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INTERROGATING THE IMPACT OF ILLEGAL ARTISANAL AND SMALL-SCALE MINING ON AGRICULTURE AT EAST AKIM MUNICIPALITY

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Abstract

While illegal artisanal and small-scale mining (ASM) supports many Ghanaians' livelihoods and contributes to the country's mineral richness, its uncontrolled and unlawful nature results in various negative repercussions. This is particularly concerning because it is considered a key sector of Ghana's economy, employing about a third of its workforce in 2023. For this reason, the following article examines the impact of illegal mining on agriculture in the East Akim municipality of Ghana using qualitative and quantitative research methods. Through a three-stage sampling technique, 40 smallholder farmers selected from ten communities at the East Akim Municipality participated in the questionnaire survey in January-July 2023. In addition, four interviews were conducted with leaders and officials from the East Akim Municipal Assembly on the topic surveyed. Findings represented by the descriptive statistical methods confirmed that illegal mining has resulted in mass land degradation, pollution from toxic chemicals, continuous flooding, and soil erosion, adversely affecting agriculture productivity in the region.

Keywords

Illegal mining; Agricultural productivity; Environmental impact; Sub-Saharan Africa.

Introduction

Mineral mining has significantly contributed to most African countries' economies, and many authors have explored the socioeconomic significance of ASM of precious minerals (Suglo et al., 2021; Ofosu et al., 2020). ASM is widely practiced worldwide, and about 30 million people in more than 70 countries are estimated to be directly engaged in ASM activities (Singo & Seguin, 2018; Owusu et al., 2019). ASM is an increasingly vital rural economy, providing direct livelihoods for an estimated 44,5 million people globally and 25 million in sub-Saharan Africa (Hilson et al., 2021; Moyo et al., 2022). Hilson & Maconachie (2017) also estimated that about 20 million people in SSA are directly employed in the ASM sector, and an additional 100 million people indirectly depend upon its activities for their livelihoods.

Despite the economic benefits of ASM, it is highly environmentally destructive (Ofosu et al., 2020; Kinyondo & Huggins, 2021; Owusu et al., 2019). ASM is associated with environmental issues such as mercury contamination (Yeaboah et al., 2024; Yeboah, 2023; Obiri-Yeboah et al., 2021), land degradation, pollution, biodiversity harm (Antwi-Boateng &

Akudugu, 2020), and antagonistic competition with agriculture to production factors such as land, water, labor, and capital (Ofosu et al., 2020; Gilbert & Osei-Bonsu, 2016; Yeboah, 2023). Agriculture and illegal mining have complex and dynamic connections that might negatively affect agriculture. They share the same geographical area and compete for the same input resources, such as land, water, labor, and capital, making them complex (Yeboah, 2023).

The illegal mining sector is characterized by non-compliance to environmental regulations and, as a result, leads to environmental deterioration issues (Ofosu et al., 2020; Hilson & Maconachie, 2017), which can, in turn, hurt agricultural productivity. One key mechanism is land degradation that affects agro-based livelihoods (Mkodzongi & Spiegel, 2019; Munyoka, 2020; Macheka et al., 2021; Magidi & Hlungwani, 2023). Land degradation is associated with deforestation, making it susceptible to landscape destruction and soil erosion (Marther et al., 2020), making once-fertile fields unsuitable for agricultural cultivation. Open-pit mining leads to mixing heavy rock material with topsoil, which has very low water retention, low organic content, low nutrients, and highly toxic components, rendering the soil unfertile for farming (Kinimo et al., 2018). For instance, studying the impact of mining on agricultural lands and food security at Kyebi in the Eastern region of Ghana reported that illegal mining operations have resulted in land degradation, with crops destroyed and soils contaminated. It implies that mining-induced land degradation can potentially harm crop production and animal husbandry in rural regions. Nevertheless, three billion people in rural areas rely on agriculture, with 475 million (80%) living on small farms globally (Gumbo et al., 2024).

Additionally, illegal mining can adversely affect agriculture through water pollution (Obiri et al., 2016; Mujere & Isidro, 2016). This can be seen in situations when volumes of water are used in processing mineral ore freshwater (Suglo et al., 2021) as well as when mining waste is discharged into water bodies and seepage from tailings and waste rock impoundments (Emmanuel et al., 2018). It can pollute the water bodies with heavy metals such as mercury. Studies have shown that the metallic mercury (Hg) concentration of river water and wells near gold mining regions is high (Malik et al., 2010), and these waters might harm food crops when they flow into agricultural lands. For instance, Dube et al. (2024) and Tuffuor & Takora (2024) noticed a correlation between the surge in illegal mining-related activities and increasing water and mercury use. Furthermore, runoff and wastewater from gold mining have made most water bodies opaque brown due to mud and chemical components from illegal mining activities (Kusi-Ampofo & Boachie-Yiadom, 2012), rendering them unfit for home and agricultural use.

