THE IMPACT OF INDUSTRIAL SURFACE GOLD MINING ON
FOOD CROP PRODUCTION IN THE TARKWA-ABOSO AREA

By

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THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF M. PHIL DEGREE IN GEOGRAPHY AND RESOURCE DEVELOPMENT.

The University of Ghana, Legon, Accra
June 2002
DECLARATION

I, Ebenezer Peprah, hereby declare that this thesis is my own work produced under supervision, and that to the best of my knowledge, it contains no material previously published or substantially overlapping with material submitted for the award of any other degree at any institution, except where due acknowledgement is made in the text.

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ABSTRACT

Mining companies have created the wrong impression that soils in the Tarkwa-Aboso area are infertile and not suitable for crop production. The government of Ghana therefore continues to lease concessions in the Tarkwa-Aboso area to mining companies, who not only scrape off the rich topsoils and vegetation to expose the gold ore for extraction, but also food crops are destroyed, and farming communities are displaced.

Dr. Henry Obeng conducted a soil survey in Tarkwa-Iduapriem in 1992, and his studies proved that soils in the area are good for the cultivation of cassava, plantain, cocoyam, rice and other staple crops. According to Obeng’s report, cash crops such as cocoa, rubber plantation, oil palm, and citrus also grow well in the area. The District Director of Agriculture of the Tarkwa area also reiterated that the uncontrollable displacement of farmers and degradation of farmlands through surface gold mining and “galamsey” operations have adverse impact on food crop production.

This research revealed that due to the expansion of industrial surface gold mining in the Tarkwa-Aboso area, many farmers in the area have been displaced and over 79% of the displaced farmers have no access to arable land.

How important was food crop production in Tarkwa-Aboso before industrial surface gold mining was introduced in the area? Was the Tarkwa-Aboso area self-sufficient in food production before industrial surface mining?
What is the current food crop production situation in the Tarkwa-Aboso area? What are the contributory factors to the current food situation in the area? How does surface mining contribute to the current food situation in Tarkwa-Aboso?

The major finding of the research was that surface gold mining and food crop production cannot co-exist. There is the need for policy changes to reduce the impact of industrial surface gold mining on farmlands and communities in the Tarkwa-Aboso area.
DEDICATION

This thesis is dedicated to the underprivileged in society.
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CHAPTER ONE

1.0 GENERAL INTRODUCTION

1.1 Background to the study

Humans require food to supply the necessary nutrients to build tissue for the skin, muscles and the body. Food is also required to repair the tissues as they wear and die. To keep the body in good working condition; such as good health and peace of mind, a balance diet is required. Yet, eight hundred million people worldwide go hungry daily and thirty five thousand die each year from hunger (UNHR, 1994). It is estimated that twenty percent of Sub-Saharan Africa’s population is undernourished, thus, a growing number of people are exposed to hunger related diseases such as goiter, exophthalmia, cretinism, marasmus, and Kwashiorkor (FAO 1998).

Many governments in sub-Saharan Africa count on access to cheap sources of food, which enable them to keep food cost low, while they neglect their agricultural areas and people. Countries in Africa, Asia and Latin America still depend on the international market for food supply to feed their increasing population. They have fallen prey to the notion that industrialization holds the key to poverty alleviation and hunger reduction, while small-scale farming, which produces the bulk of food crops, is neglected.

Ghana, as a developing country, is confronted with two options: relying on food aid and directing scarce foreign exchange resources to food
importation. Ghanaian officials have resorted to these options in a desperate attempt to meet the country's food demand, which expanded at an annual rate of 2.9% between 1970 and 1988 (N.A.R.S.P, 1994). In 1990, coordinated efforts were required to solve Ghana's food problems. Accordingly, the government adopted the development approach contained in its Vision 2020 document. Among the strategies of development outlined in the document, are improvements in the nutritional status of Ghanaians and encouragement of small-scale farmers in food crop production. The objectives of these policies are to provide food at reasonable prices to consumers, to encourage the population to adopt better nutritional practices, and thus reducing malnutrition.

The Ghanaian agricultural policy is intended to promote the emergence of medium to large scale farming enterprises while increasing agricultural production and productivity. Government policies also aim at making agriculture an attractive employment alternative to industry, trade and commerce (N.A.R.S.P, 1994). The Agricultural Development Bank (ADB), for example, expanded its lending activities in the agricultural sector by €172 billion. Under the Inventory Scheme, the Bank also made available €4.4 billion and €10 billion for fish and maize inventories respectively. The Village Infrastructure Project, which seeks to reduce poverty in rural communities, was also launched. It focused on the provision of basic village-level infrastructure in the form of rural water, rural transport, post-harvest infrastructure and institutional strengthening. Inspite of these provisions,
less than 30% of consumers’ expenditure on food goes to the farmer or the fishermen (N.A.R.S.P, 1994).

Numerous obstacles impede small scale food crop farming in Ghana. Some of these obstacles include ecological and physical constraints such as land degradation, lack of food research programs to increase food production. Inaccessible roads and exploitative nature of middlemen and women also affect food crop production in Ghana, which is dominated by small scale farmers. Over 60% of Ghana’s population are predominantly small scale farmers, who produce food on subsistence level.

Based on the advice and supervision of the World Bank (WB) and the International Monetary Funds (IMF), the government of Ghana enacted an investment code in 1986. The main goal of the code was to attract foreign investors and to diversify the economy from total dependence on exports of few primary commodities. Because of the policy changes, the mining sector was completely revamped and surface gold mining was indirectly given all the needed support. Support was in the form of tax holidays, liberal immigration quota for expatriate miners, and ten years tax exemption. Unfortunately, the mining sector has not created the economic growth that people in mining areas anticipated, neither has there been any technological transfer to the local communities where mining operates. Rather, mining has created a major hindrance to food crop production and other agricultural activities such as lumbering and hunting.
As an extractive industry, surface mining is associated with depletion of natural resources, scraping off topsoil, destruction of vegetation and diversion of watercourses. Surface gold mining require larger acres of land to operate, in the process, other land users such as farmers, timber operators and estate developers are denied access to land. Farmers are evicted from their lands, and relocated to new areas different from their socio-cultural environment. Communities are relocated to areas where distance to fertile lands is great and much time and energy is wasted in walking to and from farms. The round trip sometimes can be ten miles or more and can take about two hours on each trip. Farmers consequently reach their farms already exhausted and the amount of work they are able to accomplish in a day is frequently inadequate. What they bring home often does not justify the labour and time expended. These and many other issues associated with industrial mining have generated into bitter conflict between miners and farmers in mining communities in Ghana. In 1998, for example, the chiefs and people of the Tarkwa-Aboso area marched through the principal streets of Tarkwa to protest against the destructive nature of surface mining in the area. They expressed concern about the lackadaisical attitude of miners on land reclamation, displacement and resettlement of affected communities. They called for a ban on surface gold mining in the area.
1.2 Problem statement

During the early years of gold mining in Ghana there were no environmental concerns (Junner, 1935). Land reclamation was not strictly required nor was agriculture affected because gold mining was restricted to the underground (Rumsey’s Report, 1882). However, since the privatization of the mining sector was introduced in the early 1980s when an investment code was enacted to liberalize the sector to attract investors, land degradation and community displacement have become a common phenomenon in mining areas. From 1986 to 1990 mining companies in the Tarkwa-Aboso area increased from 1 to 8, all of them engaging in large-scale surface gold mining (Minerals Commission 1990 annual report).

The increase in the number of mining companies and transformation into surface mining operation has created an unfavorable competition for land. Food crop farmers who constitute the bulk of the farming population in the Tarkwa-Aboso area are marginalized and finding it extremely difficult in acquiring land. Farmers in Tarkwa-Aboso claimed that before surface gold mining began in the area, farmland was in abundant supply and local food crop production sufficiently met the demands of the community. Since industrial surface gold mining activities expanded in the area, farmers could barely produce enough to feed their families and communities.

Can surface gold mining impact on food crop production? Has Tarkwa-Aboso ever been self-sufficient in food crop production?
1.3 Research objectives

Based on the enumerated problems, the main objective of the research is to assess whether or not industrial surface gold mining affects food crop production in the Tarkwa-Aboso area.

The specific objectives are as follows:

- to assess the pattern and levels of food crop production in the Tarkwa-Aboso area before surface gold mining
- to assess the pattern and level of food crop production in the Tarkwa-Aboso area after surface mining
- to compare the pattern and level of food crop production before and after surface gold mining in the Tarkwa-Aboso area
- to analyze the impact of surface gold mining on food crop production in the Tarkwa-Aboso area; and
- to identify other factors that affect food crop production in the Tarkwa-Aboso area
- to recommend strategies that will reduce the impact of industrial surface gold mining in the Tarkwa-Aboso area.

1.4 Conceptual frameworks

Three major factors affect food crop production; these are land, labour and the capital. These three factors determine to a large extent food crop production in the Tarkwa-Aboso area. (See model 1.2). Land is an
indispensable factor in small scale food crop production. In subsistence food crop farming, crop production is dependent on the size of the cropped area. Labour is the human resource that tills the land to produce food. It is the most important resource in food crop production. The healthier and happier the labour force, the more productive they become. In small scale farming, labour determines the farm size, and indirectly the annual output. Capital on the other hand is the tool that labour uses to till the land. Without capital, labour will be unproductive, and land cannot be tilled for agriculture purposes. Some of the capital needed for food crop production include, funds to purchase inputs like cutlass, fertilizers and other tools needed by the farmers. These three factors are interdependent; none can be productive without the other.

Since its operations occur on surface land, surface gold mining operations have direct impact on land, labour and capital. Surface mining exposes land to erosion by clearing the vegetation and scrapping off the topsoils. Erosion affects soil productivity because it removes the top soil which contains most of the organic matter, plant nutrients, and fine soil particles, which help to retain water and nutrients in the root zone where they are available to plants. The subsoils that remain tend to be less fertile, less absorbent, and less able to retain pesticides, fertilizers, and other plant nutrients. Many farmers in such communities are forced to cultivate on fragile lands, which are less fertile and less productive. As a result, food production is affected because many farmers become landless, others are
forced to reduce their farm size, and others just abandon farm work to find alternative job in the mine or mine related jobs (see model 1.1).

Model 1.1 Impact of Surface gold mining on food crop production

Food crop production is affected when indigenous populations, who are mostly farmers, are evicted from their land for mining. Initial labour requirement for mining activities is very high. Casual labourers are needed
to clear the land, to construct building for the installation of mining equipments and offices, to assist in reconnaissance survey, building of roads and residential facilities for the mine workers. However after these projects are completed, many of these labourers, often employed as casuals, are laid off. Having been distracted from farming because of the relatively higher mine wages, it becomes difficult for these labourers to return to the land, moreover because farmlands in the immediate surroundings have been acquired by mining companies, farmers have to walk for over 5 kilometers to have access to land. These affect the attitude of the community towards farming. Many labourers are drifted towards mining, and other mine related jobs. The impact is that food crop farming is abandoned and left in the hand of the old and children, leading to low food crop production.

Capital invested directly to open new mines and expand old mines, higher salaries paid to mine workers, and monetary compensation paid to displaced communities introduce cash into the local economy. These conditions set the platform for diversification of the local economy from exclusively agriculture to include other sectors such as trading and transportation. Farming becomes unattractive not only because of the difficulties in acquiring lands, but also investors in the area prefer to invest in ventures that directly serve the mining sector. Food crop farming becomes less attractive, because compensation paid for destroyed crops are insignificant compared with compensation paid on cash crops. The effect is
that capital needed for agricultural investment is diverted to other sectors and food crop production is negatively affected.

1.5 Proposition

- Surface gold mining activities have a major impact on food crop production in the Tarkwa-Aboso area
- Food crop production in Tarkwa-Aboso is land and labour dependent
- Other factors also affect food crop production in Tarkwa-Aboso.

1.6 Rationale for the study

Primarily, this thesis is in partial fulfillment for the award of Master of Philosophy (M.Phil) Degree in Geography and Resource Development, University of Ghana, Legon.

Secondly, this thesis aims to deconstruct the notion that mineral extraction holds the key to economic emancipation. This project outlines some problems of industrial mining and the causes of low food production in mining areas. The rationale is to explain how surface gold mining is a hindrance to food crop production and other economic development in Tarkwa-Aboso and Ghana in general. I am optimistic that this thesis will encourage policy makers to weigh the long term and short-term impact of surface mining on arable land and food crop production in Tarkwa-Aboso and other mining areas in Ghana.
1.7. Literature review

1.7.0 Introduction

Research on mining operation often focuses on the general socio-economic benefits of mining on local communities. Other literature focus on environmental issues associated with mining. Unfortunately, very limited literature focuses on the direct impact of mining on food crop production. Many organizations, including the United Nations have researched extensively on food crop production in almost all countries in the world. These organisations have identified physical and ecological factors as some of the major problems affecting food crop production. Unfortunately these food research institutes have failed to identify industrial surface mining as a major obstacle to food crop production.

In the literature review, an attempt is made to identify issues associated with industrial surface gold mining which, directly and indirectly affect food crop production.

1.7.1 The nature of the mining industry

A mining enterprise is an industrial unit intended for exploring and exploiting mineral deposits. It includes the extraction of ore (breaking or separating part of the rock from the ore), its loading, transport and hoisting to the ground surface. Mining is the branch of industry involving the exploration and removal of minerals from the earth. Mining is one of the oldest and most important economic endeavours of humankind, because it
provides the raw ingredients for most of the material world around us and, like agriculture, is the lifeblood of civilization.

There are three general approaches to mining minerals namely: surface mining, underground mining and solution or fluid mining. Surface or open-pit mining requires extensive blasting, as well as rock, soil, and vegetation removal, to reach deposits. Benches are cut into the walls of the mine to provide access to progressively deeper ore, as upper-level ore is depleted. Underground mining entails sinking a shaft to reach the ore. Passages are then cut from the shaft at various depths to access the ore. Solution or fluid mining entails drilling into intact rock and using chemical solutions to dissolve deposits.

The main objective of any type of mining is to remove the valuable mineral economically and safely with minimum damage to the surrounding environment. The Earth has many natural resources on which we depend that must be mined. Coal, oil, gas, and other mineral fuels are used for heating, electricity, and numerous industrial processes. Nonfuel minerals such as iron ore, precious metals, and industrial metals, and non-metallic materials like sodium and potassium are used in chemical and agricultural applications. Even crushed stone used in road building and other construction projects must be mined. Mining affects our standard of living and impacts almost everything we do. A myriad of items that we use in our homes and offices and for transportation, communications, and national defence all require
minerals. For example, more than 30 different minerals are needed to make a television or telephone (US Bureau of Mines, 2002).

Apart from Antarctica (which has a treaty in place preventing short to medium term exploitation and exploration of mineral), mining takes place in all the world’s continents. Traditional mining countries, the USA, Canada, South Africa and Chile dominate the global mining scene. Africa as a whole is a major producer of gold, producing about 30% of global production (Mbendi, 2002).

Zimbabwe is historically known as a prominent producer of gold in Africa, however, political and economic issues could cause production problems for local producers. Tanzania and Mali are rapidly becoming Africa’s newest gold producers with several mines being commissioned.

Gold mining in Ghana, Tanzania, Burkina Faso, Cote D’ivore and Zimbabwe is centred on underground and open pit operations in the Achaean age stone belt. The Witwatersrand placer gold deposit is the main point of mining in South Africa, where gold is mined through the underground method. Ghana’s geographic setting is the primary reason for its wealth of mineral resources such as gold, bauxite, manganese and diamonds (Mbendi, 2002). South Africa holds 35% of the global gold resources and exports 99% of gold outputs. Gold is the most important mining sector in South Africa, contributing over 27.4% in mineral revenue (Mbendi, 2002).
Several of the world's largest mining corporations are active in Africa. The newly merged gold producer Barrick-Homestake, one of the largest gold producing companies in the world, producing over 3.8 million ounces annually, has commissioned the Bulyanhulu mine in Tanzania, which began operations in mid 2001. AngloGold is active in South Africa, Namibia, Tanzania, Mali and Zimbabwe. Gold Fields is active in Ghana and South Africa. Ashanti Gold fields recently merged with Anglo Gold to become one of the largest gold mines in the World (Mbendi, 2002).

Clarke (1997), a mining expert of the East-West Centre in Honolulu, placed much emphasis on the economic importance of mining. He emphasized that "Mining has many economic benefits. Miners negotiate a variety of action programs that ensure that community residents are used for as much of the labour in mining activities. In addition to job and training, mining companies frequently build schools and hospitals or health facilities for workers and their families."

Ironically, these significant economic and social benefits of industrial mining come with socio-cultural and environmental consequence, which are related to mining itself, to the elimination of the residues from the mine, to the transportation of the mineral and to its processing, which frequently produces hazardous substances. For example, small scale farmers are victimized because of the unintentional eviction of farmers from their land. Cash compensation paid to communities for loosing their farmlands can not
be reinvested in agriculture because of land shortage and land inaccessibility. Sexually Transmitted Diseases (STDs), the spread against which no one has natural immunity, depletes the human resources in mining areas. The youth, who constitute the engine block of farming population drift to the mining sector, leaving farming in the hands of the old and children. Clark (1997) did not deny the negative impact of surface gold mining, however, he failed to emphasize the impact of industrial mining techniques on food crop production.

1.7.2 Gold mining techniques

There are three broad techniques used for gold extraction, namely; underground, surface mining (heap leach) and solution or fluid technique. These techniques determine the extent to which mining affect food crop production. In this context, emphasis is placed on surface gold mining/heap leach techniques and its impact on food crop production.

1.7.2.1 Heap leach/surface mining

Presently over 60% of minerals mined in the world are extracted by the opencast method, causing devastation of the ecosystem (WRM bulletin, 2003). The gold rush in the 1850's brought huge environmental changes in the Australian landscape in a relatively small amount of time. Prior to the 1850's indigenous communities in Australia had lived in harmony with the land for centuries. However the discovery of gold disrupted and rapidly destroyed
the ecosystem, putting mounting pressure on the native flora and fauna (WRM Bulletin, 2003)

Deposits that can be mined using surface mining techniques differ greatly in character. They may vary from small surface gold, sand, gravel, or stone to large metal sulphide or oxide deposits that are several kilometers wide and long and possibly 0.8 km (0.5 mi) deep, but most readily mined from the surface. Other metallic deposits may fill cracks in the rocks, twist, or form large underground areas, but are so deep that they require shafts and tunnels to reach them. Even some relatively flat-lying deposits are so deep that they require shafts more than 3.2 km (2 miles) deep to reach them.

Today’s surface mining methods in metal/non-metal mines usually require removal of soil and/or useless rock before drilling and blasting the deposit in benches or stair-steps. Since few deposits are pure, waste rock may be removed to the waste pile by shovel and truck or front-end loader while ore is loaded into other vehicles to be taken to processing plants.

Surface mining techniques include (1) identification of the ore and waste rock, (2) removal of surface soil and debris, (3) drilling and blasting of ore and waste, (4) removal of ore to processing facilities and waste to the dump, and (5) reclamation and environmental rehabilitation.

