UNIVERSITY OF CAPE COAST

EFFECTS OF SAND WINNING ON THE LIVELIHOOD OF FOOD CROP FARMERS IN THE AYENSUANO DISTRICT, GHANA

SENA KWAME KOM

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BY

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Thesis submitted to the Department of Geography and Regional Planning of the Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirement for the award of Master of Philosophy degree in Geography

SEPTEMBER 2024

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature…….. Date…….

Name: Sena Kwame Kom

Supervisor's Declaration

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

Supervisor's Signature……. Date……

Name: Mr Paul Baidoo

ABSTRACT

Fertile agriculture lands are degraded continuously by sand winners in several communities. This study therefore, examined the effects of sand winning on the livelihood of food crop farmers in Ayensuano District, Ghana. In this study, a mixed method research technique was used. Specifically, the explanatory sequential research constituted the study design. A sample of 316 respondents took part in the study. An interview schedule, interview guide, and an observation checklist were utilised in the collection of data. Quantitative data was analysed using descriptive statistics, binary logistic regression, linear regression and Pearson chi-square test of independence whiles a thematic analysis was performed on the qualitative data. The study discovered that majority of farmers had their farmlands reduced, and some had lost all of their farmlands. It also emerged that air pollution is on the rise as a result of the dust produced by moving trucks loaded with sand since the communities are not tarred. Besides, the study also found out that constructional related activities and petty trading were the new livelihood activities engaged in by the people. It is suggested that the Physical Planning Department of the District Assembly should work together with land owners and opinion leaders in each of the communities to develop local plans to earmark specific areas for sand winning ensuring that people's farms are not destroyed whiles households or farmers should start engaging in more non-farm livelihood activities in order to sustain their livelihood.

KEYWORDS

Sand winning

Livelihood

Farmers

Food production

Health

Ayensuano

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DEDICATION

To my parent Mr and Mrs Kom

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LIST OF ABBREVIATIONS

DFID	Department for International Development
GSS	Ghana Statistical Service
GSSP	Ghana Strategy Support Programme
IFPRI	International Food Policy Research Institute
IRB	Institutional Review Board
MoFA	Ministry of Food and Agriculture
NGOs	Non-Governmental Organisation
PIPs	Policies, Institution and Processes
SDGs	Sustainable Development Goals
SL	Sustainable Livelihood
SPSS	Statistical Product and Service Solution
SRID	Statistics, Research and Information Directorate
UNEP	United Nations Environment Programme

CHAPTER ONE

INTRODUCTION

The first chapter covers the background of the study, statement of the problem, the general objective, specific objectives, research questions, significance of the study, delimitations, limitations, definition of terms and organisation of the study.

Background to the Study

Globally, people are fighting to have and maintain a sustainable livelihood. The theory of sustainable livelihood offers a framework for examining and modifying the lives of people who are impoverished and disadvantaged. It is a collaborative approach founded on the understanding that every individual possesses resources and skills that may be enhanced to help them live better lives (May et al., 2009). The Department for International Development (DFID, 2000), describes livelihood as resources available for use as well as activities undertaken for the survival of individuals and households. Simply put, it is the means by which people make a living. These means could be ones' capabilities, assets, income and activities required to secure the basic needs of life. A livelihood is considered sustainable if it can withstand and bounce back from shocks and strains, preserve or improve its resources and capacities, and avoid jeopardizing the foundation of natural resources (Chambers & Conway, 1992). Assets, which can be natural resources such as land, water, agriculture, livestock among others are very important in the sustainability of livelihood.

Land is important to our livelihoods and is the building block for access to other rights and services (May et al., 2009). It serves multiple

purposes including agricultural livelihoods and construction activities such as sand winning. The increasing demand for land for residential, industrial, commercial and sand winning purposes has led to conversion of many agricultural lands in rural and peri-urban areas (Abdulai, 2020). These multiple purposes sometimes conflict and to a large extent depriving people of their livelihood, requiring that appropriate rules and regulations are put in place to minimize the conflict and to ensure sustainable usage of the land. Foresti et al. (2007) believe that in order to meet the needs of those affected, the state, private organizations, and people must balance competing interests in a way that upholds human rights. This places emphasis on the institutional theory, which contends that a society must initiate the legal institutional process in order to establish rules that will govern people's behaviour and the state's behaviour in a way that is acceptable (Scott, 2004).

Agriculture is one of the major assets that serve as a source of livelihood for many people globally (Davis et al., 2017). Aside being the main source of food and raw materials, agriculture also provides employment opportunities for a large population of people globally (Rehman, 2022). The industry remains one of the biggest sources of employment in many areas. In developing countries like Ghana, it helps reduce the high rates of unemployment (Rehman, 2022). The agricultural industry has been under pressure due to many factors including climate change and sand winning among others (Adjei, 2010).

Sand winning involves the scooping of the solid earth such as sand and gravel using machines or manpower for the purposes of building, construction and other developmental projects (Sadick et al., 2018). Virtually all

construction activities depend on sand and gravels among others (Abu & Peprah, 2020). Universally, the surge in urbanization and the requirement for countries to make available modern infrastructure for their citizens has led a high demand for sand beyond its natural replenishing rate (UNEP, 2019). Aside contributing to a nation's infrastructure development, it also serves as a source of livelihood to others including the sand winners and the land owners. Globally, people are being influenced to go into sand winning on a daily basis (Kibet, 2014). Despite its benefits, sand winning is causing many devastating effects on agricultural lands in many parts of the world (Sekhar & Jayadev, 2003; Ashraf et al., 2011; Peprah, 2013; Sowunmi et al., 2023). Sand mining has the potential to lower agricultural lands' productivity levels, according to the United Nations Environmental Programme (UNEP, 1992).

In Ghana, majority of the sand used for building projects comes from coastal, forest, and agricultural areas across the nation (Mensah, 1997; Peprah, 2013). This causes the devastation of both agricultural and non-agricultural lands as well as vegetation (Hedge, 2011; Aromolaran, 2012). The sand winners' operations have a direct bearing on land degradation, especially when it comes to gathering and devastation of topsoil, which is essential for farmers' crops and the growth of normal vegetation (Peprah, 2013).

This results in land loss thereby depriving the landholders/owners access to their indigenous resources like land. This goes against the entitlement theory, which holds that people's ability to acquire food is dependent on their endowment sets, such as agricultural land. Hence, the inability to secure land for production, for sale or consumption may result in entitlement failure and deprivation. (Sen, 1981; Musolino & Nucera, 2016).

This directly poses threat to the success of the Sustainable Development Goals 1 and 2, which states No Poverty, and Zero Hunger respectively. In Wa, (Upper West Region, Ghana) for example, where sand winning has been identified as one of the major threats to agriculture land and crop production, some households have completely stopped farming while others have been reported to continue farming for varied reasons aside other non-agricultural activities (Abdulai, 2020).

Ayensuano district in the Eastern region of Ghana is bedevilled with sand winning activities. Moving through the district, one could see many abandoned winned sites left unreclaimed. The district remains one of the food baskets (Otoo, 2021) of the country with about 81 % households of the population being farmers (Ghana Statistical Service, 2014). A preliminary interaction with the indigenes revealed that sand winning has been going on for quite some time now with no proper remedy from the opinion leaders (Personal communication). There is no systematically documented literature on the situation. Search on sand winning in Ayensuano district only resulted in a report presented to the Parliament of Ghana in 2017 stating the devastating effect of the menace on developmental growth of the district. Other information found were some news items that were reported by journalists from some news agencies in Ghana including starrfm.com.gh (Ansah, 2020) and Onuafm/3news.com (Otoo, 2021) on the devastative effect of sand winning on people's farms. The situation needs urgent attention to avert any further disaster in order to sustain food security as well as farmers' livelihood.

Statement of the Problem

The agricultural sector remains a dominant employer of labour particularly in rural Ghana (Ghana Statistical Service 2014). According to Annoh-Dompreh (2017) agriculture remains the major source of employment in Ghana, engaging over 60% of the population. It serves as the main source of livelihood for the rural populations. Both men and women engage in farming activities basically to build their livelihoods and/or generate income for their survival. Farm laborers and others who depend on these fields for their survival lose their jobs as a result of sand miners' degradation of agricultural lands and damage to farm roads (Hoering, 2008; Viswanathan, 2002).

The activities of sand winning pose severe environmental and socioeconomic challenges to many developing nations (Alhassan, 2010). Despite serving as a source of livelihood and income for many people (Salifu, 2016), it's devastating effect on the environment and livelihood of others, including farmers, cannot be overlooked. The activity often results in land degradation through deterioration of the soil profile, ruin of soil surface configuration and changes in land topography, rendering farmlands unsuitable for cultivation (Wainaina et al., 2021). The agricultural sector is one of the areas typically affected by this mining activity. When soils are exposed due to the destruction of vegetation through sand winning, among others, leaching of soil nutrient and acidification occurs. When the soil dries out, it may shrink and become unsuitable for productive farming or plant growth (Frimpong, 2015).

The negative effect of sand winning on livelihood of farmers is of global concern. For instance, hundreds of people in Kerala's Alappuzha Coast who depend on the area for rice cultivation and the coastal coconut trees for their survival have lost their jobs as a result of sand winning (Salifu, 2016). The situation is not different in Ghana. Abdulai (2020) reported that the activities of sand winners in Wa (Upper West Region) had devastated farmlands, making it impossible for farmers to cultivate there because the top soil has been scooped away, leaving the area unsuitable for farming. This led to a drastic decrease in farmlands. This will definitely impact the livelihood of the farmers in this area, forcing them to develop other livelihood strategies that do not depend on the forest or farmlands.

When people's sources of livelihoods are in danger, they often create adaptive methods to better their situation over time and coping mechanisms to deal with the shocks in the short term. Some farmers may turn to nonfarm activities to be able to still sustain their livelihoods whiles others may migrate to neighbouring communities to acquire new lands to continue farming. Arthur & Benediktsson (2016) reported that some farmers in Golinga, Northern Ghana, whose lands have been destroyed through sand winning, in search for greener pastures, migrate to neighbouring villages to continue farming or to Tamale to take up trading to still sustain their livelihood.

Indiscriminate sand winning is seriously going on in the Ayensuano district, Eastern region, and it is one of the significant problems impeding the growth and development of the district (Annoh-Dompreh, 2017). The district remains one of the food baskets of the country. Farmlands which serve as the main asset of livelihood to majority of the inhabitants of the district are

gradually being destroyed through sand winning activities. Complaints about illegal sand winning in the district have been in the news for some time now. Kojo Ansah of starrfm.com.gh on 12th January, 2020 reported on illegal sand winners entering communities in Anfaso- Ayensuano district and spoiling crops of farmers with impunity. The report indicates that sand winners even go to the extent of employing the services of land guards unleashing terror on farmers and scaring them from their farms. Maxwell Otoo of Onua Fm on 23rd December, 2021 also reported of hundreds of farmers in Makro Maase a suburb of Asuboi in the Ayensuano district losing their residences and farmlands to unlawful sand winning activities. This activity clearly poses serious danger to agriculture and can cripple food production in the district.

Despite these activities clearly going on in the district, the communities and other stakeholders fail to implement appropriate actions intended to salvage the land following the sand winning. This is ruining the serenity of the district. The delay in action, however, can be due to lack of research in the district that systematically examines the level of awareness of sand winning activities by stakeholders, the consequences of sand winning on livelihoods of food crop farmers, the environment, as well as assess the roles and challenges of the local authorities and other stakeholders.

Purpose of the Study

The main purpose of this study was to examine the effect of sand winning on the livelihood of food crop farmers in the Ayensuano District

Objectives

The specific objectives are to:

1. examine the awareness of stakeholders on sand winning activities in the district
2. assess the perception of the food crop farmers on the effect of sand winning activities on their respiratory health
3. explore the socioeconomic impact of sand winning activities on the lives of food crop farmers
4. investigate any new livelihood strategies employed by the stakeholders

Research questions

1. What is the awareness of stakeholders on sand winning activities in the district?
2. How does sand winning activities affect the respiratory health of the food crop farmers?
3. To what extent does sand winning affect the socio-economic situation of food crop farmers?
4. What are the new livelihood strategies employed by the stakeholders?

Hypothesis

The research hypothesis to be tested will be based on how the respiratory health and the socioeconomic status of food crop farmers are affected by sand winning. The hypotheses hence are related to objectives 2 and 3. The null hypotheses state that

H_0: There is no statistically significant relationship between sand winning and the respiratory health of the food crop farmers

H_0: There is no statistically significant relationship between sand winning and the socioeconomic status of food crop farmers

Significance of the Study

The researcher hopes that by exploring the nuances and gaining a deeper understanding of the opportunities and challenges that sand winning presents for food crop farmers, other researchers will be inspired to push the boundaries of discussions about how farmlands are turned into sand winning sites. Primarily, the research is intended to enhance comprehension of how sand winning is affecting the livelihood of food crop farmers in the Ayensuano District where farming is the primary occupation for the majority of the population. Furthermore, the research intends to examine the awareness of stakeholders on sand winning activities in the district. Adequate knowledge of stakeholders with regards to sand winning issues in the district will help to design suitable policies and regulations to help regulate sand winning challenges. Also, the study looks at the effect of sand winning on respiratory health as well as the impact of sand winning on the socioeconomic situation of the food crop farmers. This study will supply crucial evidence to the Ministry of Food and Agriculture to enable them plan, develop, and implement strategies and sustainable programmes to rejuvenate agriculture as a whole.

This will also help the food crop farmers to come up with appropriate farming methods that could help improve upon food production in the midst of sand winning as well as the new livelihood strategies they will employ in order to improve upon their livelihood. The study will be important for agriculture development, and help to shape policies on sand winning and food

crop production in the district. The results will also guide future investigations into the impact of sand winning on food crop farmers.

Delimitation

Thematically, this thesis concentrates on the effect of sand winning on the livelihood of food crop farmers. The thesis specifically captures the awareness of stakeholders with regards to sand winning activities in the district, the effect of sand winning on the respiratory health of the food crop farmers, the socioeconomic impact of sand winning on the livelihood of food crop farmers as well as the new livelihood strategies employed by the food crop farmers.

Geographically, this study was limited to Ayensuano District. It focuses on Ayensuano because it has witnessed significant destruction of farmland over the years. The target population was household heads who are food crop farmers in selected communities in the district. It also includes a representative of MoFA, a representative of the district Assembly, an Assembly member and a health worker.

Limitations

The study made use of information derived from farmers' self-assessment. Information about awareness, respiratory effect of sand winning, socio-economic issues as well as new livelihood issues resulted from farmer's opinions, perceptions, experiences and practices on the field since proper records were not kept by these food crop farmers.

Definition of Terms

Food crop farmers refers to farmers who engage in the production of crops such as maize, cassava, cocoyam and plantain.

Livelihood refers to the assets people draw on in order to make a living.

Taskforce is a group of people selected to protect illegal sand winning activities.

Sand winning refers to the scooping of the top soil for construction purposes.

Organization of Study

The study is divided into five chapters. The first chapter is an introduction that covers the study's background, problem statement, general objective, specific objectives, research questions, significance, delimitation, and limitations. The relevant theoretical, conceptual and empirical frameworks of the study are dealt with in chapter two. Chapter three constitutes the methodology which includes research philosophy, research approach, research design, study area, target population, sample and sampling procedure, research instrument, data collection procedure, data processing and analyses and ethical consideration. Chapter four consists of the analysis and discussion of results as well as key findings, whilst chapter five includes the summary, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This second chapter reviews the relevant literature on how sand winning affects agriculture and its overall impact on farmers' livelihood. This chapter places the study in a scholarly context by developing a conceptual framework for the study through research papers, journals, reports, internet, articles, textbooks, presentations and other relevant materials. This literature review was built around the following thematic strands: a) Defining the concept of sand winning b) awareness of farmers on sand winning c) the impact of sand winning on agriculture d) the effect of sand winning on the livelihood of farmers. Empirical review was also done based on the topic for the research work.

Theoretical Perspective

This study was guided by the sustainable livelihood theory which may encompass some other theories such as the entitlement theory and the institutional theory. The main focus was, however, on the sustainable livelihood theory from which the conceptual framework was derived.

Sustainable livelihood theory

A sustainable livelihood approach emphasizes the various ways by which individuals make a living. This is especially important in underprivileged and rural areas where people rely on a variety of side jobs rather than a single regular employment to support themselves (Tao & Wall, 2009). A sustainable livelihood approach to development places a strong emphasis on the amount of capital that the local population possesses in five

different capital-based assets: social, financial, physical, natural, and human (DFID, 1999; Helmore & Singh, 2001; Scoones, 1998) The strategy bridges the gaps between micro and macro-development efforts and is dynamic and focused on the needs of people (Simpson, 2007). Incorporation and evaluation of sustainable livelihoods from the host communities' viewpoint can contribute to better project management and execution. This process is aided by an evaluation of the livelihood needs and preferences of the host communities. Sustainable livelihoods was defined by Chambers and Conway (1992) as encompassing the skills, assets (both material and social), and activities essential for survival. A sustainable livelihood is one that is able to survive and pull through shocks and stresses, preserve or improve its resources and capacities, and not jeopardising the natural resource base.

Similar to this, sustainable access aims to support local communities' means of subsistence, preserve their customs and natural areas, and grow commercially successful industries (Simpson, 2007). In addition to emphasizing participation, sustainability, legitimacy, democratic processes, and empowerment, the sustainable livelihoods approach to development connects the global to the local and aims to account for the various systems, networks, and day-to-day activities that are present in a given community for a development scheme (Helmore & Singh, 2001).

Sustainable livelihoods take into account not only the economic, social, and environmental dimensions of sustainability that are commonly understood, but also the resilience of individuals and the resources they already possess, as opposed to what development project donors may think they might require. As a substitute to the primarily macro-level dependent

sustainable development approach, “the concept of sustainable livelihoods may merit exploration as a useful, more tangible, organizing framework, particularly for work with impoverished or marginalized communities” (Tao & Wall, 2009). The framework for integrating data at the household and community levels for the purpose of gathering and analyzing assets related to the economy, culture, and environment is provided by a sustainable livelihood framework (Simpson, 2009).

The ability to create a decent life with the resources at hand is expressed by the term "livelihood" (Ellis & Freeman, 2004). The concept of livelihood clarifies how resources are allocated to support a living in a specific environment. Some claim that the term "livelihood" refers to a "means of gaining a living." (Chambers & Conway 1992, p. 6). The basic livelihoods framework, as proposed by Ellis and Freeman (2004), is divided into three main sections. The components of the first section are outcomes, activities, and assets. The second section comprises the vulnerability contest. The components in the third section are Institutional and policy (Ellis & Freeman, 2004). Understanding the priorities and everyday reality of impoverished men and women is at the heart of the Sustainable Livelihoods (SL) approach. What these people really do for a living, the resources they can access, and the straggles they have in doing so. The reasoning behind this is that greater understanding of this will benefit people who are creating policies and initiatives.

