

*Full Length Research Paper*

# Environmental and rural livelihoods implications of small-scale gold mining in Talensi-Nabdam Districts in Northern Ghana

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Received 22 May, 2014; Accepted 23 September, 2014

Small-scale mining (SSM) continues to pose complex environmental, health and livelihood problems among rural folks in mining communities. One of the most subtle impacts of SSM activity on the environment is its implications on rural livelihoods. However, most studies regarding SSM activity and the environment sideline their implications on rural livelihoods of residents mining communities and how the affected communities cope with such effects. The purpose of this study was to examine the environmental impact of SSM small-scale mining and its implication on the rural livelihoods of Yale, Digari and Datuko in the Talensi-Nabdam Districts in Northern Ghana. Also examined in this study are the adaptive strategies employed by affected members to cope with the SSM activity in the study area. This has become necessary as rural folks are the hardest hit in terms of the negative effects of small-scale mining. Adopting qualitative research approach in sourcing data, the study demonstrated an interesting linkage between the SSM activity, the natural environment and rural livelihoods as the activity tends to destroys more sustainable natural resource based and rural livelihoods and also provides and diversifies other non-mining livelihood sources. Hence affected community members tend to adapt strategies to cope with SSM activities. The contention of this article is that there is the need for effective collaboration of stakeholder both at the local and national level on policy making and implementation on SSM small-scale mining activities and environmental management.

**Key words:** Small-scale mining, rural livelihoods implications, farming, Talensi-Nabdam Districts, Yale, Digari and Datuko

## INTRODUCTION

There is a recent heightened interest and unprecedented upsurge in the small-scale mining industry in Ghana (Mining Journal, 2010; Minerals Commission, 2010; Awudi, 2002). The Talensi-Nabdam District situated in,

the Upper East of Ghana is no exception (Agyemang small-scale mining industry in socio-economic, socio-cultural and political development, poverty reduction and improved standards of living (Hilson, 2006) depicts the

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thriving nature of the industry today (Hilson, 2006). However, ironically it is sad unfortunate to 2012), hence cannot go unnoticed. The imperative role of note that emissions waste disposed from small-scale mining resulting from the method of extraction and processing causes serious environmental problems which affect health and livelihoods of residents of most mining communities (Agyemang, 2010; Obiri et al., 2006). Small-scale mining activities also violate human rights of residents of mining communities and sometimes adjoining communities (CHRAJ, 2008). As at 2009, the government of Ghana had granted over 200 mining licences and leases, with about 128 local miners and 51 foreign miners (Mining Journal, 2010). It is estimated that over 100,000 people are small-scale miners in Ghana (Minerals Commission, 2010) and about 60,000 are estimated to be illegal-miners or 'galamsey' operators (Obiri et al., 2006).

The Talensi-Nabdam District of the Upper East Region of Ghana has witnessed a massive influx of migrants, both locals and foreigners, especially in communities of Yale, Dakute and Degari since the liberalisation of small-scale mining in 1989 (Awumbila and Tsikata, 2010; Talensi-Nabdam District Report, 2009; Bolgatanga District Assembly Report, 2002). Even though small-scale mining is legalised in Ghana, most small-scale miners have not registered with the Minerals Commission, thus are illegal (Awumbila and Tsikata, 2004). Illegal small-scale mining is swaying in the district, specifically Yale community (CHRAJ, 2006). About 17% percent of the small-scale miners in the Talensi-Nabdan district are illegal operators ("galamsey") (Agyemang, 2010). According to Hilson (2001), most small-scale miners tend not to comply with existing mining laws due to lack of strict enforcement, supervision and regulations. Awumbila and Tsikata (2004) also argue that small-scale miners have no intention of been illegal but due to several constraining factors they encounter in the processes of licensing and registration of their operations. Other reasons for illegal small-scale mining ("galamsey") include; unemployment, insufficient institutional support, uncooperative large-scale mining companies among others (Hilson and Potter, 2003). This illegal sector is of the greatest cost to the natural environment in the Talensi-Nabdan District (Hilson, 2001). Nevertheless, the findings of Agyemang (2012) revealed that the driving forces of environmental changes or impact in the Talensi and Nabdan areas include both illegal and legal small-scale miners. Both legal and illegal small-scale mining has environmental, health, economic and social effects. Small-scale mining tends to destroy vegetation and farmlands, causes pollution, creates open pits, and causes displacement of people (Teschner, 2012; Agyemang, 2010; Obiri, et al., 2006; Hilson, 2002a). Over 70% of the total land area in Tarkwa is open pit large-scale mining concessions, destroying farm lands as well as vegetation in the area (Akabzaa and Darimani, 2001). The major environmental problems in the Talensi-Nabdan

