and above were 173 and constitute 49.2% of the respondents. The implication is that majority of respondents were matured and knowledgeable enough to understand the topic of concern.

Table 3: Mean Score Response on the effect of deforestation on crop production

S. No	Items	VHE	HE	ME	LE	\bar{x}	Decision
1	Deforestation exposes farmland to erosion.	140	79	81	51	2.9	HE
2	Deforestation causes adverse effect to soil fertility by destroying soil texture and structure.	127	102	68	54	2.9	HE
3	Deforestation exposes farmland to excessive wind.	131	92	72	56	2.8	HE
4	Deforestation exposes farmland to excessive sunshine.	94	89	83	85	2.5	HE
5	Deforestation increases the survival of crop pest and diseases.	99	97	79	76	2.6	HE
	Grand Mean					2.7	HE

Source: Field survey 2023, N = 351, Criterion mean = 2.50

Research Question 1: To what extent does deforestation affects crop production in the Niger Delta region of Nigeria? The data presented in Table 3 indicated that mean score for item 1, 2, 3, 4 and 5, is 2.9, 2.9, 2.8, 2.5 and 2.6 respectively. The items mean were greater than the criterion mean of 2.5 indicating that the deforestation has effect on crop production in the study area. Furthermore, with a grand mean of 2.7 which is also greater than the criterion mean of 2.5, further shows that the deforestation has adverse effect

on crop production to a high extent. The implication is that deforestation exposes crops and the soil to excessive sunshine which affect soil fertility, crop growth and food production. Deforestation also increases the survival of pest and disease that damage crops yield.

Research Question 2: To what extent does deforestation affects fish production in the Niger Delta region of Nigeria?

Table 4: Mean Score Response on the effect of deforestation on fish production

S. No	Items	VHE	HE	ME	LE	\bar{x}	Decision
6	Deforestation increases incidence of drought.	100	95	78	77	2.6	HE
7	Deforestation increases fish disease infestation.	151	79	72	49	2.9	HE
8	Deforestation causes destruction of property from heavy storm.	142	80	70	59	2.9	HE
9	Deforestation causes high temperature and heat waves.	134	79	70	68	2.8	HE
10	Deforestation exposes fishes to excessive sunshine.	120	80	79	72	2.7	HE
	Grand Mean					2.8	HE

Source: Field survey 2023, N = 351, Criterion mean = 2.50

The result in Table 4 shows that mean score for item 6 - 10 is 2.6, 2.9, 2.9, 2.8 and 2.7 respectively which are all greater than the criterion mean of 2.50. In addition, the grand mean of 2.8 is also greater than the criterion mean of 2.50. This is indication that deforestation highly affects fish production in

the Niger Delta Region. In implication is that deforestation causes high temperature and heat waves which make the water condition unfavourable fish habitation. Deforestation exposes pond eater and fishes to excessive sunshine which further affect aquatic lifestyle.

Research Question 3: To what extent does deforestation affects livestock production in the Niger Delta region of Nigeria?

Table 5: Mean Score Response on the effect of deforestation on livestock production

S. No	Items	VHE	HE	ME	LE	\bar{x}	Decision
11	Deforestation reduces grazing time due to excessive heat (animals seek shade)	188	96	28	39	3.2	HE
12	Deforestation causes a reduction in animal growth because food intake is reduced.	181	80	41	49	3.1	HE
13	Deforestation decrease fertility and activity level of livestock due heavy exposure to sunshine and heavy rainfall	175	111	47	18	3.3	HE
14	Deforestation increases livestock mortality	154	122	46	29	3.1	HE
15	Deforestation reduces laying performance of chicken due to excessive heat.	156	146	33	16	3.3	HE
Grand Mean						3.2	HE

Source: Field survey 2023, N = 351, Criterion mean = 2.50

Analysis of data presented in Table 5 indicates that the mean score of 3.2, 3.1, 3.3, 3.1 and 3.3 were obtained for item 11, 12, 13, 14 and 15 respectively and are all greater than the criterion mean of 2.50. In addition, the grand mean of 3.2 which is also greater than the criterion mean of 2.50. This is an indication that it is the general opinion of the respondents that deforestation affects livestock production in the Niger Delta Region of Nigeria. The implication is that deforestation exposes livestock to excessive sunshine and rainfall and further interfere and interrupt livestock feeding, fertility and activity.

Test of Hypotheses

Hypothesis One

H₀₁: There is no significant relationship between deforestation and crop production in Niger Delta region of Nigeria.

Table 6: Pearson Product Moment Correlation Coefficient (PPMC) analysis of the significant relationship between deforestation and crop production

		Deforestation	Crop production
Deforestation	Pearson Correlation	1	.735
	Sig. (2-tailed)		.000
Crop Production	Pearson Correlation	.735	1
	Sig. (2-tailed)	.000	

Source: Author’s computation using SPSS 2 N=351

The result presented in Table 7 shows that, the 2-tailed value of the Pearson Product Moment Correlation Coefficient (PPMC) analysis is .000. The standard alpha value is .05. Hence the null hypothesis cannot be accepted. This implies that, the alternative hypothesis which states that, there is significant relationship deforestation and crop production is upheld.

