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Food Security in the Midst of Our Mined Lives: Perspectiveson Food Security and Mining in the Asutifi District of Ghana

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Abstract. Mining inevitably impacts the livelihoods of mining communities in a number of ways. Effects on food production and ultimately food security have been argued variously in the literature. In this study, the mining operations in the Asutifi district and its relationship with supply of foodstuffs in the local district markets as well as food insecurity areanalysed. Using quantitative techniques, semi-structured questionnaires were distributed to 150 respondents in the Asutifi district and responses analysed using frequencies, Cross tabulation, Chi-Square ($\chi 2$) and Analysis of Variance (ANOVA). The study found out that crop yield has reduced since mining started and residents largely attributed it to fertility loss from mining activities. Respondents also noted that the reduction in crop yields have affected the supply of foodstuff to the local markets in the district. However, using a Chi-Square ($\chi 2$) to test the relationship between mining operations and supply of foodstuff to the local markets, there was no statistically significant association between mining operations and reduction in supply of foodstuffs to the market. Any reduction in supply of foodstuff was largely due to chance. The ANOVA test as well the Tukey HSD Comparison test in variations in the views of respondents on mining operations and food insecurity in future in the district showed a no statistically significant variations or differences in the views of the respondents when grouped according to their respective occupations. All occupational groups agreed that mining operations in the Asutifi district poses a significant threat to food security in the future.

Keywords: Mining, Livelihood, food security, Asutifi, Foodstuffs.

Introduction

Gold mining has become increasingly attractive during the last decades due to soaring gold prices. This has triggered a gold boom, both in industrialized countries (e.g., the United States, Australia, and Canada) and in developing nations (e.g., South Africa, Peru, Indonesia, or West Africa) (Hammond et al, 2007). In fact, many countries such as Ghana and South Africa consider their mineral wealth an asset, which could be used and in fact is used to stimulate or enhance their economic growth potential and also to steer their economies into greater levels of development (Opoku-Ware, 2010). However, it is observed that "to date, mining has a poor record in terms of its contribution to sustainable development, with few communities receiving significant benefit and mining sites experiencing lasting negative ramifications" (Reed & Miranda, 2007: 15). Since gold is often extracted using toxic substances, the environmental consequences of gold mining can be devastating, particularly in fragile tropical ecosystems (Akpalu and Parks, 2007; Kumah, 2006; Sousa and Veiga, 2009).

Mining activities are unavoidable in the development of an economy of any country enriched with mineral resources. This is usually so because of the benefits that is enjoyed by countries involved in extraction of mineral resources; these benefits can be categorized into internal and external. With regards to internal benefits, there is usually the creation of employment and revenue generation. Externally, foreign exchange is available to countries endowed with mineral resources. Despite the benefits of mining, studies conducted lately to investigate into effects of mining on environment and food security have revealed mining activities to be hazardous to the development of the economy than a blessing to the economy. Most mining companies claim to respond to these negative effects of mining on the environment and food security by undertaking Social Responsibility Programmes (SRPs) which is usually aimed at developing communities within their catchment areas. To mitigate such impacts, governments, mining companies, and rural stakeholders sometimes react with resettlement and alternative livelihood programs, and former farmers engage in small-scale artisanal mining (Banchirigah and Hilson, 2010).

However, in Ghana, the question is how the recent gold rush has affected Ghana's environment and local livelihoods. Existing studies suggest widespread land transformations and degradation (Agbesinyale, 2003; Akabzaa and Darimani, 2001) and thus fundamentally changed livelihood foundations, but overall, land use changes due to mining remain poorly understood. Moreover, there is increasing evidence that Ghana may face a resource curse dilemma: economic diversification is lacking and the country's economic dependency on mineral resource export revenues grows (Adler and Berke, 2006; Akabzaa and Darimani, 2001; Aryee, 2001). Agriculture which is the back bone of Ghana's economy has suffered the most neglect over the years especially in the mining areas. Many cocoa farmers have had to reluctantly give up their ancestral farmlands spanning from four to five generations to mining companies. Meanwhile, between 1993 and 1997 mining contributed 1.5% to Ghana's GDP as against 40% by agriculture. Again, the mining sector in 2007, 2008 and 2009 contributed 5.9%, 5.6% and 5.8% of the GDP respectively to the country's GDP, whilst the agricultural sector also contributed 34.3%, 33.9% and 35.4% to the GDP in these years respectively (GSS, 2009). In a developing country such as Ghana where about 65% of the population is engaged in agriculture as their source of livelihood, any activity like mining that claims vast arable lands will be an affront to national food security as well as sustainable economic gains and initiatives (GSS, 2009). Even though Ghana accrue taxes and royalties from mining, it is insignificant compared to the gains from agriculture to the national economic development.

