UNIVERSITY FOR DEVELOPMENT STUDIES

EFFECTS OF GRAVEL WINNING ON SMALLHOLDER FARMERS IN SAGNERIGU DISTRICT OF NORTHERN GHANA

ISSAH LUCY

2017

UNIVERSITY FOR DEVELOPMENT STUDIES

EFFECTS OF GRAVEL WINNING ON SMALLHOLDER FARMERS IN SAGNERIGU DISTRICT OF NORTHERN GHANA

BY

LUCY ISSAH (UDS/MIC/0045/13)

THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL EXTENSION, RURAL DEVELOPMENT AND GENDER STUDIES, FACULTY OF AGRIBUSINESS AND COMMUNICATION SCIENCES, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN INNOVATION COMMUNICATION

JULY, 2017

DECLARATION

Student

I, Lucy Issah, hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate Signature ……..….. Date ……..

Lucy ISSAH

Supervisor

I hereby declare that the preparation and presentation of the thesis was supervised in accordance with supervision of thesis laid down by the University for Development Studies

Supervisor's Signature ……..….. Date ……..

Dr. NASHIRU SULEMANA

ABSTRACT

Urbanization has led to increased need of gravel to support infrastructural development in the Sagnarigu District. Some smallholder farmers in the Sagnarigu District have involved themselves in gravel winning as an alternative source of livelihood which has both positive and negative effects on them. The study assessed the effects of gravel winning on the smallholder farmers in the Sagnarigu District of the Northern Region of Ghana. A cross sectional study was done employing both quantitative and qualitative instruments to gather data on the perceived benefits and adverse effects of gravel winning in the area. The study also considered proposed strategies to improve upon the situation in the district. Results of the study showed that while smallholder farmers formed over ninety percent (90%) of the personnel involved in gravel winning, they were the least involved in decision making in the industry as the chiefs gave out large tracks of land for gravel winning without involving them. With this, their farmlands were converted into gravel winning pits leaving them with limited source of livelihood. The study further revealed that gravel winning impacted both negatively and positively on the smallholder farmers and the community as a whole. The negative effects included that the activity triggered loss of farm lands, destruction of roads, deforestation, loss of economic plants, ill health, conflicts and exposure of lands to erosion. One major benefit identified was that the smallholder farmers were able to meet the cost of education of their wards and other social needs. They were also able to invest in the little left of their farming activities. It was recommended that the chiefs and the local authority be made to apply the revenue accrued from gravel winning in a transparent and accountable way. Smallholder farmers who lose their farm lands to gravel winning should be adequately compensated. Government agents in charge of gravel winning such as the Environmental Protection Agency (EPA) must live up to their responsibilities and be more responsive to the destruction and pain that the gravel winning operations cause the people in the Sagnarigu District.

ACKNOWLEDGEMENT

Many people have contributed immensely to the success of this work such that I cannot acknowledge all of them through this medium. However, I cannot but express my sincere gratitude to God, Almighty for His mercy, strength, and wisdom showered on me from the beginning of the work to the end. I specially acknowledge the unquantifiable guidance and encouragement from my supervisor, Dr. Sulemana Nashiru. Without his advice, criticisms, and direction, this work would not have been possible. My profound gratitude goes to the Course Coordinator, Dr Francis Obeng, for the assistance given to us from the beginning of the programme to its end. I am also thankful to all my friends who helped, in diverse ways, to bring this work to a successful end. I will also like to express warm gratitude to all lecturers and colleague students for their valuable contribution in my work. I wish to thank my family members and all those who have contributed to make this work successful. I wish to state that all the good things about the work are the credit of all mentioned above but any shortfall is mine.

