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Effects of Quarry Activities on Arable Crop Production in Odeda Local Government Area, Ogun State, Nigeria

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Abstract

One of the challenges confronting sustainable agricultural production in Nigeria is increased activities of quarry operatives negatively impacting on agricultural land across the Nation. However, there are limited studies on its effect of quarry operations on arable crop farming especially in southwest region of Nigeria. This study researched the consequences of the effects of quarry activities on the profitability of arable crop production in Odeda Local Government Area, Ogun state. Three stage sampling procedure was used to choose 120 arable crop farmers from selected communities in the study area. Descriptive and inferential statistics (multiple linear regression) was employed to analyze the data from a structured questionnaire administered in the field. The results revealed that most (70.83%) of the arable crop farmers were affected by quarrying activities in the study area. The multiple regression results revealed that years of formal education of farmers was positive and significant at 1% level to arable crop output. Also, farm size (ha) was positive and significant at 5% to arable crop output while soil degradation was negative and significant at 1% to arable crop output in the study area. It is recommended that appropriate policy should be initiated to control quarry activities while the miners should develop new technologies to reduce noise, dust particles and other effects of blasting which negatively affect crop production and farmers health.

Keywords*:* Arable, Degradation, Production, Quarrying, Revenue loss, Soil

1.0 Introduction

Agriculture is a significant contributor to the Nigerian economy, as it accounts for 22.3 percent of the first quarter of the Country's Gross Domestic Product (GDP) in 2021 (NBS, 2021) and employing more than 36% of the country's working population (AFCFTA, 2020). It also

provides food for the teeming population and raw materials for agro-allied sector of the economy. Crop production is the most important agricultural sub-sector referring to its contribution to GDP and foreign exchange, many of its contributions to economic growth cannot be overlooked, It accounts for 87.6 percent of the agricultural sector, livestock 8.1 percent, while fishing and forestry are 3.2 percent and 1.1 percent respectively. Crop production grew by 2.31 percent in first quarter of 2021 from 3.68 percent in the fourth quarter of 2020 and 2.38 percent in the first quarter of 2020 (NBS, 2021)

Rural dwellers have over the years embraced agriculture as their only source of livelihood, little do these farmers know that their activities will be short lived as a result of the discovery of natural resources such as gold, marbles, granite to mention a few. Many human activities hinged on the spirit of diversification and improved living standard have impaired farmers of their farms well-being and has led to serious reduction in crop production leading to hike in food prices, this has caused concerns amongst economists and researchers as it indicates strong pointer to increasing threat to the future of Agriculture and food security of the at national level. One of these many activities is quarrying. Quarrying is the act of discovering and using rocks from the earth's crust. Stone quarrying is the process of extracting dimension stone, rock, sand, gravel, construction aggregates, or other minerals from the ground in order to use them as construction materials or to sell them for commercial purposes (Sinclair, 2012).

Construction operations, including as building factories, schools, hospitals, and airports, are made easier by the use of construction aggregates and dimensional stones that are extracted from quarries. Even while quarrying provides advantages, there are drawbacks for the environment as well, such as dust emissions, noise pollusion, disturbance of the soil, decline in biodiversity and vibrations in the earth (Atieno, 2015). The workers at and near quarry sites are also seriously concerned about their health as a result of quarrying activity. Numerous respiratory conditions, including asthma and lung cancer, are brought on by continuous exposure to the quarry's dust (Ozcan and Musaoglu, 2012). It also has an impact on the water and land of the environment which has an impact on farmers' production.

Majority of the country's food is produced by farmers who cultivate arable crops on limited supply of land, unfortunately, these people are continually exposed to the effects of quarries with its consequential effects on agricultural production. Several studies (Osuocha et al., 2016; Eshiwani, 2014; Bewiadziet al., 2018; Bassey and Okon, 2021) concluded that quarry activities led to land erosion, degradation, destruction of arable lands and forests, loss of habitat for certain plants and animal species, and distorted leaf structure, stomata and cuticle abrasion, which in turn caused oxidative stress, poor conductance, reduced photosynthesis, decreased growth rate, necrosis, decrease in the nutritional composition of plants, and culminating in withering of the plant. According to Eta et al. (2019), there are two main effects of quarry activities: decrease in crop yields due to particulate matter released during quarry activities, which make vegetables unappealing; and a significant impact on farmers' health due to the prevalence of respiratory diseases, cough, asthma, and cough/catarrh. Nwachukwu et al. (2018) revealed that quarry activities like blasting, disposal of waste rocks and transportation have the unintended consequences of destroying natural habitats and flora and releasing airborne dust particles that result in air pollution.