Livelihoods, in the Sustainable Livelihood approach, refer to more than income, encompassing: ‘ the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is

sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the long and short term' (Chambers & Conway, 1992). The livelihood theory's several elements such as its assets, activities, livelihood methods, and results are explained in more detail below.

In the livelihoods approach, resources that are readily available and aid in production are referred to as assets or capital. They are therefore the resources that people use to implement their livelihood strategies. Natural capital, human capital, physical capital, financial capital, and social capital are the five different categories into which Ellis and Freeman (2004) divide assets and capital.

Natural assets

These are "natural resource base that yields products utilized by human populations for survival" (Ellis, 2000). It is typically based on materials found in the natural environment. Natural capital comprises land, water, agriculture, soil, livestock, renewable/non-renewable resource, and genetic resource among others. Human capital refers to the labour, skills, education, health, sex, and other resources accessible to households (Ellis, 2000).

Human capital

Human capital contains both quantitative and qualitative components, according to (Rakodi et al., 2002). For example, the number of family members and the amount of time available for them to participate in income-earning activities might be considered the quantitative dimension of an

individual's human capital. Conversely, the qualitative component describes the health, education, and skill levels of those who are employed to provide money. Its significance is increased in impoverished and rural African communities where labour is frequently the primary resource and wealth.

Physical assets

These refer to "assets brought into existence by economic production processes" (Ellis, 2000). According to Rakodi (2002), physical asset includes affordable housing, transportation, affordable and clean energy, information access, investment items, tools and equipment for efficient operation, enough water, technologies, and other things are all considered physical assets.

Financial capital

Financial capital is the total amount of money owned by households, including cash, savings, loans, grants, and credit availability in addition to assets like cattle, remittances, social security, and other sources (Ellis, 2000).

Social capital

The final asset is the social capital, which is crucial yet very controversial when working with underprivileged populations. It speaks of the social capital that people utilize to achieve their goals for a living (Rakodi, 2002). It is mutual among groups and depends on the level of trust as well as the rules and values of that community in a given social context (Ellis, 2000; Moser, 1998). Moser (1998) maintains that social capital "increase reliance on informal credit arrangements" (Moser, 1998). The motion represents the level of trust-based inclusivity within the society. Social capital links networks and affiliations which based on roles, religion, gender, status as a castle, ethnicity, among others. Over time, social capital varies (Ellis, 2000; Moser, 1998).

According to Ellis and Freeman (2004), livelihood construction is not a simple problem. Instead, it entails a great deal of social and political complexity, and occasionally, not all activities (or assets) fit into the framework of sustainable livelihoods. Finding options or courses of action is made easier by the categories. Asset status influences a person's or a household's motives and talents in a variety of ways. Asset status encourages people or groups to pursue livelihood opportunities at their disposal. Individuals and households can ascertain what kind of possessed or owned assets can provide a result with, given a specific setting (Ellis & Freeman, 2004; Scoones, 1998).

Activities

Men and women engage in planned activities or choices in order to establish their livelihoods or produce income levels that allow them to survive. A variety of actions aimed at establishing asset bases and facilitating access to consumable goods and services are typically included in them. To help people or families achieve (or not achieve) a result, they mix, replace, or diversify assets. These include, among other things, land cultivation, animal husbandry, migration, remittances, fishing, hunting, and employment with steady enumeration (Chambers & Conway 1992; Ellis, 2000; Ellis & Freeman, 2004).

Livelihood strategies

Livelihood strategies are coping mechanisms that are meant to react to shocks in the short term and adaptive techniques that are meant to improve conditions in the long term. Men and women's choices and preferences, as well as the resources and opportunities that are accessible to them (which are influenced by Policies, Institutions, and Processes (PIPs) and changes in the vulnerability setting), all have a role in influencing livelihood options.

Outcomes

These are the ultimate results of the activities executed by persons or households. They are the outcomes of livelihood strategies used by men and women, as well as feedback into the context of vulnerability and asset bases. It is a contrast to poor livelihood fallouts which leads to depletion of asset bases, resulting in increased vulnerability. These may include wages gained from on-farm, off-farm or nonfarm activities.

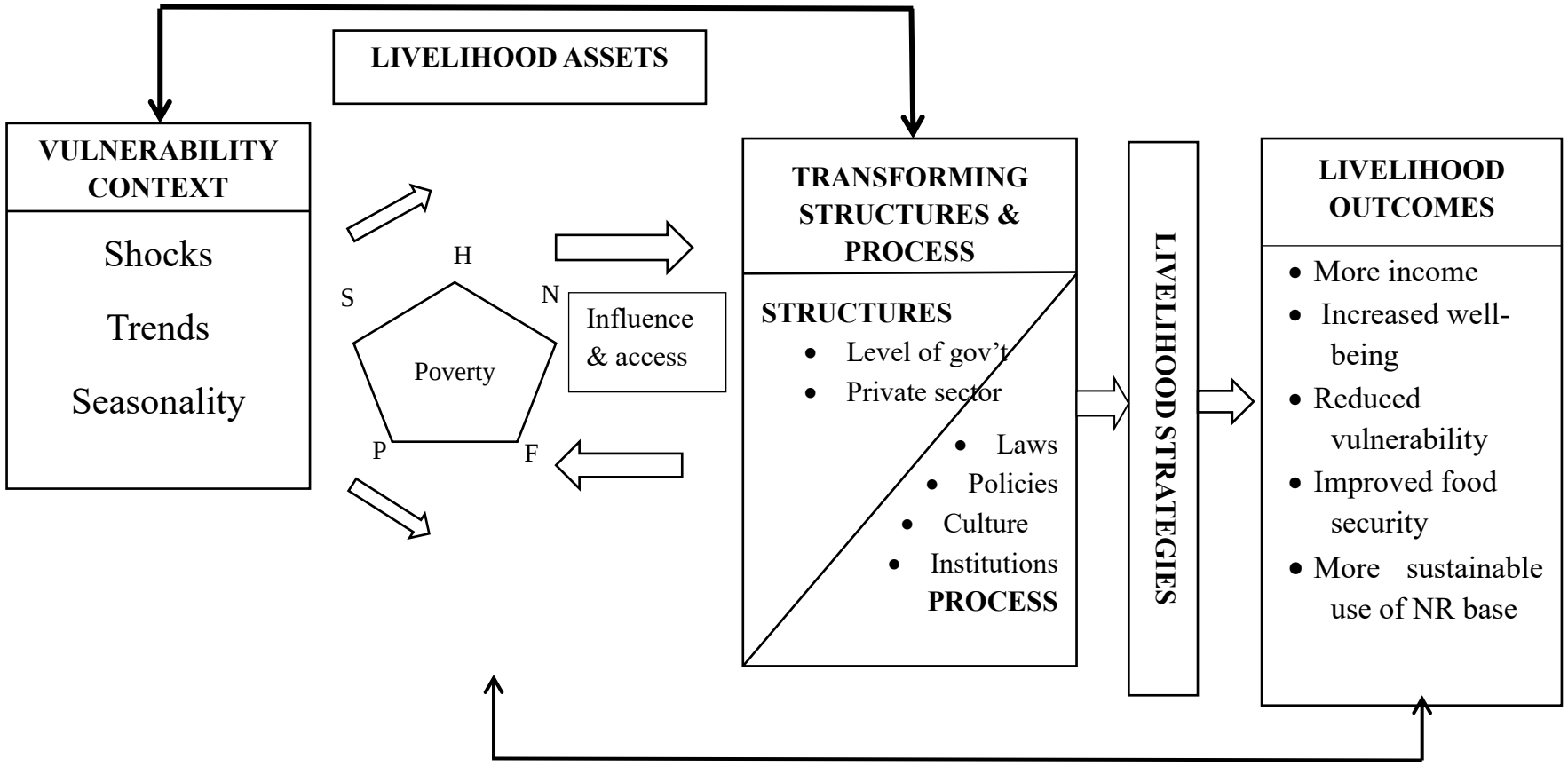

Figure 1: Sustainable Livelihood theory

Source: Department for International Development (DFID) (1999)

Vulnerability Context

Vulnerability refers to "a high degree of exposure to risk, shocks and stress; and proneness to food insecurity" (Ellis, 2000). The connection between the risk of an unfavourable occurrence and one's capacity to navigate through the risk and deal with such catastrophes is reflected in the term vulnerability. When a person, family, or community cannot withstand the shocks brought on by a high probability of unfavorable events, they are said to be very vulnerable. Ellis (2000) is of the view that resilience and sensitivity are components of natural resource management and agro-ecology literature that refine vulnerability. "Resilience refers to the ability of an ecological or livelihood system to bounce back from stress or shock. Sensitivity refers to the magnitude of a system's response to an external event" (Ellis, 2000). In a given household or community, low sensitivity combined with high resilience indicates a strong livelihood system, and vice versa. Individuals, households, and communities are forced to adjust livelihood strategies in response to shocks in order to prevent unplanned livelihood failures.

Policy, Process and Institutions (PIPs)

These encompass a wide variety of environmental, social, political, and economic elements that influence people's decisions and, consequently, assist to plan livelihoods. Institutions are "regularized practices (or patterns of behaviour) structured by rules and norms of society which has persistent and widespread use" (Scoones 1998: p. 12). As noted by Scoones (1998), "institutions are the rules of the game and the organization is the players." Institutions possess the ability to mediate the intricate diverse processes involved in attaining a sustainable existence.

The organization is simply a term used to describe people bounded to pursue proposed objectives. In the social structures, there are both official and informal institutions. Institutions are dynamic, often changing gradually and incrementally, constant transformation as a result of social interaction (Ellis, 2000). According to Ellis (2000), the purpose of institutions is to reduce doubt by creating a solid framework that facilitates human interaction. They play a crucial role in deciding who has access to the different kinds of capital assets that both men and women utilize to pursue their livelihood plans, either by serving as obstacles to their access or as intermediaries to make assets available to them. Ellis (2000) highlights the distinctions between institutions and organizations. Institutions include laws, customs, land tenure systems, the actual market, and others. Organizations include governmental entities such as the police forces, ministries, external services, and administrative bodies. Non-Governmental Organizations (NGOs), associations, and private businesses are further examples (Ellis, 2000).

Entitlement theory

This theory was derived from the understanding that deprivation might be caused by an individual's incapacity to obtain resources and their inability to obtain food through endowment sets such as agricultural land (Sen, 1981). This theory was submitted by Sen Amartya in 1977 in response to 'the great Bengal famine' of 1943, the Sahel area famine of 1968-1973, the Ethiopian famine of 1972-1974, and the Bangladesh famine of 1994 (Sen, 1981; Osmani 1993). The theory was to explain causes of famine and poverty.

Drawing from this theory, Osmani (1993) and Devereux (2001) further clarify that, food insecurity impacts individuals with limited access to

sufficient food due to poverty, loss of entitlements like land, or other socio-cultural issues. As expounded by Abdulai (2020), the entitlement theory is established on four key beliefs including endowment set, entitlement set, entitlement mapping, and entitlement failure. In the endowment set it is argued that people are gifted with endowment sets such as agricultural land and other resources that are owned through known customs and practices. Abdulai (2020) hence argues that with these resources such as agricultural land, an individual or household is able to support itself without external help, consequently, in the absence of these resources, the individual or household may suffer scarcity.

The entitlement set is made up of the various commodities gotten from the usage of a person's endowment set. Maxwell & Smith (1992) further explain that this entitlement set proposes the conversion of an endowment set through production or trade-in-commodities. The entitlement mapping also known as E-mapping, on the other hand is said to be the link between the endowment and the entitlement theory (Osmani, 1993). The E-mapping, according to Nayak (2000) and Osmani (1993), is the frequency at which the resources of the endowment set can be transformed into products and services in the entitlement set. Sen (1981) further makes the point clearer that these four mechanisms form the basis for accessing food hence any disruption in this order leads to entitlement failure, which is the failure of an individual or household to make a living and provide for his or her family. In this instance, farmers in Ayensauno district are faced with the sand wining menace depriving them of their farmlands which serve as their endowment set. This further robs them of their entitlement set truncating their entitlement mapping

and at the long run making them feel like failures since they may not able to provide for themselves and their families. This in some severe cases can even lead to starvation and death during famine. These are very serious instances which call for some form of national policies to ensure that people's livelihood is well protected to avoid the incidence of entitlement failure. Households must be safeguarded from losing agricultural land and the devastation of livelihoods caused by the rising demand for sand for a variety of uses. This is where institutions must come on board to help salvage the situation.

Institutional theory

As clearly stated by Scott (2004), institutions influence people's attitude and conducts and provide stability and order in a society. This is the claim of the institutional theory. Hrelja et al. (2017), also clarifies that, institutions make up the constrains that are devised by society to regulate the structure of political, economical and social interactions. They made a distinction between formal and informal institutions, where formal refers to legally defined governance processes and informal refers to undocumented governance mechanisms. According to (Scott, 1987, 2004), institutional procedures acquire legal status, develop into authoritative guiding principles for social behaviour, and are embraced by people as part of social reality. In view of this, Jan & Lu (2012) support the idea that a social action on a problem is initiated once it becomes legally recognized in a community. In this regard, the institutional theory forms the theoretical basis for analysis of the loss of farmland and farm-based livelihood, as well as the availability and role of institutions in relation to sand winning in the Ayensuano District in particular.

Conceptual Framework

The study adapted the framework of Sustainable Development Livelihood (DFID, 1999). The study took into consideration only natural asset (farmlands). With regards to sand winning implications, the focus is on the physical implications such as loss or reduction in farm size, soil quality as well as air quality and socioeconomic implications such as productivity (food), income, savings, and social status of the farmers. Awareness of the implications sand winning activities have on agricultural land is very vital in helping various stakeholders take more informed decisions in handling the menace. This brings on board various institutions such as the traditional authorities, agricultural agencies (MoFA), district Assembly and other institutions such as Food and Agriculture Organization that are concerned with agricultural activities in the district. These institutions have norms, bye laws and policies governing the land and agricultural activities. Therefore, these policies and laws can help shape the sand winning activities in the district. Institutional policies and processes will help come out with livelihood strategies such as diversification (trading, artisanry), intensive agriculture and reclamation.

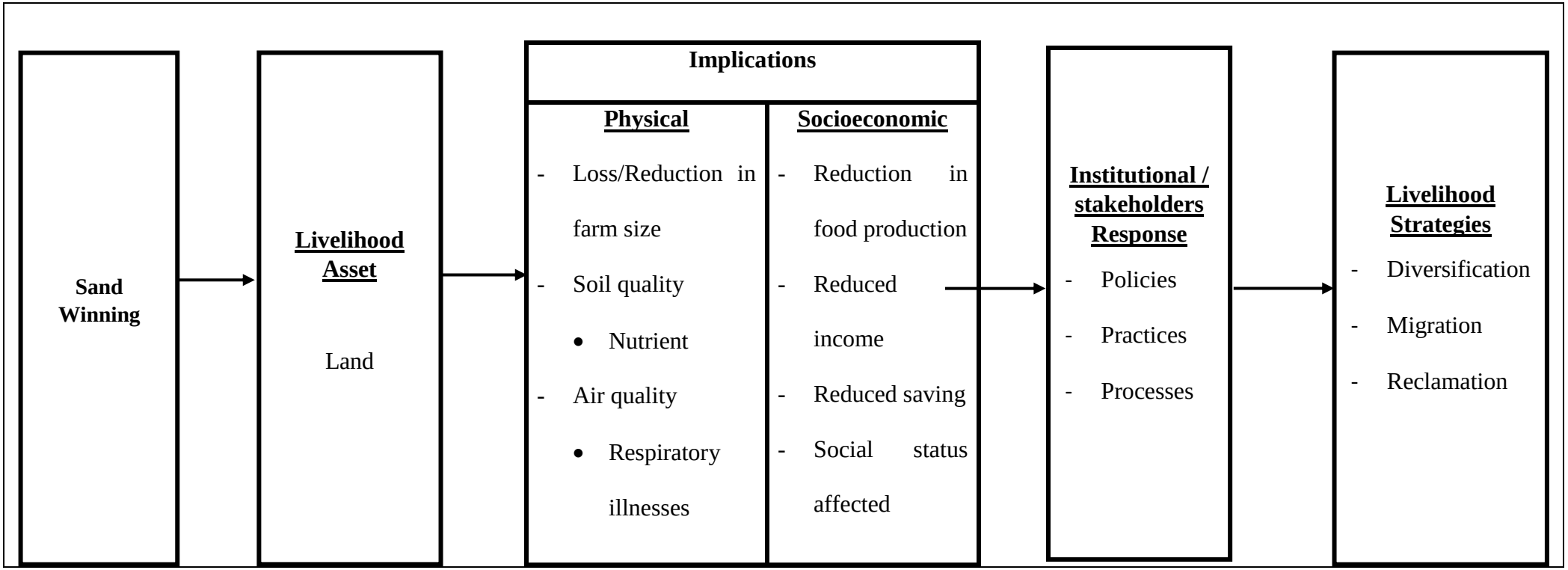

Figure 2: Conceptual framework
Adapted from DFID (1999), (Oduro et al. (2015)

Sand winning is one of the major destructors of land which serves as a livelihood asset to many people in farming communities. The distortions posed on the land often lead to negative implications such as physical and socioeconomic. physical implications include loss or reduction in farm size, soil quality affected, and distortion in air quality. The sand winning activities in some cases results in the complete loss of farmlands where the farmers are denied their asset entirely, and in other instances part of their lands are winned leading to a reduction in the farm size available for cultivation. The scooping of the top soil also depletes the land of its nutrients rendering it less fertile for cultivation. The activities of the sand winners as well as the movement of trucks loaded with sand in and out of the communities also result in air pollution from dust since the roads are not tarred.

The socioeconomic implications include reduction in food production, reduction in income, reduction in savings, social status affected. The loss or reduction in farm size implies reduced crop yield which often results in reduction in food availability and crops for sale, directly affecting the income and savings of the farmers. With farmers not producing enough food for the household or crops to sell and make some income, their social status including relations may be negatively impacted. The sand winning implications call for response from the institutions and other stakeholders including the District Assembly, Ministry of Food and Agriculture, Mineral Commission and the Farmers. Responses such as policies, practices and processes will inform the livelihood strategies that should be adopted to sustain farmers' livelihood. Households may adopt new livelihood strategies which may be a combination with off-farm activities or alternative or intensified farm activities. Off-farm

activities such as petty trading, carpentry, masonry may be some strategies employed by some farmers aside their farming activities to obtain some extra income in the face of the sand winning activities or as alternative source of income due to the loss of farm land. Some carry out reclamation of winned lands with fertile soil to enable them recultivate the land, while some practice diversification of crops and animal husbandry. Still others migrate to nearby communities for greener pastures either through farm activities or off-farm activities.

