

**Research Article****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****\*Bassey, Philip Etabee and Okon, Ntiamba Paul**

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**Received 15<sup>th</sup> May 2021; Accepted 17<sup>th</sup> June 2021; Published online 13<sup>th</sup> July 2021**

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**Abstract**

**Introduction:** Akamkpa Local government area in Cross River State, Nigeria is naturally endowed with granite and limestone. This has attracted several quarry industries into the area to exploit these abundant natural resources. Although the quarry industries have brought some infrastructural and pecuniary benefits to the communities, there are equally attendant effects of the quarry activities on the physical and social well-being of the inhabitants living in proximity to the quarry sites. **Method:** A cross-sectional descriptive study was carried out to determine the environmental and social effects of quarrying on the selected quarry communities in Akamkpa LGA of Cross River State, Nigeria. Two hundred and ninety-one copies of the study questionnaire were retrieved from the respondents for analysis. **Results:** The findings of this study showed that the quarrying activities have impacted negatively on the people and the environment. Noise was a major concern to the respondents. 78 (27%) of them complained about noise alone; while 99 (34%) of the respondents complained about noise in addition to vibrations and dust haze. Additionally, the respondents complained about air and water pollution and its effect on their farming activities. 50 (17.5%) of the respondents reported a decline in their current agricultural yield compared to previous harvests about five years ago. **Conclusion:** Although quarry activities, created employment and generate wealth for community members, there were equally associated short-term adverse effects and long-term negative impact on the environment and the livelihoods of the community members. Some residents have sold their farmlands to the quarry firms, while other residents have abandoned farming altogether. The loss of farmlands and other quarry-related factors had resulted in poor agricultural yields over the years. Effort should therefore be geared towards reclaiming abandoned quarries by earth-filling them for agricultural purposes to boost declining food production in the quarry communities.

**Keywords:** Stone quarry, Environmental degradation, Dust haze, Poor crop harvest, Land reclamation.

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**INTRODUCTION**

Quarries can be found all over the world. Quarrying whether on a small-scale artisanal level or on a large industrial or commercial scale is not a new phenomenon (Shrock, 2002). Quarrying activities are usually undertaken to extract a particular type of rock such as marble, limestone, slate or gypsum from the earth (McCandless and Whiston, 2013). Man's quest for socio-economic development usually involves the exploitation of the earth's resources most of which lie below the surface of the earth. These exploitative activities which include quarrying provide employments and create means of livelihood for the quarry workers. Usually, most companies that set up their quarries, construct access roads to enable them evacuate the rocks from the quarry site. While the quarrying activities might provide some temporary means of livelihood for the local populace, the activities for the duration that the quarry is operational, the quarry activities also directly or indirectly create environmental problems that impinge on the social, economic or the health of residents in the quarry communities (Lad and Samant, 2014). It is an established fact that quarries have impacted negatively on the environment through the pollution of water, air, soil contamination as well as the destruction of the environment, the fauna and the flora (Kleinfelder, 2015; Ming'ate and Mohamed, 2016). Globally, different governments in line with their priorities and levels of human rights concerns have enacted laws not only to protect the environment from degradation but also to shield their citizens and sometimes the wild-life from the attendant hazards

resulting from the disruption of the natural environmental ecology and biodiversity. Notwithstanding the human rights perspectives or considerations, operators of quarries in several countries in Africa, including Nigeria, often violate these laws with impunity with the sole aim of maximizing their profits (Omosanya and Ajibade, 2011). These nefarious activities have both short and long-term consequences. The short-term effects include noise, air and surface water pollution; while the long-term impacts include soil erosion, degradation of farmlands, creation of swamps and the pollution of underground water sources. Other effects include ground vibration arising from the blasting and crushing of rocks which can impact negatively on human health (Oguntoke, Aboada, and Gbadebo, 2009). Rock quarrying has a significant effect on the natural landscape and land topography. The removal of some landscape items such as trees, slopes and vegetation can have cascading effects on the surrounding landscape if too much is removed without restoration, the surrounding soil and bedrock will erode, and erosion can lead to further land degradation. Although residents of the quarry communities are aware of the risks associated with living near quarries site, their general low socio-economic status made them incapable of taking decisive measures toward relocating elsewhere (Oguntoke *et al.*, 2011). Akamkpa Local Government Area (LGA), is blessed with plethora of mineral resources such as the granite rock which has led to the establishment of 32 functional quarry industries in some communities in the local government area. (An LGA is considered to be the equivalent of an administrative district in some countries). Although the quarries have provided a means of livelihood for the people of the local government area, they have also resulted in the degradation of the

