

UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

**EFFECTS OF ARTISANAL AND SMALL-SCALE MINING ON FOOD SECURITY IN
DAKURUPE AND KUI COMMUNITIES OF BOLE DISTRICT**

LATIFATU-S. IDRIS

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BY

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UNIVERSITY FOR DEVELOPMENT STUDIES



DECEMBER, 2017

DECLARATION

Student

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere:

Candidate's Signature..... Date.....

Name:

Supervisor'

hereby declare that the preparation and presentation of the thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development studies.

Principal Supervisor's Signature..... Date:

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Co – Supervisor's Signature..... Date:

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ABSTRACT

The study analysed the extent of artisanal and small scale mining's effects on household food security in Dakrupe and Kui communities of the Bole District. Precisely the study ascertained the level of food security, explored the effects of ASM activities on food production and ascertained ASM activities effects on the dimensions of food security in Dakrupe and Kui communities of the Bole District. Based on a cross-sectional survey, the study employed simple random and purposive sampling technique in selecting 161 households out of a total of 205 for the study. Descriptive statistics were employed for the data analysis with the help of statistical package for social sciences (SPSS). The study discovered that the level of food security in Dakrupe and Kui is low thus inhabitants are largely food insecure. The communities are not food sufficient and depend much on neighbouring communities for food supply. The study also discovered that the activities of ASM has negative effects on food production in the two communities. Most farmers have abandoned farming to engage in mining, farm lands are used for mining hence farmers and potential farmers do not have access to arable lands to carry out farming activities and farming lands have become infertile due to deposition of chemicals in the soil by miners. These has negatively affected crop yield and the quality of food produced in the communities. The study recommends that in order to reduce food insecurity and poverty in the two communities, the government through the Ministries of Gender and Social Protection and Food and Agriculture in collaboration with the Bole District Assembly must acquire vast farming land from the *Tindanas*, this land should be protected from miners and should be given to persons willing to farm at a very high discounted rate. Persons willing to farm should also be supplied with funds and agricultural inputs at a discounted rate. This will create the motivation for people to engage in farming and thereby increase food production in the communities.



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DEDICATION

I dedicate this work to my parents, Mr. Francis Kukula and Mrs. Olivia Hawa Alhassan as well as my son Ayaan Dinko.



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List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ASM	Artisanal Artisanal and small-scale mining
CAADP	Comprehensive Africa Agriculture Development Programme
CASM	Communities and Artisanal and small-scale mining
CDS	Centre for Development Studies
DA	District Assembly
FID	Department for International Development
RP	Economic Recovery Plan
AO	Food and Agriculture Organization
NS	Food and Nutrition Security
DP	Gross Domestic Product
MO	Genetic Modified Organic Food
SS	Ghana Statistical Service
TZ	German Technical Cooperation
IV	Human Immune Virus
LO	International Labour Organization
MF	International Monetary Fund
I	Legislative Instrument
IC	Minerals Commission
IDGs	Millennium Development Goals
IMSD	Mining Minerals and Sustainable Development
GO	Non-Governmental Organization
HC	Population and Housing Census
MMC	Precious Minerals Marketing Corporation
PNDC	Provincial National Defence Council
SDC	Swiss Agency for Development and Cooperation
SLA	Sustainable Livelihood Approach
SPSS	Statistical Package for Social Science
SSMP	Artisanal and small-scale mining Project
UN	United Nations



UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nation Development Programme
UNEP	United Nations Environmental Programme
WHO	World Health Organization



CHAPTER ONE INTRODUCTION

1.1 Background of the Study

In Ghana, it is unknown exactly when gold mining began, however, it is certain that the local inhabitants were accustomed to winning gold prior to the arrival of the Portuguese in 1471. At that time, nearly all the gold appear to have been obtained from streams and rivers in the rain forest and in coastal sands, where it had been washed down from the interior by rivers and rains (Jocking, 2005). Gold mining by the indigenous people of Gold Coast (now Ghana) and other places of the world were done through artisanal and small-scale mining (ASM), through the use of rudimentary tools (Gbireh *et al.* (2007). Gbireh *et al.* (2007) posit that small scale gold mining has been operational in Ghana since gold was first discovered and mined.

Artisanal and small-scale mining continue to be a popular form of gold mining across developing countries, employing more people than large scale mining (World Bank, 2013). Currently small-scale mining is being practiced, in approximately 80 countries globally (World Bank 2013). Artisanal and small-scale mining has expanded rapidly in many developing nations driven by increasing population pressure and limited alternative income sources in rural areas (Lahiri-Dutt 2004).

Although SSM remains the oldest mining method in the world, estimation of the number of people engaged in the SSM activities globally varies widely. In 2003 the International Labour Organisation placed the figure at 13 million, this increased outrageously to 50 million in 2012 according to Zolnikov (2012). The number of artisanal small-scale miners in Ghana has also increased incredibly over the last three decades, with some estimates suggesting that 200,000 people were engaged in small-scale mining in the 1990s (Hilson & Potter 2003), which shot up to 500,000 in the mid-2000s (Tschakert 2009; Nyame & Grant 2014), and currently stand above 1,000,000 people (Hilson & Garforth 2013). There are sharp variance estimations as to the actual number of miners involved in SSM in Ghana due to scarcity of data on illegal small scale miners, which make up the majority (70-80%) of those engaged in the activity (Hilson & Yakovleva 2007; Tschakert 2009).



Since the emergence of the small scale mining law in 1989, Ghana has seen increase in the number of individuals and groups engaging in SSM activities, even though the actual number still remain elusive. Ghanaian gold production from SSM activities has risen tenfold and doubled since 1998, accounting for an estimated contribution of \$461.1 million to the national economy since 1989 (Yakubu, 2000).

In 2011, about 245,000 ounces of gold mined by the ASM sector were bought by and then sold through Precious Minerals and Marketing Company (PMMC) and Asap Vasa at the average annual 2011 price of U.S. \$1568 per ounce (GoldPrices, 2015). Thus nearly \$386 million were officially recorded to have been generated by ASM, not including those unknown, but estimated to be substantial revenue from sales through informal markets and non-traditional means.

In 2012, ASM production increased by 43% to 357,493 ounces, which, at the 2012 average annual price of \$1669 per ounce, represented about \$597 million of ASM gold, a one year increase of more than 64% in market value of ASM production. PMMC's total purchases and exports of gold from small scale miners increased significantly in 2012 from 235,787 ounces in 2011 to 316,699 ounces in 2012. The 2012 performance was about 34% higher than the amount recorded in 2011. Asap Vasa's purchases and exports of gold from small-scale miners also appreciated immensely from 10,173 ounces in 2011 to 40,794 ounces in 2012; a 301% appreciation (Ghana Chamber of Mines, 2014).

Despite ASM sector serving as means of livelihood to many people especially the poor and the vulnerable in rural communities and significantly contributing to GDP, there has been great concern about the sector's potential destruction to arable farmlands (Danyo & Osei-Bonsu, 2016). Artisanal small scale miners compete with farmers for land thereby threatening agriculture and food security, the mainstay of the rural economy (Ghana Statistical Service, 2014).