Land Ownership and Use in Ghana

Land is a very important asset in acquiring a livelihood, either owned or leased. Land ownership and management in Ghana is strongly rooted in customary practices. Families and chiefs are the main authorities in land matters controlling over 90 % of total land areas in Ghana with the others entrusted in the state through compulsory acquisition (Abdulai & Ndekugri, 2007). It is well known that these families and chiefs possess the administrative ability to administer land, which makes it challenging for state institutions to control access to and usage of the land (Abdulai, 2020), leading to uncontrolled degradation.

A case study from the Greater Accra region revealed that this land tenure system where the local chiefs and family heads control the land and it use is not favourable to majority of the local residence since these leaders have the final say in what the land should be used for without any input form planning authorities (Arko-Adjei, 2011). Land serves for vast purposes including construction of residential, civil and commercial structures, mining activities (sand and minerals), and farming (West & Anderson, 2017). These

activities in many ways conflict with each other and more so in these recent times due to continual population growth.

In view of this, Goetz (2008) acknowledges the significance of land use and asserts that it is a key area of policy concern for urban planners and legislators because of the interdependencies between people and communities, which have a major impact on social and economic well-being. Coskun et al. (2008) therefore suggests that any land use activities that result in negative permanent changes to the land should be well regulated to protect future generations. This calls for effective and well-thought-out plans that caters for inconsistent objectives of social actors and to ensure sustainable land use ((Metternich, 2017; Abdulai, 2020). This will go a long way to protect agricultural lands especially in farming communities and help households sustain their livelihoods.

In spite of this fact, there is the rising concern of land use change, especially agricultural land use change in rural and peri-urban communities (Mandere et al., 2010; Samat et al., 2011). Many agricultural lands in these areas are being converted into housing, commercial, and infrastructure purposes. Hence agricultural lands are threatened due to the never-ending demands for land to support urban activities.

Agriculture

Agriculture is the backbone of many economies worldwide, serving as direct source of food and other raw materials for human use. Agriculture is central to Ghana's foreign exchange earnings and the overall economic wellbeing (USAID, 2023). The agricultural sector remains one of the major driving forces in the development of the Ghanaian economy employing about

50 % of the employed of people of the country (GSS, 2019). An estimate of 44.1 % households in Ghana own or operate a farm. The production usually serves dual purpose as consumers as well as for commercial purposes (Ferreira et al., 2022).

The Ghana Strategy Support Programme (GSSP) proposed that agricultural growth will have enormous result on reducing poverty at the regional level because of the strong relationships between income and consumption (IFPRI, 2005). Despite these prospects the sector is faced with many challenges which seem to restrain its growth. Factors such as climate change, soil nutrient deficiency, land litigations among others pose challenge to food crop production even for domestic consumption, leading to increase in importation of crops such as maize, onion, chilli etc. from neighbouring countries and even Europe (Asante & Bawakyillenuo, 2021).

Reports by SRID, (2011) showed that about 90 % farm holdings in Ghana are by smallholder farmers with farmlands less than 2 hectares in size. These are used mainly for food crops such as maize, cassava, sorghum, yam, sweet potato, rice and millet often produced with inadequate technical and operational efficiencies, depending solely on rain water for irrigation (Asante & Bawakyillenuo, 2021). These also contribute to the low level of crop yields produced in the country. Aside these factors, urbanization and illegal mining in its various forms (Asare et al., 2023; Abdulai, 2020) continuous to take a heavy toll on agriculture by depriving farmers of their agricultural lands.

As reported by Amoateng et al., (2013) many agricultural lands in Abuakwa in Ghana, have been loss depriving the indigenes, who are mainly farmers, their livelihood. A study by Naab et al. (2013) in Tamale, Northern

Region of Ghana, also revealed that 40 % of the people observed reduction in their agricultural produce due to reduction in farm size. Furthermore, they reported that 23.8 % of the people loss their income and 27.5 % reported scarcity of food. With the United Nations' goal of achieving the Sustainable Development Goals by 2030, any retrogression especially in the area of No Poverty and Zero Hunger (Goals 1 and 2 respectively) needs prompt attention. A study by Kleemann et al. (2017) in the Ga West Municipality, Greater Accra Region revealed that many agricultural lands in the area have been exploited for sand, converting the lands to sand mining pits thereby displacing farmer households from their livelihood.

Sand Winning

Sand winning is the process of scooping sand from the earth's surface for building, construction and other development purposes (Peprah, 2013). Sand grains have diameter ranging from 0.002 to 0.08 inch, and 0.08 to 4 inches for gravel (Hull, 2001). The sand winning activities have some impact one way or another on the socio-economy of people in and around the mining communities (Mngeni et al., 2016). This impact may be positive or negative.

Positive effects of sand winning

The importance of sand in infrastructure development cannot be overlooked and more so in this ever-increasing global population growth and urbanization. It is worth noting that there is no substitute for it in construction. The amount of natural resources used in buildings and transportation infrastructure worldwide increased 23-fold between 1900 and 2010 (Krausmann, 2001). The most extracted group of materials globally, sand and gravel, makes up the largest portion of these primary material inputs (79%, or

28.6 gigatons annually in 2010), surpassing biomass and fossil fuels (Schandl et al., 2018).

Sand winning serves as a means of livelihood for the players; landowners and miners. Ituen et al. (2019) elaborated that sand winning contributes positively to employment generation for both indigenes and non-indigenes. As observed by Shymbin & Nongbri (2022), sand winning activities serve as a regular source of income from the sale of the sand and provides very high profit for the winners. In some instances, it may provide economic gains for the country and local communities directly or indirectly (Gunaratne, 2015; Rukmana et al., 2020).

Negative effects of sand winning

In recent times, most of the information on sand winning is negative, often lamenting on the devastating effect on sand winning on the environment. It is worth noting that the situation is a global one. According to projections, Vietnam's domestic demand for sand for construction was estimated to be 2.1–2.3 billion metric-cubed between 2016 and 2020, while the nation's overall sand deposits were just over 2 billion metric-cubed (Bac, 2017). At that rate of sand use, Vietnam was predicted to run out of construction aggregate by 2020 (Bac, 2017). Since the demand for sand would not end, there must still be a way to supply one way or the other, and it is worth noting that there is no substitute for it. According to the UNEP, (2019), sand mining poses a barrier to sustainable development; yet, research to aid the development of policies for its sustainable extraction and use is still in its early stages (Asare et al., 2023).

As the cries of other nations resound, Ghana is mining sand and gravels beyond the legal available resource. The sand winning menace does not only affect the environment but also people's livelihood that are linked to land. Land degradation results mainly through deterioration of the soil profile, ruin of soil surface configuration and changes in land topography. Peprah (2013) outlined four key negative effects of sand winning in the municipality of the Upper West region. First, he observed that sand winning exposes and destroys roots of trees causing them to fall during storms thereby negatively affecting the vegetation and biodiversity of the environment. Tagoe (2005) also reported earlier about this phenomenon stating that at the slightest heavy rain, most of the existing farmlands in the winned enclaves experience erosion due to the removal of the adjoining lands. Secondly, he ascertained that mined pits are left uncovered and these collect water during raining seasons thereby serving as breeding sites for mosquitoes and hence its related health challenges. The effect of sand winning activities on health cannot be overlooked, both on the sand winners and the communities.

A study by Tagoe (2005) in the Ga districts further observed that aside the increase in malaria cases, the communities reported cases of skin diseases and Buruli ulcer allegedly as a result of the stagnant water collected in un-reclaimed sand mined pits. Other health concerns reported by the people and health facilities allegedly as a result of the sand winning activities include frequent lungs and chest diseases, and upper respiratory diseases due to dust inhalation; bilharzia and typhoid fever since some even resort to collected water in pits for domestic use; and some cases, abandoned sites are reclaimed with garbage which also serve as sources of other disease infestation.

Tagoe (2005) further reports of poor nutrition which affects the general wellbeing of the affected people in the community, especially the farmer households. Thirdly, he also mentioned that the farmer tenants usually lose their cultivable lands due to the higher financial returns offered to the landowners by the sand winners as compared to the scanty revenues from the farmers. Fourthly, landless farmers are paid no compensation for losing their crops and farmlands. This of course is heart-breaking making farmers in sand winning communities insecure about their livelihood since many of these famers are not adequately compensated to empower them pick up any other livelihood activities.

Mngeni et al. (2016) argues that quantifying the socio-economic effect of sand winning is difficult because the activities are usually illegal, kept from the regulatory authorities. In Ghana, there have been sand and stone mining operations for ages. The precise time this started has, however, not been documented (Biney, 1982; Biney et al., 1993; Sakey, 1991). This could be explained by the fact that most of the sand winning activities are done at the blind sight of the regulatory bodies, the miners fail to register their activities. This is coupled with the fact that the agreement is between the miners and the landowners; chiefs and family heads. Asare et al. (2023) observed that lands are leased by traditional owners to farmers for agricultural use, however, in view of sand winning these farmers are not involved in the decision making. The lands are given out to the sand winners and the farmers are left to face the consequences. It is clear that the landowners care less about the environmental impact and sustainable livelihood of the residence as long as they can make their money (Asare et al., 2023; Arthur & Benediktsson's, 2016). The

landowners also have their reasons for giving out their lands for the sand winning activities which basically boils down to quick money. When asked about some of the reasons why people would prefer to go into sand winning than agriculture, the long maturity periods for agricultural crops, the seasonality of agricultural activities, and the detrimental impact of climate variability on agriculture were some of the replies. In highly endemic sand winning areas, it is observed that between 700 to 1000 truckloads of sand are winned from farmlands (Asare et al., 2023; Dawson, 2020). In sole farming communities, this can be very devastating, destroying agricultural lands and posing threats to livelihood of the local residents who depend on the land for employment and food (Asare et al., 2023; Johnbull & Brown, 2017; Peprah, 2013).

Unregulated sand winning does not only pose danger to income and food security but extends further to pose danger to the respiratory health of people as well as destruction of the environment among others. One of the challenges faced in some of the sand mining communities is the dust produced as trucks move to and from the community, especially during the dry seasons, mainly due to untarred road networks (Peprah, 2013). The effect of dust on human health cannot be ignored. The human body is equipped with different mechanisms of dealing with dust we inhale, but in some cases, it is overwhelmed by finer particles in large doses it may not be able to cope (www.sahealth.sa.gov.au). Dust can get into the human body through three main roots; inhalation, ingestion and dermal absorption (Ali et al., 2023). As further expounded by Ali et al (2023) nearly every major health issue that can be fatal, such as respiratory illnesses, gastrointestinal issues, skin, heart, and

eyes, is mostly caused by dust. The non-biodegradability and carcinogenic properties of heavy metals make them more dangerous than other elements in the dust. The risk of dust exposure to humans varies depending on the kind, dose, and exposure location (Ali et al., 2023)

Additionally, sand winning, in many cases, lead to various kinds of conflict among the miners, tenants, indigenes among others. Some further hazards from these activities may include noise of the operations, dust, truck traffic, pollution, as well as visually distorted landscapes (Musah et al., 2009). These, however, don't seem to be the focus of many studies but can have direct effect on the physical wellbeing and peace of the indigenes. In general, unsustainable sand winning can contribute to a large extent in impeding the achievement of the SDGs 1, 2,3,8,15 and 16 which are No Poverty; Zero Hunger; Good Health and Wellbeing; Decent Work and Economic Growth; Life on Land (Protect, Restore and Promote Sustainable Use of Terrestrial Ecosystems and Forestry by Combating Desertification, Land Degradation, and Biodiversity Loss); and Peace, Justice and Strong Institutions, respectively.

Institutional response to sand winning

Considering the positive vis-à-vis the negative effects of sand winning especially with regards to sustaining livelihoods, there is an urgent need to strictly regulate the activities of the sand winners. Many empirical literature points to the fact that institutions needed in regulating this menace are faced many challenges. These challenges span from lack of specific governing rules, lack of human resources and adequate information among others. Findings from Asare et al. (2023) revealed that there was no specific law guiding

activities of sand mining but rather a general one, the Minerals and Mining Act 2006 (Act 703) which was amended in 2015 (Act 900) and again in 2019 (Act 995). This act was supported by the EPA Act 1994 (Act 490) and Local Governance Act, 2016 (Act 936). These Acts mostly are focused on the expensive minerals such as the gold and diamonds rather on sand. With the sand winning increasing become a menace and posing threats to sustainable livelihood and food security, specific policies and clear guidelines on sand winning need to be formulated and enforced.

Furthermore, studies around the globe concurred that there are no specific institutions governing sand mining and that most regulating bodies rely on broad mining regulations which do not directly address the issues characteristic in sand mining (Asare et al., 2023; Dewi et al., 2019; Gondo et al., 2019; Koehnken, 2020). Asare et al. (2023) further ascertained that in some instances there are different agencies responsible for managing aspects of sand mining which definitely could result in lack of regulatory cohesion and bureaucratic permit to guide the sand miners. Moreover, inadequate resources such as staff, information needed for decision making and empowerment cripples or impede the agencies in carrying out their duties in managing sand winning in the communities (Asare et al., 2023). To be able to address this menace, institutions and regulatory bodies need to be adequately equipped to carry out the task of implementation and enforcement of the laid down rules. This starts with having a comprehensive and wholistic view of the sand winning including the benefits to the players involved (landowners, sand winners, and consumers), the effect on livelihood of farmers whose farms are

being winned, food crop production and the nation at large since we all depend on food from these areas for survival.

Livelihood strategies in the face of sand winning

Survival is very key even in the most difficult of situations. In this era where agricultural lands are being transformed for various purposes such as residences, industrial buildings, hospitals, schools and even mining sites, people whose livelihood depend directly on agricultural land need to find various means to survive. Many of such reports include intensification of agricultural practices and diversification into various non-farm activities (Abdulai, 2020; Peprah, 2013). In the study by Abdulai (2020), it was revealed that due to the reduction in fertile lands many of the food crop farmers resort to intensive agriculture such as the use of organic fertilizer, lining and pegging to increase crop population, and planting of high yielding crop varieties to enhance crop yield.

Some farmers also resort to crop diversification where farmers plant crops that seem to be better supported by the type of land available. Abdulai (2020) reported that some farmers combine both farm and non-farm activities as a form of livelihood strategy with many of them engaged in animal husbandry. A report by Oduro et al. (2015), however, revealed that most farmers diverse completely from agricultural activities and turn to activities including trading, artisanry activities and services to sustain their livelihoods in the face of agricultural land loss.

Empirical Review

Reviewing empirical studies gives valuable logical research the necessary foundation. According to Baumeister & Leary, (1997), empirical

reviews prevent researchers from "reinventing the wheel" and aid in highlighting connections between various empirical findings. Additionally, the empirical review aids in expanding on prior knowledge and avoiding the repetition of outcomes that have already been established (Griffee, 2012; Sternberg, 1991). It also helps to shape the methodology and also guide the analysis of data collected.

Empirical review on effect of sand winning on the livelihood of food crop farmers

The presentation of the empirical review follows the themes that are reflected in the research project. All the empirical studies reviewed here were studies that focused on sand winning and its effect on livelihood and the environment.

In a study conducted in 2020, Feyissa investigated how sand mining affected the environment and the way of life of residents in a few chosen Rural Kebeles (RK) in the Dugda District in the East Shawa Zone of Oromiya in Adis Ababa, Ethiopia. Primary data was gathered by Feyissa from four RKs in the District: Sera Wakale, Dongorota Gusa, Oda Boqota, and Birbrsa Gale. Purposive sampling was used to select 22 key informants and the systematic sample technique was used to choose 337 respondents out of the total. Interviews, questionnaires, and field observations were used to get information from the respondents. Tools like crosstab analysis, correlation, Chi-square, and mean comparison were used to analyze the quantitative data. Thematic analysis and content analysis of the information as they transpired in the field were used to analyze the qualitative data.

The study discovered that the main factor driving people to mine or harvest sand was unemployment. High earnings and consistent revenue from

sand sales were also cited as benefits of sand mining for livelihoods and as a source of money for Meki town and the district. At the regional and national levels, sand played a unique role in the construction sector. Sand mining has been shown to have detrimental effects on people's livelihoods. Unplanned route trucks have ruined roads, harmed farms and vegetation, and created dust during the dry season.

According to the study, while sand mining helps some people make a living, it also has a terrible impact on the environment and disrupts the livelihood of farmers' and communities. The report suggests that laws governing sand mining should be passed and implemented by all relevant government agencies. Such decisions could stop the sand miners from causing unnecessary devastations to farmlands, vegetation and water bodies (river). Furthermore, local authorities need to properly demarcate sites for sand winning activities, and ensure effective oversight to guarantee that the necessary environmental impact assessments are done on such lands prior to mining the sand.

Second, Adjei, (2010) evaluated how the reclamation program and Action Aid Ghana affected the food security and livelihood for residents of the Ga West Municipality in Ghana's Greater Accra Region. Data was collected from a sample of one hundred Action Aid Ghana clients in the Ga West Municipality using an interview schedule. Agyei noted that the Ga West Municipality, which was once Accra's food basket, is now a net importer of food items of all kinds. He pointed out that the problem has emerged as a result of the high rate of estate development and sand winning. Agyei noted that residents think farming is more profitable than sand winnings, which only

brings in large sums of money temporarily, while farming generates a sustainable income. Adjei made the point that farming, as opposed to sand winning activities, may assist alleviate food-related problems and ensure food security. Adjei came to the conclusion that the Action Aid Ghana reclamation project increased food production and improved the people's standard of living. Adjei suggested that the practice be conducted in other communities in the area and in areas where sand winning is prevalent by Action Aid Ghana and other NGOs. He went on to say that the EPA ought to properly educate landowners and sand contractors on the implications of land reclamation on food security.

In a similar vein, Peprah (2013) studied Sand Winning and Land Degradation: An Indigenous Sand Winner's Perspective from Wa in the Upper West region, Ghana. He combined the qualitative and quantitative methods. Peprah gathered information from 50 respondents by using the convenient sampling technique. He gathered information from the respondents through observation, questionnaires, and interviews. For the quantitative data, a questionnaire was employed; for the qualitative data, interviews and observation were conducted. Peprah used descriptive statistics like cross tabulation, percentages, and frequencies to quantitatively analyze the data that was gathered. According to Peprah, the majority of driver-respondents (52%) didn't agree that sand winning degrade the land. Seventy percent more claimed that farmers are not rendered jobless by sand winnings. According Peprah, the respondents had varying views about the effect of sand winning in the community. Seventy-four percent of respondents rejected the idea that food shortages are caused by sand winning. Seventy-six percent disagreed that sand

winning attracts more mosquitoes and cases of malaria, with 84% of respondents concurring that sand winning is a lucrative business. Even though many farmers lose their farms, some farmers who still possessed land profited from the money collected from each truck load of gravel or sand that was removed from their properties.

The study comes to the conclusion that other livelihood activities would have to take the place of agriculture livelihoods due to the increasing demand for sand for the infrastructure industry. Also, Wa would have to depend on its nearby communities for food supply. The sand winning winning sites could be converted into recreational centres such as parks and gardens.