Air pollution, noise pollution, water pollution, and harm to biodiversity are some of the environmental effects of quarrying, caused by the exploration, blasting, transportation, and disposal of waste rocks. Humans who breathe in polluted air experience irritation in their noses and eyes, while plants suffer internal structural damage that can result in stunted growth or even death. There is noise associated with mining for minerals, especially when blasting techniques are used. Additionally, a considerable amount of trash is released during mining operations. The unbalanced freshwater environment may be contaminated by these wastes which may include Hydrogen sulfide. When breathed, it irritates the upper respiratory tract, eyes, mucous membranes and induces dizziness and headaches. This study attempts to evaluate the effects of quarrying activities on arable crop production in the area - Odeda Local Government Area of Ogun State where quarrying activities are prevalent with its attendant effects on crops such as cassava, cocoyam, yam and vegetables to mention a few. The study would make appropriate recommendations on how quarrying activities would have symbiotic relationship with arable crop production without undermining health conditions of the quarrying operatives and arable crop farmers. Eta *et al*. (2019) among others worked on perceived effects of quarry activities on vegetables using mean scores without analyzing the effects on farmer's profitability hence this study. The main objective of this study is to evaluate the effects of quarry activities on the profitability of arable crops in Odeda Local Government Area, Ogun State, Nigeria. The specific objectives are to; describe the socio economic characteristics of arable crop farmers in the study area; assess the effects of quarry activities on farmer's production; identify constraints to arable crop production in the study area; examine the economic effects of quarry activities on arable crop production and estimate the gross margin of arable crop production in the study area.

2.0 Material and Methods

2.1 Study Area

The study was carried out in Odeda Local Government Area of Ogun state, Nigeria. Odeda Local Government Area (LGA) has its headquarters at Odeda Community. The location of the study area is 7°13′N, 3°31′E, and has coverage of land area of 1,560km^2. The population of the area based on population census in 2006 is 109,449 (NPC, 2006 Census). The climate of the area characterizes of tropical climate with two seasonal rainfalls from April to July and September to October. It includes temperature of about 32^{o}C and humidity which can be as high as 95%. It has about 25 to 30 peri-urban areas, 860 villages and hamlets and people are predominantly Egbas. The people of the study area are majorly small scale. The major food crops cultivating include cassava, yam, cocoyam, plantain, maize and vegetables, while cocoa is the major tree crop. The people of the study area diversified in quarry business, trading, craft and artisan works. The quarrying activities are prominent in 11 sites in the study area while the operators are the communities closest in proximity to the sites.

2.2 Sampling Technique

Three stage sampling procedure was used in selecting representatives for the study. The first involved purposive selection of one local government area (Odeda LGA), the second stage involved random selection of five communities and information is elucidated from the arable crop farmers with questionnaires. The procedure ended with a random selection of 24 farmers from 5 communities making a total of 120 farmers.

2.3 Method and Types of Data Collection

For this study, primary data were employed. Farmers in the study area were given semi-structured questionnaires to complete in order to collect relevant data. Socioeconomic characteristics, planting material costs, manure costs, fertilizer costs, herbicide and insecticide costs, total labor costs, total marketing costs, irrigation water charges, transportation costs, number of quarry sites, crops lost to quarrying activities, health effects of quarrying activities, soil pollution, soil degradation, and percolation are just a few of the data collected from arable crop farmers.

2.4 Analytical Techniques

Data collected were analysed using descriptive and inferential statistics. Descriptive statistics include frequency count, percentages, mean, ranking and standard deviation. Inferential statistics include Gross margin and least square regression technique.

2.5 Gross Margin Analysis

The profit analysis is calculated by application gross margin analysis. Gross margin is determined calculating the difference between gross revenue and total variable costs as expressed below:

$$GM = PQ - \sum_{i=1}^{n} V_i M_i \quad (1)$$

GM = Farm gross margin
P = Market price of output
Q = Quantity of output
V_i = Unit price of the variable input i
M_i = Quantity of variable input i
n = Number of variable input used.