Food insecurity is a global phenomenon but with marked regional variations. It has been estimated that in 2011–2013, a total of 842 million people (12.0% prevalence of undernourishment) or around one in eight people in the world were suffering from chronic



hunger, regularly not getting enough food to conduct an active life. The share of developed regions was put together at 15 million people (less than 5% prevalence). A greater proportion of hungry people, 827 million of them live in developing countries with a current prevalence of undernourishment estimated at 14.3 percent (FAO, IFAD & WFP. 2013).

In sub-Saharan Africa, 222.7 million people (28.4% prevalence) were reported to be undernourished or facing food crises (FAO, IFAD & WFP. 2013). Ironically, it has been reported that most of the food insecure in sub-Saharan Africa are rural dwellers (FAO, 2012).

About 1.2 million people, representing 5 percent of Ghana's population, are food insecure. Thirty four percent (34%) of the population are in Upper West region, followed by Upper East with 15% and Northern region with 10%, amounting to approximately 453,000 people. (WFP, 2009). Throughout the country, about 2 million people are vulnerable to become food insecure. About 507,000 (40%) people are vulnerable of becoming food insecure in the rural areas of Upper West, Upper East and Northern regions.

As emphasized by UNDP (2012), the roots of sub Saharan Africa's food insecurity have always and largely been misguided policies, weak institutions and failing markets. However, current developments and dynamics in Ghana including issues such as sociodemographic changes, environmental pressures and climate stresses, growing insecurity of access to land due to the activities of illegal miners (*galamsey*) appear to be adding up to the challenge package on food security.



2 Problem Statement

The Bole District of the Northern Region being described as mainly a rural district with agriculture as the mainstay of inhabitants has witnessed gold rush in recent times (GSS, 2014). Communities with high deposit of gold such as Kui, Dakrupe, Gbombiri, and Camp in the district has seen unprecedented influx of migrants from other districts of the country and citizens of neighbouring countries including Nigeria, Togo, Mali, Burkina Faso and Ivory Coast all doing artisanal gold mining.

Most inhabitants of the district who were mainly farmers have abandoned farming to mine gold illegally mainly on the arable farmlands. The very few inhabitants who are still involved in farming have to compete for arable land with these artisanal miners. Even though the brisk mining in the district has been halted by the government due to a moratorium placed on artisanal mining about seven months ago, it appears the activity of the miners in the district especially Kui and Dakrupe communities that spanned over six years can have influence on the food security of the communities. This issue of concern necessitated the study to assess effects of artisanal and small-scale mining on household food security in Dakrupe and Kui communities of the Bole District. In order to bring to the attention of stakeholders and policy makers the findings so as to inform policy direction on food security in the country.

3 Research Question

3.1 Main Research Question

The study mainly seeks answer to the question; what is the extent of artisanal and small scale mining's effects on household food security in Dakrupe and Kui communities of the Bole District?

3.2 Specific Questions

- . What is the level of food security in Dakrupe and Kui?
- . How does ASM activities affect food production in Dakrupe and Kui communities?
- . How does ASM activities affect the dimensions of food security in Dakrupe and Kui communities of the Bole District?



4 Research Objectives

4.1 Main Research Objective

The study seeks to mainly analyse the extent of artisanal and small scale mining's effects on household food security in Dakrupe and Kui communities of the Bole District.

4.1.2 Specific Objectives

The study seeks to achieve the following specific objectives;

1. Ascertain the level of food security in Dakrupe and Kui?

2. Explore the effects of ASM activities on food production in Dakrupe and Kui communities of the Bole District.
3. Ascertain ASM activities effects on the dimensions of food security in Dakrupe and Kui communities of the Bole District

1.5 Significance of the Study

This study is being conducted in a time when the activities of small scale miners are on the increase and with the negative socio-environmental consequences associated with their activities drawing international attention. The study will therefore be beneficial to the Ministry of Food and Agriculture (MoFA-Gh) World Food Programme (WFP) and Food and Agriculture Organisation (FAO). The outcome of the studies will bring to bear the level of food security in Dakrupe and Kui communities. This will inform the various food oriented organisations (both national and multinational) on the level of food insecurity in mining communities, thereby giving these bodies enough information on the need to streamline mining so as to ensure food security.

The study will also be beneficial to Non-Governmental Organisations (NGOs), Civil Society Organisations (CSOs) and donor communities interested in fighting poverty, social injustice and protecting the environment. The findings from the study will bring to the attention of these groups the livelihood challenges community members face as a result of activities of small scale mining companies. This will help these NGOs, CSOs and donor communities to know the needs of the affected communities so as to channel their support in that direction.

Lastly, the study will also add to existing literature in the fields of mining, development management and food security. It will also serve as a blueprint for further research on food security in other communities where mineral extraction is ongoing, thereby broadening the knowledge of students and practitioners.

1.6 The Scope of the Study

The research considered the effects of ASM activities on food security. Emphasis was laid on the effects of ASM regards its economic, environmental and health impact both in the short – run



and long – run on food security. It was further expatiated to tackle how indigenes engaged in ASM achieve food security dimension (i.e. availability, accessibility, utilization and stability) and the effects of ASM activities on food production. To better understand the phenomenon, primary data was collected from respondents from Dakurupe and Kui communities in the Bole District only.

1.7 Limitation of the Study

Ideally the study should have been conducted in all the mining districts across the country however due to time and financial constraints, it was limited to only one district (Bole District). Even within the Bole District, the study was able to capture only two communities due to the time constraints. This constraints may hinder the generalizability of the study to the entire country. Further studies is therefore encouraged in the future in order to fill these gaps in the future.

1.8 Organisation of the Thesis

This study is structured and presented in five chapters, each of which deals with a specific topic relevant to and connected with the research.

Chapter One presented the introduction and background of the study, problem statement, research questions of the study, research objectives and the justification for the research.

Chapter two looked at the conceptual framework of the study and also reviewed literature relevant to the study. It contains definition of key concepts prevalently used in the study. The

techniques for data collection and analysis, sampling techniques used in fieldwork are discussed together with the sources in Chapter Three. This chapter also delved briefly into the geographical

and demographic scope of the study area. Chapter Four focused on the data presentation, analysis and discussions of the data collected. Chapter Five presented the summary of the whole

research, conclusion drawn and researcher’s recommendations.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section introduces the operationalization and conceptualized definition of terms, conceptual framework underpinning the study, history of mining and reviewed literature in connection to the objectives set for the study. This helped to understand the concepts understudying and identified the gaps that existed in literature from past to present studies and find remediation to filling those gaps.

2.2 Definition of Relevant Concepts

This section reviewed the conceptualization and definition of terms and drawn conclusion on accepted definition to fit the study.