District include; land degradation, digging of pits and upturning of vegetation, uncovered deep underground mining pit and erosion (Awumbila and Tsikata, 2004). This is also evident in the district report, as land degradation, open pits, farmlands destruction, the displacement of people and water pollution are major threats by illegal surface mining (Talensi-Nabdam District Report, 2010).

Toxic chemicals include mercury, cyanide arsenic, lead and copper pollute underground waters and streams. These chemicals pose treats to ecological and aquatic animals as well as health threats to miners and the people in surrounding communities (Akabzaa et al., 2009; Obiri et al., 2006). The rampant spillages of cyanide and mercury by small-scale miner pollutes water bodies, affects food crops and human health (Agyemang, 2010; Obiri et al., 2006). In 2005, an investigation of the spillage in Kokoteasua was reported to be caused by small-scale miners (Obuasi Mine Report, 2006). Similar incidents are happening in Kibi, Obuasi, and Tarkwa among others. A research conducted in the Talensi-Nabdam District revealed that over 5% of the people had mercury level over the WHO value of 50 ug/L. This was due to the high pollution of the streams and rivers (Paruchuri et al., 2010). Different studies in the district reveal that the common health hazards in the district include malaria resulting from waters in pits, respiratory infections, tuberculosis, skin diseases and miscarriages (Agyemang, 2010). Nonetheless, small-sale mining has not only led to environmental damages but also violated some basic human rights of surrounding communities (CHRAJ, 2008). Small-scale mining activities deny people in the district the right to clean water, health, nations and rural livelihood foundations (CHRAJ, 2006; Kumah, 2006). The most recent violated human rights in the district are the displacement of people, the destruction of farmlands, and the inadequate/ lack of compensation to community members. According to a press release by a movement in the district, the Movement of Gbane People for Justice (MOGPEJ), 527 farmers are displaced and 3000 economic tress (Shea nut trees) are destroyed by a Chinese company "hiding" behind two small-scale mining companies "Yenyeya and Porbortaba". MOGPEJ also reported that the company had illegally acquired 747 acres of land without compensation (GNA, 2012).

Although policies and legal frameworks such as the Minerals and Mining Law, PNDCL 153 (Government of Ghana, 1986; 2006), The Small Scale Mining Law, PNDCL 218 (Government of Ghana, 1989a) and institutions such as the Minerals Commission, Ghana Chamber of Mines, Environmental Protection Agency (EPA) are put in place to protect the environment and the welfare of Ghanaians, most small-scale miners still operate unsatisfactorily (Minerals Commission; 2010). A study by Agyemang (2012), using community truth approach, indicated that some areas like Nangodi in the Talensi-Nabdan District, experienced little effects of small-scale