In Ghana, as in most African countries, ASM has boosted the economy by creating jobs, increasing mineral output, particularly gold, and increasing the country's gross domestic product. Nonetheless, the disadvantages of unregistered and unregulated ASM outweigh the advantages (Suglo et al., 2021). For example, Prosper & Guan (2015) reported that the rise of ASM in the Adowli-Kaleo district, one of Ghana's Upper West Region districts, has had a significant environmental impact, including farmland loss, crop and forest cover destruction, and water body pollution.

Obeng et al. (2019) also recognized illegal mining as a source of environmental issues such as water pollution, deforestation, low soil fertility, and limited access to agricultural land. Furthermore, the disturbances created by illegal mining activities in the country include the destruction of forest cover and soils due to the entry of hazardous waste into soil and water bodies, frequently leading to health concerns. According to Suglo et al. (2021), the repercussions of illegal mining operations in Ghana should be prioritized for essential restitution because efforts to address the implications of the sector's operations have stalled, even though researchers and policymakers have investigated illegal mining. Research has

shown that understanding how artisanal mining relates to other standard livelihood methods, such as smallholder farming, is one of the best ways to predict how it would affect rural populations (Osumanu, 2020). Therefore, this study aims to evaluate how illegal mining affects agriculture in Ghana's East Akim municipality.

1 Overview of Mineral Mining in Ghana

Mining in Ghana can be divided into two major types based on the production scale: large-scale mining (LSM) and small-scale mining (SSM). For decades, Ghana has had both ASM and large-scale gold mining operations (Yankson & Gough, 2019). In Ghana, SSM encompasses ASM, which indigenous people mainly perform. SSM is a less intensive form of mining that uses simple or primitive equipment (Aziabah & Ayelazuno, 2024). SSM is defined as mining gold by a technique that does not require enormous spending by an individual or group of individuals not more than nine in number or by a supportive society made up of ten or more persons in Ghana (Worlanyo & Jiangfeng, 2021). On the other hand, LSM typically requires a substantial financial outlay, a substantial workforce, and advanced technology (Amponsah-Tawiah & Dartey-Baah, 2011). Amidst all this, both LSM and SSM support numerous livelihoods for the local, nearby, and distant communities at the microeconomic level; in particular, mining acts as a shock absorber and buffer in local and nearby communities. It means that, on a personal level, mining helps poor farmers and residents survive while also fostering the expansion of small and medium-sized enterprises (Wilson et al., 2015).

1.1 Defining Illegal Mining in Ghana

Mining is considered illegal when carried out without a permit or in unapproved areas such as forest reserves, game reserves, or near water resources, even if a permit is granted (Erusani & Aji, 2022). In Ghana, ASM, known as galamsey, is deemed unlawful because operators have not legally registered their locations with the government (McQuilken & Hilson, 2016; Andrews, 2015). Since 1989, when the Small-Scale Gold Mining Law (BRR, 1989) went into effect, there has been an official division between illegal artisanal mining (galamsey) and lawful SSM. The former Minister of Lands, Forestry, and Mines recently stated that galamsey operations cannot be equated to SSM, which is allowed and supported in the country (Banchirigah & Hilson, 2010). However, ASM is commonly called illegal mining because most ASM operators have not registered their operations, and their activities are mainly carried out unofficially (McQuilken & Hilson, 2016). ASM operators also rely heavily on labor-intensive, low-tech, primitive mining techniques and tools to unearth mineral-bearing rocks and extract desired minerals or metals such as gold, diamond, and cobalt (Aziabah & Ayelazuno, 2024; Bansah, 2023). It is a hallmark of illegal mining, which comprises crude mineral extraction techniques, extremely laborious processes, hazardous working conditions, and frequently detrimental human and environmental health consequences (Baddianaah, 2024). ASM is a crucial livelihood activity in Ghana, generating significant income, employment, and economic progress. ASM employs an estimated one million people in Ghana and supports approximately 4.5 million more (McQuilken & Hilson, 2016).

According to Yeboah (2023), Ghana's government has attempted to combat illegal mining since 1989, but it has not been effective yet. Examples of such interventions include legislation, military interventions, and alternative livelihood programs (Yeboah et al., 2024). According to Yeboah (2023), some of the reasons for the failure of government interventions aimed at combating illegal mining activities in Ghana include inadequate legal and institutional structures, political interference, and a lack of political will to deal with Ghanaian politicians. Moreover, Yeboah (2023) argues that state enforcement authorities need more

resources, equipment, technology, and financial and human resources to properly monitor and manage illegal mining operations. Furthermore, inadequate stakeholder management, a lack of planning, and insufficient collaboration between the government, the Minerals Commission, and local chiefs harmed plans to combat illegal mining in the country.