This research is set out to investigate the scale of mining in the Asutifi District and its effects on food supply to the local markets in the Asutifi district and whether residents perceive the start of mining in the district as posing a threat to future food security for the residents in the district. The study seeks to find answers to the following questions;

- Has food supply to the various local markets in the district reduced as per the start of mining in the Asutifi district? And
- Are there any variations in the ideas of food insecurity resulting from mining in the Asutifi District different on the basis of resident's occupation? This is to

obtain a clear understanding of the differences in thinking about the food insecurity in the district from occupational stand point of the residents linked directly or indirectly to mining operations in the Asutifi district.

Study Area

Occupying a total land surface area of 1500 sq.km, the district is one of the smallest in the Brong Ahafo Region with a total of 117 settlements in the district and four paramountcies, namely: Kenyasi No.1 Kenyasi No.2, Hwidiem and Acherensua (Government of Ghana (GoG), 2002). "The district capital Kenyasi is about 50km from Sunyani, the regional capital of Brong Ahafo, through Atronie and Ntotroso" (GoG, 2002). Perhaps the most important potential for the development of the district lie in the abundant natural resources in the areas of forest and forestry products, good soil of high agronomic value, sand, clay and mineral deposits like gold, diamond, and bauxite (GoG, 2002).

Topographically, the Asutifi District lies within the forest dissected plateau "with average height of about 700 feet above sea level and the lowest part of Kenyasi found along the river basins whilst the highest point is found within a chain of mountains" (GoG, 2002). In fact, geologically, the area is fully covered by rocks of Birimian and Dahomeyan formations with these rocks known to be gold, manganese and Bauxite bearing rocks (GoG, 2002) and could explain why currently gold is being mined in the areas where these rocks are found by Newmont Ghana Gold Limited one of the biggest mining companies in the world. In addition to these are "large areas of forest reserves such as the Biaso Shelter Belt, Bia Tam Forest Reserve, Asukese Forest Reserve, Goa Forest Reserve and Desiri Forest Reserve with these forest reserves together covering a total of about 475.63 square kilometres , about 30% of the entire land surface area of the area" (GoG, 2002) and it is to be assumed that the massive exploitation of the area for minerals would invariably affect these forest since they are also embedded with some Birimian rocks.

In respect of development, the district is mainly rural and one of the most deprived districts in the Brong Ahafo Region (Ghana Statistical Service, 2008). About 31% of the people in the district live below the poverty line with 15% of them living under conditions of extreme poverty (Suleman et al, 2013). Four communities in the district, namely Gyedu, Ntotoroso, Kenyasi No.1 and No.2 are purposively selected for this study because of the presence of Newmont activities in these communities and the closeness of the open pits operated by Newmont to these communities. The topography of the study area consists of low hills with a maximum elevation of about 540m. The project area is drained by a number of seasonal streams and rivers that flow generally southeast and feed into the upper basin of the Tano River, which is perennial. From the project area, the Tano River flows southwards forming a section of the border between Ghana and Cote d'Ivoire before discharging into the Atlantic Ocean. The study area falls within the wet semi-equatorial climatic zone of Ghana (Walker, 1962). It is characterized by an annual double maxima rainfall pattern occurring in the months of May to July and from September to October (Anon, 2005).