Hypothesis Two

H₀₂: There is no significant relationship between Deforestation and fish farming in the Niger Delta region of Nigeria.

Table 7: Pearson Product Moment Correlation Coefficient (PPMC) analysis of the significant relationship between deforestation and fish farming

		Deforestation	Fish Farming
Deforestation	Pearson Correlation	1	-.630
	Sig. (2-tailed)		.003
Fish Farming	Pearson Correlation	-.630	1
	Sig. (2-tailed)	.003	

Source: Author’s computation using SPSS 20 N = 351

The result in Table 8 revealed that the p-value (.003) is less than the standard alpha value of 0.05, which means that the correlation between deforestation and fish farming is highly significant. In other words, we reject the null hypothesis that state that there is no significant relationship between deforestation and fish farming and therefore, accept the alternate that states that there is a significant relationship between deforestation and fish farming. The relationship is however, negative.

Hypothesis Three

H₀₃: There is no significant relationship deforestation and livestock production in the Niger Delta region of Nigeria.

Table 8: Pearson Product Moment Correlation Coefficient (PPMC) analysis of the significant relationship between deforestation and livestock production

		Deforestation	Livestock Production
Deforestation	Pearson Correlation	1	-.767
	Sig. (2-tailed)		.000
Livestock Production	Pearson Correlation	-.767	1
	Sig. (2-tailed)	.000	

Source: Author’s computation using SPSS 20, N = 351

The data presented in Table 9 reveals that, the Pearson Product Moment Correlation Coefficient (PPMC) analysis is significant at 0.05 alpha level. Hence the null hypothesis which states that, there is no significant relationship between deforestation and livestock production in the Niger Delta region is rejected. This means the alternative hypothesis which states that, there is a significant relationship between deforestation and livestock production in Niger Delta region is upheld.

Discussion of Findings

From the analysis of Table 3, it is revealed that deforestation strongly affect crop production in the Niger Delta region of Nigeria. In addition, the test of hypothesis one on Table 6 indicates that there is a significant relationship between deforestation and crop production in the Niger Delta region of Nigeria. The implication of the result is that deforestation exposes farmland to erosion, causes adverse effect to soil fertility by destroying soil texture and structure, increases the survival of crop pest and diseases, exposes farmland to excessive wind etc. The result agrees with the finding of Ibrahim, Bila and Sulumbe (2016) [9] who reported an inverse long-run relationship between deforestation and

agricultural productivity. The result reveals that 1% increase in deforestation will result in 1.7% decrease in agricultural productivity.

The findings of the study revealed deforestation affects fish production in the Niger Delta region of Nigeria. Furthermore, result from the test on hypothesis two in Table 7 revealed that there is a significant relationship between deforestation and fish production in the Niger Delta region of Nigeria. In other words, deforestation increases incidence of drought, increases fish disease infestation, causes high temperature and heat waves, exposes fishes to excessive sunshine etc. This result supports that of Ibrahim, Bila and Sulumbe (2016) ^[9] who reported an inverse long-run relationship between deforestation and agricultural productivity. The result reveals that 1% increase in deforestation will result in 1.7% decrease in agricultural productivity.

Also, the result shows in Table 5 that deforestation has serious effect on livestock production in the Niger Delta region. However, the test of hypothesis three revealed a significant relationship between deforestation and livestock production in the Niger Delta region of Nigeria. Result in Table 8 shows that the p-value (.000) is less than the standard alpha value of 0.05. This is an indication that deforestation reduces grazing time due to excessive heat, causes a reduction in animal growth because food intake is reduced, decrease fertility and activity level of livestock due heavy exposure to sunshine and heavy rainfall etc. Adu, G., Marbuah, G. and Mensah, (2012) ^[1] also stress that farmer's deforestation path leads to socially suboptimal outcome.

Conclusion

From the findings of the study, it was concluded that deforestation has negative consequences on agricultural activities in the Niger Delta region of Nigeria. Deforestation has continued to reduce the total forested land area in the Niger Delta region of Nigeria. Its effects are quite obvious now, that environmental awareness is gradually reaching every strata of the society. Also, from the economic point of view deforestation has created a negative impact on the average Niger Delta.

Recommendations

In view of the findings of the study, it is necessary to advance the following recommendations.

1. There is the need to promote active private sector participation in the mitigation of the impacts of climate change on crop production. This will help expedite the development of innovative and cost-effective approaches to reduce deforestation.
2. To help ensure effective mitigation of the impacts of deforestation on crop production it is recommended that resource capacity of the institutions be strengthened to enable them function effectively. The institutions must be equipped with the necessary logistics like computers and vehicles which can enhance their operation.
3. Programmes to slow down the speed of deforestation like World Bank assisted programme of 1992 to 1996 needs to be revitalized with aim of curtailing the increasing rate of deforestation. This will enhance micro climate, improve soil nutrient, checkmate soil degradation, reduce desertification, erosion and improve agricultural productivity.

4. The respondents should be seriously educated about the rules governing the forest reserve, methods of tree production, sustainable forest management practices, conservation and livelihood-based approaches.

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