

UNIVERSITY FOR DEVELOPMENT STUDIES

ASSESSING THE SOCIO-ECONOMIC EFFECTS OF MINING ON AGRICULTURE IN ASUTIFI DISTRICT OF THE BRONG AHAFO REGION, GHANA

MUMUNI ELIASU

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By

**MUMUNI ELIASU (HND AGRIC. ENG., PGC AGRIC. MECH., PGD FIN.
MGT)
(UDS/MAE/0017/09)**

**Thesis Submitted to the Department of Community Development of the Faculty
of Planning and Land Management, University for Development Studies in
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Environmental Security and Livelihood Change**



OCTOBER, 2011

DECLARATION

I, hereby declare that this thesis submitted is the result my own original work and that no part of it has been presented for another degree in this university or else where:

I have therefore acknowledged all sources of secondary materials used by duly referencing the sources in accordance with the American Psychological Association (APA) system of referencing.

Mumuni Eliasu
(Student)
UDS/MAE/0017/09

.....
Signature

05/10/11
.....
Date

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Development Studies.

Dr. Seidu Al-hassan
(Supervisor)

.....
Signature

06/11/11
.....
Date



ABSTRACT

Whilst the mining industry has helped to stimulate economic growth of the country through employment generation, payment of taxes and royalties and other corporate social responsibilities, its activities have also adversely impacted a lot on the environment, social and other livelihood sources like agriculture in their areas of operation. The mining sector often undermines the performance of the agricultural sector in agrarian areas through the acquisition of viable agricultural lands as well as shift in the labour trend in favor of mining activities. The study therefore assessed the socio economic effects of mining on agriculture in the Asutifi district of the Brong Ahafo region. The production levels of some selected crops and income levels of farmers in the study communities were estimated. The extent to which the mining activity affected the size of farm lands and labour supply to agricultural production in the study area were examined. Structured questionnaires were administered for the survey alongside the use of secondary data. Agricultural production levels decreased over the past years as a result of mining activities. The income levels of farmers decreased with 52% of the respondents earning not more than \$1,500 a year. Scarcity of land with increased cost in land acquisition, labour shortages and higher wage demands due to the competition from mining activities was discovered as a major challenge to farmers and agricultural production in general. Stable market and producer prices should be set for other major crops just like cocoa to improve farmer's earnings. Also, concessions in the acquired area that are yet to be developed or mined from the 2,992 hectares of land, could be temporally released to the respective farmers for farming until such a time that those lands would be needed by the mining firms.



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DEDICATION

This dissertation is dedicated to the Almighty Allah for His kindness and mercy for seeing me through this programme successfully and to my family who had the patience and understanding throughout my studies.



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LIST OF ACRONYMS

ADA-Asutifi District Assembly

ADP-Assembly District Plan

APA- American Psychological Association

DDP- District Development Plan

EPA-Environmental Protection Agency

GCM-Ghana Chamber of Mines

GDP-Gross Domestic Product

GLSS- Ghana Living Standards Survey

GSS- Ghana Statistical Service

ILO- International Labour Organization

IRIN-Integrated Regional Agricultural Network

MMSD-Mining, Miner and Sustainable Development

MOFA-Ministry of Food and Agriculture

PNDC-Provisional National Defense Council

SACM-South African Chamber of Mines

SPSS- Statistical Package for Social Sciences

SNTC- Swaziland Natural Trust Commission



SRID-Statistics, Research and Information Directorate

TWN- Third World Network

WBCSD -World Business Center for Sustainable Development

WHO- World Health Organization



CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

From gold to limestone and copper to oil, mining activities have been extracting commodities from the earth and providing means of livelihood to human societies for thousands of years. By convention, these materials could be categorized into metals, fuels, construction materials and industrial materials. In recent years, the process of exploring, mining and processing various minerals, has come under tremendous pressure to improve its social, developmental and environmental performance (MMSD, 2003).

Since the beginning of civilization of mankind, man found the use of minerals as indispensable tool in sustaining life with the “lion cave” being the oldest known mine from Swaziland which proved to be about 43,000 years old. Hungary and the Ancient Egypt also mined flint and malachite respectively for weaponry tools and ornaments over centuries ago (SNTC, 2007).

Mining involves the extraction of valuable mineral deposits or other geological materials from the ground or earth. These deposits could be gold, bauxite, manganese, precious metals, diamond, oil, coal, limestone and many others. Any material that cannot be grown through agricultural processes created artificially in a laboratory or factory is normally mined. It normally involves prospecting and exploration through surface or underground mining. Australia, United States, Canada, South Africa and Ghana are some countries with mining experience and technologies. Currently, China is the highest gold producing country in the world. It improved on its 2006 production figures of 247.2 tons by 13.47%, contributing 280.5 tons to global production in 2007. Ghana is Africa's second largest producer of gold after South Africa with



prospective gold deposits located in the western and middle (Western, Ashanti and BrongAhafo Regions) parts of the country (Akabzaa and Darimani, 2001).

In Ghana, mining started over centuries ago dating back to the 15th century of the pre colonial times. Small-scale mining also known as “galamsey” was legalized by the Provisional National Defense Council (PNDC) law 218, of 1989. Both the small and the large scale mining contribute to economic growth in the form of taxes and royalties to the country. The nation derives the bulk of its foreign exchange earnings from gold mining which accounts for over 90% of the country’s mineral export. Apart from gold, Ghana produces significant quantities of diamonds and bauxite and counted amongst the top five countries producing manganese ore in 2006. As of June 2006, sixty six (66) local and forty seven (47) foreign companies held prospecting/reconnaissance licenses in Ghana. Additionally, thirty one (31) companies had been granted mining concession leases to operate in the country. Many of the companies holding exploration licenses are focusing on gold exploration (Ghana Chamber of Mines, 2006).

Figure 1.1 overleaf shows the locations of major gold deposits in the country that are currently being explored by these licensed mining companies with other areas around Bole in the Northern region and Bolgatanga in the Upper East region yet to be commercially explored. Despite the rich deposits of these minerals in this country, not much development can be shown for these years of extraction as compared to Johannesburg and Australia which have visible proceeds from mining for their physical infrastructure. Rather it’s social, environmental and health effects are enormous and visible in Ghana.



Fig. 1.1: Mineral Deposits in Ghana



Source: (Ghana Minerals Commission)

According to the International Labour Organisation (ILO), mining is one of the world's most hazardous sectors, and is associated with about 15,000 deaths each year. In South Africa for instance, each ton of gold mined cost one life and twelve serious injuries (Agyapong, 1997).

The use of cyanide to leach minerals and arsenic contamination of surface, ground water and plants through soils makes it hazardous apart from its environmental degradation. This has serious health implications on all living things. Cyanide blocks the absorption of oxygen by human cells, making the victim to suffocate. Exposure to concentrated levels of cyanide can be fatal to human beings (Great Mining, 2009).

Agriculture which is the back bone of the country's economy has suffered the most palpable neglect over the years especially in the mining areas. Many cocoa farmers have had to reluctantly give up their ancestral farmlands spanning from four to five generations to mining companies. It is usually the case that when mining companies acquire a land in a community for prospecting, the local farmers are required to abandon their farms. They are paid some compensation which never meets any economic or moral requirement for such huge losses (Agyei, 2007).

Meanwhile, between 1993 and 1997 mining contributed 1.5% to Ghana's GDP as against 40% by agriculture. Again, the mining sector in 2007, 2008 and 2009 contributed 5.9%, 5.6% and 5.8% of the GDP respectively to the country's GDP, whilst the agricultural sector also contributed 34.3%, 33.9% and 35.4% to the GDP in these years respectively (GSS, 2009).

In a developing country such as Ghana where about 65% of the population is engaged in agriculture as their source of livelihood, any activity like mining that claims vast arable lands will be an affront to national food security as well as sustainable economic gains and initiatives (GSS, 2009). The taxes and royalties accrued to the state from mining are insignificant compared to the gains from agriculture to the national economic development.



1.2 Problem Statement

Agriculture is the main stay of the Ghanaian economy with 65% of the population engaged in it and Asutifi which is the study area has 77.4% of its population engaged in agriculture (GLSS, 2008). This means that any threat to any of the factors of production will have serious implication on the agricultural production sector with a consequential damage to the fragile economy. This is confirmed by the production trend of agricultural crops from 2003- 2009 in the district which dropped by 1.9% together with a sharp increase in labour cost within the same period (SRID-MOFA, 2009).

It is also estimated that about 9,575 individual farmers in the district with 7,500 hectares of their farmlands have been taken over by Newmont Gold Ghana Limited for gold exploration (Action Aid, 2005). This means that the practice of fallowing where farmers allow the land to regain its fertility by leaving it for a year or more without cropping on it can no longer be practiced since they are now restricted to small pieces of lands for farming if not completely lost to the miners.

These problems can contribute to decreasing agricultural labour supply and productivity in general and also increase cost of food items in the area which raises the following questions:

- What are the production levels of some major crops in the study area with the mining activities?
- How has mining affected the incomes of farmers in the study area?
- How has mining activities affected the size of farm lands in the study area?
- What are the levels of labour supply to agricultural production in the study area?



1.3 Objectives of the Study

The main objective of this study is to assess the effects of mining on agriculture in the Asutifi District of the Brong Ahafo Region. The secondary objectives include the following;

- a. To estimate the production levels of some selected crops amid mining activities in the study area,
- b. To estimate the mean income levels of farmers in the study communities,
- c. To examine the extent to which the mining activity has affected the size of farm lands in the study area and,
- d. To evaluate the level of labour supply to agricultural production amid mining in the study area.

1.4 Significance of the Study

Ghana is largely an agriculture led economy, deriving its economic growth from the agricultural sector with the Brong Ahafo region and the Asutifi district in particular being one of the food baskets in the country, contributes immensely to this growth. According to the district assembly about 77.4% of the people in the district engaged in agriculture to support their lives and household economies. Mining (NGGL) according to WBCSD, (2009) employed only about 3,500 people (4.14%) of population (84,475) in the area as at December 2008. These clearly shows that though both sectors actively contribute to the development of the area, the adverse impacts of the mining activities if not well managed can cause serious effects on the environment and the people in these areas.



Several impact studies on environment and livelihoods have been done in the district, but specific studies on its impact on agriculture have not been adequate. This has left discussions on impact of mining on agriculture particularly in speculation.

It is therefore imperative to assess the socio-economic effects of mining activities in the area on agriculture as no research related to this has been done to the best of the researcher's knowledge. Findings from the study which was based on selected production levels of crops, estimates of farmers income, availability of labour and land accessibility for agriculture could be utilized by the District Assembly, the District Agricultural Directorate and Newmont Gold Ghana Limited to make informed decisions for responsible mining that will have normal impact on agricultural development for integrated sustainable economic development in the study area.

The findings will further elucidate the situation of farmers in the provision of alternative livelihood program and other development interventions under the corporate social responsibility of NGGL and other mining companies of the country. The findings will also contribute to knowledge and literature on the subject of mining and agriculture for further studies.

1.5 Organization of the Study

Chapter one is the introduction of the study. Chapter two provides a review of literature to the study with focus on the types and forms of mining, social, economic, environmental, health and agricultural impacts of mining. Chapter three discusses the methodology of the study. This outlines the profile of the study area, the research design and data analysis of the study. Chapter four presents discussions on the findings from the survey of the study. Lastly, chapter five provides conclusions and recommendations of the study.