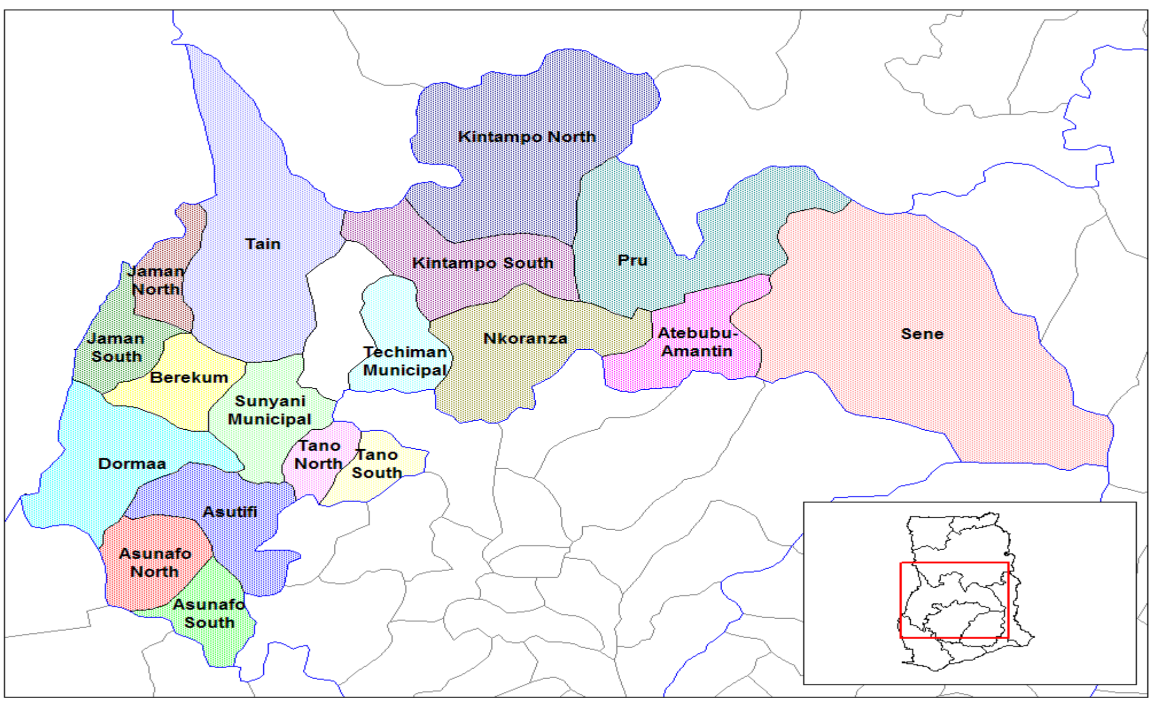

Figure 1 Map showing Brong Ahafo region of Ghana with its districts including the Asutifi District.Data source: Government of Ghana 2009 adopted from Opoku-Ware, 2010.

The mining lease area extends over an area of 45 km from the Kenyasi area in the south to the Subenso area in the north. The lease area has been divided into two main blocks by the Bosumkese Forest Reserve and they are generally referred to as Ahafo South and Ahafo North Areas as shown in Fig.1.2 (Dotse, 2008). The Ahafo North Area is the northern half of the property and covers mainly areas to the north of the Bosumkese forest and the areas in and around Yamfo south, Susuanso, Terkyere and Adroba communities. The total tonnage defined over the Ahafo North Project Area is estimated as 32 Mt at 3.2 gm/t containing 3.2 Moz of gold (Dotse, 2008).

Methods

The study employed a descriptive survey using self-administered structured questionnaires on mining operations and activities in the Asutifi District Newmont Mining Company. Specifically, the study assessed the socio-demographic characteristic of the respondents, response on crop yields since the start of mining, supply of foodstuffs to the market by farmers before and after the start of mining in the district and factors contributing to change if any to food supplied to the various local markets in the Asutifi district. In all, 150 residents of the districts were selected for the study. Households and their residents were selected using the simple random sampling technique. This technique was favourable because the district settlement pattern is such that people live in households of about eight (8) to about fifteen (15) and more closely knit and related family members living together in the same house. With such a pattern, I could easily move from one family or household to the other and administer the structured questionnaire to the residents in the selected households. Each resident in the sample were asked the same sets of structured questionnaire and their respective answers coded into Statistical Package for Social Sciences (SPSS, Version 16.0).

The results from the study (quantitative data) were analysed with the Statistical Package for Social Sciences using descriptive statistics such as frequencies and percentages. Comparative analysis, using Chi Square ($\chi2$) was used to determine the relationship between crop yields reduction due to mining and foodstuffs supplied to the local markets by farmers at 5% significance level. Furthermore, in determining the variation in responses about food insecurity in the Asutifi district from the occupational stand point of the residents, a One-Way Analysis of Variance (ANOVA) was used to analyze the mean difference or variation in responses on food insecurity among the residents on the basis of their respective occupations. For this test, the Means (M) and Standard Deviations (SD) among the respondents at the occupational categories were analysed. Again, the ANOVA Statistics and the Post-Hoc test using the Tukey HSD Multiple Comparison Test was analysed to identify the exact location of the variations or differences among the respondents' occupational categories and views on food insecurity and to determine whether those claims are statistically significant in relation to food insecurity in the Asutifi district.