DEDICATION

This thesis is dedicated to my late parents Mr and Mrs Thomas Issah, my husband, children and siblings.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CIA Central Intelligence Agency

DR CONGO Democratic Republic of Congo

EAP Environmental Action Plan

EGD East Gonja District

EPA Environmental Protection Agency

EPFL Ecole Polytechnique Fédérale de Lausanne

ETI Ethical Trading Institute

FAO Food and Agriculture Organisation

FBS Farm Business School

FLO Fairtrade Labeling Organization

GDP Gross Domestic Product

GSS Ghana Statistical Service

IFAD International Fund for Agricultural Development

IFPRI International Food Policy Research Institute

ILO International Labour Organisation

IMF International Monetary Fund

LI legislative instrument

MA Mining Act

MOFA Ministry of Food and Agriculture

MOE Ministry of Education

NGO Non-Governmental Organisation

PNDCL Provisional National Defense Council Law

USA United States of America

USAID United States Agency for International Development

WMMF World Mines Ministries Forum

LIST OF APPENDICES

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Gravel winning is a common activity carried out at an alarming measure in many parts of the Northern Region of Ghana (Imoru, 2010). Gravel winning activities in the region are so prevalent that there are signs of it in the Tolon, Kumbungu, Savelugu-Nanton, Karaga, Chereponi, Saboba, West Mamprusi, Yendi Municipality, Tamale Metropolis, Nanumba North and Nanumba South districts. For a majority of the above named districts, road contractors have created them to do the roads they have been contracted in the area (Ibid). However, in the Sagnarigu District, recently carved out of the hitherto Tamale Metropolis, gravel winning activity is so grievous given its proximity to Tamale and its own fast growing urbanization. The operation poses a great threat not only to the environment but also to food security as farm lands are converted into gravel winning pits.

According to Kindt and Lowthian, (2012) in America, gravel is mined for many purposes including navigation, agriculture, drainage, flood control, channel stability, construction aggregate – largest mining industry in most states. They further explain that gravel is used in base material and asphalt for transportation projects, bedding for pipelines, drain rock in leach field septic systems, aggregate mix in concrete for transportation and buildings. Buttleman, (1992) also argues that in the state of Minnesota in the United States of America, in construction, sand and gravel are used in concrete aggregates, concrete products, asphalt, road base, fill, snow and ice control, and other miscellaneous uses. Buttleman, (1992) further explains that in 1990, every person in the United States of America consumed about 8.5 tons of sand and gravel. Sand and gravel consumption is so

important to the economy that it is considered one of the most accurate measures of economic activity.

According to Peprah (2013), sand and gravel constitute the primary raw materials for the construction of roads, bridges, houses, factories, schools, markets and offices in Ghana. Murray and Cerrillos (2004), underscore the vital role of gravel in construction by stating that highways and roads demand enormous amounts of aggregate and stone material for construction. This tells the story of the high demand for gravel in the fast growing urbanized district.

Since creation, man has been involved in tilling the land and nursing the fruits of the soil as well as fishing from water bodies to survive. This has largely been done at the family level. Farming, in these ways, has been variously referred using different terminology including smallholder farmers, small scale farmers, peasant farmers, resource poor farmers, out growers, etc. The varying description of such farmers is conditioned by many factors including the crop that is cultivated, the context, country and even ecological zone in which the cultivation is done. However, generally, the term 'smallholder farmers' refers to the limited resource endowment of the farmers relative to commercial farmers in the sector. Smallholder farmers are also defined as those farmers owning small-based plots of land on which they grow subsistent crops and one or two cash crops relying almost exclusively on family labour. Also, it is sometimes widely used to include farmers who do not own or control the land they farm on. Often, the term 'out growers' is used to refer to smallholders who are in a dependently managed relationship with an exporter (FAO 2012a). Furthermore, the Fair-trade Labeling Organization (FLO 2011) identifies a smallholder farmer as one who depends on family labour, as opposed to non-family.

According to the Ecole Polytechnique Fédérale de Lausanne (EPFL) (2013), smallholder farmers, whose output supports a population of roughly 2.2 billion people, manage about 85% of the world's farms. Agriculture is a source of livelihood for an estimated 86% of rural people worldwide, comprising 2.5 billion people and provides jobs for 1.3 billion smallholder farmers and landless workers. The Indian Agricultural Census Report of (2000) is more explicit in terms of land cultivated by smallholder farmers and identifies smallholder farmers as it defines them as 'those marginal and sub-marginal farm households that own or/and cultivate less than 2.0 hectares of land.