CHAPTER TWO

LITERATURE REVIEW

This chapter presents a review of literature relevant to the study. It reviews the types and forms of mining in Ghana focused on the social, economic, and environmental and health impacts of mining.

2.1. Forms and Types of Mining in Ghana 2.1.1. Small Scale Mining

Small scale mining operations means the mining of minerals by a method not involving substantial expenditure by an individual or group of persons not exceeding nine in number or by a co-operative society made up of ten or more persons (Balfors and Knol, 2007).

History has it that gold was being exported from Ghana in the sixth century B.C. but diamonds were not discovered until 1919 by the Geological Survey. The geological survey group was the only miners of gold and diamond in the traditional economy until 1905 when the colonial authorities through legislation made their operations illegal. Alluvial gold was being mined on river terraces and flats in Ashanti and other regions. Ghana derived its former name the ‘Gold Coast’ from the abundance of gold and trade in gold with earlier Europeans who visited the country (Appiah, 1998). Small-scale mining has traditionally played an important role in the economy of Ghana.

According to Akabzaa and Darimani (2001), rudimentary type of mining was considered illegal until the enactment of the PNDC Law 218 of 1989 legalizing the small scale mining (SSM) activity. This law also empowered the SSMs to sell gold to authorized dealers such as the



Precious Minerals Marketing Corporation (PMMC) as the marketing agency for gold and diamonds. This otherwise known as “galamsey mining” as still being called today uses simple tools like the shovel, the pick axe and other tools to dig pits for mineral exploration.

During the period that the sector was outlawed, the miners still carried out their operations amidst harassment by the security agencies. Small-scale mining is estimated to provide direct and indirect employment to over one million people in Ghana (Akabzaa and Darimani, 2001). Despite the legalization of their operations, some still operate illegally. The small-scale mining law requires them to register with the Minerals Commission who would assign them specific areas to operate, however due to the frustrations in the process; many of them opt to operate illegally. This has given rise to two groups of small scale miners, those registered and licensed and those operating illegally (Akabzaa and Darimani, 2001).

It is estimated that the average galamsey miner gets a substantial daily income of about \$7 (Appiah, 1998). According to a study on the contribution of mining to the Ghanaian economy commission by the Ghana Chamber of Mines, revenue that accrued from small-scale mining in 2008 amounted to \$340 million, with annual income per miner estimated at \$1,700. However, about 95 per cent of them did not pay royalties or any form of tax to the government (Ghana Chamber of Mines, 2008).

Globally, about 100 million people in 70 countries are believed to be engaged in artisanal small-scale mining, producing about 10.6 million ounces of gold annually at a face value of \$9.6 million. In Ghana, it was estimated that between 100,000 and 300,000 people were engaged in artisanal small-scale mining as of 2008, producing about 425,000 ounces of gold, representing



about 15 per cent of national contribution from the extractive industry (mining and quarrying). However, about 95 per cent of them, according to the study, did not have licenses to operate (Daily Graphic, 2009). This notwithstanding has brought lot of dangers and tragedy to the miners, the communities and the country at large. Inappropriate mining of minerals poses a serious threat to the environment, resulting in reduction of forest cover, erosion of soil at a greater scale, pollution of air, water and land as well as reduction in biodiversity (UNESCO, 1985).

Recently reports emerged from Dompase, near Wassa Akropong in the Amenfi East District in the Western Region of Ghana, to the effect that 18 people lost their lives when a mining pit they were prospecting for gold caved in and buried them. The loss of such lives, apart from the gnashing of teeth, the trauma, pain and anguish it unleashes to the families, relatives, friends and well-wishers of the bereaved, also adversely impact on the development and progress of the nation, as the most vital resource of society, the human capital are lost (Daily graphic, 2009).

2.1.2 Large Scale Mining

Commercial mining in Ghana is operated mainly in Western, Ashanti and the Brong Ahafo regions of the country with ten (10) mining license companies (Ghana Minerals Commission, 2010). The most common forms of mining are open cut, underground mining and drilling. There is a huge range of materials that mines extract: coal, peat, sand, limestone, marble, granite, clay, diatomaceous earth (used in cosmetics and filters), sulphur, gold, silver, platinum, copper, zinc, lead, aluminum, iron, nickel, cobalt, magnesium, titanium, chromium, phosphorous, arsenic, boron, silica, salt, water, oil, gas, uranium, thermal energy, and many others (Ali Saleem, 2009).



Surface mining is when the soil and rocks overlying the mineral deposits are removed. It is used when deposits of commercially useful minerals or rocks are found near the surface; that is, where the *overburden* (surface material covering the valuable deposit) is relatively thin or the material of interest is structurally unsuitable for tunneling (as would usually be the case for sand, cinder, and gravel). Surface mining is safer than underground mining because the miners are not exposed to such potential hazards as roof falls, to explosions caused by methane gas or dust ignitions, and to mine-worker pneumoconiosis (black lung) and coughing caused by long-term exposure to respirable coal dust (Ekosse and Fouche, 2005).

In underground mining, the ore body is normally too deep for surface or open cut to be done and the overlying rock is left in place whilst the minerals are removed through shafts or tunnels. Ventilation is normally provided in underground mining, but in cases of uranium, care must be taken to avoid or minimized radiation exposure and dust inhalation. Entry into underground mines is by vertical shafts, or by a sloping tunnel, called a 'decline' (OECD, 1999).

To extract the ore, the components required to build large pieces of machinery are taken down the shaft and assembled in the area where the miners are working. One method of underground mining involves blasting hard rock and ore to create large openings in the ground (called 'stopes'). The mined material can be brought to the surface by trucks, or in large containers (called 'skips') that travel up and down the shaft (SACM, 2002).

2.2 Impacts of Mining

Mining as an activity has both positive and negative contributions to economies and the environment in general as reviewed below.



2.2.1 Socio-Economic Impacts of Mining

2.2.1.1. Economic Impacts

Large mining operations invest substantially in local economic development, through the provision of training, public services such as education and health, and public goods, such as clean water, roads and transport, energy, and infrastructure to the local people and the country as a whole (Pearce, D. W. and R. K. Turner, 1990). Pearce and Turner, (1990) further stated that, apart from mining operations offering direct employment impact to the people, there are substantial potential for developing downstream and lateral economic activities with suppliers and refiners along the chain for both miners and non-miners.

Barry, (1996) also added that, employment generated indirectly by a mining operation amounts to between 2 to 25 times the number of direct employees, in certain cases even more than that. Studies also conducted by the World Bank on mining and poverty reduction showed that, every dollar spent by a mine on operations could generate an average of 2.8 US dollars in the local economy (World Bank, 2001).

According to the Ghana Chamber of Mines, the mining and mineral industry injected a total of US\$2.9 billion into the economy in 2009, representing an increase of 27 percent from the 2008 figure of US\$2.3 billion. The rise was due to an appreciation in gold output by 13.3 percent from 2,585,993 ounces in 2008 to 2,930,328 ounces in 2009 coupled with an increase in the average realized gold price by 14 percent from US\$852 per ounce in 2008 to US\$970 per ounce in 2009. It further argued that, the increase in gold production at the Golden Star Wassa Limited, Chirano Gold Mines, Gold Fields Ghana-Tarkwa, AngloGold Ashanti Obuasi, Golden Star-Bogoso and Newmont Ahafo cumulatively offset the decline at the AngloGold Ashanti-Iduapriem mine,



which accounted for the rise in overall production of gold which stimulated the economy through the provision of infrastructure and other support services by government (Ghana Chamber of Mines, 2009).

2.2.1.2. Social Impacts

The social impacts of large-scale mining projects are controversial and complex. Mineral development can create wealth, but it can also cause considerable disruption. Mining projects may create jobs, roads, schools, and increase the demands of goods and services in remote and impoverished areas, but the benefits and costs may be unevenly shared. The high demands of land in mining communities and the influx of migrants to these areas in pursuit of jobs automatically increases the cost of accommodation, food prices and other consumables. The implications are that those who do not earn high income or are not employed in the mining sector, (wages in the mining sector are said to be higher than the average wage in Ghana) will not be in the position to afford decent accommodation for themselves and their families or fend for themselves and their families as well. Migration of young ladies into mining communities in search of non-existent jobs may lead to prostitution with its implications for the spread of transmittable diseases including HIV and AIDS (World Bank, 2010).

In Obuasi, Tarkwa and Kenyasi of Ghana, influx of migrants from other parts of the country to these areas are higher for works like small scale mining (galamsey) putting pressure on the social services and other amenities in these communities.



2.2.1.3. Risks to Socio-Cultural Stability

One of the significant impacts of large-scale mining on the local community is a rapid change in the economic and social fabric of society. Findings attributed to a study conducted by Biney, (2008) on this subject showed that disparities in incomes emerged and the lure of new opportunities creates in-migration disrupting some cultural stability and other social norms. Different groups compete for access to public goods and social services and new tensions in the community abound, though the diversity of these groups brings in new paradigms, positive competitions and developments. New types of poverty are created with a mixture of “original residents” who have been unable to share in employment opportunities, and “newcomers” who have migrated in with the hope of finding employment, but have been unsuccessful in doing so. Social ills such as alcohol abuse, prostitution and child labour often increases when they should have been benefiting from their natural resources (Downing, 2002).

The Asutifi area as a gold mining community has the propensity to experience these socio cultural stability issues in the long term as more migration figures continue to increase in the area.

2.2.1.4. Governance, Macroeconomic Management, and Corruption

Not all countries with substantial natural resources provide an attractive framework for foreign direct investment to leverage existing opportunities for generating fiscal income; nor are mining companies, in particular, when state owned, always managed with appropriate financial and operational effectiveness and efficiency. This according to the World Bank, (2010) on its poverty reduction and mining study for 2010 said a weaker policy regime situation like Ghana’s



case exposes such countries to corruption and mismanagement. It argued that mineral-dependent economies are often more prone to governance and corruption issues than non mineral-dependent economies.

Also, negative consequences of macroeconomic mismanagement may be harsher in the context of mining than in a non mining economy. The presence of mining will inflate wages and keep the exchange rate strong, which can prevent other sectors, for example, agriculture, from being internationally competitive and thus from realizing the opportunity for export-driven growth. The costs of macroeconomic mismanagement are high, given the often substantial fiscal revenue from mining, particularly when considering that these natural resources are nonrenewable (World Bank, 2010).

2.2.2 Environmental Impacts of Mining

2.2.2.1 Water Quality and Dust Pollution

Environmental damage can be caused by small-scale mining and large-scale mining. Water quality water quantity, tailing management, noise and dust pollution as well as ecosystem disturbances are issues that can adversely affect the health and livelihood of the poor and vulnerable in society. For instance, Weber-Fahr Monica, (2002) revealed in a cross-study analysis of environmental damages as a result of mining operations in 51 mining countries across the globe, that about 60% of the residents in these communities were at risk of environmental pollution (Weber-Fahr, 2002). In the context of mine closure, abandoned or orphaned mines normally in open pit forms causes pollution and potential public danger. Environmental and health standards may not have been agreed upon at the beginning of a mining operation, or they



may not be easily monitored which could be attributed to a relaxed monitoring of the use of the environmental impact assessment frameworks by miners. Lack of preparation for mine closures at the time of a mining operation increases negative impacts on local environments and regional economies upon closure which in turn affects government budgets (Anderson, 1997 and Auty, 1993).

