

Illegal Small-Scale Gold Mining in Ghana: A Threat to Food Security

Danyo Gilbert*, Osei-Bonsu Albert

Coconut Research Programme, Oil Palm Research Institute, P. O. Box 245, Sekondi, Ghana

*Corresponding author: bertdanyo@gmail.com

Abstract Ghana is endowed with extensive mineral and agricultural resources. The regions which serve as the major agro-ecological zones coincide with the largest deposits of mineral resources. Destruction of arable land in the agro-ecological zones by illegal small-scale gold mining (*galamsey*) affects agricultural productivity, and threatens food security in Ghana. This article examines the impact of the effects of illegal small-scale gold mining in Ghana, through the lens of a conceptual model that links *galamsey* and agricultural productivity, in terms of the realistic threat to food security, using secondary data such as Ghana's agricultural productivity records, consumer price indices of food commodities, and the national food import statistics. The data show that, major *galamsey* regions (Ashanti, Brong Ahafo, Eastern, Central and Western), recorded progressively lower food productivity and correspondingly higher Consumer Price Indices than the national averages over the last few years (from 2012). Over the same period, the contribution of agriculture to the gross domestic product (GDP) declined inversely with mining. By degrading arable lands, contaminating water bodies, polluting the air, shifting labour from food crop farming to mining and displacing farmers, *galamsey* by surface mining is largely responsible for the low food production, food price spikes and the high cost of living, especially in *galamsey*-prone regions of Ghana. But surface mining can be a short term land use that may be followed by productive farmland, if reclamation is done correctly. Land expansion from reclamation of degraded open cast mines will boost agricultural productivity; close existing yield gaps in crops, enabling the country to achieve food import substitution for major food staples, particularly cereals such rice and wheat. This in turn, will reduce the national import food dependence, food import bill, food price hikes and the cost of living. Thus, reclamation of degraded *galamsey*-mines is critically important in achieving all three dimensions of the United Nation's Sustainable Development Goals (social, economic and environmental), and more specifically goal two (end hunger, achieve food security, improved nutrition and promote sustainable agriculture) of the Post-2015 Agenda. The author therefore, recommends compulsory reclamation of degraded surface mines for arable use, as a sustainable proposition to mitigate the threat of food insecurity in Ghana. The threat to food security is real and imminent!

Keywords: 'Galamsey' Impacts, agricultural productivity, food security, land reclamation, model

Cite This Article: Danyo Gilbert, and Osei-Bonsu Albert, "Illegal Small-Scale Gold Mining in Ghana: A Threat to Food Security." *Journal of Food Security*, vol. 4, no. 5 (2016): 112-119. doi: 10.12691/jfs-4-5-2.

1. Introduction

Ghana occupies an estimated total land area of 23 884 245 hectares with a 550 km long coastline. The estimated national population is 27 043 093, with a growth rate of 2.5% per annum. It has 10 administrative regions and 216 districts. The country is endowed with extensive natural mineral and agricultural resources. Agriculture is the backbone of the economy, contributing about 30% to the GDP and employing approximately 60% of the labour force (Table 1). About 7.85 million hectares is under cultivation. The principal agricultural exports are cocoa, timber, horticultural products, fish/sea products and the principal imports include rice, wheat, chicken, milk, and fish.

Ghana's geological space is prospective with diverse kinds of natural minerals. Those mined on commercial basis include gold, bauxite, diamond and manganese. Others such as kaolin, salt, limestone, mica, feldspar, to

mention a few are either only partially exploited or unexploited [1]. These mineral deposits are mainly found in the Ashanti, Brong Ahafo, Eastern, Western, and sometimes in the Northern parts of Ghana. Mining (including quarrying) contributes approximately 7.2% to the GDP annually (2006-2014) and employs a fairly large proportion of the labour force.

There are presently about thirteen (13) large-scale mining companies and sixteen (16) operations, and over a 1000 registered small-scale companies in the sector [1]. Though, natural resources are important to the industrial and economic development of the country, they are non-renewable and exhaustible therefore, their exploitation and utilisation can never be sustainable substitutes for agriculture. Agriculture therefore, is critical to the attainment of the global goals of poverty reduction (SDG 1) and food security (SDG 2) in a more sustainable manner.

Food security according to [2] exists "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary

needs and food preferences for an active and healthy life". More recent additions to this definition include social access to food (e.g. through social protection and safety net), governance and right to food [3]. But while food security continues to surge in the developed world, it experiences progressive decline in developing countries. In Ghana, this is attributable largely to the substitution of arable lands for mining among other probable causes.

Table 1. Share of Agriculture in GDP (%) of Ghana for the indicated Period (2006-2014)

Year	Sector			GDP at Current Market Prices (GHS Million)
	Agriculture	Services	Industry	
2006	30.4	48.8	20.8	18 705
2007	29.1	50.2	20.7	23 154
2008	31.0	48.6	20.4	30 179
2009	31.8	49.2	19.0	36 598
2010	29.8	51.1	19.1	46 042
2011	25.5	49.1	25.6	59 816
2012	22.9	49.1	28.0	75 315
2013	22.4	49.8	27.8	93 416
2014	21.5	51.9	26.6	113 343

Source: Ghana Statistical Service, Revised 2014 Annual GDP Bulletin.