The next is a research by Tagoe, (2005) about how the socioeconomic conditions of the communities in the Ga West district are affected by sand winning. Using cross tabulations, images, frequencies, and to measure the impact, Tagoe used a cross-sectional descriptive and explanatory approach. Interviews was conducted for different stakeholders, including the community members, district officials, chiefs, and elders. Information was gathered from the Minerals Commission, the Town and City Planning Departments, and the Ga District Assemblies as well. Sand winners and some stakeholders do not follow the ungazetted bye-laws and other operational requirements, according to Tagoe's study's findings. Sand winning has both beneficial and detrimental effects, according to Tagoe. Benefits include cash for the District Assemblies, income for the landowners, a supply of raw materials for construction, and jobs for the youth. The survey also showed that the majority of farmlands are leased for sand winning activities, which have major negative effects on farming. Furthermore, indiscriminate sand winning activities have been linked

to health issues such as skin disorders, Buruli ulcer, malaria, and other conditions. In addition, low income, inadequate nutrition, an increase in school dropout rates, and environmental degradation such as noise pollution, air pollution, and land degradation are further detrimental impacts of indiscriminate sand winning. Tagoe suggested that the byelaws be gazetted as quickly as possible.

Furthermore, Salifu (2016) conducted a study on the implication of sand mining on the environment and livelihoods of people in some selected communities in Brong Ahafo Region. He made use of primary data from three districts in the area: Wenchi, Techiman Municipalities, and Sunyani West District. Salifu selected two hundred (200) respondents by employing convenience, systematic, and purposeful sampling methods. Interviews, questionnaires, and field observations were used to get information from the respondents. Chi-square and correlation were two of the statistical techniques from Statistical Product for Service Solutions (SPSS, version 20) that were used to analyze the quantitative data. Thematic and content analysis of the events as they happened in the field were used to analyze the qualitative data.

It was discovered that sand mining negatively impacted livelihood due to the destruction of vegetation cover and water bodies, but it was also found to have positive effects due to very high profits and regular income from the sales of sand. The study's main finding was that unemployment was the primary factor that drove people into sand mining. The investigation also showed how the local authorities failed to stop the sand miners' operations from harming the environment and other sources of livelihood. The study comes to the conclusion that while sand mining helps some people to make a

living, it also has the potential of degrading the environment and jeopardize agricultural livelihoods. The report suggests that all assemblies create and uphold bylaws regarding sand mining. By doing this, the sand miners might be stopped from causing needless damage to waterbodies, vegetation, and farmlands. Once more, the local government should clearly demarcate sand mining sites to guarantee that environmental impact assessments are completed on the lands before any sand is mined.

Another study was conducted by Sumani, (2019) on Possible Environmental and Socio-Economic Ramifications of Sand and Gravel Winning in Danko Upper West Region of Ghana. In order to understand the causes of the spread of sand/gravel winning in Danko and its surroundings and the consequences that go along with it, the researcher employed qualitative dominating mixed-methods research in which he consulted 48 survey respondents and 15 key informants.

The study discovered that extraction of sand and gravel had certain advantages, such as helping the building and road construction industries, creating jobs, and producing dugouts for residential usage. The loss of farmlands, the pollution of the environment, and the marginalization of women were among the devastating effects of sand/gravel mining operations. The study came to the conclusion that, when it comes to sustainability concerns, sand/gravel winning has both pros and cons. Therefore, for the sector to continue benefiting all parties involved in the entire sand/gravel winning value chain, all parties must work in a safe and environmentally sustainable manner.

More so, Abdulai (2020) conducted a study on Agricultural Land use Change and Emerging pattern of Livelihood in peri-urban Wa, Ghana. He employed a mixed-methods approach in his research. Purposive sampling was utilized to choose the key informants, and a simple random procedure was used to sample household heads from seven communities. Abdulai collected data using an interview schedule, an observation guide, an interview guide, and a group discussion guide. Descriptive statistics, the chi-square test of independence, binary logistics regression, and the Wilcoxon Signed Rank test were used to analyze the quantitative data, and thematic analysis was used to analyze the qualitative data.

Abdulai observed that as a result of the expansion in Wa township, there have been a drastic reduction in the size of farmlands and also some farmers have lost their farmlands completely. This according to Abdulai has force farmers to resort to petty trading as well as constructional related activities in order to improve upon their livelihood. Abdulai suggested that the Physical Planning Department should work with the local landowners to develop local plans for areas designated for sale in order to prevent the sale of areas without a local plan. Additionally, he made the point that in order for traditional households to escape poverty, they should start taking up more non-farm income-generating occupations.

Moreover, research conducted by Arthur & Benediktsson (2016) on the degraded sand mining site at Golinga, Northern Ghana. They were interested in the connections between rights to utilize land and degradation. He gave a case study of a sand and gravel mine areas in northern Ghana, where grazing and agricultural cultivation were once done on the area, but now mining is

done for profit. Due to the loss of topsoil and plants, Arthur & Benediktsson noticed that the activity leaves behind open pits on the ground that develop bigger with wind and water erosion. Waste management firms utilized these pits as landfills for trash, which makes the site's degradation even more detrimental to the nearby towns.

Arthur & Benediktsson's research specifically sought to quantify the entire area of the mine left bare, pinpoint the causes of changes in land use, and look into how the people's quality of life was affected by degradation while taking gender into consideration.

Additionally, he investigated if land tenure systems, whether modern or traditional, have contributed to the area's degradation and whether relevant institutions are capable of aiding in the land's recovery. Arthur & Benediktsson conducted interviews, recorded GPS coordinates for the location, and gathered secondary data. He discovered that farmers who lost their farmlands received no compensation, and the majority of them are unemployed.

The results showed that the area's traditional land systems conflict with environmental laws and practices. Plans for reclamation were not put in place to improve the area's recovery. According to Arthur & Benediktsson (2016), relevant authorities should give sand and gravel mining far greater attention and make sure that the advantages are shared fairly among the impacted parties. They also suggested giving the former landowners the authority to demand that their land be reclaimed.

Finally, Asare et al., (2023) researched into the scope of governance of terrestrial sand mining around the periphery of Accra, Ghana. Thirty key

informants, including sand winners, truck drivers, employees of real estate companies, representatives of the Environmental Protection Agency (EPA), local government officials, and the Minerals Commission (MC), provided qualitative data for the study. The instruments employed for gathering data were focus groups and observation. In the course of gathering data, truckloads of sand and the mining process were observed, and three Focus Group Discussions (FGD) with Farmer Based Organizations (FBOs) were conducted. Asare et al., (2023) observed that sand mining in the study areas was regulated by several governing bodies with little collaboration among them. Illegal sand mining was pervasive in the study areas for varied reasons including the bureaucratic licensing procedures, lack of teamwork among regulators, bribery of some regulatory officials by miners, inadequate monitoring of miners, especially at night, and landowners' preference for sand mining over farming because of the quick financial gains from the miners. The lives of majority of the local people were adversely impacted by the destruction of farmlands by sand miners, while the miners, landowners, and truck drivers benefited financially from the industry. To ensure sustainable sand mining along the outskirts of Accra, Asare suggests that the current licensing procedure have to be reviewed, regulatory bodies should work together, and that compliance with current rules be made mandatory.

Lessons Learnt

The empirical review revealed that some of the studies focused on the effect of sand winning on the environment and livelihood whiles other studies focused on the socioeconomic life of the people. Also, the review showed that majority of the studies used both the quantitative and the qualitative methods whiles

few studies used only the qualitative approach. The studies also reveal that questionnaire and interview schedule were used in the collection of quantitative data while interview guide, focus group discussions and observation were used in the collection of qualitative data. The review further shows that descriptive statistics, chi-square test of independence, binary logistic regression and others were used to analyse the quantitative data whereas thematic analysis was used to analyse the qualitative data.

In terms of the findings, the empirical review demonstrates that sand winning activities have led to the reduction of farmlands and also farmers losing their farmland completely. Again, other authors stated the urgent need for money as the reason why some land owners give out their land for sand winning. Generally, the empirical review showed that as a result of sand winning farmers adopted both farm and no n-farm livelihood strategies as coping mechanisms.

Summary

A comprehensive review was done on literature relevant to the study. The review considered the theory that best suite this work. The sustainable livelihood theory was adapted and the various key point relevant to the study such as; asset, activities, vulnerability context, policy process and institution were explained. Again, the literature also looks at other theories like entitlement theory and institutional theory. The work also featured the conceptual framework that was developed.

Furthermore, relevant concept in relation to sand winning and livelihood were discussed into details. The concepts include; land ownership and use in Ghana, Agriculture, sand winning, positive effect of sand winning,

negative effect of sand winning, institutional respond to sand winning, health (respiration) issues in relation to sand winning and also livelihood strategies. Finally, empirical review was done. That is similar works done by other researchers in relation to sand winning and its effect on livelihood was discussed.

CHAPTER THREE

RESEARCH METHODS

Introduction

This section of the study considered the research approach and procedures for data collection and analysis. It focuses specifically on the research philosophy, research approach, research design, the study area profile, population, the sampling procedure, data collection instrument, data collection procedures, data processing procedures and ethical issues arising from the conduct of the research.

Research Philosophy

The philosophy of pragmatism underpinned this study. That is the combination of the positivism and interpretivism. One of the philosophical stances that directs social science research is positivism. Quantitative methods are employed by positivist researchers, including statistical analysis for hypothesis testing (Adam, 2014). In this study the number of acres of farmland cultivated by farmers before and after sand winning were quantified which falls in line with the positivists' ontology.

Nevertheless, a number of academics have highlighted some of the shortcomings of quantitative methods. Rahman (2017) is of the opinion that the positivist method fails to foster collaboration between researchers and respondents, leading to the emergence of the interpretivist viewpoint.

Interpretivists operate under the epistemic premise that there is no such thing as a singular reality, but rather that reality is a product of the meaning that individuals assign to objects, events, and activities Guba (1990). Interpretivist

usually adopt qualitative methods. Interviews and observation are used by qualitative researchers to gather data for thematic analysis.

The pragmatist philosophical approach emerged as a result of the flaws of the two schools of thought. This implies that it makes it possible to obtain answers to research problems by combining objectivity and subjectivity. As a result of this, pragmatic researchers do not rely just on one study methodology but rather what would work for the research objective.

The rationale behind selecting the pragmatic approach for this study was that while decisions about livelihood possibilities and observation cannot be quantified, factors like age, income, and the size of land used for farming can (Aliyu et al., 2014). Hence, putting the two together helps the researcher to obtain accurate picture about how sand winning activities affect the livelihood of food crop farmers in Ayensuano District. The use of pragmatist philosophy was also motivated by the observation that both qualitative and quantitative data have weaknesses, which, when combined, minimize the shortcomings and produce reliable data.

Research Approach

The mixed method approach was adopted in this research study. According to (Johnson et al., 2007) definition, mixed method research is a form of study that uses both quantitative and qualitative methodologies to gather and analyze data, draw conclusions for breadth and depth of understanding, and confirmation. In other words, the mixed method approach involves combining several methods within a single study which involve the choice of the pragmatists' philosophy to guide the study (Johnson et al., 2007). Additionally, (Pandey & Pandey, 2015) note that the mixed method offers a

framework for gathering pertinent data with the least amount of time, effort, and money. This implies that the entire study process, from data collecting to result presentation, incorporated both quantitative and qualitative methodologies.

The mixed method approach was appropriate for this study because the two sets of data were combined during analysis and result interpretation to ensure that the true context of the impact of sand winning is recorded. Additionally, it made data and methodology triangulation possible, ensuring that the complexity of the sand winning effect on livelihood was understood. Lastly, the study minimized the method's shortcomings while maximizing its strengths.

Research Design

Research design is the procedures used in scientific investigations for data collection, analysis, interpretation, and reporting (Creswell & Clark, 2017). Explanatory sequential research design was used for the study. The adoption of an explanatory design allowed the researcher to accurately describe the issues of interest, which made it appropriate. It aids in gaining understanding into a situation. According to Guest & Fleming (2015), an explanatory study design is gathering quantitative data initially, then gathering qualitative data to supplement the quantitative data and let the researcher expound on the quantitative finding. In this sense, (Subedi, 2016) evaluated that the methodology enables the researcher to utilize the quantitative findings to get a broad overview of the study issue, and then utilize the qualitative findings to refine and clarify the picture that the quantitative results provide.

These actors also point out that the process of interpreting findings entails presenting the quantitative data first, before the qualitative data.

In this study, the measurable effect of sand winning on farmers' livelihood was first collected through interview schedule, and then followed by in-depth interviews with other agricultural stakeholders and state organisations to ascertain their awareness about the ongoing sand winning activity and its effect on farming and the livelihood of food crop farmers in the district, as well as to know measures being taken to regulate the activity. It was the right approach to take for this study since I initially engaged the respondents to identify and comprehend problems related to sand winning in the district, how it has affected food crop farmers' livelihoods, followed by an In-depth interview with the key informants to confirm the issues raised by the respondents. This helped me to further ascertain what the institutions have put in place to regulate the menace. In other words, the qualitative and quantitative data were integrated such that the qualitative data collected from the key informants confirmed the quantitative data collected from the respondents.

Study Area

Ayensuano District is one of thirty-three (33) districts in the Eastern Region of Ghana, with its capital located in Coaltar, according to the Ghana Statistical Service's 2021 Population and Housing Census. It is located between latitudes 50 451 N and 60 51 N and longitudes 00 151 W and 00 45 W. It is situtated in the Southern part of the Eastern Region sharing borders with Suhum Municipality to the north, Nsawam Adoagyiri Municipality to the south, Akwapem South District to the east, Upper West Akim District and West Akim Municipality to the west. Ayensuano District covers a land area of

499 km^2, which is equivalent to 2.3 percent of the entire land area of the Eastern Region (19,323 sq km) and 0.2 percent of the total land area of Ghana (239,460 sq km). The district is situated in Ghana's forest zone, with tropical climate conditions. The tropical monsoon winds, which migrate from the south-west to the northeast, have an impact on the pattern of rainfall, which ranges from 1270 to 1651 mm annually. The geological formation of the district is marked with the Birrmain and Voltarian rock formation. The Birrmain formation being the most important formation in Ghana is the major underlying formation in the district. It contains the most valuable minerals including gold and bauxite. The rocks, especially the granite, found in the District are suitable for both building and constructional purposes (NDPC, 2021).

The district was formerly enclosed in a semi-deciduous forest. However, due to human activities like farming, sand mining, lumbering, and fuel wood extraction, the area covered by the original vegetation has significantly decreased to the point that it is primarily covered by secondary forests and regrowth thickets. The soil type is good for both agriculture and lumber purposes. The main economic activity of the inhabitant is farming. Crops such as cocoa, oil palm, cassava, plantain, maize, vegetables and fruits are produced on a large scale. These crops are grown both for commercial and for personal consumption. The roads within the communities in the district are not tarred not even the district capital.

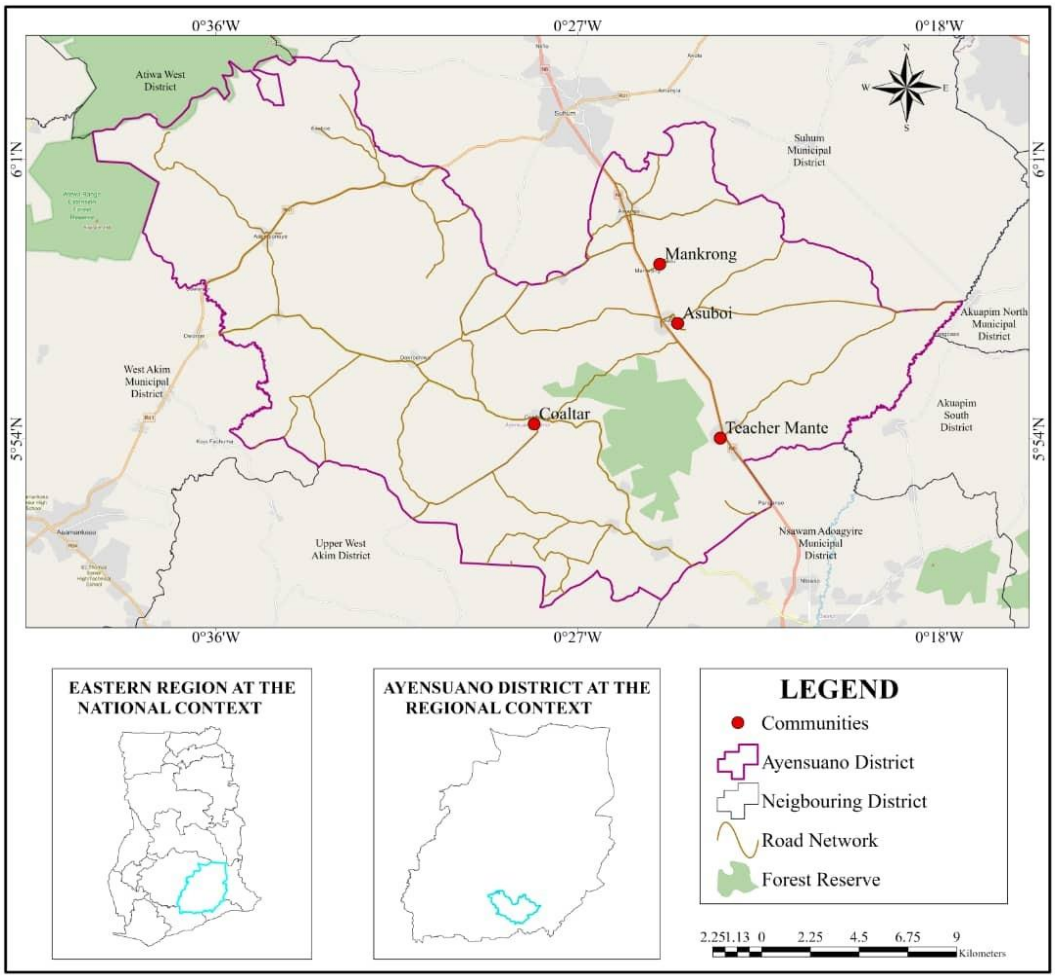

Figure 3: Map of Ayensuano District
Source: Department of Geography, UCC

Target Population

The target population for this research was 1,499 households into food crop farming from the four communities under consideration, and other agricultural stakeholders like the Ministry of Food and Agriculture (MoFA), a representative from the district Assembly, health practitioner and an Assembly member who provided relevant information needed for this study. The breakdown of the number of households in the selected communities for the study is detailed in Table 1:

Table 1: Distribution of farming households in selected communities

No.	Name of Community	Total household
1	Coalter	361
2	Asuboi	491
3	Teacher Mante	537
4	Mankrong	107
TOTAL		1,496

Source: MoFA 2023

Sample and Sampling Procedure

The unit of analysis was the households who are into food crop farming. Household heads or any other member who could supply the necessary information represented the households. This helped me to get direct information on the matters of interest. The four communities were purposively selected. Yamane (1967) sample size proportional calculator was used to calculate the sample size.

$$n = \frac{N}{(1 + Ne^2)}$$

Where, n= Number of samples

N= Total population (total population of farmers in the four selected communities) = 1,499

e= Confidence interval= 0.05

$n = \frac{1,496}{1+1,496(0.05)^2}$ n= 316

Therefore, the total sample size for respondents for the survey was 316 households into crop farming. The farmers were selected from four communities (Coaltar, Asuboi, Teacher Mante and Mankrong). The four communities were selected because these areas are some of the major farming communities in the district where sand winning activity is endemic. The total

sample for each community was derived using a proportional-to-size allocation technique. The proportional division for each community is presented in Table 2. Proportional allocation was appropriate for the survey since there were no notable differences in the social and economic characteristics of the communities from which the sample was drawn, and the goal was to describe some shared characteristics of the population (Ahmed et al., 2022).