Least Square Regression Technique

$Y = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, et)$

The explicit equation is:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 \ldots\ldots\ldots + b_8X_8 \ldots + et \quad (2)$$

Where:

Y= output (kg)
X_1 = age of respondents years
X_2 = years of formal education
X_3 = farm size in hectares
X_4 = household size in numbers
X_5 = farming experience in years
X_6 = dug pits
X_7 = water contamination (Dummy)
X_8 = soil degradation
$\beta_0 \ldots\ldots\ldots \beta_7$= parameters to be estimated
et= error term

3.0 Results and Discussion

3.1 Socioeconomic Characteristics of the Arable Crop Farmers

Table 3.1 presents the socio-economic characteristics of the arable crop farmers in the study area. The results reveal that the mean age of the farmers was 47.38 years, which shows that majority of the farmers are in their active production stage of the age group 41-60 years. The result of the sex distribution shows that majority (91%) were male. This is largely influenced by culture that favours men with larger share of land than women. This may also inform why women are more involved in marketing and processing of arable crop produce than in production over men, according to Abdulakeem *et al.* (2017). Over 50% of the sample population were married this is an opportunity for them to engage family labour hence reducing cost incurred through labour hire, the mean household size is 9.16 this means family labour is inevitable in the study area. 65% of the farmers possess primary education this might be a hindrance to making informed decisions on farming practices, reading and comprehending the grievous effect of quarrying around and on them.

The mean farming experience of farmers in the study area was 20.25 years The implication is that farmers in the study area can rely on their previous experience in crop production which can be beneficial to increase productivity. It evident in the record of their contact with extension agent that majority 55.8%, had no contact with extension agent. This is a clear indication that farmers hardly have professionals to relay their challenges and receive clear cut information on steps to overcoming farming challenges. The mean of their farm size is 3.5ha which implies that the arable crop farmer in the study area is smallholder operators.

3.2 Methods of Quarrying Activities and Arable Crops Uprooted

Method of quarrying in the study area is shown in Table 3.2. The results revealed that the major method of stone excavation in the study area is blasting (95.8%). 1.7% of them identified digging process or heating process while just (0.8%) of them wedging process. This indicates that the major method used in the quarrying process is blasting. Notably, the residual from the blasting may spread to farms and harm their crops and this can also lead to soil degradation, soil erosion and water pollution in the study area**.**

3.3 Consequences of Quarrying Activities on Arable Crop Farmers in the Study Area

Table 3.3 revealed the distribution of respondents based on their perceived consequences on production in the study area. The table, shown in descending order revealed that rock explosion (60.3) during mining activities is a major constraint affecting arable crop production. This was closely followed by conflicts between miners and farmers (57.7), assault (53.7) and soil degradation as a result of mining activities (52.3). Other perceived limitation includes weather effects (48.7), water contamination (44.7), soil contamination (39.0), Dug pits (37.0), kidnapping (28.3), murder (27.7) and removal of arable crops (26.7). Rock explosion maintains the highest constraints to crop production; this is as a result of method used (blasting) in quarrying processing by miners. In the same vein, this can lead to conflict between miners and farmers resulting in assault in that order. In tandem, Akanwa *et al*. (2016), Bamgbose *et al*. (2014) and Bassey and Okon (2021) stated that fly rock accidents, dust hindering process of photosynthesis as a result of rock explosion is a major issue of quarrying process in agricultural activities.

Table 3.1: Socio-economic characteristics of arable crop farmers

Characteristics	Frequency	Percentage (%)
Age		
< 21	1	0.8
21-40	38	31.7
41-60	61	50.8
>61	20	16.7
Mean = 47.38		
Sex		
Male	91	75.8
Female	29	24.2
Marital Status		
Single	5	4.2
Married	93	77.5
Divorced	22	18.3
Household Size		
1-5	25	20.8
6-10	53	44.2
11-15	35	29.2
16-20	7	5.8
Mean = 9.16		
Educational Level		
No formal	10	8.3
Primary	78	65.0
Secondary	21	17.5
Tertiary	11	9.2
Secondary Occupation		
No	65	54.2
Yes	55	45.8
Farming experience (years)		
1-10	26	21.6
11-20	44	36.7
21-30	36	30
>31	14	11.7
Mean = 20.25		
Extension contact (Number of visit)		
None	67	55.8
Once	41	34.2
Twice	10	8.3
Thrice and above	2	1.7
Farm size (Ha)		
< 2.5	38	31.7
2.5-5	57	47.5
5-7.5	21	17.5
7.5-10	3	2.5
> 10	1	0.8
Mean = 3.50		

Source: Field survey, 2022.