¹Whereas agricultural GDP was declining progressively (from 2012), the services and industrial (including mining and quarrying) sectors were generally increasing linearly, presumably due to *galamsey*. The marginal decline in industrial GDP is due mainly to scaling down, and folding up industries due to prolonged (from 2010) electrical energy deficit in Ghana. The mining component of the industrial sector increased however

For centuries, the greatest threats to agriculture and for that matter, food security have been declining land mass (sea erosion), low soil fertility and productivity, poor quality seed/planting material, pests and diseases attack, harvest and post-harvest losses (poor packaging and storage practices), high cost of farm inputs, illiteracy, primitive agricultural practices and technology among others.

In recent decades, however, the adverse impacts of urbanization, mining, and quarrying in synergy with changing climate and variability on agriculture have become grave concerns for agricultural scientists and their farmer clients, national government, policy makers and other stakeholders in the agricultural sector in Ghana. Research reveals that surface mining in particular, constitutes the major cause of land use change from crop land to mining land. Also, land expansion potential has been reaching its limits in most agro-ecological zones of Ghana [4]. The regional land area is shown in Table 2.

Table 2. Land Area by Region

Region	('000) sq. km	% of Total
Western	23.92	10.03
Central	9.83	4.12
Greater Accra	3.24	1.36
Volta	20.57	8.62
Eastern	19.32	8.10
Ashanti	24.39	10.23
Brong Ahafo	39.56	16.58
Northern	70.38	29.51
Upper East	8.84	3.71
Upper West	18.48	7.75
Total	238.53	100.00

Source: The Ghana Survey Dept. Accra.

Mining in Ghana, predates the colonial era. All mining

operations are managed by the Minerals Commission of Ghana, which is an agency under Ministry of Lands and Natural Resources of Ghana. The legislative framework for mining in Ghana is embodied in the Minerals and Mining Act, 2006 (Act 703). Within this legal framework, the state is the owner of all minerals occurring in their natural state within Ghana's land and sea territory, including its exclusive economic zone.

Mining operations are categorized as either small-scale or large-scale depending on the size and the legal framework within which the operations take place. Small scale concession is usually 25 acres in size allocated to only Ghanaian nationals to undertake mining in accordance with the Minerals and Mining Act of 2006 guidelines (Act 703:82-99). The law allows Ghanaians holding mineral rights/license to enter into joint venture agreement with foreign partners to provide capital, expertise, and equipment for the mining project. The foreign investors act as financiers with option to buy all gold produced at an agreed price as per the Licensed Minerals Exchange (LME) price and export same through the Precious Minerals Marketing Corporation (PMMC) or any other authorized gold exporter in Ghana. The holders of such concessions act as dormant partners taking their share of resources mined when such is declared by the operator.

Small scale concessions license usually come with the Environmental Protection Agency (EPA) permit, and as such holders are allowed to go into mining straight away without any legal restrictions. Small scale concession license is usually a five-year renewable license.

Large-scale concession is usually more than 25 acres either as a block (21hectares) or blocks of mining concessions joined together. Mostly large-scale concessions run into hundreds of kilometers cutting across districts within a particular region of Ghana. There is rigid legal framework that governs large scale concessions. Generally, mining is prohibited in forest and game reserves, in areas close to rivers and water bodies, residential and other public infrastructure.

Though mining is important to the economy, illegal small-scale gold mining has adverse effects on the environment (land, water and air), the society (health and education), and the economy (livelihoods; agriculture) of the country. The liberalisation of the mining sector in Ghana has brought in hordes of local and foreign investors into the mining sector, and Ghana's agriculture has never been the same. Much of the energy needed to sustain agriculture has been diverted either in part or wholly to mining activities even though, for an agrarian economy like Ghana, mining can never be a reliably sustainable alternative to agriculture. Just like food crops, vast plantations of cash crops especially cocoa and oil palm are given as concessions for gold and diamond prospection. Near-virgin forests ideal for agriculture are similarly ceded out resulting in massive environmental degradation, pollution of water and air; ultimately threatening food security and public health [5].

1.1. The Objectives of the Study

The goal of this article, is to accentuate mitigation of the adverse effects of illegal small-scale gold mining, locally referred to as *galamsey* on the environment (land,

water and air), the society (education and health), and the economy (livelihoods). The specific objectives are:

1. To draw logical links between impacts of the adverse effects of illegal small-scale gold mining and agricultural productivity, in terms of the realistic threat to food security in Ghana, using secondary data such as the national agricultural productivity records (NAPR), consumer price indices (CPI), and national food import statistics (NFIS);
2. To recommend compulsory reclamation of degraded open cast *galamsey*-mines for arable use, as a sustainable proposition to mitigate the threat of food insecurity in Ghana.

2. Background

Small-scale gold mining existed in Ghana as far back as the eighth century as a household economic activity [6]. People mined for gold on small-scale along the coastal areas justifying the colonial name of Ghana: “The Gold Coast” [7]. The Minerals and Mining Act, 2006 (Act 703) of Ghana defines small-scale gold mining operation as the mining of gold by any effective and efficient method that does not involve substantial expenditure by an individual or group of persons not exceeding nine in number or by a co-operative society made up of ten or more persons. According to the World Bank Group, “Small-scale mining is largely a poverty-driven activity, typically practiced in the poorest and most remote rural areas of a country by a largely itinerant, poorly educated populace with few employment alternatives” [8].

These may suffice for a working definition of the small-scale gold mining activity. In reality, however, there are many well-educated, fairly rich and highly-placed individuals such as politicians and chiefs involved in small-scale mining (legal or illegal) in the urban/suburban areas as well as in the hamlets and cottages of Ghana. In fact, the Economic Commission for Africa concedes that, there is no universal definition for small-scale mining [9].

