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SOCIO-ECONOMIC IMPACT OF PARTICIPATION IN MINING AND QUARRYING ON POVERTY ALLEVIATIONAMONG RURAL FARMING HOUSEHOLDS IN KWARA STATE, NIGERIA

Y.U. Oladimeji[1], S.A. Adepoju[2], S.A. Galadima[3] and A.M. Fagge[4]

[1]Department of Agricultural Economics, Institute for Agricultural Research, Ahmadu Bello University, Zaria, Nigeria
[2]Department of Geology and Mineral Sciences, Kwara State University, Malete, Nigeria
[3]Department of Agric. Education, Umar Suleiman College of Education, Gashua, Nigeria
[4]Department of Economics and Development Studies, Federal University Dutse, Nigeria

ABSTRACT

Mining and quarry sectors are considered as one of the most important viable sectors in Nigerian economy. This paper assessed the socio-economic impact of quarrying and mining on poverty alleviation among rural farming households in Kwara State, Nigeria. A three stage sampling technique was employed to arrive at the sample size of 177 farming households that were involved in quarry and mining. Data for the study were collected from the rural households with the aid of structured questionnaire using interview schedule and questionnaire administration. Descriptive and inferential statistics as well as Foster-Greer-Thorbecke -FGT indices and stochastic dominance were used to analyze the data obtained. The results of decomposition of poverty reveal the socio-economic impacts of participating in quarrying and mining in the study area. The results also show that age, marital status, household size and distance from home to quarry sites were the determinants of rural households' participation in quarrying and mining. The signs of all the four statistically significant estimated parameters conformed to the *a priori* expectations. The study concluded that the earning from the quarrying can be used to offset income shortfalls during fallow period. It is recommended that the mineral potentials in the rural areas should be harnessed and developed to cater for rural households that are left fallowed during off-farm season.

Keywords: Socio-economic**;** impacts; quarrying; poverty alleviation

INTRODUCTION

Among Nigeria's innumerable natural resources, the potential of mining and quarry sector contends as one of the most important sectors in Nigerian economy with its principal consumers in construction and cement manufacturing industries. Limestone and marble are extremely valuable industrial rock raw materials also used in the production of agro-

chemicals, fertilizer, abrasives, industrial fillers and ceramics (Felix and Yomi, 2013). Over the years, Nigerian mining and quarry sector had been a source of livelihood and employment for both rural and urban households. Total number of employees in the mining and quarrying sector had a steady growth between 2010 and 2012 from 1,031,033 to 1,358,795 employees. Nonetheless, mining and quarrying activity (excluding crude petroleum and natural gas) has not significantly contributed to GDP between the 1980-2012 period, peaking at 1.12% of total GDP at 1990 constant basic prices in 1982 and decline to about 0.09% to the national GDP in the period covering 2010-2012 (NBS, 2015). According to the Nigerian Bureau of Statistic – NBS (2015), total output in mining and quarry was valued at N103. 24 billion in 2012 and this accounted for only 0.3% of its GDP, due to the influence of its vast oil resources. From 2015 to date, Nigeria economy has witnessed development of the mining and agricultural sector due to diversification from oil and gas. The mining sector accounts for 0.3% of national employment, 0.02% of exports and contributed 0.6% to the Nigerian GDP as at the year 2015 (IPB, 2016).

Despite the low contribution of mining and quarry sector to GDP, the potential of mining and quarry resources (mineral resources) to Nigerian economy can be underscore. Nigeria is blessed with over 37 mineral commodities found in over five hundred (500) locations across the country. Seven of these have been identified as strategic minerals which the Nigeria Federal Ministry of Mines and Steel Development would want to develop and promote to encourage investment. These include Iron ore, Coal, Bitumen, Gold, lead/zinc, limestone and Barytes (IPB, 2016). Yet, the domestic mining industry is underdeveloped, leading Nigeria to import minerals that it could produce domestically, such as fertilizer, chemicals, salt, iron ore and other vast array of industrial mineral products.