Results and Discussions

The results of the study are as follows. From Table 1 below, most of the respondents have some form of education. Respondents with education at the Primary level were the highest with 38.7%, those with Junior High School (JHS) were 23.35%, followed by Senior High School (SHS) with 4.7% and 2.7% having obtained Tertiary education. However, 30.7% of the respondents indicated that they have not attained any form of education and are stack illiterates.

Table 1 Socio-Demographic Profile of Respondents.

VARIABLE	FREQUENCY (N)	PERCENTAGE
Education	**Frequency (N= 150)**	**Percentage (%)**
Primary	58	38.7
JHS	35	23.3
SHS	7	4.7
Tertiary	4	2.7
No Education	46	30.7
Occupation	**Frequency (N= 150)**	**Percentage (%)**
Farmer	112	74.7
Trading	25	16.7
Newmont workers	5	3.3
Government workers	3	2.0
Others	5	3.3
Age	**Frequency (N= 150)**	**Percentage (%)**
20-24	1	0.7
25-29	3	2.0
30-34	13	8.7
35-39	21	14.0
40-44	26	17.3
45-49	32	21.3
50-54	27	18.0
55-59	16	10.7
60+	11	7.3
Gender	**Frequency (N= 150)**	**Percentage (%)**
Male	91	60.7
Female	59	39.3

With many of the respondents having some basic education, it can be concluded that good farming practices with the potential of good crop yield and output can be employed by the residents as part of their agricultural activities. Such a conclusion is backed by a similar study by Asadullah and Rahman, (2005) and Adebiyi et al, (2009) that increased levels of education among the general population would impact on work output (Asadullah and Rahman, 2005; Adebiyi et al, 2009). Similarly, Weir (1999) also asserts that increased literacy and numeracy may help farmers to acquire and understand information and to calculate appropriate input quantities in a modernizing or rapidly changing environment.

On occupation, most of the respondents were farmers, 74.7%. This was followed by people engaged in some form of trading who constituted 16.7%, with respondent directly employed in the mining company (Newmont Goldmining (GH) Limited being 3.3% and those in government work constituting 2.0%. However, 3.3% were involved in other types of jobs generally. In fact, this trend is consistent with findings by Dauda et al (2013) that found residents and migrants to the Asutifi district as largely engaged in farming, followed by trading, mining and the civil service. This is largely attributed to the fact that most of the district residents are largely uneducated and those educated have only basic educational background that cannot guarantee them more formal jobs.

The age distribution of respondents was categorized into nine interval range or scales of ages from: 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59 and above 60 years age groups. The 45-49 year group constituted the highest respondents (21.3%), followed by the 50-54, 40-44, 35-39, 55-59, 30-34, 60+, and 25-29 years age groups with 18.0%, 17.3%, 14.0%, 10.7%, 8.7%, 7.3%, 2.0% of respondents respectively. The 20-24 year group (0.7%) had the least number of sampled respondents as presented in Table 1 above. With regards to results obtained, it was revealed that majority of the respondents were in the active age group and can therefore be regarded as active and physically disposed to pursue economic activities. This group of respondents was engaged in most farming activities in the communities. This confirms Uddin (2008) studies that the age of a person is a crucial determinant of the ability to perform a job with young people better able to apply their eagerness, dedication, consciousness and motivation towards achieving a target successfully. However, from the study, 60.7% were males and 39.3% were females and this trend was not deliberate as no standard gendered criteria or considerations were used to select respondents. The trend may merely be by chance as the sampling was basically random.

The respondents were first asked about the trend in crop yields in terms of changes in yields output before and the start of mining in the Asutifi District. From Table 2 below, most of the respondents 96.7% indicated that average crop yields have reduced because of mining. However, 3.3% of the respondents noted that there have not been any crop yield changes after the start of mining. Similarly, the same percentage of respondents 96.7% solely attributed the reduction in crop yield output to mining activities whereas the remaining 3.3% of the respondents did not believe that mining was the main cause of crop yield reduction in the Asutifi District. More specifically, the 96.7% respondents who attributed the crop yield reduction to mining activities in the Asutifi district noted that the reduction was mainly as a result of land degradation resulting from the mining operations. To them, the once fertile lands have been degraded by mining activities and have rendered most of them infertile and unfit for crop production. On the other hand, the remaining 3.3% respondents who did not attribute crop reduction to mining operation however indicated that the crop yield reduction was largely due to large tracts of land taken over by Newmont and not necessarily due to the mining operation. From their responses, lands taken over by Newmont have reduced substantially the quantum acreage of lands that was previously available to the farmers for farming purposes. That to them, have reduced the size of lands farmers had for farming and hence, accounting for the crop yield reduction. See Table 2 below;