The first step, identification, must include as much as possible about the size, geometry, values, environment, water, strength, and physical qualities of the ore and waste in and around the ore body to be mined. This requires drilling holes that recover samples, making test pits and openings,
and using geophysical methods involving waves, rays, or other systems to acquire information. Identification may take years at great costs, but without the information, the engineer cannot design a safe, economical plan to remove the desired material. The next four steps often proceed in sequence, with each process overlapping if possible. Surface soil and debris may be placed to one side for later reclamation and replanting. At the very least, such soil is removed and protected against erosion and environmental damage. Surface rain and drainage must also be controlled for the life of the mine and future environmental protection after mine shutdown. Although the stripped soil may uncover the rock, the remaining surface is often irregular and weathered, requiring levelling and removal by either bulldozing or drilling holes that are loaded with explosives and blasted. This initial work establishes the mining plan for haul roads, bench width and height, drilling, loading, and blasting of the ore body and the waste that is included in the ore and external to the ore body (U.S Bureau of Mines, 2002). This is the most environmentally degrading part of surface mines, which requires monitoring by independent Environmental Protection Agencies.

Information gathered from exploration, as well as the initial excavation activities help to develop the plan for appropriate bench height and width, slope of each segment of the pit, tonnage and value to be recovered each shift, and other parameters necessary for successful, orderly recovery of the ore body at maximum safety and economy. Gradually, the pit deepens, and problems of water encroachment, haulage road maintenance, pit slope, and
increasing waste-to-ore ratio are resolved until a predetermined closure point is reached or economical changes occur that no longer make it profitable to mine (US Bureau of mines, 2002).

In a typical heap leach operation, huge quantities of rock are crushed and piled atop clay and plastic liners in huge decks. A sodium cyanide solution is then sprayed onto the pile. As the solution passes through the rock layers, it teases the gold out of the ore where it is collected at the bottom and processed. Cyanide combines with up to 90% of the gold including particles of gold that are too small to be seen by the naked eye. As little as 1 ounce of gold can be extracted from 3,000,000 ounce of low-grade ore. Surface gold miners in the Tarkwa-Aboso area use the heap-leach method in which cyanide solution is sprayed over crushed ore heaped into open piles. The crushed ore is usually underlain with impermeable pads to prevent cyanide seepage into the soil. In other ways, huge tanks are built to contain the crushed ore onto which cyanide is sprayed. Aboso Gold fields limited uses this method, where huge tanks containing the crushed ore are sprayed with cyanide solution to separate the gold from the tailings. This version was developed 100 years ago by the United State Bureau of mines and commercialized by Newmont Corporation. (African Agenda vol. 15 page 15).

Tarasov (1973) outlined some of the advantages of heap leach to include complete mechanization and the use of powerful and highly efficient machines and mechanisms of unlimited dimensions. He also noted that there is greater safety in the working environment and better hygienic working
conditions than in underground mining. Heap leach also promotes higher efficiency of labor (3-5 times) and a lower mining cost (2-3 times). According to Tarasov, heap leach has the possibility to expedite increase in production with minimal losses. Unfortunately, Tarasov failed to outline the long-term negative effect of heap leach on the environment. For example, statistics show that one teaspoon of 2% cyanide in water could degenerate all life forms (Africa Agenda, vol. 15). The dangers of cyanide culminated its ban in several developed countries such as the United States of American and Sweden. In June 2000, for example, a bill was listed in Parliament to ban the use of cyanide in New South Wales. This was in reaction to the environmental catastrophe in Romania and an accident in Papua New Guinea. The Turkish Supreme Court also restricts the use of cyanide in gold mining in the country. The state of Montana in the United States of America has also banned the use of cyanide heap leach technology in gold and silver mining. Unfortunately, this dangerous chemical is still used in gold mining in Ghana and the Tarkwa-Aboso area in particular. The recent spillage of cyanide used by Goldfield Ghana Limited, into rivers, which destroyed aquatic life in the Tarkwa-Aboso area, is an opportune warning of the negative effect of surface gold mining.

Although, the use of chemicals in surface gold mining may not have a direct impact on food crop production, threat to human and aquatic life cannot be underestimated. Heap leach has undesirable pollution risks and if
cyanide is contained, it represents a long-term toxic contamination source. This has serious consequences on microorganism in soils.

1.7.2.2 Underground Mining Techniques

Underground mining takes place when minerals lie deep beneath the surface. It is only economical to work the underground if the ore grade is of high quality. To get to the ore body, a vertical shaft, horizontal entrance or passage (edit) or inclined passage (winze) is drilled for ore and waste removal to provide ventilation. (PMMC news, 2000).

In underground mining, diverse extraction methods are employed. Some of these are block caving, top slicing, sublevel caving, longhole stopping, shrinkage stopping, open stopping, and square stopping. Many methods are employed because mineral deposit has different shapes and each ore body has different physical characteristics, all bearing on the choice of mining methods.

Currently, there are no underground mines in the Tarkwa-Aboso area. Then Tarkwa Gold Fields limited now, Goldfields Ghana Limited (GGL), which had operated underground mines until 1986, is currently engaged in surface operations. Notwithstanding, underground mining has a comparative advantage over surface mining in environmental issues as well as employment opportunities for indigenous people. Surface disturbances such as land degradation, community displacement and disruption of farming activities are minimal in underground mining (Cummings and Givens, 1973).
Cummings (1973) made an effort to create a good image for underground mining but he failed to discuss other fatalities of underground mining such as pollution of underground water, cave-in of shafts, and cage failures. As a labor intensive industry, underground mining often absorbs a labor force that would have been used for farming activities. Besides absorbing farm laborers, underground mining also creates health problem for workers who often retire with tuberculosis and other heart and lung related diseases. Another mining operation, which has always been condemned by industrial mining experts and environmentalist, is native gold mining.

1.7.2.3 Native gold mining method

Native gold mining popularly known as galamsey has existed over 400 years in Tarkwa-Aboso. There is no internationally accepted definition of small scale mining, however, Hentshel identified major characteristics that define a small scale mine; These include; lack or reduced mechanization, physically demanding work, low level of occupational safety and health care; deficient qualification of personnel on all levels of operation; low levels of production, inefficient consideration of environmental issues and lack of social security. The term native mining as used in this thesis refers to both licensed and unlicensed galamsey operations.

Native gold miners often work under electricity poles, bridges, farmlands or wherever it is feasible to operate. Because native gold miners
are not confined to a clearly defined location, but move from location to location, they are always in conflict with larger mining companies and farmers because of land encroachment. Native gold mining usually involves experienced men who use crude implements such as hoes, pick axe, shovel and chisel to mine the gold. Where a spot is identified to be rich in gold, the men dig and extract the ore. Washing is a method by which the gold gem is acquired. The crashed rock or soil is washed over locally prepared slopes called spoat – which is overlaid with well-prepared blanket to trap the black soil containing the gold. Mercury is then poured on the black soil and squeezed between white calico cloths to trap the gold. Sometimes acid is poured on the raw gem to burn all metals. The gold is purified by means of adding heat. The gem is sold to local buyers who may be agents for big men in the cities. Usually these agents are the financiers of the projects and so the workers in turn are obliged to sell the gem to the agents at affordable but mutually agreed price.

One characteristics of native mining is that there is no job security. Most of the workers are normally school dropouts with little or no education. In order to bring value into the profession, and to regulate their operations, both training and organization into small groups occurs in Ghana, Bolivia, Namibia, Zimbabwe and Venezuela (UNEP, 2000). Because of the size and nature of its organization, native miners face more difficulty in attracting investment capital than senior mining companies (majors). Similarly, projects at mine development or expansion stages attract less capital, understandably
due to the high risks associated with the exploration stage. Consequently, native gold miners are forced to target old abandoned properties, waste dumps, or already known deposits of the larger gold mining companies.

There are no exact figures on the number of native miners in Ghana, though it is estimated that approximately 100,000 Ghanaians are employed as native gold miners. Statistically, small mines account for more than 10% of world’s gold output and produce up to 20% of Africa’s gold. In sub-Saharan region, more than 1.5 million people work in the informal mining sector. In Zimbabwe, the figure is 100,000. In Tanzania, the Central African Republic, and Sierra Leone, the total gold output currently comes from small-scale mines. (ILO, 1996). Unfortunately all these operations require extensive use of land which often occur on arable lands in places where land were under cultivation or being left to fallow for farming to begin in the subsequent years.

The International Labour Organisation (ILO 1996) estimated that small-scale mining, sometimes called artisinal mining, has a worldwide work force of 11-13 million. Few small-scale miners have formal mining skills, although many have a lot of experience. Environmental abuses such as land degradation, water pollution, and destruction of vegetation and food crops are very common in small-scale mining. Although the effects of small-scale mining on the environment are known, its direct impact on food crop production is not well documented nor is it thoroughly studied.
The Tarkwa-Aboso mining area has always been the scene of conflict in recent years. Foreign-owned exploration and larger mining companies displace farmers and native miners. Can surface gold mining coexist with food crop production? Does surface gold mining interfere with food crop production?

1.7.3 Global overview of food crop production

As of September 2002, the number of countries facing serious food difficulties throughout the world stands at 32, with 21 in Africa, 6 in Asia, 3 in Latin America and 2 in Europe. In southern Africa, the food crisis following two consecutive years of poor cereal harvests is worsening due to insufficient and slow food imports, both commercial and emergency relief. Prices of cereals are rising throughout the sub-region further curtailing access to food for large sections of the population. A series of FAO/WFP Crop and Food Supply Assessment Missions in April/May 2002 estimated the number of people in need of food aid at 12.8 million. However, follow-up vulnerability assessments recently undertaken by SADC Regional Vulnerability Assessment Committee, in collaboration with international agencies, have estimated the number at 14.4 million, with the largest increases in Zimbabwe and Zambia. A regional WFP emergency operation worth US$ 507.3 million to provide food assistance to 10.3 million most affected people until the next harvest in April 2003, was jointly approved by FAO and WFP in late June
2002 and an international appeal launched in early July. However, only 36 percent of the appeal had been pledged by mid-September. Coupled with the low level of pledges, some countries of the sub-region have been reluctant to accept food aid supplies produced with genetically modified organisms (GMOs), which has further delayed food deliveries (F.A.O 2002).

In the Great Lakes region, the overall food supply situation has improved in Burundi and Rwanda following improved food productions in 2002. However, food production in the Democratic Republic of Congo continues to be hampered by persistent civil conflict, coupled with dry weather in southern parts in recent months.

In eastern Africa, serious food shortages have started to emerge in several parts of the sub-region, particularly in Eritrea, parts of Ethiopia and Kenya. In Eritrea, prospects for current crops are bleak due to the failure of the short "azmera" rains and the continued drought into the important planting months of June and July. Over one million people are estimated to be in need of emergency food assistance (FAO, 2002). In Ethiopia, poor secondary season "belg" rains and a late start to the current main "meher" season rains have created a rather alarming food situation. Large numbers of livestock have died and unusual migrations in search of water and pasture are reported in several parts of the country. In response, the Government appealed to the international community for nearly US $12 million to stave off the effects of poor rains. In Kenya, the "long rains" have been inadequate
in several parts, leading to a poor food outlook for 2002/03. The food supply situation is particularly alarming in the districts of Mandera, Moyale, southern parts of Tana River, West Pokot, Koibatek, Marakwet and Baringo. In Sudan, crop prospects are unfavourable due to delayed onset of rains and population displacement in the south following recent escalation of the long-running conflict. In Somalia, despite a favourable outturn of the recently harvested main season "gu" crops, continuing insecurity and escalation of conflict in parts with the attendant population displacement are cause for serious concern. In Uganda, despite an overall stable food supply situation, erratic rains in parts and recent population displacements in the north pose serious food problems in the affected areas. In Tanzania, the recent good harvests from the main season crops have improved overall food availability (FAO, 2002). In central Africa, crop growing conditions are favourable so far in Cameroon, while in the Central African Republic, erratic and below average rainfall have affected crop development in some regions.

In northern Africa, aggregate production of wheat and barley is estimated to be four percent down compared to the above-average crop in 2001. Lower wheat outputs in Algeria and Tunisia are not offset by increased harvests in Egypt and Morocco. By contrast, increased barley production in Morocco and Egypt more than offset declines in Algeria and Tunisia. The output from the paddy crop in Egypt is anticipated to be average (FAO, 2002).
In western Africa, Liberia’s, agricultural activities have been disrupted by renewed civil strife, pointing to reduced rice production over the years. In the western part of the Sahel, the dry spell in July 2002 which severely affected growing crops and raised serious concerns over the food supply outlook, ended in August in most parts of The Gambia, Guinea Bissau, Mauritania and Senegal. However, an FAO mission which visited Senegal and The Gambia in late August/early September 2002, anticipated declines in cereal production due to reduced yield potential and localised crop failures. In Mauritania, most "dieri" (rain fed) crops failed. In Cape Verde recently planted maize also failed in parts, following irregular rains in August. Mauritania and The Gambia have declared national disasters and appealed for emergency food aid. In the eastern and central parts of the Sahel, weather conditions have been much more favorable with widespread and regular rains over most of Burkina Faso, Chad, Mali and Niger. Crops are generally growing satisfactorily and overall crop prospects are favorable (FAO, 2002).

In Asia, food shortages prevail in DPR Korea, where WFP urgently requires additional pledges to implement its emergency relief operations until the end of the year. A large number of countries have been affected by tropical depressions, typhoons and an erratic 2002 monsoon season, causing excessive rainfall and severe floods in some areas and drought in others. The most widespread damage occurred in Bangladesh, China and India. In Bangladesh, floods affected 7 million people and caused more than 150
deaths from flood-related incidents and diseases. Some 300,000 hectares of paddy fields were submerged and widespread damage to housing and infrastructure was reported. In China, notably in central and southern provinces, torrential rainfall and typhoons resulted in floods and landslides with extensive damage to property and infrastructure, displacement of millions of people and more than 1500 deaths, while in northern and north-eastern provinces, drought affected crop production and caused devastating forest fires. In India, the monsoon brought unusually heavy rainfall from mid-June to the north-eastern states, mainly Assam and Bihar, affecting some 21 million people and causing 400 deaths. In Nepal, heavier than normal rains led to widespread floods and landslides in central and eastern parts, affecting 260 000 people with more than 500 deaths reported. A severe drought hit Mongolia in 2002, affecting both livestock and cereal production and increasing food aid needs above the current levels. Droughts have also affected southern parts of Sri Lanka and Sindh and Baluchistan provinces of Pakistan.

In the Near East, favorable weather conditions in most countries have boosted domestic food production. In Afghanistan agricultural production has recovered strongly, reducing cereal import requirements by more than a third compared to the previous two years. Funding shortfalls in the face of massive return of refugees gives cause for serious concern. Investment in the agricultural sector, particularly in the rehabilitation, upgrading and
maintenance of the irrigation infrastructure will be essential for speedy recovery of the Afghan economy. In the Islamic Republic of Iran, torrential rain in August triggered flash floods and landslides in north-eastern provinces, affecting 100,000 people and causing 37 deaths. The food situation in the West Bank and Gaza Strip is grave due to continuing confinement of families in homes by curfews and military operations.

In the Asian CIS, improved precipitation and relatively better growing conditions have improved the food outlook this year. Cereal output in the Kyrgyz Republic, Uzbekistan, Turkmenistan, Azerbaijan and Armenia have significantly improved. However, food supply in Tajikistan and Georgia remains rather tight (FAO, 2002).

In Central America and the Caribbean, averages to above-average outputs are expected in Guatemala, El Salvador, Nicaragua and Honduras. However, localized droughts are still reported. Food assistance is being provided by the international community to affected farmers, many of whom have also been affected by the collapse of international coffee prices. Thousands of households and workers have been rendered food insecure by the crisis. In Costa Rica and Panama, heavy rains and flooding are reported, particularly along the Caribbean coastal areas, with damage to food crops. In Jamaica, the agricultural sector is slowly recovering from the impact of the heavy rains and flooding in June 2002. In Cuba, the western parts of the
country and the Isle of Youth were seriously affected by Hurricane with
damage to crops and infrastructure (FAO, 2002).

In South America, especially in the Andean countries, heavy
snowstorms and freezing temperatures in the highlands of Bolivia and
southern Peru have affected livestock production. In Europe, wheat output in
the EU increased by about 13 percent to 104 million tonnes, in 2002, but the
quality of later harvested crops was reduced by widespread heavy summer
rains. However, aggregate output of other grains is likely to be down overall
and just below average. In Eastern Europe, wheat production has dropped
sharply in Hungary and Romania. In the Balkans, cereal harvest is estimated
at levels close to the sharply recovered harvest of the preceding year. Floods
and hail, which normally occur during late spring and summer in the region,
have had insignificant effect on crops this year.

In North America, wheat production in 2002 fell further in the United
States to just below 46 million tonnes, 14 percent down from the previous
year’s below-average output. Prospects for the maize harvest, which had just
started in the Corn Belt, deteriorated due to exceptionally dry conditions
throughout the summer. Maize output is now forecast at 225 million tonnes,
about 6 percent below 2002’s about-average crop. In Canada, prospects for
the 2002 cereal crops deteriorated sharply during July and August due to one
of the worst droughts on record. Wheat production is forecast at just 15.4
million tonnes, 5 million tonnes down from last year and almost 40 percent
below the five-year average, and barley production is also likely to fall sharply (FAO, 2002).

World food crop production faces many challenges and some of these challenges include erratic rainfall, drought, and temperatures. Human factors such as war and poor farming system also affect food crop production. Among the human factors, surface gold mining has been identified as one of the challenges that many farmers encounter in their efforts to produce food to feed their families and communities. How does industrial surface gold mining affect food crop production?

1.7.4 Surface Mining and Food Crop Production

It is calculated that together with oil prospecting, mining is threatening 38% of the last stretches of the world’s primary forest. (WRM Bulletin, 2003). Unlike other industries, a mine’s location is depended on where the ore is discovered. It is economical to locate a mine in the area where the ore is discovered in order to avoid the expensive haulage of large volumes of mine tailings.

In Sierra Leone, surface mining of rutile led to the relocation of entire villages to areas ecologically different from their original locations (Africa Agenda, no. 15 page 8). Communities near the mining sites were presented with a host of new hazards, including land degradation, flooding and pollution. These new environments were historically, economically and
traditionally different from the ancestral home. Five thousand and three hundred people from 11 villages in Sierra Leone were moved and resettled in places where water and farmland are grossly inadequate. A whole ethnic community in the Thung Yai Naresuan wildlife sanctuary in Thailand were killed when rivers in the area was polluted with lead, through lead mining in the area. A study showed by the Thailand Mineral Resource Department in 1995 revealed that there was between 165,720 to 550,380 ppm (part per million) lead in sediments in the Klity village, far above the 200ppm safety standard in Thailand.

The 1990s marked a major departure from Ghana’s mining sector. State control and ownership in the sector was dismantled substantially and an investor-friendly environment put in place. The land tenure system in the Tarkwa-Aboso area was adversely affected. Traditional authorities no longer have custody of lands in their area of jurisdiction. Because of the perceived economic benefits, mining is preferred to farming over land use.