2 Research Methods

2.1 Study Setting

This article forms part of a more extensive (Adjei et al., 2023) conducted between January and July 2023 in the East Akim Municipality in Ghana. The East Akim Municipality is located in the central portion of the Eastern Region at coordinates 5°55′29.89″N 0°58′55.78″W. It is bordered by six districts, namely, Atiwa District to the north, Juaben to the south, Suhum-Kraboa-Coaltar District to the west, Fanteakwa District to the east, New Juaben to the south, and West Akim District to the north. It has a total land area of about 725 km^2. The terrain is typically undulating, with various rock formations providing relief features, from flat-bottomed lowlands to steep-sided highlands rich in bauxite, gold-bearing rocks, kaolin, and iron pans (GSS, 2015).

2.2 Respondents and Sampling Method

The study participants were selected using probability (i.e. random sampling) and non-probability (i.e. purposive sampling) sampling techniques. A three-stage sampling technique was used to select the respondents because a multistage sampling technique helps collect data from large, geographically spread populations such as this study's population (Sedgwick, 2015). The study's population is smallholder farmers spread across the eight zonal councils in the East Akim Municipality. Consequently, in the first sampling stage, the simple random sampling technique selected five zonal councils, representing more than half of the zonal councils. This technique uses the fishbowl method without replacement. In the second stage, two communities were also selected from each of the five selected zonal councils using the simple random fishbowl method without replacement, making ten communities. These communities were Akim Tafo, Apedwa, Asafo, Asiakwa, Bunso, Maase, New Tafo, Old Tafo, Osiem and Kibi. In the third stage of the sampling process, four farmers were purposively sampled from each of the ten communities, comprising 40 farmers. Hence, 40 respondents were used for the study. Additionally, two traditional leaders and two officials from the East Akim Municipal Assembly were selected for an interview on the impact of illegal mining on agriculture in the area.

2.3 Research Design and Data Analysis

This study used a mixed research approach comprising qualitative and quantitative data collection and analysis methods. This approach not only enables diversification of methods of collecting data from respondents (Creswell et al., 2007), but it also allows for a more prosperous and valid interpretation by complementing the strengths of both qualitative and quantitative methods (Decrop, 1999). The study used a questionnaire, interview, and observation to collect data from primary sources in January-July 2023. A questionnaire was chosen because it provides a structured and standardized approach to collecting data, allowing for generalization, consistency, and comparability among respondents, essential for statistical analysis (Dillman et al., 2014). The questionnaire used in this study was in English and comprised 29 open and closed questions grouped under four sections, lettered A-D. Section A consisted of questions on respondents' demographics. Section B consisted of questions assessing the causes of the upsurge in illegal mining at East Akim municipality. Section C

comprised questions examining the impact of illegal mining on agricultural land, and Section D consisted of questions investigating the effects of illegal mining on agricultural productivity. The interviewers personally administered the questionnaires to the respondents in the field. In cases where a respondent did not know English, the interviewers translated the questions into his/her mother tongue.

The authors conducted the interviews to capture the diverse perspectives and rich, detailed data that the quantitative methods might overlook (Patton, 2014). The interviews aimed to gain a nuanced understanding of the complex dynamics between illegal mining and agriculture in the East Akim Municipality. The qualitative data was obtained by using an interview guide for in-depth interviews (Eppich et al., 2019) with officials from government institutions, chiefs, and local leaders. Thematic analyses were employed to analyze the qualitative data. The interviews were tape-recorded and transcribed verbatim, and frequencies of similar words and phrases were sought to help identify themes. It helped identify patterns in the data and make conclusions. The respondents' responses have been presented as quotations to buttress the quantitative results analyzed.

The quantitative and qualitative data were coded and descriptively analyzed using the IBM Statistical Package for Social Sciences to obtain the frequencies and percentages. The results were then presented in tables and pie charts in Section 3.

3 Findings and Discussion

3.1 Background Characteristics of the Respondents

The primary data shows that 31 (77.5%) farmers were male while a few nine (22.5%) were females. Most farmers were between the ages of 31-40 (37.5%) and 51-60 (37.5%). Furthermore, a significant number of 16 (40%) of the farmers had no formal education, and a good number of 11 (27.5%) had a basic level of education. In addition, most farmers were farm owners (37.5%) or farmers on family lands (37.5%). The background characteristics of the farmers are represented in Table 1.