On water pollution, many mines have an active programme that lowers the water table or divert major watercourses away from the mines. This exercise has disruptive consequences for the quality and availability of surface and ground water. The concentration of mining operations in Tarkwa has been a major source of both surface and groundwater pollution. Four main problems of water pollution have been noticed in Tarkwa mining areas. According to Amoah, (2003), chemical pollution of ground water and streams, siltation through increased sediment load and increased fecal matter and dewatering effects were the major water pollution problems from mining activities. Various chemicals such as cyanide and mercury are used during ore processing. These chemicals constitute the major pollutants of surface and ground water. Chemical pollution could also occur through the misuse, mishandling and poor storage of explosives. Sulphur dioxide fumes from mining companies could also generate extensive chemical pollution.

In addition to these, heavy metals from mining operations contribute to water pollution as well. The presence of such heavy metals above a certain threshold can be injurious to human health and the environment, particularly aquatic life. Water samples obtained from boreholes, wells and streams within Tarkwa area produced startling results of very high abnormal content of fecal coliform, suspended solids, chloride, colour and manganese content, particularly in the Angbenabe River at Nkwantakrom. While the permissible level of suspended solids, for instance,



for the EU, WHO, and USA ranged between 1 mg/l and 5mg/l, results of water analyses of the stream at Nkwantakrom had as much as 138 mg/l. For colour, the international standards range between 15 and 20 mg/l, while the same river had as much as 700mg/l (Amoah, 2003).

On poisoning from chemicals and cyanide spillage, a study conducted in Tarkwa and its surroundings by Hilson G., (2002) on “The environmental impact of small-scale gold mining in Ghana: identifying problems and possible solutions”, revealed that mercury poisoning of small scale miners is a serious health hazard. According to the study, this is a result of indiscriminate use and improper application of mercury in the processing of gold by small scale miners. Nursing mothers as well as their children stand a great risk of poisoning. According to medical experts, mercury poisoning can lead to birth defects in women when it enters the placenta and may lead to death. Cyanide is known to be lethal to humans in very small quantities, with only a teaspoon of 2% cyanide solution causing death. Because of the number of cyanide spills and accidents, the use of cyanide in mining and in larger quantities to remove gold from ore or crushed rocks are creating more and more controversies (Agyapong, 1998).

According to a press release in January, 2010 by WACAM (Wassa Association of Communities Affected by Mining), the Ahafo mine in Kenyasi is not left out, as they spilled cyanide in waters and streams of closer communities in October, 2009 which made the government of Ghana to fine them about US \$4.9million for causing the spill of the cyanide with high residual impact on the environment and health of the people.



2.2.2.2. Drainage in Soils

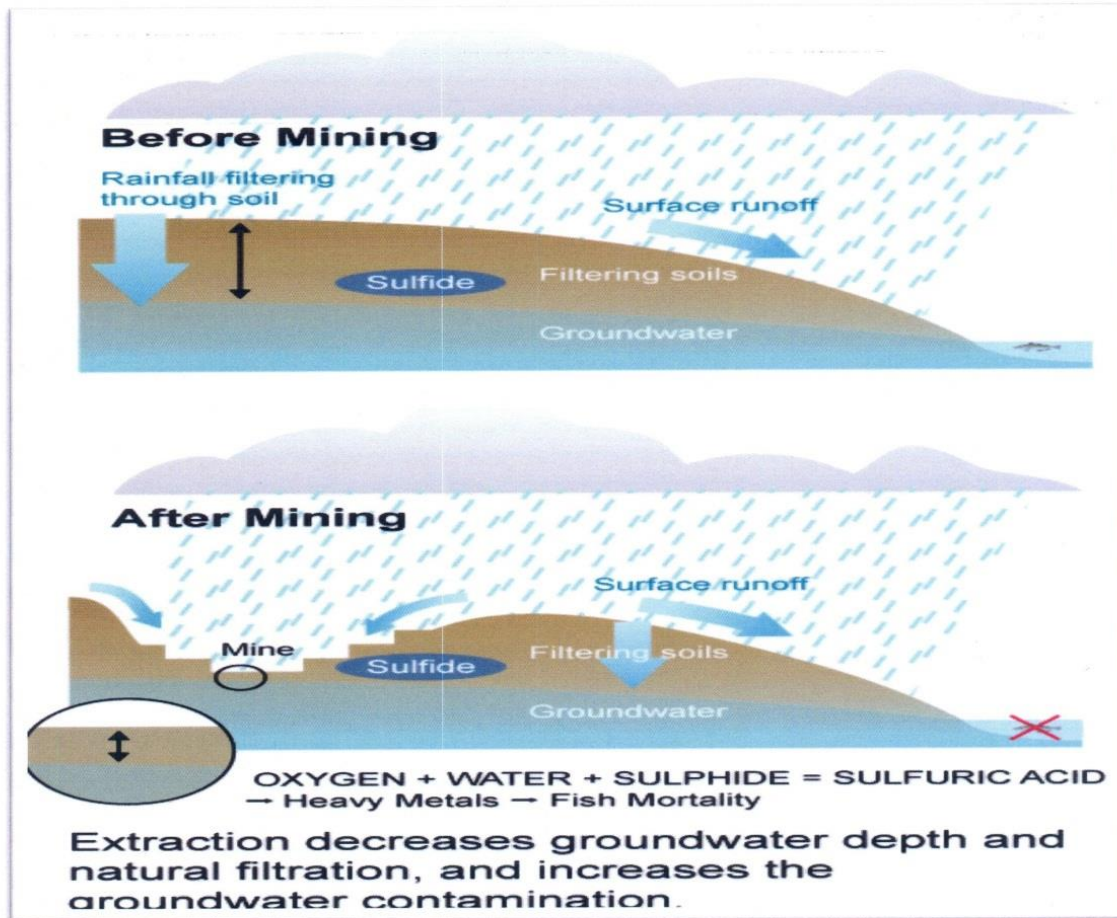
According to UNEP, (2008), Acid Mine Drainage (AMD) is the number one environmental problem facing the mining industry. AMD occurs when sulphide-bearing minerals in rock are exposed to air and water, changing the sulphide to sulphuric acid. It can devastate aquatic habitats, is difficult to treat with existing technology, and once started, can continue for centuries (Roman mine sites in Great Britain continue to generate acid drainage 2000 years after mining ceased). Acid mine drainage can develop at several points throughout the mining process: in underground workings, open pit mine faces, waste rock dumps, tailings deposits, and ore stockpiles.

This is best appreciated from Figure 2.1 overleaf, where ground water depth and infiltration is decreased with an increased in contamination of the ground water as a result of mining activities. Again, it shows how exposed the underground water is to heavy metals after mining which is not good for plant growth as revealed by UNEP, (2008). Also, there is a precipitant that blocks out the sunlight, restricting plant growth and virtually upsetting the balance of many waterways. The effects are sometimes devastating to the plants and animals in the environment surrounding the mine. Presently, many companies are developing options to help solve the acid mine drainage problem (Lawhorn W. D., 2010).

UNEP, (2008) argued that apart from endangering aquatic species in waters, the contamination of the underground water with the acid makes it poisonous for consumption and for agricultural use especially for fish culture.



Fig. 2.1: Before and After Visual of Mining Effects on Rainfall Drainage



Source: (UNEP/GRID-Arendal, 2008).

2.2.2.3. Impact on Arable Land

There is also a problem of deforestation and land degradation from the open cast mining system by both large scale companies and artisanal small scale miners. Having cleared the lands for extraction, some mining companies make the effort of reclaiming the land by reforestation, but



changes in the natural ecosystem of the land and vegetation causes the destruction of the biodiversity. This situation is aggravated by artisanal miners who clear forest and dig large trenches leaving them bare, thus exposing the soil to erosion which cannot be used for agricultural purposes and also serving as breeding grounds for mosquitoes (Kusimi, 2007).

Akabzaa and Darimani (2001) argued that, considerable areas of land and vegetation in Tarkwa for instance were cleared to accommodate surface mining activities which constitute over 70% of the total land area of Tarkwa. The tailing dam of one mine took a total of 6.3ha of land given an estimated per acre yield of cassava of 108,000 bags. This means the tailings dam has denied the farmers a minimum of 275,351 bags of cassava per annum. The tailings dam, plant site and feed stockpile of Ghana Australia Goldfields Limited alone affected a total of about 315 farmers currently cultivating around the area. In Akabzaa and Darimani's view, the takeover of the dam had significant implications on the farmers' income and food security of the families due to the presence of tailing dams. Again, depleting the vegetation by surface miners has long-term effects even when the soil is replaced and trees are planted after mine closure. The new species that might be introduced have the potential to influence the composition of the topsoil and subsequently determine soil fertility and fallow duration for certain crops. In addition to erosion where surface vegetation is destroyed, there is deterioration in the viability of the land for agricultural purposes and loss of habitat for birds and other animals. This can culminate in the destruction of the luxuriant vegetation, biodiversity, cultural sites and water bodies (Akabzaa and Darimani, 2001).

The 2009 cyanide spillage from Newmont in the Ahafo mine area was from its tailing dams which contain a lot of poisonous chemicals that was spilled in to the Subri River where a lot of communities depend on for their water and other livelihood needs.



2.2.2.4. Land Fragmentation

Land fragmentation is a serious limiting factor as it causes higher increases in cost and makes the productivity improvement activities uneconomical. Fragmentation could be due to family holding division to members, higher demand for land for different purposes and increase in population size in an area. In areas where natural resources like gold and other metals exist, mining firms have to resettle communities to different locations to enable them mine these resources. This contributes to displacing farmers and reduces their farming land sizes and indirectly eliminating large scale farming apart from other land use needs (Khalil and Gholamhossein, 2008).

According to Khalil and Gholamhossein, (2008), land fragmentation due to traditional ownership or family structure is antithetical to agricultural growth, because it does not support mechanized and commercial farming. Apart from the natural restriction, other factors include partial inheritance system or population pressure, significant imperfections in the land market; and the breakdown of common property system under the pressure of population growth. In their conclusion, they argued that, it was logical that partial inheritance leads to land fragmentation when land with similar quality is equally divided by heirs and when the increase of population growth puts pressure on land use.

Meanwhile, according to Inoni, and Adun, (2006), with land fragmentation, small fields tend to lessen the damage of soil erosion and protect crops in a severe climatic condition. Since crops have distinctive growth requirements, a diversification in agricultural production caused by land fragmentation may reduce risk in total agricultural production. Per capita arable land availability in a village is likely to be correlated with variation in land quality (soil types, water access,



drainage conditions, road access, and so on), is one of the variables that has significant impact in two models. It is assumed that with the acquisition of lands by Newmont in the Ahafo area left over lands are going to be fragmented for agricultural and other uses.

2.2.2.5. Polluted Farm Lands and Crop Contamination

Contamination of crops through poisoning as a result of waste from mining is a problem in the Obuasi area according to TWN Africa (Action Aid, 2005). TWN Africa indicates serious poisoning of local crops in areas of historic gold mining activity, with high levels of mercury, zinc and arsenic found in local ‘Obuasi oranges’. “Mercury values were up to 5 times more than EPA limits and 26 times more than World Health Organization limits. Zinc concentrations were also up to 5 and 8 times more than EPA and WHO limits in the soils and in plants.