Perloff and Wingo (1981) argue that the rise in income, production, and employment in mining areas stimulate expansion of other activities through the multiplier process. They emphasised the economic benefits of mining to a particular community without considering the implication on hunters, farmers, and other users of land. Perloff and Wingo again missed the point when they mentioned the 1849 gold rush in California (USA) to validate their argument. According to them, the 1849 gold rush in California stimulated food crop production through the opening up of large crop and
livestock areas, which eventually became independent of the mining industry. The economic boom, because of the gold rush, injected cash into the local economy and created opportunities for farmers to expand the cropped area and reap the benefits of high demand for food in mining areas.

Baldwin (1966), however, cautioned that the multiplier effect of cumulative growth and self-sustaining growth associated with mining is not automatic. Much of the economic impact of surface gold mining, according to Baldwin, leaks from the host country or the region of mining. The gold mine in California was solely managed and owned by Americans who reinvested their profit in their country; thus, revenue generated from gold exports remained in America, unlike Africa where gold mines are 90% foreign owned and mineral revenues leaves the country. Baldwin used Zambia's metal industry, which has not generated the economic emancipation that Zambians were made to believe in 1920, to assert his point. He reiterated that not only is the Zambian metal mining industry capital intensive and the mine also does not provide any significant income for the Zambians to transform consumption patterns, but also revenues generated from the mines are repatriated to foreign countries. Effective demand is therefore insufficient to provide more than limited stimulus to food production.

FAO (1996) suggested that sufficient resources must be committed to food research programs if sustainable food crop production at the global, regional and national levels is to be accomplished. The question is; where are
the farmlands to grow crops? Where are the labourers to cultivate the land, when mining continues to marginalize farmers?

1.7.5 Impact of surface gold mining on farm labour

Gold mining, involves the exploitation of a non-renewable resource. It starts with a given endowment of a valuable resource and ends with the depletion of the endowment (Perloff and Wingo, 1981). As a complex economic venture with non-renewable resources, the true value of a mineral cannot be known until the deposit is depleted (Bosson and Varon 1977). Large-scale industrial mining requires large capital investment, which normally cannot be provided by local mining firms. Consequently mining projects in developing countries are dominated by foreign companies.

When a new mine moves into an area, inhabitants often have high, but false expectations of economic boom. Often forced to relinquish their farmlands and houses for mining projects, indigenous people become disappointed when the economic boom does not occur. Evicted from their land and compensated with cash, farmers become unmotivated to go back to the land to continue their farm work, their attitude towards farming diminishes and the desire for mining job increases.

1.7.6 The future of surface gold mining in Tarkwa-Aboso

Even though impact of mining varies according to the type of mineral and the mines, this is intrinsically an unsustainable activity. Mining implies
the exploitation of non-renewable resources by means of destructive or contaminative method, such as crushing, grinding, washing and casting. There is now compelling evidence that mining severely limits a nation's ability to sustain growth (WRM, 2000). This is a surprising "discovery" for those who think that 'riches' in the ground are unfailingly translated into money in the bank. But for those who have done in-depth studies into mining operations, this is not a hard fact to find. Zaire, Bolivia and Sierra Leone are not merely poor- they have been ruthlessly impoverished over hundreds of years. Much of the crippling 'foreign debts' carried by these countries is actually interest supposedly owned on capital which, has never been invested in people self-development. Instead, it has gone into building mines, dams, mills, power and processing plants in order to transform natural capital into exportable value.

The resurgence of mining activities in Tarkwa-Aboso has led to a major land use conflict between farmers and miners. Mining experts use economic tools to justify their operation. For example in 1997 gold accounted for 38.1% of Ghana’s foreign exchange earnings of US $1489.9 million (Mineral Commission 1998). Unfortunately, this is just a gross figure since only 1% to 2% of this value actually flows back to the economy through royalties and taxes. The rest of the income is repatriated to foreign countries of the mining companies. Abugre (1997) noted that these deceiving and misleading figures do not take into account the social and environmental costs incurred through surface gold mining because there is no computation
of the cost to the agriculture sector due to the loss of fertile farmlands, and
displacement of farming communities.

Convery and Tutu (1995) undertook a study and reported that the cost of
environmental degradation resulting from natural resource exploitation
and consumption in Ghana was 4% of the gross domestic product in 1985.
With development of many environmental organizations such as Friends of
the Earth (FOE), Workshop Four-WS4, and Save the Earth Foundation,
environmental awareness has taken a serious dimension, and people are
calling for environmental accountability.

Many critics including Yao Graham- editor of Africa Agenda magazine
(vol 15, 1998) believe that there is a need to reform or even repeal the mining
policies and investment codes in order to address some of the issues of
surface gold mining. He critically analyzed some of the land use policies.
According to Graham, priority must be given to agricultural land use over
any other economic uses of land. Degraded arable land in the Tarkwa-Aboso
area and any mining areas in Ghana should be reclaimed and miners should
desist from using farmland as waste dumps.
CHAPTER TWO

2.0 THE STUDY AREA AND RESEARCH METHODOLOGY

2.1 The study area

Tarkwa-Aboso is a mining complex in the Western region of Ghana with a total land area of 1500km². (See map 1, 2 and 3). The complex is rich in mineral resources such as gold, manganese and soils. Over 415km², representing 27.7% of the land areas are gold mine concessions (See table 2.1). Located about ninety minutes drive from Takoradi, the complex has four major mining companies, namely; Gold Fields Ghana Limited (GGL), Aboso Gold Fields Limited (AGL), and Ghana Australian Gold (GAG). All these companies engage in surface gold operations. Their main mine plants are located at Old Atuabo, Damang, Iduapriem, and Teberebie, respectively.

Table 2.1 Surface gold Mining Concessions in the study area.

<table>
<thead>
<tr>
<th>Name of Company</th>
<th>Total Concession (Km²)</th>
<th>% of total land area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold Fields Ghana Ltd. (GGL)</td>
<td>222</td>
<td>14.8%</td>
</tr>
<tr>
<td>Teberebie Gold Fields Ltd.(TGL)</td>
<td>42 ( sold )</td>
<td>2.8%</td>
</tr>
<tr>
<td>Ghana Australian Gold (GAG)</td>
<td>95.8</td>
<td>6.38%</td>
</tr>
<tr>
<td>Aboso Gold Fields Ltd. (ABL)</td>
<td>55.4</td>
<td>3.69%</td>
</tr>
<tr>
<td>Total</td>
<td>415 km²</td>
<td>27.7%</td>
</tr>
</tbody>
</table>

Source: Tarkwa District Assembly Socio-Economic Survey-1996
MAP 1. TARKWA-ABOSO MINING AREA.

Scale: 1: 150,000
MAP 3. TEBEREBIE AND ATUABO MINING COMMUNITIES

1:150,000
2.1.1 The people and socio-economic activities

Despite a rich and detailed study of the people of Ghana, the Wassa people in the Tarkwa-Aboso area were not seriously documented except in the context of military and mercantile history. They were presented as having served the interest of the colonial protection powers against the Ashantis and the Denkyiras. Gold mining among the Wassas is very ancient and has been in operation for over four hundred years. Native gold mining is still popular and represents the main source of income for some of the inhabitants in Tarkwa and its surrounding communities.

2.1.1.1 Gold mining

Historical studies indicate that expatriates played a significant role in the development of industrial mining of gold in the Tarkwa-Aboso area. The French, Dutch, and Portuguese owned most of the mine concessions. Nevertheless, the natives also owned shafts. Noted among them was Ennimel Komah, Chief of Aboso, who had some mine concessions. Unlike the other mines owned by Europeans, native labourers had the opportunity to work in the mines owned by the natives. The various groups included Wassas, Fantes, and Apollonians. Instead of fixed wages per diem to the miners, each shaft was leased to workers who received one third of the output as their payment. (Archival Material, Rumsey’s Colonial report, 1889)
2.1.1.2 Agriculture

The majority of Tarkwa inhabitants are migrants who went to Tarkwa to establish cocoa and rice farms as far back as 1950s but had to join the lucrative native mining industry, which was booming in those years. Food crop farming was subsistent in nature. Despite mining activities in the area, agriculture dominates the economy in the Tarkwa-Aboso mining complex, as the average farm size was 5 hectares (MOFA Tarkwa District, 1996).

The main food crops cultivated in the Tarkwa-Aboso area include maize, yam, plantain, rice, and cocoyam. Cash crops such as oil palm, rubber, cocoa, coffee and coconut grow very well in the district. The district has potential for cultivating vegetables and non-traditional export crops such as mushrooms, and pineapple. The area under cultivation is gradually reducing due to land shortage and land pressure caused by surface gold mining. An average farm size of 5 acres has reduced to 2.5 acres (MOFA, Tarkwa District, 1999).

The land area under agriculture (1083 sq.km) represents an estimated 46% of the total land area of the whole Wassa West district (MOFA Tarkwa District 1999). Ninety three percent of farmers use either the bush fallow system or shifting cultivation. Only 2% practice crop rotation and 5% have adopted agro-forestry-farming practices.
2.2 Demography

At the time of this research, the 2000-population census report had not been published, consequently the 1984 estimates were used. The report indicated that the population of Wassa West district was 260,000 with a growth rate of 3.0%, which was above the national average of 2.6%. The high population growth rate in the area was mainly due to the increase in immigrants searching for jobs in the mines.

The four main mining areas selected for the thesis had the following population figures in 1984. The 2002 population figure for the complex was based on information provided by the Assembly members of the selected communities (see table 2.2).

<table>
<thead>
<tr>
<th>Community</th>
<th>*1984</th>
<th>**2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teberebie</td>
<td>243</td>
<td>1200</td>
</tr>
<tr>
<td>Damang</td>
<td>144</td>
<td>500</td>
</tr>
<tr>
<td>Atuabo</td>
<td>1793</td>
<td>2500</td>
</tr>
<tr>
<td>Mile 8/Iduapriem</td>
<td>22</td>
<td>54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,207</td>
<td>4254</td>
</tr>
</tbody>
</table>

Source: *1984 population census, **Field data

Apart from Damang, all the remaining villages fall under the Tarkwa-Aboso mining complex. Damang was chosen as part of the study area because surface mining has also affected the community.
2.3 Climate:

Tarkwa is characterized by southwestern equatorial climate influenced by southwest monsoon winds from the South Atlantic Ocean and the dry dust laden east monsoon (known as Hamattan), which blows over the Sahara desert from the northern sub-tropical high-pressure zone. The mean temperature ranges between 24°C-28°C. The lowest monthly temperatures for the period are recorded in July-August to a maximum in February and March when cloud cover is least. The annual rainfall pattern is a double maxima occurring in the months of April to June and October to November. Average rainfall is from 330mm in January to 2530mm in June for the 1992 period. Relative humidity does not vary greatly throughout the year ranging between 70% and 90%.

2.4 Soils:

The soils in the area belong to the oxysols group, which developed over the siliceous Tarkwaian sandstone, quartzite, and phyllite with two main soil associations, Juaso-Manso/Asuoso-Pamasua compound association. Even though, they have lost silica but are rich in iron and aluminum, oxides and kaolintic clays. They are deep-seated, well drained red or yellow soils with excellent granular structure. They are generally loamy highly leached as a result of high rainfall in the region and thus acidic in reaction (PH 4.0-5.0).
2.5 Land suitability

The oxysols, which dominates the district, are suitable for the cultivation of major carbohydrate and oil crops such as cassava, plantain, rice, yam, Cocoyam, maize, rubber, oil palm and coconut.

The relative humidity is generally high throughout the year. It is between 75%-80% in the wet season. The fair temperature and rainfall enhance the production of major food crops; cassava, yam, plantain, rice, maize and cocoyam, including vegetables. According to the District Director of Agriculture, gold mining distracts the inhabitants from cultivating the land. This is manifested in the form of labor shift from agriculture to mining, the dislocation of farmers and reallocation of lands to mining companies in the district. With difficulties in obtaining land, farmers divert to either trading, galamsey, or emigrate from the district.

Statistics show that agriculture employs 46.2% of the labor force in Tarkwa. 90% of these farmers are food crop producers and 10% are cash crop producers. Mechanized farming in the district is constrained by the relief, which is undulating with escarpments ranging between 150 and 300 meters in height. However, conditions in the district are conducive for rice development in the valleys. The rich minerals in the district have attracted both large and small-scale mining companies who compete with farmers for land. Presently, there are eight registered large-scale and fifteen small-scale mining companies in the Wassa west district.
2.6 Methodology

Choosing the methodology for this study involved repeated field trips to Damang, Atuabo, Teberebie and Iduapriem. Data was acquired through the survey research method. The survey method involved personal interviews, focus group discussions, and questionnaires. Personal interviews involved a face-to-face interpersonal interview with respondents who were asked to answer questions pertaining to the research hypothesis. The methodology is divided into three parts.

- Sources of data
- Sampling techniques
- Data analyses

2.6.1 Sources of data

There are two main sources of data in social science research; these are primary and secondary data source. Both sources were used for the research. The main primary sources included; archival data, answered questionnaires from the local farmers. Traditional authorities, the District Chief Executive (DCE), the District Environmental Officer (DEO), and the District Agriculture Officer (DAO) were also additional source of data for the research. Market women were also interviewed for their opinions on impact of mining on food crop production. The major secondary data sources included the national population census reports, archival data, textbooks, journals, magazine newspapers and official statistic reports. The Internet also provided
invaluable secondary data for the research. Focus group discussions were also organized to provide additional qualitative data for the research. The focus groups involved the chief and elders of Atuabo and those of Teberebie. The discussions were held separately.

Variables that were measured and analyzed included; land tenure systems in the Tarkwa-Aboso area, annual quantity of bags of food crop, and per capita food crop production. Other variables such as government policies and programs, attitude towards farming, and galamsey operation were also measured.

2.6.1.1 Research Instrument

The main research instruments were questionnaires, which were designed to acquire both qualitative and quantitative data. Two types of questionnaires were used; the closed-ended and the open-ended. In the closed ended questions, respondents were offered set of questions from which, they were asked to choose the one that most closely represented their views. Although this type introduces bias by forcing respondents to choose from given alternatives, however, analysis of information is straightforward. The open-ended ones do not force respondents to adapt to preconceived answers, however, they are difficult to answer and still more difficult to analyze without a coding frame.

In order to avoid biases associated with closed ended questionnaires, the open-ended questions were mostly used. This allowed respondents to
express their opinions on the food situation and mining issues in the study area. An advantage of open-ended questions is that it does not force the respondent to adapt to preconceived answers.

Another important research tool was the interview segments. The schedule-structured interview, in which the questions, the wording, and sequence are fixed and identical for every respondent, was used to ensure that variable answers given by respondents could be attributed to the actual differences and not to variations in the interviews. In addition to the scheduled structured interview, the researcher also used the non-scheduled-structured interview, which gave the respondents the liberty in expressing their definition of surface gold mining and food crop production in the study area. This type of interview was specifically designed for the official authorities in the study area; namely, DCE, DAO, DEO and Assembly members.

Computer was used for typing the report and the Microsoft excel software was used in calculating the statistics found in the reports. Microsoft software was also used for the construction of the tables and graphs. Digital camera was used in capturing field photographs to give visual impression of the effect of mining on arable land, vegetation and forests in the study area. The cannon scanner was used for scanning the photographs and the maps of the study area, which appear in the report.
2.6.2 Sampling technique

The study area has a total population of 4254 (Population census 1984). (See table 2.3) Due to resource and time constraint, only 150 farmers, representing 3.5% of the population from the four villages were selected for the research. In addition to the 150 farmers, the District Chief Executive (DCE), District Agriculture Officer (DAO), the District Environmental Officer (DEO) and the District Executive of small scale Miners Association, (DESSMA) were interviewed.

In order to have a fair representation of views from all the four communities, proportionate sampling size was used for the research (see table 2.3). Both probability and non-probability sampling techniques were used for the selection of the respondents. In the Probability sampling technique, each housing unit in each of the four communities was given an equal chance to be selected. The selection of the 150 respondents was based on the number of years of farming experience. The minimum farming experience was ten years, using 1986 as the base year, which marked the year when industrial surface gold mining was introduced in the area. The same year marked the period when many communities were evicted from their land and most farmers were forced to uproot their food crops prematurely for surface mining to begin operations.

The chiefs of Teberebie and Atuabo were the main traditional authorities interviewed for the research. Government officials including the DCE, DDA, DEO and DAO, DESSMA were selected purposely for interviews.
The Chiefs of Damang and Idupriem were non-residents of their villages hence it was difficult to track them for interview. Consequently, the Assemblyman of Damang and Agya Kofi Boye, a ninety-year-old farmer at Iduapriem or mile 8 provided invaluable information for the research.

Because of security restrictions and unwillingness of representatives from the mining companies to grant the researcher time and space for the research, no representatives of the mining companies were involved in the research. However, annual reports from the mining companies, and informal interviews of retrenched and retired mine workers provided invaluable data for the research.

2.6.2.1 Teberebie

With a total population of 1200, a proportionate sample size of 42 was selected from Teberebie, thus representing 28% of the 150 farmers for the research. The selection of the sample size was made from the list of names on the 80 member Farmers Cooperative Association registration book. This association was formed by displaced farmers in Teberebie to protect their interest against the destruction of farmland in the area. The chairman, Financial Secretary and the Administrative Secretary were part of the sample size. The remaining farmers were randomly selected from the list. Led by a research assistant from the community, respondents were identified at their homes and farms to answer the questionnaires. Illiterate respondents were assisted in filling and answering the questionnaires.
2.6.2.2 Damang

In Damang, the Assemblyman was helpful in gathering as many farmers as possible. All those who gathered were food crop farmers who had farms before 1986 and continue as farmers after surface mining. Due to time constraints, a quota sample size of 18 farmers representing, 12% of the total sample frame was selected to answer the questionnaires. The 18 farmers were selected based on their willingness to participate in the interview.

2.6.2.3 New Atuabo

At New Atuabo, where the largest population of 2500 was encountered, 88 farmers, representing 59% of the sample size were interviewed. The 88 farmers were selected using systematic random method. Six hundred houses were identified with each household having an average family size of four. One farmer was selected from each sixth house for interviewing. An Additional data was also acquired through accidental interview of farmers returning from their farms.

The focus group for the research came from Atuabo. The group was selected from the town planning committee of Atuabo. This involved, the assembly man, the chief, the head teacher of Atuabo Junior Secondary School, the Queen mother of Atuabo, Unit Committee Chairman of Atuabo and the Representative of Farmers in Atuabo. The theme covered for the focus group discussions include; Mining and farm lands, compensation of displaced farmers, resettlement and alternative source of income, the youth and
farming, land tenure system, and socio-economic impact of mining in Atuabo and the Tarkwa-Aboso area in general.

2.6.2.4 Mile 8/Iduapriem

Fifty-four farmers live in mile 8, only 2 farmers, representing 1% of the total sample size of the research were interviewed. The researcher had the privilege to interview a 90-year-old man, Agya Kwesi Boye (whose land is where GAG’s gold milling plant is built) and the Assemblyman of the village who has been in the farming business for over twenty years. Thus, only two key farmers were interviewed in Mile 8. However, 10 more farmers were accidentally interviewed while the researcher was waiting at the bus stop for a ride to the next research station.

Table 2.3. Proportionate sampling size of the study area.