Some of the characteristics of smallholder farmers enumerated by Ethical Trading Initiative (2005) are that they produce relatively small volumes of produce on relatively small plots of land. They are generally less well-resourced than commercial skill farmers. They are also considered to be part of the informal economy with dependence on family labour, but may hire workers. The men and women in smallholder farming are often vulnerable in supply chains. They also produce and export commodity as a main livelihood activity.

In the foreword to the Africa Progress Report (2014:15), Kofi Annan, a former Secretary General of the United Nations, reiterates the difficulty of many African people when he writes 'Africa may be showing impressive headline growth, but too many of our people remain stuck in poverty.' He underscores the need to boost the chances of improving upon the situation referring to the findings of the report in the following words: 'This year's *Africa Progress Report* finds that if we want to accelerate Africa's transformation, then we

have to significantly boost our agriculture and fisheries, which together provide livelihoods for roughly two-thirds of all Africans.'

The Africa Progress Report (2014:15), acknowledges agriculture as the pivot of the development success story of Africa. However, it has not realized this potential because of low levels of productivity which has trapped the numerous African farmers in poverty, 'act as a brake on growth, and weaken links between the farm and non-farm economy – links that were crucial to development breakthroughs in Bangladesh, India and Vietnam.' Africa's farmers could feed rapidly growing urban populations and generate exports to meet demand in global markets if great attention were paid to the welfare of our farmers. The expectation, following the description of smallholder farming is that it will not be common in our time. But according to Women in Informal Employment: Globalizing and Organizing [WIEGO] (2016), 60% or half of the world's population that works in agriculture are smallholder farmers. Furthermore, the Economic Report of Africa (2009) intimates that agriculture takes care of over seventy percent of the workforce of most African countries. Majority of these people are smallholder farmers and pastoralists.

According to the International Food Policy Research Institute (IFPRI) (2008), smallholder family farming which rely mainly on family labour is the backbone of agricultural production in developing countries. Smallholder farmers do not only dominate the labour force of many African countries but also play a very important role in the Indian economy. For example, according to the Agricultural Census Report, smallholder farmers constitute about seventy-eight percent of Indian farmers and contributes forty-one percent in national grain production. Notwithstanding the substantial and increasing contribution to the national

food supply and to GDP in developing countries, the smallholder families ironically constitute more than half of the hungry and poor in the world.

According to the United Nations Food and Agriculture Organization [FAO] (2000), four-fifths of the developing world's food is a product of small-sized farms. Small, family-run farms are also home to the majority of people living in absolute poverty, and half of the world's undernourished people. This is partly attributed to climate change (Zurek, Streck, Roe and Haupt, (2014) which has brought about poor rain patterns resulting in droughts or more rains at wrong times and leading to disasters like floods. The floods sometimes come with pests and crop diseases. Another reason attributed to the misfortunes of small-sized farmers is the unhealthy traditional farming practices such as bush burning and over cropping. These methods of farming impoverish the land rendering it incapable of supporting healthy plant and crop growth.

Occurring concurrently with the dwindling fortunes of smallholder farmers is the advent of urbanization especially in Africa. The demand for high and quality infrastructure in the form of schools, markets, hospitals roads etc. is rising (Peprah 2013, Musah 2009). Since gravel is a crucial ingredient in the construction of the facilities, gravel winning has received so much attention in rural communities where most smallholder farmers live. The evidence of gravel winning activities is clear along the roads of rural communities especially those near urban cum urbanizing communities. Gravel winning, therefore could have some impact (negative and positive) on smallholder farmers in the socio-economic and health aspects of their lives.