In addition, arsenic values were 24 and 1,226 times more than the EPA and WHO limits respectively as a result of the mining activities (Action Aid, 2005). With these deposits in the soil in higher concentrations, crops directly absorb the substances and assimilate it to the roots and fruits which are not safe for human consumption.



CHAPTER THREE

METHODOLOGY

This chapter explains the methodology applied in the study. The study area and its socioeconomic features, the data collection techniques and methods used are also discussed. Analytical models are used to determine the mining impacts of mining on agriculture in the study area. The data collection techniques then outline the research design and sampling method, questionnaire design and administration and relevant statistical tools used in the analysis of the data set.

3.1 The Study Area

This chapter discusses the socio-economic profile of the area with emphasis on the selected mining communities in the district. The Asutifi District is one of the districts in the Brong Ahafo Region of Ghana which was created in 1988 and is classified by the Ministry of Local Government and Rural Development as deprived based on the infrastructural development and social amenities in the area. The district economy is mostly agrarian and like a normal deprived district, agriculture is in the hands of peasant farmers who still depend on rudimentary methods for production. It has an ecologically balanced semi-deciduous forest reserves (District Profile).

The district is however endowed with a variety of resources which include the following;

- Gold, Diamond and other mineral deposits at Wamahinso, Nkrankrom and Kenyasi.
- Vast Forest Reserves (about 475.63km square) stocked with timber and other forest products.
- Large quantities of Clay and Sand deposits

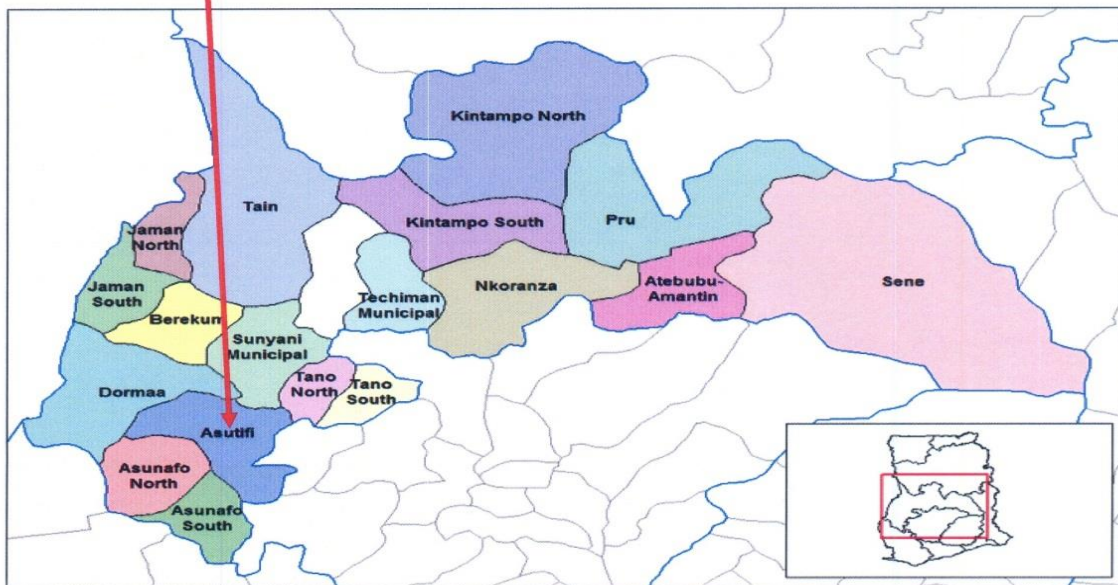


- Good soil of high agricultural value
- Well established Senior Secondary Schools like OLA Girls, Acherensua, Hwidiem, Gyamfi Kumanin.

3.1.1 Location and Population Size

The Asutifi District which is in the BrongAhafo Region occupies an area of about 1,500 square kilometers. The district is located between latitudes 6°40' and 7°15' North and Longitudes 2°15' and 2°45' West. It shares boundaries with Sunyani Municipal in the north and Asunafo in the south and to the west with Dormaa as indicated in figure 3.1 below.

Fig: 3. 1. The Study Area



Source: (The Survey Department)



It has a total population of 84,475 inhabitants with 50.4% being females and 49.6 % males. It is predominantly rural with only 15% of the district being urban (GSS, 2000). Current estimated population in 2009 for the district put the figure at 107,925 with about 77.4% involved in agriculture (ADP, 2010). It has about 117 settlements and out of this only three - Kenyasi, Hwidiem and Acherensua are urban settlements having a population of over 5,000 (GSS, 2000).

3.1.2 Geology and Minerals

This physiographic region is underlain by Precambrian rocks of Birimian and Dahomeyan formations. The Birimian formations are known to be the gold bearing rocks. There are reported cases of gold deposits at Kenyasi, Ntotroso, Nkrankrom, Acherensua and Wamahinso. Diamond has also been discovered at Wamahinso. There is also a widespread deposit of sand and clay; sand at Kenyasi, Gambia No.2, Hwidiem and Acherensua and clay at Nsunyameye and Dadiesoaba. Birimian rocks also have a high potential for Manganese and Bauxite. There are rounded out crops of granite found over the Birimian rocks at Kwadwo Addae Krom, Goa Asutifi, Georgekrom and Konkontreso. These rocks have a high potential of iron and bauxite (DDP, 2002).

3.1.3 Climate and Vegetation

The district lies within the wet semi-equatorial zone marked by double rainfall maxima with a mean annual rainfall between 125cm and 200cm. The first rainy season is from May to July and the second rainy season is from September to October when the district comes under the influence of the Wet Maritime Airmass. There is a sharp dry season between the two rainy



seasons the main one coming between November and March when the tropical continental Air mass in the country sweep over the area (DDP, 2002).

Relative humidity is generally high ranging between 75% to 80% during the two rainy seasons and 70% to 80% during the rest of the year. The district has a moist semi-deciduous forest. Human activities notably farming, lumbering and occasional bush fires have however disturbed this vegetation. This has changed some areas into a derived wooded savanna. Such transitional zones could be observed along the roads to Koforidua, Kensere and Kenyasi. There are however, large areas of forest reserves which include Biaso Shelter Belt, Bia Tam Forest Reserve, Asukese Forest Reserve, Goa Forest Reserves, Desiri Forest Reserves. These forest reserves together cover a total of about 475.6 square kilometers representing 30% of the entire land surface area of the district (DDP, 2002).

3.1.4. Migration

About 54% of the people in the district are migrants (mainly Ashantis) while the Bonos; the indigenes constitute only 9 percent of the population (DPP, 2004). These immigrants had however stayed in the district since time immemorial and hence do identify with the area and with development activities, but out-migration is not prominent in the district. The gross out-migration rate is about 35 people per 1000 (DPP, 2010). With the advent of Newmont Gold Ghana Limited, migration pattern and rate have changed.



3.1.4 Income and Poverty Levels

The predominant economic activity in the District is subsistence agriculture (mostly farming) which engages 77.4% of the economically active labour force. Other professionals outside of this occupation engaged in agriculture as a minor activity. The service sector accounts for 21% of the active labour force consisting mainly of trading and this leaves the industrial sector with only 1% of the labour force employed in this sector. Average household income earned per month for households is G1-1020.23. Taking the main income as average income, annual per capital income is estimated at G1-10243.06 (DPP, 2004).

Crop farming constitutes the major source of income in the district, and accounts for about 50% of all incomes. This is followed by wages and salaries which is 15%, business and trading 15%, small scale industry 8.5%, livestock farming 6%, pension, rents and remittances 3.5%, and others 2%. The leading area of household spending is on food which represents 55%, followed by energy 15%, transport 11%, education 9%, health 5%, funerals 3% and housing 2% (DPP, 20022004).

The Ghana Living Standard Survey, (2005) puts the expenditure on food at 69%. Expenditure on food in the district, therefore, falls below the national average. This could be attributed to the fact that it is a food crop growing area and almost all the farmers concentrate on subsistence agriculture.

Generally, the standard of living of the people is low. About 50% of the people live below the poverty line. The people's access to basic facilities and services is limited, and this account for their inability to contribute meaningfully to development. The people earn very little and cannot therefore save to build capital for development (GLSS, 2009).



3.2 Agricultural Production Pattern in the District

3.2.1 Yield trends in the Asutifi District

The district, over the years, have had varied yield pattern of crop produce. Yield estimates since 2006 carried out by the Ministry of Food and Agriculture are presented below (Table 3.1).

Table 3. 1: Yield Trend of Crops in the District

ESTIMATED YIELD OF SELECTED CROPS PER HECTAR (HA) IN THE ASUTIFI DISTRICT BY MOFA					
YIELD MT/HA (Metric Tons/Hectare)					
CROP	2006	2007	2008	2009	Achievable/expected Yields
Maize	2.3	4.02	2.2	2.1	6.0
Rice	1.7	2.7	1.9	1.8	6.5
Yam	11	12.5	11	10.0	49.0
Plantain	13.1	13.1	13.5	14.0	20.0
Cocoyam	7.9	7.9	8.0	9.0	10.0
Cassava	18.0	16.6	16.8	17.0	48.7
Cocoa	11.2	10.3	10.0	10.1	12.2

Source: (SRID-MOFA, 2010)

From Table 3.1 above, the data shows a very little change in the production pattern and according to the document, the varying yield trends could be due to several factors like low soil fertility levels in the area, high cost of inputs like fertilizer and chemicals (herbicides). Again, comparing the yield trend to the achievable yields of crops for the country provided by the Ministry of Food and Agriculture through SRID as in Table 3.1, the yield gaps are wide as more



input is needed to increase it to the national average. Apart from cocoyam that are better and close to the national average, the other crop yield trends are not satisfactory in line with the achievable yields. Adoption of good land management practices to increase soil fertility, use of high yielding varieties, and engagement of more extension officers to narrow the gap between farmers to extension officer ratio in the area can help increase the yields.

3.3 Newmont Ghana Gold Limited

Newmont Mining Corporation is a leading gold producer with operations in five continents, employing approximately 34,000 people and contractors worldwide. Newmont recently developed its first project in Ghana in 2006, and it is the only mine operations of the company in Africa, which at the end of 2007 had over 17 million ounces of gold reserves, representing nearly 20% of its global gold reserves. This is expected to last for 20 years especially in the Ahafo mines (WBCSD, 2009).

It operates the open pit system and currently mines from three open pits but with about 17 pits in total. It employed a total of 3,528 employees including Ghanaians contractors in 2008. Newmont have just started operations too at Akyem in the Eastern Region of the country though with low concession as compared to the Ahafo mines (WBCSD, 2009).

The operation at the Ahafo mines displaced about 823 households (5,185 people) of both residential buildings and cropped fields in the mine area. In addition, 878 households (4,390 people) will be economically displaced through the loss of cropped fields located in the mine area. The total number of impacted households is 1,701 consisting of 9,575 people (Planning Alliance, 2005).



Newmont launched a community development fund to contribute an estimated US\$ 500,000 annually via a community foundation to support community development programs. Newmont Ghana Gold has also embarked on other community development initiatives including the provision of water, sanitation, upgrading of the local clinics and training centers, school construction, HIV/AIDS programs for the communities as well as a program on malaria prevention in the district. Again, the Ahafo Linkages Program by Newmont which operates in 12 communities has been able to generate about \$4.7 million since 2008 within these communities through local content use and involvement (WBCSD, 2009).