<table>
<thead>
<tr>
<th>Communities</th>
<th>Total Population</th>
<th>No of farmers sampled</th>
<th>% of total sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male/female</td>
<td></td>
</tr>
<tr>
<td>Teberebie</td>
<td>1200</td>
<td>30/12</td>
<td>28%</td>
</tr>
<tr>
<td>New Atuabo</td>
<td>2500</td>
<td>50/38</td>
<td>59%</td>
</tr>
<tr>
<td>Damang</td>
<td>500</td>
<td>12/6</td>
<td>12%</td>
</tr>
<tr>
<td>Mile 8/Iduapriem</td>
<td>54</td>
<td>2/0</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4254</strong></td>
<td><strong>150</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Source: Field Data. 2002
2.6.3 Data analysis

Simple bar graphs and tables were used for comparing the nature of food crop production before and after surface gold mining in the Tarkwa Aboso area. Photographs showing the effect of surface mining on arable land were also used for the research. These pictures provided empirical evidence on how surface mining operations have cleared vegetation and dumped wastes on farmland, thus preventing any farming activities on these lands. Simple logic and inferences were drawn from the qualitative and quantitative data gathered from respondent and personal observations.

The next chapter attempt to assess the nature of food crop production before and after surface gold mining in the Tarkwa-Aboso area. Some of the variables that will be measured include, land, labour and capital. This is an attempt to assess whether land was easily accessible before surface gold mining, and whether Tarkwa Aboso was self-sufficient in food crop production before surface gold mining.
3.0 FOOD CROP PRODUCTION BEFORE AND AFTER SURFACE GOLD MINING IN TARKWA-ABOSO

3.1 Introduction

Farmers in the Tarkwa-Aboso area want a ban on surface mining because it is the cause of the decline in annual food crop production. Miners on the other hand claim that lands in the Tarkwa-Aboso area are not fertile for any effective crop production. This chapter attempts to analyze this conflicting situation in the Tarkwa-Aboso area by assessing the nature of food production in the Tarkwa-Aboso before and after surface gold mining using 1986 (the year when industrial surface gold mining activities was introduced in the Tarkwa-Aboso area) as the base year.

3.2 Food crop production before surface gold mining in Tarkwa-Aboso

According to the Policy Planning, Monitoring and Evaluation Department (PPMED 1991), the Northern region is the leading producer of maize, yam, rice, ground nut, and millet in Ghana. Although the Western region is not a major food crop producing area, cassava, maize, rice, yam, plantain, and cocoyam are cultivated in the Tarkwa-Aboso area. The quantity of food crops produced in the Tarkwa-Aboso area is insignificant when
compared to what is produced in the northern region. This, notwithstanding, food crop production is very important in the Tarkwa-Aboso area where 90% of the farmers are food crop producers.

In an attempt to understand the nature of food crop production before and after surface gold mining in the Tarkwa-Aboso area, a total of 150 farmers were sampled for interview. The sampled Farmers were asked to compare with the nature of food crop production before industrial mining and the current food crop production in the area. Land, labour and capital were the three major variables that were measured. Themes covered in the research included; land availability and accessibility; tenurial arrangements; government policies and programs; attitudes towards farming and mining in the Tarkwa-Aboso area; and the impact of galamsey mining on food crop production.

3.2.1 Land availability and accessibility before surface gold mining.

A country is “land- scarce” if per capita land is less than 0.07 hectares (FAO, 1994). Land per capita of less than 0.07 is a warning sign of per capita land decline, especially if a country has limited capacities for intensive food production. Four countries were experiencing arable land scarcity in the early 1960s: Kuwait, Singapore, Oman and Japan (F.A.O 1998). However, food crop production was not affected in these countries because they could afford the agricultural inputs and technology needed to approach food self-sufficiency with less than 0.07 hectares of land per capita through trading and food
import. Ghana on the other hand uses its meager foreign exchange earning from cocoa and mineral exports on food imports. Meanwhile there are vast lands that could be cultivated to save the country from draining its foreign exchange income on food imports.

Ghana’s land per capita has been decreasing since 1960 from 0.36 hectares in 1960 to 0.18 hectares in 1990 (F.A.O. 1998). The reduction in land per capita could be attributed to increasing population growth rate and industrialization. The rate of population growth and industrial expansion particularly, lumbering and recently, industrial surface gold mining, raise much concern to agriculturalists and environmentalists.

Access to and availability of arable land is very crucial for food crop production. Land availability, used in this context, is the acquisition of land for farming purposes without any bureaucratic hindrances. Implicitly, land should be acquired as and when needed and farmers can expand their farm size without any difficulties. This implies that land must be in abundant supply so as not to interfere with the bush fallow system. Bush fallow ensures that a piece of land is left uncultivated for a period of not less than ten years for the soil to naturally regain its fertility due to over cropping. Land accessibility on the other hand, is the proximity of land to homes, market or major roads and cities. Thus, land must be within walking distance from homes. In this thesis, the term accessibility and availability are interchangeably used.
One hundred and fifty farmers randomly selected from Damang, Teberebie, Mile 8 and Atuabo were interviewed. During the interview segments, the 150 sampled farmers reiterated that land was in abundant supply before industrial surface gold mining was introduced to the area. Seventy eight percent of the farmers had their farms within 2km from their homes. None of the farmers traveled beyond 5km to their farms (see table 3.1). As a result, farmers spent more hours on their farm, which could have been wasted in walking between farms and residence. Seventeen farmers, representing 11% of the sampled farmers walked beyond 5 kilometers to their farms. These farmers however, traveled this far in order to cultivate cash crops like cocoa, coffee and oil palm. Because land was easily accessible, average farm size was also relatively larger. Sixty-seven percent of the sampled farmers cultivated an average farm size of 3 hectares per annum. Eleven percent had an average farm size of 10.5 hectares per annum and 22% had an average farm size of 23 hectares per annum (see table 3.2)

Table 3.1 Number of farmers and the Distance of farmlands from their homes.

<table>
<thead>
<tr>
<th>Distance in KM from place of residence</th>
<th>No. Farmers</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Around the house</td>
<td>50</td>
<td>34%</td>
</tr>
<tr>
<td>1-2 km</td>
<td>66</td>
<td>44%</td>
</tr>
<tr>
<td>3km-4km</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>5km</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>6km and above</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Field data, 2002
Table 3.2 Annual farm size before industrial surface gold mining in T/A

<table>
<thead>
<tr>
<th>Average Farm size (hectares)</th>
<th>No. Farmers</th>
<th>Percentage (%) of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>100</td>
<td>67%</td>
</tr>
<tr>
<td>10.5</td>
<td>17</td>
<td>11%</td>
</tr>
<tr>
<td>23</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>30 above</td>
<td>33</td>
<td>22%</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Field Data 2002

There was a large influx of cocoa farmers in the 1950s and this disrupted food crop production because large expanse of land was used for the cultivation of cash crops. Inspite of that food crop production was not affected because 70% of these cash crop farmers interspersed their farms with food crops.

According to Agya Kwesi Boye-head of Enim family of Iduapriem/Mile 8, not only land was easily acquired, but also market accessibility was a major advantage to food crop production in the old Iduapriem area. “The women walked for only 2km to sell their produce”. According to Agya Boye, the large influx of migrants looking for jobs in the underground mines provided ready market for food, and because the youth in the Iduapriem area resented underground mining jobs because of frequent cave-ins and cage failures, there was large proportion of labourers who were easily available for farming. In addition, the customary tenure system, which ensured that traditional authorities have custody over land and community
members have usufructual right over communal lands made it easy to acquire land.

3.2.2 Tenurial Arrangement

In traditional social settings characterized by underdeveloped product markets and supply systems, landholding arrangements have a pervasive influence. Mutual obligations exist: neither landlords nor tenants have the clear right to abolish one set of relationships and substitute another. For example, a tenant cannot easily switch land lords nor can a land lord easily dismiss tenants and hire labourers. Traditional authorities are the main custodians of land. They wield maximum control in releasing lands to any interested party. Relationship between landlords and tenants is informal. Strangers can have access to land through transfer of land by the land-owning community so long as he remains a good member of the community. The form of transfer include; sharecropping, leasehold, and gifts. Outright purchase is not encouraged because of the belief that land belongs to both the living and the dead. In order to ensure that community members have easy access to land, kinship laws ensure that each of the community members enjoys free usufructual access to communal land. This was the customarily land tenure system that was practiced in the Tarkwa-Aboso area before the introduction of modern surface gold mining in the area.

The most common tenurial arrangement was the share cropping system in which the “Abunu and Abusa systems” proved to be most popular.
In the Abunu and Abusa systems farm produce is shared between the farmer and the landlord for use of the land. In the Abusa system, the landlord takes a third of the farm produce and the remaining two thirds go to the farmer. Within the Abunu system, farm produce is shared equally between the landlord and the tenant farmer. One of the major disadvantages of the share cropping system is that, farmers feel they are working for landlords and this discourage farmers from investing their energy and time to increase production. For example, in part of North Africa, land lords may claim two, three or sometimes four times the farmer's share of the crop. In part of Egypt Delta, an entire wheat crop farm may be claimed by the land lord as rent, while the farmer and his family subsist on a meager diet of maize, grown after the wheat is harvested. Irrespective of that, land could be acquired without any hindrances, as long as the farmer is willing and ready to cultivate the land.

3.2.3. Labour Availability

Labour is an indispensable variable for subsistent farming. The more labourers one employs, the larger the farm size and the higher the annual production. In the early 1850s Australia's agriculture suffered a drastic reduction in annual production because of the exodus of farm labourers to the gold mining sector. The acreage under wheat production in Australia for example, fell from 12,150 hectares in 1851, to 6885 in 1852, and only 3240 hectares in 1853.
Until 1986, Tarkwa Gold Fields Limited (now Goldfields Ghana Limited), was the only major mining company in the Tarkwa-Aboso area. However, because of cave-ins and cage failures, the indigenous people were deterred from mining jobs. Consequently, mining employees were predominantly migrants from the northern and the Volta region. Farm labour was cheap and easily acquired, because many of the economic migrants could not find jobs in the mines, either because there were no vacancies or because they were scared to go underground. These surplus labourers found alternative employment in farming. Labour was also available in the early 1980s because of the repatriation of over one millions Ghanaians from Nigeria and many of these “economic refugees” found themselves in mining areas.

As already emphasized, farm labourers were in abundant supply in the early 1980s because of the large influx of economic migrants to the Tarkwa-Aboso area. The “Ndoboa” farm labour system proved to be the most popular. This is a system where community members formed groups of five to ten members to help one another on their farms on rotational basis. The only cost that a host farmer incurs in this system is providing food and water for the group. This was very popular in the early 1980s and 65% of the sampled farmers relied on Ndoboa labour system. Others relied on the by-day system. Here a labourer is hired and paid over 6 hour period, usually from 6:00am-12 noon. In this system, the farm owner provides food and weeding inputs for the labourers and pays them at the end of the day. Some labourers
could also be hired to clear a given portion of land for an agreed fee. Depending on the farm size and the thickness of the forest, a hectare of land attracted a fee of £10,000 (before 1986). Galamsey provided alternative source of employment for the indigenous people and the migrants. This had an impact on farm labourers because of the relatively higher wages. However, until 1986 when it was legalized, galamsey operators often suffered police and army brutalities. These brutalities deterred many from engaging in the operations. Besides underground mining, farming was one of the reliable sources of employment in the Tarkwa-Aboso area. Research on reveals that galamsey has serious negative effect on the environment. Farmers in the Tarkwa-Aboso areas were asked to comment on the impact of galamsey on food crop production before it was legalized in 1986.

3.2.4 Impact of Galamsey on food crop production before modern surface gold mining in the Tarkwa-Aboso area.

Galamsey has existed for over four hundred years in the Tarkwa-Aboso area. Technically known as artisanal mining, galamsey makes a substantial contribution to the economy and social development of the Tarkwa-Aboso area. Globally, small scale mining provides a livelihood to at least six million men and women (UNEP, 1997), often complimenting agriculture and other seasonal trades. Small scale mining often offers ‘safety net’ to people made unemployed by economic contraction or retrenchment and to subsistence farmers affected by drought.
Characteristically, galamsey operations are developed haphazardly, poorly equipped and usually managed by large population of illiterates and school drop outs. Technically, galamsey is a wasteful method of gold mining practice, because of the use of crude extractive techniques such as hammer, chisel and shovel to dig the earth to extract the ore. Because of the high risk and its illegal nature, galamsey is poorly funded and so the “try and error” techniques of identifying sources of gold deposits is used. Because of its unregulated and haphazard nature, environmental impact such as water pollution and destruction of vegetation are severe in galamsey operation.

In an attempt to assess the impact of galamsey on food crop production, 135 farmers, representing 90% of the sampled farmers from Teberebie, Atuabo, Damang and Mile 8, indicated that galamsey did not pose any problem on food crop production. Because it was an illegal operation, galamsey occurred in remote locations away from the farmlands. Notwithstanding, 10% of the sampled farmers indicated that galamsey posed a major problem on food crop production in the area. Farmland and crops were destroyed, rivers on their farms were contaminated with mercury and mud.

Natural factors were also analyzed to assess whether they had any impact on food crop production in the Tarkwa-Aboso area.
3.3 Natural factors

In subsistent food crop farming, climatic elements like rainfall and temperature are very important factors. Calculation of the global sunlight, water and soil nutrients suggest that farmers could feed at least in theory—many more people than current world population. In real world however, physical factors such as weather and pests may not cooperate. Lack of fertile soils or water may seriously limit food crop production. In the Egypt delta area for example, decline in water supply due to increasing population led to an annual decline in food crop production.

Due to time constraints and lack of financial resources, Obeng’s 1990 soil research in the Tarkwa-Aboso area was strongly relied on for the writing of this section of the thesis. Obeng’s (1990) report on the nature of soils in the Tarkwa-Aboso area proved that the soils are fertile for large scale food production. Obeng classified the soils in the areas based on the nature of the topography. According to him, the summit of the hills in the Tarkwa-Aboso area does not favour food crop production because, the heavy rains in the area leads to leaching of soil nutrient at the summit. The valley bottoms are also not good for cassava, plantain, and maize production because of flooding during the raining season. The only land available for the cultivation of cassava, plantain, and maize are the hill sides. The waterlogged valley bottoms are good for the cultivation of paddy rice and taros.

Land, labour and climatic conditions were favorable for food crop production before surface gold mining in the Tarkwa-Aboso area. Farm lands
were easily acquired and farms were within walking distance from homes and labour was in abundant. The next subsection attempts to measure the number of bags of food crops that were produced in the area before industrial mining.

3.4 Annual quantity of food crops before industrial surface gold mining in the Tarkwa-Aboso area

The greatest challenge of this thesis was acquisition of data on annual production figures on food crops in Teberebie, Atuabo, Iduapriem and Damang. This was because there were no production figures on food crop production in these communities. Figures obtained from the District Agriculture Office were on total figures for all the districts and not for a particular community. Moreover, until 1986, national production figures on food crops in Ghana were compiled at the regional and the national level. There were no data on community level food crop production. Production figures for this thesis were henceforth provided by the sampled farmers from the four selected communities. Because there was no baseline data for comparison, figures provided by the farmers were likely to be inaccurate. However, comparison of the figures among the four communities showed a particular trend, which somehow, validated the data provided by the sampled farmers.

The maximum bag capacity weighing 91 kilograms was the unit of measurement. Farmers were asked to estimates the annual maximum bags of
food crops they produced before the introduction of industrial surface gold mining. The following total bags of food crops were produced annually in Teberebie, Atuabo, Damang and Iduapriem before industrial surface gold mining; 2272 maxi bags of maize; 7260 maxi bags of cassava, 1372 maxi bags of rice, 2640 maxi bags of plantain, 550 maxi bags of yam and 589 maxi bags of cocoyam (See Table 3.3).

Table 3.3 Annual maxi bags of food crop before surface gold mining in Tarkwa-Aboso Unit of measurement (91kg maxi bag)

<table>
<thead>
<tr>
<th>Community</th>
<th>Maize</th>
<th>Cassava</th>
<th>Rice</th>
<th>Plantain</th>
<th>Yam</th>
<th>Cocoyam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teberebie</td>
<td>300</td>
<td>1230</td>
<td>291</td>
<td>530</td>
<td>298</td>
<td>83</td>
</tr>
<tr>
<td>Damang</td>
<td>619</td>
<td>1400</td>
<td>643</td>
<td>800</td>
<td>128</td>
<td>98</td>
</tr>
<tr>
<td>Mile 8</td>
<td>360</td>
<td>780</td>
<td>--</td>
<td>550</td>
<td>24</td>
<td>299</td>
</tr>
<tr>
<td>Atuabo</td>
<td>993</td>
<td>3,860</td>
<td>432</td>
<td>760</td>
<td>100</td>
<td>102</td>
</tr>
<tr>
<td>Total</td>
<td>2272</td>
<td>7260</td>
<td>1372</td>
<td>2640</td>
<td>550</td>
<td>589</td>
</tr>
</tbody>
</table>

Source: Field Data, 2002

These gross figures conceal food per capita figures for the study area. Per capita annual crop production was measured, by crudely dividing the annual total by the number of farmers. (See table 3.4).
Table 3.4 Annual per capita food crop production before surface gold mining in the Tarkwa-Aboso area.

<table>
<thead>
<tr>
<th>Crops</th>
<th>maize</th>
<th>Cassava</th>
<th>Plantain</th>
<th>Cocoyam</th>
<th>Yam</th>
<th>Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO, of farmers</td>
<td>56</td>
<td>150</td>
<td>79</td>
<td>26</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Annual qty of maxi bags</td>
<td>2272</td>
<td>7260</td>
<td>2640</td>
<td>589</td>
<td>550</td>
<td>1372</td>
</tr>
<tr>
<td>Annual per capita</td>
<td>40.5</td>
<td>48.4</td>
<td>33.4</td>
<td>22.6</td>
<td>30.6</td>
<td>76.2</td>
</tr>
</tbody>
</table>

Source: field Data 2002

On the average, a farmer produced 40.5 maxi bags of maize, 48.4 maxi bags of cassava, 33.4 maxi bags of cocoyam, 30.6 maxi bags of yam and 76.2 maxi bags of rice per annum before industrial surface gold mining in the Tarkwa-Aboso area (see table 3.4). Annual per capita production figures for each of the communities are also shown in tables 3.5a-3.5d.

