



Cocoa production, farmlands, and the *galamsey*: Examining current and emerging trends in the ASM-agriculture nexus

Daniel Siaw^{c,*}, George Ofofu^a, David Sarpong^b

^a College of Business, Arts & Social Sciences Brunel Business School, Brunel University London Kingston Lane, Uxbridge, UB8 3PH, United Kingdom

^b Aston Business School Aston University, Birmingham, United Kingdom

^c Birmingham City Business, School Birmingham City University, UK

ABSTRACT

In this paper, we build on the diverse discussions on the nexus between artisanal and small-scale mining and agriculture to examine emerging relationships between mining operators, smallholder cocoa farmers, and landowners in rural cocoa-growing communities. Empirically, we draw on fresh insights from in-depth interviews with loosely coupled chain actors in Ghana's cocoa and mining sectors, we found what we call 'coerced to sell' strategies deployed by miners in the acquisition of farmlands for their operations. We go further to shed light on the employment trajectories of the new breed of landless farmers, and the emerging diversification strategies of landowners. Implications of our findings for the policy and practice of ASM and farmlands are outlined.

1. Introduction

Over the past decades, artisanal and small-scale mining (ASM) activities – a low-tech, labour-intensive form of extraction and processing of mineral ores such as gold – have become an important source of employment for many inhabitants in most mining communities across the globe (Arthur-Holmes and Abrefa Busia, 2022; Banchirigah, 2008; Hilson and Garforth, 2013; Ofofu et al., 2020; Ofofu and Sarpong, 2022). Although some emerging studies have sought to question, and rightly so, the sustainability potential of ASM considering the environmental issues involved (Clifford, 2022), the sector is known to provide employment opportunities for most miners, including the unemployed educated youth (Arthur-Holmes et al., 2022). The sector also provides employment opportunities for livelihoods dependent on the ancillaries of the sector, including traders, transport operators, gold buyers, equipment suppliers etc. (Arthur-Holmes and Abrefa Busia, 2021; Hilson and Banchirigah, 2009).

Underpinning these livelihood and employment opportunities in relation to ASM, however, is the issue of access to mineralised lands, land rights, and land tenure arrangements (Mensah, 2021). In Ghana, state lands constitute about 20–30% of all lands, with other forms of land ownership including customary/stool lands and private land ownership constituting about 70–80% (Campion and Acheampong, 2014; Larbi et al., 2004). This implies that, spatially, most mineralised lands, which form the predominant resource for both ASM and large-scale mining operations, fall largely within lands under customary

or private ownership (Aubynn, 2009; Nyame and Blocher, 2010). In the Ghanaian minerals and mining setting, however, despite the existence of customary and other forms of land ownership, and the many institutions involved in the management of mineral resources, the state is the ultimate owner of mineral endowments and the authoriser of mineral rights (Boafo et al., 2019; Nyame and Blocher, 2010).

In the 'authorisation' transactions, there appears to be very little input from landowners in the appropriation of mineralised lands; traditional authority and customary land tenure practices are virtually ignored in land allocation strategies (Boafo et al., 2019; Hiron, 2014; Nyame and Blocher, 2010). The consequence of the neglect of the important stakeholders and customary land tenure practices in the land allocations systems has been the proliferation of parallel systems—the formal state system, and the customary land tenure system (Mensah, 2021; Nyame and Blocher, 2010; Larbi et al., 2004) with the latter remaining the easiest and most familiar system of land tenure for many miners and landowners (Boafo et al., 2019; Mensah, 2021; Nyame and Blocher, 2010). In this vein, Van Bockstael (2019), for example, provided evidence from Cote d'Ivoire to highlight the beneficial side of such land tenure arrangements.

In cases elsewhere, it has been revealed that although many mining governance officials rhetorically seem to resent such 'informal' land arrangements, in reality, they (officials) have become the actual beneficiaries of the arrangements (Crawford and Botchwey, 2017) bringing into focus the need for proper decentralisation mechanisms (Hiron, 2014) and the proper management of cooperation between the state and

* Corresponding author.

E-mail addresses: daniel.siaw@brunel.ac.uk (D. Siaw), george.ofosu@brunel.ac.uk (G. Ofofu), d.sarpong1@aston.ac.uk (D. Sarpong).

<https://doi.org/10.1016/j.jrurstud.2023.103044>

Received 13 October 2022; Received in revised form 17 May 2023; Accepted 27 May 2023

Available online 6 June 2023

0743-0167/© 2023 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

customary landowners as a precondition for the formalisation of ASM operations (De Jong and Sauerwein, 2021).

Subsistence agricultural production of food and cash crops, at least in the case of Ghana, dominate land use activity in most mineral-rich lands (Knudsen and Fold, 2011). Communal landowners, chiefs, and private land owners usually lease out portions of land for tenure to farmers on various terms ranging from months to years (Knudsen and Fold, 2011; Otsuka et al., 2003). Within these arrangements, the farm produce is usually shared on an *abunu* or *abusa* basis.¹ However, in recent times, agriculture has been known to have become an unviable livelihood option - what is referred to as 'agricultural poverty' (Bryceson, 1996, 2002; Hilson and Garforth, 2012, 2013); this is due, in part, to structural adjustment programmes that sought to abolish basic subsidies and reduce credit and extension services for agricultural purposes (Banchirigah, 2006; Campbell and Clapp, 1995; Hilson and Potter, 2005). In the case of Cote d'Ivoire, for example, Odijie (2016) attributed the decline in cocoa production - mimicking 'agricultural poverty' - to the depletion of the forestlands that stimulate cocoa production. The decline in agricultural production and the revenues accruing from same, coupled with rising poverty, the high cost of living, and rising inflation in the Ghanaian context, lead landowners either to engage in ASM activities or to sell their lands to operators of illegal/informal² small-scale mining - popularly referred to as *galamsey* in Ghana (Myjoyonline.com, 2017; Nyame and Blocher, 2010).

Although these *galamsey* operations have downsides, especially in relation to the physical environment (Ofosu et al., 2020; Macháček, 2019), the operations continue to serve as an engine of especially low-skill employment not only in Ghana (Banchirigah, 2008) but also in other mineral-rich countries such as Mali (Teschner, 2014), Malawi (Kamlongera, 2011), and the Democratic Republic of the Congo (Gee-nen, 2012) etc. Revenues from the ASM sector have provided 'start up' capital for the establishment of other small-scale enterprises, financed education, and paid medical costs for many miners especially women (Maconachie, 2011, pp. 1064–1066). Funds from ASM have also facilitated smallholder agricultural activities. Indeed, in the ASM-agriculture complementarities cycle, there is an abundance of evidence showing a positive relationship between the two sectors (Fisher et al., 2019; Hilson and Garforth, 2012, 2013; Kamlongera, 2011; Maconachie and Binns, 2007; Mkodzongi and Spiegel, 2019; Ofosu et al., 2020; Okoh and Hilson, 2011; Persaud et al., 2017).