3.4 The Research Design.

This section discusses how data for this study was collected and analysed. These include the data collection through questionnaire administration, sampling methods and frame and data analysis.

3.4.1 Data Collection

The data gathered for study was qualitative and quantitative in line with the specific research objectives. It consisted of a primary and secondary data. The primary data was derived from interviewing key individuals through structured questionnaires administration, observations and the secondary data was sourced from institutions such as MOFA, Newmont Ghana Gold Limited and COCOBOD in addition to consultation of relevant journals, dissertations and other publications.

3.4.2 Questionnaire Design and Administration

Open and close type questionnaires' were used in conducting the study as seen in the appendices.

It was categorized into three sections focusing on the socio demographic features, the socio economic impacts and the general impacts of mining activities on agriculture. The researcher



used questionnaire because it greatly helps respondents give specific and direct answers to questions asked. Prior to the questionnaire administration, a focus group discussion was undertaken to explain the purpose of the study and the questionnaire to them. Respondents who could read were given the questions to answer while those who could not read and understand were interviewed.

Pre-testing of the questionnaire was done at Kenyasi No. 2 to help the researcher fine tune the questions and improve on the skills of the questionnaire administrators in order to have reliable and efficient data. The secondary data sources consisted of a desk study of books, dissertations, journals, correspondence, relevant information from the ministry of food and agriculture, the mining companies, the chamber of mines, and the district assembly to extract information and statistics for the study.

3.4.3 Sampling Method and Techniques

The population of the district with about 117 communities as given by the Ghana Statistical Services was 84,475 as at the year 2000. Probability sampling was then used to select the three communities namely; Kenyasi, Ntotroso, and Ola Resettlement. This was to allow for equal participation of all the 15 communities covered by the mining activities for the survey, and also to avoid biasness by the researcher.

The estimated total population for the three study areas was 12,122 people (GSS, 2000). With a confidence level of 95% and 5% precision level with an estimated population of 12,122 a sampling formula of $n = \frac{N}{1 + N(e)^2}$ was used to arrive at the sample size.



Where, n =Sample size

N =Population size

E= Level of precision

N= 12,122

e= 0.05 at a confidence level of 95%

$$n = \frac{12122}{1+12122(0.05)^2}$$

n = 387.22 approximated to **387**

Since it is impossible to deal with the entire population in these three study areas due to resource, budgetary and time constraints, a representative sample size of **120** was selected for the survey. The advantage of choosing a representative sample size is that, it enables models to behave well as a result of large degree of freedom (Sarantakos, 1997).

The target population for this study was households with farmers being the sampling units of the study area. Purposive sampling was used to determine the sampling units and the target population of the study. This was used because of the nature of the research objectives as it focused on crop farmers. Simple random sampling was then used to select the farmers for the survey. Simple random sampling was used to ensure that every farmer stood the chance of being selected for the study. It also allowed for maximum selection of both male and female farmers as well as cash and non cash crop farmers.



Table 3. 2: Study Area, Population and Sample Size Distribution

COMMUNITY	POPULATION	SAMPLE SIZE SELECTED
Kenyasi	6,258	62
Ntotroso	4,060	40
Ola Resettlement	1,804	18
Total	12,122	120

Source: (Author's Construct, 2010)

Using proportions of the community's respective population from Table 3.2 and their total sum of 12,122 with 120 as the sample size, Kenyasi was 62, Ntotroso 40, and Ola Resettlement 18 as captured in table 3.2 above for the study. Proportions were used to determine the sample distribution for each community because it allowed for a fair sample size representation and distribution from the respective community population as shown above for the study.

3.4.4 Data Analysis

The data collected was subjected to descriptive analysis with the use of bar charts and frequency distribution tables. Statistical software's including SPSS and excel sheets were used to produce graphs and frequency distribution tables with all the data pre-coded before the analysis. The analytical framework used for the analysis is shown in Table 3.3 over leaf.



Table 3.3. Analytical Framework of the Study

Objectives	Output	Analysis
To estimate the production levels of some selected crops amid mining activities in the study area.	Production levels	Production (Tons) =Acreage (ha) x Yield (kg/ha).
To estimate the mean income levels of farmers in the study communities.	Income levels	TR-TE= Net Income , where TR is total revenue, TE is total expenditure.
To examine the extent to which the mining activity has affected the size of farm lands in the study area.	Farm land size	Farm land size, availability and cost.
To evaluate the level of labour supply to agricultural production amid mining in the study area.	Labour	Labour availability, accessibility and affordability before the mining activity and now.

Source: (Author's Own Construct, 2010)

Data from the study area was analysed in comparison to the national achievable yields pattern provided by the Ministry of Food and Agriculture over the years with respect to the production patterns in the study area.



CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the analysis of data collected on the Socio -Economic Effects of Mining on Agriculture in the Asutifi District of the Brong Ahafo Region. It focused on the socio demographic features of the survey, the production levels of crops in the study area, income level determination for farmers and labour supply valuation to the agricultural sector in the study area. It went further to analyse the link between mining activities and agricultural land size in the study area.

The interpretation of the data consisted of graphs, pie charts and tables used to aid in the analysis of the data. A review of the socio-demographic characteristics of respondents with much emphasis on the objectives of the study was also examined.

4.1. Socio Demographic Characteristics

The socio demographic characteristics discussed are age, sex, education and employment status of respondents. It shows the features or profile of the farmers and its reflection in the study area.

4.1.1. Sex of Respondents

Out of the 120 respondents interviewed, 54 of them were women representing 45% whilst 66 of them were men representing 55%. It is therefore clear that the highest respondents to this survey were men as shown in table 4.1. This also confirms other studies that men constitute the general active agricultural working force and that of the mining sector (Aroma *et al.*, 2006), though with a fair representation of women.



Table 4.1. Sex of Respondents

Sex	Frequency	Percent (%)
Female	54	45.0
Male	66	55.0
Total	120	100.0

Source: (Field Survey, 2010)

4.1.2 Age Group of the Respondents

The age of the respondents was categorized into five (5) age categories as shown in table 5 below. The age category with the highest frequency was the 36 to 45 age group with about 58.4% of the total respondents. This shows that majority of the farmers in the three study areas are within this category and are assumed to be actively engaged in farming activities and are the higher group of labour force to the sector in the area.

Table 4.2. Age Group of Respondents

Age Range	Frequency	Percent (%)
18 to 25	7	5.8
26 to 35	28	23.3
36 to 45	70	58.4
46 to 55	10	8.3
56 and above	5	4.2
Total	120	100.0

Source: (Field Survey, 2010)

Also, the lowest age category who responded were the 56 and above group and this could be attributed based on this results to old age and retirement from active farming, but the younger

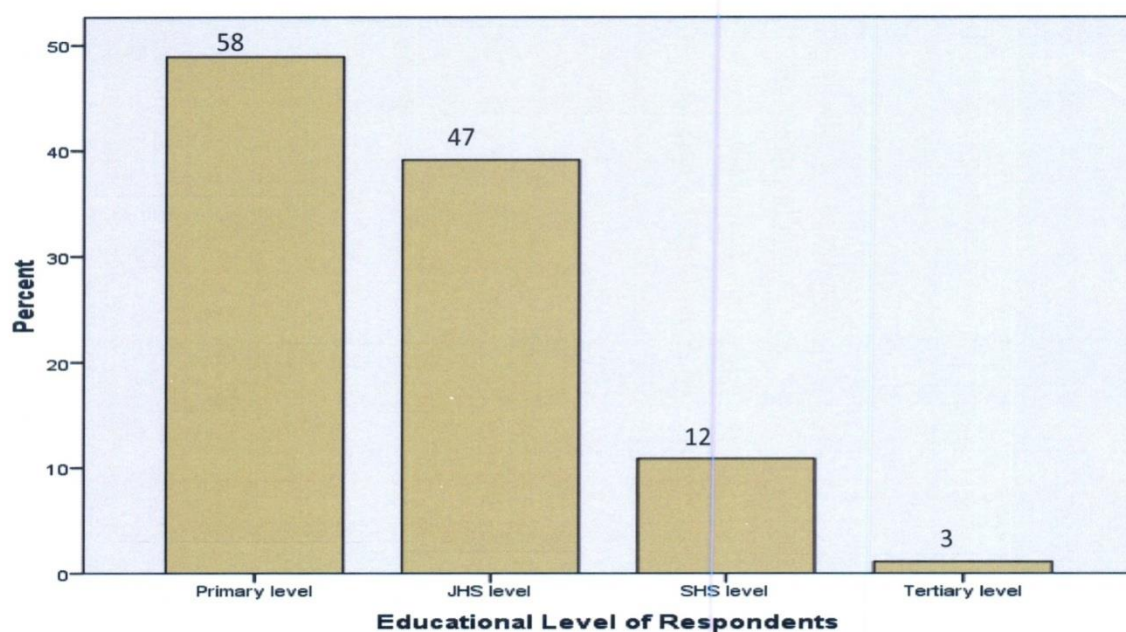


group mainly less than 25 years could be attributed to lesser interest in agriculture and would prefer the jobs of the mining sector as it pays more than farming.

4.1.3 Educational levels of Respondents

The survey revealed that, 58 of the total respondents interviewed representing 48.9% had primary education with 47 of them representing 39.1% attaining the Junior High School level and only a few as 3 of the respondents making 2% had tertiary education with 12 of them also representing 10% had Senior High School education. This indicates that most of the farmers interviewed did not have higher education and

Figure 4.1. Educational Levels of Respondents



Source: (Field Survey, 2010)

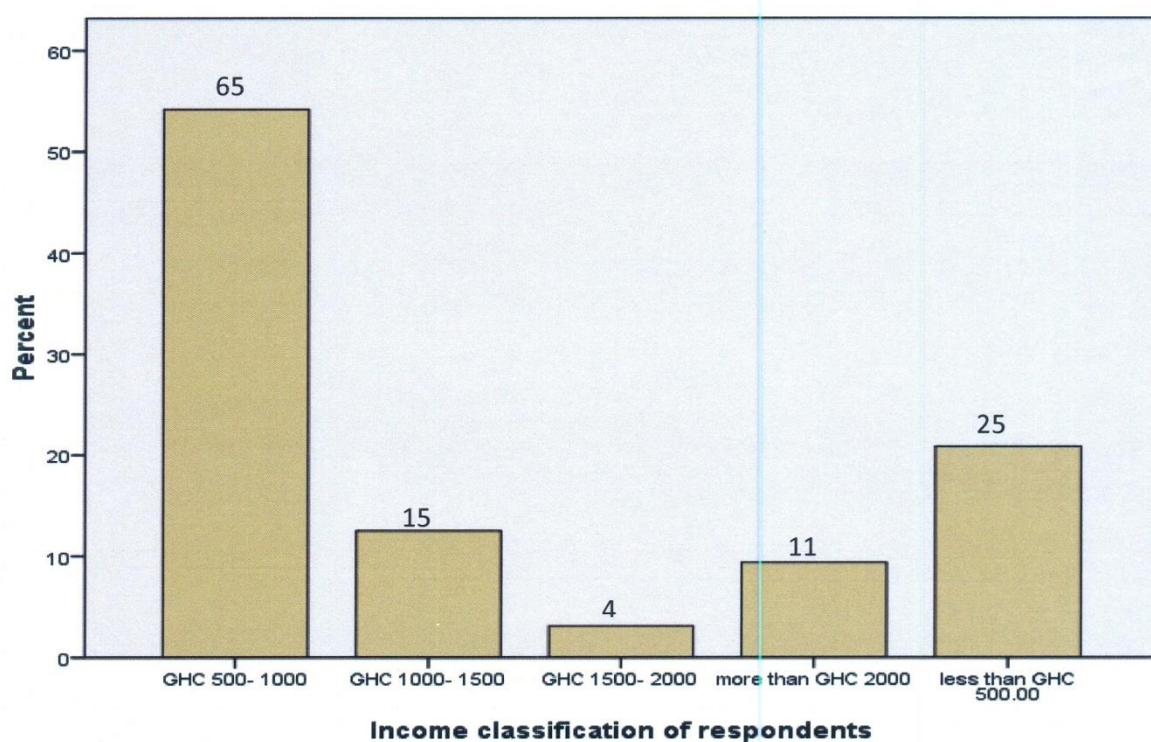
farming is their occupation (Figure 4.1). Those with higher education may be having other careers engaged in with farming as a hobby.