Tab. 1: *Socio-demographic characteristics of the respondents*

Socio-demographic characteristics		Frequency of responses	Percentage [%]
Gender	Male	31	77.5
	Female	9	22.5
	Total	**40**	**100.0**
Age	18-30	2	5.0
	31-40	15	37.5
	41-50	4	10.0
	51-60	15	37.5
	Above 60	4	10.0
	Total	**40**	**100.0**
Educational level	No education	16	40.0
	Basic education	11	27.5
	Secondary education	4	10.0
	Not answered	9	22.5
	Total	**40**	**100.0**

Socio-demographic characteristics		Frequency of responses	Percentage [%]
Marital status	Married/co-habitation	30	75.0
	Single	2	5.0
	Divorced	1	2.5
	Widowed	5	12.5
	Not answered	2	5.0
	Total	**40**	**100.0**
Household size [number of persons]	No dependent	2	5.0
	2	4	10.0
	3	2	5.0
	More than 3	32	80.0
	Total	**40**	**100.0**
Type of land ownership	Farm owner	15	37.5
	Tenant farmer	7	17.5
	Family land	15	37.5
	Other types	3	7.5
	Total	**40**	**100.0**
Length of residency in the community	6-10 years	13	32.5
	11-15 years	13	32.5
	More than 15 years	14	35.0
	Total	**40**	**100.0**

Source: Authors' field survey from 2023

3.2 The Impact of Illegal Mining on Agricultural Land

Previous studies show that ASM operations have long-term impacts on agricultural lands by depleting environmental resources such as water, soil, the landscape, vegetation, and the ecosystem, among others, and these environmental deterioration issues tend to hurt agriculture (Suglo et al., 2021; Mensah et al., 2015). In line with this, this section analyses the environmental impact of illegal mining in terms of its impact on agricultural land. From the analysis, more than half (82.5%) of the study participants indicated that illegal mining has adversely affected agricultural lands. Some of the identified impacts include flooding of farms (31.3%), loss of forest cover and biodiversity (26%), constant erosion (24.2%), and land pollution from toxic chemicals (18%). Usually, large tracts of forests that serve as buffers are destroyed by illegal mining, thereby exposing farmlands to excessive runoff and floods (Adjei, 2017). This is detrimental because flooding harms agricultural systems, causing massive crop damage, disease outbreaks (i.e., fungal diseases), and destroying animal feed (Praveen & Sharma, 2019). Another key issue that arises from the depletion of forest resources and, in turn, threatens agricultural productivity is soil erosion (Bhandari et al., 2021). This is because essential plant nutrients such as nitrogen, phosphorus, potassium, and calcium are lost when soil is eroded. Eroded soil typically contains about three times more nutrients than the soil left behind on eroded land (Berhe et al., 2018; Meena et al., 2017). The loss of soil nutrients negatively affects crop growth. The farmers' responses regarding the impact of illegal mining on agricultural lands are depicted in Table 2.

Tab. 2: *The impact of illegal mining activities on agricultural land*

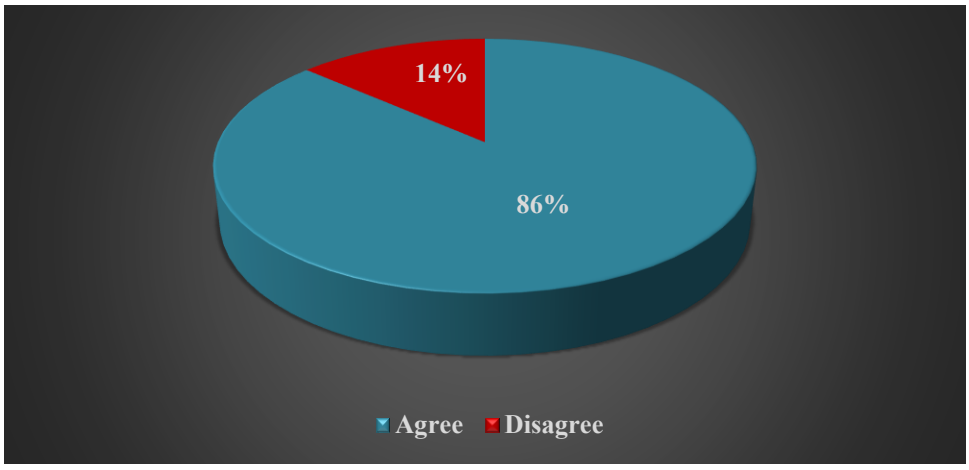
The respondents' attitude to the illegal mining activities' impact		Frequency of responses	Percentage [%]
Illegal mining adversely affects agricultural land.	Agree	33	82.5
	Disagree	7	17.5
	Total	**40**	**100.0**
If you agree with this statement, what are the main impacts?	Flooding of farms	16	48.5
	Loss of forest cover and biodiversity	4	12.1
	Constant erosion	8	24.2
	Land pollution from toxic chemicals used by illegal miners	5	15.2
	Total	**33**	**100.0**

Source: Authors' field survey from 2023

3.3 The Impact of Illegal Mining on Water Bodies

In response to the impact of illegal mining activities on water bodies, the majority (86.5%) of the farmers indicated that illegal mining is negatively affecting the water bodies in the area, and the remaining (13.5%) indicated that illegal mining is not having any impact on the water bodies in the area. This finding aligns with various studies (Obiri-Yeboah et al., 2021; Kuffour et al., 2018), indicating that illegal activities seriously influence water bodies. Water is a vital input for agricultural productivity in practically every aspect. It has a decisive effect on yield because even good seeds and fertilizers can only reach their full potential if plants are adequately watered (Dhawan, 2017). Hence, the destruction of the quality of water bodies' water by illegal mining activities (Emmanuel et al., 2018) significantly affects crop production.