Table 3.2*:* Methods of quarrying activities and arable crops uprooted

Characteristics	Frequency	Percentage (%)
Methods of quarrying activities		
Blasting	115	95.8
Digging	2	1.7
Heating	2	1.7
Wedging	1	.8
Distribution of the respondents according to major arable crop cultivated		
Cassava	56	46.7
Yam	9	7.5
Maize	38	31.7
Cocoyam	15	12.5
Plantain	2	1.7
Distribution of arable crops uprooted for quarrying		
Cassava	28	26.42
Yam	16	15.1
Maize	22	20.76
Cocoyam	21	19.81
Plantain	19	17.91

Source: Field survey, 2022.

Table 3.3: Distribution of the respondents according to perceived limitation to production

	Highly severe		**Moderately severe**		**Not severe**		
Consequences	**F**	**%**	**F**	**%**	**F**	**%**	**WMS**
Rock explosion	77	64.2	27	22.5	16	13.3	60.3
Conflicts between miners and farmers	68	56.7	37	30.8	15	12.5	57.7
Assault	59	49.2	43	35.8	18	15.0	53.7
Soil degradation	55	45.8	47	39.2	18	15.0	52.3
Weather effects	58	48.3	30	25.0	32	26.7	48.7
Water contamination	36	30.0	62	51.7	22	18.3	44.7
Soil contamination	28	23.3	61	50.8	31	25.8	39.0
Dug pits	29	24.2	53	44.2	38	31.7	37.0
Kidnapping	18	15.0	49	40.8	53	44.2	28.3
Murder	20	16.7	43	35.8	57	47.5	27.7
Removal of arable crops	19	15.8	42	35.0	59	49.2	26.7

Source: Field survey, 2022.

3.4 Current Arable Crop Production Rate

Table 3.4 indicates that majority (98.3%) of the arable crop farmers highly produce cassava, 56.7% of them produce yam, 78.3% of them highly produce maize, while about 60.0% of them produce cocoyam and 52.5% of them produce plantain. The major arable crops produced in the study area are cassava, yam and maize currently. In comparison to 5 to 10 years ago, arable crop production in the area has increased despite quarrying activities; this is in contrast to report from Bassey and Okon (2021) who reported a drastic decrease in crop production currently (during quarrying exploitation).

3.5 Effects of Quarrying Activities on Farmers

Table 3.5 indicates that majority (70.83%) of the quarrying activities have a negative economic effect on arable crop production, 22.50% indicated that there is a neutral quarrying effect 6.67% of them indicated that there is a positive quarrying effect on arable crop production.

Table 3.4: Distribution of arable crop farmers according to rate of arable crop production

	Highly produce		Moderately produce		Lowly produce	
Arable crops	**F**	**%**	**F**	**%**	**%**	**F**
Cassava	120	98.3	3	1.7	1	0.0
Yam	65	56.7	41	32.5	14	10.8
Maize	88	78.3	23	18.3	6	3.3
Cocoyam	18	10.8	75	60.0	39	29.2
Plantain	7	4.2	49	43.3	61	52.5

Source: Field survey, 2022

Table 3.5: Distribution of arable crop farmers according to economic effects of quarry activities on arable crop production

Quarry effect	Frequency	Percentage
Positively	8	6.67
Negatively	85	70.83
Neutral	27	22.50

Source: Field survey, 2022.

3.6 Values of Crop Lost to Miners

Table 3.6 shows the arable crop farmers would have generated the highest income ₦5600.00 from the sale of cassava which constituted 30.18% of the total revenue if not for the loss of 452.70kg of the crop to the stone miners. Plantain is next to cassava with a mean loss of ₦4313.00 (348.75kg), constituting 23.25% of the total revenue lost. Yam, maize and cocoyam generated mean revenue loss of ₦3680.00 (297.60kg), ₦2860.00 (231.30kg) and ₦2100.00 (169.80kg) respectively, constituting 19.84%, 15.42% and 11.32% of the total lost revenue respectively. Averagely, each arable crop farmer recorded a loss of ₦18553.00 to stone miner in the study area.

Table 3.6: Values of crop lost to miners

crops	Amount destroyed (kg)	Expected income generation (₦)	Percentage
Cassava	452.70	5600.00	30.18
Plantain	348.75	4313.00	23.25
Yam	297.60	3680.00	19.84
Maize	231.30	2860.00	15.42
Cocoyam	169.80	2100.00	11.32
Total	**1500**	**18553.00**	**100**

Source: Field survey, 2022.

