Scholars Academic Journal of Biosciences
Abbreviated Key Title: Sch Acad J Biosci
ISSN 2347-9515 (Print) | ISSN 2321-6883 (Online)
Journal homepage: https://saspublishers.com/journal/sajb/home

OPEN ACCESS

Environmental Sciences

Effect of Gas Flaring on Andoni, Niger Delta Ecosystem

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DOI: 10.36347/sajb.2019.v07i07.005 | **Received:** 20.07.2019 | **Accepted:** 27.07.2019 | **Published:** 30.08.2019

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Abstract | **Original Research Article**

The aim of this study is to examine the impact of gas flaring on crop yield around the communities in Andoni Local Government Area of Rivers State. Two hundred (200) questionnaires were distributed across 11 communities and 94.5% were successfully returned and in the cause of the study, a null hypothesis with its alternative was used and tested in respect to climate/crop yield information, using chi-square statistical tool and percentages. The result revealed that gas flaring has great effect on the land through acid rain which destroys the structure and texture of the soil and in turn impacts negatively on the yield of most crops like maize and cassava. The study also reveals that there is significant difference between gas flaring and food productivity which implies change in climate and food production. Another implication of the result is that there is low productivity and decrease in quality productivity. It was observed that the gas flaring activity of the companies in Ikuru Town has contributed negatively in almost all areas of humanly related problems ranging from poor produce of agricultural products, increasing incidence of health illnesses, poverty, hunger and death. It was recommended among others that farmers within the area should be given higher resistant varieties of crops that can withstand the adverse heat increase, so as to increase productivity and profit maximization, fertilizers should be made readily available for farmers if crop cultivation must be increased considerably and health facilities should be increased within the area to help fight against the increasing incidence of health related problems to gas flaring activity.

Keywords: Gas Flaring, Niger Delta, Food Production, Health, Poverty.

INTRODUCTION

It is a known fact that Nigeria as a nation is highly blessed with numerous natural resources which include natural gas, fuel and all manner of mineral deposits. This has been regarded as a blessing in disguise due to the consistent source of agony to the nations, communities and villages that are located where these resources are found. Natural gas, which includes a complex hydrocarbon mixture with a small amount of non-hydrocarbon gases is a petroleum product with several extraction processes [1].

Natural resources extensive inventory involving petroleum and natural gas in Nigeria is located in a region known as Niger Delta. With lake chad and Atlantic Ocean access by rivers, the Niger Delta ecosystem is off diverse consisting of marine organisms which have been known to be the main source of food production in the aquatic ecosystem [2].

Based on long-term overextended exploration and exploitation of petroleum and natural gas, there is a lack of ability to effectively and strategically explore and exploit these resources with a reduced environmental impact, and the main pollution relating to these activities has an adverse effect on both the oceanic and coastal regions and their habitats of being removed (Argo, 2011). The flaring occurrences of natural gas and sewage sanitary run-off /overflow are the two main constituents leading to environmental degradation and increase in pollution within the Niger Delta Area.

Niger Delta is a region situated in the southern part of Nigeria (Aghalino, 2009), and it comprises of several oil producing states such as, Rivers, Delta, Edo, Bayelsa, Akwa-Ibom, Ondo and Imo states with specifically farming and fishing as their main economic base. (Kamalu and Wokocha, 2010). The oil exploration magnitude of the oil and gas firms in the region and subsequent degradation in the environment has a resultant effect on the cultural and activities of the habitat in the region who earn their daily living from farming and fishing. Thus, the effect of flaring of natural gas and spillages in petroleum have reduced the supply of varieties of seafood and vegetables that are cultivated and thus, affecting the wellbeing of the residents in the

region (Ashton and Douglas, 2017).There is no exception to either the upstream and downstream of the oil and gas industries as both onshore and offshore wells conduct the procedure of flaring of natural gas[7].

Flaring of natural gas in Nigeria adds approximately 1% to the worldwide CO_2 which poses extensive issues for the environment (World bank, 2010) and is viewed as a pathway to issues associated with absence of consumer goods, cultural and ethnic perceptions towards flaring as was the opportunity for economic benefit (World bank, 2010)Over the last two decades, the quantity of natural gas that has been flared has remained at a consistent rate of 100bcm/year with less than 15 countries accounting for nearly 80% of the volume discharged into the atmosphere, contaminating the environment and a needless exhaustion of valued natural resources (Svalheim, 2005). With petroleum's inability to be considered a clean burning fuel as a result of the amount of toxins and hazardous compounds that it releases into the atmosphere, it is no longer a viable source of energy, and in stills economic distress on individuals and businesses (Davies, 2001) In some instances, the petroleum industry has engaged in isolated combat warfare against local residents with the taking of hostages to further emphasize their claims for compensation [11].