Table 2: Proportional distribution of sample size for each community

Communities	Total number of farmers	Sample size
Coaltar	361	76
Asuboi	491	104
Teacher Mante	537	113
Mankrong	107	23
Total	1496	316

Source: Kom, 2023

Simple random and purposive sampling technique were utilized in the study. Simple random procedure was employed to select farmers from each of the four communities. This gives each farmer an equal opportunity of being selected. A total of 316 household heads who were into crop farming were randomly selected from the four communities with the help of the representative from MoFA in the district. A random number was assigned to each of the household head in the selected communities. A simple random (lottery method) without replacement was used to select the respondents proportionally allotted to each of the community and put together to get the total sample for the survey. This technique was appropriate because the food crop farmers could easily be identified with the help of the representative of MoFA at the district.

The purposive sampling technique was used to select the key informants such as a representative from MoFA, a representative from the district Assembly, an Assembly member and a health worker. They were selected because they were presumed to be well-position to provide the needed information on the effect of sand winning on the livelihood of food crop farmers.

Types of data

The data for the study is detailed as follows:

- Information on awareness of stakeholders on sand winning
- Views on the effect on sand winning on the respiratory health of food crop farmers
- Views on the socioeconomic impact of sand winning on the lives of food crop farmers
- Information on new livelihood strategies adapted by food crop farmers

Source of data

The main source of data for this research was generated from primary sources. This was mainly acquired through fieldwork. The field work was undertaken between November and December 2023. The household was the unit of analyses and the household heads were the targeted respondents. This was done by the researcher and three trained assistants.

Instruments

This study employed both quantitative and qualitative data collection instruments. The main instruments that were used to collect data for this research were interview schedule, interview guide and observation checklist. The interview schedule was used to generate quantitative data whiles the

interview guide and the observation check list were used to generate the qualitative data.

Interview schedule

Interview schedule (face-to-face questionnaire) was administered to the household heads by the researcher and three trained research assistants. Bryman 2012) indicate that for the interview schedule, the interviewer is mandated to read the questions on the interview schedule to a respondent. The instrument was read and the contents explained to the respondents. The same set of questions were administered to all respondents with the aim of ensuring that responses can be combined. The interview schedule was suitable for the study because despite having some level of basic education, the majority of the respondents were not able to read or write properly.

The interview schedule was developed based on the objectives of the study. It was structured in sections based on the specific objectives of the study. The first section solicited information on socio-demographic characteristics of the respondents; including sex, age, level of education and religion. The second section dealt with the awareness of stakeholders on sand winning. Specifically, the section encompasses issues such as the length of sand winning in the community, from whom the sand winners acquire the land, where the land owners live, where the sand winners come from and the time the sand winners operate. The third part looks at the effect of sand winning on the respiratory health of food crop farmers. Basically, respiratory disease such as cough, sneezing and nasal block were looked at. The fourth section of the interview schedule solicited information on the socioeconomic impact of sand winning on the farmers livelihood. Specific items include acres

of land farmers were cultivating before sand and after sand winning, yield before and after sand winning, reason for engaging in food crop farming, how long farmers are able to feed their families before and after sand winning and how much they are able to save before and after sand winning. The fifth and the last section solicited views from farmers on the new alternative livelihood strategies they have employed.

In-depth Interview guide (I.D.L)

Interview guide was also used to collect data from the key informants. The interview guide was structured. This help to offer some opportunity to ask more pertinent information through supplementary questions often noted when it prompts the researcher. Questions for the key informants was based on objectives of the study. The researcher had a one-on-one conversation with the key informants, where they were free to ask questions and share details about the topics being discussed. The interview covered issues related to sand winning, respiratory related disease, food production, socioeconomic issues and how these issues were addressed. Four (4) key informants were subjected to in-depth interviews. They were purposively selected based on their level of experience and the position they occupy in the Ayensuano District. This method was used so that the respondents can freely express themselves on the issues raised during the interview to ensure that all relevant responses were discussed. It also allowed for further probing to retrieve all needed information.

Observation checklist

To gather primary data for this study, field observation was utilized as a key data collection instrument. Sand winning site were visited to observe

activities going on and to assess the extent of the effect on people's farm and the environment. Photographs were taken at various sand winning sites.

Pre-testing

Pre-testing was done to make sure the interview schedule, which is the instrument used to gather data, is reliable and to address any unexpected anomalies in the responses provided by the respondents. The pre-testing or pilot testing was done at Amanase a farming community within the district where sand winning is ongoing. Pre-testing of the instrument help in identifying the problems with improper interpretations relating to how long sand winninig has been going on, yield, income and savings. After the pre-testing the lapses that were likely to affect the validity and relevance of the findings were corrected. This gave full assurance regarding the validity of the instruments for the data collection.

Reconnaissance survey

Prio to the actual field work for data collection, I took time to visit the selected communities for the study. This was necessary to get familiar with the study area and also establish necessary rapport to easy entry and effective data collection. During this section, rapport was made with key informant such as representative of the district Assembly, representative of MoFA, Assembly member and health workers in the district.

Data collection procedure

Three enumerators with a minimum qualification of first degree were hired to help me in the gathering of the household data from the food crop farmers. To guarantee that there was consensus on how to interpret the items on the interview schedule, the research assistants were trained on them. They were

further taken through ethical requirements to avoid ethical lapses. The first phase of the data collection was the administration of the interview schedule (face-to-face questionnaire) to the sampled food crop farmers based on the objectives of the study. The next data collection procedure was an in-depth interview using an interview guide. This was used in engaging the key informants including a representative of MoFA, health practitioner, a representative from the district and an Assembly member. The interview was based on the objectives of the study. These people were purposively selected because of their relevance to the study. Participants for the interview were contacted for an appointment and they were briefed on the purpose of the study and their consent sought.

On the day of the data collection, permission was sought before recording the conversation. The interview for the key informant lasted for a maximum of 30 to 45 minutes. Additionally, photographs of sand winning sites and activities were taken, and other related activities or actions observed noted. The administration of the interview schedule for the food crop farmers was conducted at their various homes and that of the key informant at their various offices. Also, moving through the community any sand winning related activities or impact observed were noted. The data collection commenced on the 5th of November to the 20th of December, 2023. Thus 45 days. The number of days spend in each community depended on the number of respondents in each community.

Data Processing and Analysis

The data gathered were both quantitative and qualitative. Therefore, in order to analyse the data, both quantitative and qualitative methods were applied.

Data gathered was cross checked to avoid any form of error. The responses to the questions gathered quantitatively were edited, coded and inputted into the Statistical Product and Service Solutions (SPSS) version 26 and cleaned before analysis was started. Descriptive statistics, Pearson chi-square test of independence, independent sample T-test, binary logistics regression, and linear regression were used to analysed the quantitative data. Tables, figures, and charts were used to display the quantitative data.

Thematic analysis was conducted on the qualitative data and presented in narrations and quotations. This was done manually using the six steps outlined by Braun and Clarke (2006). These steps included an initial stage of familiarising with the recordings obtained from the key informants. This involved listening to the recordings repeatedly in order to be familiar with the data. This helped to write down early impressions. The second step involved generating initial codes. This involves organising the data in a meaningful and a systematic way by coding in order to reduce the lots of data into small chunks of meaning in relation to the specific research objectives. In the third step, codes were organised into wider themes to form themes specific to the research questions. The fourth step is reviewing themes and this included reviewing, modifying and developing the preliminary themes that were identified in step three. The data relevant to each theme were gathered. The step five involved defining themes organising the preliminary themes into final themes, putting together all the sub-themes, considering how they interact and relate to the main themes. The final step involved writing up the defined themes and making meaning of the implications. The quantitative and qualitative data were combined under each of the objectives to ensure a

complete understanding of the themes being analysed. The demographics were analysed using descriptive statistics and chi-square test of independence in order to understand the background of the respondents.

The first objective was analysed using descriptive statistics including frequencies and percentages to analysed the quantitative data gathered, whereas thematic analysis was used to analysed the qualitative aspect. The results were presented in Chart, Table, Quotations and Figures. Regarding objective two, binary logistics regression was used to analysed the quantitative data and modelling was done to predict the possible effect of sand winning on the respiratory health of the residents in the district if the menace is not regulated. Thematic analysis was employed in the analysis of the qualitative data. Results were presented in Tables and Figures.

For the objective three, Descriptive analysis, T-test, ANOVA, linear regression and modelling were conducted on the quantitative data. The paired T-test was used to compare means of crop yield before and after the sand winning activity in the district. The linear regression was then developed to predict crop yield should the sand winning continue at the current rate for between 5 to 10 years. The results were presented in Tables, Figures and Charts. The qualitative data were analysed based on themes and presented in narrations and quotations. The analysis of the objective four was based on descriptive statistics using percentages and Pearson chi-square for the quantitative information collected on the various new livelihood activities engaged in by the farmers. The analysis was done both in aggregation and based location. It also took into consideration the type of activity such as

skilled or unskilled. The qualitative information was analysed using thematic analysis.

Fieldwork Challenges

In this section, the challenges encountered on the field and the appropriate solution were outline. Firstly, even though the list of the household heads and their contacts numbers were taken from MoFA at the district level, it was difficult in getting some of the respondents since their contact were not going through when call on phone and also the names some of the respondents registered with at the district MoFa office were different from how they are known in the community. The researcher had to contact a community member in the affected communities to take the researcher and the team around in order to locate such respondents. Also, few respondents were not ready to participate with the view that we will report them to the authorities for given us information on sand winning activities even though we assure them of their privacy. We had to explain to them further about their anonymity before they accept to participate. Finally, there was an issue with language with few of the respondent. I had to call in one of my team members who happen to speak that particular dialect to attend to such respondent.

Ethical Issues

Throughout the research process, particularly in the data collection and analysis, I adhered to all professional ethics regarding the conduct of research. Firstly, upon successfully defending my research proposal, ethical clearance was sought and granted from the Institutional Review Board (IRB), University of Cape Coast. My ethical clearance-ID is (UCCIRB/2023/41). In the collection of data, all ethical concern such as right to participation, informed

consent, confidentiality, data privacy and anonymity were duly adhered to. In order to inform respondents (key informants) before conducting the research, official letters were sent to the right authorities.

Chapter Summary

The chapter began by discussing the research approach. The mixed method approach was employed in this research. The explanatory sequential design was also discussed. This was followed by the profile of the study area taking into consideration the location of Ayensuano district, the population, geographic characteristics and the vegetation of the area. The study communities include, Teacher Mante, Asuboi, Coaltar and Mankrong. The target population as well as the sample and sampling procedures were also discussed in this chapter.

The study exploited primary data which were obtained from household heads who were food crop farmers and also from key informant such as representative of MoFA, representative from the district Assembly, a health worker and an Assembly member. Interview schedule and interview guide were the primary instruments used for the data collection. Household heads were engaged with the interview schedule, and key informants were asked questions using the interview guide. The interview schedule was pre-tested at Amanase where people's farms were destroyed by sand winning and it was administered to similar respondents who were household heads. The pre-testing was to ensure that weaknesses and ambiguities in the instruments were corrected before the actual data collection.

The challenges the research encountered on the field and how the data was analysed have also been discussed in this chapter. The actual field work

was from 5th November to 20th December 2023. Data processing and analysis were also presented in this chapter. Additionally, both qualitative and quantitative data were provided; the latter were analysed using thematic analysis and the quantitative data was tested using frequencies, percentages, descriptive statistics, chi-square test of independence, T-test, and binary logistic regression. Ethical clearance was also sought from the institutional review board (IRB) of the University of Cape Coast before going to the field and also informed consent of respondents was also sought.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This section presents analysis of results that explores the basic information about the food crop famers in arears where there were sand winning activities in the Ayensuano District in Ghana. Information including the age, sex, educational level, and marital status of the farmers were collected. The information gathered is presented in Table 3.

Table 3: Demographics of respondents

Demographic	Frequency	Percent
Age of farmers		
Youth (18-35)	32	10.10
Adult (36-60)	211	66.80
Elder (>60)	73	23.10
Total		
$\bar{x} = \mathbf{51.23}$, SD = 12.56, Min = 22, Max = 95		
Sex		
Male	218	69
Female	98	31
Total	316	100
Level of education		
Basic	223	70.6
Secondary	39	12.3
Tertiary	2	0.6
No formal education	52	16.5
Total	316	100
Marital status		
Single	42	13.3
Married	194	61.4
Divorced	41	13
Widowed	39	12.3
Total	316	100

Source: Field survey (2023)

Table 3 shows some demographics of the food crop farmers (respondents) in the district. The demographics revealed that majority of the farmers (66.80%) were adults between the ages of 36 and 60 years, which was followed by the elderly (23.10%) who were above 60 years, with the youth of 18 to 35 years being the minority group (10.10%). The classification was based on the United Nations' 2006 classification. The minimum age was 22 and maximum age of 95, with the mean age to be 51.23 years. This may suggest that food crop farmers in the district were more of middle aged than youthful which confirms the assertions by Abdulai (2020) and Oteng (2020) that there was consistent dwindling interest among the youth in agricultural activities and would prefer other jobs. Furthermore, considering the age bracket mostly involved in farming, any disturbances to their source of livelihood could pose serious threats to their socioeconomic sanity.

As presented in Table 3, the total number of respondents (farmers) were 316 comprising of 218 males (69%) and 98 females (31%). Among these, 83.50% had some level of formal education from basic to the tertiary level. Majority (70.60%) had Basic education, and 16.50% had no formal education. Only 0.6% had attained tertiary education. The level of education was important because individuals with some level of education may be endowed with knowledge, skills, and other competencies putting them in a better position to adapt or switch to more lucrative sources of livelihood compared to those with no formal education (Ployhart & Moliterno, 2011; Abdulai, 2020).

The marital status of the farmers was also sampled. This could give an idea about the status of the farmer as a nuclear family man with other

dependents. Majority (61.4%) of the respondents were married, with the single being 13.3%, the divorced being 13.0% and 12.3% being widowed (Table 3). This indicated that at least 61.4% farmers had direct dependents hence any disturbance on their livelihood would directly affect the other dependents.

Stakeholders' awareness on sand winning in the district

What is the awareness of stakeholders on sand winning activities in the district? This objective sought to find out the stakeholders' awareness of the ongoing sand winning activities in the district. It sought to explore if the stakeholders were aware of the duration of sand winning in the district, who were responsible for leasing the lands to the sand winners, the residence of the leasers, where the sand winners resided, the gender involved in the sand winning and the time of operation of the activities. The aggregated results are presented in Table 4 and then the duration of sand winning presented according to community in Fig. 4. Some pictures are attached to show what was prevailing at the study site.

Table 4: Farmers' awareness on sand winning activities in the district

	Frequency	Percentage
Duration of sand winning		
1-5 yrs	108	34.20
6-10 yrs	108	34.20
>10 yrs	100	31.60
Total	316	100.00
Leasers of Land		
Individuals	102	32.30
Family/Clan Heads	49	15.50
Chiefs	99	31.30
Others	66	20.90
Total	316	100.00
Residence of Leasers		
Community	209	66.10
Outside community	43	13.60
Both in and outside	54	17.10
Don’t know	10	3.20
Total	316	100.00
Residence of sand winners		
Community	13	4.10
Outside community	184	58.20
Both in and outside	102	32.30
Don’t know	17	5.40
Total	316	100.00
Gender involved in sand winning activities		
Male	289	91.50
Female	1	0.30
Both	26	8.20
Total	316	100.00
Time of Sand Winning		
Dawn	49	15.50
Morning	9	2.80
Afternoon	9	2.80
Night	195	61.70
Dusk	54	17.10
All day	0	0.00
Total	316	100.00

Source: Field survey (2023)

Generally, it was clear that all farmers were aware of the ongoing sand winning activities in the district. The duration of the sand winning activity in the district was different from community to community, but in general, the minimum duration was one year and the maximum was fifteen years (Fig. 4). Teacher Mante was the first community to be invaded by the sand winners before spreading to the other communities (Fig. 4). In the Fig. 4, it was clear that averagely sand winning started in Teacher Mante between 12 to 15 years ago, followed by Mankrong of about 6 to 8 years ago, Asuboi of about 3 to 6 years and the least being at Coaltar with about 1 to 2 years ago.

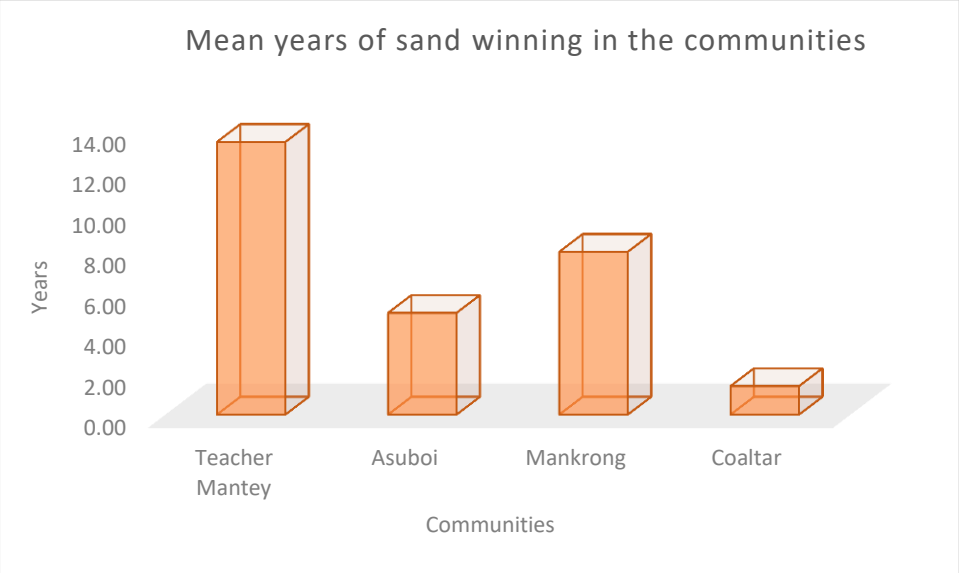

Figure 4: Bar chart showing average years of sand winning in each community

Source: Field survey (2023)

The observations made in the communities also showed some old winned sites that had been left unreclaimed and bare, with patches of grasses growing on them, some had water filled in them (Fig.5 and 6). The topography of the land had been distorted and one had to be very careful walking through those areas due to the undulating nature of the land created by the sand

winning activities (Fig. 7). At Teacher Mante, it was observed that the devastations were not only on people's farms but also close to residences (Fig. 8) as well as the utterances of some of the respondents revealed that the effect on the land and livelihoods had devastated the people.