2.1 Artisanal and Small – scale Mining (ASM)

Artisanal small scale mining (hereafter ASM) is a concept that have not had a generally accepted definition despite its controversy and attraction of academic and political debate across the globe especially in developing countries (World Bank, 1995; Hentschel *et al.*, 2003). The concept is mostly defined differently in different geographical areas across the world by academicians, organisations and policy makers and are mostly mentioned interchangeably with artisanal mining without any definitional distinctions (Mallo, 2012; Ombeni, 2015). In some jurisdictions a distinction is made between ‘artisanal mining’ that is purely manual and on a very small scale, and ‘small-scale mining’ that has some mechanization and is on a larger scale (World Bank, 2013; Tolonen, 2014; Wilson et al., 2015).

The criteria for identifying SSM are usually tied to the legislative system of most countries such criterion includes volume of production, volume of output, the amount of capital invested, the size of the workforce, the size of a claim, the depth of the mine, and or the level of sophistication of the mining equipment used (Andrew 2003). For instance, in Ethiopia the locus of SSM definition relates to the depth of working and ban on use of explosives (Hinton, 2006).



In some West African countries (for example, Mali), small-scale mining is differentiated from artisanal mining by the presence of permanent, fixed installations that are established once an ore body is confirmed and in Senegal SSM is recognized in accordance with the depth of working and the production methods applied (World Bank, 2013).

The World Bank (1995) refers to ASM as miners who use manual labour, low technology and less sophisticated equipment in mineral extraction. In this definition, the authors summed both artisanal mining and SSM together without any distinction and the focus of the definition was on the level of technology employed in the extraction. D' Souza (2002) defined ASM as a group of miners who employ some level of mechanisation or technology in their operation, have a legal license to operate on a concession and are organized in some form of mining association. This definition was also reiterated by Quiroga (2002). However, Quiroga made a distinction between ASM and Artisanal Miners. He referred to Artisanal Miners as unlicensed miners who employ a crude method of gold extraction mostly on concessions that belongs to larger scale mining companies. Rogers (2005) in his view see ASM as a mechanized mining, operated with a level of planning and knowledge concerning mining practices and has a tendency of being formalized. The definition by Rogers does not consider the immediate legality of SSM operation but the level of technology and the expertise of the miners.

According to Villegas *et al.* (2013) ASM can be sub-classified into *Permanent ASM Seasonal ASM, Rush-ASM or "rush mining" and Shock-push ASM* (citing Weber-Fahr, 2002). According to Hilson and Maponga (2003) artisanal and small-scale miners are engaged in the extraction and processing of a range of commodities, including gold and diamonds, gemstones, industrial minerals or construction materials. However, with few exceptions (e.g. China and coal, and India and construction materials).

For the purpose of this study ASM is classified to be informal, surface mining, low level of mechanization and type of work force (labour intensity) usually tagged '*galamsey*'. This is to allow the catch-all term of "ASM" which have been used sparingly by many authors.



2.2.2 Food Security

The concept of food security have evolved in the last thirty years to reflect changes in official policy thinking as underscored in Clay, (2002) and Heidhues *et al*, (2004).

The term first originated in the mid-1970s, when the World Food Conference (1974) defined food security in terms of food supply assuring the availability and price stability of basic foodstuffs at the international and national level. According to FAO (2006) “*Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices*”.

In 1983, FAO analysis focused on food access, leading to a definition based on the balance between the demand and supply side of the food security equation as “*Ensuring that all people at all times have both physical and economic access to the basic food that they need*” (FAO, 1983:cited in FAO, 2006). This definition was later revised by the FAO to include the individual and household level, in addition to the regional and national level of aggregation, in food security analysis. In tackling the poling hunger at the time, there was the need to ensure food security to arrest the food insecurity situation then and in the future. In 1986 this led to the highly influential World Bank Report on Poverty and Hunger (World Bank, 1986) which focused on temporal dynamics of food insecurity (Clay, 2002). The report introduced the distinction between chronic food insecurity, associated with problems of continuing or structural poverty and low incomes, and transitory food insecurity, which involved periods of intensified pressure caused by natural disasters, economic collapse or conflict. This was complemented by Sen’s theory of famine (1981) which highlighted the effect of personal entitlements on food access i.e. production, labour, trade and transfer based resources (FAO, 2006).

The widely accepted World Food Summit (1996) definition re-echoed the multidimensional nature of food security and includes food availability, access, food use and stability. Thus a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2012)



The study therefore adopts the multidimensional definition of food security by the World Food Summit (1996) to include *food access, availability, food use and stability*. The definition states that in order for food security objectives to be realized, all the four dimensions must be fulfilled simultaneously.

2.2.3 Household

The term household does not have a concrete definition, various authors defined the term to suite their study area. However, clear definition of household should have elements of residential forms, groupings and functions according to Beall and Kanji, (1999). Robertson (1984) observe household as a group of people who pool resources together or feed from the same pot. While Glewwe and Grosh, (2000) define household as a group of people who live together, pool their resources and eat at least one meal together each day. Glewwe and Grosh expanded Robertson's definition by adding living together to his definition. Beaman and Dillon (2010) however, see household as consisting of a group of people staying in the same dwelling place and who recognizes the power of a man or a woman as the head of the household.

The Ghana Statistical Service (2014) defined a household as a person or a group of persons, who lived together in the same house or compound and shared the same house-keeping arrangements. In general, a household consisted of a man, his wife, children and some other relatives or a house help who may be living with them. However, it is important to remember that members of a household are not necessarily related (by blood or marriage) because non-relatives (e.g. house helps) may form part of a household. This study adopts the definition given by the Ghana Statistical Service (2014) since the definition encompasses the entire elements needed to give clear understanding of what household is.

2.3 Historical Antecedence of ASM in Ghana

Artisanal small scale mining of gold has existed in Ghana and for that matter Africa way before the coming of the Europeans in the then Gold Coast (Anin, 1990). Annin (1990) gives an account of gold been traded with the Moors and the Phoenicians on the trans-Saharan trade routes before the emergence of the Portuguese and other Europeans in 1471. Artisanal mining and processing methods were employed to work both hard rock/stratum and alluvial gold deposits. Stratum gold



was mined by excavating pits to levels where a dark coloured stone which is interspersed with gold was reached. The gold was then recovered by pounding the stone to powder and then washing it (Anin, 1990). Alluvial gold was mined by collecting gravel from the beds of streams and washing sediments clean of sand and earth. The Chief whose land was mined for gold was generally entitled to one-third of the gold won, and therefore sought to promote proper organization of the activity (Anin, 1990). Furthermore, in view of the magnificent use of gold in the attire as well as customary practices of the traditional chieftaincy institution, close watch was kept over small scale gold mines operating within their lands; control and regulation (by Chiefs) of such operations has existed for over two centuries (Mineral Commission, 1987).

As a result, ASM continued in Ghana even after the introduction of modern exploration and mining methods to the country by the Frenchman, Piere Bonnat and others circa 1870. Enterprising natives, who had neither the capital nor technical ability to venture into large-scale modern mining, were also compelled to operate at the small scale level. Indeed almost all concessions being operated by large scale mining firms (Mineral Commission, 2001).