Additionally, mining industries have been viewed as key drivers of economic growth and the development process (Bradshaw, 2005), and as lead sectors that could drive economic expansion that can lead to higher levels of social and economic well-being (Bridge, 2008). These possibilities, however, remain the subject of mirage in Nigeria because of the inability of mineral resources to promote sustained economic growth and development. However, many countries especially Arabia peninsula and Australia have depended largely on their mineral export earning as Australia earned AUD 59.2 billion in mineral in 2006 alone (ICMM, 2007).

In recent times, the rising demand for primary commodities from fast-growing and emerging countries, especially China, has added to the persistent high level of minerals demand in developed countries (UNCTAD, 2007). This is coupled with high mineral prices and demand which has stimulated an investment surge in mineral exploration and production in particular the developing countries (Okeke, 2008). In order to take advantage of increases in the price of commodities, as well as the push in the equities market, resource-rich countries like Nigeria have seen a new economic opportunity and development prospect arising from the exploitation of their mineral resources.

Of recent, increased emphasis has come to be placed on the potential importance of the solid minerals sub-sector of the Nigerian economy. The quest for diversification of the national economy and in particular, the importance attached to breaking the dominance of crude oil in the export structure of the economy, has led to a focus on the sector along with agriculture. Therefore, the development of these resources is an important factor in the upliftment of economic values of people and certainly remains an important index for other sectors especially in agriculture for production of inorganic fertilizer, agro-chemicals and rural infrastructure such as roads and farm buildings. Poverty alleviation has been the priority

objective since independence not only in Nigeria but also in most developing countries. However, this objective has not been fully achieved due to a number of factors, one of which is failure to harness the mineral resources to the advantage of both households and at national levels, especially the rural areas where the resources are in abundance.

Kwara state lies mainly within basement complex rocks which cover 75% of the surface area while the sedimentary sequences of the Nupe Basin occupy the NE 25%. Industrial minerals in the state are also found in a host lithological setting and prominent types of industrial minerals hosted in these settings are talc, marble, kaolin, feldspars and granites both for construction aggregates and dimension stone. These minerals are yet to be optimally developed as there is no tangible legislation supporting their exploration in large scale. The State Ministry of Solid Minerals in supporting federal goals, in its roadmap for the growth and development of the mining industry has advocated the development of local industrial mineral usage through beneficiation to substitute for imports, create wealth and employment along the mineral value chain (KWSMSM, 2017).

It is pertinent to mention that the availability of these mineral resources opens up opportunities for development of infrastructure and increased employment of Nigerians in the rural areas where the minerals are found and where majority of farming households are left fallowed during the dry season. This paper presents the socio-economic impact of quarrying and mining on poverty alleviation among rural farming households in Kwara State, Nigeria. Specifically, it examines the determinants of participation in quarrying and mining among the rural farming households.

MATERIALS AND METHODS

Study Area

The quarry area studied is located in Kwara State, Nigeria. The study area falls within Ilorin sheet 223NW (1:50,000) (GSN) lying between longitudes 2° 30' to 6° 25'E and latitudes 7° 45' to 9° 30'N (Oladimeji *et al.*, 2015 a & b). It is a humid tropical area characterized with both wet and dry seasons. The mean annual rainfall is 1150 mm, while the mean annual temperature ranges from 25-30°C with relative humidity that ranges from 65-80% (NPC, 2006). The climate of the area is tropical with two main seasons and an intervening cold harmattan period occurring mostly from December to January (Oladimeji and Abdulsalam, 2013). The rainfall pattern is bimodal and runs from April through early October with a slight dry period of about a fortnight in August. The vegetation in the State consists largely of derived savannah with a great expanse of arable land and rich fertile soil with crops like grains and tubers mostly cultivated in all agricultural zones of the State while tree crops like cocoa and cashew thrive fairly well in agricultural zone D of the State (Oladimeji, 2014). The studied sites were accessible via a network of major, minor roads, land, foot paths, which link the quarries with neighboring settlements. It is expedient to note that majority of households in the study area engages in farming as primary occupation.