Figure 1 presents respondents' answers about the impact of illegal mining on water bodies.



Source: Authors' field survey from 2023

Fig. 1: *Respondents' attitude towards the statement: „Illegal mining adversely affects water bodies."*

Further interactions with the farmers revealed that the water bodies had been polluted with dirt and chemicals from illegal mining operations, making them unhealthy. It is consistent with studies that show that illegal mining significantly harms the quality of water bodies through acid mine drainage, heavy metal contamination, leaching, processing chemical pollution, erosion, and sedimentation (SDWF, 2024; Obiri et al., 2016; Mujere & Isidro, 2016). The large amount of water required to wash the ore frequently leads to illegal miners working near water bodies (Nasirudeen & Allan, 2014; Mudyazhezha & Kanhukamwe,

2014), and tailings are thrown directly into rivers without any treatment, resulting in severe debris contamination (Kessey & Arko, 2013). It does not only change the aesthetics of the river/stream but also its physical, chemical, and biological properties, rendering it unsuited for agricultural and domestic use.

One of the farmers in an interview explained that:

> *"The water bodies here have changed color. They have all turned to brown, making it difficult to use."* (Authors' field survey from 2023)

Another farmer in an interview expressed that:

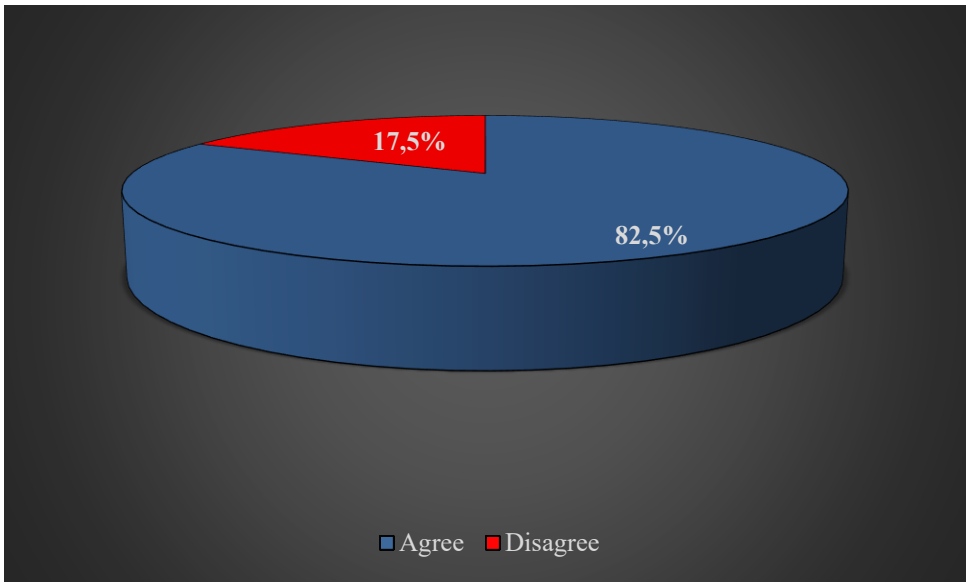
> *"This water problem has become a huge challenge for us. See, the water bodies around my farm have become so brown that I cannot use them to water my farms. I now have to carry water from the house to help me water the farms. I used to pay people to help me carry the water, but their charges have become so high that I cannot afford them anymore. So, I make my children carry gallons of water on Saturdays and keep them on the farm for further use."* (Authors' field survey from 2023)

In addition, the District Assembly Senior Executive Officer from the Asafo district added in an interview that:

> *"We have constantly received complaints from the various communities concerning the state of the water bodies. If you visit the water bodies, you will see that most of them have turned brown. We recently tested the water quality, filled with heavy metals such as mercury and lead. So, pollution of the water bodies is a challenge for everybody. The farmers cannot use it for irrigation, and households cannot use it for home use."* (Authors' field survey from 2023)

3.4 The Impact of Illegal Mining on Crop Output

According to Junior & Matsui (2018), food production has historically suffered significant shortages in locations where illegal mining is common. It has been attributed to factors such as a decrease in agricultural land use due to mining (Suglo et al., 2021; Aborah, 2014), as well as the damage of land and water resources used for crop production (Emmanuel et al., 2018; Boadi et al., 2016). Therefore, this section assesses how illegal mining has affected crop output in the region. From the responses, the majority (82.5%) of the smallholder farmers indicated that illegal mining has led to a decline in crop output. The farmers' responses regarding the impact of illegal mining on crop output have been illustrated in Figure 2.