Table 3.5a Annual per capita food crops production in Teberebie before Industrial surface gold mining

<table>
<thead>
<tr>
<th>Crops</th>
<th>No. of farmers</th>
<th>Annual qty (91kg (maxi bags))</th>
<th>Annual Per capita (91kg maxi bags)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>16</td>
<td>300</td>
<td>19</td>
</tr>
<tr>
<td>Cassava</td>
<td>42</td>
<td>1230</td>
<td>29</td>
</tr>
<tr>
<td>Plantain</td>
<td>23</td>
<td>530</td>
<td>23</td>
</tr>
<tr>
<td>Rice</td>
<td>2</td>
<td>291</td>
<td>146</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>4</td>
<td>83</td>
<td>21</td>
</tr>
<tr>
<td>Yam</td>
<td>4</td>
<td>298</td>
<td>75</td>
</tr>
</tbody>
</table>

Source: field data, 2002
Table 3.5b Annual food per capita in Damang

<table>
<thead>
<tr>
<th>Crops</th>
<th>No. of farmers</th>
<th>Annual qty (91kg maxi bags)</th>
<th>Annual Per capita (91kg maxi bags)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>14</td>
<td>619</td>
<td>44</td>
</tr>
<tr>
<td>Cassava</td>
<td>18</td>
<td>1400</td>
<td>78</td>
</tr>
<tr>
<td>Plantain</td>
<td>14</td>
<td>800</td>
<td>57</td>
</tr>
<tr>
<td>Rice</td>
<td>4</td>
<td>643</td>
<td>161</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>8</td>
<td>98</td>
<td>12</td>
</tr>
<tr>
<td>Yam</td>
<td>6</td>
<td>128</td>
<td>21</td>
</tr>
</tbody>
</table>

Source: field Data, 2003

Table 3.5c Annual food per capita production in Atuabo

<table>
<thead>
<tr>
<th>Crops</th>
<th>No. of farmers</th>
<th>Annual qty (91kg maxi bags)</th>
<th>Annual Per capita (91kg maxi bags)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>24</td>
<td>993</td>
<td>41</td>
</tr>
<tr>
<td>Cassava</td>
<td>88</td>
<td>3860</td>
<td>44</td>
</tr>
<tr>
<td>Plantain</td>
<td>40</td>
<td>760</td>
<td>19</td>
</tr>
<tr>
<td>Rice</td>
<td>12</td>
<td>432</td>
<td>36</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>12</td>
<td>102</td>
<td>9</td>
</tr>
<tr>
<td>Yam</td>
<td>7</td>
<td>100</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: field data, 2002
Table 3.5d Annual per capita food crop production in Mile 8

<table>
<thead>
<tr>
<th>Crops</th>
<th>No. of farmers</th>
<th>Annual qty (91kg (maxi bags))</th>
<th>Annual Per capita (91kg maxi bags)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>2</td>
<td>360</td>
<td>180</td>
</tr>
<tr>
<td>Cassava</td>
<td>2</td>
<td>780</td>
<td>390</td>
</tr>
<tr>
<td>Plantain</td>
<td>2</td>
<td>550</td>
<td>275</td>
</tr>
<tr>
<td>Rice</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>2</td>
<td>299</td>
<td>150</td>
</tr>
<tr>
<td>Yam</td>
<td>1</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: field data 2002.

Percentage figures in table 3.6 indicate that only 2 farmers in Mile 8 produced 43% of food crops in the Tarkwa-Aboso area while 88 farmers in Atuabo produced only 14% of the total food crops in the study area. Thus, before industrial surface gold mining, out of a total production of 14,631 maxi bags of food crop produced in the study area, Mile 8 produced the highest percentage and Atuabo produced the lowest percentage (See table 3.6 for details). The implication is that the number of farmers does not necessarily increase food crop production. Other factors also contribute to high crop yields and these may include soil fertility, motivation and the use of hybrid seeds.
Table 3.6 Percentage food crop production by each community in the study area before surface gold Mining.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Teberebie</th>
<th>Damang</th>
<th>Mile 8</th>
<th>Atuabo</th>
<th>Total (91kg-maxi bag)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>13.2%</td>
<td>27.2%</td>
<td>15.8%</td>
<td>43.7</td>
<td>2272</td>
</tr>
<tr>
<td>Cassava</td>
<td>16.9%</td>
<td>19.2%</td>
<td>10.7%</td>
<td>53.1%</td>
<td>7260</td>
</tr>
<tr>
<td>Rice</td>
<td>21.2%</td>
<td>46.8%</td>
<td>0</td>
<td>31%</td>
<td>1320</td>
</tr>
<tr>
<td>Plantain</td>
<td>20.0%</td>
<td>30.3%</td>
<td>20.8%</td>
<td>28.7%</td>
<td>2640</td>
</tr>
<tr>
<td>Yam</td>
<td>54%</td>
<td>23.2%</td>
<td>4.3%</td>
<td>18.1%</td>
<td>550</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>14%</td>
<td>16.6%</td>
<td>50.7%</td>
<td>17.3%</td>
<td>589</td>
</tr>
<tr>
<td>Total</td>
<td>18%</td>
<td>25%</td>
<td>43%</td>
<td>14%</td>
<td>14,631</td>
</tr>
</tbody>
</table>

Source: field data, 2002

The next subsection also attempts to outline the nature of food crop production since mining began in the Tarkwa-Aboso area. Factors which influenced food crop production before surface mining are also analyzed to determine whether or not they have any impact on current food crop production in the Tarkwa-Aboso area.

### 3.5 Food crop production after surface gold mining in Tarkwa-Aboso

Drastic policy changes in 1986 affected every sector of the Ghanaian economy. The investment code enacted in 1986 transformed the Ghanaian economy including the mining sector. The purpose of the investment code was to diversify the Ghanaian economy from total dependence on exports of few primary communities. The mining sector saw a major transformation.
Heavy capital of over 3 billion dollars was invested into reconnaissance surveys, building of new mining plants and importing of mining equipments into the country. The mining law, PNDCL 153 was revamped to provide incentive for mining investors. Some of the incentives included; ten years tax holidays; deregulation and privatization of the mining sector, immigration quota for expatriate miners, tax exemptions and holidays for mineral exploration, unlimited transfer of foreign capital, and free import duties on mining equipments. The response to these policy changes was tremendous. Within four years, the number of mining companies in the Tarkwa-Aboso area increased from 1 to 4 between 1986 and 1990. The new mining companies; namely, Ghana Australian Gold (GAG), Teberebie Gold fields Limited (TGL) and Aboso Gold Fields Limited (AGL) started to operate surface mining. This led to a massive displacement of 14 communities with over 10,000 population in the Tarkwa-Aboso area. Initially, many farmers were misled to believe that they would be employed in the mines. Others were motivated by the cash compensation, to give out their lands for mining. However, only crops were compensated, and no compensation was paid on land. This culminated in the historic demonstration in the Teberebie area in 1990 when mining operations in the area came to a halt, because the communities will not allow miners to operate. Food crop farmers in the Tarkwa-Aboso area attribute the decline in food crop production to land shortage and indiscriminate eviction of farmers from their land.
Is land an important determinant of food crop production in Tarkwa-Aboso? Is there a decline in annual food crop production in Tarkwa-Aboso? Does surface gold mining have any impact on food crop production?

3.5.1 Land availability and accessibility after surface gold mining in Tarkwa-Aboso

Introduction of industrial surface gold mining in the Tarkwa-Aboso area has affected land accessibility. Land is not easy to acquire for farming purposes. Many farmers are forced to leave the area or cultivate fragile lands. Calculating the amount of potential arable land is highly speculative. The usual procedure is to identify those areas in which the physical, chemical, and biological properties of soils, the temperature patterns, and the amount and distribution of rainfall support crop production with existing technology (Worthman and Cummings 1973). Backed by government, mining companies have acquired over 70% of land in the Tarkwa-Aboso area and about 40% of these lands which are farm lands have already been mined out (See photographs 3.1-3.5).
The customarily land tenurial system, which ensured that community members had usufructual right to land has been destroyed with the introduction of state land policy. Chiefs and family heads have no custody over lands in the area. Rather the government has custody over all lands in the area. The government has the right to give out lands to investors. Traditional land owners are only paid compensation on crops and not for the land. Even though Mining investors are required to exercise the best environmental practices to ensure environmental sanity, degraded lands are
rarely reclaimed. Farmlands in Teberebie for instance are used as waste
dumps and top soils are being polluted with cyanide see photograph 3.2.

Photograph 3.2 Mined-out land in Teberebie

Source: Field photograph 2002

Over 100s of hectares of arable lands in Teberebie are being destroyed
with waste dumps from surface gold mining operation of GAG. Teberebie
Gold filed limited had sold the land to GAG because TGL declared that
mining in the area was not profitable. Many farmers in Teberebie have
become landless because of expansion of mining activities on farmland. Photograph 3.3 shows oil palm trees that farmers in Teberebie have been forced to cut down.

Photograph 3.3 Destroyed oil palm plantation in Teberebie

Source: Field Data 2002

Currently, thirty-five out of the 42 sampled farmers in Teberebie have no access to arable land. Farmers in the Teberebie area walk for over 4-5 kilometers to their farm. The remaining 7 sampled farmers have a total of less
than 5 hectares of arable land. Farmers in New Atuabo also face similar land accessibility problems. Sixty-eight of the 88 sampled farmers, representing 77% of the sampled farming population in Atuabo have no land to cultivate food crops. Others spend endless hours at the Tarkwa district labour office hoping for a job in the mines. Presently only 20 of the sampled farmers in Atuabo have access to arable land. Though New Atuabo has easy access to market, farmers walk for over 4 hours to have access to land. According to the chief of Atuabo, farmers cannot expand their farm size because lands in the immediate surroundings belong to other communities. Efforts to farm on the neighboring land are not without difficulties. Old Atuabo, which had been the main source of cassava production in the Tarkwa-Aboso area, now contains the mining plant of Goldfields Ghana Limited (GGL).

Ten out of the 18 sampled farmers in Damang have no land. Each of the remaining 8 farmers have less than 2 hectares of land to grow food crops. Each of the two sampled farmers in Mile 8 has less than 5 hectares of land. (See table 3.7 for details). Currently 111 farmers, representing 74% of the sampled farmers have no access to land.
Table 3.7 Land accessibility after surface mining in the study area

<table>
<thead>
<tr>
<th>Community</th>
<th>Sampled Farmers</th>
<th>Access to Farmland</th>
<th>No Access to Farmland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atuabo</td>
<td>88</td>
<td>20</td>
<td>68</td>
</tr>
<tr>
<td>Damang</td>
<td>18</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Teberebie</td>
<td>42</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>Mile 8</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>39</td>
<td>111</td>
</tr>
</tbody>
</table>

Source: Field data, 2002.

3.5.2 Tenurial arrangement after industrial surface gold mining

The customarily tenure systems which ensure that community members have usufructual right to land is no more effective in the Tarkwa-Aboso area. Small scale farmers face many challenges in acquiring land because of the unfair advantage miners have over use of land. Indirectly, mine investors, who are mostly foreigners, become custodian of indigenous lands, and indigenous people become tenants on their own land.

The impact is that many farmers in the Tarkwa-Aboso area have diversified from agriculture to other economic ventures such as trading. Others have left the community and those who remain in the community are desperate without land to grow crops.

In the Atuabo area, farmlands have been bulldozed to open up the area for surface gold mining. Some sections of the land in Teberebie are been destroyed with mine tailings. Farmers in the Iduapriem area have been made to relinquish their farms and communities and about 90% of those who were
employed in the mines have all been laid off. Currently, over 80% of lands in
the Teberebie area are used as waste dumps for mining operations of Ghana
Australian Gold Limited (see photograph 3.4).

Damang was created as resettlement by Aboso Gold Fields Limited for
the displaced farmers in the area. Unfortunately, this new settlement is
sandwiched between two forest reserves; the Bonsa and Oppon Manso
reserves. Not only farmers in the area are forbidden to enter or even collect
firewood from these forest reserves, but also the paths leading to farmland
have been blocked by ABL to ward off trespassers on their mine concession.
The effect is that farmers wind for over three hours to have access to arable
land.
In a country where too many people are already malnourished and crop yields could be cut by half within 40 years if the degradation of cultivated land were to continue at present rate, every effort must be made to increased domestic food crop production by assisting small scale farmers who constitute the bulk of food crop producers. Currently, there is a drastic change in the quantity of food crops in the Tarkwa-Aboso area, and these are analyzed in the next subsection.
3.5.3 Annual food crop production in the Tarkwa-Aboso area after surface gold mining

There is a drastic decline in the number of food crop farmers, and annual quantity of bags since surface gold mining began in the Tarkwa-Aboso area. (See table 3.8 and 3.9)
Table 3.8. Annual maxi bags of food after surface gold mining in the Tarkwa-Aboso area.

<table>
<thead>
<tr>
<th>Community</th>
<th>Maize</th>
<th>Cassava</th>
<th>Rice</th>
<th>Plantain</th>
<th>Cocoyam</th>
<th>Yam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teberebie</td>
<td>150</td>
<td>980</td>
<td>12</td>
<td>89</td>
<td>14</td>
<td>102</td>
</tr>
<tr>
<td>Damang</td>
<td>213</td>
<td>1320</td>
<td>18</td>
<td>90</td>
<td>32</td>
<td>89</td>
</tr>
<tr>
<td>Atuabo</td>
<td>550</td>
<td>1500</td>
<td>20</td>
<td>183</td>
<td>33</td>
<td>98</td>
</tr>
<tr>
<td>Mile 8</td>
<td>67</td>
<td>412</td>
<td>9</td>
<td>60</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>980</td>
<td>4212</td>
<td>59</td>
<td>422</td>
<td>79</td>
<td>308</td>
</tr>
</tbody>
</table>

Source: Field data, 2002

The annual quantity of bags produced for the study area after surface gold mining are as follows; 980 maxi bags of maize, 4212 bags of cassava, 59 bags of rice, 422 bags of plantain, 79 bags of cocoyam and 308 bags of yams are produced annually.

At the world level, there is sufficient agricultural production to meet increasing demand over the next thirty years (FAO 2002). It is estimated that by 2030, crop production in developing countries will be 70% higher than the 1990s. Inspite of this statistics the report also acknowledges the persistent contradictions between having sufficient food at the world level and having food shortage in developing countries. The report recognizes the need for developing countries to increase their local production capacity by encouraging food crop production at every level.

Since surface gold mining was introduced in the Tarkwa-Aboso area there is a new and an insatiable demand for mining employment because of
higher salaries paid to mine employees. Secondly, an unsatisfactory compensation paid on food crops has affected the attitude of farmers towards food crop farming. Farmers in the area have developed strong desire to cultivate cash crops, which attract a comparatively higher compensation than food crops. These among other factors have directly contributed to a reduction in the number of food crop farmers in the study area, and an eventual decline in food crop production (See table 3.9).

Table 3.9 Number of food crop farmers in the Tarkwa-Aboso area after surface gold mining

<table>
<thead>
<tr>
<th>Community</th>
<th>Maize</th>
<th>Cassava</th>
<th>Rice</th>
<th>Plantain</th>
<th>Cocoyam</th>
<th>Yam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teberebie</td>
<td>9</td>
<td>33</td>
<td>7</td>
<td>2</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Damang</td>
<td>7</td>
<td>17</td>
<td>12</td>
<td>6</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Atuabo</td>
<td>20</td>
<td>71</td>
<td>23</td>
<td>8</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Mile 8</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>123</td>
<td>44</td>
<td>18</td>
<td>35</td>
<td>20</td>
</tr>
</tbody>
</table>

Source: Field data, 2002

Presently there are only 35 maize farmers, 123 cassava farmers, 44 plantain farmers, 18 rice farmers, 35 yam farmers and 20 cocoyam farmers. Food per capita production also experiences an annual decline as shown in table 3.10.
Table 3.10 Per capita annual food crop productions after surface gold mining in the Tarkwa-Aboso area

<table>
<thead>
<tr>
<th>Major crops</th>
<th>Maize</th>
<th>Cassava</th>
<th>Plantain</th>
<th>Rice</th>
<th>Yam</th>
<th>Cocoyam</th>
</tr>
</thead>
<tbody>
<tr>
<td>N0. of Farmers</td>
<td>35</td>
<td>123</td>
<td>44</td>
<td>18</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>Annual qty in 91kg per bag</td>
<td>980</td>
<td>4212</td>
<td>422</td>
<td>59</td>
<td>308</td>
<td>79</td>
</tr>
<tr>
<td>Annual Per capita</td>
<td>28</td>
<td>34.5</td>
<td>9.5</td>
<td>3.2</td>
<td>8.8</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Source: Field Data 2002

The current annual food per capita production in the Tarkwa-Aboso area is as follows; 28 maxi bags for maize, 34.5 for cassava, 9.5 for plantain, 3.2 for rice, 8.8 maxi bags for yam and 3.9 maxi bags for cocoyam as shown in Table 3.10. The extent of the decline in food per capita production was crudely determined by subtracting the food per capita production before surface gold from the per capita production after surface gold mining. The decline are as follows; 15.6 maxi bags of maize, 72.9 maxi bags of rice, 23.9 maxi bags of plantain, 18.8 maxi bags of cocoyam and approximately 32 maxi bags of yam after surface gold mining began in the Tarkwa-Aboso area. (See table 3.11).

Table 3.11. An annual per capita decline of food crops after surface gold mining was introduced to the Tarkwa-Aboso. A maxi bag weights 91kg.

<table>
<thead>
<tr>
<th>Maize</th>
<th>Cassava</th>
<th>Rice</th>
<th>Plantain</th>
<th>Cocoyam</th>
<th>Yam</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.6bags</td>
<td>14.1bags</td>
<td>72.9bags</td>
<td>23.9bags</td>
<td>18.8bags</td>
<td>31.7bags</td>
</tr>
</tbody>
</table>

Source: Field data, 2002
Table 3.12 compares the nature of per capita food crop production before and after surface gold mining was introduced to the Tarkwa-Aboso. The table depicts that there is a drastic decline in food crop production after surface gold mining.

Table 3.12. Comparison of Per capita food crop production "before" and "After" surface gold mining in the Tarkwa-Aboso area

<table>
<thead>
<tr>
<th>Crops</th>
<th>Per capita food crop production before surface gold mining (91kg bag)</th>
<th>Per capita food crop production after surface gold mining (91kg bags)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>43.6</td>
<td>28</td>
</tr>
<tr>
<td>Cassava</td>
<td>48.2</td>
<td>34.2</td>
</tr>
<tr>
<td>Plantain</td>
<td>33.4</td>
<td>9.5</td>
</tr>
<tr>
<td>Rice</td>
<td>76.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Yam</td>
<td>30.5</td>
<td>8.8</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>22.6</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Source: Field Data 2002

There is a clear indication that food crop production has declined since surface gold mining began in the Tarkwa-Aboso area. The decline is mainly due to land shortage and farm labourers due to community displacement and labour drift to the gold mining sector. There is also a change in the land tenure system which makes it difficult for small-scale farmers to have access to land.
Figure 3.1 per capita food crop production before and after surface gold mining in Tarkwa-Aboso

How does surface mining directly affect food crop production? An attempt to answer this question is the basis of chapter four.
CHAPTER FOUR

4.0 IMPACT OF SURFACE GOLD MINING IN THE
TARKWA-ABOSO AREA

4.1 Introduction

The impact of surface gold mining on food crop production is broadly grouped into two main categories; physical and socio-environmental impact. The physical impacts include; degradation of land and vegetation, water pollution, air and noise pollution. The socio-economic impacts include; community displacement, diversification of the local economy, high cost of living, and change in attitude towards agriculture. Health and safety of inhabitants and mine workers are also important socio-economic impact of mining on food crop production.