Sampling Procedure and Sample Size

Eleven quarry sites sourced from Kwara State Ministry of Solid Minerals (KWSMSM) provided the basic cross-sectional data. A three stage random sampling technique was employed for selecting the representative sample of farming households that

are involved in quarry production. Firstly, three Local Government Areas (LGAs) with large concentration of functioning quarry sites were randomly selected from the five LGAs where the quarries are located. Secondly, nine quarries were identified in the three (3) LGAs. Lastly, the list of rural farming households that were involved in quarrying and mining in each village was compiled through referral with aid of management of the quarry sites. All the 177 rural farming households were sampled (Table 1).

Table 1: Sample procedure and sampling size

LGAs*	Location*	Quarries*	Sample size
Ilorin east	Oke-oyi	Kam	21
Asa	Eyenkorin,	Padson	17
Ilorin east	Oke-oyi	Dasofunjo	23
Moro	Kulende	Chinese	22
Moro	Jebba Road	Fossil	21
Ilorin east	Onisapa area	Bellison	17
Moro	Shao,	Abule	19
Asa	Kilanko	Toye	18
Asa	Elere	Mt'Olive	19
5	12	12	177

*Kwara State Ministry of Solid Mineral, 2017& *Reconnaissance survey, 2017

Data Collection

Data was collected from the rural households with the aid of structured questionnaire and interview. Data collected include socio-economic and institutional factors such as income.

Analytical Techniques

Methods of Estimating Impact

According Khanker *et al*. (2010) several methods with different challenges have been used in the literature to examine the impact of involvement in project or non-randomized programme to address the fundamental question of the missing counter-factual situation, that is, what would have been the situation of the farmers in the absence of the programme/project or engaging in quarrying and mining as the case may be.

However, the t-statistic model was used to test hypothesis that socio-economic factors have no significant influence on income of farmers that participated in mining and quarrying in the study area. However, unlike PSM model, this will not help to deal appropriately with the problem of selection bias caused by selection on observables or unobservables present in cross-sectional or non-experimental studies. The specific expression used to determine the t-statistic is as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S_1}{n_1} + \frac{S_2}{n_2}}} \quad (1)$$

Where: t = calculated t-value; $\overline{X}_1$ = mean value of income of farmers when participated in quarry; $\overline{X}_2$ = mean value of income of farmers without participation in quarry; S_1 = standard deviation(SD) of $\overline{X}_1$; S_2 = SD of $\overline{X}_2$; n_1 = sample size of $\overline{X}_1$ and n_2 = sample size of $\overline{X}_2$

Assessing Impact of Quarrying on Poverty Alleviation

Foster-Greer-Thorbecke (FGT) indices were used to examine the impact of quarrying and mining on poverty alleviation among sampled farmers. The FGT measure of poverty using socioeconomic characteristics for the farmers' i^{th} $P\alpha_i$ is given as:

$$p_{ai} = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^{a} \quad (2)$$

Where: Pα is the FGT poverty index for the i^{th} sub-groups, n is the total number of households in the i^{th} subgroup households, Y_i is the expenditure/income of i-th household, z is the poverty line, q is the number of the sampled household population below the poverty line and α is the aversion to degree of concern (a co-efficient reflecting different degrees of importance accorded to the depth of poverty and it ranges from 0 to 2. When the aversion to poverty (α) is equal to zero, it is the incidence of poverty in the population. When α is equal to 1, it shows uniform concern and measure the depth of poverty (the proportion of expenditure shortfall from the poverty line). When α is equal to 2 distinction is made between the poor and the poorest, that is, the severity of poverty (FGT, 1984; Oladimeji *et al.,* 2014a & b, 2015a & b). The poverty line that was used for this study was defined as the two-thirds of mean household income/expenditure per adult equivalent per months (Oladimeji *et al.,* 2016).