Table 2 Respondents Views on Mining and Crop yields reduction

VARIABLE	FREQUENCY (N=150)	PERCENTAGE (%)
Average yield reducing because of mining		
Yes	145	96.7
No	5	3.3
Reduction of yield attributed to mining?		
Yes	145	96.7
No	5	3.3
Causes of yield reduction		
land degradation	145	96.7
Parts of land taken over by Newmont	5	3.3

In assessing the trends of crop yield outputs before and after mining started in the district, crop yield output analysis was done to determine real crop yield trends for some selected crops that are largely grown by the residents of Asutifi District. From Table 3, it was revealed that food crops cultivated before mining started in Asutifi district and current level of food crop produced has reduced. For instance majority of respondents produced an average of 26-30 bags of cocoa before mining commenced, but after mining had commenced, majority of respondents could only produce an average of 16-20 bags of cocoa.

Table 3 Average annual yield before mining and after mining started in the Asutifi district for some selected crops

Crops grown	Yield before mining	Percentage (%)	Yield after mining	Percentage (%)
Cocoa	11-15 bags	0.7	5-10 bags	4.7
	16-20 bags	9.3	11-15 bags	25.3
	21-25 bags	25.3	16-20 bags	44.7
	26-30 bags	50.7	21-25 bags	19.3
	Above 30 bags	10.7	26-30 bags	2.7
	No response	3.3	No response	3.3
Plantain	11-15 bunches	2.0	5-10 bunches	2.7
	16-20 bunches	4.0	11-15 bunches	31.3
	21-25 bunches	27.3	16-20 bunches	40.0
	26-30 bunches	48.7	21-25 bunches	23.3
	Above 30 bunches	18.0	26-30 bunches	2.7
Cassava	11-15 bags	2.7	5-10 bags	8.0
	16-20 bags	8.0	11-15 bags	37.3
	21-25 bags	30.7	16-20 bags	41.3
	26-30 bags	40.7	21-25 bags	12.0
	Above 30 bags	18.0	26-30 bags	1.3
Oil palm	21-25 bunches	3.3	11-15 bunches	3.3
	26-30 bunches	3.3	16-20 bunches	4.0
	Above 30 bunches	0.7	No response	92.7
	No response	92.7		

The trend was similar for all the other crops that were selected for assessment except for Oil Palm that has a relatively stable crop yield output even after the start of mining in the community. In order to establish if the crop yield reduction affected the food crops available for sale in the markets, most of the respondents indicated that the source of the food stuffs in the markets are primarily obtained from the farmers in the district but in recent times, they travel outside the district to buy from other market centres to sell to the district residents because there has been a reduction of food stuffs as a result of mining, claiming most farmlands in the area cannot produce the quantity demanded to meet the local consumption of the district residents. However, food stuff traders and farmers made it known that quantity of food crops available and sent to the local markets is not all year round, which sometimes leads to food shortages. Food shortage is usually common from the beginning of the farming season (March-June) but within September –December food quantity supplied to the market is high.

Table 4 food supplied to market increase or decrease * causes of reduction in food supply by farmers Cross tabulation

		causes of reduction in food supply by farmers		
		claim of land by Newmont	loss of soil fertility on farmlands	Total
food supplied to market increase or decrease	Increase	10 90.9%	1 9.1%	11 100.0%
	Decrease	12 8.6%	127 91.4%	139 100.0%

From table 4, a Cross tabulation analysis of the an increase or decrease in food crop supplied to the markets as well as reasons accounting for the trend in supply of food crops by the farmers showed that 91.4% of the respondents who indicated a massive decrease in the levels of food crops supplied to the markets attributed the decrease in supply of foodstuffs to the markets to the loss of soil fertility due to land degradation by mining whereas 8.6% of them also attributed the decrease in supply to the lands taken over by Newmont Gold mining (GH) Limited. On the other hand, 90.9% of respondents who said there is an increase in food supply to the markets indicated that if there is any decrease at all, it may be due to the lands claimed by Newmont which has reduced land size for farming rather than loss of soil fertility due to land degradation from mining activities (9.1%). This trend is consistent with the earlier response by the respondents that soil fertility loss due to land degradation from mining operation is largely accountable for crop yield reduction and ultimately affecting the levels of food crops supplies to the local markets in the Asutifi district.