Until 1986, the extraction of gold in the Tarkwa-Aboso area had overshadowed the importance of agriculture in the area. However, when the chiefs, elders and citizens of the Teberebie area marched on the streets of Tarkwa to protest against the unwonted destruction of farmland and food crops in the area, as a result of industrial surface gold mining, farming in the area began to gain recognition. The main concern of the people was that, surface gold mining has adversely degraded all arable lands in the area; many communities have been displaced without proper compensation and many farmers have been relocated to new areas where economic conditions are
unfavourable. Labour from agriculture has also drifted to the mining sector and many of the youth have diverted their attention from agriculture to other mine-related businesses such as transportation and hiring of mine equipments. This chapter attempts to outline the impact of surface gold mining on food crop production in the Tarkwa-Aboso area.

4.2 Physical impact

The physical impact of industrial mining on land has already been emphasized in chapter three with digital photographs. This chapter attempts to give a detailed analysis of the impact of surface gold mining on land and vegetation, and aquatic life. This subsection attempts to outline the effect of degraded land and vegetation on food crop production in the Tarkwa-Aboso area.

4.2.1 Land and vegetation

The Environmental Protection Agency (GH) (EPA, 1995) revealed that the type of mining and characteristics of a particular mineral deposit determines the degree to which mining disturbs the landscapes and vegetation. Underground mining usually causes little disturbances and rehabilitation of landscapes is restricted to tailing dumps, removal of buildings and equipment and making the area safe.

Since mining moves large quantities of rock, and, in the case of surface mining, overburden (material overlying a mineral deposit that must be
removed before mining), land impacts are large. These impacts may be temporary where the mining company returns the rock and overburden to the pit from which they were extracted. Many copper mines, for example, extract ore that contains less than 1% copper. For many non-ferrous metals, virtually all of the mined ore thus becomes waste. Artisanal mining, e.g. alluvial mining for gold and diamonds, often has an impact far greater than the size of the operation. Many areas are pock marked by thousands of small holes which have been indiscriminately dug in search of precious minerals. Trenches that scar the landscape are problems in some places where artisanal mining takes place. These activities may lead to erosion and the localized destruction of river banks.

Lands in the Tarkwa-Aboso area are undergoing rapid degradation, mainly because of industrial surface gold mining activities. The removal of overburden and waste rocks has significantly changed the topography and stability of the landscape in Teberebie, and Atuabo (See photo 3.1-3.5). Forest, vegetation, water bodies and a large proportion of arable lands in the study area are destroyed.

Currently over 20% of lands in Tarkwa-Aboso has been destroyed through industrial mining activities (Dramani and Akabzaa 2002). It is estimated that at the close of mining, a company would have used 40-60% of its total concession space for activities such as citing of mines, heap leach facilities, tailing dumps and open pits, mine camps, roads, new resettlement
for displaced communities (Dramani 2001). The significant impact on farm size cannot be underestimated, as there is already no farmland in Atuabo.

Apart from the Neung forest reserve, forests in the Tarkwa-Aboso area have been reduced to secondary forest through illegal lumbering. Over 60 km² of the Neung forest reserve in Tarkwa-Aboso has been leased to GAG for gold prospecting (African Agenda, 1997, Vol., 10, page 17). In Atuabo, Teberebie, Damang and Iduapreim/Mile 8, all the lands have been scraped off their vegetation and topsoil for surface gold extraction. The direct effect of deforestation is that the soils are exposed to increased insulation and thus induces extremes of microclimatic conditions of temperature and moisture. Raindrops impact causes splash erosion while infiltration is reduced and surface run off is increased. Habitats are destroyed, species diversity is lost, and the soil looses its fertility.

Deforestation on extensive scale may alter macro-climatic patterns through changes in insulation, windflow, evaporation and desiccation. These changes affect soil nutrients which are essential for crop production. The change in climate such as low rainfall experienced in recent times in the western region could be attributed to deforestation caused by surface gold mining in the study area. Farmers in the Tarkwa-Aboso area are worried that when mining ceases to operate, land in the area would no longer be useful for any agricultural purpose. Chisholm and Dumsday (1987) estimated that it costs US $500 to $10,000 to rehabilitate a hectare of large-scale open pit mine. United States of America for example, suffered adversely in the middle of the
1960s, when surface gold mining destroyed over 10,000 km² of land in the Arizona area.

Considering the degree at which land is being degraded in the Tarkwa-Aboso area, restoration of the land will be very expensive, and there will be no land to cultivate food crops, if measures are not taken immediately to halt surface mining on arable land and ensure that mining companies reclaim all degraded lands in the Tarkwa-Aboso area.

4.2.2 Aquatic life

It is a well-known fact that clean water is absolutely essential for healthy living. Adequate supply of fresh and clean drinking water is a basic need for all human beings on the earth, yet it has been observed that millions of people worldwide are deprived of good drinking water. Freshwater resources all over the world are threatened not only by over exploitation and poor management but also by ecological degradation. The main source of freshwater pollution can be attributed to discharge of untreated waste, and dumping of industrial effluent. The mining industry uses large quantities of water. Mining brings sulphide-containing minerals into the presence of air, where they are oxidised and react with water to form sulphuric acid. This acid rock drainage (ARD) impacts both groundwater and surface water. Tailing damps and waste rock heaps are also sources of acidic drainage water, affecting surface and underground water. The chemical deposits left behind
by explosives are usually toxic and they contaminate and increase the salinity of mine water. In situ mining, in which a solvent is allowed to percolate through unmined rock, leaching minerals directly, has the potential to contaminate groundwater. Artisanal mining may impact water where mercury is used to process gold (US Bureau of Mines 2002).

The inhabitants of the Tarkwa-Aboso area are concerned about the pollution of surface and groundwater resources by large scale mining operations. Over nine villages along the banks of the Bonsa River lost their fish stocks and food crops in the 1996’s accidental spillage of cyanide from the gold mining activities of GGL.

Mercury is a toxic metal that occurs naturally in the environment. There are both inorganic forms and organic forms of mercury. Many of the forms of mercury circulate in the environment, moving from land or water to air and back again, and the forms of mercury may change from one to another as they circulate. Human activities significantly redistribute mercury and release it into the environment. They allow mercury that was formerly unavailable to the biosphere to be mobilized and carried to new areas via air and water. In the water or soil, microorganisms can convert inorganic mercury into a more toxic organic form, methylmercury. Fish take in methylmercury from their diet and from water passing over their gills. They bioaccumulate the methylmercury in their bodies because the rate of intake of methylmercury is much greater than its elimination. Methylmercury
bioaccumulates in the tissues of a fish throughout its lifetime. It can build up
to high levels in predator fish at the top of the aquatic food chain — levels that
are tens of thousands to millions of times above the level found in the
surrounding water. Fish with high levels of methylmercury may be caught
and consumed by humans, waterfowl or other wildlife (http://www.epa.gov/grtlakes/bnsdocs/merchealth/).

All forms of mercury are toxic to humans, but the various forms of
organic and inorganic mercury have different toxicity. Generally, organic
forms are much more toxic than inorganic forms. The organic forms of
mercury are primarily neurotoxins. Therefore exposure can damage the brain
and nervous system. The developing brain of a fetus or child is especially
vulnerable to organic mercury exposure. Inorganic forms of mercury
primarily affect the kidney, but are also neurotoxins. Other organs and
systems of the body can be harmed by exposure to mercury. It is estimated
that 70% of people who are exposed to mercury for an average of 30 months
or those who live within 500 hundred meters of a source of mercury have
clinical symptoms of poisoning, (African Agenda, vol. 15). The fetus of a
mother who eats contaminated fish can be exposed to methylmercury via the
mother’s blood, and an infant can be exposed by ingestion of breast milk.
Mercury cannot be removed from fish before they are eaten because
methylmercury accumulates in the muscle, not the fat. Most of the states in
the U.S., including New York State, issue cautionary advisories about eating
the fish caught in some of their waterways because of the presence of mercury. These advisories represent conservative measures to protect human health.

In Minamata, Japan, inorganic mercury was used in the industrial production of acetaldehyde. It was discharged into the nearby bay as waste water and was ingested by organisms in the bottom sediments. Fish and other creatures in the sea were soon contaminated and eventually residents of this area who consumed the fish suffered from MeHg (methyl mercury) intoxication, later known as the Minamata disease. The disease was first detected in 1956 but the mercury emissions continued until 1968. But even after the emission of mercury stopped, the bottom sediment of the polluted water contained high levels of this mercury (http://edugreen.teri.res.in/explore/water/health.htm)

A large number of temporary rivers and marshes in the Iduapriem area where paddy rice were cultivated are made uncultivable of because of mercury pollution. Inhabitants in Jerusalem, a small village near Iduapriem cannot drink nor use the Ahweafuturu stream because it is polluted with chemical discharges from GAG surface mining operation. The United Nations Environmental Program (UNEP) recommends the ban of the use of mercury amalgamation, yet miners in Ghana ignore these regulations.

Acquah’s (1994) research in Tarkwa and other mining towns in Ghana showed that acid rains caused by arsenic and sulphur dioxide and smoke
discharged from the obsolete reduction plants render mangoes trees barren. Farmers in Teberebie believe that the unexplainable withering of fruits and crops after every heavy rainfall could be the result of the acid rains.

4.2.3 Dusts, Noise and Air Pollution

Resource exploration, extraction, processing and transportation generally involve plant, equipment and techniques which have the potential to produce significant levels of noise, vibration and airblast, and which may impact on the surrounding environment. Even at the exploration stage, significant levels of noise, vibration and airblast can be produced, for example from engines, airblast drilling equipment, shot hole drilling and blasting or vibrating machines for seismic exploration (mostly in the search for oil and gas).

Noise from mining is a common source of community concern because operational noise emissions frequently occur on a continuous basis. This can interfere unreasonably with day to day activities, particularly concentration, recreation and sleep, and result in an adverse impact on residential amenity. Vibration and airblast from blasting can lead to community concern primarily due to the fear of structural damage. This fear occurs because people are able to detect vibration at levels which are well below those which result in even superficial damage to buildings and items of heritage value. In Australia this concern may extend beyond man-made structures, to sites of natural or
cultural significance such as Aboriginal art and sacred sites and valued landscapes [http://www.deh.gov.au/industry/industry-performance/minerals/booklets/noise/noise1.html].

Akabzaa and Dramani (2001), identified sulphur dioxide (SO\textsubscript{2}), nitrogen dioxide (NO\textsubscript{2}), carbon dioxide and black smoke as the major concerns within the Tarkwa area. The activities that generate this particular matter include site clearance, and road building, open pit drilling and blasting, loading and haulage, vehicular movement, ore and waste rock handling as well as heap leach crushing by companies doing heap leach processing.

Noise can interfere with sleep, speech and hearing. These can cause stress-related diseases such as hypertension. The silica-rich dust generated during drilling, blasting and crushing of ore could cause severe colds and silicosis when inhaled in substantial amount (Akabzaa, 2001). Dust generation is a major pollutant in the study area. Most of the crops near the main road are stained with dust deposits making it unwholesome for human consumption.

4.3. Health

The process of gold mining and processing involves activities which give rise to various environmentally caused diseases. Such activities include: blasting which creates dust, increasing particle matter in air and water and
processing methods which produce toxic chemicals such as cyanide, arsenic, sulphur dioxide. Generation of diseases due to pollutants and accidents at mines are part of the major adverse impacts of surface gold mining.

Medical records from the Tarkwa-Gold Field Hospital, Government Hospital and Ghana National Manganese Hospital show that the most frequently reported ailment at the hospital are vector borne diseases such as malaria, schitomiasis and onchocerciasis. Respiratory track diseases especially pulmonary tuberculosis and silicosis are very common in the Tarkwa-Aboso area. Skin diseases, accidents resulting from galamsey activities and mental cases are also prevalent.

The prevalence of malaria in the Tarkwa-Aboso area is mainly due to the stagnant water in trenches and abandoned mined sites, which serve as breeding grounds for mosquitoes. Malaria is a major public health problem in Tarkwa-Aboso. It is the primary cause of child mortality in Ghana and the Tarkwa-Aboso area is the worst affected area with an annual mortality rate as high as 85/1000 compared with the national average of 80/1000.

As much as ill health may not have direct impact on food crop production, the number of hours and financial resources spent on health issues has a direct impact on food crop production in the study area. It does not only drain financial resources of the farming population, but also labour hours which are lost in hospital attendant.
4.4. Socio-economic impact of industrial surface gold mining.

From 1986 to 1997, Ghana’s gold mining sector attracted about $3 billion of foreign direct investments, representing more than 60% of all such investment in the country (Akabzaa, 2001). Most of these funds went into mine rehabilitation and expansion of existing mines, new exploration projects, development of new mines and establishment of mining support companies such as equipment supply companies, assay laboratories etc. The new money, new affluence and new wants, and desires became the hallmark of inhabitants in mining areas. The new employment opportunities attract people from diverse ethnic and social background, to the mining centre. Avenue for brisk commercial and services like, banking, trading, and transportation flourish in the area. As an extractive industry with total dependent on natural resources which are mostly in the land, surface gold mining conflict with other users of land. Since mining is capital intensive and supposedly “a new way of life”, many developing countries give it all the needed policy supports, while neglecting other sectors of the economy.

This subsection analyses the socio-economic impact of surface gold mining with particular reference to the Tarkwa-Aboso area, bearing in mind, impact of surface gold mining on food crop production.
4.4.1. Employment

The mining sector is a significant contributor to formal and informal employment in host countries. Up to 1995, the mining sector accounted for an estimated 20% of formal sector employment, with large-scale mining employing about 20,000 people (Akabzaa, 2001). Mining sector support companies such as assay laboratories, equipment leasing and sales agencies, security and catering agencies also contribute to formal sector employment.

Table 4.1 Employment statistics for mines in the Tarkwa-Aboso area

<table>
<thead>
<tr>
<th>Company</th>
<th>1995</th>
<th>1996</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>TGL</td>
<td>941</td>
<td>1194</td>
<td>1413</td>
</tr>
<tr>
<td>GAG</td>
<td>536</td>
<td>586</td>
<td>680</td>
</tr>
<tr>
<td>GGL</td>
<td>1459</td>
<td>-</td>
<td>1138</td>
</tr>
<tr>
<td>AGL</td>
<td>-</td>
<td>-</td>
<td>309</td>
</tr>
</tbody>
</table>

Source: Minerals Commission

The reality of the fact is that the mining sector has a relatively limited employment capacity. Employment potential with mining is limited to the few skilled. As an enclave industry with heavy use of capital and expatriates, surface mining has not generated the employment benefits that indigenous people are made to believe. When Tarkwa Goldfields limited (the only
underground mine in the Tarkwa-Aboso area,) closed its underground mines to start surface mining in the early 1990s, over 2000 workers were retrenched and made redundant. In addition, the persistent decline in gold prices requires a radical restructuring of the mining sector to reduce cost. The common practice is labour lay offs and payment of cash compensation to affected workers. From 1992 to 1998, Akabzaa (2001) noted a net loss of 1000 mine workers between in the Tarkwa-Aboso area.

Mining accounts for the high rate of unemployment in the Tarkwa area because farmers and other users of lands are denied access while surface mining activities do not provide enough jobs to match the total number of people laid off from agriculture (Akabzaa, 2001). Retrenched mine workers and displaced farmers do not reinvest in agriculture for three main reasons: One, there is no monthly salaries in farm work; two; there is no land to cultivate crops and three; farming in the area has become less lucrative because of constant displacement of farmers and meagre cash compensation paid on food crops.
4.4.2 Compensation and Resettlement

Appiah (2001), defines compensation as the amount of money required, so far as money can do so, to put a claimant dispossessed of his interest or rights by a compulsory acquisition of his property in the same position as if his property had not been acquired. In other words, the claimant should not be worse off through the acquisition of land after compensation. The underlying principle is to ensure that the claimant is financially compensated adequately for the loss experienced. Thus, compensation valuations are based on the principle of equivalent re-installation, thus to put the owner, as much as possible, in the same position he was before the acquisition.

Mining Law of 1986, (PNDCL 153) makes provision for holder of mineral concessions to compensate affected communities. Communities affected by mining in the Tarkwa-Aboso area are not satisfied with the compensation paid to them because their socio-economic needs were not considered, neither the communities were fully involved in the design of the compensation package. Food crop farmers felt humiliated when, cassava, which is the most widely cultivated crop, is barely compensated for. Considering time spent, labour cost and general high cost of living in the area, money compensation paid to them is inadequate. Moreover, only crops were compensated, no compensation was paid for the land on which crops are cultivated.
On the issue of settlement, 90% of the sampled farmers are against the location of their new settlements. The new settlement created for Teberebie for example, is sited too close to the mine sites. Constant blasting and vibration from dynamite explosives affect houses, and crops. In fact, cracks on all buildings in the area testify to these claims.

Although there tend is an improvement in housing and other infrastructures compared with those in existence before the miners started operations, local people still prefer their old village location. When presented with the argument that the present location have far better infrastructures than their former ones, most of the farmers commented “we don’t eat houses, where are our crops, farm land society and backyard garden”. When compared with the other three settlements, New Atuabo has relatively better facilities. There is a good access road to the main Tarkwa-Aboso road. The houses are neatly laid out. The primary and Junior Secondary School (JSS) in the area is well located with big compound for recreation. There is a church building, community centre and pipe borne water. However, farmland is visibly unavailable. Farmers walk for over 4-5 miles to have assess to farmlands.

As shown in table 4.2 compensation paid to displaced farmers in Teberebie was woefully inadequate considering the time spent and money invested on the cultivation of crops. For example, an acre of cassava crop attracted a cash compensation of €6000 and €10,000 was paid for an acre of cocoyam crop.
<table>
<thead>
<tr>
<th>Crops</th>
<th>Size</th>
<th>Compensation in cedis of crops (GH₵)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local oil palm</td>
<td>Matured</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>200</td>
</tr>
<tr>
<td>Agric oil palm</td>
<td>Matured</td>
<td>1200</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>400</td>
</tr>
<tr>
<td>Rubber</td>
<td>Large</td>
<td>1100</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>400</td>
</tr>
<tr>
<td>Plantain</td>
<td>Matured</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>150</td>
</tr>
<tr>
<td>Banana</td>
<td>Matured</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>50</td>
</tr>
<tr>
<td>Coconut palm</td>
<td>Large</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>200</td>
</tr>
<tr>
<td>Orange tree</td>
<td>Large</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>500</td>
</tr>
<tr>
<td>Pineapple</td>
<td>Matured</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>15</td>
</tr>
<tr>
<td>Cocoyam</td>
<td></td>
<td>10000 per acre</td>
</tr>
<tr>
<td>Cassava</td>
<td></td>
<td>6000 per acre</td>
</tr>
<tr>
<td>Maize</td>
<td>Matured</td>
<td>10000 per acre</td>
</tr>
</tbody>
</table>

Source: Assessment report proposed expansion phase III (TGL)
In the Damang area, displaced farmers are "sunwitched" between two forests reserves- Bonsa and Opon Mansi where farming is restricted. Even though the relocation did not take into account the economic needs of the people, in comparison to those in Teberebie and Iduapriem, compensation package for affected communities in Damang was an improvement from that of Teberebie, which was the first ever resettlement program for the people in the Tarkwa-Aboso area. In the package, Persons with crops had their crops compensated for with farming allowance. Persons with completed building were also compensated based on the building value and an additional relocation allowance. Persons with completed building with crops had crop compensation, farm allowance, building value, and relocation allowance. Farmers in Damang were given farm allowances, and by the end of April 1997, all forms of infrastructure had been completed in Damang and 80% of the 572 landlords from the area had been resettled or received compensation (see table 4.3).
Table 4.3 Compensation package for Damang

<table>
<thead>
<tr>
<th>DISLOCATED FARMERS</th>
<th>COMPENSATION PACKAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person with crops</td>
<td>Farm allowance</td>
</tr>
<tr>
<td>Person with completed building</td>
<td>Based on building value, relocation allowance</td>
</tr>
<tr>
<td>Person with completed building, with crops</td>
<td>Farm allowance, building allowance and relocation allowance.</td>
</tr>
</tbody>
</table>


A total of 1.45 billion cedis were paid as compensation to 518 farmers in Damang and it surrounding villages. Considering the high cost of living in mining areas, monetary compensation is not adequate to improve the living standards of displaced farmers. This brings out the question whether money is the best form of compensation for displaced communities in mining areas.