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environment, which has consequentially also affected their livelihoods. To the best of our knowledge there is no published research work on how the quarrying activities has affected the environmental and the farming activities of the residents in quarry communities in Akamkpa Local Government Area of Cross River State, which has therefore necessitated this study.

### Statement of the problem

Living near a quarry site can be considered to be hazardous considering the inherent dangers associated with the operations of a quarry. Residents who live within quarry locations are exposed to extreme noise, dust haze, vibrations as well as chemical pollutants. Other physical hazards associated with quarry activities in the host communities include; fly rock accidents, damage to ceiling and houses by the fly rocks as well as damage to crops and livestock loss which are the sometimes the economic mainstay of the local communities (Bangbose *et al.*, 2014). The quarry dust or toxic run-off water from the quarry pits can also affect vegetation and farm crops resulting in poor yields. Considering the fact that quarrying activities have been going on in Akamkpa for over 25 years. There was a need to assess how these activities have impacted on the lives and livelihoods of the residents in the mining communities.

### Objective of the study

The general objective of this study was to determine how quarry activities affect the environment by impinging on the farming and agricultural productivity of the residents in the quarrying communities in Akamkpa LGA.

### Specific objectives

The specific objectives of this study were to:

1. Determine the people's perception about the operations of quarry industries in their communities.
2. Determine the communities' perception of the environmental effects of quarrying.
3. Determine the communities' perception of the effects of quarrying on their agricultural productivity.

### To guide the study, we set the following research questions

1. What are the communities' perceptions about quarrying in their localities?
2. What are the communities' perceptions about the environmental effects of the quarrying?
3. What are the communities' perceptions about the effects of the quarrying on their agricultural productivity?

## METHODOLOGY

### Study setting

This study was carried out in Akamkpa LGA of Cross River State, Nigeria. The Local Government area is located in the Southern Senatorial Zone of Cross River State (CRS) and lies within latitude 5° 2' N and longitude 8° 12' E. It has a land mass of 4,300 square kilometers and is bounded by Odukpani and Akpabuyo LGAs to the South-West, Biase and Yakurr LGAs to the East, Ikom and Etung Local Government Areas to the North and the Republic of Cameroon to the West.

### Scope of the study

The study assessed the environmental effects of quarrying in the area and its effects on the farming activities of the inhabitants living within or near the quarry sites. The study did not include physico-chemical analysis of soil, water and air.

### Study design and study population

A cross-sectional descriptive study design was carried out in three quarry communities in Akamkpa LGA of the state, namely: Akamkpa urban, Nsan and Obung. communities in Akamkpa LGA of CRS, Nigeria to determine the effects of quarrying using both structured and semi-structured questionnaire. The study population comprised all adults aged 18 years and above who live within the vicinity of the operational quarries in the selected quarry communities.