mining after the legislation but it became rampant due to the refusal of Mineral Commission to listen to their concerns and plight. The unlawful activities by miners in the district are attributed mainly to the lack of monitoring and supervision (Hilson, 2008). Nevertheless, the question is, how has the environmental consequence resulting from small scale mining affected livelihoods. Existing studies reveal that environmental consequences most especially from surface mining such as land degradation and pollution often erode rural livelihoods, displace people and hence forcing these people to develop alternative sources of livelihoods (Kumah, 2006). According to Hayes (2008), the destruction of vegetation and farmlands by miners affect agriculture and food security. Pollution resulting from small-scale mining affects both livestock and aquatic activities. He also argued that small-scale mining tend to drive people from more sustainable livelihoods such as farming to other alternative livelihoods which lead to the possible destructions of fertile lands for resources. In this regard, such alternative livelihoods engaged by these rural folks tend to further destruct the environment (Banchirigah and Hilson, 2010) and in the long run expose rural livelihoods to unsustainable risk (Adjei, 2007). Dominant livelihoods in the Talensi and Nabdam areas are farming which includes poultry, crop farming and livestock rearing, shea nut picking, extraction of firewood or fuel picking and hunting (Talensi-Nabdam District Report, 2010; Awumbila and Tsikata, 2004). A recent report by GNA Ghana News Agency (2012) revealed that livelihoods such as farming, shea nut picking were affected due to the displacement of about 527 farmers and the destruction of about 3000 shea nut trees. The underpinning concern is, should a country continue with a course whose negative effects on citizens appear to outweigh the positives as suggested by some studies? According to Awudi (2002), gains and achievements in the sector are at a very great cost to the environment, health and the livelihood of the people. Schueler et al. (2011) argue that the cost may be much higher than previously perceived due to the rapid eroding livelihood foundations of rural folks resulting from mining. The need for this study in the Talensi-Nabdam District gives emphasis to the statements, "Is land degradation, pollution, displacement of people and their rural livelihood foundations in mining communities a price for mining communities for possessing mineral resources in their communities?" "Small-scale mining is a necessary evil, what sustainable strategies can be adopted to benefit both miners and the communities concerned?" "Large-scale miners undertake corporate social responsibilities, what social responsibilities are undertaken by small-scale miner?" Following the discussions above, there is the impression that, there are numerous exertions in the form of policy, research or studies on small-scale mining and its environmental implications in the world, Africa and Ghana. In most Africa countries like Ghana, attention is noted to be given to small-scale mining and its

environmental effects (Aryee et al., 2003; Amankwah and Amin-Sackey, 2003). With regard to the Talensi and Nabdam areas, some studies have been done on small-scale mining and the environment (Agyemang, 2012). Studies have also been done on migration dynamics and small-scale mining (Agyemang, 2010; Awunbila and Tsikata, 2004), and child labour and small-scale mining (Hilson, 2008). Despite the interesting insight provided by these studies on the environmental consequences and small-scale mining, ironically, neither of them clearly analyse environmental consequences emphasising on implications on rural livelihoods in the Talensi and Nabdam areas and how these rural folks cope with SSM activities. Nevertheless, Yale, Datuku and Digari communities possess distinct cultural, social and physical environmental characteristics from other study areas. Again, before the advent of SSM in the study area, residents of these communities were among the largest producers of food crops in the district; today, these three communities are among the least producers of food crops and the poorest communities in the district despite their rich endowment in gold and other natural resources. Equally, studies on sustainable strategies that can be adopted to benefit both small-scale miners and communities affected, despite the environmental consequences caused by miners in Yale, Datuku and Digari, are scanty. The problem of this study is entrenched in this stare, the incessant environmental consequences resulting from crude small-scale mining on rural livelihoods in Yale, Datuku and Digari, coupled with the difficulty in adapting strategies that will benefit both small-scale miners and affected communities concerned. The study therefore seeks to identify rural livelihoods that are affected by small-scale mining and to find out how these affected communities are coping with small-scale mining activity.

### Profile of study area

The study area encompasses Yale, Datuko and Digare. These three communities are geographically found in the Talensi-Nabdam District, located at the North-eastern part of Ghana. In terms of distance of the three communities to their mining sites, Yale and Datuko communities are closer to their mining sites which is approximately 0.5 Km. However, the distance from Digari community to its mining site is about 1km. The three communities fall within the Talensi-Nabdam District, located in the Upper East Region at the North-eastern part of northern Ghana. The Talensi-Nabdam District Assembly (TNDA) was carved out of the Bolgatanga Municipal Assembly in 2004. It lies between latitude  $10^{\circ} 15'$  North and  $10^{\circ} 60'$  North of the equator and longitude  $0^{\circ} 31'$  West and  $1^{\circ} 0.5'$  West of the Greenwich meridian. The District has a land area of 912 sq. Km. Based on the Population and Housing Census (Ghana Statistical Service, GSS 2012),