In the case of the Sagnarigu District in the Northern Region of Ghana, some smallholder farmers, as a result of the meager income accruing from the cultivation of crops and some other traditional occupations, resort to digging and fetching of gravel to earn extra income. According to the Ghana Statistical Services [GSS] (2014), inhabitants of the district engage in many minor occupations apart from agriculture. Some of them include tailoring, petty trading, government employment, NGO employment, politics etc. These other groups of inhabitants are not much affected by issues of gravel winning like it is with smallholder farmers.

Of great interest in this study, is the impact of gravel winning on the people of the Sagnarigu District from the perspective of the smallholder farmers. The advent of rapid urbanization in the Sagnarigu District and Tamale Metropolis has had many accompanying repercussions on the development of the people especially on crop and animal production as the mainstay of the economy in the district. For this reason, the people seem to have found a little relief in gravel winning as an alternative livelihood strategy. The people find this activity, which operates on a rather large scale as a supplement to the income earned from their traditional income source (agriculture). Notwithstanding this seeming relief that the smallholder farmers find in this newly discovered livelihood strategy, there appears to be potential long term dangers/effects that may come in its wake. Thus, there are as many dangers of this activity as there seem to be positive effects. In order to minimize the problems brought in the wake of gravel winning and maximize its benefits, the perspectives of the smallholder farmers who engage in gravel winning activities are important. This thesis, therefore, seeks to understand the perspectives of smallholder farmers who are both beneficiaries and victims of gravel winning in the Sagnarigu District.

1.2 Problem Statement

Rapid urbanization is leading to high demand for gravel in the Sagnarigu District and has had many accompanying repercussions on the development of the people especially on agriculture (crop and animal production) as the mainstay of the economy. This, among others, has attracted smallholder farmers to switch to gravel winning as an alternative livelihood strategy in order to meet their daily needs. The activity of gravel winning, from my observation as a native resident of one of the communities where the activity is deeply rooted, is that the youth in the communities rather give gravel winning too much attention to the detriment of agricultural activities which are their main source of income as well as their traditional source of livelihood. The farms are even converted into gravel winning pits resulting in reduction in output of crop produce. The immediate result of this phenomenon is low food production which results in food insecurity.

Imoru (2010:1) reports that over 187.5 hectares fell to gravel winning with one hundred and seventy-seven farmers directly affected in ten districts of the Northern Region sampled for his study. A lot of research has been done on gravel winning across the world including the USA (Suzanne, 2002); Australia (Erskine and Green, 2000), France (Petit, Poinsart and Bravard, 1996), Italy (Surian and Rinaldi, 2003), Belgium (Gob, Houbrechts, Hiver and Petir, 2005), Britain (Sear and Archer, 1998), Nigeria (Aromolaran 2012) and Ghana (Peprah 2013). Notwithstanding the fact that so much research has been conducted into this area in different contexts, the effects of gravel winning on communities in which gravel winning takes place is not yet fully understood with regards to the smallholder farmers whose farms are used for the activity of gravel winning.

This study therefore contributes to filling this knowledge gap by exploring the effects of gravel winning by drawing data from the Sagnarigu District, of Northern Region, concentrating on empirical evidence based on the perspectives of smallholder farmers.

1.3 Objectives of the Study

General Objectives

The general objective of the study is to understand the effects of gravel winning activities in the Sagnarigu District from the perspective of smallholder farmers.

Specific Objectives

The following specific objectives shall underpin my research work:

1. To describe the nature and extent of gravel winning in the Sagnarigu District.
2. To investigate potential benefits of gravel winning to smallholder farmers in the Sagnarigu District
3. To examine the negative effects of gravel winning from the perspective of smallholder farmers in the Sagnarigu District.
4. To explore opportunities to address negative effects of gravel winning in the Sagnarigu District.

1.4 Research Questions

Main Research Question

What are the perspectives of smallholder farmers on the effects of gravel winning activities in the Sagnarigu District?