After the coming into force of large scale mining, various legislations were enacted which limited SSM activities from 1905 onwards and eventually made it illegal for anyone to engage in ASM. This in turn led to the domination of gold mining in Ghana by English owned large-scale mining companies, and nearly a complete eradication of the small-scale mining sector. In fact, prior to 1989, artisanal activities, together with the marketing of gold from such workings, were considered illegal (Nyame, *et al.*, 2014).



However, artisanal gold miners (galamsey) thrived, and the gold were predominantly smuggled for sale outside the country through a well-oriented black market (Mineral Commission, 1987). These miners were causing havoc to the ecosystem and the mining communities without economically contributing much to the macro economy of the country due to the illegality of their operations (Aryee *et al.*, 2003). Outputs were rather enriching neighbouring countries, which were found to be exporting gold despite lacking significant gold deposits (Hutchful, 2002).

The increasing awareness of the fact that the continued marginalisation of the small-scale gold mining sector was detrimental to the economy led to a study into the phenomenon, which resulted in its regularization through the enactment of the *Small-Scale Gold Mining Law*, PNDCL 218, in May 1989. This also resulted in changing and tasking the Diamond Marketing Commission which was a state agency responsible for marketing diamonds into the Precious Minerals Marketing Corporation with an expanded mandate to see to sales of gold from small scale miners as well (Ghana Chamber of Mines, 2013).

4 Artisanal Small Scale Mining's Effects on Food Production

There has been considerable efforts of national governments and the international community to reduce hunger and malnutrition in the context of the erstwhile Millennium Development Goals (MDGs) and other initiatives, but the proportion of undernourished people in developing countries especially Ghana has been largely constant since the mid-1990s (FAO, 2010). Notwithstanding the progress in hunger reduction made until 2007 in some countries, the 2008 global food price crisis and subsequent food price spikes in local markets have pushed or kept millions of people in food insecurity (FAO 2009; Brinkman *et al.* 2010). The causes are labelled among others to high and uncertain impacts from extreme climate changes which is a global phenomenon and can also be ameliorated to a limited extent of technological advancement and enhanced resources and income availability (Burton *et al.* 1993).

According to Mol and Ouboter (2004), the ecological impacts caused by ASM activities include diversion of rivers, water siltation, landscape degradation, deforestation, destruction of aquatic life habitat, and mercury pollution which affect farm products such as crops and livestock.

According to Nyankweli (2012) due to destruction of surface vegetation, there is significant reduction in the available arable land and loss of habitat for birds and other animals.

Observations indicated that the arable land occupied by mining companies consumed 289.2 hectares arable land comparable to estimated maize yields per acre (1 acre = 0.404 hectares) of 5-14 bags (500 - 1,400 kg), this means the tailing open pits has deprived farmers of at least 680,000 kg of maize per annum. This according to Urama (2013) agriculture and mining rely on similar inputs, outputs and externalities. Their inputs whether for producing food, or gold or iron ore and the externalities of both are socially and environmental. Hence, both industries deprive



some humans of basic human rights; that is access to food or access to a good environment or access to a good living. He argues that there is a relationship between the two industries and can be symbiotic or competitive depending on the situation.

On the contrary, Mining also can deliver infrastructure development. Opening up new mines may also open up new land for agriculture in places that were not accessible before. Deliberate development of infrastructure along mining corridors may also favour agriculture eventually (Jrama, 2013). Thus mining revenues from artisanal Artisanal and small-scale mining are expected to improve food security, through multiplier effects, providing bread from stones indirectly by improving incomes and employment and creating other opportunities for income generation by rural households living around the mines. In mined areas the evidence is always that incomes are better: this is often so wherever industrial activity is happening.

.5 Artisanal Small scale Mining and Food Security.

The activities of ASM has both positive and negative implications on residents of mining communities and the country as a whole (see Amankwaha & Anim-Sackey, 2003; Jenkins & Yakovleva, 2006; Mzembe, 2012; Frederiksen, 2016). A study by Ulrike *et al.*, (2012) revealed that SSM alleviate poverty in mining communities by giving employment opportunity to young people in mining communities. Hentschel *et al.*, (2002) suggested more than 100 million people earn their livelihood through ASM activities worldwide especially in remote villages of developing countries. A recent study by Ombeni (2015) in Tanzania shows mining communities are opened to micro-economic growth, socio-cultural development as a result of SSM companies. Social infrastructure including construction of feeder roads, provision of water for agriculture irrigation to boost food production are mostly initiated by mining companies in their operating communities (McQuilken 2013; Nyame & Grant, 2014).

Despite the numerous positive impact of ASM activities, Zolnikov (2012) reports ASM operation is the most socio-environmental destructive economic activity in recent years. Recent study by Crawford and Botchwey (2016) revealed the recent mechanization and the intensification of gold production by ASM firms has led to very high environmental degradation in areas of alluvial mining, inclusive of both land and water bodies. The authors contend, many



abandoned pits are left uncovered and become flooded, posing a danger to local residents, especially children, and to livestock. Crawford and Botchwey (2016) claim the activities of ASM improve the living conditions of the very few people who are directly engaged in many, living many jobless as a result of massive destruction of farmlands and water bodies used for fishing. Boateng *et al.*, (2014) revealed cocoa farmers are more affected by the activities of small scale miners. The authors report that farms closer to mining sites experience cocoa pods dropping immaturity from the trees, wilting yellowing of leaves and low yield.

Wilson *et al.*, (2015) revealed social stability and food security in most mining communities are being threatened due to land access and use conflicts between land owners and small scale miners and between small scale miners and farmers. Stirton (2010) reports the use of mercury and its release into the air and water bodies by small scale miners post health risk to residents, miners and crops. According to Persaud and Telmer (2015) it is very common to see crops near mining sites not doing as a result of chemicals that have been deposited in the soil. From the literature, it can be said that the activities of artisanal small scale miners are double edged-swords, they have both positive and negative impact on residents' food security.

6 Conclusion

Based on the various literature reviewed, it can be concluded that artisanal small scale mining may have potential effects on food security not only in the mining communities but on adjoining communities as well.



CHAPTER THREE

METHODOLOGY


3.1 Introduction

This section discussed the profile of the study area and the research methodology that guided the study. It described the research design and strategy of enquiry underpinning the study. It also described the target population, sampling, sample size and how it was determined, data sources, method and instruments used in data collection and analysis.

3.2 Profile of Bole District.

Bole District is situated between latitudes $8^{\circ}10.5^{\circ}$ and 0° and longitude 1.50° E and 2.45° W. It is located at the extreme western part of the Northern region of Ghana and bordered to the North by the Sawla-Tuna-Kalba District, to the West by the Republic of Cote D'ivoire with the Black Volta being the boundary between the two neighbouring countries, to the East by the West Gonja District, to the South-east by the Kintampo Municipal and the South-West by the Wenchi Municipal in Brong Ahafo Region. The Bole district covers an area of 6,169.2 kilometre square, out of the area of 69,766.2 kilometre square of the Northern region. This shows that, Bole district covers Nine percent (9.0%) of the total land area in the region.