Source: Author's field survey from 2023

Fig. 2: *Respondents' attitude towards the statement: „Illegal mining adversely affects a crop output"*

Interview responses with farmers indicated that their crop output has significantly decreased. The farmers attributed the decline in crop output to factors such as the reduction in farmlands, destruction of farmlands, continuous flooding of farmlands, and soil infertility. This is consistent with Gilbert & Osei-Bonsu's (2016) assessment that by deteriorating arable lands, contaminating water bodies, polluting the air, and transferring labor from food crop production to mining, illegal small-scale gold mining is primarily responsible for low food production. One of the respondents in an interview explained that:

> *"Our crops are constantly destroyed by floods because there are no more trees to control the floods."* (Authors' field survey from 2023)

Also, illegal mining has, over the years, become a severe competitor for agricultural land for its operation (Atta & Tholana, 2022; Gilbert & Osei-Bonsu, 2016) since illegal mining has spread quickly into new frontiers, especially true in areas where agricultural activities have historically been present (Ofosu et al., 2020). This scenario was observed in the study area as farmers lamented the reduction in their farmlands due to the encroachment of illegal miners. Some even indicated that portions of their farms were sold to illegal miners by their family heads for quick money. Most rural farmers work on family lands and, therefore, do not have ownership over their farmlands. As such, the farmlands can be sold even without the consent of the farmers. One of the farmers in an interview expressed:

> *"My crop yield has significantly reduced. At first, I was able to produce more than 18 bags of cocoa annually, but now, I produce just about six bags. Large portions of my farmland were sold to illegal miners by my family heads, reducing the size of the land I farm. So I have been farming on a small piece of land for so long, and this has caused the soil to be depleted."* (Authors' field survey from 2023)

It is confirmed that 3.5% of Ghana's land, formerly used for agriculture, has been taken over by illegal mining (Yiridomoh, 2021). Suglo et al. (2021) also argue that it is evident that the loss in land use for agriculture induced by mining, particularly illegal mining, will adversely affect agricultural output.

3.5 Discussion

Ghana's agricultural sector is regarded as the most significant sector of the economy, employing approximately 29.75% of the country's workforce (Asravor & Sackey, 2023) and accounting for approximately 18.27% of the country's gross domestic product (Statista, 2024). However, there is a significant overlap between mining and agriculture (Cuba et al., 2014), and the rivalry for essential inputs frequently leads to conflict (Aragon & Rud, 2012). Agriculture competes with mining activities for resources such as land use and water, frequently resulting in long-term repercussions of mining on agriculture (Adjei et al., 2021; Duncan, 2020; Hilson, 2002). In line with this, this study aims to analyze the impact of illegal ASM on agriculture in Ghana's East Akim municipality. The findings on the impact of illegal mining on agriculture are in tandem with those of Ofosu et al. (2020), who found that illegal mining could have adverse effects on agriculture through three main mechanisms: land degradation and farm invasions, water contamination, and mercury contamination.

The study's findings showed that illegal mining operations harm the farmlands by destroying forest cover and causing frequent flooding, erosion, and land degradation. It has been established that one of the most notable effects of illegal mining is the loss of large areas of forest cover, which causes the vegetation to shift from thick to sparse (Adjei, 2017). This is because, in order to make way for their operations, illegal miners frequently clear trees from certain landscapes (Osman et al., 2022). Because ASM is unregulated, the miners frequently get away with implementing environmental safety and restoration measures like afforestation. Therefore, by stripping the land bare of vegetation, the soil becomes prone to erosion, and farmlands become liable to flood (Gilbert & Osei-Bonsu, 2016) since there are no trees to serve as a buffer. The study discovered such scenarios in the study area as the respondents expressed that they have been experiencing constant soil erosion and flooding of their farmlands a massive threat to agricultural productivity. The adverse impact of flooding on agriculture has been discussed by various studies (Praveen & Sharma, 2019). Sîli et al. (2020) stated that floods cause massive damage to crops and affect the level and variability of agricultural production. In addition, Osman et al. (2022) indicated that flooding farmlands caused by illegal mining activities was one of the primary causes of cocoa production decline in Ghana's Amansie West District. Furthermore, research indicates that erosion is the most dangerous to soil fertility and productivity, making regulating nutrient loss difficult (Rashmi et al., 2022; Rahman, 2013; Kefi & Yoshino, 2010). For example, Asfaw et al. (2020) evaluated Malawi's economic distributional impacts of soil loss. They found that erosion deprives rural families of the natural capital required to raise agricultural production and improve food security. In addition, soil erosion wipes away nutrient-rich topsoil, depriving crops of the necessary nutrients to grow.