METHODOLOGY

The study adopts a cross-sectional descriptive design, where the researchers used the questionnaire as the research instrument to collect information from Andoni Local Government Area, Rivers State. Out of 200 questionnaires that were distributed, 189 were properly filled and retrieved. This shows a 94.5% returned rate. The population of the study includes residents that were selected from eleven (11) communities in Andoni Local Government Area. A systematic sampling technique was adopted to selected 200 farmers in the respective communities in Andoni. Excel sheet was used to analyzed the data collected from the field in a bar chart and the study hypothesis was tested using the chi-square distributed at 0.05 level of significance.

RESULT AND DISCUSSION

This results and analysis from the field survey through the questionnaire as an instrument of data analysis are shown here. The questionnaires were distributed to eleven (11) villages in Andoni Local Government Area of Rivers State, Nigeria.

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Questionnaire Response Rate from Eleven (11) Selected Villages in Andoni Local Government Area

Table-1.0

S/n	Name of Village	No of administered question	No of questionnaire returned
1	Agwuta Obolo	26	21
2	Ataba I	20	20
3	Ataba II	10	10
4	Asarama	9	9
5	Unyeada I	16	16
6	Unyeada II	11	11
7	Ekede	22	19
8	Ikuru Town	9	9
9	Unyen Gala	17	17
10	Ngo town	27	25
11	Samanga	33	32
Total		200	189

Table 1.0 represents the total number of questionnaires that were distributed in selected villages in Andoni Local Government Area and those that were successfully retrieved. Out of 200 questionnaires that were distributed, 189 questionnaires were well filled and retrieved by the researcher. This shows a 94.5% returned rate.

Table-2.0: Age of Respondents

Age	Frequency	Percentage
20-30	42	22.2
31-40	57	30.1
41-50	29	15.3
51-60	27	14.2
61-above	34	17.8
	189	**100%**

Source: Field Work, 2019

Majority of the respondents in the study area were in their youthful age, as shown in Table 2.0. 30.1% of the respondent within age 31-40, 22.2% are within age 20-30, 15.3% between age 41-50,14.2% within age 51-60 and 17.8%, age 61 and above. [12].

Table-3.0: Sex Distribution of Respondents

Age	Frequency	Percentage
Male	80	42.3
Female	109	57.7
	189	**100%**

From the table above, out of a total of 189 questionnaires retrieved 42.3% were male while 57.7% were female respondents. There was more female respondent in the area as against the Nigerian Annual Abstract of Statistics (Nigerian Bureau of Statistics 2010) in Andoni Local Government Area, women are more populated than men in the area.

There was also the complaints of the oil and gas industries using the divide and rule system rather than focus driven sustainable development programmes locals amongst the host communities, this again presents issues of class differentiation and issues putting the petroleum organizations against local communities (Sonibare, 2006)

Table-4.0: Respondents Class of Farmer

Class of farmers	Frequency	Percentage
Educated male farmers	56	29.6
Illiterate male farmers	24	12.7
Educated female farmers	68	36
Illiterate female farmers	41	21.7
	189	**100%**

Source: Field Work, 2019

The demographics analysis also shows that they are more educated female farmers than male farmers and thus, more literate farmers than Illiterate farmers with ratio; Educated farmers; 65.3, Illiterate farmers; 34.7

Table-5.0: Marital Status of the Respondents

Marital Status	Frequency	Percentage
Single	49	26
Married	93	49.2
Widow	28	14.8
Widower	14	7.4
Others	5	2.6
	189	**100%**

Source: Field Work, 2019

The demographics analysis also posited that there are more married respondents with about 49.2% of the total respondents, 26% are single, 14.8% are Widow, 7.4% are Widower, 2.6% fall within others.

Table-6.0: How Long Have You Been Farming?

No of Years	Frequency	Percentage
1-4 years	39	20.6
5-9 years	42	22.2
10-14 years	40	21.1
15-19 years	26	13.7
20-above years	42	22.2
	189	**100%**

20.6% of the respondents have been farming for 1-4 years, 22.2% within 5-9 years, 21.1% within 10-14 years, 13.7% within 15-19 years and 22.2% has 20 years and above.