### Sample size determination

The Lutz formula (1982) was applied in selecting the study sample as follows:

$$n = \frac{Z^2 \times P \times Q}{E^2}$$

Where n is the sample size

Z = 0.05 (95% confidence interval)

P = Prevalence of event or probability of event occurring  
i.e. 0.5, (50% since P is unknown)

Q = Probability of non-occurrence (0.5)

E<sup>2</sup> = the assumed margin of error (0.06<sup>2</sup>)

$$n = \frac{Z^2 \times P \times Q}{E^2} = \frac{1.96^2 \times 0.5 \times 0.5}{0.06^2}$$

$$= \frac{3.8416 \times 0.36}{0.0036}$$

$$= \frac{0.9604}{0.0036}$$

$$= 266$$

To account for attrition bias, ten percent (10%) of 266 = 26 was added

Therefore n = 266+26

$$n = 292$$

### Sampling procedure

A multistage sampling technique was used in selecting the respondents. Stage 1 involved the application of a simple random sampling method through balloting to select three communities out of all the communities where quarries are located. Stage 2 involved the application of a systematic sampling technique using appropriate sampling intervals to select households from each of the selected communities. The third and final stage was the selection of the respondents from the households. In situations where there were two or more respondents in a household one of them was selected through balloting.

### Instrument for data collection

A pre-tested and validated interviewer administered questionnaire was used for data collection, the questionnaire

had both close and open end and was structured in a manner to cover all variables under investigation.

### Method of data analysis

Data entry and analysis was carried out using the Statistical Package for Social Sciences (SPSS). The results were presented as descriptive statistics using tables and figures.

### Ethical clearance

Ethical clearance for the study was given by the Ethical Committee of the Public Health Department, Faculty of Allied Medical Sciences, College of Medical Sciences, University of Calabar. Informed consent was also obtained from the respondents before the administration of the questionnaire.

## RESULTS

### Socio-demographic characteristics of the respondents

Socio-demographic characteristics of sampled respondents showed that 164 respondents (56.4%) were males and 127 respondents (43.6%) were females. The age distribution of the respondent revealed that, 115 respondents (39.5%) aged 20-29 years were the highest, followed by 68 respondents (23.4%) aged 30-39 years and 46 respondents (15.8%) ages 40-49 year. The result showed that people with secondary level of education were dominant with 114 respondents (39.2%), followed by those tertiary level of education. The marital status of the respondents indicates that, 143 respondents (49.1%) were married and 115 respondents (39.5%) were single. In terms of occupation, traders were predominant, followed by civil servants 52 (27.5%). See Table 1.

**Table 1. Sociodemographic characteristic of the respondents**

Demographic characteristics	Frequency	Percent (%)
<b>Gender</b>		
Male	164	56.4
Female	127	43.6
Total	291	100.0
<b>Age (Years)</b>		
18-19	21	7.2
20-29	115	39.5
30-39	68	23.4
40-49	46	15.8
50-59	34	8.2
60 years and above	17	5.8
Total	291	100.0
<b>Educational level</b>		
No formal education	22	7.6
Primary education	38	13.1
Secondary education	114	39.2
Tertiary education	117	40.2
Total	291	100.0
<b>Marital status</b>		
Single	115	39.5
Married	143	49.1
Separated	14	4.8
Cohabiting	19	6.5
Total	291	100.0
<b>Occupation</b>		
Trader	80	27.5
Civil servant	52	17.8
Quarry worker	31	10.6
Farming	38	13.1
Others	22	7.6
Unemployed	68	23.4
Total	291	100.0

### Problems associated with the quarry activities that the respondents experienced

As shown in Table 2, the major source of concern of the respondents was the loud noise from the quarries. Most of them 78 (26.8%), complained about noise; and 45 (15.5%) of them complained about the granite dust haze, while 38 (13.1%), complained about vibration. However, most of them 99 (43%), listed all three problems (noise, dust haze and vibrations).

**Table 2. Most complained about quarry-related problems in the community**

Identified Problem	Frequency	Percent
Noise	78	26.8
Vibration	38	13.1
Quarry dust haze	45	15.4
Noise, vibrations and dust haze	99	34.0
Noise and dust haze	1	0.3
Noise and vibration	4	1.4
No opinion	26	8.9
Total	291	100.0

### The effects of the identified environmental problems associated with quarrying

With regards to the effects of these problems, majority 208 (71.4%) the respondents reported that the vibrations emanating from the quarries caused their houses to shake; and 16 (5.5%) opined that the vibrations resulted in cracks of the walls of their houses, while 10 (3.4%) of them stated that the vibrations had resulted in the breaking of the louvers of the windows of their houses. See Table 3.