4.4.3 Cost of Living

One of the negative effects of mining is the high cost of living within communities living near mine locations. All the indices (accommodation, health, water, food...) that make a decent life have “price tags” beyond the reach of the average person. Living on credit for many in Tarkwa-Aboso is a way of life, particularly for the rural farmers. Dramani and Akabzaa (2001), identified two main factors that account for the income disparities in favour
of mining companies’ staff. The salaries of the Ghanaian staff are indexed to the dollar, which raises their income far above their counterpart in the public sector. The expatriate staffs of the mine are also paid internationally competitive salaries, which further widen the income disparities in Tarkwa-Aboso, and that has influenced the pricing of good and services such as housing and food. The other crucial factor accounting for the high cost of living in the Tarkwa-Aboso area is the redraw of significant percentage of the labour force from agriculture and other income-generating activities.

4.4.4 Domestic investment

Even though mining is the leading foreign exchange earner for the country, contributing 40% of gross foreign exchange, in real terms, the sector contributes only 1.5% to the gross domestic product (GDP) of the country while agriculture contributes over 40% (Akabzaa and Dramani, 2002). Thus, Ghana’s mining sector is not making any decisive contribution to the economy, and it does not hold the key to sustainable development of the country.

Investment is very low in the Tarkwa-Aboso area and this is attributed to a number of factors associated with industrial surface gold mining. According to the Assemblyman in Teberebie, over 70% of their income is spent on food and shelter. He attributed the high food prices to the displacement of 79% of the food crop farmers which has created importation of food. Thus, inhabitants of mining areas, including the mine workers, live
from pay check to pay check and people could barely save money for future investments.

When respondents were asked what they would do when mining ceases, the indigenous residents looked dejected because they have no farmland to cultivate, neither do they have the requisite skills to engage in any other business. The migrants however responded that they would go back to their place of origin.

4.5 Attitude towards Farming

Since the commencement of mining in Tarkwa-Aboso, 79% farmers do not have access to arable land. Mining companies have acquired 70% of lands in the Tarkwa-Aboso area, and farmers need to obtain permission from the mining companies before they could work on their own ancestral land. Any attempt to farm on these lands is met with hostilities from the hired security personnel. To have access to land, farmers walk for over 5 kilometres. Inspite of these farm food crops are inadequately compensated and farmers are not involved in the negotiations to determine their future. These and other issues demoralize farmers in the Tarkwa-Aboso area. They have developed a negative attitude towards farming and a high desire for mining related jobs. The inhabitants of the Tarkwa-Aboso area are concern about the rate in which the land is being destroyed by surface mining and they believe that a time will come when there will be no land for farming.
4.6 Absence of Vital facilities

One of the many promises made for introducing mining into communities include the provision of vital facilities like feeder roads, market centres and effective transport systems to improve the economy of communities in mining areas.

Earnings from Gold exports increased from US$107.9million in 1992 to US$682m in 1995. In 1997 tax revenue of c467,138,998 was paid by TGL to the government of Ghana for the development of Teberebie community, however, only c467,113,000 was ceded for that purpose. Despite economic importance of the Tarkwa-Aboso area many communities in the area still lack very vital facilities, such as hospitals, good roads, modern community centre, and basic infrastructures like public toilets and urinary.

The Government hospital in Tarkwa, which caters for the medical, needs of the people in the Tarkwa-Aboso area, needs medical doctors and vital drugs. The mining clinics of GGL, GAG, and TGL were established built exclusively for the few miners and their families. The only clinic near Teberebie is also strictly for mineworkers. Even facilities in the clinic are for first aid purposes. Serious cases are referred to the government hospital in Tarkwa, which is about 6km away. This is very unfortunate considering the fact that inhabitants in the area are prone to diseases such as Tuberculosis, skin rashes and other lung and heart related diseases which emanate from industrial surface mining activities. Yet, medical facilities to cater for such ailments are conspicuously absent.
Impact of surface gold mining on food crop production cannot be understated. It has created serious mayhem in the Tarkwa-Aboso area. It has created land dispute and high cost of living. The ordinary farmer who has no other skills but farming, have to struggle to survive. Having lost his ancestral land, and being denied employment in the mines, the small scale farmer in the Tarkwa-Aboso area is indeed a victim of industrial surface gold mining’s unfair treatment of the ordinary citizen of Ghana. Inspite of the impacts that mining has on food crop production, other factors also impact on food crop production in the Tarkwa-Aboso area. These other factors are discussed in Chapter five.
CHAPTER FIVE

5.0 OTHER FACTORS THAT AFFECT FOOD CROP PRODUCTION
IN TARKWA-ABOSO AREA.

5.1 Introduction

Food crop production is affected when farmers are displaced, evicted from their land and when farm labourers drift to other economic sectors such as mining. In the Tarkwa-Aboso area, surface gold mining has displaced over 14 communities including Teberebie, Atuabo, Mile 8 and Iduapriem. This has resulted in a large scale reduction in farm size and eventual reduction in food crop production. However, other factors such as use of mineral revenues, family disorganization, government policies and programs, access to market information such as pricing, storage facilities, and general attitudes towards farming also have an impact on food crop production. This chapter analyses how these factors affect food crop production in the Tarkwa-Aboso area.

5.2. Use of Mineral Revenue

An annual quantity of about 2.2 million ounces of gold, representing about 45% of exchange revenues are produced in Ghana. Apart from gold, Ghana also exports, diamonds, bauxite and manganese. Gold accounted for US$ 651.1 million of the total Mineral Sector Contribution to National exports of US$ 682.2 million in 1995. Mineral exports were 45.48% of the total
commodity exports in Ghana. Gold accounted for 95.44% of the total mineral exports

(See table 5.1). (Weight of gold is in ounces, weight of diamond in carats and weight of Bauxite and Manganese in Metric Tonnes)

Table 5.1 Ghana’s Mineral Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Gold (ounces)</th>
<th>Diamond (carat)</th>
<th>Bauxite (metric tonnes)</th>
<th>Manganese (metric tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>373,937</td>
<td>256,358</td>
<td>299,939</td>
<td>284,911</td>
</tr>
<tr>
<td>1989</td>
<td>429,476</td>
<td>285,636</td>
<td>374,646</td>
<td>273,993</td>
</tr>
<tr>
<td>1990</td>
<td>541,408</td>
<td>636,503</td>
<td>368,659</td>
<td>246,869</td>
</tr>
<tr>
<td>1991</td>
<td>845,908</td>
<td>687,736</td>
<td>324,313</td>
<td>311,824</td>
</tr>
<tr>
<td>1992</td>
<td>998,195</td>
<td>656,421</td>
<td>399,155</td>
<td>276,019</td>
</tr>
<tr>
<td>1993</td>
<td>1,262,424</td>
<td>590,842</td>
<td>364,641</td>
<td>295,296</td>
</tr>
<tr>
<td>1994</td>
<td>1,430,845</td>
<td>757,991</td>
<td>451,802</td>
<td>238,429</td>
</tr>
<tr>
<td>1995</td>
<td>1,708,531</td>
<td>631,707</td>
<td>530,389</td>
<td>186,901</td>
</tr>
<tr>
<td>1996</td>
<td>1,606,880</td>
<td>614,737</td>
<td>383,370</td>
<td>267,000</td>
</tr>
<tr>
<td>1997</td>
<td>1,758,005</td>
<td>829,524</td>
<td>536,728</td>
<td>332,443</td>
</tr>
<tr>
<td>1998</td>
<td>2,382,339</td>
<td>822,619</td>
<td>341,118</td>
<td>384,400</td>
</tr>
</tbody>
</table>

Source: Drills Bits and Tailings, vol 5, no. 19, 2000
While in gross terms, mining is the leading foreign exchange earner, its net foreign exchange contribution to the national economy is minimal (Akabzaa, 2000). This is because of generous tax exemption given to mining investors and the fact that mining companies retain on the average, 75% of their export earnings in off-shore accounts for various purposes. Mining operations are justified on an economic basis. Before mining begins, communities in mining areas are given high hopes of employment and income. Mining companies promise to develop and increase economic activities in the area. Communities, therefore welcome mining companies in the area, many land owners willingly give their lands to the companies expecting a fair compensation package. Unfortunately, to this date, many mining communities are dissatisfied with mining operation in their area. Although the Tarkwa-Aboso area hosts most of the gold mining industry in Ghana, revenues from mineral exports earmarked for the development of Teberebie and other communities in the area are misleading (See table 5.2)

<table>
<thead>
<tr>
<th>Year</th>
<th>Royalties paid by TGL to the government (amount in millions of cedis)</th>
<th>Amount released from Gov. to Teberebie</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>1,093,948,818</td>
<td>109,394,882</td>
</tr>
<tr>
<td>1994</td>
<td>1,668,455,665</td>
<td>166,845,567</td>
</tr>
<tr>
<td>1995</td>
<td>2,898,782,682</td>
<td>289,878,268</td>
</tr>
<tr>
<td>1996</td>
<td>3,870,505,852</td>
<td>387,050,585</td>
</tr>
<tr>
<td>1997</td>
<td>4,671,138,998</td>
<td>467,117,900</td>
</tr>
</tbody>
</table>

Source: Mineral Commissions 1998 Annual report
From 1993 to 1997, a total of ₦1,420,283,202 were earmarked by the government of Ghana for development projects in the Teberebie. However, the District Chief Executive of Tarkwa in 1999 indicated that since his appointment as the Executive of the district the beginning of 1997, his district has received only ₦20 million as property rate and ₦50 million as mineral rights. Thus since the beginning of 1997 only ₦70 million has been given to the district for socio-economic development. This contradicted records from Minerals Commission’s 1998 Annual Report, which indicated that an amount of ₦467,117,900 had been earmarked for the socio-economic development of the Tarkwa-Aboso area, through royalties from GGL. Who is speaking the truth? This is beside the point. The main issue is how are mineral revenues used? According to the Chief of Teberebie, his village council has made repeated appeal to the District Assembly for loans to assist them in their farming operation as well as to complain about the dumping of mine tailings on their land. To this date no revenues have been released to the affected communities, neither has the dumping of mine tailings on arable land ceased.

In a focus group discussion with the chiefs and inhabitants of Atuabo, Mile 8, Damang, and Teberebie, it was revealed that there was no cordial relationship between the mining company and the community. According to the Chief of Atuabo, it is almost impossible to discuss issues with the mining companies, who feel less responsible for development projects in the area. The chief of Damang and Teberebie remarked that until 1986, communities channeled their grievances through the mining companies who willingly
assisted them in their development projects. However, since the introduction of the district assembly concept, the mining companies feel less responsible for needs of the community.

According to the District Director of Agriculture, one of the greatest challenges of his job is funding for food crop research programs in the area. In his opinion this is mainly due to the fact that agriculture is disregarded in the area because people are made to believe that soil in the area is not fertile and therefore agricultural investment in the area is not worth the risk.

5.3 Family disorganization

Relocation and compensation measures implemented by mining companies have serious consequences for families with a close-knit social unit (Akabzaa, 2000). In the Tarkwa-Aboso area, new housing arrangements have disrupted long-established family net works. The housing units provided by TGL did not conform to the size of the house holds. For example a family that had a house with five rooms and large space was resettled in an area with three rooms in crowded space. Residents in Atuabo for example are bitter about the fact that their new resettlement has separated families; there are no lands for backyard gardens. In the Atuabo area, irresponsible male family heads opted for relocation instead of resettlement. This enabled them to collect cash compensation and they subsequently abandoned their families. This deepened the plight of affected rural women and children.
Environmental Impact Assessment in the Tarkwa-Aboso area stated the total number of displaced people as 22,267 from 20 communities including Teberebie, Damang, Atuabo and Iduapriem/Mile 8 (See table 5.3).

Table 5.3 Population displaced and the companies responsible

<table>
<thead>
<tr>
<th>Company</th>
<th>No. of communities resettled</th>
<th>No of communities relocated</th>
<th>Total population displaced</th>
</tr>
</thead>
<tbody>
<tr>
<td>TGL</td>
<td>3</td>
<td>1</td>
<td>522</td>
</tr>
<tr>
<td>GAG</td>
<td>0</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>GFG</td>
<td>6</td>
<td>7</td>
<td>20,000</td>
</tr>
<tr>
<td>AGL</td>
<td>1</td>
<td>1</td>
<td>3,700</td>
</tr>
</tbody>
</table>

Source: Dramani and Akabzaa (2001)

Based on the capita production of food crop in the study area, as shown in table 3.4, the total loss of food as a result of the displacement of over 22,267 farmers in the whole Tarkwa District cannot be over emphasized. For example the activities of TGL alone, which lead to the displacement of 552 people means that the district lost 22,356 bags of maize, 26606 bags of cassava, 18436 bag of plantain, 12475 bags of cocoyam, 16891 bags of yam and 42062 bags of rice since it started operation in the district.

5.4 Government policies and programs

The United States of America, Canada, Australia and Japan are self sufficient in food crop production because of good government polices and
programs such as credit facilities and tax exemptions. From 1996 to 1997, Ghana imported 285,000 metric tons of cereals to supplement her food need (FAO, 1998). The government of Ghana however, is making effort to offset the effect by making policy changes to:

- promote increased smallholder productivity and ensure that all efficient agricultural producers earn incomes that are comparable to those outside agriculture, thus making agriculture an attractive employment alternative to industry, trade and commerce;
- ensure that agriculture contributes effectively to the country’s balance of payment through export diversification and import substitution.

These policies are ineffectively implemented in Tarkwa-Aboso area. Miners continually displace farmers and dump waste materials on arable lands. Even though there is no magic blue print for a quick solution to the real and perceived problems of food crop production in Tarkwa-Aboso, significant policy initiatives could be taken to improve the performance of small-scale farmers in the area. Some of these could be informational, some could be organizational, and some could require a change in attitude. All require a more deliberate and coordinated policy framework such as provision of credit facilities, agriculture subsidies, funding of small-scale farmers research programs and building of silos and other storage facilities throughout the farming communities in the Wassa West district. Policies
should be enacted to include serviced plots for the displaced farmers. This will reduce the burden and the frustration that come with starting all over to clear another piece of land.

5.5. Market information and storage facilities

One of the major challenges facing small-scale farmers is lack of market information on pricing and storage facilities. On the average, most small-scale farmers produce food crops purposely to feed themselves and their families and then sell the surplus. However, during bumper seasons when harvest is high, farmers throughout the country, including those in the Tarkwa-Aboso area, make heavy losses because of lack of storage facilities and where they could get better pricing of their produce. Most often, rural farmers do not have information on prices and the market situations. Farmers therefore rely on middle men and women who exploit them by paying less than the market value of their produce.

There are no storage facilities in the Tarkwa-Aboso area. Some of the farmers are compelled to preserve their foodstuffs using traditional methods. Holes for example, are dug in the ground into which cassava is stored. This method works for a short period after which farmers are forced to consume the crop, which begins to rot after three weeks. Preserving maize involves the use of smoke and heat. This method involves the construction of a shed with straw and raffia leaf. This structure built over traditional kitchen where heat
from the fire used in cooking keeps the crop dry and free from rodent attacks. According to the farmers, maize could be stored this way for at most six months. The disadvantage of this method is that the crops begin to go bad when the intensity of heat from the kitchen decreases. Farmers in Teberebie cannot practice these methods of crop preservation because of scarcity of firewood, which is aggravated by deforestation of forests through surface mining operation in the area. There are no storage facilities for plantain in the study area and farmers do not have any traditional storage method. Consequently, plantain is consumed as they are harvested. Rice is usually stored in sacks and kept in dry places to avoid contact with moisture. Most of the farmers keep the rice in their houses or in sheds built specifically for storage of cocoa in the communities.

Cocoyam and yam are also stored in baskets. These foodstuffs can be stored for a longer period provided they are kept in dry conditions. In short, lack of scientific storage facilities makes it virtually impossible for farmers in Tarkwa-Aboso to increase food crop production.

5.6 Access to credit facilities and extension service

Access to extension services and credit facilities are some of the important measures that can influence crop production. Extension education and research into food crop production can go a long way to introduce hybrid seeds that can help improve crop yields within a short period. Unfortunately,
during the mid 1980s subsidies on agricultural inputs in Ghana were completely removed as a matter of government policy. The effect was that farmers have difficulties gaining access to credit facilities because banks demand collateral security before loans could be given. Consequently 90% of the sampled farmers in the study area rely on their own meager income to supplement their farming activities. Ten percent rely on family friends, and moneylenders. One disadvantage of moneylenders is the high interest rates. Traditional moneylenders often charge as high as 100% interest within a set period. Failure to pay often results in disputes and humiliation. In effect, farmers are not able to raise enough funds to purchase basic farming tools.

5.7 Attitudinal factors.

Attitude is a state of mind that determines ones relation to whatever he or she is involved in. In the context of this topic, attitude is a state of mind. Attitude is externally determined by a number of factors including alternative economic means of survival and cultural orientation of the individual. Before surface gold mining, there had been a strong desire to grow crops because of land availability and accessibility. Many migrants who could not gain employment in the underground mine diverted their attention to farming because gaining employment in the mining companies was difficult and small-scale mining or galamsey was illegal. However, since surface gold mining was introduced to the area, cost of living has increased because of
large income disparities between miners and farmers. For example, the salaries of the Ghanaian staff in the mines are indexed to the US dollar, which raises their income far above their counterpart in the farming sector. In addition, the expatriate staff of the mines is paid internationally competitive salaries, which further widens the income disparities in the Tarkwa-Aboso area. Legalization of small-scale mining has changed the attitude of the youth from farming to mining. Many of the youth would rather work in the mine than cultivate the land. Other reasons accounting for the youth's low attitude towards farming include, lack of farm land and inputs, and low social status of farmers due to low income. Farming is also a tedious job and it is regarded by the youth in the community as a "punishment". One of the youth in Damang asked the question: "Why are we assigned a plot of land to weed as punishment when we commit an offence in school?" In short, weeding as a form of punishment for recalcitrance in our educational system helps to set a negative image in the minds of the youth about farming as an occupation. Furthermore, the forms of compensation paid to food farmers discourages the youth from engaging in food farming.
CHAPTER SIX

6.0 SUMMARY, POLICY IMPLICATION, RECOMMENDATION, CONCLUSION

6.1 Summary

Many governments in sub-Saharan Africa count on access to cheap sources of food, which enable them to keep food cost low, while they neglect their agricultural areas and people. Ghana, as a developing country, is confronted with two options: relying on food aid and two, directing scarce foreign exchange resources to food importation (Sinkam, 1988). In 1990, coordinated efforts were required to solve Ghana’s food problems. Among the strategies of development, outlined in the development program documents entitled, Vision 2020, are improvements in the nutritional status of Ghanaians and encouragement of small-scale farmers to increase food crop production. The Ghanaian agricultural policies were also intended to promote the emergence of medium to large scale farming enterprises while increasing agricultural production and productivity.