The liberalisation of the mining sector in Ghana by the Small Scale Gold Mining Law (PNDC Law 218, 1989) has brought in hordes of local and foreign investors into the mining sector. The legislation was to revive the small-scale sub-sector, facilitate supervision and minimize associated environmental hazards [10]. Two groups of small-scale gold miners have evolved as an indirect consequence of the legalization of small-scale gold mining in Ghana, namely: the licensed/legal and the unlicensed/illegal small-scale gold miners.

According to [11] there is very little difference either organizationally or technologically between both scales of operation, albeit, the legal small-scale gold mining has security of tenure. Both scales are labour intensive, need neither skilled labour nor sophisticated technology, operate with limited capital investment resulting in low productivity [9].

Despite the boom, especially in the illegal small-scale mining, there is growing unease with regard to the real benefits accruing to the ordinary Ghanaian in the mining communities and to the country as a whole. The industry

is getting increasingly destructive. Fears have been expressed that, illegal small-scale gold mining in Ghana might be a resource curse rather than a blessing [12].

3. Materials and Methods

Much of the information on the adverse effects of illegal small-scale gold mining on the environment, the society and the economy of Ghana was drawn from relevant published literature on the subject. The agricultural productivity figures (APF), consumer price indices (CPI), and the national food imports statistics (NFIS) were taken from the Ministry of Food and Agriculture (MoFA), the Statistical Service of Ghana (GSS), and the Ministry of Trade and Industry (MTI) respectively. Robust analytical approach was used to evaluate the data through the perspectives of a conceptual model that logically links illegal small-scale gold mining (*galamsey*) and agricultural productivity, in terms of the realistic threat to food security in Ghana.

4. Results

The problem with small-scale mining in Ghana is not the widespread availability of precious mineral deposits especially gold, but rather the methods of exploitation of these resources. *Galamsey* which colloquially means “gather them and sell”, mostly employs the open cast gold mining method, using primitive equipment/machinery such as dredging boats, water pumps, pick-axe, shovels and toxic chemicals such mercury, arsenic, cyanide etc. The miners are neither able to protect themselves nor the environment where they operate resulting in serious environmental and socio-economic challenges in Ghana.

4.1. Impacts of Illegal Small-Scale Gold Mining on the Environment

Certainly, the greatest casualty of illegal small-scale gold mining in Ghana is the environment. The environmental impacts of *galamsey* are well-documented in Ghana. They include land degradation, destruction of flora and fauna, air pollution and heavy metal contamination of soils and water [8,17] (Figure 1). By stripping the land bare of vegetation, top and sub-soils, open cast *galamsey* impoverishes the land and renders the soil prone to erosion. The dredging and washing of alluvial gold in rivers and streams is the major cause of water pollution in Ghana [8]. Rock blasting using dynamite also releases air-borne particulates which reduce air quality.

Per the relevant literature, the most hazardous pollutants from mining are heavy metals such as mercury, lead, cadmium, selenium, copper, chromium and arsenic [13]. Heavy metal pollutants released into the environment inhibit biological activity, especially at higher concentrations, with the sensitivity being species dependent [14]. Some metals form compounds that can be toxic, carcinogenic or mutagenic, even in very low concentrations [15].



Figure 1. *Galamsey* Menace: Destruction of Cocoa Plantation; Arable Land Degradation; and Pollution of Water Body

4.2. Impacts of Illegal Small-Scale Gold Mining on the Society

The social impacts of illegal small-scale gold mining have been documented by both researchers and international organisations such as the World Bank, International Institute for Environment and Development (IIED), and the International Labour Organisation (ILO) [16,17,18]. The major impacts of illegal small-scale gold mining on society are on education and public health.

Illegal small-scale gold mining employs child labour force resulting in high incidence of absenteeism and dropout rate in schools. The allure of gold money is so strong that many children, unable to see through this fleeting wealth, mortgage their future sometimes, with the tacit support of their parents. Even where parents vehemently oppose their children, these children care less, because with their newfound wealth they are able to fend for themselves. In fact, some of them in the short term even acquire luxury that their parent could never afford in their life time. Consequently, vices such as drug abuse, violent crimes, prostitution and teenage pregnancy among others are rife in *galamsey* communities in Ghana.



Figure 2. Skin roseola resulting from arsenic intake/ingestion. Source: [19]

Illegal small-scale gold mining has both direct and indirect impacts on the health of *galamseyers* foremost and the society at large. The heavy metals used in the extraction and processing of gold are toxic to human health. Indeed, many *galamseyers* suffer from a range of skin infections, eye diseases and mental illnesses, all attributable to the toxicity of the chemicals used for prospecting and processing gold dust [19]. The hand and foot nails of many of the operators are hardened, deformed

or completely detached from the hands and feet (Figure 2). Respiratory tract infections such as tuberculosis and silicosis and water-borne diseases such as schistosomiasis and onchocerciasis are also common [28].

Galamsey operations are physically exacting. Operators in their bid to shore up their strength often resort to noxious performance-enhancing drugs, commonly marijuana. The dependence causes abuse leading to many social and health challenges.