**Table 3. Community members' perception of the harmful effects of the quarry activities**

Perceived harmful effect of quarrying	Number of respondents	Percent (%)
Have you experienced vibrations of the earth?		
Yes	212	72.9
No	18	6.2
No opinion	61	20.7
Total	291	100.0
Perceived effects of the vibration experienced by respondents		
House shaking	208	71.4
Cracks on the walls of the house	16	5.5
Breakage of louvers of windows	10	3.4
House shaking and cracks on the walls	8	2.7
House shaking and breakage of louvers	1	0.3
None of the above	6	2.1
No opinion	42	14.4
Total	291	100.0
Perceived pollutions resulting from the quarrying activities		
Air pollution	151	50.9
Water pollution	27	9.3
Land pollution	24	8.2
Air and land pollution	1	3
Air, water and land pollution	51	18.3
None of the above	15	5.2
No opinion	20	6.9
Total	291	100

As shown in Table 3 above, the respondents also expressed their perceived effect of the quarrying activities on the environment. Majority, 151 (50.9%) reported that the quarry activities has resulted in air pollution, 27 (9.3%) felt the quarry activities has polluted their water sources; while 24 (8.2%)

indicated that the land has been polluted by the quarry activities. 51 (18.3%) of them however felt that the problem of pollution was intertwined; involving the air, water and land.

**Perceived effect of the quarry activities on their agricultural productivity**

The respondents assessed their agricultural productivity about 5-10 years ago after the inception of the quarry activities vis-à-vis their current involvement (i.e. at the time of this survey in 2016). As shown in Table 4, Cassava, a major staple food, was the predominant food crop that was cultivated by the respondents, with 76 (26.1%) of them reporting that they cultivated cassava prior to the establishment of the quarries. This was followed by cocoyam and plantain 40 (13.7%) and 38 (13.3%) respectively. Only 15 (5.1%) were engaged in mixed cropping. In comparing the engagement of the respondents in agricultural activities in the past 5-10 years and the current situation, it could be seen from Table 4, that there has been a drastic drop in the number of community members who were engaged in cultivating the aforementioned food crops. For cassava, there was a marginal decrease from 76 (26.1%) to 74 (25.4%). However, for cocoyam, those planting cocoyam dropped from 40 (13.7%) to 10(3.4%); while those cultivating plantain also dropped from 38 (3.1%) to 14 (4.8%). Interestingly, over the years the number of respondents who engaged in mixed cropping increased from 15 (5.1%) to 99 (34%) at the time of the survey.

**Table 4. Comparison of the pre-quarrying crop harvest versus current crop harvest**

Crops	Pre-quarrying crop harvest		Current crop harvest	
	Number of respondents	Frequency (%)	Number of respondents	Frequency (%)
Cassava	76	26.1	74	25.4
Cocoyam	40	13.7	10	3.4
Plantain	38	13.1	14	4.8
Banana	17	5.8	8	2.7
Yam	10	3.4	7	2.4
Cassava, plantain, cocoyam	15	5.1	99	34
No opinion	95	32.6	79	27.1
Total	291	100.0	291	100.0

**Respondents assessment of the differences in crop yields in the past compared with current yields**

From the results displayed in Table 5, it showed that 35 (12%) of the respondents were of the opinion that the current crop harvest was comparable to that obtained 5-10 years ago. 33 (11.3%) opined that the current crop yield was better than the harvest 5-10 years ago. However, majority 72 (24.8%) of the respondents reported that the current harvest was lower than the previous harvests 5-10 years ago; while 25 (8.6%) of the subjects reported that they had experienced crop failure or poor harvest.