In order to determine whether a relation of stochastic dominance holds between two distributions of socioeconomic characteristics, the distributions are first characterized by their cumulative distribution functions, or CDFs. In the context of a random variable Y, the value of the CDF of the distribution of Y at y is the probability that Y should be no greater than y. Suppose that we consider two distributions A and B, characterized respectively by CDFs FA and FB. Then distribution B dominates distribution A stochastically at first order if, for any argument y, FA(y) ≥ FB(y). Thus

$$F_A(y) \geq F_B(y) \quad (3)$$

Higher orders of stochastic dominance can also be defined, i.e. define a sequence of functions by the recursive definition

$$D^1(y) = F(y), \quad D^{8+1}(y) = \int_0^y D^8(Z)dz, \text{ for } s = 1, 2, 3\ldots. n \quad (4)$$

Thus, the function D^1 is the CDF of the distribution under study, $D^2(y)$ is the integral of D^1 from 0 to y, $D^3(y)$ is the integral of D^2 from 0 to y, and so on. By definition, distribution B dominates A at order s if $D^8{}_A\ yy \geq D^8{}_B\ (y)$ ¸ DsB(y) for all arguments y. The lower limit of 0 is used for clarity of exposition; in general it is the lowest income in the pooled distributions.

Determinant of Level of Participation in Quarrying and Mining

Tobit regression model was employed to determine the level of participation in quarrying and mining among rural farming households. This model involves an outcome equation, which uses a truncated model to determine the level of participation in quarrying and mining. Thus, the model is expressed as:

$$Y_i^* = \beta X_i + v_i \quad (5)$$

$$Y_i = \begin{cases} Y_i^* \; if \; Y_i^* > 0 \; and \; D^* > 0 \\ 0 \qquad otherwise \end{cases}$$

Y_i = observed response on the level of participation (indexing); X_i = vector of socioeconomic variables; β = vector of parameter estimates and v_i = error term. The error terms u_i and v_i are usually assumed to be independently and normally distributed.

RESULTS AND DISCUSSION

Socio-Economic Factors Affecting Farmers' Level of Participation

Table 2 depicts socio-economic characteristics of rural farming households involved in mining and quarrying in the study area. The result implies that the bulk of the respondents (74.6%) were household heads either married or divorced/widow. The mean age of respondents was 29 years with a minimum and maximum of 15 and 52 years respectively. About 77.4% of the respondents had a range of 21-40 years with standard deviation of 1.49 years. This implies that majority of the rural farming households involved in quarrying and mining were active, agile and could stand the demands for the enterprise.

Expectedly, male rural households (93.22%) outweighed the female counterpart (6.78%) in involvement in quarrying in the study area. The presence of female-headed households in quarrying could be attributed to a number of reasons such as death of male heads, migration, divorce and economic reasons. Although the result showed the dominance of men in quarrying and mining sector in the study area, the contribution of the women folk cannot be undermined as they are involved in breaking, packing, recording and sales. A number of socio-cultural factors, restricted women from full involvement in this sector and these include energetic nature of the enterprise among others. The result shows differentiation of roles and functions based on gender and ensured participation of both male and female in the enterprises, thereby contributing to the alleviation of poverty among both sexes in the study area. It also shows the suitability of the enterprise in possible formulation of development programmes aimed at providing employment to rural households without gender bias.

Table 2: Socio-economic characteristics of rural farming households involved in quarrying (n = 177))

Variables	Distribution	F	%	Mean	Min.	Max.	Stdev
Marital status	Single	45	25.42	-	-	-	-
	Married	111	62.71				
	Divorced	12	6.78				
	Widow (er)	9	5.09				
Age (years)	11-20	21	11.86	28.9	15	52	1.49
	21-30	89	50.28				
	31-40	48	27.12				
	41 & above	19	10.73				
Sex	Male	165	93.22	-	-	-	-
	Female	12	6.78				
Educational attainment	Nil	102	57.63	-	-	-	-
	Primary	49	27.68				
	Secondary	17	9.60				
	Tertiary	9	5.09				
Household size (persons)	1-3	24	13.56	7.0	2	21	2.06
	4-6	43	24.29				
	7-9	54	30.51				
	10 and above	56	31.64				
Distance (Km)	0.1- 1.0	91	51.41	1.09	0.50	7.5	1.42
	1.1-2.0	47	26.55				
	2.1-3.0	31	17.51				
	>3	8	4.52				
Societal status	Tilted	10	5.65	-	-	-	-
	Not titled	167	94.35				