4.1.4 Income Levels of Respondents (Farmers)

Monthly income levels of respondents revealed that 65 of them representing 54.2% earns between GH¢500 to GH¢1000 per month which constituted the majority from the study. Less than GH¢500 as income earned by respondents per month was few with only 25 of the respondents representing 20.8%. From figure 4.2 below, (11) 9.4% of respondents earn more than GH¢2000. It was realized that farmers in this category were cultivating both cash and non cash crops (cocoa, maize, rice cassava, plantain etc) and hence their higher monthly returns.

Figure 4.2. Monthly Income levels of Respondents



Source: (Field Survey, 2010)



4.2. Estimation of Production Levels of Crops in the Study Area

As indicated in earlier in Table 3.3 of the analytical framework for this study, yield and area cultivated was used to estimate the production figures for the study. According to Patil S. *et al.*, (2010), production levels can be estimated using a relationship like Acreage (ha) x Yield (kg/ha). Cassava, maize, plantain, cocoa and rice were crops the study concentrated on in estimating the production levels. Amount of inputs used in cultivating these crops were not captured in this study as emphasis was on the outputs alone.

About 76.3% of the farmers cultivate three (3) or more acres of crops with 26% of the respondents having two acres each, with 36.4% cultivating less than two (2) acres of food crops. Almost all respondents interviewed cultivate many of the crops but 44% of the 120 respondents were growing more maize than other crops with an average yield of 2.02 metric tons per hectare. The yield trend over the past four (4) years from MOFA compared to the yield estimates from this study are captured in Table 4.3 below. Apart from 2007 where the yield level for maize was 4.02Mt/ha, which was quite high, the average yields for the district for maize was 2.6Mt/ha for the past five years. Other crops over the years in review showed marginal changes both in reduction and on increase as seen below.

Table 4.3. Comparison of Yield Levels of Some Selected Crops with MOFA Achievable Yields Standards

ESTIMATED YIELD OF SELECTED CROPS PER HECTARE(HA) IN THE ASUTIFI DISTRICT						
YIELD MT ¹ /HA						
CROP	2006	2007	2008	2009	Achievable Yields by MOFA	Actual Yields from the

¹ MT is a metric system unit of measurement which refers to a metric ton equivalent to 1000kg.



						field Survey (2010)
Maize	2.3	4.0	2.2	2.1	6.0	2.0
Rice	1.7	2.7	1.9	1.8	6.5	1.5
Plantain	13.1	13.1	13.5	14.0	20.0	13.3
Cocoyam	7.9	7.9	8.0	9.0	10.0	8.0
Cassava	18.0	16.6	16.8	17.0	48.7	18.1
Cocoa	11.2	10.3	10	10.1	12.2	10.1

Source: (MOFA and Field Survey, 2010)

This low yield trend could be due to several reasons like changes in rainfall pattern in the area, higher cost of inputs like fertilizer and herbicides as well as low soil fertility due to continuous cropping.

Production levels for cocoa also decreased in the study area as many of them had less than 3 acres of cocoa under production than before. Average yield for an acre of cocoa was estimated to be 10.1mt/ha as against a normal or achievable production level of 12.2mt/ha. This reduction in the acreage of cultivable lands could be due to the takeover of the lands by Newmont Ghana Gold Limited, the mining company in the study area. The high cost of land could also be due to the increasing number of farmers in the area. Cassava and plantain had a stable production levels in the study area as yield levels of 18.1mt/ha and 13.3mt/ha metric tons respectively were recorded, though with a reduced acreage of lands available. Rice was the least affected, as only 9% of the respondents cultivates it with an average yield of 1.5Mt/ha, whilst the standard achievable production yield is 6.5Mt/ha from MOFA. A respondent intimated that, rice farmers



have less than 0.4ha of arable lands for cultivation in the area. This is because there are few valleys in these communities suitable for rice cultivation.

4.3. Income Levels of Farmers

Yield and prices of crop produce were used to determine the total revenue of farmers with total expenditure taken out from the revenue to determine farmer's income levels. Thus $TR - TE = \text{Net Income}$, where TR is total revenue, TE is total expenditure. Expenditure incurred by respondents was basically on labour, land acquisition and cost of agricultural inputs. Only 3% of the respondents interviewed had the highest income level of between GH¢2500 - GH¢3500 for a season or yearly, whilst 52% of the respondents fell in the category of GH¢500- GH¢1500 which was considered low for a season after taking out all expenditures incurred. Those with net income of GH¢1500- GH¢2500 were in the middle category constituting about 24% of the respondents.

Respondents who were cultivating cocoa had better income levels than the other food crop farmers. A seasonal amount of GH¢7000- GH¢8000 representing 21% was revealed as their income generated per year was far encouraging than the earnings of the other farmers or respondents. Respondents in this group had this income level because the producer price for cocoa increased from GH¢150 a bag to GH¢200 for a 64kg of cocoa by government.

The revelation was that, though average yields of their crops per hectare were normal, prices of the produce were so low with the exception of cocoa which government always sets a producer price. Again, total costs of production namely labour; seed, herbicides, land cost and fertilizer



were higher which could also contribute to the low income levels of the 52% of the respondents. Hence it was difficult making much profit from their hard work.

A discussion with a District Development Officer of the Ministry of Food and Agriculture in the district indicated that there have been an intensive new agricultural extension technology transfer from their outfit to farmers aimed at increasing their yield output in the mist of the challenges faced by the farmers in the area.

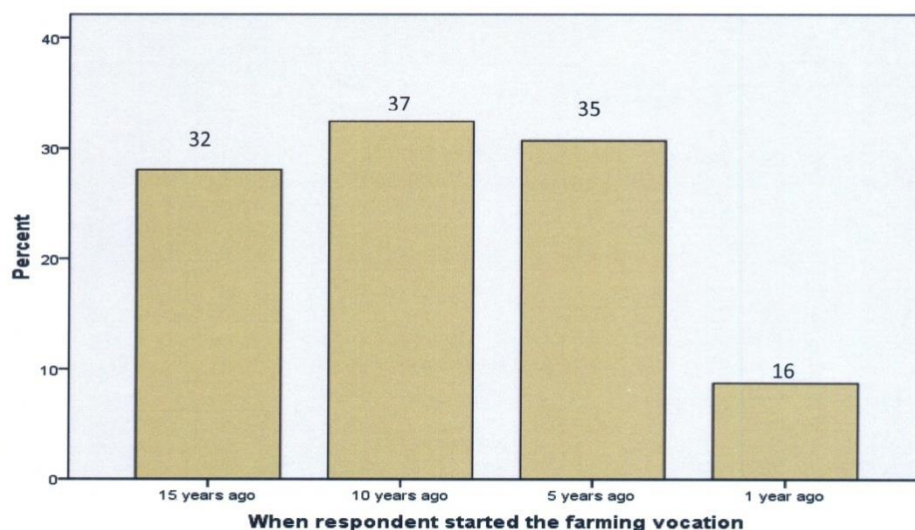
Respondents interviewed showed they were economically active from their agricultural activities to improve their house hold economies and other needs depending on the number of dependants and responsibilities on them. Again, it showed a spillover effect by serving both the rural and urban economies. That is, the produce from farming activities is used to feed the household in the rural areas and the remainder sold to people in the urban area at cheaper prices.

4.4. Mining Activities and Agricultural Land Size for Agriculture in the Study Area.

Thirty seven (37) of the respondents representing 30.8% indicated that they started their agricultural practices about 10 years ago, whilst (32) of them making 26.7% started farming 15 years ago. Majority of the youth (35) representing 29.2% of the total respondents started farming within the last 5 years. A few as 16 number of the respondents indicated they started farming as a vocation and career just for one (1) year.



Figure 4.3. Years Respondents Engaged in Agriculture



Source: (Field Survey, 2010)

From the survey, about 10 to 15 years

ago, farmers could secure more farm lands (4 acres or more) with GH¢5 or GH¢10, or an equivalent of produce from land owners and sometimes at no cost at all. But now, the highest number of acreage a farmer could access was 3 at a cost of GH¢180 for a season which is quite expensive. Some of the reasons given for the changes were, land being lost to the mining firm, increasing number of farmers in the area leading to higher demands for land and cost simultaneously in addition to general increase in land usage for other things like buildings and settlements.

From Table 4.4 overleaf, 57.5% of the farmers attributed the difficulty in land acquisition to increase in demand of land as a result of increase in farmer numbers, whilst 23.3% attributed it to the lost of their arable lands to NGGL. It could be assumed to have contributed indirectly to the increase in the cost of lands and land fragmentation leading to more demand of land by farmers.



Migrant farmers from the Northern regions and the Volta could also contribute to the increase in demand for agricultural land in the area leading to increase in cost also.

Table 4.4. Difficulty in Land Acquisition

Attributed Causes	Frequency	Percent (%)
Increased demand for land	69	57.50
Don't know	3	2.50
High cost of land	20	16.67
Land was lost to miners	28	23.33
Total	120	100.00

Source: (Field Survey, 2010)

Respondents whose arable lands were acquired admitted receiving compensations (money) from Newmont Gold Ghana Limited, which to them was not sustainable comparing it to the earnings they were getting from their farms annually.

Shortages of arable lands have been worsened by the acquisition of over 2,992 hectares of land by Newmont Ghana Gold Limited operating gold mines in the area. This has led to the increase in cost of acquiring the existing scarce arable lands for farming, meaning a portion of the 77.4% of the population engaged in agriculture in the district have lost out their source of livelihood. Some of the respondents confirmed that the presence of the mining company though has created jobs for some of the people in the area have bequeathed them to small land holdings for agricultural activities limiting their ability to embark on large scale farming. Hence further expansion of existing mines or future discoveries of gold in the area could further reduce the



agricultural land size in the area. According to the Ministry of Mines and Energy, approximately 30 percent of Ghana's land is currently under concession to gold mining firms, and each year more arable farming land are diverted to this use (IRIN News, 2008).

