

## Effect of Environmental Emission and Dispersion of Pollutants from Black Carbon on the Income of Rural Farmers in Etche Local Government Area, Rivers State

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### Abstract

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The study examined the effect of environmental emission and dispersion of pollutants from black carbon on the income of rural farmers in Etche, an epicenter of high yielding varieties of farm produce. Rivers State has been wanton and constant with critical wellbeing, social and financial results for its people for more than three decades. Utilizing an example of 50 agriculturists drawn from five communities in Etche LGA in the upland of Rivers State, the negative effect of oil spill and pollution of black carbon on crop income was accentuated. Black carbon reduced crop profits as a unit rise in oil leak decreased harvest wage by 2.45 naira. Also, a percentage increase in emission of black carbon greatly depressed farm income by 3.69 percent. The use of different means of livelihood apart from farming which is 80%, migration of farming family 72%, withdrawal from agriculture 40% were the major mitigation strategies adopted by the farmers. In order to halt the continual emission and dispersion of pollutants from black carbon it is therefore, recommended that Mediations programs and additionally arrangements, for example, interest in innovative work, top and exchange framework, carbon assess strategy, reception of clean power design, and other administrative measures ought to be composed so as to moderate the impact of black carbon and perhaps decrease its odds of discharge to the barest least. For example, some new advancements that can ingest abundance CO<sub>2</sub> are as of now being proposed or potentially created by Chemical and Petrochemical engineers, consequently organizations in charge of transmitting a great part of the black carbons can be ordered to buy and utilize such advances.

**Keywords:** *Environmental, Emission, Dispersion, Pollutants, Crop, Income, Black carbon, Rural farmers*

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<http://internationalpolicybrief.org/journals/ijasr-online-journals/intl-jrnl-of-sci-research-in-social-sciences-mgt-studies-vol3-no2-november-2018>

### **Background to the Study**

Nigeria has been anticipated to be among the twenty biggest set up economies on the planet by 2020. Agricultural science has been distinguished to be the real area that can realize this excellent accomplishment. Nigeria has the desire of broadening her economy from unrefined oil reliance, thus the National Industrial Revolution Plan of 2011. The once predominant subsistence-arranged rural economy is in danger of steady underestimation (Federal Ministry of Environment [FME], 2010).

Furthermore, Food and Agriculture Organization [FAO] (2008) evaluation showed that the quantity of hungry and malnourished individuals, because of inadequate nourishment accessibility and absence of access to food, have expanded from around 90 million out of 1970 to around 225 million in 2008, and is anticipated to include more than 100 million by 2015.

Environmental emission may affect on the four key measurements of nourishment security accessibility, solidness, access, and usage (Schmidhuber and Tubiello, 2007). Accessibility of farming items might be influenced by CO<sub>2</sub> directly through its effects on crop yields, edit irritations and maladies, and soil ripeness and water-holding properties. It can likewise be influenced by environmental change by implication through its effects on economic growth, wage dispersion, and agricultural request (Schmidhuber and Tubiello, 2007).

In particular, carbon situations prompt abatement in the creation of exchanged and non-exchanged harvests, however not domesticated animals. Emissions likewise exacerbate the welfare of all portions of families, where the most helpless groups are the rustic poor family unit. Against this foundation, this examination inspects effect of emission and dispersion of pollutant from black carbon on the income of rural famers in Etche Local Government Area, Rivers State, Nigeria.

The change in climate as a result of the emission of green-house gases over the years has been having lots of impacts on the communities of the various nations of the world. Nigeria has been having her share of the impacts particularly resulting from gas flaring by the oil companies in the Niger Delta. These impacts are felt by the farmers of Nigeria and Etche LGA, River State in particular. Environmental pollution is known to be having impacts on agriculture thereby having effects on agricultural production and income of the farmers. A lot of research had been commissioned as a result of oil companies operating in the area on the socio-economic effects of their operation in host communities and a lot of research have been reported, examples include Enete (2004) investigated the impact of climate change on Agricultural production in Enugu state and Edoja (2006) examined the dynamics relationship among CO<sub>2</sub> emission, agriculture efficiency and food security in Nigeria but then dependent studies on the effect of environmental pollution of black carbon emission on the income of rural farmers have not been conducted.

Base on the above problem, the study responded to the subsequent research questions: Does awareness and knowledge level affect environmental emission on agriculture in Etche Local Government Area, Rivers State, Nigeria? Does environmental emission and dispersion of pollutant from black carbon affect farm income, land productivity and crop yield? What are the effects of environmental emission and dispersion of pollutants from black carbon on income of farmers in Etche Local Government Area, Rivers State, Nigeria? What are mitigation strategies of farmers on the effects of environmental emission in Etche Local Government Area, Rivers State, Nigeria?