High rate of accidental death resulting from drowning, pit collapse, and landslides is another important adverse social impact of *galamsey*. Several operators continue to die in the trade, many of whom are breadwinners for their families resulting in abject poverty and broken homes. For instance, as recently as 2010, over one hundred illegal miners died in Dunkwa On-Offin in the Central Region when the *galamsey* pit caved in on them near the Offin River [7]. Another accident occurred just a year later at Attaso near Kotokuom in the Ashanti Region, involving twelve operators [20]. In short, *galamsey* deaths are regular occurrences in Ghana.

4.3. Impacts of Illegal Small-Scale Gold Mining on the Economy

Loss of livelihoods of farmers in communities invaded by illegal small-scale gold miners is an important economic consequence of *galamsey* (Figure 1). Many farmers in the major *galamsey*-prone regions of Ghana are settler farmers. They have no usufruct right over the lands they cultivate. Whenever the owners of these lands decide to cede them for mining, the settler farmers must move out with or without compensation depending on existing agreement or customary practices governing the use of such lands. This leads to displacement and loss of livelihood. Even where compensations are paid, they are often meager to pay for relocation and acquisition of new lands for farming. Some of the farmers are illiterates, unable to practice any other trade in a sustainably profitable manner, making a shift in occupation to other employment opportunities very difficult.

The shifting of farmlands to mine lands creates local food deficits and food price hikes, since the shortfall has to be sourced from distant towns at exorbitant prices. The operators sometimes divert streams and river courses, depriving downstream users of their sources of water. Fish and other aquatic organisms die-off is common forcing fishermen to abandon their source of livelihood, resulting in less food availability in the communities [21]. The influx of foreign illegal miners such as the Chinese increases human population in the *galamsey* areas putting further pressure on food supplies and raising the cost of living.

5. The Conceptual Model: Logical Link between *Galamsey* and Food Security in Ghana.

Agriculture is critically important to the attainment of the global goals of poverty reduction (UN-SDG 1) and food security (UN-SDG 2) in a more sustainable way [22]. Land is a prime resource in the production of agricultural commodities [23]. Reduction in agricultural land base due

to competition from non-agricultural uses such as urban sprawl, road infrastructure and mining, could result in low agricultural production. Because once a piece of land is converted for non-agricultural use; chances of reclaiming that land for agricultural production are slim [23].

The soil is the most important part of land in agriculture, because it is the primary medium for the growth of crops (food and fodder). Primary functions of soil in agriculture include sustaining biological productivity, regulating water flow, storing and cycling plant nutrients, filtering, buffering, and transforming organic and inorganic materials [24]. As the science of agriculture developed, plant nutrients were identified as essential components of soil health, at least with respect to sustaining biological productivity. Soil health is the capacity of a soil to function within ecosystem and land use boundaries, to sustain biological productivity, maintain environmental quality, and promote plant and animal health [24].

Surface-mining disturbs the agricultural land base more than any other type; removes vegetation and soils, interrupts ecosystem service flows, often results in permanent farmland loss and has high risk of entering the human food chain. Surface-mining generally, degrades lands beyond short-term reclamation for intensive post-mining agricultural purposes (Figure 1).

In the Ghanaian experience, the adverse impacts of *galamsey* by surface mining method include: deforestation, reduction of soil fertility through stripping of top and sub-soils, aggravated soil erosion, chemical contamination of surface and underground water, air pollution, physiological disorders in crop plants and low yields, food price hikes and high cost of living, displacement and general increase in air and water-borne diseases.

Therefore, the need for quality, consistent, and timely information on the agricultural sector for the formulation of sound development policies and plans to improve the efficiency of food production and distribution, thereby raising productivity, incomes and ultimately enhancing the livelihood of the Ghanaian farmer is critical. The Ghana 'Agriculture Facts and Figures' Initiative by the Statistics, Research and Information Directorate (SRID) of the Ministry of Food and Agriculture (MoFA) serves as quick reference for various categories of users by providing salient features of Ghana's agriculture in figures, with focus on crops, livestock and fisheries sub-sectors of the economy, as well as food commodity and input prices. The SRID works with international collaborators such as the International Food Research Policy Institute (IFPRI) and USAID (SRID). The Statistical Service of Ghana's Consumer Price Index (CPI) measures the change overtime in the general price level of goods and services that households acquire for the purpose of consumption with reference to the price level in a base year (www.statsghana.gov.gh). The Ministry of Trade and Industry's national food import statistics (NFIS) records the volumes (in metric tons) and monetary value (in US Dollars) of food commodities imported to the country annually.

The regions of Ghana which serves as the agro-ecological zones coincide with the largest deposits of mineral resources in Ghana (Figure 3a & Figure 3b). The destruction of land by *galamsey* operations therefore, affects agricultural productivity thereby, threatening food security. This logical link between illegal small-scale gold

mining and agriculture (food security) is verifiable from Ghana's agricultural productivity records, consumer price indices of food commodities and the national food import statistics (Figure 4; Table 3 and Table 4).