the total population size of the district is 115,020 made up of 57,318 females and 57,702 males (Ghana Statistical Service, 2010). There are two main dialects spoken, Taleni and Nabit. The District Assembly shares boundaries with the Bolgatanga Municipal Assembly to the North, Bawku West District to the East ; West and East Mamprusi Districts to the East, Kasena-Nankana East District to the West (Talensi- Nabdam District Assembly, 2010). In terms of climate the district lies within the tropics and characterized by two seasons. The two are the short rainy season which starts from May to October, and the long dry season which begins from October and ends in April. The district has a mean rainfall of 88-110 mm and an annual rain fall of 950 mm. It has a maximum temperature of about 45°C in March and a minimum temperature of 12°C in December. The district lies within the Guinea Savannah woodland vegetation type consisting of deciduous trees such as baobabs, dawadawa, shea, and ground flora grasses (Talensi-Nabdam District Assembly, 2010). Topographically the district falls within the Birimian, Tarkwaian and Voltarian rocks of Ghana. Relatively it has an undulating lowlands and with gentle slopes ranging from 1 to 5% gradient and some rocks. The **district** is drained by Red and White Volta and their tributaries. With regards to economic activities, agriculture is the main source of employment for the people, 90% are engaged in crop production. Other economic activities undertaken are mining, fuel wood extraction and food processing. Due to the soil types, geological structure, and vegetation, crops grown in the District include maize, millet, guinea corn, groundnuts, potatoes and vegetables.

## RESEARCH DESIGN

According to Creswell (2009), research designs are plans and procedures for research that span decision from broad assumptions to detailed methods of data collection and analysis. Bryman (2008) adds that the research designs provide frameworks for data collection and analysis. Thus, cross-sectional design is chosen for this study to provide a framework for data collection and analysis. A cross-sectional design “entails the collection of data in more than one case (usually more than one) and at a single point in time to collect a body of quantitative or quantifiable data in connection to two or more variables (usually many more than two) which are examined to detect a pattern of association (Bryman, 2008). The cross-sectional design thus was appropriate in studying the three communities in the Talensi and Nabdam areas. This was because the study involved the study of three different communities on relevant issues on SSM, the environment and rural livelihoods at a single point in time. It also involved the collection of data on these issues to establish a connection or association among them. Again, the choice of the cross-sectional

design is influenced by the fact that, it supports the research strategy adopted and the intended objectives. Bryman (2008) argues that the cross-sectional design supports a mixed strategy, where qualitative and quantitative data can be collected concurrently.

## RESEARCH METHODOLOGY

The study obtained data from both primary and secondary sources. Primary data from key informants and focus group participants was obtained through field surveys such as self-administered questionnaire, semi-structure interviews and researcher’s observation. Secondary data on small-mining, environmental and livelihood policy information were obtained from institutions such as the Minerals Commission in the Upper West Region, The Regional Office of the Environmental Protection Agency, Ministry of Minerals and Natural Resources, District Assembly and Ghana Statistical Service (GSS). Desk research on relevant books, academic publications and reports, articles, magazines, government publications also served as secondary data sources.

### Methods of data collection

The study employed Land Satellite Imagery, self-administered questionnaire, semi-structured interviews, observation and text and document reviews to collect relevant data for analysis and validation of findings. The employment of all these data collection methods helps to ensure validity and reliability.

### Semi-structured interview

Semi-structured interview refers to a context in which an interviewer has a series of questions that are in the general form of an interview guide but is able to vary the sequence of questions (Bryman, 2008). He further argues that such an interviewer has some latitude to ask further questions in response to what are considered as relevant replies.

Semi-structured interview was used to collect data from key informants such as the Minerals Commission, Assembly members, the District Assemblies and traditional leaders. With regards to this, one (1) respondent was interviewed from the Minerals Commission, three (3) assembly members and three (3) traditional leaders each from the three communities under study. Other interesting stakeholders such as youth movements group in the study area were also interviewed. The study chose this technique for key informants because the semi-structured interview made room for supplementing and validating information obtained from members of the three communities. Bryman (2008) argues that semi-structured interviews are flexible and thus easy to probe. Thus, the researcher was able to prompt and probe deeper into relevant and confront unknown issues related to the research objectives.

### Self-administered questionnaire

Another data collection tool employed in this research to obtain data was questionnaire. A questionnaire consists of a set or series of questions used to collect data from respondents (Bryman, 2008). This could be under the supervision of the researcher or not. Bryman (2008) argues that self-administered questionnaire becomes self-completion questionnaire when it is under the supervision of the researcher. Questionnaire under the supervision of the researcher was administered to miners and members of the

three communities on the impact of small-mining on the natural environment and how it affects rural livelihoods. For the purpose of this study one hundred and sixty questionnaires were administered to miners and members of the three communities.