### **Objective of the Study**

The broad objective of the study is to examine the effect of environmental emission and dispersion of pollutants from black carbon on income of rural farmers in Etche Local Government Area, Rivers State, Nigeria. Specifically, the objectives are to:

1. Ascertain the awareness and knowledge of the effect of environmental emission on agriculture in Etche Local Government Area, Rivers State, Nigeria.
2. Estimate the effects of environmental emission on farm income, land productivity and crop yield.
3. Estimate the effects of environmental emission and dispersion of pollutants from black carbon on income of rural farmers in Etche Local Government Area, Rivers State, Nigeria.
4. Identify the mitigation strategies of farmers on the effects of environmental emission in Rivers State, Nigeria.

### **Methodology**

**Research Design:** the study used the survey research design

#### **Sampling Procedure**

Multistage inspecting strategies were used to draw tests for the investigation. The first stage involves the selection of Etche local government area. The second stage include the arbitrary choice of five communities from the local government area, making a total of five communities and the final stage involved the random selection of ten farmers making a total of 50 farmers for the study.

#### **Data Collection Methods**

This study used primary data gotten with the guide of surveys controlled by and by to the respondents, interview and focus group discussion. Data collected include crop yield, land territory developed, work and capital information used, farm salary and rate of environmental emission. It also considered the farmers' impression of their impact on rural creation and farm income. Data on the financial qualities of the agriculturists was also acquired.

#### **Data Analysis Techniques**

Both descriptive and econometric techniques were used to achieve the stated objectives of the study. Descriptive statistics were used to achieve objective 1, 2 and 3 while objective 4 was achieved with the ordinary least square method.

### Model Specification and Estimation

To appraise the impact of environmental emission and dispersion of pollutants from black carbon on income of rural farmers, the accompanying econometric models relating crop yield, land efficiency, and farm pay with the under recorded logical factors were determined and along these lines evaluated:

$$CRP_{inc} = f(LNDSZ, LBRNT, PLTMT, FRMXP, CPTNT, OILSP, MKTPZ, CPI, \epsilon) \dots$$

Where:

- CRP<sub>inc</sub> is annual crops income in naira
- LNDSZ is land profitability estimated as the proportion of harvest yield to land measure
- FRMNC equals the profits after deducting of expenses of generation
- LNDSZ is land estimate developed estimated in hectares
- LBRNT is work taken a toll for every cropping season
- PLTMT is cost of planting materials
- CPTNT is the deterioration cost of capital sources of info
- FRMXP is cultivating knowledge estimated as number of years in crop cultivating
- OILSP is oil slick sham (oil spillage = 1, no spillage during cropping year = 0)
- MKTPZ is normal market cost for the bushel of harvests created
- CPI is the Crude oil pollution index
- ε is the error term.

Since financial hypothesis does not show the exact numerical type of the relationship among the factors, diverse practical types of the above models including the straight, semi-logarithm, logarithm and exponential capacities was tried to discover the lead condition that picked on the bases of monetary, factual and additionally econometric criteria Koutsoyiannis, (1977) and Olayemi, (1998).

### Results and Discussion

Presentation of the Level of Awareness and Knowledge of Environmental Emission and Dispersion of Pollutants from Black carbon

**Table 1: Level of Awareness and Knowledge of Environmental Emission and Dispersion of Pollutants from Black carbon**

Awareness	*Frequency	Percentage	Ranking
I am aware of environmental emission of black carbon.	49	98	1 <sup>st</sup>
Environmental emission causes land degradation	33	66	3 <sup>rd</sup>
Environmental emission leads to Climate change	12	24	8 <sup>th</sup>
It causes high rate of crop failure	22	44	5 <sup>th</sup>
Environmental emission decreases crop yields.	19	38	6 <sup>th</sup>
Environmental emission land and water pollution.	40	80	2 <sup>nd</sup>
Environmental emission causes migration.	14	28	7 <sup>th</sup>
It causes rise in temperature.	23	46	4 <sup>th</sup>

**Source:** Field Survey, 2018, \*Multiple responses recorded

From the Table 2 majority (98%) were aware of the emission of black carbon in the atmosphere, 80% had knowledge that environmental emission lead land and water pollution, 66% were aware that environmental emission causes land degradation and reduced soil fertility, 46% had knowledge that environmental emission of black carbon rises the temperature of the environment which are not healthy for crop growth and yield and also 44% know that environmental emission causes high rate of crop failure in the study area. In all, the farmers in the study area had full knowledge of the effect of environmental emission and dispersion of pollutants from black carbon on their yield and income.

### Presentation of the T-test Results

**Table 2: Test of Differences of the Effect of Environmental Emission on Crop Yield, Land Productivity and Farm income**

Production Parameter	Mean difference	D.F	t-value	p-value
Crop yield (kg)	288.862	49	2.825	0.0051**
Land productivity(yield/ha)	771.201	49	7.876	<0.0001**
Farm income(N,= )	15718.72	49	19.088	<0.0001**

**Source:** Field Survey, 2018.

The results of Table 2 indicate that environmental emission of black carbon had a measurably significant impact on crop yield, land efficiency and in addition cultivate income.