ANALYSIS OF DATA

Question 1; Did Your Crops Grow and Yield Better When You Started Farming Than Now?

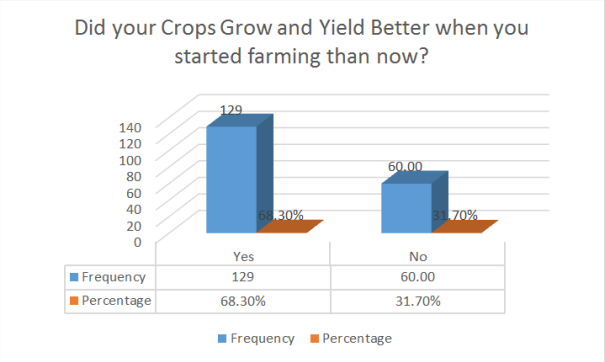

Fig-1.0 : Source: Field Work 2019

From Fig 1.0, 68% of the respondents indicated yes and 31.7% indicated No to the question above. This shows that there is low productivity of farm yield in the latter than in the former.

Question 2; Do You Experience More Dryness In Farm Land Around the Flow Station in The Study Area?

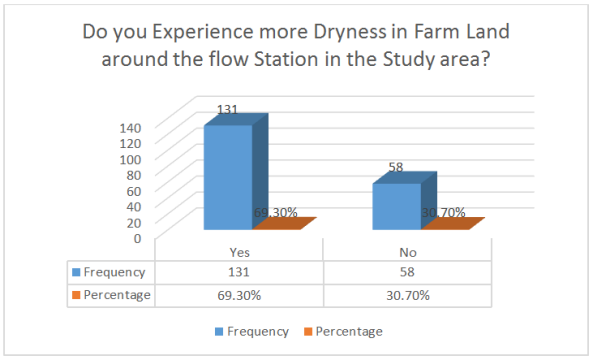

Fig-2.0: Source: Field Work 2019

69.3% of the respondents denoted that they experience more dryness in their farmland around the flow station in the study area while 30.70% of the respondents indicated No in Fig.2.0. The implication is that the food production in Andoni station will have a

negative impact on agriculture product in the listed villages and also increase the risk of not enhancing agriculture due to gas flaring from production in the station.

Question 3; Do You Notice Increase in Heat Level (Temperature) In Andoni At Present Than Before?

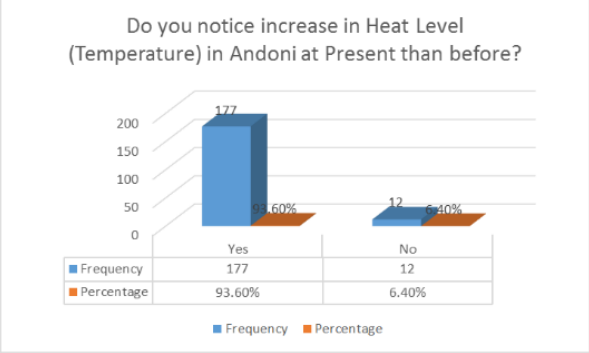

Fig-3.0: Source: Field Work 2019

As observed in Figure 3.0, 177(93.6%) of the respondent indicated that there has been an increase in the Heat level in Andoni ever since the Andoni Station was built and 12(6.40%) indicated No, which shows that plants are at high risk of Withering.

Question 4; How would you evaluate your farm produce today with respect to the past?

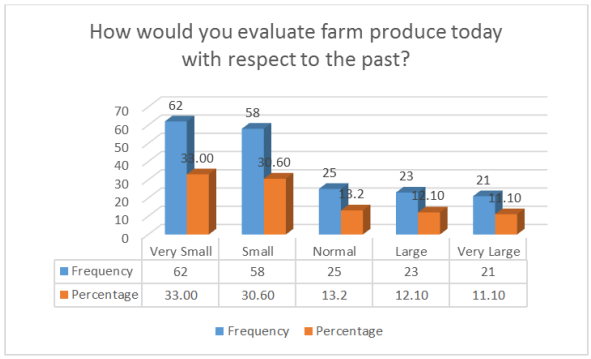

Fig.4.0: Field Work2019

Figure 4.0 above reveals that 62(33%) of the respondents said the farm produce is very small, 58(30.6%) said the farm yield is small, 25(13.2%) posited that the yield has been Normal, 23(12.1%) indicate that the farm yield has been large while 21(11.1%) believe that the yield has been very large. This shows that the farm yield has to be encouraged before as compared to the present yield, which could result in incessant poverty and food shortage

Question 5; Is There Adequate Rainfall in Your Area That Can Sustain Good Plant Growth?