### **Participant observation**

Participant observation is the process of enabling the researcher to learn about the activities of people under study in the natural environment through interaction, observation and participation in those activities (Bryman, 2008; DeWalter and Dewalter, 2002). DeWalter and Dewalter (2002) argue further that participant observation aims at developing a holistic understanding of the phenomenon under study, hence increasing validity. Participant observation was used to provide an in-depth knowledge on how miners extract and process gold and the changes in landscape aesthetics in the Talensi and Nabdam areas. The researcher undertook several visits to the three communities to watch, listen and take photographs of how gold ore are extracted and processed and some environmental effects of S small-scale mining on the environment and rural livelihoods. The purpose of these plates was to present a pictorial impression of environmental and livelihood consequences of SSM. The method adopted, alongside processed satellite landsat images, questionnaire, semi-structured interviews and document analysis, was to strengthen validity as argued by DeWalter and Dewalter (2002).

### **Sampling techniques**

As a result of the mixed research strategy or triangulation research approach, the study employed both stratified random sampling and purposive sampling techniques. Due to the heterogeneous characteristics among respondents, stratified random sampling technique was used to sample miners and community members for interviews. The stratification was based on miners and community members in the three areas of study. This was necessary to help ensure accurate and proportionate representation as well as effective generalization of their responses for the populations in the communities. Bryman (2008) supports this by arguing that simple random and stratified random sampling techniques are imperative probability sampling techniques that ensure effective generalization of a research finding. Purposive sampling technique was used to sample staff of the Talensi and Nabdam Districts, the Minerals Commission, Traditional authorities and youth groups. These subjects are selected based on their knowledge of the research questions (Bryman, 2008).

### **Sampling Frame**

The sampling frame consisted of 170 respondents sampled. 160 non-key informant comprising miners (65) and members of the three communities (Yale comprised 35 respondents, Datuko comprised 30 and Digari was made of 30 respondents) and 10 Key-informants comprising staff from Minerals Commission (1), the Talensi - Nabdam District Assembly (2), Traditional authorities such as chiefs and Tindanas (3) and Assembly members (3) and MOPPEJ (1). The variation in number of sampling unit among the communities and miners was based on their population sizes as well as the three communities' closeness to the mining sites.

## **RESULTS AND DISCUSSION**

To comprehensively understand the effects and

implications of small-scale mining on rural livelihoods and the coping or adaptive strategies to small-scale mining by affected members, the empirical findings of this study are discussed using the Sustainable Livelihood Approach or Framework (SLA) and the Mining Induced Displacement and Resettlement Approach (MIDRA). This is because these two approaches formed the theoretical frameworks upon which this study was grounded.

### ***Rural livelihoods affected by small-scale gold mining***

The claim of Obiri et al. (2012) that "rural livelihoods" are designed based on their natural resources is evident in TND.

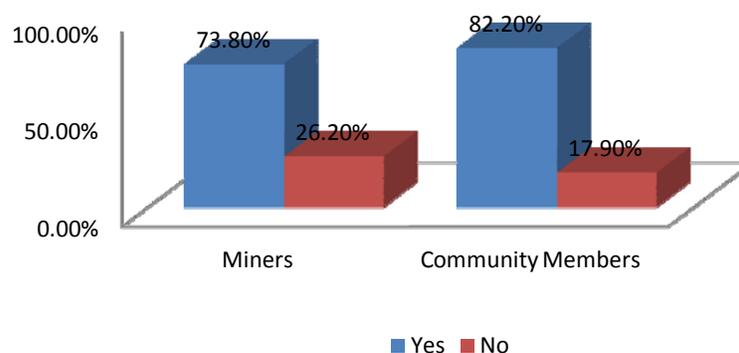
Most of the research participants said that before the advent of small-scale mining, in the study area the major sources of livelihoods were farming, hunting, fishing, shea nut picking and herbal medicine and in a few cases trade. Research participants were of the opinion that the small-scale mining in the three communities had destroyed most of these sources of livelihoods. Most participants acknowledged that small-scale mining in the study area had negatively affected either their own livelihoods or members of their households (Figure 1).