Specific Research Questions

1. What is the nature and extent of gravel winning in the Sagnarigu District?
2. What are the perceived benefits of gravel winning to smallholder farmers in the Sagnarigu District?
3. What are the perceived negative effects of gravel winning to smallholders in the Sagnarigu District?
4. How can the negative effects of gravel winning in the Sagnarigu District be addressed from the perspective of smallholder farmers?

1.5 Significance of the Study

The study is set out to investigate the effects of gravel winning activities in the Sagnarigu District. There are other new districts in the Northern Region with similar conditions of poor yields from crop and animal production for similar reasons. But the Sagnarigu District by its peri- urban nature and rapid urbanization makes demand for gravel in the construction industry lend itself readily for this study.

Though research on gravel winning in Ghana exists (Musah, 2009 and Peprah, 2013), these have been more geared towards river sand mining on river banks. The research works available have also been in different districts, and regional administrative set ups. However,

the Sagnarigu District is far away from rivers. Rather, it is located inland where farm lands are converted into gravel pits. Therefore, this study will be of immense help to the district authorities in planning the district and managing its resources. Of particular relevance of this study will be to the Ministry of Food and Agriculture to look into alternative ways of improving crop and animal production in the district and beyond. It is also to help the Government of Ghana put in more effective ways of supporting rural and smallholder farmers to better diversify their sources of livelihoods to meet the fast growing urbanization of contemporary Ghanaian society.

1.6 Definition of Key Terms

Gravel Winning: digging and fetching of gravel in large quantities

Livelihood: the means through which a person or a group of persons get their daily bread and necessities of life. In this case, income generation to meet the necessities of life is paramount.

Alternative livelihood: source of income that complements another one already in existence. In this study, gravel mining complements crop and animal production to fetch in income.

Smallholder Farmers: farmers who are forced to produce in little quantities for one reason or another.

Perceived Benefits: the good things appreciated by the farmers, and the generality of the society, emanating from the harvest and sale of gravel.

Perceived Disadvantages: these refer to the negative effects of gravel mining on the society.

Remedies: these refer to the solutions to limit the effects of the negative outcomes from gravel mining.

1.7 Organisation of the Study

The research is organized into five chapters. Chapter One introduces the subject matter and states the problem being researched as well as the objectives and research questions. In Chapter Two, the researcher presents related literature on gravel winning from within and abroad. Chapter Three presents the research methodology and provides a profile of the study area. Chapter Four deals with analysis of the data with the final chapter presenting recommendations and concluding remarks on the study.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 Introduction

In this chapter, I present relevant literature on the subject matter including nature and extent of gravel winning, acquisition of gravel winning sites, purpose of gravel winning, benefits and negative impact of gravel winning on smallholder farmers, and by extension, the community. I also review literature on suggestions to mitigate the negative effect.

2.2 Defining gravel

Gravel is a heavy and cheap commodity made of small weathered stones used to make surface for paths and roads. The resource's compressibility, plasticity and textural properties have been valued in construction for hundreds of years (Goddard, 2007).

Gravel winning refers to the activity of gathering and carrying away parts of the solid earth such as sand and gravel as raw material for construction of roads and buildings. Gravel consists of eroded fragments of rock formation in which the diameter of grain of gravel ranges from 0.08 to 4 inches (Hull, 2001). In Ghana, sand and gravel are derived from natural deposits. The grains of sand occur in natural form at the sea coast, riverine and savanna areas. Granules and pebbles of gravel are derived from the earth or crushed from quarrying rock. Together, sand and gravel constitute the primary raw materials for the construction of roads, bridges, houses, factories, schools, markets and offices (Peprah, 2013).

2.3 Nature of Smallholder Farming

Smallholder farming has been variously referred using different terminology including smallholder farmers, small scale farmers, peasant farmers, resource poor farmers, out growers, family farmers etc. (FAO 2002). The varying descriptions of such farmers are conditioned from the crop that is cultivated, the context, country and even ecological zone in which the cultivation is done.