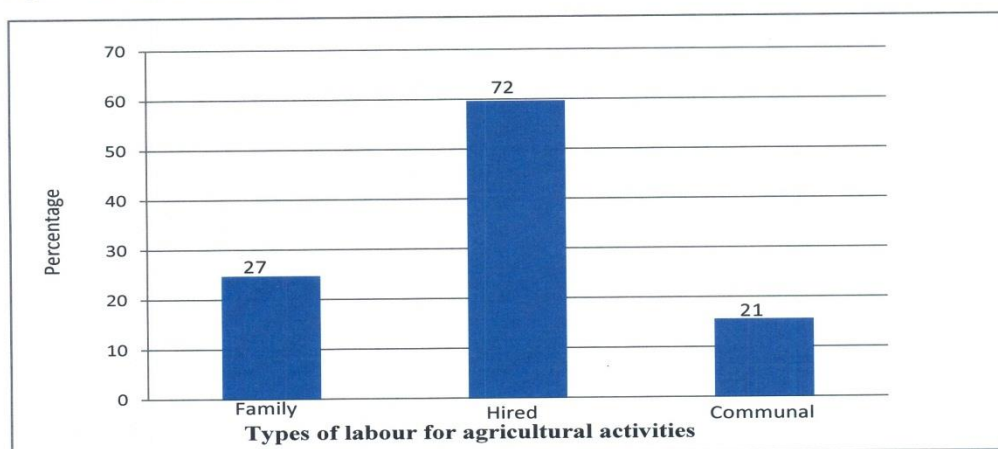
4.5. Evaluation of Labourly to Agricultural Production

Labour is an indispensable input in agricultural production cycle. Hired labour dominated the responses with (72) of them representing 59.6% affirmed that, it is a source of labour supply for their agricultural activities (Figure 4.4). This is a drain on the farmer's purse as an increase in the use of hired labour can lead to an increase in the cost of production. Hired labour is more effective if there is a supervision or involvement of either the fanner or the family. As a traditional practice, family labour is still being used as (27) of the farmers representing 24.7% of the respondents confirmed the use of the family labour, though it was lower than the hired labour. Communal labour use was quite low as only (21) of the farmers making 17% of the respondents resorted to using the communal system for their farming activities. It clearly showed the fading out of the "nnobua²" and other communal benefits being enjoyed by the people in these communities. An interaction with officials of the Ministry of Food and Agriculture at the Asutifi district on this findings showed there was a gradual shift of family and communal labour supply to hired form of labour which is increasing the cost of crop production in the area. Cost of labour per man day of work respondents say was GH¢5 and at a peak period could go as high as GH¢6 or more which to them is expensive because the frequencies required to undertake all the cultural practices in the farms.

²An Akan term, which refers to a communal system of coming together to working in groups normally for farming activities for their mutual benefits rotationally when required by a member.



Figure 4.4. Types of Labour Respondents Use

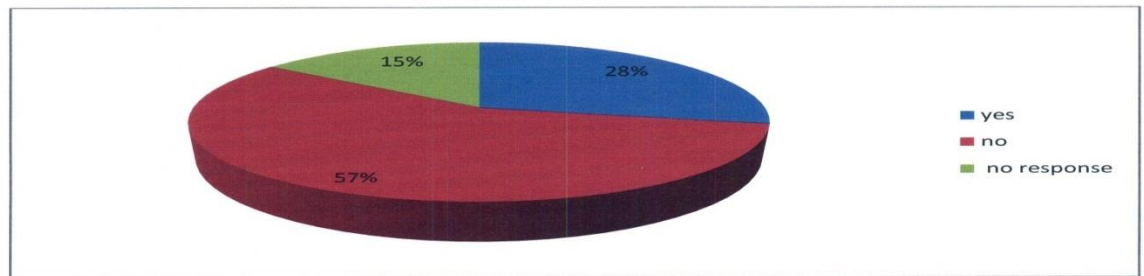


Source: (Field Survey, 2010)

Apart from being expensive for farmers to pay, 57% of the respondents said labour was not even available for farming as most of the able working youth are engaged in mining activities in the area (Figure 4.5). Twenty eight (28%) responded yes to show that there was available labour for their farming works. One respondent remarked that “during farming season, it is extremely difficult to get labour for our farming activities as most of those we used to hire are now mine workers who are earning more than the farmers could afford”. To confirm this, the respondents were asked whether mining activities were creating labour shortages in their communities. The response showed 46(38.3%) and 35(29.2%) of the farmers respectively in Figure 4.6, indicating they agree and strongly agree with the perception that, the mining activities have created shortages of labour for their farming activities in the area (Figure 4.6)



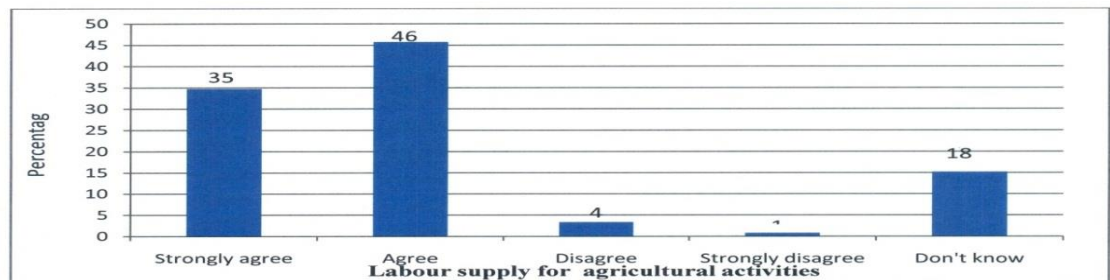
Figure 4.5. Availability of Labour for Farming or Agricultural Activities



Source: (Field Survey, 2010)

About 15% of the farmers who responded that they did not know, could be assumed to be using a lot of family labour on their farms as that do not require the search for outside labour.

Figure 4.6. Perception on Labour Shortages for Agricultural Activities



Source: (Field Survey, 2010)

Migrant farm workers from the Northern part of Ghana appeared to be the main labour force for the farming activities especially in the cocoa and the rice farms, whilst the indigenous youth appeared to be attracted to the mining activities in the area. Unfortunately, these migrant workers always return home after some period of the season making the labour supply situation inconsistent in these communities. From these discussions, change in extended family support systems and the increase in white color jobs could all be contributory factors to the gradual shift from the family labour system to the hired type labour which can be difficult to source at peak periods. This creates social as well as economic burdens on farmers to use hired labour in the farms whilst having many dependents to take care in their households.



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CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter looks at the summary, conclusion and recommendations of the study. It specifically outlines the findings of the study, the policy recommendations, the limitations of the study and suggestions for future research.

5.1 Summary of Findings

The study examined the socio economic effects of mining on agriculture in the Asutifi area with emphasis on the production levels of some crops in the study area and the mean income levels of respondents (farmers). It also examined the impact of mining on land size for agricultural activities and labour supply to the sector agriculture in the study area.

From the study, the decline in production level of selected crops over the past years cannot only be attributed to the takeover of agricultural lands by the mining company, scarcity of labour and associated cost. Several other factors like low soil fertility and higher cost of agricultural inputs like fertilizer and agrochemicals may have contributed to the decline in production of these selected crops.

Unstable and lack of guaranteed prices of crops produced, coupled with increasing higher cost of production significantly affected the earnings of the farmers. Guaranteed, stable and increasing producer price for cocoa by government cushioned the cocoa farmers to earn higher prices for their produce thereby increasing their mean incomes. Only 3% of food crop farmers could earn between GH¢2500 - GH¢3500, whilst 21% of the farmers in the area earned between GH¢7000-GH¢8000 per annum. Since 52% of the farmers interviewed earn between GH¢500- GH¢1500,



which is far below \$995 (in convertible currency) per annum and this classifies them as low income earners by the Atlas Classification adopted by the World Bank (2010).

The increase in cost of land acquisition immensely affected the acreage of land acquired for cultivation by farmers. Again, the large track of land totaling 2,992 hectares acquired by Newmont Gold Ghana Limited in the area, also contributed to the fragmentation of the agricultural lands making the remaining lands not only difficult and scarce to acquire, but also costly. Farmers had to forcefully relinquish their long age ancestral farm lands for smaller and unsustainable compensations. This contributed to the decline in production levels of crops in the area leading to reduced earnings of farmers in the area.

Labour supply for farming activities in the area changed gradually from the family and communal labour system to the expensive hired labour system which is now predominant in the three communities. A study on the Shifting Trend in Rural Livelihoods by Birago A. *et al.* (2006) in the district confirmed the findings from this. According to the study 60% of all labour supply for farming activities in the area is hired. This study was carried out to examine the livelihood trend or shift with the current operations of the mining activities in the area.

The increasing cost of labour, land and agro inputs in the area coupled with the low levels of farmer's incomes and lower production levels of crops compared to the national averages have a direct social burden on farmers. Rents, number of dependents and other house hold expenditures on education and utilities have worsen the plight of these vulnerable farmers.



5.2 Conclusions

From the discussions of the results, the takeover of farm lands contributed to land fragmentation and increase in cost of farm lands in the area. Labour supply was more easily accessible and cheaper before the advent of the ongoing mining activities in the area.

Some of these adverse impacts could be attributed to the mining activities in the area as it triggers these situations and causes indirect effects on farmers and agriculture in general in the area, but other factors like population growth, poor soil fertility, existence of other livelihood sources like trading, processing and the increase in white color jobs in the area could also contribute significantly to these findings in this study.

5.3 Policy Recommendations and Suggestions for Further Research

From the findings of this study, the following policy recommendations could help improve on the agricultural production and farmers' well-being in the Asutifi District whilst maintaining the activities of mining in the area.

- Concessions in the area that are yet to be developed or mined from the 2,992 hectares of land could be temporally released to the respective farmers for farming until such a time that those lands would be needed.
- Vigorous agricultural extension system must be pursued in order to fully maximize the yield levels of the lands they cultivate because good agricultural practices can enhance better yield than vast lands.



- The District Assembly, the Ministry of Food and Agriculture and Newmont should jointly team up with interventions to improve on the agricultural performance in the area.
- Other sustainable livelihood sources (aquaculture, livestock and engagement by the mining company) could be provided by government (District Assembly) to improve on the household incomes and reduce the high cost of living in the area.
- Stable market and producer prices should be set for other major crops like the cocoa sector to improve on farmers earnings.
- Further research on the impact of mining on health of farmers in these mining communities is recommended. Also all aspect of agriculture including livestock, fisheries and vegetables must be added for any impact studies of mining on agriculture to ensure an integrated approach in planning.

5.3 Limitations of the Study

The sample size employed in the study was relatively small compared to the population of the study area. Relatively low or smaller sample size may not be representative enough of the sampled population without certain features (Sarantakos, 1997). But this was due to time constraints, distance and other resource challenge for the study. Difficulty in accessing the availability of comprehensive data over the years before the start of the mining for comparism to the current trend had an effect on the before and after analysis method.

Another problem encountered was respondent's unwillingness to give out information whilst others refused to be interviewed or be interacted with. Also, the study should have covered other areas of agriculture such as the livestock, fisheries and vegetable farmers instead of only



concentrating on the food crops. Food processors and traders should have been added to the survey especially on the pricing of food stuff.