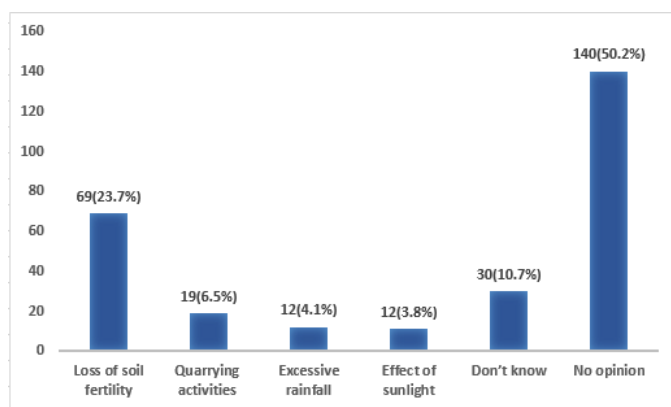
**Respondents reasons for their perceived poor crop harvests**

As shown in Figure 1, the respondents gave various reasons for their perceived poor crop harvests at the time of the survey compared to the harvest 5-10 years ago. Majority 140 (50.2%) of the subjects had no opinion and therefore gave no response, while 30 (10.7%) had no explanation for the perceived poor crop harvest. On the other hand, 69 (23.7%) of them opined that the poor harvest was due to loss of soil fertility; 19 (6.5%)

of them attributed the poor harvest to quarrying activities, while 12 (4.1%) of them felt it was due to excessive rainfall.

**Table 5. Assessment of current crop harvest in contrast to previous harvests 5-10 years ago before the quarry operations**

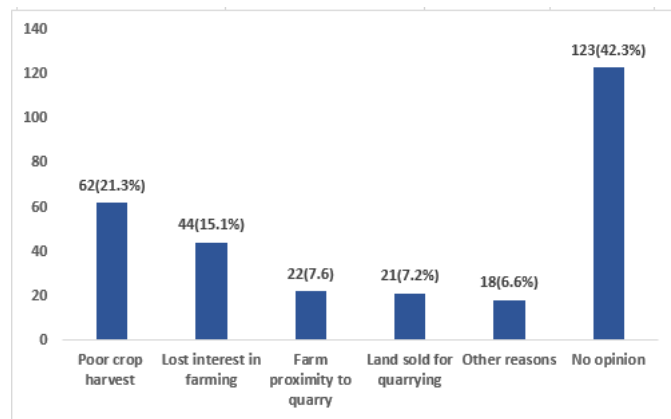
Performance indicator	Number of respondents	Percent (%)
Current harvest is comparable to that obtained 5 years ago	35	12.0
Current crop harvest is better than what obtained 5 years ago	33	11.3
Current crop yield is lower than what obtained 5 years ago	72	34.8
Crop failure / poor harvest	25	8.6
No opinion	126	43.3
Total	291	100.0



**Figure 1. Respondents reasons for their perceived poor crop harvests**

**Reasons for stoppage of farming activities**

In the course of time following establishment of the quarry business in Akamkpa LGA, some members of the community stopped farming. The respondents gave various reasons for opting out of farm work. As shown in Figure 2, 62 (21.3%) of the respondents attributed their quitting of farming to poor crop harvest. 44 (15.1%) said they had lost interest in farming, while 22 (7.6%) of them stated that the farm was too close to the quarry sites. Another reason given by 21 (7.5%) of the respondents was that their farmlands were bought over by the quarry operators.



**Figure 2.**

**DISCUSSION**

As Lad and Samant (2013) have observed, quarrying has some intrinsic land use policy implications; because it usually