In answering the question of whether food supply to the various local markets in the district reduced due to the start of mining in the Asutifi district, the relationship between mining operations and food supply was analysed. This was to ascertain the validity of the claims by the respondents that it is mining operations in the Asutifi district that had largely reduced the supplies of foodstuffs to the local markets. In establishing such relationships or association between mining and food supply to local markets, a Chi Square ($\chi 2$) test was done to establish such association.

Table 5 and 6 Chi-Square Tests and Symmetric Measures

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.409[a]	1	.522
Continuity Correction[b]	.000	1	1.000
Likelihood Ratio	.775	1	.379
Fisher's Exact Test			
Linear-by-Linear Association	.407	1	.524
N of Valid Cases[b]	150		

		Value	Approx. Sig.
Nominal by Nominal	Phi	.052	.522
	Cramer's V	.052	.522
N of Valid Cases		150	

From the top row of Table 5, the Pearson Chi-Square statistic for the association between mining activities and a reduction in the supply of food stuffs to the local markets in the Asutifi district shows the Chi Square as ($\chi 2$) =*0.409* with a 1 degree of freedom, with the *P* value of *P= 0.522* at a significant level of 0.05 (*α = .05).* The test result indicates a no-statistically significant association between mining operations and the reduction in the supply of foodstuffs to local markets in the Asutifi district. This means that the availability of foodstuffs in the local markets in the Asutifi district does not have any relationship with the mining operations in the district. This result is in sharp contrast to the assertions by the respondents that mining operations have affected the crop yields and as such food supply to the markets in the district. It can therefore be concluded that any reduction in food supply to the local markets since mining started may be attributed to chance and not because of mining operation. In fact, the Phi and Cramer's V test of the strength of association between mining operations and foodstuffs supply to the local markets confirmed the Chi Square ($\chi 2$) test result of no statistically significant relationship with both the *P* values for the Phi test *P=0.522* and Cramer's V values also being *P=0.522* respectively at a significance level of 0.05 (*α = .05*(See Table 6above). This shows that the strength of association between mining operations and food supply to the local markets in the Asutifi district is very weak and as such reduction in foodstuff supply to the markets in the district cannot be attributed to mining operations but by chance or error. Hence the residents claim that mining has reduced food supplies to the local markets is rejected and as such cannot be true.

In the determining the existence of variations in the ideas of food insecurity resulting from mining in the Asutifi District,the respondents were asked if they agreed (A), disagreed (DA) or uncertain (U) about the mining operations and food insecurity in the district in the years ahead.

Table 7 Respondents views on Food Insecurity

Views on food insecurity	Frequency (N= 150)	Percentage (%)
Disagree	38	25.3
Uncertain	11	7.3
Agree	101	67.3
Total	150	100.0

From Table 7, 67.3% of the respondents indicated that they agreed (A) that mining poses food security threats to the residents of the Asutifi district, 25.3% on the other disagreed (DA) that mining poses any food security threat in the district whereas 7.3% were indifferent or uncertain (U) about mining posing food security threats. Furthermore, a consistent pattern was realized on the responses about mining and food insecurity from the occupational groupings of the respondents. From a crosstabulation analysis spelling out specifically the respective occupation of the respondents and their views on mining and food insecurity in the district, Table 8 shows that 64.3% of the respondents who were farmers agree (A) mining poses food security threat, 29.5% disagree (DA) whereas 6.2% were uncertain (U). For respondents who were traders, 80.0% agree (A) that mining poses food security threat, 8.0% disagree (DA) and 12.0% were uncertain (U). Respondents who have secured employment with the mining company, Newmont showed that 60.0% agree (A), and 40.0% disagree (DA) on the view that mining poses food security threat. For respondents employed by the government in the district, their views on mining and food security was apt with all of the respondents

(100%) agreeing (A) to mining and the threat of food insecurity. The result is a confirmation of a general response of the residents in the district that mining operations in the Asutifi district poses a food security threats to the residents in the years ahead.