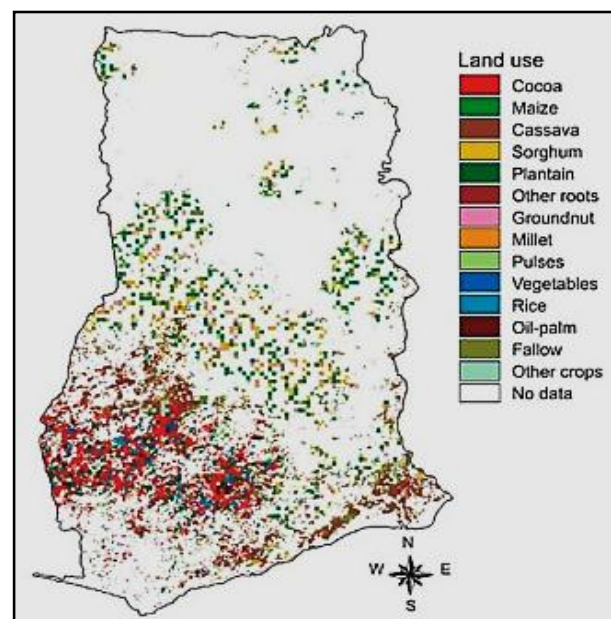


Figure 3a. Agricultural Land Use Map of Ghana

Source: <http://www.fao.org>.

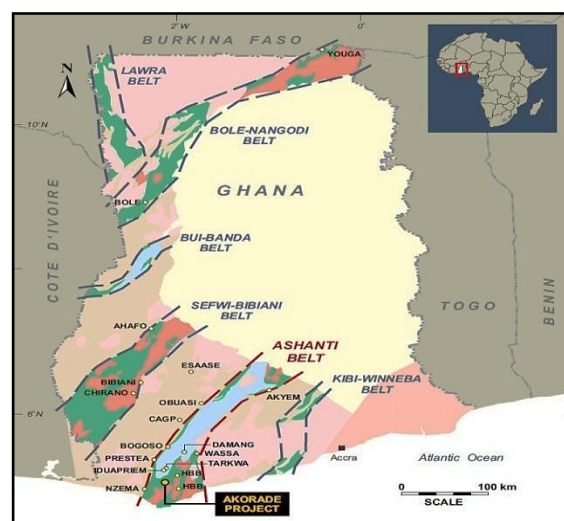


Figure 3b. Minerals Deposit (Belts) Map of Ghana

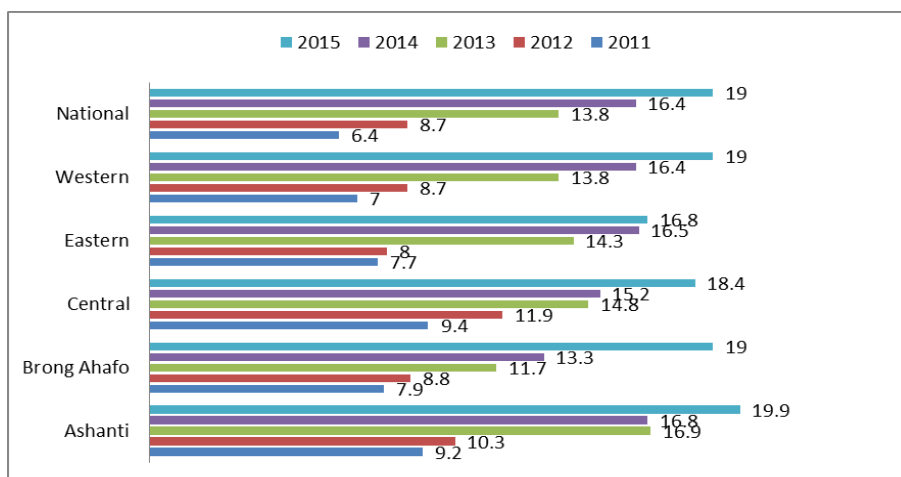
Source: <http://uoguelph.ca>.

Table 3. Indices of Annual Production of Selected Food Crops in Ghana (2009 -2014)

Crop	Year					
	2009	2010	2011	2012	2013	2014
Maize	162	187	168	195	176	120
Millet	146	130	228	107	92	83
Rice (Paddy)	190	239	109	233	275	186
Sorghum	102	94	84	82	75	88
Cassava	173	191	202	206	227	145
Cocoyam	98	100	84	82	82	82
Plantain	195	194	250	195	202	114
Yam	247	237	119	284	302	141
Groundnut	350	383	336	343	295	92
Cowpea	380	407	439	414	372	113

Source: Ministry of Food and Agriculture. Adapted.

²Annual food production generally declined progressively from 2012 onwards, but for some minor exceptions (i.e., rice, cassava, and yam). The decline is attributable to *galamsey* impacts.



Source: Author's Construct.

Figure 4. Regional Annual Inflation Rate (%) for *Galamsey*-Prone Regions of Ghana: 2011-2015.

Table 4. Quantity (Metric tons) and Value (millions USD) of Cereal Imports (2010 – 2014)

Year	Wheat		Rice		Maize		Sorghum	
	Mt.	USD	Mt.	USD	Mt.	USD	Mt.	USD
2010	315 838	117.18	320 152	200.88	955	0.60	0.50	n.e.
2011	325 030	150.46	543 465	391.17	4 515	4.38	31	0.01
2012	190 711	149.55	508 587	319.80	113 343	6.79	0.60	0.10
2013	-	-	644 344	392.30	-	-	-	-
2014	374 597	402.46	413 597	221.09	5 355	7.65	0.10	0.03

Source: Ministry of Trade & Industry. ^aFigures from GSS. n.e: value is negligible; (-): not available. Adapted.

6. Discussions

Ghana's geological space is prospective with diverse kinds of natural minerals [1]. The problem of illegal small-scale gold mining in Ghana is not the widespread availability of precious mineral deposits especially gold in Ghana, but rather the methods of exploitation of these resources. Illegal small-scale gold mining woefully fails to strike a balance between the nation's economic and social well-being resulting from the exploitation, sale and utilization of mined resources and the protection of the environment and agricultural productivity [25]. *Galamsey* by surface-mining disturbs the agricultural land base more than any other type of non-agricultural land use.