Respondents who admitted that small-scale mining had affected livelihoods, most of them acknowledged that farming was mainly affected, compared to the other livelihoods in the communities (Table 1). 15.6% admitted trade only, 9.4% acknowledged agriculture and trade were affected, 8.6% specified others and mentioned livelihoods like fishing, firewood picking, hunting and shea nut picking. The remaining 21.3% claimed neither them nor any of their households' livelihoods were affected.

### ***How does small-scale mining affect farming as a source of livelihood?***

Agriculture is the dominant source of livelihood of the three communities; respondents highlighted crop farming, livestock rearing and fishing as the sectors of agriculture affected by the small-scale mining activity. In this regard, most participants claimed that the small-scale mining activities had caused the death of livestock, theft of animals, unproductive farming lands and low farm labour productivity. However, a few respondents claimed that the small-scale mining had led to improvement in farming activities (Table 2).

From Table 2, a key concern is the death of livestock which respondents (15.6%) argued to be related to the use of chemicals such as mercury and cyanide in processing gold. According to respondents, the use of such chemicals has polluted the water bodies, grasses and created stagnant polluted water in pits and around the communities hence deaths of farm animals. Other participants argued that the use of these chemicals also prevents the growth of grasses which is necessary for



**Figure 1.** How Small-scale mining affect households' source of Livelihood(s). Source: Fieldwork Data Analysis, 2013.

**Table 1.** Livelihoods affected by small-scale mining.

Affected Livelihoods	Frequency		Total
	Miners	Community Members	
Agriculture only Farming	28	44	72 (45%)
Trading only	10	15	25 (15.6%)
Farming and Trade	6	9	15 (9.4%)
Others	4	10	14 (8.6%)
Not applicable	17	17	34 (21.3%)
Total	65	95	160 (100%)

Source: Fieldwork Data Analysis, 2013.

**Table 2.** How small-scale mining affects agriculture.

How Agriculture Farming is Affected by SSM	Frequency		Total
	Miners	Community members	
Death of Livestock	9	16	25(15.6%)
Theft of Livestock	12	9	21(13.1%)
Unproductive Farmlands	6	15	21 (13.2%)
Reduction in Agriculture Farming activities (reduction in farm labour)	4	11	15(9.3%)
Improvement in Agriculture farming activities (increase in farm labour)	3	2	5(3.1%)
Not Applicable	31	42	73 (45.6%)
Total	65	95	160(100%)

Source: Fieldwork Data Analysis, 2013.

livestock grazing. This was buttressed by the Assembly woman of Datuko, who claimed that; "... *tailing sold to the foreign miner is been processed again in the forest with cyanide; this chemical kills every living thing (plants and animals) that comes into contact with it. When our animals get into contact with this chemical they die...*" One of the major social costs of small-scale mining discussed in the previous section was the high rate of crime. A prominent manifestation of crime associated

with the prevalence of SSM is theft, 15.6% of the respondents argued that, the theft of their property most especially livestock was a major effect of small-scale mining. Respondents claimed that their livestock that move into the mining sites often get missing and are suspected to be stolen or in some cases get trapped in uncovered pits. Few respondents (13.2%) also claimed small-scale mining in the three communities had led to the development of unproductive farmland, and this has

resulted in low farm output. In their view, the small-scale miners invade their farmland and after extracting gold they do not undertake any form of land reclamation thus creating bare lands and exposing their farmlands to severe erosion, pollution and flood, especially during the rainy seasons. The researcher encountered a number of individuals and families who claimed their farmlands both in the bush and at home were used by miners without any form of land reclamation. A participant stated that; "apart from taking over our land at the bush some come into our communities and compete with us for our farmlands". Interestingly, respondents presented two phases in terms of the supply of farm labour. While some respondents (9.3%) claimed that SSM activity had decreased the supply of labour in farming, other respondents (3.1%) claimed that SSM had rather increased labour for farming. According to those who argue that the activity had led to an increase in supply of labour in farming, as income generated from the mining activity is often used to increase their farmland sizes and employ extra labour during the rainy season. An interview with a traditional leader suggests both claims were right but a reduction in farm labour was rather high. According to him; "Digari is noted as one of the intensive farming communities in the District but after the advent of mining in the community most of the young men have moved to the mining site at the expense of farming. Only a few return or sent income to their families' to undertake farming activities during the rainy season..."