Table 8 Occupation * food insecurity Crosstabulation

		food insecurity			Total
		disagree	uncertain	agree	
Occupation	Farmer	33	7	72	112
		29.5%	6.2%	64.3%	100.0%
	Trading	2	3	20	25
		8.0%	12.0%	80.0%	100.0%
	Newmont workers	2	0	3	5
		40.0%	.0%	60.0%	100.0%
	Government workers	0	0	3	3
		.0%	.0%	100.0%	100.0%
	Others	1	1	3	5
		20.0%	20.0%	60.0%	100.0%

Although with this result, a cursory overview of the residents' views on mining operations in the Asutifi district and food insecurity can be ascertained, it does not give the actual variations in views among the residents from their occupational standpoint on the variables of mining operations and food insecurity and whether such views as expressed by the residents is significantly varied or similar. To establish such variations or differences in views among the occupational categories, the One-Way Analysis of Variance (ANOVA) test was useful in determining the variations in the views of the residents about mining and food insecurity in the district.

From the test statistic, the Mean (M) and the Standard Deviation (SD) scores for the various occupational grouping of respondents, that is, Farmers (F), Traders(T), Newmont workers(NW), Government Workers (GW) and Other occupation (O) were (*F(M)=2.35, SD=0.908), (T(M)=2.72, SD=0.614), (NW(M)=2.20, SD=1.095), (GW(M)=3.00, SD=0.000), (O(M)=2.40,SD=0.869*). See Table 9 below.

Table 9 Occupational groups Means (M) and Standard Deviations (SD) on mining and food insecurity

food insecurity	N	Mean	Std. Deviation
Farmer	112	2.35	.908
Trading	25	2.72	.614
Newmont workers	5	2.20	1.095
Government workers	3	3.00	.000
Others	5	2.40	.894
Total	150	2.42	.869

The Mean (M) and Standard Deviation (SD) scores on variation in the views of the residents on their occupational grouping showed slight variation if any in the similarity of their views about mining posing food insecurity threat to the residents of Asutifi district with only the Government workers (GW) having a Mean *(M)= 3.00*. An occupational grouping One-Way between groups Analysis of Variance conducted revealed a no statistically significant difference or variation in views on mining and food insecurity in the Asutifi district among the various occupational groups with the test showing a *P* value of *P= 0.249*, *f =1.020* at a 0.05 significant level (α = *.05)*(See Table 10 below).

Table 10 ANOVA

Food Insecurity	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.080	4	1.020	1.364	.249
Within Groups	108.460	145	.748		
Total	112.540	149			

Non significant at *P>0.05*

The implication is that among the various occupational groups of respondents in the Asutifi district, their views on mining operations posing a threat to food security for the district in the years ahead are same or similar and that no differences or variations exist among the residents in their thinking about mining and its threat to food security and a secured livelihood. However, since the Probability *(P)* value (Sig value) for the ANOVA test does not tell which occupational means are different, a more comparative test for the various occupational groups is made. It could be that there might be significant variations or that the views of farmers might be significantly different from traders and the rest of the occupational groups. It could also be that all conditions might be significantly different from each other and vice versa. For this type of comparative test for occupational groups, the Post-Hoc Comparisons using the Tukey HSD test was used.

Table 11 Multiple Comparisons for occupational groups on mining and food insecurity food insecurity
Tukey HSD

(I) Occupation	(J) Occupation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Farmer	Trading	-.372	.191	.299	-.90	.16
	Newmont workers	.148	.395	.996	-.94	1.24
	Government workers	-.652	.506	.699	-2.05	.75
	Others	-.052	.395	1.000	-1.14	1.04
Trading	Farmer	.372	.191	.299	-.16	.90
	Newmont workers	.520	.424	.735	-.65	1.69
	Government workers	-.280	.528	.984	-1.74	1.18
	Others	.320	.424	.943	-.85	1.49
Newmont workers	Farmer	-.148	.395	.996	-1.24	.94
	Trading	-.520	.424	.735	-1.69	.65
	Government workers	-.800	.632	.712	-2.54	.94
	Others	-.200	.547	.996	-1.71	1.31
Government workers	Farmer	.652	.506	.699	-.75	2.05
	Trading	.280	.528	.984	-1.18	1.74
	Newmont workers	.800	.632	.712	-.94	2.54
	Others	.600	.632	.877	-1.14	2.34
Others	Farmer	.052	.395	1.000	-1.04	1.14
	Trading	-.320	.424	.943	-1.49	.85
	Newmont workers	.200	.547	.996	-1.31	1.71
	Government workers	-.600	.632	.877	-2.34	1.14