Generally, the name smallholder farmers, is based on the limited resource endowment of the people in this sector, relative to other farmers. Smallholder farmers are also defined as those farmers owning small-based plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labor. Also, it is sometimes widely used to include small farmers who do not own or control the land they farm on.

Often, the term 'outgrowers,' is used to refer to smallholders who are in a dependently managed relationship with an exporter. Furthermore, the Fairtrade Labeling Organisation (FLO 2011) regards a smallholder farmer as one who depends on family, as opposed to non-family, labour as a basis for its definition. Smallholder farmers, whose output supports a population of about 2.2 billion people, manage about 85% of the world's farms. Agriculture is a source of livelihood for an estimated 86% of rural people worldwide, comprising 2.5 billion people, and provides jobs for 1.3 billion smallholders and landless workers.

Some of the characteristics of smallholder farmers enumerated by Ethical Trading Initiative (2005) are that they produce relatively small volumes of produce on relatively small plots of land. They are generally less well-resourced than commercial skill farmers, they are also considered to be part of the informal economy with dependence on family labour, but may

hire workers. These people are often vulnerable in supply chains and men and women are involved. They also produce an export commodity as a main livelihood activity.

2.4 Nature and Extent of Gravel Winning

This section reviews literature on the extent to which gravel in winning is done.

2.4.1 Acquiring a Site for Gravel Winning

Sites for gravel winning in most countries are properly acquired from the relevant regulating government department. In Australia, there are stringent laws regulating gravel winning. The extraction of gravel in that country is governed by a combination of the laws that regulate mining, local government, road building and environmental protection. The applicable law depends on the person or authority who is extracting the gravel and the person or authority who is in control of that land. Private users may only take gravel from Crown (public) land if they have authority to do so under a state. A person who wishes to extract gravel from Crown land must first obtain a mining lease under the Mining Act 1978 (WA).

Furthermore, all Crown land, including reserves, is available for mining. However, mining on reserves requires the approval of the Minister for Mines and Petroleum. Mining in national parks and Class A nature reserves may require the approval of both Houses of Parliament. Any person can apply for a mining lease. The applicant must first “mark out” the area to be mined, and then lodge an application with the mining registrar. Any person can object to the granting of an application for a mining lease, including on environmental grounds.

Similarly, in the United States of America (USA), the site must qualify for all necessary land use and environmental permits. The operation must be profitable considering all costs, including acquisition, operation, compliance with regulations, and reclamation (Dryer 1976; Banino 1994).

According to Goddard (2007), complications in acquisition of gravel winning sites includes decisions on where to mine, how much and how often requires definition of reference state and sand budget. Reference state is the minimal acceptable physical and biological condition of a channel. Though reference state is difficult to determine, a general knowledge of fluvial processes is necessary to minimize detrimental effects of mining. A sand budget for a particular extraction area for example a stream or open area should be done to first determine the amount of sand that can be removed without causing degradation and erosion. Before doing a sand budget, consider mining methods to be used, particle size, characteristics of the sand, riparian vegetation and magnitude as well as frequency of hydrologic events after disturbance.

On sand and gravel winning methods, Hill and Kleynhans (1999) discuss various ways that sand and gravel are mined in the United States of America. Dry pit mining is a method used when sand is extracted above water table from a dry stream bed and exposed bars using conventional bulldozers, scrapers and loaders. Wet pit mining involves extraction of sand and gravel from below water table stream channel or a perennial river using hydraulic excavator or dragline. Dewatering can be done in advance to allow easy excavation though this depends on deposit thickness, permeability of the ground as well as after use and restoration requirements. Bar skimming or scalping is a method used when only the top

layer of soil is removed by scraping without excavating below summer water table which is the level of underground water in summer season (Hill and Kleynhans, 1999).

In Ghana, numerous laws govern mining of all sort of minerals. For example, various environmental regulations, laws and guidelines exist in Ghana for the management and control of the environment by mining companies (Anon, 1994). Mireku-Gyimah (2015) lists a number of legislative instruments including the Minerals and Mining Law, PNDC Law 153, Deed of Prospecting, Ghana's Mining and Environmental Guidelines, 1994, the Environmental Assessment Regulations 1999, the Deeds of Mining Leas and the Small Scale Mining Law,PNDC Law 218.