Field survey, 2016/2017

The results of the analysis of the educational attainment of the respondents' shows that the educational status is largely skewed towards the informal education as about 58% of the pooled rural households did not have formal schooling, while only 14.7% attended at least secondary school only. Therefore, literacy rate was very low among the rural households sampled Forde, (1994); Oladimeji *et al.*, (2015a & b) agree with this assertion, that the low level of education and social status of the rural farming households were some of the constraints to agriculture and indeed their development.

The results of household size shows that the average numbers of persons per household were approximately 7 with standard deviation of 1.24 and 10 and above as modal class. Therefore, the size of the household affects the amount of farm and non-farm labour, determines the food and nutritional requirements of household and often affects poverty status and household food security. The distance covered and proximity to the quarry site may affect farmers' choice of engagement in quarry and mining. Results indicated that the mean distance covered to site across the respondent is 1.1 km with minimum and maximum of 0.5 and 7.5 Km respectively. This implies those respondents who reside very close to the location of quarry sites are more likely to participate in quarrying than their counterparts who live far off.

Poverty Profile of Rural Household Involved in Quarrying based on Socio-economic Characteristics

The results indicate that 75.5% of the sampled household heads fell below poverty line of ₦6,049.8 per person per year without their extra earnings while 48.6% met a threshold of ₦6,049.8 when the income from their quarrying engagement were included. Thus, in Table 3, twenty one respondents earned at most ₦50,000 per person per year without including their income from quarrying and had poverty incidence of about 65% but only 4 respondents fell to the same income group and the poverty incidence was reduced to 42.6% among the same group when extra earnings from quarrying were included.

The results of decomposition of poverty based on income earning was reinforcing in Figure 1. The cumulative distribution function (CDF) of the farm income plus earnings from quarry of the respondent stochastically dominated that of sole farming income ones.

Table 3: Identified level of poverty alleviation based on socioeconomic characteristics of farmers involved in quarrying

Variables	Distribution	P_0	P_1	P_2	n	Share of poverty	
Without extra	10 000 – 50 000 [a]	0.653	0.007	0.008	21	21	24.42
Income (N)	50 001 – 100 000[b]	0.626	0.052	0.009	132	61	70.93
	>100 000 [c]	0.274 [ac]**	0.000	0.00	17	4	4.65
With extra (N)	10 000 – 50 000 [a]	0.426	0.019	0.006	4	1	1.67
Income (N)	50 001 – 100 000[b]	0.409 [ab]*	0.011	0.002	109	84	97.67
	>100 000 [c]	0.098 [ac]**	0.007	0.003	64	1	1.66
Marital status	Single [a]	0.299**[ab]	0.012	0.000	111	45	52.33
	Married [b]	0.469	0.088	0.006	45	33	38.37
	Divorced [c]	0.784[bc]**	0.019	0.021	12	5	5.81
	Widow (er) [d]	0.693	0.055	0.015	9	3	3.49
Age	11-20[a]	0.408	0.043	0.002	21	6	6.97
	21-30[b]	0.421*** [ab]	0.063	0.001	89	40	48.84
	31-40[c]	0.501 [bc]*	0.071	0.001	48	27	31.40
	41 & above [d]	0.532	0.090	0.005	19	11	12.79
Sex	Male [a]	0.462*** [ab]	0.059	0.001	165	82	95.35
	Female [b]	0.298	0.021	0.000	12	4	4.65
Education	Nil [a]	0.493	0.027	0.009	102	62	70.93
	Primary [b]	0.428	0.063	0.072	49	19	22.09
	Secondary [c]	0.396	0.011	0.000	17	5	5.82
	Tertiary [d]	0.300***[dba]	0.021	0.002	9	1	1.16
Household	1-3 [a]	0.402	0.020	0.005	24	6	6.98
size	4-6 [b]	0.507			43	12	
	7-9 [c]	0.581 [ac]**			54	30	
	10 and above	0.620			56	38	
status	Titled [a]	0.104 [ab]**	0.000	0.000	10	4	4.65
	Not titled [b]	0.503	0.026	0.005	167	82	95.35