The 2010 Population and Housing Census (PHC) conducted by the Ghana Statistical Service (GSS, 2010) puts the population of Bole district at 61,593 comprising 31,022 males and 30,571 females.



The vegetation of the district consists of savannah wood land, with economic trees such as peanut, dawadawa, teak, kapok and mango. These trees support the socio-economic lives of the people when they are processed. There are various kinds of soils in the district that support plant growth. The main types of soils include savannah ochrosols, tropical brown earth and terrace soils. The savannah ochrosols are generally poor in organic matter and nutrient because of the absence of dense vegetation caused by bush burning, overgrazing and poor farming practices in the district. It is important to note that, the tropical brown earth is suitable for mechanized farming. The terrace soils occur along rivers and suitable for grain crops and tobacco.

The district has an agrarian economy which is indicative of the large quantity of agricultural products produced every year. Artisanal and small-scale mining activities (*galamsey*) has in recent times assumed an un-proportional dimension never experienced in the economic life of the district. Kui, Dakrupe, Banda Nkwanta, Gbombiri, and “Camp” are now settlements with migrant populations in their thousands, coming from all parts of the country including some neighbouring countries like Burkina Faso, Togo, Mali, and Nigeria. Plate 3.1 shows the district map of Bole District.



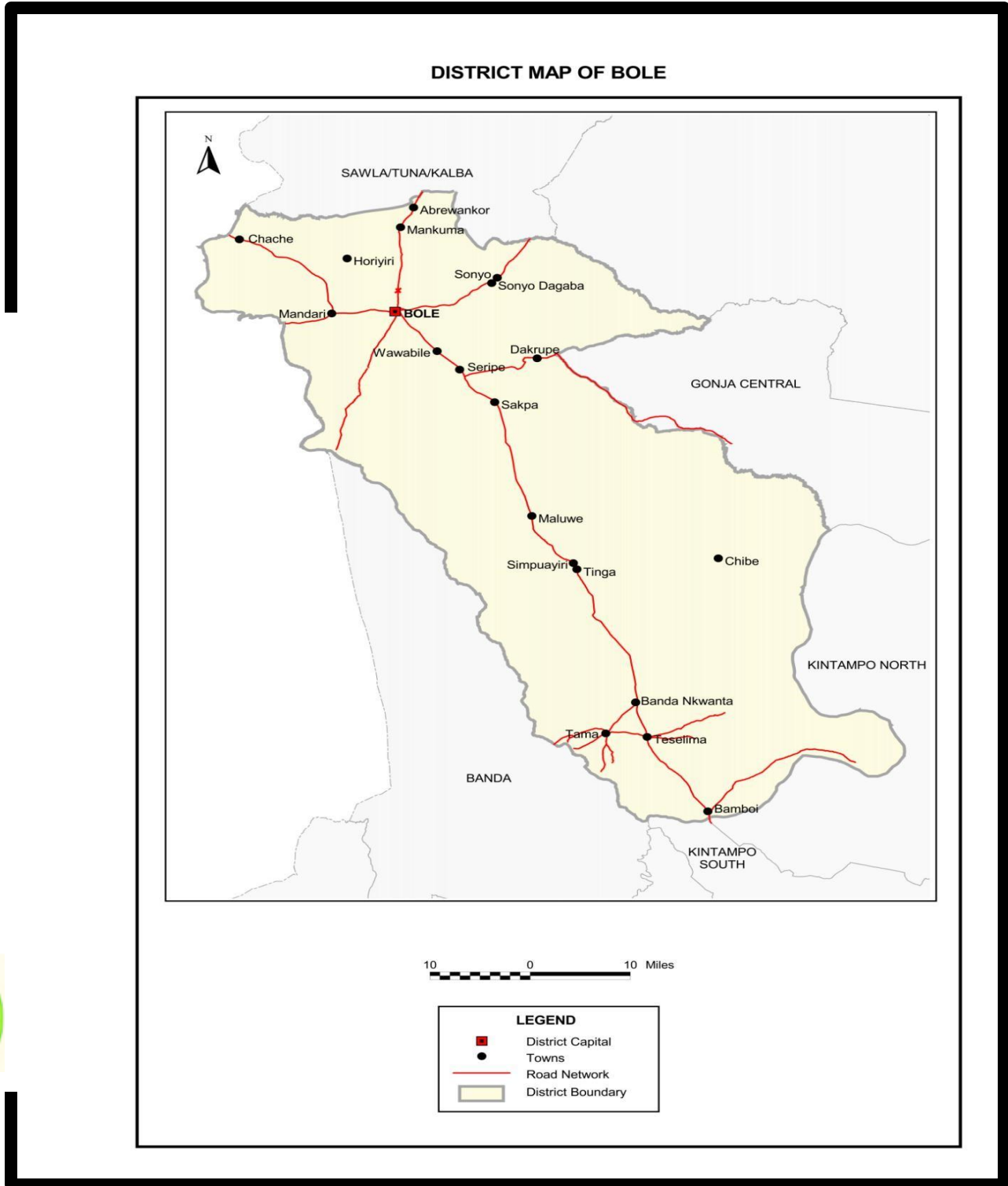


Plate 3. 1: Map of Bole District
Source: GSS (2014).

3.3 Research Design

A cross-sectional survey design with mixed method approach of both quantitative and qualitative methods were used in the study. This method seeks to elaborate or expand the findings of the qualitative method with that of the quantitative method that can help to show the different facts that are connected with the nature of the status of the current problem or condition as it happens at the time of the study (Creswell, 2009). Mixed method approach was adopted because the design offers the opportunity to compensate for inherent method weaknesses, capitalize on inherent method strengths, and offset inevitable method bias.

4 Target Population

The target population of the study comprised of all households in the Bole District numbering 10,160 households according to GSS (2014).

4.1 Sample Frame

The sample frame obtained consists of all households in Dakrupe and Kui communities numbering 205 (Dakrupe 132, Kui 73).

4.2 Sample Size

The sample size for the study was determined by Yamane (1967) recommended formula assuming an alpha at 0.05.

$$n = \frac{N}{1+N(\alpha)^2} \text{Where:}$$

N = target population

n = sample size

1 = constant

α = margin of error (0.05)

From the pilot survey conducted by the researcher, the target population of households who engage in mining and farming at Dakrupe and Kui were 132 and 73 respectively. This gives N = 132 at Dakrupe and N = 73 at Kui, in which case the sample size becomes:

Dakrupe: $n = \frac{132}{1+132(0.05)^2} = 99.25 \cong 99$

Kui: $n = \frac{73}{1+73(0.05)^2} = 61.73 \cong \underline{\underline{62}}$



Thus the total sample size for the two communities was 161; comprising 99 for Dakurupe and 62 for Kui in the Bole district. The total sample size of 161 was chosen for both communities in their proportions to show representativeness to enable generalization to the target population.