As indicated earlier, ASM operations can be destructive. The proliferation of the illegal land trading arrangements, and the consequential proliferation of illegal mining activities have been known to have negative consequences for the environment (Macháček et al., 2022; Ofosu et al., 2020) and for the production of major cash crops such as cocoa (Boateng et al., 2014; Snapir et al., 2017). Equally of concern, recent studies are beginning to portend a bleak future for agricultural production in general and cocoa production in particular due, largely, to climate change mechanisms (Ehiakpor et al., 2016; Hashmiu et al., 2022b; Savo et al., 2016). According to the findings by Hashmiu et al. (2022b), based on data gathered through household surveys and key informant interviews with over 408 household heads and 32 key informants in some farming communities in Ghana, cocoa production may not be the long-term crop choice for many farmers. According to the study, while market security has generally created a strong incentive for

¹ *Abunu* and *abusa* are the two major types of share-cropping contract in Ghana. Under *abunu*, the landowner and labourer divide returns equally between them. Under *abusa*, they split returns into thirds, with the labourer often getting two thirds and the landowner getting one (This may be more common where the labourer has had to clear and prepare land before farming it, for example (Nyame and Blocher, 2010).

² In this study, we use illegal/informal to refer to artisanal and small-scale miners who do not possess the requisite licence from government/official regulatory agencies.

cocoa farming, some farmers continue to exhibit risk aversion by avoiding or abandoning cocoa farming (Hashmiu et al., 2022b). The decision to farm cocoa is negatively predicted by perceptions of drought and the lack of money as the most severe risk factors of cocoa farming, and the lack of land ownership and social networking with cocoa farmers. Thus, currently, although the renewed interest in cocoa farming can be sustained, especially considering market uncertainties for alternative crops, this may not be the case in the long term. More households are likely to avoid or abandon cocoa farming if climate and food security risks should worsen as projected, and more so if the market for other food and cash crops is stabilised (Hashmiu et al., 2022b). In conjunction with risk factors such as climate change already posing significant challenges to cocoa production (Denkyirah et al., 2017; Ehiakpor et al., 2016), the expansion of the illegal mining frontier may further engender negative consequences for livelihoods dependent on the long-cherished cocoa sector.

Although studies have shown that ASM formalisation could be the panacea for curbing the environmental excesses of ASM operations and their consequential negative impact on agricultural production, the formalisation process has largely been poorly planned and uncoordinated (Byemba, 2020; Klein, 2022; Maconachie and Conteh, 2021; Spiegel, 2015; Weng and Margules, 2022). According to scholars, it has become almost impossible for individuals to secure the necessary paperwork and licences to participate in ASM because calls to simplify the licensing scheme for small-scale mining and to remove the burdensome costs linked to registration, which are seen as the main reasons why most individuals choose to operate illegally, have been ignored (Hilson et al., 2018, 2022; Hilson and Maconachie, 2020; Siwale and Siwale, 2017). In addition, government policy, over the years, has also prioritised the development of large-scale mining companies by providing an enabling environment, such as tax incentives, to attract foreign investment (Hilson, 2017, 2019; Sauerwein, 2020). This has also meant the release of vast concessions to large-scale mining companies, thereby denying local people access to mineral-rich areas suitable for small-scale mining. Displaced farmers and ASM operators have very limited options in the formal economy, and as a result, a majority are turning to illegal ASM or selling their lands to ASM operators (Hilson, 2017, 2019).

Studies have examined the ASM-agriculture nexus and its socio-economic implications for livelihoods especially in the rural mineral-rich economies (Hilson and Garforth, 2012; Ofosu et al., 2020; Okoh and Hilson, 2011). In doing so, these studies have mainly examined the nexus either in a markedly positive light (Hilson and Garforth, 2012; Mkodzongi and Spiegel, 2019) or a highly negative one (Boadi et al., 2016; Kitula, 2006). Hence, other dominant and emerging issues, such as, for example, the land purchasing strategies of miners and landowners, have largely remained as marginalia in the literature. In this sense, our study seeks to contribute to the empirical developments in the ASM-agriculture nexus. Seeking to (re)examine recent developments in this arena in relation to cocoa production, our findings particularly reveal that mining operators employ new 'coerced to sell' strategies in seeking to acquire lands from landowners. In addition, our findings suggest that landless miners get trapped in the 'riskier' ASM economy, while landowners diversify into non-agriculture incomes with adverse effects on the production of food.

The rest of the study is structured as follows. Following the introductory section, we present a detailed review of the dynamics between cocoa production and ASM especially in the Ghanaian context. After this, the methodology section underpinning the validity of our findings is highlighted. Next, the penultimate section presents our findings, while the final section offers discussion of the findings and a conclusion.

1.1. Cocoa production, and the *galamsey*

Ghana is the second largest producer (after Cote d'Ivoire) of cocoa in the world (Bymolt et al., 2018). According to reports, when the

Americas was replaced by West Africa as the leading cocoa-producing region in the 1920s, Ghana was the world's largest producer of cocoa (COCOBOD, 2022). Ghana's importance as a leading producer eventually peaked in the early 1930s, when it accounted for about 40 per cent of global production (Fold, 2002; Knudsen, 2007). Over the years, cocoa has been one of the country's most important sectors for employment generation and foreign exchange earnings, coming second after mineral exports (Abbadi et al., 2019; Danso-Abbeam et al., 2020). It is estimated that cocoa generates about US\$2.2 billion annually in foreign earnings to Ghana (Cocobod News, 2021, p.13). In 2017, for example, the estimates suggest that the country received about US\$ 2.71 billion from the export of cocoa (Abbadi et al., 2019, p.4).

Although cocoa production is predominantly a small-scale activity with the average farm size being between 2 and 4 ha, the importance of cocoa to the improvement in livelihoods has been well established (Hill, 1961; Knudsen, 2007; Roldan et al., 2013; Danso-Abbeam et al., 2020). The sector not only provides avenues of employment for smallholder farmers and temporary wage labourers in rural communities but also provides a means of sustenance for most people in urban areas, which function as locations for storage and transportation hubs (Knudsen, 2007). The contribution of cocoa production to household crop income and food security has also been extensively examined elsewhere (Graefe et al., 2017; Hashmi et al., 2022a). Some estimates suggest that over 6 million Ghanaians depend (in)directly on the sector for their livelihoods (Gockowski et al., 2011).

Across Ghana, the production of cocoa usually takes place in the forest areas including the regions of Ashanti and Brong (Bono), and the Western, Central, and Eastern regions (Bymolt et al., 2018). Coincidentally, however, these are the major areas where the rich gold-bearing rocks (minerals), suitable for both small- and large-scale mining activities, are located (Hilson, 2002). Thus, ASM activities and cocoa production usually share and/or compete for the same factor inputs, such as land and labour, in these areas (Boateng et al., 2014).