P_o is the headcount index, P_1 is the poverty gap index, P_2 is the squared poverty gap;***; ** and * denotes test of significance differences from group total at 1%, 5% &10% respectively

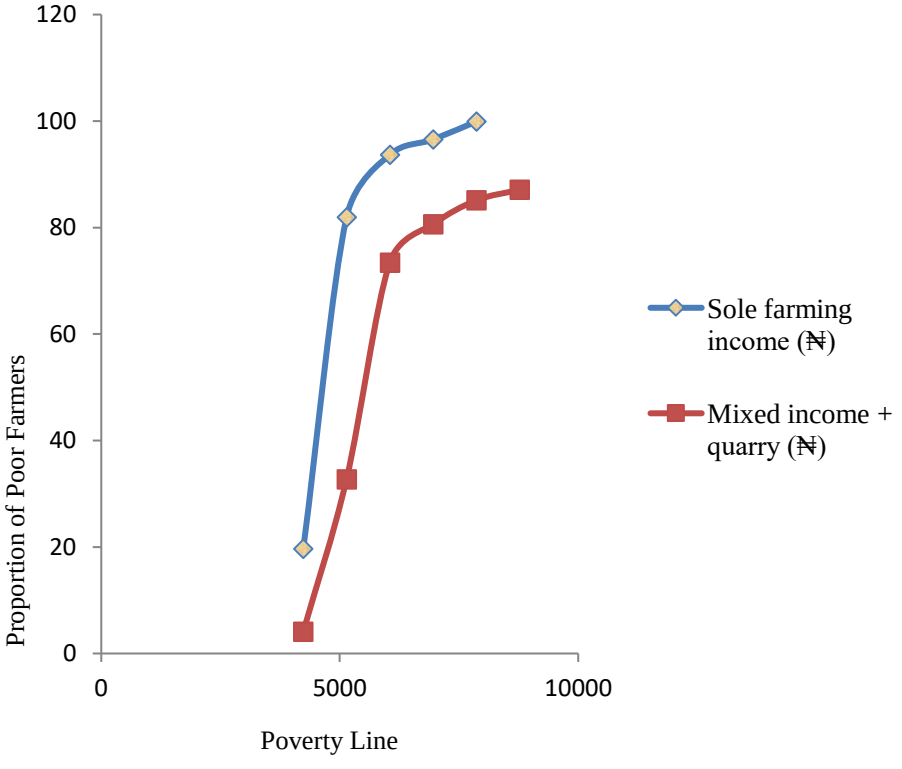

Fig. 1: Distribution of dominance analysis by income earned of quarry-farmers respondent

Poverty incidence was prevalent (53.2%) among rural households with age range of 41 years and above as against 40.8% for age range of 11-20 years. This might be due to the fact that age 11-20 years respondents are stronger and are expected to engage more actively in quarrying and mining than older people. The result of decomposition of poverty based on gender reveals 46.2% percent of male-headed households live below the poverty line in comparison with female-headed households with headcount of 29.8%. The results with respect to the depth and severity of poverty also followed similar pattern like that of the poverty incidence. The poverty incidence (P_o) sub-groups of male and female respondent were statistically significantly different at 1%. The result of decomposition of poverty based on gender was reinforcing in Fig. 2. The cumulative distribution function (CDF) of the female-headed rural households stochastically dominated that of the male-headed ones. This shows that the male-headed rural households will always be poorer than the female-headed households within the range of the specified poverty line. This implies that the head count ratio was robust to all possible choices of poverty lines within the specified range. The second order stochastic dominance automatically holds truth.