By stripping the land bare of vegetation, top and sub-soils, surface mining impoverishes the land by rendering the soil prone to erosion and leaching of soil nutrients, hindering agricultural productivity. Also, pollution of underground water by heavy metals used in illegal small-scale gold mining poisons arable lands thereby causing physiological disorders in crop plants leading to poor growth and yields [26]. Physiological disorders of crop plants are otherwise caused by changing environmental conditions such as temperature variations, moisture, unbalanced soil nutrients, extremes of soil pH and poor drainage, etc.

In a study of mining impacts on agricultural lands and food security in Kyebi and its environs (Eastern Region, Ghana), [26] found a direct causal relationship between mining and low food production in the mining communities. He cited destruction of farmlands by *galamsey* as a major contributor. He is supported by

[27,28], that where mining is practiced, there is reduction in food production generally leading to food price spikes, and high cost of living.

A careful study of Ghana's agricultural productivity records (2009-2014), consumer price indices (effectively, inflation rate) of foodstuffs (2011-2015), and the national food import statistics (2012-2014), clearly shows progressive decline in food production and corresponding rise in consumer price indices in the regions of Ghana endowed with mineral resources and notorious for *galamsey* activities (Figure 4; Table 3 and Table 4). These include the Ashanti, Eastern, Central, Brong Ahafo and the Western regions. These regions consistently recorded higher CPI than the national average (Figure 4). But of these five, the Ashanti, Central and Western regions are the worst hit, leading to lower agricultural productivity and higher consumer price indices (effectively, rate of inflation). Similarly, the national import food statistics is rising in tandem.

Agricultural structure and regional distribution of agricultural GDP and rate of inflation significantly differ across Ghana's agro-ecological zones. The Forest Zone remains the major agricultural producer, followed by the savannah zone, with the coastal zone being the minor (Figure 3a); [29]. Like many African countries, agricultural growth in Ghana is driven by land expansion, rather than land productivity (yield growth) [4]. The destruction of arable land by *galamsey* therefore, adversely impacts agricultural growth and its share of GDP, and will ultimately affect food security in Ghana. While it may reasonably be argued that, the progressive decline in agricultural share of GDP is merely the result of faster growth in the industrial (especially mining and quarrying) and services sectors, the argument falls flat in view of the progressive decline in food production, and its associated food price spikes and high cost of living. These would not be case, if the agricultural sector was indeed growing as well.

Increasing awareness of the adverse impacts of *galamsey* by surface-mining has led to some remedial interventions; environmental legislation and sporadic arrest and prosecution of illegal miners. A case in point is the inter-ministerial taskforce (drawn from the military, immigration and police) set up by the president of Ghana in 2013 to crackdown on illegal miners. During that year, the Ghanaian authorities arrested and deported over 4500

illegal Chinese miners (The Guardian, 2013), significantly reducing the scale of illegal mining activities by foreigners.

But thus far, the multiplicity of laws governing environmental issues within the small-scale gold mining industry such as the Minerals and Mining Act, 2006 (Act 703), the Environmental Protection Agency Act, 1996 (Act 490), and the Minerals Commission Act, 1993 (Act 450), have not sufficiently address the dangers of *galamsey*, especially enforcement of environmental laws. Lack of operational clarity between legal and illegal small-scale gold mining, coupled with the perceptibly high level of enforcement corruption, political complicity and leniency have undermined effective application of the regulatory mining laws, thereby exacerbating the menace of illegal small-scale gold mining in Ghana.

Public outcry against the degrading and polluting effects of *galamsey* by surface-mining can be abated by providing/restoring the source of livelihood to the affected inhabitants [25], through compulsory reclamation of surface-mined lands. Research has shown that, surface mining can be a short term land use that may be followed by productive farmland, if reclamation is done correctly [30]. The need for reclamation is imperative because land expansion potential is reaching its limits in most agro-ecological zones, due to population explosion, rapid urbanization and the industrial revolution in Ghana.

The pioneer restoration ecologist A. D. Bradshaw, on the basis of several ecosystem restoration studies concluded that re-vegetation is the most appropriate and cost effective long term remedy for the majority of underlying problems of open cast mines. In the initial stages, quick-growing grasses with short life cycle, legumes and forage crops are ideal. Planting of mixed species of economic importance can be done after 2-3 years of growing grasses [25]. Globally, reclaimed mines are used for the establishment of forest (afforestation), pasture/rangeland, ecological parks (wildlife), and food crop production among others.

Though, reclaimed surface mines are suitable for the cultivation of both food and tree crops, lingering effect of the poisonous chemicals and the risk of contamination of the human food chain (bioaccumulation), tilts the scale in favour of perennial non-edible tree crops such as rubber and teak. But most rural *galamsey*-communities are unwilling to wait for long-term reclamation schemes such as afforestation using non-edible fruit trees. As largely peasant farmers, merely having sufficient food for subsistence is of overwhelming importance. They therefore, simply move out to areas where there still exist arable lands, both far and near. But this shifting cultivation practice is not sustainable in light of the ever-increasing spate of illegal small-scale gold mining activities, even in forest reserves. For the willing farmers, the financial demand in maintaining such non-edible perennial crops is burdensome, being resource-poor.