Despite the competition for resources, ASM, in some instances, has been considered to be a 'friend' of agricultural (cocoa) production. Funds from ASM have been known to facilitate smallholder agricultural activities including cocoa production (Hilson, 2011; Hilson and Garforth, 2012, 2013). A strand of literature casts the spotlight on the mining-farming complementarities that are shaping rural labour trajectories (Chigumira, 2018; Goetz, 2022; Pijpers, 2014; Teschner, 2014). The literature generally argues that agriculture has become an unviable livelihood option particularly due to interrelated processes of structural adjustment and de-agrarianisation and that for many people, especially in Africa, ASM has become an important element of their livelihood portfolios (Banchirigah, 2008; Fisher et al., 2019; Kamlongera, 2011; Persaud et al., 2017).

In practice, the working of small-scale mines and agricultural activities are seasonal in nature. ASM activities are usually undertaken in the dry season, while agricultural activities usually occur in the rainy season (Hilson and Van Bockstael, 2011; Ofofu et al., 2020). The reality, therefore, is that ASM activities can provide additional employment opportunities for agro-based labourers, including cocoa farmers, during their idle season (Chigumira, 2018; Ofofu et al., 2020). This phenomenon helps to curtail rural-urban migration.

Despite the complementarities/friendship between ASM and agricultural production, the environmental degradation mechanisms associated with ASM can make it a 'foe' of agriculture activities (Arthur et al., 2016; Ofofu et al., 2020). The negative land legacy of mining – abandoned pits, degraded lands – can render land unfit for agricultural purposes (Kitula, 2006). In the Geita mining district in Tanzania, for example, Kitula (2006) found numerous abandoned mine sites and pits in the farming-mining communities, with the negative effect on agriculture and livelihoods being that these mine pits not only make land unsuitable for agricultural activities following closure but also adversely affect livestock production (Kitula, 2006). Mantey et al. (2016) provided similar evidence from the Western Region of Ghana – a hotspot for ASM

and agricultural activities. This negative legacy of mining and the existence of a strong competition between rural farmers and small-scale miners over access to land, labour, and water has always negatively affected agricultural production, the more sustainable of the two industries. For example, the depletable and non-renewable nature of minerals makes ASM a short-term activity (Clifford, 2022; Ofofu et al., 2020). However, although cocoa trees may take some time (about 3–4 years) before bearing fruit, they have been known to produce fruits for about 30–50 years, thus making cocoa production a more reliable investment (Eberhard et al., 2022).

Following on from the above discussions, Ofofu et al. (2020) argued that the 'good' ASM-agriculture relationship should be interpreted with some caution. Their argument takes the following form: ASM booms trigger major population influxes (Bryceson and Jönsson, 2010; Okoh and Hilson, 2011) with negative consequences especially for the physical environment. Thus, farmer-miners who respond favourably to the 'good' relationship between ASM and agriculture may be those who do not live and have their farmlands in and around mining sites. This is a group referred to as 'lucky migrants'. They may even not have come from mineral-rich areas. Thus, it is convenient for them to travel to distant mining sites to engage in the activity (especially during the dry season) and go back to find their farms intact (during the wet season). With studies showing the high informality rate and the consequent environmental degradation associated with ASM, those who reside in the mining communities ('unlucky locals') who mostly suffer from farm invasions, and the wanton destruction of cocoa farms, for example, may view the complementarities differently. Thus, according to Ofofu et al. (2020), the ASM-agriculture complementarities may therefore be only partly true for non-mineral-rich areas where smallholder farmers do not have to deal with competing ASM interests.

As indicated earlier, studies have examined the negative environmental impacts of ASM on cocoa production (Boadi et al., 2016; Boateng et al., 2014; Eberhard et al., 2022), and the illegal land transactions that propagate ASM to the detriment of cocoa production (Boateng et al., 2014; Nyame and Blocher, 2010). In examining these transactions, however, the stories and the livelihood impact on the landless farmers who, though often caught in the middle of the land-trading transactions, have received very little attention. In addition, the newly emerging strategies of illegal ASM operators in terms of land acquisition, the diversification strategies, and the consequences thereof for miners and landowners after land-purchasing agreements, have not been thoroughly examined. Following the presentation of our methodology section, our study shines the spotlight on these issues.

1.2. Empirical research context

We developed our contribution in the context of the Ghana cocoa industry. Empirically, we chose Ghana's cocoa sector, given that the country is positioned as the world's second largest cocoa producer (Cocobod News, 2021), contributing approximately 800,000–1,000,000 tonnes of certified and conventional cocoa annually (Ghana Cocoa Board, 2019). Despite numerous attempts by the industry players to diversify Ghana's economy after the discovery of oil in recent years, the cocoa sector remains a pillar in the Ghanaian economy (Ghana Cocoa Board, 2019; Roldan et al., 2013).

The Eastern region, being the first 'cocoa frontier' (Bymolt et al., 2018, p.43), is still one of Ghana's cocoa 'breadbaskets'. The selected districts for this study were Atiwa, Atiwa West, and East Akim,³ which produce large amounts of cocoa in the Eastern region of Ghana. The Atiwa district is in the north-western part of the region. It shares a boundary with the Kwahu West municipality to the north, East Akim municipality to the south, Birim Central municipality district to the west, and Fanteakwa District to the east and south-west. The inhabitants

³ <http://ghanadistricts.gov.gh/Home/District/235>.

are predominantly farmers cultivating cocoa, oil palm, plantain, cassava, yams, and various vegetables, but cocoa and oil palm are the main cash crops. These districts have long been known for their involvement in agricultural activities, an activity that traditionally has engaged 80% of the population. In recent years, however, the dynamics of these districts—and the wider Eastern region, for that matter—have changed. Due to the region's endowments in gold, mining activities have become more pronounced, particularly in the West and East Akim Municipal areas and Atiwa district (Ghana districts, 2021). Thus, in the last two decades, the districts have seen an upsurge of artisanal and small-scale gold mining activities. Mining companies such as Bygus Mining Company, Bello Mining Company, Begudum Mining Company, Xtra Gold Resources Corporation, and MOS Mining Company have all emerged and are well identified as operating in the districts (Ghana districts, 2021).

2. Methods

Data for the study were collected over a six-month period, with semi-structured interviews utilized as the main data collection method. In each district, we interviewed some cocoa farmers who had sold their farmlands to artisanal miners, as well as interviewing landowners and artisanal miners. Some of the cocoa farmers interviewed were natives of the communities, and others had come from other regions (Northern, Upper West/East), settled in the Eastern region, and started engaging in cocoa farming through the *abunu* and *abusa* (crop sharing) system. Almost all landowners interviewed hailed from the community. However, all artisanal miners interviewed for this study were not natives of the communities. They were small-scale mining operators who were operating in the region. They buy cocoa farmlands and concessions from the landowners for mining activities. None of the cocoa farmers were below the age of 18, about 20% were within the age range of 30–35 years, while 80% of the cocoa farmers, landowners, and artisanal miners were in the age range of 35 years and above. Drawing on the demographic structure of the study area, it was revealed from the data that older people generally stay in the rural communities and the youth travel to the cities in search of greener pastures. This explains why 80% of the cocoa farmers and landowners were 35 years old or more.