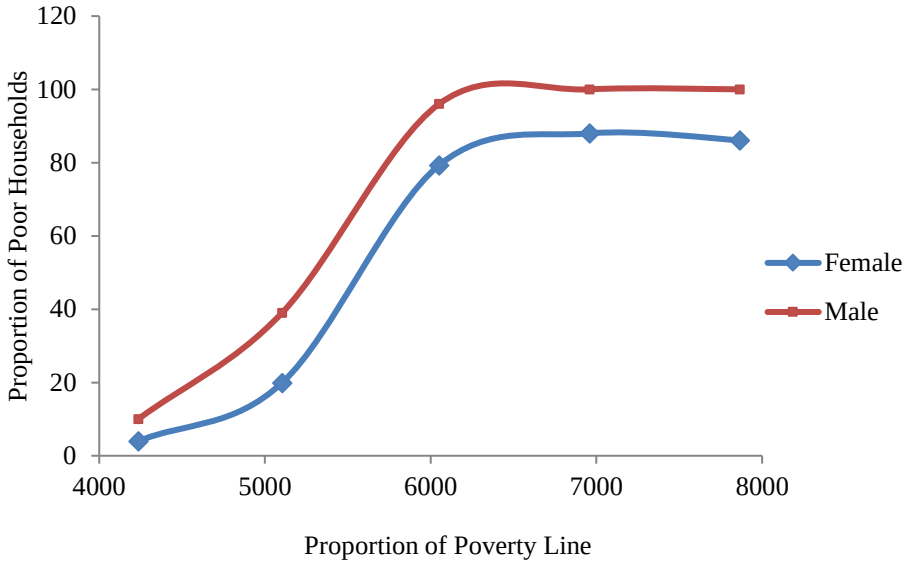

Fig. 2: Distribution of dominance analysis by Sex of quarry-farmers respondent

The result also shows that the average years of schooling of rural household heads were inversely related to the poverty status.

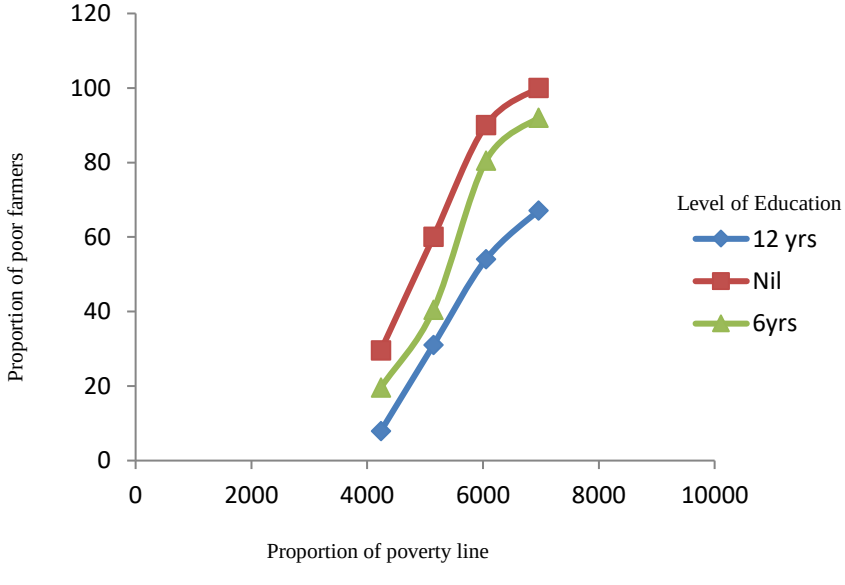

Fig. 3: Distribution of dominance analysis by years of schooling of quarry-farmers

For example, the incidence of poverty was highest (49.3%) among non-formal educated respondent compared to either respondent with primary education (42.8%) or those with at least 12 years of education with 39.6% poverty incidence. The poverty incidence (P_o) sub-groups were significantly different from the whole group index at 1%. Figure 3 presents the CDF for years of education attainment by rural households. The CDF of respondent with 12 years and above of formal education lay completely below those respondents with heads having no formal education and those with less than 6 years education. This may be due to the fact that the educated households may be involved in other activities such as government job to earn additional income. These results are comparable to findings of Oladimeji *et al.* (2015 a & b, & 2016) of poverty status among artisanal fishermen in Kwara state, Nigeria.