3.7 Effects of Quarrying Activities on Farm Income of Arable Crop Farmers

The effects of quarrying activities on arable crop farmers' farm income are shown in Table 3.7. The table revealed the loss in mean farm income, the highest (₦34537.10) was recorded by plantain constituting 18.70% loss. Maize was next with a mean loss of ₦ 39447.10 in farm revenue, which constituted 16.60% loss. Cassava and cocoyam suffered a mean income loss of ₦8716.40 and ₦5195.50 respectively, constituting 4.00% and 4.20% percentage loss in income respectively The result shows that there is significant different in revenue before and after quarrying activities for all the crops.

3.8 Effects of Quarrying Activities on Arable Crop Farmers' Production

Table 3.8 presents the multiple regression results showing the relationship between output and some selected socio-economic characteristics. The result showed that R^2 is 0.613, implying that the explanatory (independent) variable explained 61.3% of the total variation in the result revealed that years of formal education of farmers was positive and significant at 1% level to arable crop output in the study area. This indicates that a year increase in farmer education level will result in 0.021 increases in the output of arable crops. This may be attributed to the fact that, educated farmers are better informed on early signs and dangers of quarry activity on their crop

production and will act swiftly to curtail the expected menace. Also, farm size (ha) is positive and significant at 5% to arable crop output (kg) in the study area. This implies that given quarry activity, a unit increase in farm size will result in 0.028 increases in output. This is expected as increase in size of farm will cause increase in number of crops planted translating to higher output harvested ceteris paribus. The result also showed that soil degradation was negative and significant at 1% level to arable crop output in the study area. This indicates that a unit increase in soil degradation through quarry activity will cause 0.034 decreases in the output of arable crops. This may be attributed to the fact that, a degraded soil will affect the availability of soil nutrients to the crop.

3.9 Gross Margin of Arable Crop Production

Table 3.9 shows the gross margin analysis of crops cultivated per production season which involves the total cost (TC) and the total revenue (TR). The total cost involves the total variable cost which includes planting material cost, cost of manure, cost of fertilizer, and cost of herbicides, cost of insecticides, total labor cost, total marketing cost, water charges for irrigation and transportation cost. The mean total revenue (TR) of cassava cultivated is ₦1195108.33 while the total cost which involves the total variable cost is ₦191554.1 Total labor cost (32.7%) accounts for highest percentage budget share followed by the total marketing cost (20.9%). The gross margin was estimated to be ₦1003554.23. The mean total revenue of yam cultivated is ₦1218959.29 while the total cost is ₦241646.2.

Table 3.7: Effects of quarrying activities on farm income of arable crop farmers

Crops	Income before quarrying activities	Income after quarrying activities (₦)	Difference in income (₦)	Percentage loss in income (₦)
Cassava	218448.50	209732.07	8716.40	4.00
Yam	178419.6	152265.4	26154.2	14.7
Maize	238389.80	119294.30	5195.50	4.20
Cocoyam	124489.80	119294.30	5195.50	4.20
Plantain	185219.40	150682.30	34537.10	18.70
Total	944967.00	830916.67	114050.33	12.07

Source: Field survey, 2022.

Table 3.8: Linear regression analysis result on the effects of quarrying activities on arable crop farmers' production

Variable	Coefficient (β)	Std. Error	t value	P>|z|
Constant	10.057	0.097	10.896	0.000***
Age	0.003	0.003	1.038	0.301
Education	0.021	0.007	3.114	0.003***
Farm size (ha)	-0.028	0.012	2.341	0.021**
Household size	-0.005	0.007	-0.651	0.516
Farming experience	-0.002	0.003	-0.555	0.580
Dug pit	0.027	0.029	0.945	0.347
Water contamination	0.016	0.032	0.508	0.612
Soil degradation	-0.034	0.030	-4.144	0.005***
R^2 =	0.613			
Adjusted R^2 =	0.534			
F value	27.512*			

Source: Data analysis, 2022

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Total labor cost (25.9%) takes the highest percentage budget share of the total variable cost while water charges for irrigation (3.8%) takes the lowest percentage budget share. The gross margin was estimated to be ₦977313.09. The mean total revenue of plantain cultivated is ₦865689.72 while the total cost is ₦103334.9, total labor cost (32.6%) takes the highest percentage budget share of the total variable cost while total marketing cost (2.9%) takes the lowest percentage budget share. The gross margin was estimated to be ₦762354.82

4.0 Conclusion

The result showed that quarry activities have negative effects on the cultivation and production of arable crops in the study area. This is as a result of rock explosion causing dust that affects crop and farmers' health. However, production still continues even when the farmers complain of the blasting method used. The result also showed that arable crop production is profitable in the study area; an increase in farm land will result in more output, thereby increasing revenue.