A total of 39 interviews were conducted with cocoa farmers (20), landowners (10), artisanal miners (5), and officers of the Ghana Cocoa Board (4). In the semi-structured interviews, only 5 interviewees were females; they belonged to the cocoa farmers and landowners' groups. The artisanal miners and the Ghana Cocoa Board officials interviewed were all males. The reason for this gender disparity in the data among cocoa farmers and landowners is in line with the fact that, generally, women comprise only about 25% of those involved in cocoa production in Ghana, see for example (Danso-Abbeam et al., 2020). The industry, generally, is labour-intensive and is fully dominated by men due to the traditional agricultural practices, which most women do not have the strength to implement. The few women in cocoa production are also elderly, that is, generally aged over 50 years.

Interviews usually lasted 45–50 min and were digitally recorded and transcribed. In addition to the interview data, documentary evidence on artisanal mining in rural communities in Ghana, found on social media (YouTube),⁴ and some online publications, which are viewed as a rich source of insight (Adam and Healy, 2000), was added to supplement the interview transcriptions. These secondary sources helped to build up a solid baseline understanding of the various land trading arrangements that exist between landowners, artisanal miners, and smallholder cocoa farmers in Ghana. Tables 1 and 2 are summaries of the data collected and sources of the additional information retrieved for the inquiry.

Table 1
Summary of data collected.

No.	Actors	Number of actors interviewed
1	Cocoa farmers	20
2	Landowners	10
3	Artisanal Miners	5
4	Ghana Cocoa Board	4
5	Social media (YouTube videos)	2
	Total	41

Table 2
Other data sources and information retrieved.

No.	Data Source	Information retrieved
1	Social Media	Documentaries of cocoa farmland sales, land negotiations between artisanal miners and landowners/cocoa farmers.
2	(YouTube) Archival document (Ghana web)	Publications on artisanal miners taking over cocoa farmlands, COCOBOD reports on low cocoa production due to artisanal mining.

2.1. Data analysis

Given that our evidence emerged from multiple sources, we adopted two main steps in its analysis. The first phase entailed building a story from the perspectives of each participant (actor) regarding how cocoa farmers acquire the farmlands, crop-sharing agreements, farm sharing between the landowners and smallholder cocoa farmers, and transactional agreements between artisanal miners and landowners. After developing the narrative from each actor, we began to compare the stories between each actor and the linkages between them. During this stage, some actors were contacted again to help gain a better understanding of the trading arrangements in practice. We used an iterative approach to evidence analysis, constantly moving back and forth between the literature and fieldwork evidence in an attempt to develop a better understanding. The narratives from the chain actors—landowners, cocoa farmers, and artisanal miners - and the publicly available documents helped in developing how the arrangements in land acquisition, crop-sharing, land-sharing between landowners and cocoa farmers as well as the transactional agreements between landowners and artisanal miners emerge in practice.

3. Research findings

3.1. The sale of lands: the financial motivation

In line with some of the findings of, for example, Nyame and Blocher (2010), our findings confirm that the allure of an immediate lump sum of money persuades some landowners to sell their lands to *galamsey* operators. Confirming the 'agricultural poverty' syndrome (Hilson and Garforth, 2012), some landowner-farmers complained that the proceeds from their farms could barely meet their needs and sustain their livelihoods. An interview with a cocoa farmer, who was also a landowner, revealed that the long-term returns from cocoa production, in the face of rising inflation and high food prices, were unsustainable. He shared his opinion as follows:

I have worked as a cocoa farmer for over forty years and cannot even boast of Ghc (2000) a s my savings. Meanwhile, the price of everything keeps going up. Do you think this is how a man with a family should live? Your wife may not even respect you and your children will continue to live in penury if God does not intervene. So, when some miners decided to buy my farm and offered me Ghc 50,000, I took the money with both hands and feet and thanked them. They are now working on the land and have even employed one of my sons who used to work with me on the farm. I know they will destroy the

⁴ <https://www.youtube.com/watch?v=I0k3zzkFhG4>.

⁵ <https://youtu.be/UrpCbJBU40>.

land, but I don't care much. The land was not giving me anything substantial anyways.

Another landowner, who had sold his land and had become a sort of 'middle' man between *galamsey* operators and landowners, explained it this way:

I live with my wife and four children. Our main source of income was from this cocoa farm I inherited from my uncle. Although the price of a bag of cocoa was stable, the money I got kept depreciating because the price of everything kept going up. So, I found some miners and sold the land to them, and they gave me good money. Now I have an arrangement with the miners and scout for people who are willing to sell their lands to *galamsey* operators. I then get a share of the money from the transactions.

However, although some landowners were willing to sell their lands to the miners, we also found instances where landowners were forced to sell their lands. The following paragraphs attest to these facts.

3.2. The 'coerced to sell' phenomenon

As indicated above, the financial enticement had encouraged many miners to willingly sell their lands. However, we found evidence to indicate that not all the landowners were willing to sell the lands in the first instance. Nonetheless, proximity to sold lands and the negative effects of ASM – the 'unlucky locals' phenomenon (Ofosu et al., 2020) – had coerced the farmers to sell their lands. An ASM operator explained their strategy in the following words:

We don't just go to the farm and start degrading the lands in the search for gold. Any community we have visited, we first contact the chief of the community before we even contact the farmer or the landowner after inspection. The chief receives their portion of the financial transactions before we go into negotiation with the farmer and pay for the land. All transactions are agreed on before we start work on the farmland. Sometimes, farmers who are not in agreement we try to persuade them by paying huge sums of money for the land. Those 'recalcitrant' farmers and landowners who refuse to sell the farmlands, we set water pathways into their farms just to destroy the cocoa farm, so they can sell the farmland to us.

A farmer-landowner explained the situation in this way:

I did not want to sell my land because, personally, I despise *galamsey*. I have been to nearby towns and the destructive effects of *galamsey* have always been appalling. However, all the farms bordering my farm had been sold to *galamsey* operators. I went to my farm and discovered that the farm had been flooded by the water (tailings) from the *galamsey* sites. I then had no option but to sell the land to the miners.

Another farmer conveyed his experience as follows:

I observed that the activities of the illegal miners nearby had negative effects on my cocoa farm. The farm got flooded regularly by the tailings from the mining sites. I believe they use some chemicals in the mining operations. The leaves of the cocoa plants were getting yellowish, and the crops were wilting. When I confronted one of the managers of a neighbouring mine, he told me that they had acquired the land 'legally' from the landowner and therefore had the right to mine. Thus, if I felt aggrieved, that was my problem, not theirs. Afterwards, the mine manager contacted one of my uncles and asked him to talk to me so that I could sell the land to them. I contemplated and came to the realisation that I could lose my farm and land without compensation. I therefore sold the land to them.

Highlighting the scale of the problem and the mitigation mechanisms currently being deployed by the Ghana Cocoa Board, an official had this to say:

The cocoa sector has lost over 19,000 ha of cocoa farmlands to *galamsey* operations. Now some cocoa farmers even carry water from their homes to irrigate their farms due to how highly polluted our water bodies have become due to *galamsey* activities. We have started capacity building training through our extension officers and the cooperatives to ensure our farmers understand the consequences of the present activities. We have also introduced the village savings and loans scheme, which provides soft loans to support farmers. All these initiatives are to ensure they have financial freedom and desist from selling their cocoa farmlands to artisanal miners and continue to produce quality, certified, and sustainable cocoa for Ghana.