Figure 5: Unreclaimed winned site with patches of grasses
Photo credit: Author (2023)

Figure 6: Unreclaimed winned site with pit filled with water
Photo credit: Author (2023)

Figure 7: Winned site with undulating topography
Photo credit: Author (2023)

Figure 8: Winned site close to residence
Photo credit: Author (2023)

When asked about who leases the land to the sand winners for their operations, it came out that individual land owners (32.30%) and Chiefs (31.30%) led in leasing the lands to the winners (Table 4). This was followed by others (unknown) who made up 20.9%, and family/clan heads who constituted 15.5%. Studies by Arthur & Benediktsson, 2016; Abdulai, 2020;

Asare et al., 2023 showed that lands in Ghana were mostly under the custodian of Chiefs and family/clan heads who mostly were responsible for giving out lands to miners.

In this study, however, it was observed that individual land owners formed the majority group of people (32.3%) who offered their lands to the sand winners to operate. This further contradicts the work done by Arthur & Benediktsson (2016) on sand winning in Northern Region where an Environmental Officer believed that it was much easier to regulate release of lands owned by individual land owners. Everybody wants to survive, and as said by Abdulai (2020) and Asare et al. (2023) when there was a pressure or demand for a livelihood resource such as agricultural land, land owners may prefer to sell it and use the money for non-agriculture activities. They also added that high demand for land coupled with the desire to make money often drove chiefs and heads of land-owning families to sell or lease their lands to developers and other speculators. Arthur & Benediktsson (2016), Peprah, (2013) and Salifu (2016) found out that the leasers of lands (especially for sand winning activities) obtained good returns from the sand winning contractors hence would prefer giving the lands out to the sand winning contractors than for farming purposes.

Majority of the leasers in the Ayensuano district (66.1%) lived right in the communities and obviously realized the devastating effect of the sand winning activities but their quest for money supplanted any other effects. Again, the leasers were only focused on their short-term gain forgetting about the long-term effect on land, food production, and even the health of the people. This confirms an observation made by Arthur & Benediktsson (2016)

in the Northern region of Ghana where sale of land for building purposes is lucrative for the chiefs and landowners and in most cases, this surpasses the preference of the rural populations who need the land mainly for farming purposes.

Majority of the sand winners (>58.2%) resided outside the communities confirming the observations made by Arthur & Benediktsson (2016) and Asare et al. (2023). Only few, about 4.1% resided in the communities including the sand prospectors who go about testing the soils to discover areas suitable for winning. This confirmed a report on sand winning from the Greater Accra Region that 'most of the sand contractors and their employees, payloader operators and tipper truck drivers were from outside the communities (Asare et al., 2023) but the sand prospectors and few teenagers who direct trucks to the site were often natives of the communities' (Peprah, 2013; Asare et al., 2023). Majority of the sand winners were male (91.5%) with few indicating that both sexes were involved (8.2%) which confirmed the findings of Peprah (2013) and Sumani (2019). At Danko in the Upper West region Sumani (2019) observed that only 6% female were involved in the sand winning activities and they were collecting rent on behalf of the landowners. In this study, however, the specific role of the women was not exploited.

The time of operation of the sand winners was reported to be mostly at night (61.7%), as was stated by one of the farmers

'We only woke up in the morning to see that our farm had been winned'

and this statement run through with many of the affected farmers.

This confirms previous studies that stated that most of the sand winning operations were carried out at night (Salifu, 2016; Asare et al., 2023) mostly to avoid confrontations with farmers and other community members. The other percentages indicate that the activities were carried out at various times during the day.

Key informants' awareness of sand winning in the district

To find out if the appropriate authorities in the district were aware of the ongoing sand winning activities and how it is being managed, some key informants were interviewed using interview guide with open ended questions. Their responses were analysed using thematic analysis. The responses were coded and themes developed. Four themes run through the interview in relation to objective 1 including Destruction, Illegal, Conflict and Disregard of regulations. The participants were labelled Informant A, Informant B, Informant C. The response from the key informants is in sync with the response from the food crop farmers.

The participants were asked what they knew about the sand winning going on in the district and its effect on food crop farming. All the key informants interviewed said the sand winning has existed in the district for a long time given between 10 to 12 years. They all said it is a real challenge in the district seriously affecting food production. Informant A has this say

> *The sand winning is really a challenge in the district, many farmers' crops are destroyed by the sand winners and sometimes we have to go and evaluate the lands and crops destroyed.*

Informant B said

> *It is an issue in the district, people's farms are destroyed and sometimes you cannot even trace those who came to do it.*

and Informant C said

> *I was not even given any notice that something like this was happening. They are really disturbing us.*

All the respondents alluded to the fact that the sand winning is going on and causing many devastations in the district. They said most of this activity is illegal. They said the lands were leased to the sand winners by the chiefs and individual land owners without going through the appropriate channels, which is contacting the District Assembly to obtain permit. It came out that the sand winners were supposed to be registered with the District Assembly before they can undertake any sand winning activity in the district. However, this is not done, as said by Informant B

> *The sand winners are supposed to be from a certified company and they have to fill a form to register with the District Assembly, but most of them don't come because they are illegal people. They are not from any certified company.*

and Informant C also added that

> *These people are all 'gallamsayers' with no permit, so they always hide to carry out their activities.*

I further probed if there were any by-laws regulating the activities of the miners and the general response was that there are some regulations that were developed by the Assembly specifically to regulate the sand winning activities. None of them denied knowing the activity going on in the district,

and they all agreed it was devastating and needed to be regulated. As reported by Peprah (2013) in Wa, Salifu (2016) in Sunyani West, Wenchi and Techiman Municipalities, and Tagoe (2005) in the Ga Districts, Asare et al., (2023) in the Greater Accra Metropolitan Area, among others there were by-laws governing sand winning activities in these areas. These by-laws were said to be Minerals and Mining Act that governs mining in general. Informant B in reading part of the Regulations said

> *Sand winners must first meet the landowners and any tenants that may be farming on the land and after negotiating they must report to the Assembly to obtain a permit for their operation. They are required to come with the leaser's Ghana Card to show that the leaser indeed gave them the go ahead to win the land. A staff from the Assembly and MoFA is made to go to the said land to evaluate the land and any crops on it and the sand winner made to pay the stipulated cost to the farmer. The sand winner is then to sign an agreement to do reclamation after the sand winning. Also, the sand winners are to scoop the top soil and deposit at nearby site which will be used later in the reclamation process. Failure to follow these procedures the sand winner will have his or her permit revoked and penalized.*

The informants also added that even though these regulations are there, both the sand winners and the leasers of the land did not adhere to them. Informant A said

> *Some of the land leasers feel the land belongs to them so they can do whatever they want to do, they give out the land and tell the sand winners to go and win and not involve the Assembly.*

The activity was also mostly carried out at night with the perpetuators gone by the morning thereby making it difficult to regulate the activity and bring the perpetuators to book. Informant C said

> *Even though these regulations are there the people are very stubborn, because of that they will not even do it during the day, to avoid any confrontations.*

In the incidence of a farmland being destroyed without following this due process, a farmer was to report to the Assembly and then the Task Force conducts an investigation, value the land and the crops and the perpetrators brought to book. The task force was made up of the police, a representative each from MoFA and the Assembly. However, there was a challenge with this system. Most of the farmers were not the landowners, they were *'squatters'* as put by Informant A. The landowners hence felt that the land was theirs and they had the final authority on what it should be used for, hence some of them leased out the land to the sand winners and then encouraged them to go ahead with their activity without going seeking permit from the Assembly. Furthermore, the cost of the investigation rested solely on the farmer, hence in the case where the guidelines were breached most of the farmers would rather not report the problem to the Assembly but would prefer to *suffer the consequences* as indicated by Informant C. If this menace is to be effectively regulated, there is the need for the institutions to conduct regular and intensive community education on the adverse effects of the sand winning on food

production, people's livelihood, health, and the community at large. It needs to be emphasized that the Assembly does not seek to eradicate sand winning but rather to regulate it to ensure a sustainable activity as well as reverse or prevent the devastating effect of its illegal operation.

All the key informants interviewed had different views about how these regulations were being implemented. Those in the district capital, Coaltar, had a strong believe that the regulatory body; the Task Force, in place were effective in ensuring that the winners followed the guidelines. Some reclaimed lands in Coaltar had been cultivated with maize (Fig. 9) and cassava (Fig. 10). In other instances, the top soil was scooped onto a nearby site (Fig. 11) waiting to be used for reclamation. However, those in the other communities seemed not to see any action of the regulations. One of the key informants indicated that, in some of the communities, instead of the Task Forces of the Assembly, they saw Task Forces of the sand winners, guarding them with guns while they mined. This scared the farmers and they would dare not question or report the perpetrators.

Figure 9: Reclaimed land planted with maize (Within black circle)
Photo credit: Author (2023)

Figure 10: Reclaimed land with cassava
Photo credit: Author (2023)

Figure 11: Scooped top soil to be used for reclamation
Photo credit: Author (2023)

Due to the illegal nature of the activity and the continual disregard of the regulations there often arose conflict among the parties involved especially between sand winners and farmers. Some of the sand winners operated during

the day so when the farmers happened to meet them destroying their crops, conflict usually arose. The sand winners believed the lands were legitimately leased to them by the landowners hence they owe no duty to the farmers while the farmers also believed that since they had planted the crops they need to be compensated for their inputs. Informant A said

> *The farmer also feels his livelihood has been destroyed and hence at least he should be compensated for his crops and this usually develops into quarrels between them.*

Informant C also said that

> *Now some of the sand winners because they have the backing of the chiefs operate during the day with body guards protecting them and sometimes even holding guns in their hands so even when you go and meet them on your farm you are even afraid to confront them.*

These conflicts will surely arise when people's livelihood is threatened in this manner. It is therefore imperative for the Institutions to come in strongly to ensure that rules are enforced to protect both party's interest. According to Scott (2004), Institutions influenced the pattern of attitudes and behaviours, which shaped actor's attitudes and behaviours and provided stability and order in a society. With this assertion, it is believed that if the Institutions as a holistic force stood their ground and enforce these processes in all the communities in the district, they would gain legality, become authoritative rules for social behaviours and would be accepted by the individuals as social realities (Scott, 1987; 2004). As suggested by Foresti et al., (2007), in order to meet the needs of those impacted, the state, private organizations, and

individuals must strike a balance between competing interests in a way that upholds human rights.

The perceived effect of sand winning on respiratory health

The research question asked under this objective was how does sand winning activities affect the respiratory health of the food crop farmers? This sought to find out if the sand winning activities posed any danger to the health of the residents of the affected communities in the district, specifically looking at the effect on the respiratory health of the people. Respondents were asked if they were ever diagnosed of any respiratory illnesses such as cough, sneezing, and Nasal block as a result of sand winning activities. Furthermore, a regression model analysis was conducted to predict the possible rise of respiratory illnesses in the affected communities should sand winning persist.

Table 5: Distribution of respiratory disease as a result of sand winning

	Frequency	Percent
Not Affected	275	87.0
Affected	41	13.0
Total	316	100.0

Source: Field survey (2023)

The result in Tabel 5 showed that about 13% (41) of the respondents could associate the respiratory illnesses they experience to the sand winning activities going on in the communities. The others, 87% (275) said even though they may experience some form of respiratory illnesses once a while, they could not categorically say that it is as a result of the ongoing sand winning activities. Furthermore, binary logistic regression was used to

establish the likelihood effect of sand winning activities on respiratory diseases.

Table 6: Logistic Regression on the perceived effect of sand winning activities on respiratory disease among farmers

							95% C.I. for EXP(B)	
		B	S.E.	Wald	Df	Sig.	Exp(B)	Lower	Upper
Step1[a]	Length of Sand Winning	2.415	.426	32.210	1	.000	11.192	4.860	25.772
	Constant	-7.844	1.205	42.407	1	.000	.000		

Source: Field survey (2023)

Table 6, the odds prediction equation is $odds = e^{-7.844+2.415x}$. It implies that if there were no sand winning activities, the $Odds = e^{-7.844+2.417(0)} = e^{-7.844} = 0.00$. That is the odds of respiratory disease was 0.00 times as likely than less likely to increase if there were no sand winning activities. The odds of respiratory disease in areas of sand winning activities was $e^{2.415} = 11.192$ times as likely than areas of no sand winning activities. That is sand winning activities were 11.192 times as likely to increase respiratory diseases than less likely among the people in the community. The model parameters, length of sand winning activities was significant with a p-value of 0.00. From the responses of the respondents, they did have some level of respiratory challenges such as sneezing and coughing but they were not able to attribute it solely to the sand winning activities. However, the respondents were quick to add that they did experience some respiratory issues such as sneezing and coughing mostly when the trucks loaded with sand moved through the community.

This finding reflects the aspect of the conceptual framework that suggest that sand winning will lead to respiratory illnesses. Some of the respondents also said that the dust produced as the trucks move continually through the communities was very unbearable. This was observed in Teacher Mante one of the days as an interview was ongoing. A truck loaded with sand passed by leaving a cloud of dust behind it (Fig. 12). Many of the roads to these winning sites were untarred and really dusty especially during the dry season. As observed by Tagoe (2005), Peprah (2013), and Feyissa (2020) the moving trucks carrying the sand usually left heavy dust behind them especially during the dry season.

Figure 12: Moving truck loaded with sand leaving dust behind it
Photo Credit: Author (2023)

Key informants' assertion on the effect of sand winning on respiratory health

To ascertain the effect of the sand winning on the respiratory health of the people in the communities, some appropriate authorities were interviewed using open ended questions. They were asked if they were previewed to any health-related challenges as a result of the sand winning activities in the district. The responses were coded and themes were developed for analysis. One theme run through the responses, and that is Air pollution. The respondents were labelled as Informant A, Informant B (same as in Objective 1) and Informant D.

All respondents listed dust produced by the moving trucks as one of the major pollutions observed from the mining sites. Informant A said

> *Of course, sometimes the dust produced as the vehicle moves through the town can really be unbearable and it makes people cough a lot. A lot of the farmers complain of cold.*

Informant D revealed that the dust is a major source of concern in the communities, however, its effect may not be directly seen immediately. These illnesses are mostly not recorded in the health centres because most people with cough or cold would prefer to go to the drug stores or self-medicate. Informant D said

> *It is really a problem, sometimes when you see the thick dust produced by these moving trucks you have to cover your nose to prevent inhaling it. But the people don't usually report these illnesses to us because they will prefer to treat themselves or go to the drug store for some cold relief.*

For Informant B, even though he agreed that there is usually dust produced by these moving vehicles he could not associate them to any respiratory illnesses.

Well, the dust produced is true but I cannot say it is the cause of people coughing or having catarrh.

Many of these roads are untarred hence causing air pollution as the trucks moved to-and-fro the communities. The effect of dust on human health cannot be ignored. Dust can get into the human body through three main roots; inhalation, ingestion and dermal absorption (Ali et al., 2023). As further expounded by Ali et al (2023) dust is the major cause of almost all serious health problems including the eyes, skin, heart, stomach and respiratory disorders, among others, which could lead to death. In Tagoe's report some of the respondents associated some illnesses (such as malaria) they encountered to mosquitoes bred in stagnant water from winned pits as well as respiratory illnesses due to dust, among others. Continuous exposure to high doses of dust could be a source of health concerns to the people of the Ayensuano district. This needs to be taken more seriously than is being done in the district. The effect of dust in sand winning prone areas needed to be seriously considered and regulated appropriately.

I further sought to find out if the level of effect of sand winning activities on the respiratory disease was significantly influenced by age and gender of the individual.

Table 7: Logistic Regression Model Summary

Independent variable	-2 Log likelihood	Cox & Snell RSquare	Nagelkerke R Square
Length_Sand Winnig	176.964[a]	0.191	0.355
Length_Sand winning & Age	176.959[a]	0.191	0.355
Length_Sand winning & Gender	176.907[a]	0.191	0.355
Length_Sand winning, Age & Gender	176.903[a]	0.191	0.355

Source: Field survey (2023)

Table 7, the −2 Log Likelihood test for length of sand winning activities as the only predictor variable in the model was 176.964 , length of sand winning activities and age as predictors was 176.959, length of sand winning activities and gender as predictors was 176.907, and length of sand winning activities, age and gender as predictors was 176.903. These showed that, with length of sand winning activities, age, and gender in the model, the −2 Log Likelihood value had reduced by 0.061 which was approximately not equal to one. Again, the Nagelkerke R Square values for all the models was 0.355, explaining 35.5% of the variation in respiratory disease of individuals. Thus, length of sand winning activities was enough to predict the likelihood of respiratory disease in individuals.

Socioeconomic impact of sand winning on farmers' livelihood

The research question to address this objective was 'to what extent does sand winning affect the socio-economic situations of food crop farmers?' This objective sought to look at the impact of sand winning on the socioeconomic status of food crop farmers in the district. This took into consideration farmers whose lands had been directly affected by the sand winning and those that might not have been affected by sand winning activity

(Fig.13) and how this effect might have impacted their general socioeconomic status such as their income and food security.

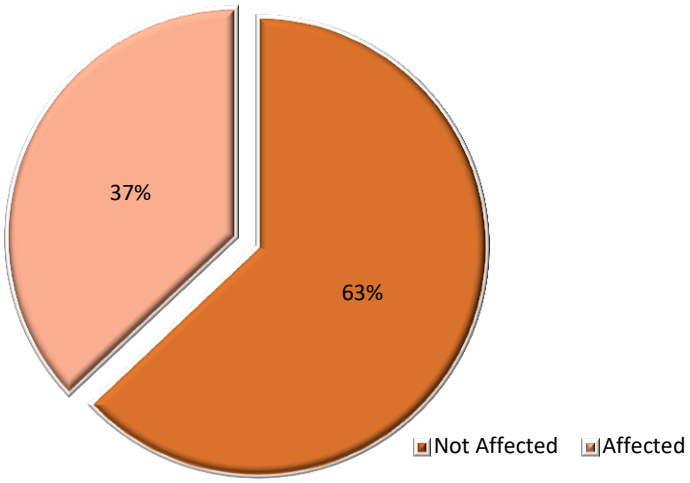

Figure 13: Pie chart showing percentages of affected and not affected food crop farmers in the district

Source: Field survey (2023)

A glance at the above chart with a p-value of 0.00 less than alpha of 0.05, it was clear that the difference between the means was significant hence I rejected the null hypothesis that sates that the means of those affected equals the means of those not affected. However, considering the fact that 37% of the population of food crop farmers in the district had been negatively affected by sand winning activities in the district was alarming. That is 37% of households having their livelihoods disrupted. That is 37% reduction in food crop production. When this data was analysed based on what pertains in the different communities, the devastation was clearly exposed (Fig. 14).