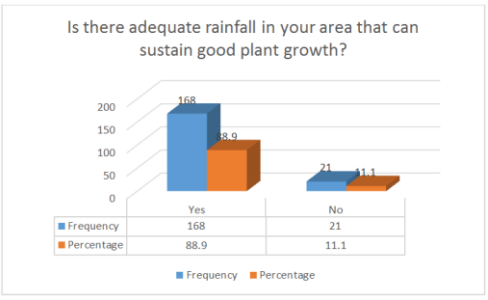

Fig-5: Source: Field Work 2019

As see in Figure. 5, 168(88.9%) indicates that there has been adequate rainfall in the area to sustain plant growth while 21(11.1%) posited that there has not been adequate rainfall in the area. This explains that the problem of low growth and yields of crops are not as a result of inadequate rainfall.

Question 6: Do Your Crop Stem, Leave and Yield Become Dryer and Smaller, and Sometimes Die off?

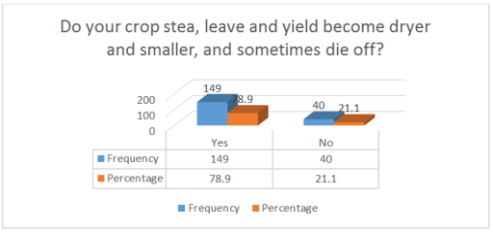

Fig-6: Source: Field Work 2019

The Figure 6 above indicates that 149 (78.9%) of the respondents agree that their crop stem, leaves and yield become smaller and dryer and sometimes die off while 40 (21.1%) of the respondent indicated do not agree. This implies that the gas flaring activities in Andoni station is no doubt the cause of these incidences in plants grown in Andoni Local Government Area.

Question 7: Do You Notice If Farm Lands Close to The Flow Station Produce More Than Those Far Away?

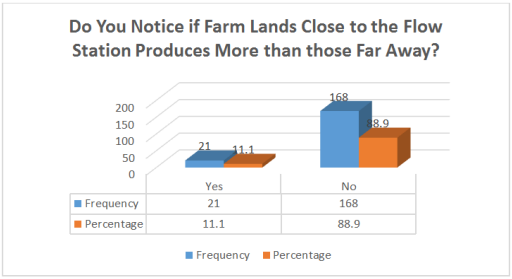

Fig-7: Source: Field Work 2019

From the result as represented in figure 7 above, 11.1% of the respondents had a positive response to question 7 and 88.9% of the respondents had a negative response indicating No to question 7. This shows that Andoni Station has negatively affected agricultural production in Andoni.

Question 8: What Can You Say About the Constant Burning of Fire and Smoke in The Flow Station?

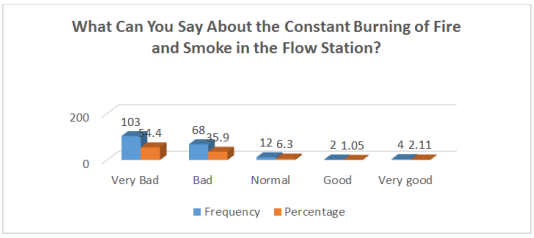

Fig-8: Source: Field Work 2019

Majority of the respondents posited that the incessant burning of Fire and Smoke in the Flow Station is very bad where 103(54.4%) indicated Very Bad, 68(35.9%) said it is bad, 12(6.3%) said it is normal, 2(1.05%) and 4(2.11%) ascertained good and very good respectively. This implies that the industrial activities in Andoni Station affect the ecosystem of Andoni.

Question 9: Do You Observe More Health Problems Pollution in Your Area?

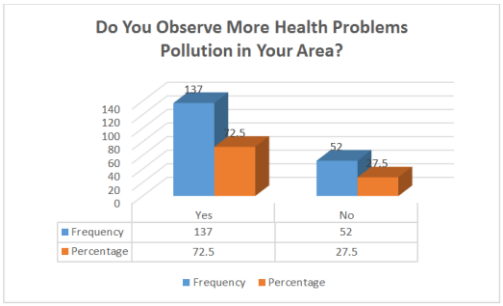

Fig-9: Source: Field Work 2019

137(72.5%) of the respondents said Yes to the fact that they observed more health problems pollution in the area while 52(27.5%) indicated No. This shows that gas flaring in Andoni station causes some health problems in the area.