Determinants of rural households' participation in quarrying and mining

Tobit model in Table 4 was used to consider how variables affect the extent of rural households' participation in quarrying and mining. An additional insight was also provided by estimating the log-likelihood value to be -83.002, the Adjusted R^{-2} of 0.499 and the prob. > Chi-square of 0.002, which implies statistically significant at 1% level. The diagnostic statistic implies that the overall model was well fitted and the explanatory variables used in the model were collectively able to explain the determinants of participation in quarrying and mining.

Table 4: The determinants of rural households' participation in quarrying and mining

variable	operationalized	β_i	coefficients	SE	t-value
Constant	intercept	β_0	-0.003	0.002	-1.74*
Age	years	β_1	0.286	0.094	3.03***
Sex	dummy	β_2	-0.145	0.098	-1.48
Level of education	years	β_3	0.207	0.183	1.13
Marital status	numbers	β_4	0.408	0.201	2.04**
Household size	numbers	β_5	0.518	0.289	1.79*
Distance from home	Kilometer	β_6	-0.014	0.007	-2.01**
Social organisation	dummy	β_7	0.003	0.003	0.99
Diagnostic statistic					
No. of observations	177				
Log likelihood function	-83.002				
Restricted likelihood	-92.036				
Prob. > chi^2	0.002				
Pseudo R^{-2}	0.499				

***; **; * denote statistically significant at 1%, 5% and 10% respectively

The results depict age (P<0.01), marital status (P<0.05), household size (P<0.10) and distance from home to quarry site (P<0.05) as determinants of rural households' participation in quarrying and mining. The signs of all the four statistically significant estimated parameters conformed to the *a priori* expectations. The positive regression coefficient for age (0.286) implies that age has a direct influence on the decision to participate in quarrying and mining. Other things being equal, labour productivity is a function of age. It is believed that young people tend to engage more in hard labour compared to old ones. Therefore, age

has great potential for increasing agricultural productivity and secondary production and, hence, for improving household income and reducing poverty in the study area.

Coefficient for marital status was positive and significant in influencing farmer's participation in quarrying and mining at 5% level of probability. This suggested that respondent who are married were more likely to engage in quarrying than their counterparts whose marital status was single. The coefficient of household size (0.518) was positive and statistically significant at 5%. This implies that a unit increase in family size, the more the likelihood of respondent engages in quarry and mining by a unit of 0.518. Coefficient for distance to quarrying and mining site was negative and statistically significant at 5% in influencing respondent decision to participate in quarrying. This is because long distance to the quarry site can be a disincentive to respondent whose village is far to participate in quarrying and mining.

CONCLUSION

It can be concluded that earnings from quarry and mining impacted on the socioeconomic status of rural farming households in the study area. The study concluded that age, marital status, household size and distance from home to quarry site were the socioeconomic determinants of rural households' participation in quarrying and mining. Thus, the development of mining and quarrying sector is an important alleviation measure against redundancy for rural dwellers during fallow or dry season especially in areas where irrigation projects are not available. It can also serve as alternative employment opportunities to improve rural income which is agriculture dominated. The study noted that the earning from the quarrying can be used to offset income shortfalls during fallow period.

It is recommended that the mineral potentials in the rural areas should be harnessed and developed to cater for rural households that are left fallowed during off-farm season. In view of the fact that rural households sampled engages in secondary occupations that alleviated their poverty, partly due to volatile nature of agricultural production system and seasonality, suggests also that any policy aimed at alleviating poverty and standard of living of the households in the study area should at least for now target both farming and secondary occupations.

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