It is possible therefore to argue based on these findings that, where neither a respondent nor any member of his household is engaged in SSM activities but only agriculture, they are likely to incur more cost of securing additional labour for agriculture production. The reverse is true for respondents or household members engaged in SSM.

### **Small-scale mining and its impact on trade and other sources of livelihood**

Another important source of livelihood which is affected by small-scale mining is trade (Table 1). Participants who acknowledged that the small-scale mining had impacted on trade argued on the establishment of new, expansion and diversification of trade in the communities of study. Observation on the field revealed a number of trading activities; prominent among them were food vending, kiosks and sales of water among others. Other participants specified livelihoods affected by small-scale mining to include hunting, fishing and picking of shea nuts. Hunting in general was almost abandoned due to the mining activities. Findings from this research revealed that the higher income earnings from mining activities alongside the forest destruction, vibrations and explosives use have driven animals away. Another common source of livelihood which was argued among participants, mostly women to have been affected by the activity was

shea nut picking. The clearing of shea trees by miners during gold extraction was also reported by participants to have affected shea nut production since such trees were cut down. On the effect on fishing, respondents claimed not only were they not getting enough fish but that stock of fish easily go bad in a very short time. This was suspected by participants to be as a result of bioaccumulation from polluted water and mining activities. Based on the above findings, it is evident that farming is the most affected source of livelihood in the three communities under study and as observed by the research participants. The destruction of agricultural activities through death and theft of livestock, rendering agriculture land unproductive and the reduction of agricultural activities through the loss of farm labour reflect the finding of Obiri et al. (2012) and Hayes (2008), Shoko (2002). It is further noted in these previous studies that vegetation destruction and pollution of land and water bodies by small-scale miner have destroyed livestock grazing, crop cultivation, aquatic and livestock life. However, the view of Philip (2006) that due to higher earning in mining activities contrast to earnings from livestock rearing and crop farming explains the reason for low labour turn out for agriculture activities. Most of the respondents were of the opinion that despite the negative effects of the mining activities in the three communities, its operation has improved other sources of livelihood. Particular emphases, per participants, were the establishment of new trades, expansion and diversification of trading. This reflects the views of Hayes (2008); He viewed trade as a short term source of wealth and exploitative resulting from SSM. It might therefore be prudent to establish, based on the responses from participants, that some community members who are not directly involved in the mining activity have taken advantage of it to establish other supplementary or alternative sources of livelihoods at the expense of more sustainable sources of livelihood like peasant farming. This, according to participants, may be the reason behind the low turnout of labour farming.

### **Coping strategies**

The study also sought to assess the coping strategies undertaken by community members whose livelihoods are affected by small-scale mining. Out of the 126 respondents who claimed their livelihoods were affected, 109 (86.5%) admitted adopting strategies while the remaining 17 (13.5%) claim they did not put any adaptive measures. Table 3 shows coping strategies undertaken by community members whose livelihoods were affected by the small-scale mining activities.

### **Land reclamation as an adaptive strategy to cope with small-scale mining**

Few of the participants acknowledged land reclamation

**Table 3.** Coping with the small-scale mining activity.

<b>Adoptive measure to cope with SSM</b>	<b>F</b>	<b>%</b>
Land Reclamation	20	15.9%
Resettlement of Farmlands	31	24.6%
Control of Animal Movements or tethering	13	10.3%
Resort to Mining	26	20.6%
Resorting to Alternative livelihoods alongside agriculture	19	15.0%
Do nothing	17	13.5%
Total	126	100%

Source: Fieldwork Data Analysis, 2013.

was a strategy some community members have adopted to cope with the mining activities. Some of the respondents acknowledged that some small-scale miners undertake land reclamation activities while others do not. For lands that have not been reclaimed by miners, respondents acknowledged community members undertake reclaiming degraded lands themselves. Research participants revealed how expensive land reclamation was to undertake, especially when they have to apply agro-chemicals and local manure to the soil.

### **Farmlands resettlements as an adaptive strategy to cope with small-scale mining**

Resettlement of farmlands was the dominant adaptive strategy chosen by respondents to cope with small-scale mining.