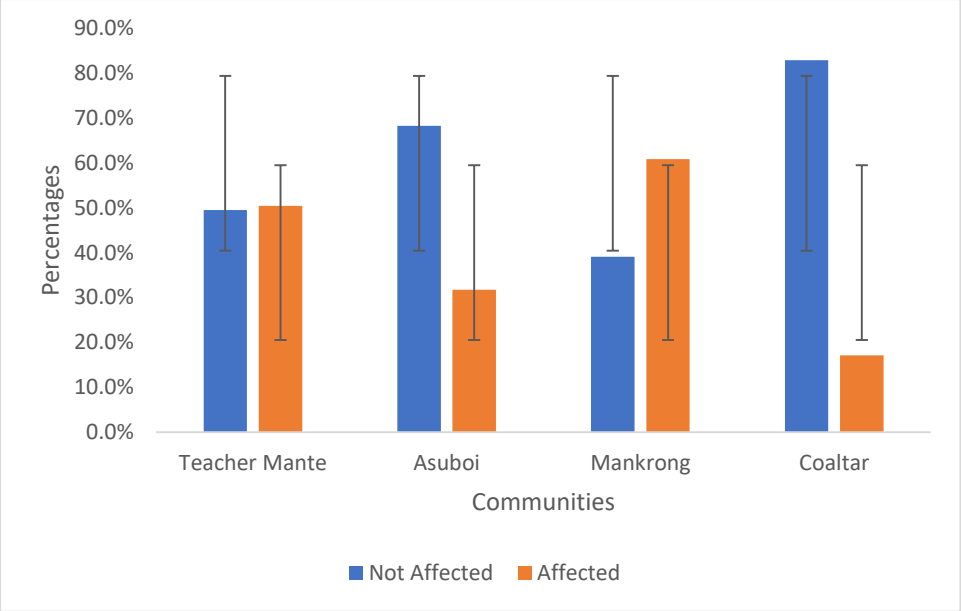

Figure 14: Bar chart comparing percentages of lands affected and not affected in each community

Source: Field survey (2023)

As depicted in the bar chart above (Fig. 14), Mankrong was the most hit by the effect of sand winning in the district. Over 60% of farmers had their livelihoods disrupted by this menace. Though as compared to Teacher Mante, sand winning started later (Fig. 4), the community was the smallest in terms of population size (107 households into food crop farming- MoFA, 2021). It was one of the communities with current destructive activity of the sand winners. Some farmers in the community had completely lost their lands to the sand winners with no hope of locating any other farmland. The community had been severely hit by the sand winners, showing no mercy to the few farmlands in the community. Per observation and some of the utterances of the farmers from this community, many of them had been devastated with many in fear of what the future holds for them since their dreams seemed to be shattered.

A female farmer said:

I arrived on my farm one day after two weeks break only to find out that my maize and cassava crops have been completely destroyed so I am now in the house doing nothing.

In Teacher Mante, the percentage of lands affected almost equal those that had not been affected, 50.4% and 49.6% for affected and not affected respectively. This community has endured the longest period of sand winning in the district (Fig. 4). It was also the largest community in terms of population in the district with about 537 households engaged in food crop farming (MoFA, 2021). This showed that quiet a high number of farmers had been affected by the menace. The story was not different in this community as many farms were winned without prior notice to the farmers. A farmer from this community said

I went to farm in order to work on my four acres maize farm just to see that my entire maize farm had been destroyed and the surface soil had been scooped away. I had to sit on the ground for about thirty minutes because my temperature was rising.

At Asuboi, with a population of 491 households engaged in food crop production (MoFA, 2021), many of the famers live in fear of losing their farms to the sand winning activities. A 95-year-old farmer who had been affected in this community said he now resorted to selling out his farm lands to other interested farmers because he could not continue to bear with the continuous sight of devastation, he encounted when he visited some of his farms.

Coaltar was the least affected basically because sand winning started there just about two years ago (Fig. 4). Further probe of this situation revealed

that Coaltar, being the district capital, had some operational Task Force that carried out regular patrol in the community to deter perpetrators. Additionally, the developed regulations guiding the sand winning activity in the district were mainly practiced. The farmers in the community attested to the fact that due to regulations from the District Assembly the sand winners didn't pester them in the community like in the other communities.

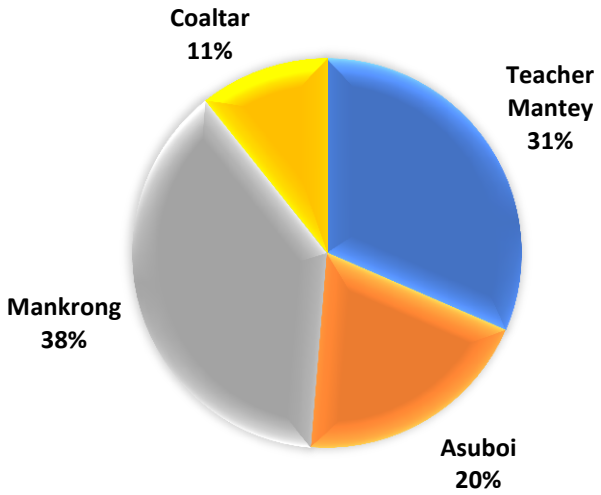

Figure 15: Pie chart showing the mean percentages of the farmers affected in each community

Source: Field survey (2023)

In all, the percentage of farmers whose lands had been destroyed to some degree by the sand winning activities are shown in the Pie chart above (Fig. 15). Mankrong had the highest number of farmers affected (38%) followed by Teacher Mante (31%), Asuboi (20%) and then Coaltar (11%). For some of these farmers their entire farms had been affected and for some their farm sizes had been reduced. This finding agrees with the aspect of the conceptual framework that suggest that as a result of sand winning farmers will have their farm size reduced or loss their entire farmland.

In accessing the direct effect on the socioeconomic status of the farmers such as crop yield, food security, earnings, and savings, various analysis were conducted including descriptive statistics and paired t-test for the quantitative data, and theme analysis for the qualitative data collected.

Table 8: Descriptive statistics on crop yield per planting season before and after sand winning in the district

	Yield per season before sand winning	Yield per season after sand winning
Mean	15.98	6.58
Minimum	6.00	2.00
Maximum	36.00	18.00
Sum	1,870.00	770.00

Source: Field survey (2023)

Considering the impact on crop yield per planting season, a descriptive statistic was carried out to observe any change in the yield before the sand winning and yield after sand winning. The result is presented in Table 8. The mean yield before the introduction of sand winning was 15.98 bags of maize, however, with the introduction of sand winning, mean yield dropped to 6.58 bags. The total crop yield before the sand winning was 1,870 bags and this reduced to 770 bags. This agrees with the aspect of the conceptual framework that suggest that food production will be reduced as result of sand winning.

To further determine the significance of this difference, Paired sample t-test was conducted and the result is presented in Table 9.

Table 9: Paired samples T-test on the yield as a result of sand winning activities

		Paired Differences					t	Df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair1	Yield before sand winning - Yield after sand winning	3.228	5.279	.297	2.644	3.812	10.870	315	.000

Source: Field survey (2023)

A hypothesis was developed and tested

H_o: average yield before sand winning activities is the same as average yield after sand winning activities

H_1: average yield before sand winning activities has decreased after sand winning activities

The result show that there was a significant difference between the average yield before and after sand winning activities with p-value of 0.00 which was less than alpha value of 0.05 with mean 3.228 and standard deviation 5.279 (Table 9). We therefore, fail to accept the null hypothesis and conclude that average yield before sand winning activities has decreased after sand winning activities. For most of these farmers, the reduction observed in yield was mainly due to reduction in farm size and not necessarily as a result of reduced fertility of the land. This is because except for those in Coaltar who had their lands reclaimed, the winned lands were usually left as pits that were filled with water (Fig. 6) or sloped erosion-prone lands (Fig.16) or clayey lands (Fig. 17) that were not able to support crop production. This confirms assertions by Tagoe, 2005 and Kleeman et al., 2017 who reported that the mined pits were left to be filled with water thereby depriving farmers of their livelihood and even in some cases these served as sources of disease spread including Malaria and Buruli ulcer thereby raising other public health concerns.

Fig. 16: Sloped land left after sand winning

Photo Credit: Author (2023)

Fig. 17: Clayey surface left after sand winning

Photo Credit: Author (2023)

Table 10: Mean yield per planting season by the communities

Community	Yield Per Planting Season		
	Before Sand Winning	After Sand Winning	Difference
Teacher Mante	13.09	4.11	8.98
Asuboi	17.27	7.79	9.48
Mankrong	22.14	12.29	9.85
Coaltar	18.77	8.23	10.54

Source: Field survey (2023)

Table 10 shows the mean yields for each community before and after the sand winning invaded the district. It also shows the mean by which total yield has been reduced per each planting season in each community. The mean reduction in yield was 8.98, 9.48, 9.85 and 10.54 for Teacher Mante, Asuboi, Mankrong, and Coaltar respectively. This level of reduction was significant when the paired t-test was conducted for the pooled yield of the four communities (Table 9) but when analysed to find out if the mean among the communities were significant, the result showed that there was no significant difference in the mean between the communities with the p-value of 0.55 which is higher that the alpha value of 0.05. All communities were equally affected. Despite Coaltar had the least presence of the sand winning activities the effect on the few that were affected by the sand winning had a significant mean reduction in yield per planting season.

Table 11: ANOVA of mean yields among communities

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	46.299	3	15.433	.704	.551
Within Groups	2476.692	113	21.918		
Total	2522.991	116			

Source: field survey (2023)

This further reflected in how long these farmers were able to feed their families with the produce from their farms (Table 12), the percentage of the produce they were able to sell (Table 13), and how much money they were able to save from their sales (Table 14).

Table 12: How long farmers were able to feed their families with produce before and after sand winning

Number of Months	Before Sand winning (%)	After Sand Winning (%)
1-3	1.74	65.22
4-6	50.43	26.95
7-9	3.48	0
10-12	44.35	7.83
Total	100%	100%

Source: Field survey (2023)

In Table 12 above it depicts that before the sand winning majority of the farmers (50.43%) were able to feed their families with their produce for 4 to 6 months and this was closely followed by 44.35% who were able to feed their families for 10 to 12 month and the least number of months was 1 to 3 months which involves just about 1.74% of the farmers. When we come to

after the sand winning, however, the story was significantly different. Majority of the farmers (65.22%) were able to feed their families with the produce from the farm for only 1 to 3 months. This was followed by 4 to 6 months comprising of 26.95% of the farmers. Only 7.83% were able to feed their families for 10 to 12 months as against 44.35% before the sand winning evaded the district.

Table 13: How much farmers were able to sell before and after sand winning

Quantity (%)	Sold before sand Winning (%)	Sold after sand winning (%)
<50	19.66	88.69
>50	80.34	7.83
None	0	3.48

Source: Field survey (2023)

Most of the farmers (93.7%) (Table 13) say they farmed for both domestic use and for sale. When asked what percentage of the produce they were able to sell compared to what they were able to sell now after the introduction of the sand winning, about 19.66% say they use to sell less than 50% of the produce and 80.34% say they sell more than 50% of their produce before the sand winning (Table 13). After the introduction of the sand winning, the situation was now completely reversed with 88.69% saying they were only able to sell less than 50% of their produce and 7.83% selling more than 50%. When probed further some responded by saying

> *Now that our farm size has been reduced what we plant is not even able to sustain the family for long, how can we sell it. We can only sell small to buy some other things that we need.*

About 3.48% even say they were not able to sell at all, what they produce was only enough to feed the family.

Table 14: Percentage of income saved before and after sand winning

Percentage saved	Before Sand winning	After Sand winning
<20	34.78	20.87
20-40	45.22	2.61
50	8.70	0
None	11.30	76.52

Source: Field survey (2023)

Regarding the farmers' sustainable income, they were asked how their incomes had been affected in all these and out of the total number of respondents, about 33.9% had seen some negative effect on their income. This is not different from the observation by Naab et al (2013) who noticed that sand winning has caused 23.8% of farmers in Tamale (Northern Region) to lose their income with even 27.5% reporting to had scarcity of food. This surely disrupts any attempt of these farmers to save for any future activities as farmers in the Ayensuano District were asked how much of their sales they were able to save (Table 14). Before the sand winning, 34.78% said they were able to save 20% of their income, 45.22% said they were able to save between 20 to 40% of their income and 8.70% were able to save 50% and 11.30% said they were not able to save any money. After the introduction of the sand winning, the situation is much of concern, 20.87% were able to save 20%, only 2.61% were able to save between 20 and 40 %, 0% were able to save 50 % and over 76% said they were now not able to save anything at all (Table 14). This sure is a looming poverty.

With just about 6 years to the deadline for the Sustainable Development Goals, these reports don't seem to support Ghana's role in achieving these goals. SDG 1 and 2 especially are directly affected by these reports. The goal 1, 'No Poverty' seeks to end poverty in all its forms everywhere, leaving no one behind. The manner in which sand winning activities were depriving people of their livelihoods is a huge threat to achieving this goal. Furthermore, the goal 2 'Zero Hunger' which ties into this seeks to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. What is happening at the Ayensuano district and other areas such as the Tamale (Naab et al., 2013), Wa (Abdulai, (2020), Abuakwa (Amoateng et al., 2013), and Ga West (Kleemaann et al., 2017) among others in the country clearly is the opposite of what this goal seeks to achieve.

Furthermore, many of these farmers felt they had been deprived of their entitlement without compensation and had been left to pick up their own lives back. More than half of the affected farmers (53.98%) claim they had not been compensated in any way when their lands were invaded. About 1.8% said they were compensated with another land and 42.5% claim they were compensated with some money, however, that does not match the value of the land or crops that were destroyed. Some even said the sand winners had paid part of the agreed amount with the promise to pay the balance after the sand was winned but that never happened.

Key informants' assertion of impact of sand winning on socioeconomic status of farmers

I further sought to know if the key informants were preview to the consequence the sand winning is posing on the socioeconomic status of the food crop farmers in the district. The responses were coded and two themes were derived. The themes were, living on charity, and abandonment. Informants A, B and C had a lot to say to this question. To start with, all the informants affirmed that the sand winning had adverse effect on the food crop farmers and this had affected the income and hence social status of some of them. Some of those affected had completely lost their farmlands with no other source of livelihood and being faced with poverty and hunger, they depend on charity to survive. Informant C explained that

> *Some of the farmers now depend on alms from families and friends to survive*

This definitely will have an effect on the individual's ego, and not only that but this could go further to affect their mental health and its related issues on the whole. Informant A also said that

> *Sometimes you talk to those affected and you can see that they are confused because they don't know how they will survive, their only source of livelihood has been taken away from them.*

The views express above are in line with the theoretical framework which point to the fact that when people's livelihood asset is tempered with it can lead to poverty.

When it comes to the issue of compensation the feeling is more of abandonment. Many of the affected farmers felt abandoned and betrayed by

the sand winners and sometimes the landowners. The sand winners failed to compensate the farmers. Even in instances where the farmers succeed in striking a deal with the miners, they only partially fulfilled this deal. Informant B said

> *Most at times the sand winners only agree to pay some compensation when they are reported to the Assembly by the farmers and even with that the agreement is that they would pay part of the money at the beginning of the operation and then pay the rest when they finish, but they usually don't pay the arrears when they finish the operation. It is a big problem.*

This was what Informant A had to say about compensation of affected farmers

> *As for compensation, it is still a challenge. Sometimes you will not even see those responsible to discuss any compensation terms with them because they came to operate in the night. But those that we are able to trace, we go to the farms to evaluate the cost of the crops destroyed and then ask the sand winners to pay. Some of them comply but others too will pay some but run away after the winning and not fully pay the amount evaluated.*

All these said by the key informants confirms the information gotten from the respondents in relation to the socioeconomic impact of sand winning on the food crop farmers. There would need to be stricter arrangement to ensure the farmers were better compensated for their loss of crops most especially.

Projection for nearest future

Notwithstanding the current state of the adverse effect of sand winning in the District, Ayensuano still remains one of the '*main food baskets in*

Ghana', as said by Informant B. However, with this rate of destruction of farmlands and crops, how long can this continue to be the case. With this in mind I further developed a Regression model to predict yield production if sand winning activities should continue for 5 to 10 years and beyond. The result is presented in Table 13 below.

Table 15: Regression Equation on yield as a result of sand winning activities

Term	Coef	SE Coef	T-Value	P-Value
Constant	0.0119	0.0188	0.63	0.529
Acres of Land	5.9600	0.0160	373.19	0.000
Length of Sand Winning				
5-10 years	-0.0089	0.0261	-0.34	0.033
Above 10 years	0.0583	0.0263	2.21	0.028

Source: Field survey (2023)

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.189341	99.78%	99.78%	99.77%

From the modelling, it was predicted that with the rate at which sand winning activities were being undertaken in the district, there will be reduction in crop yield by 0.0089 (Table 15) within five years to ten years compared to length of sand winning activities below five years as a base line. This reduction was significant (p-value of 0.033) and hence need to be taken seriously. This model was able to accurately predict up to five years implying that if the activity should further last for just about five more years, there will be a significant reduction in food production in the district. Whiles the world is trying to fight against hunger by 2030, this observation seems to be pulling

Ghana back in realizing this Sustainable Development Goal. Interestingly, the narration changes with longer years, ten years and above. The model predicts that yields will increase by 0.0583. Many factors could be considered for this observation such as land regaining its fertility over the period, and the reclamation programme already being carried out in some of the communities when intensified may also lead to the increment in the crop yield predicted. Though statistically significant (p-value of 0.028) the 0.0583 increment was still quite low to have much-desired impact on food production in the district.

The adjusted R-square showed that 99.78% of the variation was explained by the model.

New livelihood activities

What are the new livelihood strategies employed by the food crop farmers?

This section sought to investigate any new livelihood activities the farmers engaged in to further support their farming activities.

Table 16: Distribution of farmers who engaged in new alternative livelihood activities

Community	New Livelihood activities to support farming	
	Not Engaged	Engaged
Teacher Mante	48.7%	51.3%
Asuboi	59.6%	40.4%
Mankrong	34.8%	65.2%
Coaltar	42.1%	57.9%
Total	49.7%	50.3%

Source: Field survey (2023)

It was observed that about half (50.3%) of the farmers engaged in other activities besides farming independent of whether they had been affected by the sand winning or not (Table 16). On further probing, some of the farmers who had not been affected directly by the sand winning activities alluded to the fact that with the rate at which people's farms were being ransacked by the sand winners, they had decided to support themselves with other activities so that they were not taken by surprise if their farms should be taken away. Some who had been already been affected by the activity assert that their only hope was to diversify into other ventures to be able to support their families.