3.5 Sampling

Simple random and purposive sampling techniques were used. According to Garson (2012), simple random sampling is a sampling techniques which allows data to be collected of which every person in the target population has the chance of been selected which is known to the researcher in advance. This was to give equal chance to all respondents to be selected to partake in the study.

As there was no listing of houses or household, the researcher did a pilot listing of the households by assigning numbers to each house written on the walls whilst anonymous names were labelled against each number. With the aid of Microsoft office excel software, the researcher used the excel data analysis tool to generate the sample of households to be selected for the survey.

Purposive sampling technique was used specifically based on convenience and experience of knowledge regards the characteristics of variables (ASM & food security) underpinning the study. The two communities (Dakurupe and Kui) were selected based on their experience knowledge regards the characteristics of variables (ASM & food security) underpinning the study. Also informants were selected based on convenience of getting subjects at hand to access information.

3.6 Data Sources

Data was collected using both primary and secondary source of data collection. Primary data was collected from 99 respondents at household level, who engaged in artisanal and small-scale mining in Dakurupe and 62 respondents in Kui also at household level which focus is solely on agricultural activity and production.



Secondary data was sourced through review of relevant reports, policies & regulations and published and unpublished literature on artisanal and small-scale mining and food security in Ghana and across the globe. These documents are referred to where necessary in the text.

3.7 Methods of Data Collection

This section discussed the methods and tools employed in the data collection process. It centred on primary data collection procedures. Primary data were sourced using tools or instruments such as questionnaire, interviews and observation.

7.1 Survey Questionnaire

Structured survey questionnaire made up of open ended and closed ended questions were designed and used to gather relevant data from household and groups participants of selected communities. A questionnaire is a printed self – report form designed to elicit information that can be obtained through the written response of the subjects (Burn & Grove, 2001). The questionnaire was administered to all sampled respondents in both communities by the researcher and assisted two field assistance and a key informant at when the researcher may be efficient in the language of the respondent understanding. The information obtained through the questionnaire was similar to that obtained by an interview but the questions tend to be less in depth. Questionnaires was chosen for this study because they can easily generate large amounts of information in a short period of time and in a relative cost effective way. The results of the questionnaires can usually be quickly and easily quantified by either a researcher or through the use of a software package. Also, data from questionnaires can be analysed more ‘scientifically’ and ‘objectively’ than other form of research.

.8 Data Analysis

Both qualitative and quantitative techniques were employed in the data analysis which were basically descriptive in nature. Data obtained from the field were processed (edited, coded and tabulated or graphed) through the use of computer software programmes (Statistical Package for the Social Scientists and Microsoft Excel). Descriptive statistics such as mean, standard deviation, frequencies and percentages were applied in the data analysis for all the objectives. Presentation of data were done with the aid of tables and charts for easy comprehension.



CHAPTER FOUR

DATA PRESENTATIONS, ANALYSIS AND DISCUSSIONS

4.1 Introduction

This section of the study presents the analysis and discussion of findings from the data collected from respondents. A total of 162 questionnaires were administered to respondents out of which all were retrieved and used for the analysis. The study therefore recorded a response rate of 98%. Based on the specific objectives set out by the study, the chapter is divided into three sections. These are demographic background of respondents, effects of ASM activities on food production and the dimensions of food security.

4.2 Demographic Characteristics

4.2.1 Gender

Table 4.1 presents the gender of respondents. A gender mix of male 81 (81.8%) and female 18 (18.2%) in Dakurupe and male 45 (72.6%) and female 17 (27.4%) in Kui were engaged in ASM. The above statistic shows that in both communities the males have a significant domination over their female counterparts.

Table 4.1 : Gender

	Gender	Frequency	Percent (%)
Dakurupe	Male	81	81.8
	Female	18	18.2
	Total	99	100.0
Kui	Male	45	72.6
	Female	17	27.4
	Total	62	100.0

Source: Field Survey, 2015.

4.2.2 Marital Status

Table 4.1 shows marital distribution of respondents. There was no significant difference between respondents who were single and married as there was a close match of 49.5% and 50.5%



respectively. In Kui There existed a significant gap between the married (95.2%) and the single (4.8%) spouse.

Table 4. 2: Marital Status

Marital status		Frequency	Percent (%)
Dakurupe	Single	49	49.5
	Married	50	50.5
	Divorced	0	0.0
	Total	99	100.0
Kui	Single	3	4.8
	Married	59	95.2
	Divorced	0	0.0
	Total	62	100.0

Source: Field Survey, 2015.

2.2 Level of Education

Regarding the level of education attained, Dakurupe had significant number of people within the categories of Illiterates (43, 43.4%) and Basic (48, 48.5%) with less margin of people in the secondary (8, 8.1%) whilst Kui also had significant number of people within the categories of literates (30, 48.4%) and Basic (28, 45.2%) with less margin of people in the Secondary (4, .5%). The results are depicted in Table 4.3.



Table 4. 3: Level of Education

Level of Education		Frequency	Percent (%)
Dakurupe	Illiterate	43	43.4
	Basic	48	48.5
	Secondary	8	8.1
	Total	99	100.0
Kui	Illiterate	30	48.4
	Basic	28	45.2
	Secondary	4	6.5
	Total	62	100.0

Source: Field Survey, 2015.

3 Effects of ASM on food production in Dakurupe and Kui

The table below presents the analysis of how ASM affect food production in the two communities studied

Table 4. 4: Effects of ASM on Agricultural Activities on Food Production

Responses	Dakurupe	Kui
Valid	Negatively	32
	(49.5%)	(51.6%)
Valid	Positively	30
	(0.0)	(48.4%)
Valid N	49	62
Missing	Non responses	0.0
Total	99	62

Source: Field Survey (2015).

NB: Figure not in bracket are observed frequency

Figure in bracket are observed percentage



The above table depicted that from respondent perspective, ASM had a negative effect on their food production as 49.5% of respondent in Dakurupe agreed to the assertion. At Kui, despite a bit of active farming, 51.6% agreed that the mining activities ongoing have an invariable effect on their food production even though 48.4% disagreed. In Kui they postulated that their major problem which affect their food production is bush fire, bacteria, and physiological disorder.

The study discovered a lot of farmers have abandoned farming to engage in mining, there is also struggle for farm lands between miners and farmers and the farming lands have become infertile as a result of chemical disposal by the miners resulting in low yield. Further analysis revealed that both communities which were agric-dependent a decade ago, depend on neighbouring communities for food supply since the communities' food production is not enough to feed inhabitants.

3.1 Effect of ASM on Food Security

The effect of ASM on food security was measured based on three dimensions; i.e. economic, environmental and health impact of ASM on food security by the indigene engaged in it. Below the table showing the economic impact of ASM on food security in Dakurupe.

Table 4.3 *The economic impact of ASM on food security in Dakurupe.*

Criteria	Responses	Positively	Negatively	Uncertain	Total
Short-run	How does ASM affect your economic status	99 (100.0%)	0 (0.0%)	0 (0.0%)	99 100.0
	How will ASM affect your economic status in the long-run	23 (23.2%)	69 (69.7%)	7 (7.1%)	99 100.0

Source: Field Survey, 2015.