Worst still, the many well-resourced commercial tree crop plantations are unwilling to spend resources in reclaiming these degraded *galamsey* lands for plantation agriculture. They rather compete with the poor peasants for the ever-limiting arable lands. The economic consequences of this are already evident in the declining agricultural productivity and its associated escalating food prices and high cost of living, especially in the mining communities. This is likely to aggravate the high national

import food dependence and its associated high food import bill.

Even if Ghana with the new-found oil boom, is able to raise the necessary credit to import food to offset the progressive shortfall in local food production, she should beware of the ever-evolving global climate change and variability and its potential adverse effects on countries especially Asian, who are the food baskets of the world as far as cereals, particularly rice is concerned. Should climate change impinge significantly on agricultural productivity in these countries, Ghana may either not be able to get sufficient food to import even if she has money or consistent with basic economic theory, the excess demand over supply will push import food prices up, compelling her to spend more hard foreign currency to import sufficient food. This will ultimately upset fiscal balance. Additionally, the uncertainty of food supplies from foreign sources occasioned by events such as terrorist attacks (e.g. September 11, 2001, in the USA), and the food-fuel financial crises in 2007-08 [3], should be cogent reasons for increasing local food production thereby, reducing the food deficit and reducing import food dependency in Ghana.

Land expansion resulting from reclamation of degraded *galamsey*-mines will boost agricultural productivity; close existing yield gaps in crops, enabling the country to achieve food import substitution for major food staples, particularly cereals such rice and wheat. The reward will be national food sufficiency, leading to a reduction in national import food dependence, food import bill, food prices and the cost of living. Reclamation of degraded *galamsey*-mines is therefore, critically important in addressing all three dimensions of the United Nation's Sustainable Development Goals (social, economic and environmental), but more specifically goal two (end hunger, achieve food security and improved nutrition and promote sustainable agriculture) of the Post-2015 Agenda.

In addition to compulsory reclamation, the moderate success of the inter-ministerial taskforce (drawn from the military, immigration and police) set up by the president of Ghana in 2013 to crackdown on illegal miners, makes a good case for an integrated approach to mitigating the effects and impacts of illegal small-scale mining in Ghana. During that year, the Ghanaian authorities arrested and deported over 4500 illegal Chinese miners [31] significantly reducing the scale of illegal mining activities by foreigners. Though, unlike migrant miners, local illegal gold miners do not employ heavy machinery (such as excavators, trucks, dredging machines, crushers, etc) and so cause less drastic damage, the crackdown should as well be extended to their activities for a holistic remedy to the menace.

7. Conclusion

Despite progress in mining policy formulation, policy implementation has not proceeded with commensure. The liberalisation of the mining sector which aimed among other things to formalise, harmonise and mitigate the adverse impacts and effects of illegal small-scale gold mining in Ghana has thus failed, and small-scale mining laws no longer respond effectively to the realities of sector's activities. Lack of operational clarity between

legal and illegal small-scale gold mining, coupled with the perceptibly high level of enforcement corruption, political complicity and leniency have undermined effective application of the regulatory mining laws, resulting in massive environmental, social-economic as well as agricultural productivity and food security challenges in Ghana.

By degrading arable lands, contaminating water bodies, polluting the air, and shifting labour from food crop farming to mining, illegal small-scale gold mining is largely responsible for the low food production, food price hikes and the high cost of living especially in *galamsey*-prone regions of Ghana, verifiable from Ghana's agricultural productivity records, consumer price indices of foodstuffs, and the national food import statistics. Illegal small-scale gold mining is therefore, a major threat to our country and deserves more stringent regulatory and remedial attention from the state and the citizenry than presently on offer. The authors therefore, recommend compulsory reclamation of degraded open cast *galamsey* mines as a sustainable proposition to mitigate the threat to food security in Ghana.

Reclamation of surface mines is important in order to protect birds and wild life, to reduce soil erosion, to minimize the pollution of rivers and streams, to protect and maintain water supply, to prevent and eliminate hazards to health and safety, and to protect land and enhance land use management and planning especially, for agricultural purposes. But reclamation though possible and imperative, is not the catholicon to the *galamsey* menace. The need for development with minimum disturbances to the environment without compromising economic growth and quality of life should be priority. The threat of *galamsey* to food security is real and imminent!

Acknowledgement

The authors are deeply grateful to Mr J.K. Gyimah, the Western Regional Agriculture Extension Officer for the Ghana Agricultural Productivity Records.