Our observations and interviews further revealed that these 'coerced to sell' strategies deployed by the miners had been occasioned, largely, by the use of heavy equipment in the mining operations. Most of the miners used equipment like tractors and bulldozers. The use of such equipment had made the mining operations highly immobile. Thus, unlike the farm invasion strategies, where the use of simple equipment made miners very mobile, the current deployment of heavy equipment had engendered a situation where the mining operators could easily be located and identified. The miners, therefore, not wanting to incur the wrath of the farmers and landowners, have resorted to ways by which they can either persuade or coerce landowners to sell their lands.

3.3. Caught in the middle: the plight of landless farmers

Ghanaian cocoa production is based on smallholder farmers; it mainly involves family labour but is also dependent on other migrant labour for the clearing of land, farm maintenance and harvest (Knudsen and Fold, 2011; Knudsen, 2007). The migrants and some other local farmers, being landless, mostly negotiate with the landowners for access to land. As indicated earlier, the farm produce is usually shared on an *abunu* or *abusa* basis. However, the agricultural poverty syndrome leading to the sale of lands has rendered most of these farmers vulnerable. In this sense, most farmers seek opportunities in the ASM sector. However, we found that as bad as the agricultural poverty could be, and as exciting as the farming-mining complementarities could be (Hilson and Garforth, 2012; Okoh and Hilson, 2011), once there is landlessness, the precarious nature of ASM does not seem to lead only to improvements to the livelihood of farmers. The experiences of some former famers, reinforcing the point made by Knudsen (2007) that migrants without access to land are more vulnerable in the rural farm sector, can be found in the sentences below:

There was no legal agreement between the landowner and myself twenty-two years ago when he gave the land to me. The landowner works for a government institution somewhere in the Central region and it was his younger brother in Accra who took charge of the land. All crop sharing was done by me. But last year, the landowner's brother came here and went round the farm just to inform me that they had a good offer and wanted to sell the land to an artisanal miner. The land was eventually sold and I was rendered landless. I had to survive however. So I sought employment at one of the mining sites. The work is laborious and 'dirty' and to tell you the truth, I would prefer working on my farm.

Another landless farmer-miner gave the following statement:

To be honest, cocoa farming is what brought me to settle in this community over five years ago. I have worked on several farms, but I don't own the lands. When my landlord decided to sell the land to the miners, we divided the harvested cocoa beans by three. The landlord took two, and I took one. I then decided to engage in this *galamsey* just to sustain myself and my nuclear family. But the work and the income that comes with it is no better than my farming work.

Another former farmer made the following observation:

The lands are now gone, and I got to understand that it would take time for these lands to come back to a state when we can farm on them again. The lands might not even be good for farming again in my lifetime. So, I joined the *galamsey* work, but it is not easy. I wouldn't say farming is easy, but this is worse for me. I had to work all day to be paid Ghc 30 or 35. Sometimes, the work stopped for about a month when there were rains, and there is no pay for us. I also know that this work will not be here for long. In about a year or less, they will be gone. In this case, what job am I going to do? Cocoa and food crop farming had at least sustained me for 20 plus years now.

3.3.1. Diversification strategies and the consequences thereof

Income diversification, investment, and the issue of profligacy have been examined in ASM settings (Ofosu and Sarpong, 2022; Walsh, 2003). The findings are mixed at best. While some miners do well to invest their incomes in other businesses, others do not, and they end up becoming vulnerable to economic hardship. These issues were also examined in relation to the land arrangements observed in this study. While some landowners were able to employ the money in other businesses to serve as platforms for wealth creation, others could not. Thus, having spent their money and lost their lands in a short space of time, they had become very vulnerable to economic hardship.

An interviewee (a native landowner) stated the following:

I received 'good' money after selling my land. I then started a building project with the money. I could, however, not complete the building, and the money is also now finished. I wouldn't say cocoa production was better because I was living on the barest minimum of income at best. I got employed at a mine site, but I left the job after a few days because the work was very tedious for me. Now it's very hard to find a job, and life is hard.

Another landowner shared his experience:

I couldn't do anything substantial with the money I received. There were so many family financial issues, and I had to settle them. In a way, at least I helped ease the financial burdens of some people. If this is what I can refer to as investments, fine. But there is no property I can boast of.

Some of the landowners had, however, been able to save and invest the monies realised from the sale of the lands. They spoke to the effect that the monies had served as a platform for 'wealth' creation.

I have been able to invest the money I received from the land sale in the transportation business. I initially bought a 'Pragia' (a motorcycle) and operated it myself. The business was good; thus, I saved and bought another one, which my sons now operate. In hindsight, I think it was best to sell my unproductive cocoa farm to the miners.

Here, we note that the diversification into non-agricultural incomes has implications for agricultural production and food security. Coupled with the land degradation menace in the mining communities, these diversification strategies had potentially resulted in food shortages and high food prices. In the long term also, the scale of exports of food and cash crops from these communities could be adversely affected. This became evident in an interview with one farmer:

My brother, most of the farmers, and landowners have sold their lands, and we are all now experiencing the negative effects. Those who sold their lands are now landless and are hunting for food. Now, we all have to go to other communities to buy cassava, plantain, and other crops. The food prices there are very high also.

4. Discussion and conclusion

The study notes that the issue of land tenure in relation to ASM

activities is challenging and problematic. Although ASM serves as an economic engine for most people in mineral-rich rural communities, its competition with agricultural production in terms of access to land continues to raise concerns in policy circles (Clifford, 2022; Ofosu et al., 2020). Due to the destructive mechanisms of illegal ASM on agriculture, some studies have tended to question the sustainability potential and how the sector can help realise some of the sustainable development goals set by the United Nations (Clifford, 2022).

However, it has been argued that the proliferation of illegal ASM, with its destructive tendencies, is linked to the 'mineral capture' policies by mining governance regimes (Larbi et al., 2004). These policies tend to favour large-scale mining developments leading to the displacement of local people from their land by large-scale mining companies (Hilson, 2017, 2019). In this storyline, the ASM sector is but a particularly powerful illustration of the disorder, corruption, and institutional weakness that characterise mineral and mining governance (Geenen, 2012; Siwale and Siwale, 2017). From this perspective, it has been argued that in most countries, the autochthones, who are usually the traditional or customary owners of mineralised lands, have attempted to resist the policies of mining governance regimes by either seeking to extract mineral reserves themselves, or engage in land selling arrangements with miners (Nyame and Blocher, 2010).

On the other hand, the potential for agricultural production to sustain livelihoods in rural communities has also been questioned. It has been highlighted that agriculture has become an unviable livelihood option particularly due to, for example, climate change (Hilson and Garforth, 2012; Bansah et al., 2023). Coupled with rising poverty, a high cost of living, and rising inflation, landowners have tended to engage in ASM production, or sell their lands to *galamsey* operators.