Despite these efforts, numerous obstacles still impede food crop production in Ghana. Ghana was forced to use her meager foreign exchange earnings to import food, and this had a serious impact on other sectors of the economy. In order to increase foreign exchange to meet economic expenditure, an investment code was enacted in 1986, whose policy changes
also affected the mining sector. The mining sector was completely revamped and surface gold mining was indirectly given all the needed support. Between 1986-1990, the country attracted over $3million foreign direct investments in the mining sector. Unfortunately, the mining sector has created many socio-economic problems in its area of operation. As an extractive industry, surface mining depletes the natural resources, scrapes off topsoil, destroys vegetation and pollutes water sources. Farmers, timber operators and estate developers are deprived access to land because surface gold mining requires large tracts of land. Many communities in mining areas are calling for a ban on industrial surface gold mining. The most pronounced communities agitating for a ban on surface gold mining are Teberebie, Damang, Atuabo and Mile 8, all in the Tarkwa-Aboso area.

Studies indicated that mining and food crop production co-existed before industrial surface gold mining was introduced in the late 1980s. During the early years of gold mining in Ghana, there were no environmental concerns (Junner, 1935). Land reclamation was not strictly required nor was agriculture affected because gold mining was restricted to the underground (Rumsey’s Report, 1882). Currently there are over 8 major industrial mining companies in the Tarkwa-Aboso area, all of which operate surface mines.

In order to ascertain whether there is a correlation between surface gold mining and food crop production in Tarkwa-Aboso, propositions were made that; surface gold mining has negative impact on food crop production; food crop production in Tarkwa-Aboso is land and labour dependent and
finally that other factors such as rainfall, soils and government policies and programs also affect food crop production in the Tarkwa-Aboso area.

The rationale for this thesis was to explain how surface gold mining is a hindrance to food crop production and other economic development in the Tarkwa-Aboso area. The thesis aimed at providing information for similar research projects to be carried out in other mining communities in Ghana for effective policy changes to reduce the negative impact of mining on communities.

Literature reviews did not identify mining as a major factor that hinders food crop production. Many of the literature focused on environmental issues associated with surface gold mining. Unfortunately, literature that dealt specifically with the impact of surface gold mining on food crop production was hard to find. Even though many organizations including the United Nations have written extensively on food crop farming in almost all countries in the world, there is very limited literature outlining how surface mining affects food crop production or agriculture in general. Various themes relating to surface mining and food crop production were outlined in the literature review to shed more light on why these two economic ventures cannot co-exist.

Clark (1997) discussed the negative impact of surface gold mining on the physical environment, health, culture and traditional roles within local communities. However, he failed to emphasize the impact of industrial surface mining on food crop production, neither did he discuss the types of
mining and the impact they have on food crop production. Two broad
technologies were identified in the literature as being used for gold extraction
namely; underground and surface mining (heap leach). All the mining
companies in the Tarkwa-Aboso area use the heap-leach method in which
cyanide solution is sprayed over crushed ore ‘heaped’ into open piles. Aboso
Gold fields limited for example uses huge tanks to contain crushed ore, onto
which cyanide solution are sprayed to separate the gold from the tailings.
Heap leach promotes higher efficiency of labor (3 -5 times) and a lower
mining cost (2-3 times) but it has serious environmental consequences and
this propelled the Turkish Supreme Court to restrict the use of cyanide in
gold mining in their country. The state of Montana in the United States of
America has also banned the use of cyanide heap leach technology in gold
and silver mining. Unfortunately, to date, this dangerous chemical is still used
in gold mining in Ghana and Tarkwa-Aboso in particular. Although use of
chemicals in surface gold mining may not have a direct impact on food crop
production, threat to human and aquatic life cannot be underestimated.

Underground mining takes place when minerals lie deep beneath the
surface. In underground mining, diverse extraction methods are employed.
Underground mining has a comparative advantage over surface mining in
environmental issues as well as employment opportunities for indigenous
people. Surface disturbances such as land degradation, community
displacement and disruption of farming activities are minimal in
underground mining (Cummins and Givens, 1973).
Cummins et al. (1973) made an effort to create a good image for underground mining but they failed to discuss other fatal repercussion of underground mining such as pollution of underground water, cave-in of shafts and cage failures. It is also important to note that as a labour intensive industry, underground mining often absorbs a labour force that would have been used for farming activities.

Native gold mining popularly known as galamsey has existed over 400 years in Tarkwa-Aboso. Native gold mining usually involves experienced men who use crude implements such as hoes, pick axe, shovel and chisel to mine the gold. One characteristics of native mining is that there is no job security. Because of the size and nature of its organization, native miners have more difficulty attracting investment capital than senior mining companies (majors). Consequently, native gold miners are forced to target old abundant properties, waste dumps, or already known deposits of the larger gold mining companies. Statistics show that small mines account for more than 10% of world’s gold output and produce up to 20% of Africa’s gold. In sub-Saharan region, more than 1.5 million people work in the informal mining sector. Unfortunately all these operations require extensive use of land which often occurs on arable lands in remote places where farmlands are destroyed.

The Tarkwa-Aboso area has been the scene of conflict in recent years as foreign-owned exploration and larger mining companies displace farmers and native miners. Because surface gold mining requires clearing of larger
acres of land for machinery installation and building of mining plants and offices, it often comes into conflict with land users such as farmers. In “Boom and Dislocation”, Akabzaa (1998) emphasized the negative impact of surface mining in the Tarkwa-Aboso area. He identified environmental issues such as land degradation, community dislocation, and water and air pollution.

Surface mining is unable to stimulate any meaningful development projects in developing countries like Ghana. Instead, it leaves a legacy of degraded land, environmental pollution and disgruntled communities. In addition, mining centres become centres of massive unemployment and ghost towns when surface mining ceases. The Economic Commission of Africa (ECA, 1996) noted that the African mining sector is still not making a decisive contribution to the social and economic development of Africans

Many critics including Yao Graham- editor of Africa Agenda magazine (vol 15, 1998) believe that there is a need to reform or even repeal the mining policies and investment codes in order to address some of the issues of surface gold mining. According to Graham, priority must be given to agricultural land use over any other economic uses of land. Degraded arable land in Tarkwa-Aboso and any mining areas in the country should be reclaimed and miners should desist from using farmland as waste dumps.
6.2 Policy Implications

There is the need to review the 1986 investment code and the PNDCL 153 of 1986, which represents the principal legislation that provides a framework for regulating mining activities in the country. PNDCL 153 follows the trend of earlier legislation investing all minerals in the state. The Government of Ghana is given the right over all lands with mineral resources. "Where any land is required to secure the development or utilization of a mineral resource, government may acquire the land or authorize its occupation and use under any applicable enactment for the time being in force (Mining and Explosive law, Ghana 1970). This subsection indirectly puts to a disadvantage, the rightful custodians of land. Foreigners invariably become landlords while indigenous communities, families, tribes and individuals are dispossessed of their lands. The question is "Who takes care of the land when the mineral is exhausted?" No provision is made in the law as to how land in an abandoned mine site will be managed or who will be made responsible for ensuring that degraded lands are reclaimed.

The PNDCL 153 made provision for the prevention of reconnaissance, prospecting and mining on dwelling places. Surface mining forcibly ejected communities, families and landlords from their land because residential areas were given out for gold prospecting. For example, residents in Teberebie, Atuabo, Damang and Mile 8 had to be relocated because their houses were "sitting" on gold. Meanwhile the law forbids prospecting and mining on
dwelling places. In subsections 1 of section 21, it is presumed that so long as an applicant obtains a license from the minister, the applicant has the right to obtain, impound or convey water from any river, stream or water sources for mining or other industrial purposes. Unfortunately, the law does not specify which source of water should or should not be touched by mining companies. It is common knowledge that surface water particularly rivers, suffer substantial amount of pollution during mining operation. Inhabitants in mining areas complain bitterly about water contamination.

Another important policy implication in the mining sector, which is limited in application, is the number of obligations that leaseholder have in exercising his or her right. The leaseholder is required to take “reasonable” measures on or under the surface, to mine the mineral and to stack or dump any mineral or waste in a manner approved by the chief inspector of mines. If the minister considers that the holder of a mining lease is using wasteful mining practice, he may notify the holder accordingly and require him to show, within a certain period why he should not cease practice. Although mining companies in Tarkwa continue to pollute land with chemicals, displace farmers and retrench workers unwontedly, never has the minister exercised his discretionary powers against any gold mining company. The recent controversy over whether or not Gold Field Ghana Limited spilled cyanide into water bodies in the Tarkwa-Aboso area leaves much to be desired. Even though there were many complaints over cyanide spillage, the
minister vehemently defended the mining companies until independent enquiries were made to ascertain the veracity of the case.

The law also emphasis that a leaseholder is liable to pay to the republic of Ghana royalty in respect to mineral obtained by him from his mining operation. The royalty, which was a minimum of 6% of the total volume of the mineral produced in 1975, has been reduced to 3%-12% in 1987 and the new proposal now stands at 3%. However, this could be wholly deferred in consultation with the minister of finance and Economic planning, and on advice of the mineral commission if the minister is satisfied, that it is in the national interest of the production of such mineral.

Ghanaian mining law, however, comprises of, a framework with the specifics left to the discretion of the minister to address issues through a legislative instrument. This paves the way for manipulation and subjective interpretation and application of the mining laws. It is important that proper mechanism and specifics are inserted in the mining law (PNDCL153) to make the laws more effective.

6.3 Recommendation

In order to reduce the impact of surface gold mining on food crop production and to ensure that Tarkwa-Aboso is self-sufficient in food crop production, there is the need to:
• Review the PNDCL 153 to give due consideration to indigenous owners of lands especially people who use the land for food and other commercial crop production.

• To restrict all mining activities on arable lands through policy changes. There is the need for the government to device an effective land valuation mechanism that will measure the long and short-term sustainable use of land. Before lands are concessioned to mining companies, social scientist should be involved in assessing the Socio-economic situation of communities before compensation is paid. Farmers in Tarkwa-Aboso strongly recommend that cash compensation should be spread over a longer period instead of paying to them in bulk, and if possible, they should be paid on monthly basis. Compensation should not only be paid on food crops but should cover land as well. It is proposed that the system of compensation be modified to include combination of cash and land exchange. Where communities are uprooted by mining activities, resettlement should be the preferred option. The new settlement should not be devoid of arable lands. The old settlement structure must be the foundation for the new settlement.

There is the need for frequent field trips of EPA officials to the mine centers to evaluate mine activities. The government should introduce the polluter-pays policy. This is the penalty a company pays for environmental abuse. Reclamation of degraded land is an essential part of surface gold
mining operations. It is recommended that details of the provision made by prospecting mining companies for rehabilitation of impacted surface areas during operation and after closure be required as a necessary part of the procedure for licensing mining ventures. The following recommendations are made for the stakeholders in the Tarkwa-Aboso Mining area.

6.3.1 Gold Miners

Mining companies in Tarkwa aught to review their surface mining operation. They have the responsibility to reclaim all degraded lands. In the design of the compensation package for displaced farmers, it is recommended that negotiation must be transparent; there is the need for an open forum where all community members are given the chance to present their views and to discuss issues and concerns regarding mining activities and how compensation should be paid.

The mining companies should be made to organize programs on money management for farmers in order to ensure that cash paid to displaced farmers are invested properly. Aboso Gold Fields Limited (AGL) is highly recommended in this direction for organizing seminars and training programs on mushroom and snail farming for displaced farmers.

6.3.2 People of Tarkwa

The people of Tarkwa should exercise restraint and use diplomatic means to make demands to the appropriate authorities. They should avoid
violence when their needs are not immediately met. The people should also desist from solely relying on mining companies to save them from abject poverty. It is recommended that they take farming seriously. The ministry of food and agriculture should therefore provide farmers with the necessary inputs and extension services to encourage farming in the area.

Finally, chiefs and elders in the area should be honest and transparent in dealing with the community. It is required that they be held accountable to the people.

6.4 Conclusion

Tarkwa-Aboso is an area that produced enough food to meet the needs of the communities before industrial surface gold mining was introduced in the area. However, there is a reduction in food crop production because of the massive displacement of farmers and relocation to areas where land is not easily acquired. Coupled with propaganda that the area’s soils are not conducive for food crop production, the government attention is drawn away from promoting agriculture in the area.

Studies have shown that surface gold mining is an environmentally detrimental and an unsustainable economic venture. It often leads to a depressed community when the minerals are exhausted and mining operation ceases. It is therefore important for the government of Ghana and developing countries in particular to restrict surface gold mining and
emphasize the importance of agriculture as the backbone of national development. It is highly recommended that the government must make every effort to encourage small-scale farming through effective extensive services, credit facilities, and provision of alternative service plots, to enable farmers to return to the land where they were displaced as a result of industrial surface gold mining.
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APPENDIX

DEPARTMENT OF GEOGRAPHY AND RESOURCE DEVELOPMENT - UNIVERSITY OF GHANA-LEGON, ACCRA

This is a composite questionnaire to assess the impact of surface gold mining on food production in Tarkwa-Aboso area.

Questionnaire

The questionnaire is in three sections. A, B and C. Each section is designed to suit specific categories of respondents. Namely; Farmers, Traditional Authorities and Mine authorities.

Section A

Section A is designed for farmers in Tarkwa-Aboso area to assess food production before surface gold mining (1990). The questionnaires are divided into two sections. Part A is designed to test the nature of food crop production before surface gold mining in Tarkwa-Aboso. Part B is designed to assess food crop production after surface gold mining.

Part A

Food crop production before surface gold mining.

Name of village/community ________________________________________________________

1. How long have you been working as a farmer?
2. (A). 10 years (B) 10-15 years (C) Over 16 years
3. Where were you farming?

4. How far was your farm from your house? _________________________
   (A) Just around my house (B) 2km from my house (C) 3-4km (D) 5km
5. What type of crops did you grow?
4. ________________________________________________

5. Why did you grow such crops?
   ________________________________________________

6. How many acres of land did you cultivate before surface mining?
7. 1-5 acres (B) 6-15 acres (C) 16-30 acres (D) 30 acres and more

8. How many maxi bags of the food crops did you produce annually?
   d. Cocoyam.................. e. Yam........................................

10. Where did you sell your products?
    ________________________________________________

11. How much did you get from the sale of your crops?
    ________________________________________________

12. Did you engage any labourers on your farms? Yes/no
    ________________________________________________

13. How many labourers did you engage per annum?
    ________________________________________________

14. Did you engage any family members? a. Yes b. No

15. Did you benefit from the Ndoboa system? (a) Yes (b) No

16. How much do you pay them per day?
    ________________________________________________

17. How do you pay them? a) Own source b) Loan from bank, c) others
    ________________________________________________

18. Apart from farming, do you have other source of income? Yes/no
    ________________________________________________
19. As a farmer, what kind of assistance do you get from the district assembly?

20. Did you encounter any problem in acquiring farmland before surface gold mining?

21. What kind of land acquisition problems do you encounter as food crop farmers?

22. Did you encounter any problem with Galamsey operators before surface gold mining?

23. What kind of problems do you encounter with Galamsey operators?

24. What other problems did you encounter as a farmer before surface gold mining?

25. Did you encounter any problems with galamsey operations?

Part B

26. This section is to assess food crop production after industrial surface gold mining began in Tarkwa-Aboso.

27. How many hectares of land do you cultivate at the moment?

28. How many maxi bags of food crops do you harvest per farming season?
   a. Maize
   b. cassava
   c. rice
   d. Cocoyam
   e. Yam

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30. What problems affect food crop production in your area?

31. How do you currently acquire land for food crop production?

32. How far is arable land to your place of residence?

33. Have you been recently affected by surface gold mining?

34. How were you affected?

35. Were you compensated? (A) YES (B) NO

36. If yes, how were you compensated?

37. How much were you compensated?

38. How did you use your compensation?

39. Did you invest in Farming?

40. If not why not?

41. How do you want to be compensated?

42. How has surface mining affected farming in your area?

43. How do you intend to address these problems?

44. What do you know about surface mining in your area?
45. What benefits has surface gold mining brought to your community?

46. What do you suggest should be done to reduce the impact of gold mining on food production in your area?

47. Would you like to work with the mining company?  a. Yes  b. No

48. Why?

49. How do you access the impact of galamsey on food crop production?

Section B

50. This section is designed for the traditional authorities in Tarkwa-Aboso mining area.

51. How many acres of land are under your jurisdiction?

52. How do farmers acquire land for farming purpose?

53. Approximately how many acres of lands are due to a farmer?

54. How does surface mining impact on food production in your area?

55. Do you produce enough food for the community?

56. What are the causes of the current food situation in your area?
57. Do you think surface mining has affected food production in the area?
58. How many acres of land are under surface mining?
59. How did the mining acquire their concession?
60. How many farmers were affected?
61. Were farmers compensated?
62. How were they compensated?
63. How was the compensation package designed?
64. Who were involved in the compensation design?
65. Has mining brought any improvement in the life of the people in the community?
66. Do you face any food problem in the area?
67. What kind of food problems do you face in the community?
68. How does the traditional council deal with the food problems in the area?
69. How does the mining companies help in addressing problems in the community?
70. What development projects the mining companies in your area have initiated?
71. Do you think mining has affected farming activities in the area?
72. How has mining affected food production in the area?
73. What do you think are some of the solutions to the food issues in your area?
74. What do you think could be done to improve relations between the mining companies and farmers in the district?
75. Should surface gold mining be ban in the area?

SECTION C

76. Section C is designed for government representatives – D.C.E, and District Agriculture Officer.
**District Chief Executive**

77. How many large-scale mining companies are in the district?
78. How much mineral revenue accrues to the district annually?
79. How much mineral revenue is earmarked for the development of agriculture in the district?
80. How has surface mining affected food production in the district?
81. Has the district ever been food secured?
82. How does the district address food issues in the district?
83. What is the trend of food production in the district?
84. How does the district assembly support farmers in the district?
85. How could the district do to prevent mining on arable lands in the district?

**District Agriculture Officer**

86. How fertile are lands in Tarkwa-Aboso area?
87. What crops grow well in the district?
88. What is the average farm size for farmers in the district?
89. What has been the nature of food production in the district before the commencement of surface mining in the district?
90. How many maxi bags of food were produced before surface mining began in the district?
91. How much is currently produced?
92. How has surface mining affected food production in the district?
93. How many farmers have been affected by surface mining in the district?
94. How are the ministry addressing problems of farmers in the district?
95. Is there a future for farmers in the district?