**Table 3: Presentation of the regression result of the effect of environmental emission and dispersion of pollutants from black carbon on the income of rural farmers**

Regression Result of the effect of environmental emission and dispersion of pollutants from black carbon on the income of rural farmers

Variable	Coefficient	Standard error	T-value
Constant	723.4	245.7	2.94***
land productivity	0.8723	0.4789	1.82*
Land size	1.3420	0.6117	2.19**
Labour cost	-0.8929	0.5123	1.74*
Depreciation	-0.1050	0.4339	1.16
Farming experience	0.4569	0.2441	1.87*
Oil spill	-2.4537	0.8772	2.79***
Pollution index	-3.5407	1.3369	2.65**
R <sup>2</sup>	0.6893		
Adj R <sup>2</sup>	0.6431		

From Table 3,the outcomes show that land productivity land estimate, labour cost farming experience, oil spill and pollution index had a factually significant impact on crop

income in a way reliable with an earlier desires. Be that as it may, the effect of depreciation on crop income was negative however not significant. The coefficient of land productivity, land size and farming experience were positive and significant at 10%, 5% and 10% level respectively showing that increase in land productivity, land size and farming experience will increase the crop wage of the agriculturists in the examination territory. The coefficient of labour cost, oil spill and pollution were negative and significant at 10%, 1% and 5% respectively. This implies that an increase in any of the variables will reduce the crop income of the farmers in the study area.

**Table 4: Mitigation Strategies of Farmers on the Effects of Environmental Emission**

Strategy	Frequency*	Percentage	Ranking
Migration of farming family	36	72	2 <sup>nd</sup>
Cultivation of different types of crops and wild plants	18	36	4 <sup>th</sup>
Switching crop varieties	12	24	5 <sup>th</sup>
Withdrawal from agriculture	20	40	3 <sup>rd</sup>
Use of different means of livelihood	40	80	1 <sup>st</sup>

**Source:** Field Survey, 2018. \*Multiple responses recorded

From the result, the strategies adopted by the farmers were the use of different means of livelihood apart from farming 80%, migration of farming family 72%, withdrawal from agriculture 40%, cultivation of different types of crops and wild plants 36% and switching crop varieties 24%. This indicates that majority of the farmers in the study area have either migrated or switched to other livelihood means that guarantees their survival in the midst of degraded soil and polluted environment.

### Conclusion

This paper, considered the effect of environmental emission and dispersion of pollutants from black carbon on income of rural farmers utilizing essential information from 50 small scale crop farmers drawn arbitrarily from 5 communities in 1 LGAs in upland areas of Rivers State. The study revealed that oil spills and pollution index had a negative and statistically significant effect on crop salary, in a way predictable with monetary desire. Likewise, the income of all portions of families' compounds worsens because of the emanations initiated reduction in all out harvest efficiency in agribusiness. The rate misfortune in wage is more show in zones with high concentration of oil companies, where rural farmers are the most defenseless. High helplessness of the farmers can be clarified by their overwhelming reliance on rain-sustained agriculture for occupation and their limited income diversification. The use of different means of livelihood apart from farming 80%, migration of farming family 72%, withdrawal from agriculture 40% were the major mitigation strategies adopted by the farmers.

## Recommendations

Base on the findings and conclusion reached, it is prescribed that: arrangements ought to be planned fittingly keeping in mind the end goal to have the coveted impact on the economy and at the ideal time; meditations programs as well as approaches, for example, interest in innovative work, top and exchange framework, carbon tax strategy, appropriation of clean power design, and other administrative measures ought to be composed so as to alleviate the impact of black carbon and potentially diminish its odds of outflow to the barest least. For example, some new advancements that can ingest overabundance CO<sub>2</sub> are as of now being proposed or potentially created by Chemical and Petrochemical engineers, consequently organizations in charge of transmitting a great part of the black carbons can be commanded to buy and utilize such innovations.

Government ought to consider embracing the carbon charge strategy, government ought to strengthen mitigation and adjustment rehearses so as to support crop yield and income. It is prescribed that administration through expansion laborers in the different nearby governments ought to guarantees farmers know about the impacts of black carbon emission and to instruct them on the distinctive adjustment systems keeping in mind the end goal is to support crop yield and income.

Also, rural communities should be encouraged and provided with fertilizer to improve the nutritional value of their soil in other to increase agricultural productivity and income. Postponing activity is expensive and may at last prompt higher CO<sub>2</sub> concentrations, therefore delivering extra harms to the crop economy of Rivers State because of higher temperatures, more acidic seas, and different outcomes of higher black carbon fixations.

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