In addition, there was a reported incidence of land pollution from heavy metals from illegal mining activities, which has adversely affected the suitability of the land for crop production. This is in tandem with findings showed that land pollution from mining activities has resulted in low crop growth at Kyebi in the eastern region of Ghana. This is because toxic chemicals such as cyanide and mercury used in mining render the soil inappropriate for crop production, thereby reducing crop production.

ASM can also adversely affect agriculture by contaminating water through its operations (Mihaye, 2020; Obiri et al., 2016; Mujere & Isidro, 2016; Owusu-Koranteng, 2008). The study discovered that water bodies in the area had been polluted by heavy metals and residues from ASM activities, making them unsafe for use. It verifies a study by Cordy et al. (2011), which found that unregulated mining in Colombia has resulted in significant levels of mercury contamination in the region. ASM-related activities have been linked to increased usage of heavy metals (e.g., mercury and cyanide) (Seccatore et al., 2014), and since legal miners do

not follow environmental guidelines, they mostly release the toxic chemicals from their operations into water bodies (Nti et al., 2020). It leads to the fact that the water bodies harm agricultural use as they threaten plant and animal life (Okorogbona et al., 2018; Amankwah, 2013).

Furthermore, responses from the smallholder farmers revealed that agricultural productivity in the area has generally decreased due to farming on smaller plots of land, low soil fertility due to continuous cropping, and water and land pollution. This is consistent with the assumption that crop yields are often low in locations where illegal mining is prominent (Osman et al., 2022; Junior & Matsui, 2018). For example, a study of mining's effects on agricultural lands and food security in Kyebi and the eastern region of Ghana discovered a direct causal association between mining and low food production in mining villages. Furthermore, a careful examination of Ghana's agricultural productivity records (2009-2014), consumer price indices (effectively, inflation rate) of foodstuffs (2011-2015), and national food import statistics (2012-2014) reveal a steady decrease in food production and a corresponding rise in consumer price indices in Ghana's mineral-rich regions, which are notorious for illegal mining activities (Gilbert & Osei-Bonsu, 2016).

According to Basir-Cyio et al. (2020), destroying natural resources and the environment directly affects agricultural productivity. This was witnessed in the study, as the disturbance and large clearing of forest for mining activities within the study area have directly resulted in environmental issues such as forest, land, and water resource destruction. It has perpetuated issues such as constant erosion, flooding of farms, land and water pollution. Flooding and erosion have caused ongoing crop loss and soil fertility deterioration. In addition, Ghana's agricultural growth, like that of many African countries, is driven by land expansion rather than land productivity (yield increase) (Diao et al., 2010). Evidence from the study indicates that land areas formerly used for agricultural purposes have been taken over by illegal mining. Therefore, a reduction in agricultural land for illegal mining has ultimately led to a reduction in agricultural growth.

One of the main limitations of this study is that the effects of illegal mining on agriculture may vary over time due to legislative interventions, economic developments, or changes in mining strategies. As a result, future studies should include longitudinal studies to track changes over time and better understand the long-term effects of illegal ASM. Furthermore, this study's impact assessment is limited because it only considers direct impacts, such as land degradation, water pollution, and crop loss, while ignoring indirect effects, such as changes in local economies and social structures. This narrow focus could result in an incomplete understanding of the overall impact. Therefore, in future studies, the authors will seek to take a more thorough approach, including both direct and indirect effects, to obtain a more complete picture of the impact of illegal mining activities on agriculture.

Conclusion

By assessing the impact of illegal ASM on agricultural land, water bodies and crop output, the findings from this study shows that illegal ASM activities have adverse consequences for crop production. Agriculture and mining share the same production factors, and the unregulated nature of ASM has led to the degradation of these production resources, resulting in an adverse impact on agriculture. This has been the dynamics at the East Akim municipality, where illegal ASM has led to the pollution of water bodies, thereby hindering their use for irrigation purposes and land degradation, which has led to soil fertility issues. These environmental issues resulting from illegal ASM in the area have profound implications for agricultural productivity, resulting in reduced crop output.

Based on the results of this study, it is recommended that the central government, through local governments, invest in restoration efforts by allocating financial and technical resources to rehabilitate degraded lands damaged by illegal ASM. It could include restoring soil fertility, replanting vegetation, and promoting biodiversity. Furthermore, the local authorities could encourage other income-generating activities for mining-dependent communities, like boosting small-scale businesses or agroforestry, diminishing their reliance on illegal mining.