It is recommended that there is a need for government and regulatory bodies ensure localization of quarrying and mining plants in areas that are far from crop farmers. Quarrying operatives should work on containing noise, dust and particles produce as a result of the mining process as this have a severe effect on crop and farmers health. Also, laws should be enacted by the government to regulate quarry activities, so as to minimize soil degradation, water pollution and farm revenue loss in the study area, Arable crop farmers should refrain from giving out their

lands arbitrarily for quarry activities and evolve a means of restoring their soil fertility in the shortest possible time to enhance farm productivity and ensure food security.

Table 3.9: Gross margin analysis per production season

	Cassava		Yam		Plantain	
Item	**Mean (₦)**	**%**	**Mean (₦)**	**%**	**Mean (₦)**	**%**
Revenue	1195108.33		1218959.29		865689.72	
Variable costs						
Planting Material Cost	26769.2	14.0	55301.0	22.9	22327.4	21.6
Cost of Manure		0.0	9500.0	3.9		0.0
Cost of Fertilizer	16017.7	8.4	14284.4	5.9	11716.5	11.3
Cost of Herbicides	11071.4	5.8	10279.3	4.3	7275.8	7.0
Cost of Insecticides	5000.0	2.6		0.0		0.0
Total Labour Cost	62621.9	32.7	62567.6	25.9	33686.9	32.6
Total Marketing Cost	40000.0	20.9	50000.0	20.7	3000.0	2.9
Water Charges for Irrigation	11663.9	6.1	9147.1	3.8	6323.5	6.1
Transportation Cost	18409.9	9.6	30567.0	12.6	19004.9	18.4
Total variable cost (TVC)	191554.1		241646.2		103334.9	
Total cost (TC)	191554.1		241646.2		103334.9	
Gross margin (TR-TVC)	1003554.23		977313.09		762354.82	

Source: Field survey, 2022.

References

Akanwa, A; Onwuemesi, F; Chukwurah, G; and Officha, M. (2016). Effects of open cast quarrying technique on vegetation cover and the environment in south-eastern Nigeria. *American Academic Scientific Research Journal for Engineering, Technology, and Sciences,* 21(1),227-240. DOI: http://asrjetsjournal.org/

Anand, P. B. (2006). Waste management in Madras revisited. Environmental Urbanization., 11 (20),161-176. DOI: https://journals.sagepub.com/doi/pdf/10.1177/095624789901100214

Bamgbose, T. O., Omisore, O., Ademola, A. O. and Oyesola, O. B. (2014). Challenges of quarry activities among rural dwellers in Odeda local government area of Ogun state. *Research Journal of Agriculture Environment Science*, 3,49-55. DOI: https://www.researchgate.net/publication/

Bassey, P. E. and Okon, N. P. (2021). Perspectives and experiences of the effects of quarrying on the environment and agricultural activities of the quarry communities in Akamkpa local government area of Cross River State, Nigeria. *International Journal of Science Academic Research*, 2 (7), 1767-1773.

Bewiadzi, S., Awubomu, R. and Glover-Meni, N. (2018). Searching and Cracking: Stone Quarrying, Livelihood and the Environment in the Daglama Quarry Site in the Ho Municipality. *West African Journal of Applied Ecology*, (26), 149 – 166. DOI: https://www.ajol.info/index.php/wajae/article/view/182509

Eshiwani, F. (2014). Effects of Quarrying Activities on the Environment in Nairobi County: A Case Study of Embakasi District. MSc Thesis (Unpublished). Department of Geography and Environmental Studies, University of Nairobi, Kenya.

Eta, H. C; Idiku, F. O; and Dan, U. N. (2019). Perceived Effects of Quarry Activities on Arable Crop Production in Calabar Agricultural Zone, Cross River State, Nigeria. *Direct Research Journal of Agriculture and Food Science*, 7(6), 141-146. DOI: http://directresearchpublisher.org/journal/drjafs

FAO (2020). Nigeria at a glance: FAO in Nigeria. Food and Agriculture Organization of the United Nations".www.fao.org.