References

- [1] Aubynn, T. (undated). *Mining and Sustainable Development: The Case of Ghana*. The Ghana Chamber of Commerce, pp.30. <<http://www.ghanachamberofmines.org>> [Accessed 6 July, 2016].
- [2] FAO. Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit, 13 November, 1996. http://www.fao.org/wfs/index_en.htm [Accessed 8 April, 2016].
- [3] Ballayram, B.L., & Fitzroy H. "Food Security and Health in the Caribbean. *Imperatives for Policy Implementation*". Journal of Food Security, vol. 3(6): 137-144. (2015).
- [4] Diao, X. Economic Importance of Agriculture for Sustainable Development and Poverty Reduction: *Findings from a Case Study of Ghana*. Global Forum on Agriculture, OECD Headquarters, Paris. (2010).
- [5] Danyo, G. *Oil Palm and Palm Oil Industry in Ghana: A Short History*. International Research Journal of Plant Science, Vol. 4 (6), Pp. 158-167. (2013).
- [6] Kessey, K.D. and Arko, B. *Small Scale Gold Mining and Environmental Degradation in Ghana: Issues of Mining Policy Implementation and Challenges*. Journal of Social Sciences, Vol. 5 (1): 12-30. (2013).
- [7] Adjei S., Oladejo N.K., and Adetunde, I.A. *The Impact and Effect of Illegal Mining (galamsey) towards the Socio-economic Development of Mining Communities: A case study of Kenyasi in the Brong Ahafo Region*. International Journal of Modern Social Sciences, Vol. 1 (1): 38-55. (2012).
- [8] Aryee, B. Retrospective on the Ghana Experience: *Overview of Artisanal Mining and its Regulation in Ghana*. Presentation at the 3rd Annual General Meeting of the World Bank Communities and Small-Scale Mining Programme, Elmina, Ghana, September 8, 2003.
- [9] Economic Commission for Africa (undated). Compendium on Best Practices in Small-scale Mining in Africa, Addis Ababa, Ethiopia.
- [10] Bansah, K.J., Yalley, A.B., Dumakor-Dupey N. *The hazardous nature of small scale underground mining in Ghana*. Journal of Sustainable Mining, 15. (2016):8-25. <<http://www.elsevier.com/locate/jism>> [Accessed 20 June, 2016].
- [11] Hilson, G., and Potter C. Structural adjustment and Subsistence Industry: Artisanal Gold Mining in Ghana; Development and Change 36 (1): 103-131. (2005). Institute of Social Studies, Blackwell Publishing, Malden.
- [12] Owusu-Boateng, D., Codjoe, F.N.Y., and Ofori, J. *Impact of Illegal Small-Scale Mining (Galamsey) on Cocoa Production in Atiwa district of Ghana*. International Journal of Advance Agricultural Research, Vol.2 (1): pp. 89-99. (2014).
- [13] Sen, R, and Sharandindra, C. *Biotechnology - applications to environmental remediation in resource exploitation*. Current Science, 97(6):768-775. (2009).
- [14] Means, J.L, and Hinchee, R.E. Emerging technology for bioremediation of metals. Boca Raton, Lewis. (1994).
- [15] Picardo, M, Ferreira, A. and Da Costa, A. *Continuous thorium biosorption - Dynamic study for critical bed depth determination in a fixed-bed reactor*. Biores. Technol., 100:208-210. (2009).
- [16] World Bank. Artisanal and Small-scale mining. (2013). <<http://www.worldbank.org/en/topic/extractiveindustries/brief>> [Accessed 20 June, 2016].
- [17] Kitula, A.G.N. *The environmental and socio-economic impacts of mining on local livelihoods in Tanzania: a case study of Geita District*. Journal of Cleaner Production, 14 (3): 405-414. (2006).
- [18] Hilson, G. *The environmental impact of small-scale gold mining in Ghana: identifying problems and possible solutions*. Geographical Journal, 57-72. (2002).
- [19] Adu-Yeboah, J.K. and Obiri-Yeboah, D. Practical Social Studies for Senior High Schools. KwaDwoan Publishing, Accra. 2008.
- [20] Daily Guide Newspaper. The Galamsey Threat. 26 November, 2011. <<http://www.dailyguideghana.com>> [Accessed 20 June, 2016].
- [21] Oblokuteye, K.P.H. The effects of illegal small-scale gold mining on the environment-A case study at gold hall Galamsey site, Tarkwa, Ghana: University of Mines and Technology. (2010).
- [22] National Development Planning Commission of Ghana. United Nation's Post -2015 Agenda. 2015. <http://www.ndpc.gov.gh> [Accessed 20 July, 2016].
- [23] Thamodoran, R., English, B.C. and Heady, E.O. *Private Agricultural Land Base by Producing Areas for Year 2000*. CARD Series Paper 82-4. 2000.
- [24] Krishnakumar, S., Kumar, S.R., Mariappan, N. and Surendar, K.K. *Biochar-boon to soil health and crop production*. African Journal of Agricultural Research, Vol. 8 (38), p.p. 4726-4739. 2003.
- [25] Singh, S. Archives of EnviroNews-Newsletter of ISEB India. 2012. <<http://www.webmaster@isenindia.com>> [Accessed 1 July, 2016].
- [26] Ocansey, T.I. Mining Impacts on Agricultural Lands and Food Security: Case study of towns in and around Kyebi in the Eastern Region of Ghana. Bachelor Thesis. Turku University of Applied Sciences. 2013.
- [27] Nyamekye, E. Socio-economic Impact of Mine Closures. Accra: Green Earth. (1996).
- [28] Akabzaa, T. & Abugre, C. 'Mining Boom': Harnessing the gain for Africa. 15th African Agenda. 1997.
- [29] Breisinger, C., X. Diao, J. Thurlow, B. Yu, and S. Kolavalli. Accelerating Growth and Structural Transformation: Ghana's Options for Reaching Middle-Income Country Status. IFPRI Discussion Paper 00750. Washington, DC: IFPRI. 2008.
- [30] Darmody, R.G, Dunker, R.E. and Barnhisel R.I. Reclamation of Prime Agricultural Lands after Coal Surface-Mining: The Midwestern Experience. American Society of Mining and Reclamation, 3134 Montavesta Rd., Lexington, KY 40502. 2002.
- [31] The Guardian. Ghana deports thousands in crackdown on illegal Chinese goldminers. (2013). [Accessed 14 July, 2016].