involves land acquisition and a resultant displacement of people. It is often a source of conflict over traditional ownership and use of land vs governmental imposition of its decision on the people. However, when top level policy decisions are to be made regarding the establishment of quarries, the policy makers invariably are the decision makers who make the choice between retaining the land for agriculture, establishing the quarry at the expense of agriculture, or opting for a middle ground approach of having agriculture and quarrying coexist within the same location (Lad and Samant, 2013). The establishment of quarries involve the clearing of land for the development of access roads; this activity invariably leads to the destruction of habitats for wild animals and is also attended by the reduction in grazing lands livestock (cattle, sheep and goats) and also reduces the sources of plant life for human beings and animals (Chizoro *et al.*, 1997). Besides affecting the locals, the noise from blasting and transport activities has caused migration from the surrounding areas, affecting ecological balance by disrupting the food chain (Munyandri, 1998). This study was conducted in Akamkpa LGA, in Cross River State, Nigeria. The LGA is in the rain forest zone of the country. The inhabitants of the LGA are predominantly farmers and the main food crops cultivated in this LGA include cassava, plantain, yam, cocoyam and banana. Akamkpa LGA is endowed with large deposits of granite and limestone which explains the large number of quarries that are operational in the LGA. The quarry industry in Akamkpa has provided some basic amenities to the quarry communities such as roads and electricity; but these activities have equally impacted negatively on the lives and livelihoods of the people.

### **The perceived effects of the quarry activities on the environment**

It is an established fact that mining and quarrying activities, whether on a small or large scale, have damaging consequences (Sinha *et al.*, 2010); often resulting in and involving the complete destruction of the habitat and sometimes the livelihoods of the people in the location where these activities take place (Martínez-Ruiz *et al.*, 2007). The result of our study showed that the quarrying activities had impacted negatively on the lives and livelihoods of community members living in those quarry sites. The major environmental problems complained about included noise, air, water and land pollution. These findings are in tandem with that reported by in a similar study by Wangela (2019) on the effects of dimension stone quarrying in Ndarugo Area of Kiambu County, Kenya.

The researcher found that the quarry activities had affected 87.5% of the plants that were within the vicinity of the quarry. Some of the plants were uprooted to create room for the quarry activities, while some were destroyed by the quarry dust that settled on them. In addition, 78% of the land became stagnant pools of water. Therefore, from his findings, the poor regulation of stone quarrying in the County had resulted in massive land degradation in the region. Another major complaint of the respondents was vibration that resulted in cracks in the walls of their houses. Similar findings had been reported by Bamgboshe *et al.* (2013) involving Odeda, a quarry community in Ogun State, located in South-Western Nigeria, where the residents experienced large cracks on the walls of their houses due to the violent vibrations that emanated from the heavy drilling machines or the blasts of

explosives; sometimes resulting in the collapse of the buildings.

### **The perceived effects of the quarry activities on the agricultural productivity**

Land is a vital resource that is available for the rural poor who are dependent on farming as an occupation for their daily sustenance and livelihoods (Akanwa *et al.*, 2016). It is estimated that annually, about 2 million hectares of farm lands are lost as a result of the exploitation of the different solid minerals that are buried in the earth, resulting in the disruption of the ecosystem and the degradation of the land (Sanderson *et al.*, 2002). Quarrying activities are known to cause large scale land degradation, resulting in colossal losses of arable land and vegetation cover. In most situations, after the resources have been depleted the despoiled quarry sites are usually abandoned (Akanwa *et al.* 2016). Other adverse effects that are associated with quarry activities in the host communities include; fly rock accidents, damage to ceiling and houses by the fly rocks as well as damage to crops and loss of livestock loss which in some situations are the economic mainstay of the local communities (Bamgbose *et al.*, 2014). In most developing countries especially in sub-Saharan Africa, the quarry dust which settles on crops has been found to hinder the process of photosynthesis for plants; translating eventually into lower crop yield for most farmers in the villages hosting quarries, whose major source of livelihood is agriculture (Akanwa *et al.*, 2016). As already alluded to, the quarrying process generates dusts which contain several heavy metals and toxic elements which are released into the air (Kosmala *et al.*, 2011) and in most cases deposited on the surface of the plant leaves. Scientific evidence has shown that quarry dusts are toxic to plants and that plants that are very close to quarry sites tend to accumulate dusts and heavy metals which have been shown to reduce carbohydrate and chlorophyll levels, thus reducing the level of photosynthesis and delay flowering (Ke, 2007; Degtjarenko *et al.*, 2016; Lago-Vila *et al.*, 2017). When these toxic elements are deposited on the surface of the vegetation, the plant in response adapts its physiological functions to resolve the adverse effects of the pollutants by either increasing its production or reducing its secretion of biochemical compounds such as plant antioxidants. However, in situations where the plants cannot withstand the adverse environmental condition, the toxic element can cause physiological and morphological damage to the different parts of the plant such as the flowers, leaves, stems, and roots (Maletsika *et al.*, 2015; Rai, 2016).