FAO (2022). Nigeria at a glance. Available on https://www.fao.org/nigeria/fao-in-nigeria/nigeria-at-a-glance/en/.

Kleinfelder (2015). Biodiversity Offset Area and Management Plan (BOAMP): Karuah East Quarry Project. Kleinfelder Australia Pty Ltd. Accessed at: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent ?AttachRef=MP09_0175-MOD-1%2120191018T0 05516.543%20GMT

Lad, R. J. and Samant, J. S. (2014).Environmental and social impacts of stone quarrying-A case study of Kolhapur District. *International Journal of Current Research*,6(63), 5664-5669. DOI:https://www.academia.edu/30805541/environmental_and_social_impacts_of_stone_ quarrying_in_dire

Lago-Vila, M., Rodríguez-Seijo, A., Arenas-Lago, D., Andrade, L. and Vega, M. F. A. (2017). Heavy metal content and toxicity of mine and quarry soils. *Journal of Soils and Sediments*, 17(5), 1331-1348. DOI:https://link.springer.com/article/10.1007/s11368-016-1354-0

Lameed, G. A. and Ayodele, A. E. (2010). Effect of quarrying activity on biodiversity: Case study of Ogbere site, Ogun State Nigeria. *African Journal of Environmental Science and Technology*, 4 (11),740-750. DOI: https://www.ajol.info/index.php/ajest/article/view/71340/60295#:~:text=It%20can%20be%20concluded%20that,%2C%20environment%2C%20fauna%2C%20flor.

Maletsika, P. A., Nanos, G. D. and Stavroulakis, G. G. (2015). Peach leaf responses to soil and cement dust pollution. *Environmental Science and Pollution Research*, 22 (20), 15952-15960. DOI: https://doi.org/10.1007/s11356-015-4821-z

Ming'ate, F. L. M. and Mohamed, Y. M. (2016). Impact of Stone Quarrying on the Environment and the Livelihood of Communities in Mandera County, Kenya. *Journal of Scientific Research and Reports*, 10 (5),1-9. DOI: 10.9734/JSRR/2016/24945

National Population Commission. (2006). NPC (2006). Federal Republic of Nigeria Official Gazette, *96*(2).

Nwachukwu, M.A; Ojeaga, K; and Gilbert, C. (2018). Critical Issues of Sustainability Associated with Quarry Activities. *Aspects Min Miner Sci.*,1 (2), 1-8. Available at: https://crimsonpublishers.com/amms/pdf/AMMS.000509.pdf

Omosanya, K. O; and Ajibade, O. M. (2011). Environmental Impact of Quarrying on Otere Village, Odede, South Western Nigeria. *Ozean Journal of Applied Sciences,* 4(1),76-81. Available at: https://www.researchgate.net/publication/273336764_environmental_impact_of_quarrying_on_otere_village_odeda_southwestern_nigeria

Osuocha, K. U; Chukwu, E. C; Ugbogu, E. A; Atasie, O. C; and Ogbonna, C. E. (2016).Effects of quarry mining activities on the nutritional composition of edible vegetables in Ishiagu, Ebonyi state, *Nigeria. Journal of Experimental Biology and Agricultural Sciences*,4(5), 467-474. DOI: http://dx.doi.org/10.18006/2016.4(5).467.474

Oyegbile, S.A; Olawoye.J.E; Oladeji, J.O;and Oyesola, O.B. (2017). Vulnerability of Rural Households to Risks Associated to Quarry Activities in Oyo State, Nigeria. *Nigerian Journal of Rural Sociology*,17 (2), 92-101. Available at: https://ageconsearch.umn.edu/record/287596?ln=en

Rai, P. K. (2016). Impacts of particulate matter pollution on plants: Implications for environmental biomonitoring. *Ecotoxicology and environmental safety*, 129,120-136.

Shanta, P.K; Wei, D; Bikash, P; Janak, R.K; Jifei, Z; and Yi, S. (2017). Household Livelihood Strategies and Implication for Poverty Reduction in Rural Areas of Central Nepal. *Sustainability*, 9 (4),612. Available at: https://doi.org/10.3390/su9040612

Statista (2022). Contribution of oil sector to GDP in Nigeria 2018-2021.Available on https://www.statista.com/statistics/1165865/contribution-of-oil-sector-to-gdp-in-nigeria/.