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Test of Hypothesis

The formula for calculating chi-square is as follows;

$$\text{Chi-square } (X^2) = \frac{\sum(O-E)^2}{E}$$

Where O = observed Frequency

E = expected frequency

The degree of freedom (df) is given by the formula; (df) = (R – 1) (C – 1).

Where the values of the observed frequency "O" and expected frequency „e" are known, a five-column chi-square computation table will be drawn which will be used to compute the chi-square. Then with the calculated chi-square value known, the researcher will now make use of the chi-square table for critical value at (R - 1) (C – 1) degree of freedom at a given level of significance of (0.05) to calculate the table value.

With the calculated value and table value known, the researcher will now state the decision rule and thereafter take the decision.

From the above chi-square formula, a contingency table was prepared, used for the computation of chi-square.

Ho; there is no significant difference between Gas Flaring and the ecosystem in Andoni Local Government Area.

H1; There is a significant difference between Gas Flaring and the ecosystem in Andoni Local Government Area.

Table-6: Contingency Table

	Q1	Q2	Q3	Q6	Q7	
Yes	129	131	177	146	21	604
No	60	58	12	40	168	338
Total	189	189	189	189	189	942

Source: Authors Computation, 2019

O	E	O-E	O-E^2	O-E^2/E
129	121.2	7.8	60.84	0.5019802
131	121.2	9.8	96.04	0.7924092
177	121.2	55.8	3113.64	25.690099
146	121.2	24.8	615.04	5.0745875
21	121.2	-100.2	10040.04	82.838614
60	67.8	-7.8	60.84	0.8973451
58	67.8	-9.8	96.04	1.4165192
12	67.8	-55.8	3113.64	45.923894
40	67.8	-27.8	772.84	11.39882
168	67.8	100.2	10040.04	148.08319
				322.61745

$$\text{Chi-square } (X^2) = \frac{\sum(o-e)^2}{E}$$

Chi-square (X^2) calculated = 322.6

Degree of freedom (df) = (r – 1) (C – 1)

(2– 1) (5– 1)

1 x 4

= 4

As stated earlier, the level of significance (α) = 0.05 and with the degree of freedom 4. The critical chi-square value for 4 df and 0.05 level of significance is 9.47. With the chi-square calculated and critical value known, we now apply the decision rule.

Decision Rule:

Reject the null hypothesis (Ho) if chi-square calculated value is greater than (>) chi-square critical value, and accept the null hypothesis (Ho) if otherwise.

Chi-square (X^2) calculated value = 322.6

Chi-square (X^2) critical value = 9.47

Implication:

The implication of this result is that the null hypothesis (Ho) has been rejected, while the alternative hypothesis (Hi) which states that: There is a significant difference between Gas flaring and the ecosystem in Andoni Local Government Area is accepted.

The study examines the effect of gas flaring on the ecosystem in Niger Delta with a particular study of Andoni Local Government Area in Rivers State. The study examines the various impacts of gas flaring on the environment, people, land and crop production, gas flaring has contributed to global warming, increase in the rate of evaporation and photoperiod within the study area, crop yield at present has been considerably reduced as regards to the past, more dryness in farmland around the flow station, increase in heat level in Andoni, crop production regarded as being very small although with a considerable rainfall within the area.

Crop stem, leaves and yield become smaller and sometime die-off and above all the respondents considered the constant burning of fire releasing smoke and greenhouse gases as "very bad" on the side of the gas-flaring company within the study area.

Little monetary return has been made by the farmers within this region as indicated from the questionnaire administered were by agricultural products are not readily made available for households before considering public sale option.

CONCLUSION AND RECOMMENDATION

This study on communities located around the Andoni Flow Station. From the above analysis, it can be revealed that the effect of gas flaring on agricultural production in these communities in negative. The flaring of gas has thus, lead to global warming which has also contributed to climate change.

The rate of evaporations and photoperiod increases in Andoni communities and the yield of crops at recent has been reduced relative to the past. The study discovered a negative effect of gas flaring on the health and economy wellbeing of residents in these communities around Andoni Flow Station.

Based on the study findings, the study made some recommendations which are

- The use of strict legislation process on how the production of gas projects should be handled
- Allowing deregulation in the oil and gas sector by the government to increase technologies and productivity
- The establishment of development and research centres for natural gas for effective training programme in the oil and gas industry
- Provision of incentive and fiscal policies by the government to large scale production and gas demand.

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