In this regard, the findings from this study, in keeping with similar findings, for example, Nyame and Blocher (2010), confirm that the allure of an immediate lump sum of money persuades some landowners to sell their lands to *galamsey* operators. Confirming the 'agricultural poverty' syndrome (Hilson and Garforth, 2012, 2013), some landowner-farmers highlight that the proceeds from their farms could barely meet their needs and sustain their livelihoods; thus, they prefer to sell their lands to mining operators. The land selling arrangements, however, seem to have negative consequences for the livelihoods of landless farmers, who are often caught in the middle of the arrangements. These land-selling arrangements set in motion a vicious cycle in terms of (un)employment. With the lands sold, and eventually rendered unsuitable for agricultural production, the local landless farmers are locked into the 'riskier' economy, i.e., the ASM economy with precarious consequences for livelihoods.

Here, it is worthwhile suggesting that to minimise the 'agriculture poverty' phenomenon, the Ghana Cocoa Board should continue to provide improved economic rewards for cocoa farmers, particularly for those who no longer see the industry as a profitable and viable livelihood activity. These incentives could continue to come in the form of, for example, an increment in the premium price of cocoa to the farmers.

Although our findings confirm that monies realised from the sale of lands could serve as a platform for 'wealth' accumulation, we acknowledge that this should be balanced with the environmental costs. Land degradation activities by miners reduce the availability of land for agricultural production, with implications for food security and potential macroeconomic effects through food price inflation; in the long term, this has adverse implications for scale of exports of cash crops and efforts to reduce hunger (ACET, 2017). Particularly, the 'coerced to sell' strategies currently deployed by some miners need serious attention. With agricultural production generally, and cocoa production in particular, already under stress due to climate change mechanisms, coercing farmers to sell their lands could have very serious implications for food and cash crop production. To address this issue, therefore, we agree with scholars that mining governance regimes, under formalisation schemes, would need to properly demarcate lands to accommodate ASM operations especially (Hilson, 2017; Hilson and Banchirigah, 2009; Hilson

et al., 2022).

The issues examined in this study again bring to the fore the case for the formalisation of ASM. As has been discussed extensively elsewhere, the *galamsey*-unfriendly policies, such as high licensing fees, bureaucratic formalisation procedures, and the lack of access to mineralised lands, have led to the proliferation of illegal ASM (Hilson, 2017; Siwale and Siwale, 2017) with the consequential environmental degradation problems. In this sense, although we do not seek to be repetitive, we reiterate that mining regulatory institutions would need to adopt *galamsey*-friendly policies aimed at reducing the licensing fees, and easing licensing procedures.

These formalisation mechanisms, however, ought not to be seen as the sole panacea for curbing the environmental excesses of illegal mining. It has been noted elsewhere that even formalised operators – those who have overcome the high licensing fees and bureaucratic barriers – do not necessarily practise good environmental remediation mechanisms (Botchwey et al., 2022). Thus, a key component that should capture the attention of mining officials, miners, and scholars seems to be remediation/reclamation of mine-degraded lands. Degraded lands must be given the necessary remediation/reclamation attention targeted at restoring the lands to productive use after mining has finished. Mining, whether formal or informal, legal or illegal, cannot be considered intrinsically bad; at least it serves as an employment avenue for the most poverty-stricken people who are mostly trapped in the rural economy. The problem with mining, therefore, stems, primarily, from the environmental ills that are associated with the mining operations. This is the issue that ought to be addressed. Fortunately, addressing these ills is not impossible; ASM-induced environmental degradation challenges are remediable (Dampsey et al., 2020; Ofori and Sarpong, 2023; Zavala, 2017). The ultimate responsibility, therefore, rests with mining regulatory institutions and miners to properly finance and remediate the land degradation problems generated by mining operations. In this sense, further studies could examine how the mining governance regime in Ghana is enacting policies and responding to reclamation/remediation mechanisms as a way of seeking to restore mining-degraded landscapes back to life.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