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ZKOUMÁNÍ DOPADU NELEGÁLNÍ ŘEMESLNÉ TĚŽBY A TĚŽBY V MALÉM MĚŘÍTKU NA ZEMĚDĚLSTVÍ V REGIONU EAST AKIM

Nelegální řemeslná těžba a těžba v malém měřítku (ASM) sice podporuje živobytí mnoha Ghaňanů a přispívá k nerostnému bohatství země, ale její nekontrolovaný a nezákonný charakter má různé negativní důsledky. To je obzvláště znepokojivé, protože je považována za klíčové odvětví ghanské ekonomiky, které v roce 2023 zaměstnává přibližně třetinu pracovní síly. Z tohoto důvodu následující článek zkoumá dopad nelegální těžby na zemědělství v ghanské obci East Akim s využitím kvalitativních a kvantitativních výzkumných metod. Prostřednictvím třístupňové techniky výběru vzorku se dotazníkového šetření v období leden-červenec 2023 zúčastnilo 40 drobných zemědělců vybraných z deseti komunit regionu Východní Akim. Kromě toho byly provedeny čtyři rozhovory s vedoucími představiteli a úředníky obecního zastupitelstva Východní Akim na zkoumané téma. Zjištění reprezentovaná popisnými statistickými metodami potvrdila, že nelegální těžba má za následek masovou degradaci půdy, znečištění toxickými chemikáliemi, neustálé záplavy a erozi půdy, což negativně ovlivňuje produktivitu zemědělství v regionu.

UNTERSUCHUNG DER AUSWIRKUNGEN DES ILLEGALEN HANDWERKLICHEN UND KLEINGEWERBLICHEN BERGBAUS AUF DIE LANDWIRTSCHAFT IN DER REGION EAST AKIM

Während der illegale handwerkliche und kleinteilige Bergbau (ASM) die Existenzgrundlage vieler Ghaner unterstützt und zum mineralischen Reichtum des Landes beiträgt, führt seine unkontrollierte und rechtswidrige Natur zu verschiedenen negativen Auswirkungen. Dies ist besonders besorgniserregend, da dieser Sektor als Schlüsselsektor der Wirtschaft Ghanas gilt und im Jahr 2023 etwa ein Drittel der Beschäftigten beschäftigt. Aus diesem Grund untersucht der folgende Artikel die Auswirkungen des illegalen Bergbaus auf die Landwirtschaft in der Region East Akim in Ghana unter Verwendung qualitativer und quantitativer Forschungsmethoden. Durch eine dreistufige Stichprobentechnik nahmen 40 Kleinbauern aus zehn Gemeinden der Gemeinde Ost-Akim an der Fragebogenbefragung im Zeitraum Januar bis Juli 2023 teil. Darüber hinaus wurden vier Interviews mit Führungskräften und Beamten der Gemeindeversammlung von East Akim zu dem befragten Thema geführt. Die Ergebnisse der deskriptiven statistischen Methoden bestätigten, dass der illegale Bergbau zu einer massiven Bodendegradation, einer Verschmutzung durch giftige Chemikalien, kontinuierlichen Überschwemmungen und Bodenerosion geführt hat, was sich negativ auf die landwirtschaftliche Produktivität in der Region auswirkt.

BADANIE WPŁYWU NIELEGALNEGO GÓRNICTWA RZEMIEŚLNICZEGO I NA MAŁĄ SKALĘ NA ROLNICTWO W REGIONIE EAST AKIM

Podczas gdy nielegalne górnictwo rzemieślnicze i na małą skalę (ASM) wspiera źródła utrzymania wielu Ghańczyków i przyczynia się do bogactwa mineralnego kraju, jego niekontrolowany i niezgodny z prawem charakter powoduje różne negatywne reperkusje. Jest to szczególnie niepokojące, ponieważ jest uważany za kluczowy sektor gospodarki Ghany, zatrudniający około jednej trzeciej siły roboczej w 2023 roku. Z tego powodu w poniższym artykule zbadano wpływ nielegalnego wydobycia na rolnictwo w regionie East Akim w Ghanie przy użyciu jakościowych i ilościowych metod badawczych. Dzięki trzystopniowej technice doboru próby, 40 drobnych rolników wybranych z dziesięciu społeczności w gminie East Akim wzięło udział w badaniu ankietowym w okresie od stycznia do lipca 2023 roku. Ponadto przeprowadzono cztery wywiady z liderami i urzędnikami Zgromadzenia Miejskiego East Akim na badany temat. Ustalenia przedstawione za pomocą opisowych metod statystycznych potwierdziły, że nielegalne wydobycie doprowadziło do masowej degradacji gruntów, zanieczyszczenia toksycznymi chemikaliami, ciągłych powodzi i erozji gleby, co negatywnie wpłynęło na wydajność rolnictwa w regionie.