This supports the findings of other researchers including Arthur & Benediktsson (2016) who observed that farmers in Golinga (Northern region) whose lands had been destroyed by sand winning tend to engage in other activities either alternate farm or nonfarm activities, and Abdulai (2020) who also observed that many farmers in Wa, whose farmlands had been taken over by sand winners resort to other livelihood activities, either skilled or unskilled. These basically were some survival strategies employed by these farmers just to maintain livelihood. As stated earlier when people's sources of livelihood is under threat, they will develop other coping mechanisms in response to the shocks imposed on them. The findings were in line with the part of the conceptual framework which suggest diversification as a form of livelihood strategy the farmers will adopt in the mist of the sand winning.

Table 17: Crosstabulation of community and new livelihood activities

Community	New livelihood activities engaged in			
	Skilled		Unskilled	
	Frequency	Percent	Frequency	Percent
Teacher Mante	31	49.20	32	50.80
Asuboi	24	53.30	21	46.70
Mankrong	7	46.70	8	53.30
Coaltar	23	52.30	21	47.70
Total	85	50.90	82	49.10

Source: Field survey (2023)

Out of the 50.3% of the farmers engaged in other activities, about 50.9% were engaged in skilled activities such as carpentry, tailoring and auto-mechanics, while 49.1% were engaged in unskilled activities such as trading and animal husbandry (Table 17). According to Abdulai (2020), households engaged in farming coupled with other skilled nonfarm activities were able to earn high income to be invested into high-return activities or savings. With this argument, it is advisable for farmers, especially those in the youth and adult brackets, to pick up other skilled trades to add value to themselves and help them stand in seasons when their livelihood assets are under threat. This will be of immense advantage to farmers especially in the Ayensuano district to still maintain their livelihood even in the face of the sand winning menace. This confirms the viewpoints of the theoretical framework which says that when people's livelihood is threatened there is some form of transformation of structures and processes that serves as livelihood developed to overcome the threat of been plunge into poverty.

On further probing on how these new livelihood activities were owned, majority (87.43%) indicate that they were self-owned hence it was safe to

assume that every income they earned remains with them and able to sustain them and their dependents. Only few, 5.99%, say the ventures were jointly owned and privately owned respectively. Only one respondent, 0.59%, said he worked with an association.

Table 18: Chi-square test of new livelihood activities in relation to the communities

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.320[a]	3	.956
Likelihood Ratio	.320	3	.956
Linear-by-Linear Association	.044	1	.834
N of Valid Cases	167		

Source: Field survey (2023)

I then conducted a chi-square test to ascertain whether for a person to engage in any new livelihood is determined by the community the person is from.

H_0: There is no association between a person's community and the new livelihood engaged in

H_1: There is an association between a person's community and the new livelihood engaged in

The Pearson chi-square test value of 0.320 at 3 degrees of freedom has p-value 0.956 which is not significant (Table 18). The study then fails to reject the null hypothesis and conclude that for a farmer to engage in either skilled or unskilled activity as a new form of livelihood is not determined by the community of the farmer.

Key informants' opinion on the new livelihood strategies

Key informants were asked if they knew of any other activities the farmers engage in to supplement the farming or as an alternative livelihood activity. The response was coded and a theme derived. The theme that run though the response was coping mechanism. The Participants included Informants A and B. It came out that many of the farmers were involved in various activities as a way of coping mechanisms in the face of the sand winning, for some of the farmers their spouses engage in petty trading to support their spouses. Aside that, as explained by Informant A,

> *Ayensuano is a farming community and there are no other jobs except for fuel station attendants and that is by the roadside and not many people will be able to do that job.*

Hence many of these alternative jobs may still be agricultural related as said by some of the farmers, that they go to work on other people's farms as harvesters or oil palm fruit carriers. MoFA was said to provide some affected farmers with crops such as coconut and oil palm because they were said to be able to still grow on the winned lands even without reclamation. Informant B said

> *The District Assembly provided MoFA with coconut and oil palm seedlings and affected farmers who registered with the Assembly were given to go and plant on their affected lands.*

I, however, did not come across any farmer who had benefited from this initiative to get more information from. In all, affected farmers still develop various means as coping mechanisms to still survive in the face of the sand winning. This is in line with Abdulai (2020) and Arthur & Benediktsson

(2016) who said that households adopt both agricultural and non-agricultural livelihood strategies to cope with the loss of agricultural lands.

In this study, it was found out that not only the farmers were affected by this menace but the market women as well. Because the farmers were not able to produce enough crops for the market women to sell, many of them develop means of obtaining some produce for sale. Some of the market women provide the farmers with seed and fertilizer to enable them farm on fallowed winned lands. The harvested crops would then be sold to the market women after the input costs were deducted.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

Introduction

The chapter presents an overview of the study procedures, key findings, and conclusions made from these findings. It goes on to offer recommendations in light of these findings and conclusions. It also outlines the study's contribution to knowledge and makes suggestions for further research.

Summary

Sand winning leads to the degradation of agricultural land which serves as a source of livelihood for farmers. This study considered the effect of sand winning on the livelihood of food crop farmers in the Ayensuano district. It took into consideration four main objectives: it examined the awareness of stakeholders on sand winning, the effect of sand winning on the respiratory health of food crop famers, the socioeconomic impact of sand winning on food crop farmers and the new livelihood strategies employed by food crop farmers. It is important to note that the livelihood theory, the entitlement theory and the institutional theory guided the research.

A mixed method research approach was employed for the study and it was guided by the “sequential explanatory”. A sample size of 316 food crop farmers were selected using the simple random technique. Four key informants were purposely selected for the study. Interview schedule was used to collect data from the food crop farmers whiles the interview guide was used to collect data from the key informants. Descriptive statistics, chi-square test of independence, binary logistics regression and thematic analysis were used

to analyse the data gathered and the results were discussed based on the objectives.

The objective one which focused on the awareness of stakeholders on sand winning activities in the district showed that all stakeholders were aware of the ongoing sand winning activities in the district. Also, the duration of the sand winning activity in the district was different from community to community, but in general, the minimum duration was 1year and the maximum was 15years. Teacher Mante seem to be the first community to be evaded by the sand winners before spreading to the other communities. It was clear that averagely sand winning started in Teacher Mante between 12 to 15 years ago, followed by Mankrong of about 6 to 8 years ago, Asuboi of about 3 to 6 years and the least being at Coaltar with about 1 to 2 years ago. On the issue about who releases the land to the sand winners for their operations, it came out that individual land owners (32.30%) and Chiefs (31.30%) led in leasing the lands to the winners. This was followed by others (unknown) who made up 20.9%, and family/clan heads who constituted 15.5%. Majority of the sand winners (>58.2%) resided outside the communities as said by the respondents. Again, on the issue of the sex involve in the sand winning activities, the respondents were of the view that majority of the sand winners were male (91.5%) with few indicating that both sexes were involved (8.2%). The time of operation of the sand winners was reported to be mostly at night (61.7%).

The second objective focused on assessing the effect of sand winning on the health of the food crop farmers specifically on their respiratory health. The result showed that about 13% of the respondents were affected by some

respiratory illnesses such as cough, sneezing and nasal block as a result of tipper trucks loaded with sand moving through the untarred roads within the communities thereby producing dust. Furthermore, binary logistic regression was used to establish the likelihood effect of sand winning activities on respiratory disease. The result shows that the odds of respiratory disease were 0.00 times as likely than less likely to increase if there were no sand winning activities. The odds of respiratory disease in areas of sand winning activities were $e^{2.415} = 11.192$ times as likely than in areas of no sand winning activities. This simply means that respiratory diseases are likely to increase 11.192 times in areas where sand winning activities is ongoing compared to areas where there is no sand winning.

The third objective centred on the socioeconomic impact of sand winning on the livelihood of food crop farmers. It took into consideration farmers whose lands had been directly affected by the sand winning and how this effect may have impacted their general socioeconomic status such as their income and food security. About 37% of the food crop farmers interviewed have been negatively affected by sand winning activities in the district. When analysed based on the communities it was observed that Mankrong was most hit by the menace with 38% of the farmers affected, followed by Teacher Mante with 31%, Asuboi with 20% and Coaltar with 11%. It was observed that the introduction of sand winning into the district has significantly resulted in reduction of food production mainly due to the reduction in the size of farm lands available to the farmers. This has obviously affected the quantity of produce available to feed their families with as well as sell to get some income and even save.

The final objective looked at the new livelihood activities the farmers engage in to support their farming activities with the introduction of sand winning. About half (50.3%) of the farmers engage in other activities besides farming. It was observed that both affected and unaffected farmers had new livelihood activities. Those affected explained that these activities were intended to supplement the little income they get from their currently reduced farm size, where as those not affected explained that they had resorted to these other activities because of uncertainty of the future. Seeing how people's farms were being destroyed they had advised themselves so that in case their farms were invaded they can still have some form of support and not get into shock. Some of these farmers (50.9%) were engaged in skilled activities such as tailoring and auto-mechanics and the others (49.1%) were engaged in unskilled activities such as trading and animal husbandry. Majority of these activities were self-owned.

Conclusion

Although stakeholders were aware about the sand winning activities going on in the district, farmers especially were always devastated when they noticed that their farmland had been winned. Despite the fact that some farmers were affected by respiratory disease such as cough, sneezing and nasal block as result of the dust produced by moving trucks loaded with sand due to the fact that the roads in the communities were not tared, the victims failed to seek medical support from the health centres but rather resorts to self-medications. Also, communities with sand winning activities would experience more respiratory diseases than those without sand winning activities.

Socioeconomic situations of farmers in relation to food production, income and savings had reduced drastically even though some farmers were left with some parcel of land to cultivate. Majority were not able to feed their families with what they produced left alone sell to generate income before saving something as compared to when there wasn't any sand winning activity on going in their communities. The loss of agricultural land by farmers had compelled them to diversify their livelihood activities into petty trading, animal husbandry, constructional related activities and auto-mechanics in order to cope with the situation. Some of those who had not been affected by the sand winning activities were also engaged in some form of new livelihood activities to protect themselves from any future shock.

Recommendation

There should be community taskforce in all the sand winning communities to ensure the by-laws are enforced in these communities. This would prevent unguided sand winning activities and also prevent sand winners from destroying people's crops. Fund should be dedicated by the assembly to support the task force in carrying investigation on farms that have been invaded illegally without prior notice to the farmers. This would reduce the burden of farmers whose crops had been destroyed and encourage more farmers to report any illegal operations on their farms to help curb the menace. Otherwise with the current approach, knowing that farmers will be deterred by the cost of reporting their plight, sand winners and landowners will take advantage and continue destroying people's farm without informed notice. The Assembly in collaboration with opinion leaders from the various communities could earmark potential sand winning sites in the communities.

This will help regulate the current indiscriminate modalities being employed by the sand winners. Again, sanctions should be meted out to those who destroy people's farms to deter prospective sand winners from doing same. Furthermore, authorities should make sure that those whose land has been winned are duly compensated farmers whose land. Additionally, farmers should be encouraged to engage in nonfarm livelihood activities in other to prevent any future shocks.

Further research areas

The perception of sand winners on the effect of sand winning activities in the Ayensuano district taking into consideration the location and processes involved.

It will be important to investigation what motivates land leasers to give out their lands to the sand winners to carry out their operations despite the devastating effect on livelihood.

Another area of research could be the impact of sand winning on the livelihood of market women

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APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

INTERVIEW SCHEDULE FOR FARMERS

The study is being carried out by Kom Sena Kwame, a graduate student of the University of Cape Coast on the topic: '**Effects of sand winning on the livelihood of food crop farmers in the Ayensuano District, Ghana'** in partial fulfillment of the award of a Master of Philosophy in Geography. All information obtained will be treated with much confidentiality and would be for academic purposes and policy formulation. Your support and contribution would be very much appreciated.

SECTION A: DEMOGRAPHIC BACKGROUD OF RESPONDENT

1. Sex
   a. Male [ ] b. Female [ ]
2. Age
   ……..
3. Highest Educational level
   a. Basic [ ]
   b. Secondary [ ]
   c. Tertiary [ ]
   d. Others, Specify ……. [ ]
4. What is your marital status?
   a. Single [ ]
   b. Married [ ]
   c. Divorced [ ]
   d. Widowed [ ]
5. Religion
   a. Christianity [ ]
   b. Islamic [ ]
   c. Traditionalist [ ]
   d. Other, Specify …….

SECTION B. AWARENESS OF STAKEHOLDERS ON SAND WINNING

6. For how long has sand winning activities been going on in this community?

   …….

7. From whom do the sand winners acquire the land?
   a. Individuals [ ]
   b. Family/clan heads [ ]
   c. Chiefs [ ]
   d. Other, specify …….
8. Where do the land owners live?
   a. The community [ ]
   b. Outside the community [ ]
   c. Both in and outside the community [ ]
   d. Don't know [ ]
9. Where do the sand winners come from?
   a. The community [ ]
   b. Outside the community [ ]
   c. Both in and outside the community [ ]
   d. Don't know [ ]
10. Which gender is involved in the sand winning activities in the community?
    a. Male [ ]
    b. Female [ ]
    c. Both [ ]
11. What time of the day do the sand winners operate?
    a. Dawn [ ]
    b. Morning [ ]
    c. Afternoon [ ]
    d. Night [ ]
    e. Dusk [ ]
    f. All day [ ]

SECTION C: EFFECT OF SAND WINNING ON RESPIRATORY HEALTH

12 Any history of the illnesses listed below in the family and you inclusive as a result of sand winning? And if yes, how often do you and your family members experience it?

Symptom's	No	Yes (often)	Yes (one's a while)
Cough			
Shortness of Breath			
Sore throat			
Nasal block			
Phlegm			
Sneezing			
Chest tightness (pains)			

13 Which of the respiratory disease in question 12 have you been diagnosed of? ……

14 How is your general wellbeing now compared to how it was before sand winning? ……

SECTION D: SOCIO-ECONOMIC IMPACT OF SAND WINNING ON LIVELIHOOD

15 How long have you been farming in this community?

……

……

……

16 Has your farm land been directly affected by sand winning activity?

a. Yes
b. No (if no skip to question 34)

17 If your response to question 16 is yes, in what way have you been compensated?

a. Money
b. Another land

c. None

d. Other, specify …….

18 How many acres of land were you cultivating before the sand winning?

……..

19 What was the yield per acre for a planting season?

……

20 How many acres of land do you cultivate now?

…….

21 What is the yield per acre for a planting season now?

…….

22 What is your reason for engaging in food crop farming?

a. For home consumption [ ]

b. To sell to the local market [ ]

c. To sell and for home consumption [ ]

d. Other, specify …….

23 How long were you able to feed your family with what you produce from your farm before the sand winning?

……

……

24 How long are you able to feed your family with what you produce from your farm now?

……

25 Where do you sell/market your farm produce?

a. In the local market [ ]

b. Other market within the district [ ]

c. Outside the district [ ]

d. I don't sell any [ ]

26 How often are you able to sell part of what you produce from your farm?

a. Weekly [ ]

b. Every two week [ ]

c. Monthly [ ]

d. At the end of the season [ ]

27 What percentage of your produce was sold to the general public before the sand wining?

a. Less than 50% [ ]
b. More than 50% [ ]
c. 100% [ ]
d. None [ ]

28 What percentage of your produce is sold to the general public now?

e. Less than 50% [ ]
f. More than 50% [ ]
g. 100% [ ]
h. None [ ]

29 What percentage of what you sell were you able to save before the sand winning?

a. Less than 20% [ ]
b. 20 to 40% [ ]
c. 50% [ ]
d. None [ ]

30 What percentage of what you sell are you able to save now?

a. Less than 20% [ ]
b. 20 to 40% [ ]
c. 50% [ ]
d. None [ ]

31 How has sand winning affected your income?

a. Positively [ ]
b. Negatively [ ]
c. I don't know [ ]
d. Others, specify …….. [ ]

32 How has sand winning affected your social status in the community?

a. Positively
b. Negatively
c. No change

33 What do you do to improve production amidst the sand winning?

……

SECTION E: NEW LIVELIHOOD STRATEGIES

34 Do you engage in other livelihood activities to support farming as a result of sand winning activities?

a. Yes
b. No

35 Indicate the new livelihood activity your household engage in currently to support farming? You may state more than one.

……

……..……..……..

36 How is the new livelihood activity owned?

a. Self-owned [ ]
b. Jointly-owned [ ]
c. Privately-owned [ ]
d. Owned by an association [ ]

37 Indicate the livelihood strategies you would want to engage in in case you would have to quit farming

……..……..……

APPENDIX B

UNIVERSITY OF CAPE COAST

COLLEGE HUMANITIES AND LEGAL STUDIES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

INTERVIEW GUIDE FOR KEY INFORMANT

The study is being carried out by Kom Sena Kwame, a graduate student of the University of Cape Coast on the topic: '**Effects of sand winning on the livelihood of food crop farmers in the Ayensuano District, Ghana'** in partial fulfillment of the award of a Master of Philosophy in Geography. All information obtained will be treated with much confidentiality and would be for academic purposes and policy formulation. Your support and contribution would be very much appreciated.

INSTITUTIONAL BACKGROUND

SECTION A: DEMOGRAPHIC BACKGROUND OF RESPONDENT

Name of institution

……..

Institutional address

……

Interviewer's position

……..

Sex

a. Male [ ] b. Female [ ]

1. Type of institution
   a. Government [ ] b. Private [ ] c. Non-Governmental [ ]
2. Level of institution
   a. International [ ]

b. National [ ]
c. Regional [ ]
d. District / Local [ ]

SECTION B: AWARENESS OF STAKEHOLDERS ON SAND WINNING

3. Give me a brief history about sand winning activities in the district
4. Does your outfit have a framework guiding the activities of sand winners?
5. What are some of the complaints you receive from farmers with regards to sand winning, if any?

SECTION C: EFFECT OF SAND WINNING ON RESPIRATORY HEALTH

6. Have you heard of any health-related issues with regards to sand winning in the district?

SECTION D: SOCIOECONOMIC IMPACT OF SAND WINNING ON LIVELIHOOD

7. Has there been any change in food crop production in the district as a result of sand winning?
8. How is the sand winning affecting the income situation of farmers currently?
9. In your view can you say sand winning has affected the socio-economic situation of farmers or not? Explain your answer

SECTION E: NEW LIVELIHOOD STRATEGIES

10. What are farmers doing to improve food crop production in the midst of sand winning?
11. Which new livelihood activities are farmers engaged in now?

APPENDIX C

UNIVERSITY OF CAPE COAST

COLLEGE HUMANITIES AND LEGAL STUDIES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

OBSERVATION CHECKLIST

This observation checklist is a schedule of things to look out for on the field

1. Changes on the topography of the land as a result of sand winning
2. Physical symptoms of related illnesses on household members
3. Destruction of farmlands with crops
4. Other livelihood activities households undertake