References

- Abbadi, S., Senadza, B., Lieuw-Kie-Song, M., Abebe, H., 2019. *Assessing the employment effects of processing cocoa in Ghana*. International Labour Organization, Geneva, Switzerland.
- ACET, 2017. *The impact of expanding artisanal and small-scale mining on small holder agriculture in West Africa. A case study of Burkina Faso, Ghana and Sierra Leone*. African Center for Economic Transformation. Ford Foundation.
- Adam, F., Healy, M., 2000. *Practical Guide to Postgraduate Research in the Business Area*. Blackhall Publishing, New Jersey.
- Arthur, F., et al., 2016. Nexus between artisanal and small-scale gold mining and livelihood in Prestea mining region. Ghana. *Geography Journal*, 2016.
- Arthur-Holmes, F., Busia, K.A., Vazquez-Brust, D.A., Yakovleva, N., 2022. Graduate unemployment, artisanal and small-scale mining, and rural transformation in Ghana: what does the 'educated' youth involvement offer? *J. Rural Stud.*, 95125–95139.
- Arthur-Holmes, F., Abrefa Busia, K., 2021. Occupying the fringes: the struggles of women in artisanal and small-scale gold mining in rural Ghana—evidence from the prestea-huni valley municipality. *Gen. Issues* 38 (2), 156–179.
- Arthur-Holmes, F., Abrefa Busia, K., 2022. Women, North-South migration and artisanal and small-scale mining in Ghana: motivations, drivers and socio-economic implications. *Extr. Ind. Soc.*, 101076
- Aubynn, A., 2009. Sustainable solution or a marriage of inconvenience? The coexistence of large-scale mining and artisanal and small-scale mining on the Abooso Goldfields concession in Western Ghana. *Resour. Pol.* 34 (1–2), 64–70.
- Banchirigah, S.M., 2008. Challenges with eradicating illegal mining in Ghana: a perspective from the grassroots. *Resour. Pol.* 33 (1), 29–38.
- Banchirigah, S.M., 2006. How have reforms fuelled the expansion of artisanal mining? Evidence from sub-Saharan Africa. *Resour. Pol.* 31 (3), 165–171.
- Bansah, K.J., et al., 2023. Climate induced transformation of agriculture to artisanal mining economy in dry regions. *J. Rural Stud.* 9911–9919.
- Boadi, S., et al., 2016. An analysis of illegal mining on the Offin shelterbelt forest reserve, Ghana: implications on community livelihood. *Journal of Sustainable Mining* 15 (3), 115–119.
- Boafo, J., et al., 2019. Illicit Chinese small-scale mining in Ghana: beyond institutional weakness? *Sustainability* 11 (21), 5943.
- Boateng, D.O., et al., 2014. Impact of illegal small scale mining (Galamsey) on cocoa production in Atiwa district of Ghana. *Int. J. Appl. Agric. Res.* 289–299.
- Botchwey, G., Nest, M., D'Emidio, R., 2022. Working with legal small-scale miners: Implications for development. *Journal of International.*
- Bryceson, D.F., 1996. Deagrarianization and rural employment in sub-Saharan Africa: a sectoral perspective. *World Dev.* 24 (1), 97–111.
- Bryceson, D.F., 2002. The scramble in Africa: reorienting rural livelihoods. *World Dev.* 30 (5), 725–739.
- Bryceson, D.F., Jönsson, J.B., 2010. Gold digging careers in rural East Africa: small-scale miners' livelihood choices. *World Dev.* 38 (3), 379–392.
- Byemba, G.K., 2020. Formalization of artisanal and small-scale mining in eastern Democratic Republic of the Congo: an opportunity for women in the new tin, tantalum, tungsten and gold (3TG) supply chain? *Extr. Ind. Soc.* 7 (2), 420–427.
- Bymolt, R., Laven, A., Tyzler, M., 2018. Demystifying the cocoa sector in Ghana and Côte d'Ivoire. The Royal Tropical Institute (KIT, Amsterdam, The Netherlands).
- Campbell, B., Clapp, J., 1995. Guinea's economic performance under structural adjustment: importance of mining and agriculture. *J. Mod. Afr. Stud.* 33 (3), 425–449.
- Campion, B.B., Acheampong, E., 2014. The chieftaincy institution in Ghana: causers and arbitrators of conflicts in industrial Jatropha investments. *Sustainability* 6 (9), 6332–6350.
- Chigumira, E., 2018. Political ecology of agrarian transformation: the nexus of mining and agriculture in Sanyati District, Zimbabwe. *J. Rural Stud.* 61265–61276.
- Clifford, M.J., 2022. Artisanal and small-scale mining and the sustainable development goals: why nobody cares. *Environ. Sci. Pol.* 137164–137173.
- Cocobod News, 2021. COCOBOD Joins fight against illegal mining; proposes GH¢ 3million as compensation to cocoa farmers. https://cocobod.govt.govt.govt/resource_files/cocobod-news-april-2021.pdf. (Accessed 10 October 2022).
- Cocobod, 2022. The Ghana Cocoa Story. <https://cocobod.govt.govt.govt/cocoa-story>. (Accessed 10 October 2022).
- Crawford, G., Botchwey, G., 2017. Conflict, collusion and corruption in small-scale gold mining: Chinese miners and the state in Ghana. *Commonwealth Comp. Polit.* 55 (4), 444–470.
- Dampsey, F.G., et al., 2020. Soil properties and biomass attributes in a former gravel mine area after two decades of forest restoration. *Land* 9 (6), 209.
- Danso-Abbeam, G., et al., 2020. Gender differentials in technical efficiency of Ghanaian cocoa farms. *Heliyon* 6 (5), e04012.
- De Jong, T.U., Sauerwein, T., 2021. State-owned minerals, village-owned land: how a shared property rights framework helped formalize artisanal diamond miners in Côte d'Ivoire between 1986 and 2016. *Resour. Pol.*, 70101920
- Denkyirah, E.K., et al., 2017. What are the drivers of cocoa farmers' choice of climate change adaptation strategies in Ghana? *Cogent Food Agric.* 3 (1), 1334296.
- Eberhard, E.K., et al., 2022. Livelihood Considerations in Land-Use Decision-Making: Cocoa and Mining in Ghana. *World Development Perspectives*, 26100417.
- Ehiakpor, D.S., et al., 2016. Cocoa farmer's perception on climate variability and its effects on adaptation strategies in the Suaman district of western region, Ghana. *Cogent Food Agric.* 2 (1), 1210557.
- Fisher, R., et al., 2019. Artisanal and small-scale mining and rural livelihood diversification: the case of manganese extraction in West Timor, Indonesia. *Extr. Ind. Soc.* 6 (1), 229–240.
- Fold, N., 2002. Lead firms and competition in 'Bi-polar' commodity chains: grinders and branders in the global cocoa-chocolate industry. *J. Agrar. Change* 2 (2), 228–247.
- Geenen, S., 2012. A dangerous bet: the challenges of formalizing artisanal mining in the Democratic Republic of Congo. *Resour. Pol.* 37 (3), 322–330.
- Ghana Cocoa Board, 2019. 50th Annual Reports and Consolidated Financial Statements. https://cocobod.govt.govt.govt/resource_files/50th-annual-report-and-financial-statements-2018-2019.pdf. (Accessed 10 October 2022).
- Gockowski, J., et al., 2011. Increasing income of Ghanaian cocoa farmers: is introduction of fine flavour cocoa a viable alternative. *Q. J. Int. Agric.* 50 (892–2016–65197), 175–200.
- Goetz, J.M., 2022. What do we know about rural and informal non-farming labour? Evidence from a mixed methods study of artisanal and small-scale mining in Northwest Tanzania. *World Dev.*, 158106012
- Graefe, S., et al., 2017. Evaluating farmers' knowledge of shade trees in different cocoa agro-ecological zones in Ghana. *Hum. Ecol.* 45321–45332.
- Hashmiu, I., et al., 2022a. Cash crops and food security: evidence from smallholder cocoa and cashew farmers in Ghana. *Agric. Food Secur.* 11 (1), 12.
- Hashmiu, I., et al., 2022b. Determinants of crop choice decisions under risk: A case study on the revival of cocoa farming in the Forest-Savannah transition zone of Ghana. *Land Use Policy*, 114105958.
- Hill, P., 1961. The migrant cocoa farmers of southern Ghana. *Africa* 31 (3), 209–230.
- Hilson, G., 2011. Artisanal mining, smallholder farming and livelihood diversification in rural Sub-Saharan Africa: an introduction. *J. Int. Dev.* 23 (8), 1031–1041.