*** Farmers, Trading, Newmont workers, Government Workers, Others =Non significant at *P>0.05*

From The Post-Hoc comparisons using the Tukey HSD test, the *P* values recorded for Farmers (F) as against the other occupational groups (major row 1) are as follows; Trading*(P=0.299),* Newmont workers*(P=0.996),* Government workers (*P=0.699)* and Others (*P=1.000).* In comparing further, the views of Newmont workers (major row 3) against farmers *(P=0.996),* Trading *(P=0.735),* Government Workers *(P=0.984)* and Others *(P=0.943),* a consistent pattern in the views of the various occupational groups on mining and food insecurity in the Asutifi district emerge. Again, similar scores in *P* values were also recorded when the other occupational groups are compared among each other for major row 2, 4 and 5. From the result, there is a consistent pattern in the *P* value scores among the various occupational groups with each group showing a *P* value score of above the *0.05* significant interval when compared against each other. The effect is that in terms of views among the various occupational groups, there is no statistically significant difference or variations on their views on mining operations and food insecurity in the Asutifi District in the years ahead. This pattern of views among the occupational groups confirms the ANOVA test that also showed a no statistically different variation in the views of residents of Asutifi recording a *P* value of *P=0.249*. Hence, it can be concluded that for most people in the Asutifi district, irrespective of one's occupation, their views on mining operations and its effect on food insecurity is one of an 'agreement' that mining operations in the district poses a threat to food security in the years ahead.

Conclusion

The study set out to investigate mining operations in the Asutifi District and how the livelihoods of the district residents are influenced by mining activities. Particularly, the study focused on how mining have impacted on food production and supplies to the local markets in the district and whether there have been any significant changes in food supplies and availability in the local markets in the district. Residents' views on mining and a secured livelihood in terms of food security were also analysed.

It was found out that majority of the respondents had some form of basic education with 38.7% having attained Primary school education, 23.35% had JHS education, 4.7% had SHS education with 2.7% having attained tertiary education. However, 30.7% of the respondents had no formal education. With 74.7% of the respondents being farmers, it is believed that their knowledge level could impact positively on the agricultural practices they adopt to maximize production.

On crop yield output, the respondents noted that crop yields have reduced since mining started. 96.7% of the respondents indicated that average crop yields have reduced and largely attributed it to mining operations due to land degradation associated with the mining activities causing the once fertile lands to lose its fertility. However, 3.3% of the respondents did not agree that mining caused the crop yields reduction and noted that even if the average crop yields have reduced, it was due to the size of lands ceded to Newmont Goldmining (GH) Limited which has reduced significantly the acreage of land that farmers initially had for farming purposes and not the mining operations itself.

At trend analysis of some selected crops produced in the district, particularly Cocoa, plantain, cassava and oil palm showed a reduction in yield output since mining started in the district. Respondents indicated that the reduction has affected supplies of foodstuffs and other staples to the local markets for sale since most of the markets secure their foodstuffs from the local farmers in the district. It was found that the local traders in the markets in the district have to travel outside the district to other towns to buy foodstuffs to augment the local supplies from the district farmers since their supplies cannot meet the local demand and consumption in the district.

However, the analyses of the relationship between mining and the supply of foodstuffs to the markets using the Chi-Square ($\chi 2$) test showed a no statistically significant relationship between mining operations in the district and the supply of foodstuffs to the local markets with a Chi-Square ($\chi 2$) value being ($\chi 2$) *=0.409* and a *P* value of *P=0.522* at a 0.05 significant level (*α = .05).* This result runs counter to the claims by the respondents that it is mining operations that have caused a reduction in the supply of foodstuffs to the local markets in the Asutifi district. The Phi and Cramer's V test which measures the strength of association also lend support to the Chi-Square ($\chi 2$) test by showing a weak association between mining and foodstuffs supply to the local markets with *P* values of Phi test being *P= 0.522* and that of the Cramer's V being *P=0.522* respectively.

However, most of the respondents (67.3%) agreed that mining in the district poses food security threats for the residents in the district for the years ahead. The One-Way between groups Analysis of Variance (ANOVA) that tested the views of the respondents by their various occupational groupings revealed a non statistically significant difference or variations between the occupational groups on their views on mining and food insecurity in the future for the district residents recording a *P* value of *P=0.249* at 0.05 significant level (*α = .05).* A comparison of the variations in views between the occupational groups using the Tukey HSD Comparison test showed a consistent pattern of no statistically significant difference or variations in the views of the occupational groups when compared against each other, with each compared group recording a *P* value above the 0.05 significant level. All the occupational groups therefore agreed that mining poses a threat to food security for the residents of Asutifi district with no variations or differences in their views.

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