NB: Figure not in bracket are observed frequency

Figure in bracket are observed percentage



Regards ASM and its economic impact all respondents 99 (100.0%) agreed to the fact that ASM effect the livelihood of indigenes positively. In support of their assertion, they postulated that ASM have affected their economic status positively due to increased income as a result of gold sales. The increased income has increased their purchasing power and access and utilization of food that is made available.

In the long-run 23 (23.2%) respondents in Dakurupe agreed to the fact that ASM will continue to affect their livelihood positively, 69 (69.7%) disagreed and asserted that in the long-run ASM will affect their livelihood negatively whilst 7 (7.1%) were uncertain. In support of their assertion, those who agreed that ASM will continue to affect them positively viewed in the perspective, they will continue to gain employment and that matter will still have access to utilize food at their disposal. Despite having purchasing power, majority of the respondents generally agree foodstuffs are very expensive in the two communities which at times prevent non-miners from having access to regular meals. The finding suggests, the level of food security in the communities is high even though food may be physically available, access is hindered due to hike in prices.

3.2 Environmental Impact of ASM on Food Security

In finding out the environmental effect of ASM on food security, qualitative interview were used to find out the method of extraction used by indigenes in extracting the minerals and its effect on the environment which threatens food security.

Upon thorough interviews with informants it was discovered that, the only method of extraction in the area is surface mining with the use of primitive tools such as hoes, pig axes, shovels, pans and others. Thus finding out how this affect their environment and that matter a threat to food security, they expressed that:

Because we do surface mining method, it makes us remove all the fertile soil away... not good for farming again. It lead to creating erosion, desertification and open pits which make the land not fertile for farming and our animals falls into the open pits left behind uncovered” (household interview)

The above statement showed the disgust feeling and the effect of ASM activity on the environment therefore threatens food security in the area. In further probing, the researcher asked



whether something have been done about this to curtail the environmental effect. It was evidenced that, they do not have any measures to curtail that but they know the ASM activities have environmental effect. This meant that in a mining community, indigenes are often aware of the environmental complications of ASM but do not have any idea to reduce despite they know it threatens food security indirectly.

4.3.3 How ASM achieves Food Security Dimensions

here have been debates of whether ASM can contribute to achieving food security. This survey was conducted to unravel the facts of truth in the Dakurupe community. With reference to the food security dimensions operationalized in the definition of food security to include availability, accessibility, utilization and the stability of the other three dimensions, the sought from respondents their assertion to how ASM achieve food security dimension. This shown in table 4 below:

Table 4. 5: How ASM Achieves Food Security Dimension

Criteria	Food availability	Food accessibility	Food utilization	Stability of other three	Valid N (listwise)
Yes	6 (6.1%)	98 (99.0%)	99	2 (2.0%)	99
No	93 (93.9%)	1 (1.0%)	0 (0.0%)	52 (52.5%)	
Uncertain	0 (0.0%)	0 (0.0%)	0 (0.0%)	45 (45.5%)	
Mean	2.06	1.01	1.00	2.43	
Standard Deviation	.240	.101	.000	.538	

Source: Field Survey, 2015.

B: Figure not in bracket are observed frequency

Figure in bracket are observed percentage

The table above depicted that ASM have a perfect achievement of food security two dimension i.e. accessibility and utilization as it showed a mean and standard deviation score of **1.01 (.101)** and **1.00 (.000)** respectively but witnessed a wide gap achievement of the other two dimensions which are availability and stability of the other three, also depicting a mean and standard deviation score of **2.06 (.240)** and **2.43 (.538)** respectively.



In complementing the findings, interviews were sought to how that happens and what makes it possible. Thus informant postulated in response as:

“ASM activity do not produce food itself, but we uses the money derived from our operations to buy the food produced by farmers...if farmers do not cultivate food to make it available, ASM miners cannot get food to access and utilized with our money and cannot eat that money. Also ASM competes with agricultural activities (farming) for land...this cripple agricultural activities leading to food insecurity since ASM depend on the agricultural products for food accessibility and utilization” (household informant interview).

his means that despite ASM as a source of livelihood which can contribute to food security through it economic empowerment but it depends on agricultural products to make its food security achievable. Therefore this showed that ASM as a source of livelihood is dependent on agricultural products to achieve even it two food security dimension. Thus ASM cannot achieve 1 food security dimension if they exist no agricultural activities to make food available.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION


5.1 Introduction

This chapter brings finality to the entire study by summarizing the major findings emanating from the analysis, drawing conclusions and making recommendation for policy decisions. The study sought to ascertain the level of food security in Dakrupe and Kui, explore the effects of ASM activities on food production and ascertain ASM activities effects on the dimensions of food security in Dakrupe and Kui communities of the Bole District. Descriptive statistics and simple percentages were used in analyzing the data.

5.1.1 Summary of Findings

The study discovered that the level of food security in Dakrupe and Kui is low thus the communities are food insecure. The communities are not food sufficient and depend much on neighbouring communities for food supply.

The study discovered that the activities of ASM has negative effects on food production in the two communities. Most farmers have abandoned farming to engage in mining, farm lands are used for mining hence farmers and potential farmers do not have access to arable lands to carry out farming activities and farming lands have become infertile due to deposition of chemicals in the soil by miners. These has negatively affected crop yield and the quality of food produced in the communities.



The study also discovered that households engaged in mining generally have relatively higher income and are able to purchase the amount of food needed, however those who are non-miners are not able to access the right amount of food needed due to very high prices of foodstuffs in the communities as a result of ASM activities. This has plunged many inhabitants to food insecurity and poverty. The study discovered that farmers in the communities have ready market for their produce even though they sell their produce at very exorbitant prices due to very low supply and high demand.

5.3 Conclusion

Based on the findings, the study concludes that the activities of ASM has negatively affected all dimensions of food security in Dakrupe and Kui except economic access for non-miners. The study also concludes that the activities of ASM in the communities has negatively affected food production and has plunged majority of non-miners in the community into food insecurity and poverty.

4 Recommendation

4.1 In order to reduce food insecurity and poverty in the two communities, the government through the Ministries of Gender and Social Protection and Food and Agriculture in collaboration with the Bole District Assembly must acquire vast farming land from the *Tindanas*, this land should be protected from miners and should be given to persons willing to farm at a very high discounted rate. Persons willing to farm should also be supplied with funds and agricultural inputs at a discounted rate. This will create motivation for people to engage in farming and thereby increase food production in the communities.

4.2 The National Culture for Civic Education, The Mineral Commission, The Environmental Protection Agency, The Bole District Assembly and Non-governmental Organisations must stage intensive public education on the mining laws of the country. The general public especially miners should be educated to know how to appropriately mine so as to reduce the devastating effects of mining on the environment especially on vegetation and water bodies. The education could be carried out through the mass media including drama on televisions and on radios and through traditional means such as announcement at village centers, chiefs' palaces and durbar rounds.