The physical changes may occur in form of distorted structure of the leaves, abrasion of leaves and cuticles, stomata, resulting in poor conductance, oxidative stress, decreased photosynthesis, reduction in growth rate, necrosis and ultimately the withering of the plant (Ke, 2007; Maletsika *et al.*, 2015). Invariably, Consequently the accumulation of pollutants in the crops (leaves, stem and roots) may result in low yield, stunted growth or plant death, which translates to crop failure (Maletsika *et al.*, 2015). The result of our study showed that the agricultural yields of our respondents had declined over the years as a result of the quarry activities. Moreover, 21(7.2%) of the community members whose farmlands were adjudged to have large granite deposits sold out their farmlands to the quarry companies, while 44 (15.1%) of out of their loss of interest in farming, abandoned farming altogether to engage in quarry work. The abandonment of

farming activities by the agricultural workforce, who opted to work in the quarry business instead could also explain the resultant decline over time in agricultural yields of the quarry communities. In addition, the loss of soil fertility due to the pollution of the land by the quarry dust could also have contributed to the loss of interest in farming as alluded to by 62 (21.3%) of our respondents. This is similar to the finding by Lad and Samant (2014), who reported in their study of the environmental and social impacts of stone quarrying on agricultural productivity in the Kolhapur District in India, that majority (75%) of their subjects asserted that the deposition of quarry dust on crops resulted in the reduction by 50% of their agriculture yield over the past few years. On the other hand, majority (70%) of their respondents also reported that fruit trees in the area surrounding the quarries have equally been affected by the dust pollution, resulting in their stunted growth and decreased fruit yield. Moreover, the local farmers in the Kolhapur District complained of the reluctance of the agricultural laborers to work in the dusty atmosphere created by the quarry activities thereby making it difficult for the farmers to hire the agriculture laborers which in turn contributed indirectly to poor agricultural productivity (Lad and Samant; 2014).

### Conclusion and recommendations

The quarry industry in Akamkpa LGA has opened up the land for exploitation, which has resulted in the loss of arable farm lands, the disenfranchisement of the communities, depletion of the farming workforce due to the allure of quick financial dividends as quarry workers. This has been compounded by the loss of interest in farming resulting from poor crop harvested in recent times that is attributable to the land degradation and loss of soil fertility over the long period of land, water and air pollution. It is apparent that quarry activities in Nigeria, as is the case in most African countries are poorly managed and regulated. Much of the resource exploitation is done without recourse to the established norms of environmental sustainability. The methods used in some cases are crude and without the application of organized and systematic methods for the exploitation of these resources, which often results in the collapse of these open pit quarries or their transmuting into manmade lakes or ponds. Above all, there are also no concerted efforts or measures to rehabilitate the abandoned quarries (Akanwa *et al.*, 2016). For Akamkpa LGA, the long term danger of this situation of poor agricultural productivity would be increased food shortages, nutritional deficiencies and the attendant health problems associated with poor or insufficient nutrition especially among vulnerable population groups such as children and women of child bearing age. One of the suggested ways forward is the reclamation of abandoned quarries through massive earth filling, fertilizing the depleted soils and planting the food crops that thrive in those communities. This approach of sustainable redevelopment is therefore an important way forward in redressing the environmental degradation that is so prevalent with quarry activities especially in most developing countries like Nigeria.

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