REFERENCES

- Action Aid and BARDEP (2005). *The Socio-Economic and Environmental Impacts Of Gold Mining in the Asutifi District in the Brong Ahafo Region*. Kenyasi.
- Adadey, K., (1997). *The Role of the Mining Industry in the Economy of Ghana*. ISSER, University of Ghana. Accra.
- Agyapong, E. K. (1997). *Effects of Current Mining Practices on the Welfare of Women and Children*. As in (ILO, 1997) and (The African Agenda, 1997).Accra, Ghana.
- Agyei, E. (2007). *Impact of Mining on Livelihoods of Rural Households. A Case Study of Farmers in the Wassa Mining Region, Ghana. An MPhil Thesis*, NTNU
- Akabzaa, A. & Darimani, (2001). *Impact of Mining Sector Investment in Ghana: A study of the Tarkwa Mining Region*, A report prepared for SAPRI.
- Ali, S. H. (2009). *Treasures of the Earth: need, greed and a sustainable future*. New Haven and London: Yale University Press. Accessed on <http://en.wikipedia.org/wiki/Mining>.
- Amma et al. (2006), *Shifting Trends in Rural Livelihood. A Case Study of Asutifi District*. A Research by the Faculty of Renewable Natural Resources, KNUST, Kumasi.
- Amoah, B.A., (2003). *Proliferation of Surface Mining in Ghana: A Threat or a Blessing to the Poor in the Mining areas? A Case Study of Tarkwa Mining Area*. An MSc. Thesis, Lund. Sweden.
- Anderson, K., (1997). *Are Resource Abundant Economies Disadvantaged?* CIES Seminar Paper, pp. 97-103. University of Adelaide, Adelaide, Australia.
- Appiah H. (1998). *Organization of small scale Mining Activities in Ghana*. The South African Institute of Mining and Metallurgy, South Africa.
- Auty, R. M., (1993). *A Thesis on Resource Curse in Sustaining Development in Resource Economies*; London and New York, Routledge.





- Balfors B., Jacks G, Singh N, Bhattacharya P, (2007). *Contamination of water resources in Tarkwa mining area of Ghana: Linking Technical, Social Economic and Gender Dimensions*. A Scientific Report by Royal Institute of Technology, Sweden and University of Ghana, Accra.
- Barry, M., (1996). *Regularising Informal Mining: A Summary of the Proceedings of the International Roundtable on Artisanal Mining*. Industry and Energy Department Occasional Paper No.6. The World Bank, Washington.
- Biney, K., (1998). *The Mining Sector- Too much Concession?* Business Watch, June Edition Vol.2, No.1.
- Daily Graphic, (2009). *Illegal Mining Deprives State of Revenue.*, 21st August, Graphic Communications Limited. Accra
- Dogbevi, E. K. (2009). *Mining in Ghana: A Paradox of Pollution and Poverty*. Accra, Ghana.
- Downing, E T. (2002). *Creating Poverty: Flaws in the Economic Logic of the World Bank's Revised Involuntary Resettlement Project*. Force Migration Review. Accessed on the 10th April, 22010 from www.ted_downing.com.
- DDP (2002). *District Development Plan, Asutifi District Assembly*. Planning Department Keyansi.
- DPP (2004 and 2010). *District Profile Plan, Asutifi District Assembly*. Planning Department Keyansi.
- Ekosse, G. et al. (2005). *The Occurrence of Chest pains and Coughing among Residents and Miners living in Selebi Phikwe - Ni Cu Mines, Botswana*. African Journal of Health Sciences Vol. 12.
- Ghana Chamber of Mines (2009). *Mining Injects US\$2.9bn into Economy*. In BFT ^{2nd} June, 2010 Edition, Accra, Ghana.
- Ghana Chamber of Mines (2006). *Small Scale Mining*. Accra, Ghana

- Ghana Minerals Commission (2010). *Ghana Mineral Sector Overview*. Accessed on October 2010 from <http://www.ghanamining.org/ghweb/en/ma/mincom/mcminingnews.html>.
- Ghana Statistical Services (2000). *Ghana Population and Housing Census*, Accra.
- Ghana Statistical Service. (2008). *Ghana Living Standards Survey (GLISS 5)*, Report of the Fifth Round, Ghana Statistical Service, Accra, Ghana
- Ghana Statistical Service (1989). *The Ghana Living Standard Survey (GLISS 1)*, Report of the First Round, Ghana Statistical Service, Accra, Ghana
- Ghana Statistical Service (2009). *Revised Gross Domestic Product Estimates*, Rebased GDP Report, Ghana Statistical Services, Accra, Ghana
- Ghanaian Chronicle (2009). *Newmont Mining Corporation Depleting Ghana's Forest Reserves?* July 11th Edition. Accra, Ghana.
- Goretti, K. K. (1998). *The Environmental Impacts of Underground Coal Mining and Land Cover Changes analysis using multi-temporal remotely Sensed Data and GIS*. Unpublished M.Sc. Thesis. International Institute Aerospace Surveys and Earth Sciences (ITC). Enschede. The Netherlands.
- Great Mining, (2009). *Hazards of Cyanide in Mining*. Frederick, MD 21701, USA
Accessed on <http://www.greatmining.com/articles/tag/mining/>.
- Hilson G. (2002). *The Environmental Impact of Small-Scale Gold Mining in Ghana: Identifying Problems and Possible Solutions*. The Geographical Journal Vol. 168, No. 1 (March, 2002), pp. 57-72.
- Inoni, O. E., D. G., Omotor and F., N., Adun (2006). *The Effects of Spillage and Crop Yield and Farm Income in Delta State of Nigeria*. Journal of Central European Agriculture. Vol. 7 (2006) No. 1 (41-48).



IRIN News, (2008). *How Ghana Favors Mining Against Farming*. February 2nd Edition. Accra.

Khalil K and Gholamhossein A. (2008). *Factors Affecting Agricultural Land in Iran: A Case Study of Kamjered Sub District in Fars Province*. American Journal of Agricultural and Biological Sciences 3, (1) 358-363.

Kusimi J. (2007). *Groundwater Hydro-geochemistry and Land Cover Change in The Wassa West District of Ghana*. Royal Institute of Technology, Sweden.

Lawhorn Walter, D. (2010). *Acid Mine Drainage, the Unseen Enemy*, Valdosta State University.USA.

Mining, Miner and Sustainable Development (MMSD). (2003). *Breaking New Grounds: The report Of the MMSD Project*. London/Sterling, VA: Earth Scan.

Newmont Ghana Gold Limited, (2005). *Social and Community Development*. Accra.

OECD, (1999). *Environmental Remediation of Uranium Production Facilities*. OECD

Patsil S. S. *et al.* (2010). *Wheat Acreage, Productivity and Production Estimation through Remote Sensing and GIS Techniques*. Australian Journal of Basic and Applied Sciences, 4(8): 3132-3138.

Pearce, D. W., and V. K., Turner (1990). *Economics of Natural Resources and the Environment*. London; Harvester Wheat sheaf.

Planning Alliance (2005). *Ahafo South Project: Resettlement Action Plan*. 205-317 Adelaide St. W. Toronto, Canada.



SACM, (2002). *Underground Mining*. Report by South African Chamber of Mines. Accessed in October, 2010 from <http://www.uraniumsa.org/processing/underground.htm>.

Sarantakos, S. (1997). *Social Research*- 2nd Edition, Pargrave Publishers, New York,

N.Y. 10010. SRID (2010). *Agriculture in Ghana*. Statistics Research and Information Department, MOFA, Accra.

SNTC, (2007). “*Cultural Resources - Malolotja Archaeology, Lion Cavern*”. Retrieved on Aug. 27th 2007. Accessed from <http://en.academic.ru/dic.nsf/enwiki/12360>

Tsikata, F. S. (1997). *The Vicissitudes of Mining Policy in Ghana*. Resources Policy, Vol.23.

UNEP, (2008). *Mining Effects on Rainfall Drainage*. UNEP/GRID-Arendal) UNESCO, (1985). *Living in the Environment*. UNESCO/UNEP.

WBCSD, (2009). *Newmont, Supporting Local Economic Growth in Ghana*. Impact Measuring Case study, Geneva- Switzerland.

Weber-Fahr, M., (2002). *Mine Closure and Legacy Issues; World Bank Group Experiences*. Global mining Initiative Conference, Toronto, Canada.

World Bank, (2001). *Poverty Reduction Strategy Sourcebook-Mining*. Accessed in October from www.worldbank.org/povertv/strategies/chapters/mining/mining.htm

World Bank, (2010). *The Complete World Development Report*. World Bank Publications 1818 H Street NW Washington DC 20433.



APPENDICES

Appendix i: Cyanide Spillage in Tarkwa by Goldfields, Ghana



Source: (FAO. Org)



Appendix ii. A Mine Worker with a Bauxite Stone

Appendix iii. Goldfields Open Deep Pit Mine, Tarkwa



Source: (Ghana Minerals Commission, Ghana)



Appendix iv: Galamsey Mining in the Western Region



Source: (Minerals Commission, Ghana)

Appendix v: A Cocoa Plant with Pod



Source: COCOBOD, Ghana







Basic Level ☐ JHS Level ☐
SHS Level ☐ Tertiary Level ☐

11. Type of accommodation living in.

Owned ☐ Rented ☐ Family house ☐

B. SOCIO ECONOMIC IMPACTS

12. Do you engage in agriculture?

Yes ☐ No ☐

13. If yes, what form of agriculture?

Crops ☐ Livestock ☐ Fishing ☐ Agro processing ☐

14. Since when did you engage in this vocation?

15years ago ☐ 10years ago ☐ 5years ago ☐ 1 year ago ☐

15. How many acres of land do you cultivate now?.....

16. How many acres did you start with?.....

17. What types of crops do you cultivate?.....

18. Has the yield of you crops changed?

Yes ☐ No ☐

19. If yes, what is the cause of the change?

.....

20. How did you get this land for the farming?

Outright purchase ☐ Inheritance ☐ Rent/Lease ☐

21. If rented or purchased, how does it cost you for a season?

.....



32. If hired, how much do you pay per man day of work in the farm?

.....

33. Is there available labour for your farm activities always?

Yes ☐ No ☐

34. If No, what is the reason or cause?

.....

35. What is your average yield of crops per acre now?

.....

36. What is the average yield in the last 8 years?

.....

37. What is the average price per bag of your crop produce?

.....

38. Do you like the activities of mining in this area?

Yes ☐ No ☐

39. If Yes or No why?.....

40. Has your water sources been polluted by cyanide spillage or another waste from mining?

Yes ☐ No ☐

C. PERCEPTION OF MINING EFFECTS ON AGRICULTURE

1. Mining activities has taken over all farm lands meant for food production.

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐

Don not know ☐



2. Mining activities have created labour shortages for agricultural purposes.

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐
Don not know ☐

3. Sexually transmitted diseases have increased due to mining of gold in this community.

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐ Don not know ☐

4. Incomes of households in this community have increased due to the mining activities.

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐ Don not know ☐

5. Mining has polluted the water sources meant for household use and agricultural purposes.

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐
Don not know ☐

6. Mining causes land degradation

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐
Don not know ☐

7. Compensations for destroying farms by mining companies are lucrative than owning the farms.

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐
Don not know ☐

8. Mining companies have developed your community better than ever.

Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree ☐ Don not know ☐

THANK VERY MUCH FOR YOUR TIME AND COOPERATION