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APPENDIX

Appendix I: QUESTIONNAIRE.

**EFFECTS OF ARTISANAL ARTISANAL AND SMALL-SCALE MINING ON
HOUSEHOLD FOOD SECURITY IN DAKURUPE AND KUI COMMUNITIES OF THE
BOLE DISTRICT**

Informed Consent

Good morning/afternoon/evening. Am an Msc. student and am undertaking an academic research on **Artisanal and small-scale mining (ASM) as a source of livelihood: its effects on Food security in the Bole District.** I would like to ask you a number of questions on the research subject and will appreciate if you permit me your time. The information you give will be used solely for academic purpose and your confidentiality and privacy is highly insured. Hope your **consent** is solicited?

Yes [] No []

Thanks you!

Personal Data

. Residence.....

. Gender: 1. Male [] 2. Female [] 3. Age..... 4. Occupation.....

. Marital status: 1. Single [] 2. Married [] 3. Divorced []

. Highest level of education attained

1. Illiterate [] 2. Basic [] 2. Secondary (S.S.S, Vocational) []

3. Tertiary (Training College, Polytechnic, University) [] 4. Others, specify

. For how long have you been staying in this town/village?

.....

Section (1): The effects of Artisanal Small – scale Mining (ASM) on food security.

[Short – run effects]

The economic impact of Artisanal and small-scale mining (ASM) on food security

8. How does ASM effect your economic livelihood?

1. Positively [] 2. Negatively [] 3. Uncertain []

9. To what extent. 1. Gained employment [] 2. Rendered me Unemployed []

How?.....



10. Regards to ASM have you gained economic empowerment to food security? 1. Yes []
2. No []

11. If Yes 'how did this happened?

.....
.....

12. Do you agree to the assertion that ASM can leads to the achievement of food security in the short – run? 1. Yes [] 2. No []

13. Why your answer?

.....
.....

he environmental impact of Artisanal and small-scale mining (ASM) on food security:

4. Are indigenes involved in mining at both household and group levels? 1. Yes [] 2. No []

5. If yes, what method(s) of extraction is/are used by the company? (*Tick all that apply*)

A. Surface Mining B. Underground Mining C. Dredging D. Galamsey Method

E. Other, specify.....

6. Do you think the methods of operation by the indigenes at household and group level have some effects on the natural environment? 1. Yes [] 2. No []

7. If yes, what are some of the effects? (*Tick all that apply*)

A. Degradation of land and vegetation B. Water pollution C. Air pollution

D. Noise pollution E. Other, specify

.....

8. What actually cause(s) your tick in Q18? 1. ASM [] 2. Agricultural activities []

Other, Specify.....

19. If you answer to Q18 is 'ASM', have indigenes at household and group level thought of the adverse effects and made attempts to reduce or curtail the adverse environmental effects of ASM activities? 1. Yes [] 2. No []

20. If yes, what are some of the measures being undertaken?

A. Re-afforestation B. Resettlement to a different community C. Providing

alternative sources of livelihood D. Compensations to affected communities or



indigenes engaged in Agricultural activities E. Reviewing or varying methods of operation

F. Others, specify.....

21. Are the efforts at reducing the environmental impacts satisfactory and effective?

1. Yes [] 2.No []

The health impact of Artisanal and small-scale mining (ASM) on food security:

2. Does ASM have an effect on your human health? 1. Yes [] 2. No []

3. Which of the following diseases do you usually suffer from or contract?*(Tick all that apply)*

A. Malaria [] B. Diarrhea [] C. Skin diseases [] D. Fever [] E. Colds and catarrh [] F. Other disease(s) []

.....

4. Would you say the disease(s) chosen above are related to the mining activities?

1. Yes [] 2. No []

5. Are people engaged ASM doing anything to address the health needs of the community?

1. Yes [] 2. No []

6. If yes, what are some of these measures?

.....
.....
.....

7. Have they being any health campaign programme to educate people in the community regards ASM? 1. Yes [] 2. No []

8. If 'Yes', give any example of such campaigns you know of:

.....
.....

[Long – run effects]

The economic impact of Artisanal and small-scale mining (ASM) on food security:

8. How will ASM effect your economic livelihood in the long run?

1. Positively [] 2. Negatively [] 3. Uncertain []

9. To what extent. 1. Will Gain employment [] 2. Will render me Unemployed []



How?

10. Regards to ASM have you do hope to gain economic empowerment to food security?

1. Yes [] 2. No []

11. If 'Yes' how will this happened?

.....
.....
.....

12. Do you agree to the assertion that ASM can leads to the achievement of food insecurity in the long – run? 1. Yes [] 2. No []

3. Why your answer?

.....
.....

the environmental impact of Artisanal and small-scale mining (ASM) on food security:

4. Do you think the methods of operation regards ASM by the indigenes at household level have long term effects on the natural environment? 1. Yes [] 2. No []

5. If yes, what are some of the likely effects? (*Tick all that apply*)

- A. Degradation of land and vegetation B. Water pollution C. Air pollution
D. Noise pollution E. Other, specify

6. What actually cause(s) your tick in Q15? 1. ASM [] 2. Agricultural activities []

Other, Specify.....

7. If you answer to Q16 is 'ASM', have indigenes at household and group level thought of the adverse effects and made attempts to reduce or curtail the adverse environmental effects of ASM activities? 1. Yes [] 2. No []

8. If yes, what are some of the measures being undertaken?

- A. Re-forestation B. Resettlement to a different community C. Providing alternative sources of livelihood D. Compensations to affected communities or indigenes engaged in Agricultural activities
E. Reviewing or varying methods of operation
F. Others, specify.....

19. Are the efforts at reducing the environmental impacts satisfactory and effective?

1. Yes [] 2.No []



The health impact of Artisanal Artisanal and small-scale mining (ASM) on food security:

20. Does ASM have an effect on human health in the long – run? 1. Yes [] 2. No []

General questions:

29. Do you think ASM could leads to an increase of food insecurity and livelihood unsustainability in the long – run? 1. Yes [] 2. No []

30. Why your answer?

.....

.....

ection 2: The contribution of artisanal small – scale mining towards achieving food security dimensions.

(Please tick appropriately):

ood Security imensions	ASM contribution to food security regards its dimension	Agree	Disagree	Uncertain
availability	31. ASM contribute to food ‘availability’ among indigenes engaged in it?			
accessibility	32. ASM contribute to food ‘accessibility’ among indigenes engaged in it?			
utilization	33. ASM contribute to food ‘utilization’ among indigenes engaged in it?			
stability of the other three	34. ASM contribute to the ‘stability of the other three dimension’ over a period of time?			



5. How does ASM contribute to food ‘availability’ among indigenes engaged in it?

.....

.....

36. How does ASM contribute to food ‘accessibility’ among indigenes engaged in it?

.....

.....

37. How does ASM contribute to food ‘utilization’ among indigenes engaged in it?

.....
.....

38. How does ASM contribute to the 'stability of the other three dimension' over a period of time?

.....
.....