Research respondents also acknowledged that farmlands that were invaded and destroyed by the small-scale miners were abandoned. Thus farmers had to move further, sometimes to marginal areas to farm. In an interview with the representatives of Gbani Chief, he acknowledged that,

*“Land or farmland resettlement is the oldest and cheapest adaptive strategy in our communities, we all used to farm at the mining site but now we have moved to the bush to continue with our farming activities. This strategy is simple and cheap to adapt relative to other strategies; most farmers cannot afford agro-chemicals but rather rely on local manure which is not sufficient to retain the lost nutrient in the soil”* (Personal interview, 2013).

### **Resorting to small-scale mining and the control of animal movements**

Resorting to mining and the control of livestock movements were other coping strategy acknowledged by some of the research participants. One of the most difficult and expensive adaptive measures acknowledged by respondents was controlling the movement of livestock.

The respondents who admitted controlling or tethering their animals from getting to the mining site, their livestock was exposed to the risk of falling into mining pits, drinking polluted water and theft. This strategy as explained by respondents was more difficult and expensive during the dry season compared to the rainy season. Respondents admitted that during the rainy season animals were easily controlled and monitored, due to abundant grazing grounds, thus less expensive to feed when such animals are confined. Contrary, in the dry season, it became difficult and expensive to feed these animals if they are confined or tethered. Respondents added that the strategy required supplementary feed during the dry season and shepherding.

A female research participant confirmed this strategy when she explained that some households allow their children to shepherd the animals after school while some tend to encourage children to stay at home and shepherd these animals. Other respondents acknowledged small-scale mining as a last resort. This category of respondents sounded aggressive; they claimed that small-scale miners were enriching themselves at the expense of their sources of livelihood. Almost all the respondents explained that the destruction of farmlands left community members no choice than to sometimes engage in the small-scale mining activities. A 50 year old lady in Yale was quick enough to say *“...the farmland I depended on to farm during the short rainy season is invaded by miners. I confronted them I was almost beaten. Upon reporting them to the chief, no reasonable form of compensation was given to me yet I cannot farm on the land anymore. All I can say is I am only surviving”* (Personal Interview, 2013) (Figure 2).

Some of the respondents also acknowledged resorting to other alternative sources of livelihood but not completely ignoring farming. Such respondents indicated alternative sources of livelihoods to include, trading, firewood and charcoal burning alongside farming activities. These respondents shared the view that the single rainy season alongside the effects of the mining activities in their communities made crop farming and livestock rearing unsustainable. Though majority of the respondents were found to adapt different coping



**Figure 2.** Women in small-scale mining activity. Source: Fieldwork, May 2013

strategies, some of them acknowledged not adapting any strategy to cope with their livelihoods which has been negatively affected by the small-scale mining activity in the communities under study. Respondents in this category included those whose livelihoods were linked to shea nuts picking, hunting and fishing. It is possible to argue that adaptive strategies employed by some members implies that some community members have recognized that other rural livelihood sources such as agriculture are relevant and more sustainable in the long term compared to SSM. It is however also possible to argue that some destructive livelihoods such as shea nut picking, fishing and hunting were abandoned due to the huge capital or resources needed to adapt to such destructed livelihoods. For instance, shea trees are considered wild trees; it is also estimated that it takes 20 to 40 years to mature and bear fruits. Thus an individual will need a large piece of land with capital to embark on shea tree planting. Again, it is possible to argue that some adaptive measures discussed above are contributory factors to school dropouts in the three communities. Furthermore, some adaptive strategies such as resettlements of farmland implies that there is no competition for lands in these communities, thus emphasizing the argument of Awunbila and Tsikata (201), that there is less competition for lands in TND.

## Conclusion

The study revealed that, small scale mining has affected rural livelihood by lowering agricultural activities, reducing fishing, reducing shea-nut picking and firewood picking, and almost eliminating hunting. Small-scale mining was found to have affected farming by causing the death of livestock, theft of animals, unproductive farm lands and reduction of labour for farming activities. However, there were developments of new and diversification of new sources of livelihoods most especially in the sector of trade. Owing to the negative effect small scale mining

had on livelihood, majority of residents in mining communities had to devise ways of adapting to their changing livelihood conditions. The study found that, people whose livelihood were affected resort to land reclamation, resettlement of farm lands, strict control of animal movement, engaging in mining and other alternative livelihood for sustenance.

## Conflict of Interests

The authors have not declared any conflict of interests

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