- Hilson, G., et al., 2022. Brick by brick, block by block: building a sustainable formalization strategy for small-scale gold mining in Ghana. *Environ. Sci. Pol.* 135207–135225.
- Hilson, G., 2002. Harvesting mineral riches: 1000 years of gold mining in Ghana. *Resour. Pol.* 28 (1–2), 13–26.
- Hilson, G., et al., 2018. Opportunity or necessity? Conceptualizing entrepreneurship at African small-scale mines. *Technol. Forecast. Soc. Change* 131286–131302.
- Hilson, G., 2017. Shootings and burning excavators: some rapid reflections on the government of Ghana handling of the informal galamsey mining ‘menace’. *Resour. Pol.* 54,109–116.
- Hilson, G., 2019. Why is there a large-scale mining ‘bias’ in sub-Saharan Africa? *Land Use Pol.* 81852–81861.
- Hilson, G., Banchirigah, S.M., 2009. Are alternative livelihood projects alleviating poverty in mining communities? Experiences from Ghana. *J. Dev. Stud.* 45 (2), 172–196.
- Hilson, G., Garforth, C., 2012. ‘Agricultural poverty’ and the expansion of artisanal mining in Sub-Saharan Africa: experiences from Southwest Mali and Southeast Ghana. *Popul. Res. Pol. Rev.* 31 (3), 435–464.
- Hilson, G., Garforth, C., 2013. ‘Everyone now is concentrating on the mining’: drivers and implications of rural economic transition in the eastern region of Ghana. *J. Dev. Stud.* 49 (3), 348–364.
- Hilson, G., Maconachie, R., 2020. Entrepreneurship and innovation in Africa’s artisanal and small-scale mining sector: developments and trajectories. *J. Rural Stud.* 78149–78162.
- Hilson, G., Potter, C., 2005. Structural adjustment and subsistence industry: artisanal gold mining in Ghana. *Dev. Change* 36 (1), 103–131.
- Hilson, G., Van Bockstael, S., 2011. Diamond mining, rice farming and a ‘maggi cube’: a viable survival strategy in rural Liberia? *J. Int. Dev.* 23 (8), 1042–1053.
- Hirons, M., 2014. Decentralising natural resource governance in Ghana: critical reflections on the artisanal and small-scale mining sector. *Futures* 6221–6231.
- Kamlongera, P.J., 2011. Making the poor ‘poorer’ or alleviating poverty? Artisanal mining livelihoods in rural Malawi. *J. Int. Dev.* 23 (8), 1128–1139.
- Kitula, A.G.N., 2006. The environmental and socio-economic impacts of mining on local livelihoods in Tanzania: a case study of Geita District. *J. Clean. Prod.* 14 (3–4), 405–414.
- Klein, B.I., 2022. Local institutions and artisanal mining: governance forms in the goldfields of Madagascar. *J. Rural Stud.* 92269–92283.
- Knudsen, M.H., 2007. Making a living in the cocoa frontier, Western Ghana: diversifying incomes in a cocoa economy. *Geografisk Tidsskrift-Danish Journal of Geography* 107 (2), 29–44.
- Knudsen, M.H., Fold, N., 2011. Land distribution and acquisition practices in Ghana’s cocoa frontier: the impact of a state-regulated marketing system. *Land Use Pol.* 28 (2), 378–387.
- Larbi, W.O., et al., 2004. Compulsory land acquisition in Ghana—policy and praxis. *Land Use Pol.* 21 (2), 115–127.
- Macháček, J., Schlossarek, M., Lindagato, P., 2022. The livelihood of artisanal and small-scale miners and awareness of the use of 3T minerals in Rwanda—a case study in the rutsiro district: a qualitative assessment. *Int. J. Environ. Res. Publ. Health.*
- Macháček, J., 2019. Typology of environmental impacts of artisanal and small-scale mining in African Great Lakes region. *Sustainability* 11 (11), 3027.
- Maconachie, R., Binns, T., 2007. ‘Farming miners’ or ‘mining farmers’?: diamond mining and rural development in post-conflict Sierra Leone. *J. Rural Stud.* 23 (3), 367–380.
- Maconachie, R., Conteh, F., 2021. Artisanal mining policy reforms, informality and challenges to the Sustainable Development Goals in Sierra Leone. *Environ. Sci. Pol.* 11638–11646.
- Mantey, J., et al., 2016. Costed reclamation and decommissioning strategy for galamsey operations in 11 selected MDAs of. International Growth Centre.
- Mensah, L., 2021. Legal pluralism in practice: critical reflections on the formalisation of artisanal and small-scale mining (ASM) and customary land tenure in Ghana. *Extr. Ind. Soc.* 8 (4), 100973.
- Mkodzongi, G., Spiegel, S., 2019. Artisanal gold mining and farming: livelihood linkages and labour dynamics after land reforms in Zimbabwe. *J. Dev. Stud.* 55 (10), 2145–2161.
- Nyame, F.K., Blocher, J., 2010. Influence of land tenure practices on artisanal mining activity in Ghana. *Resour. Pol.* 35 (1), 47–53.
- Odiije, E.M., 2016. Diminishing returns and agricultural involution in Côte d’Ivoire’s cocoa sector. *Rev. Afr. Polit. Econ.* 43 (149), 504–517.
- Ofofu, G., et al., 2020. Socio-economic and environmental implications of Artisanal and Small-scale Mining (ASM) on agriculture and livelihoods. *Environ. Sci. Pol.* 106210–106220.
- Ofofu, G., Sarpong, D., 2023. Defying the gloom: in search of the ‘golden’ practices of small-scale mining operations. *Environ. Sci. Pol.* 13962–13970.
- Ofofu, G., Sarpong, D., 2022. Mineral exhaustion, livelihoods and persistence of vulnerabilities in ASM settings. *J. Rural Stud.* 92154–92163.
- Okoh, G., Hilson, G., 2011. Poverty and livelihood diversification: exploring the linkages between smallholder farming and artisanal mining in rural Ghana. *J. Int. Dev.* 23 (8), 1100–1114.
- Otsuka, K., et al., 2003. Land tenure and the management of land and trees: the case of customary land tenure areas of Ghana. *Environ. Dev. Econ.* 8 (1), 77–104.
- Persaud, A.W., et al., 2017. Artisanal and small-scale gold mining in Senegal: livelihoods, customary authority, and formalization. *Soc. Nat. Resour.* 30 (8), 980–993.
- Pijpers, R., 2014. Crops and carats: exploring the interconnectedness of mining and agriculture in Sub-Saharan Africa. *Futures* 62, 32–39.
- Roldan, M.B., et al., 2013. From producers to export markets: the case of the cocoa value chain in Ghana. *Journal of African Development* 15 (2), 121–138.
- Sauerwein, T., 2020. Gold mining and development in Côte d’Ivoire: Trajectories, opportunities and oversights. *Land Use Policy*, 91104323.
- Savo, V., et al., 2016. Observations of climate change among subsistence-oriented communities around the world. *Nat. Clim. Change* 6 (5), 462.
- Siwale, A., Siwale, T., 2017. Has the promise of formalizing artisanal and small-scale mining (ASM) failed? The case of Zambia. *Extr. Ind. Soc.* 4 (1), 191–201.
- Snafir, B., et al., 2017. Mapping the expansion of galamsey gold mines in the cocoa growing area of Ghana using optical remote sensing. *Int. J. Appl. Earth Obs. Geoinf.* 58225–58233.
- Spiegel, S.J., 2015. Shifting formalization policies and recentralizing power: the case of Zimbabwe’s artisanal gold mining sector. *Soc. Nat. Resour.* 28 (5), 543–558.
- Teschner, B.A., 2014. “Orpillage pays for everything”: how artisanal mining supported rural institutions following Mali’s coup d’état. *Futures* 62140–62150.
- Van Bockstael, S., 2019. Land grabbing “from below”? Illicit artisanal gold mining and access to land in post-conflict Côte d’Ivoire. *Land Use Pol.* 81904–81914.
- Walsh, A., 2003. ‘Hot money’ and daring consumption in a northern Malagasy sapphirine-mining town. *Am. Ethnol.* 30 (2), 290–305.
- Weng, L., Margules, C., 2022. Challenges with formalizing artisanal and small-scale mining in Cameroon: understanding the role of Chinese actors. *Extr. Ind. Soc.*, 9101046.
- Zavala, G.F., 2017. The golden practices that defy gloom. International Institute for Environment and Development.