However, Mireku-Gyimah and Tsidzi (1996) revealed that none of these specifically relates to gravel winning. This may be because the quantum of gravel winning is less, and the negative environmental impact of gravel winning activities is relatively small compared with large scale mining activities like gold and bauxite mining and therefore not easily discernible.

Per the mineral and mining law of Ghana, all mining companies are expected to submit for approval an Environmental Action Plan (EAP) to address any negative impact that would arise from the activity.

2.4.2 Categories of People Engaged in Gravel Winning

Mining is generally regarded as one of the male domains of life probably due to its huge energy demands. But women do engage in the field in many countries of the world. For

example, Hinton, Veiga and Beinhoff (1997) report that women participate directly in artisanal mining and provide statistics for female involvement in the trade. In Asia, generally less than 10% of miners are women, whereas in Latin America, the proportion tends to be higher, approximately 10-20%. The percentage of female artisanal miners is the highest in Africa, ranging between 40 and 50%. In some regions, the artisanal mining workforce is as high as 60- 100% (ILO, 1999; Amutabi and Lutta-Mukhebi, 2001; Onuh, 2002).

Women typically play a much larger role in artisanal mining than in the large scale mining sector

World Mines Ministries Forum[WMMF] (2000). Making reference to children in mines in Africa, Thorsen (2012). argues that though there is no detailed statistics of children involved in mining, there is evidence that children do carry out mining in one way or the other in Africa. He explains that in 2009, children working in quarries and mines in Katanga in the Democratic Republic of Congo were mostly boys; almost half were aged 14-17 years, around one-third 10-13 years, and 20 percent of the children were below 10 years. Similarly, in Burkina Faso**,** 61% of children working in the Pissy quarry in Ouagadougou were boys and 39% girls. Girls were slightly younger than boys; the average age for girls and boys was 12.6 and 13.3 years respectively in 2003.

In DR Congo, according to Madyise, (2013), the age group of 51-55 years carries out gravel winning more than all other age groups. He explains that in his study, respondents in this age group were readily available and willing to take part in the study since they were most affected by sand and gravel winning in or near their farm lands. The median age group is 36-40 years. The data shows that there were fewer respondents for each age group between

31 and 50 years because they were not present in villages at the time of study and most reside in towns where they work. The 21-25 age group had a high frequency and consisted of young literate adults who could understand the questions and are aware of environmental issues.

2.5 Environmental Policy and Development Objective in Ghana

The recent history of Ghana portrays land degradation and the environmental burden from the extraction of natural resources and related activities has been significant (Akabzaa, 2000; Awudi, 2002; International Monetary Fund, 2004). Since the early 1990s the government has taken substantial action to address these challenges. In 1991, Ghana adopted a National Environmental Policy that will ensure sound management of resources and the environment, and also to avoid any exploitation of these resources in a haphazard manner that might cause irreparable damage to the environment (Ebenezer, 1991).

In 1994, the Environmental Protection Council, in collaboration with the Minerals Commission,

adopted guidelines mandating environmental impact assessment for mining activities in the country (Minerals Commission and Environmental Protection Council, 1994). According to the policy, environmental impact assessments must ensure that companies that deal with sand and mining must plan their mining projects in an environmentally friendly manner in consonance with the guidelines of the EPA (Minerals Commission and Environmental Protection Council, 1994). On December 30, 2004, Government Act 490 formalized the establishment of the Environmental Protection Agency (EPA) as the primary government agency responsible for the formulation and enforcement of policies related to all aspects of

the environment (Environmental Protection Agency Act, 1994). The Ghana Poverty Reduction Strategy: 2003–2005 International Monetary Fund, 2003) points out that the country is implementing a number of activities related to natural resource and environmental management.

District Assemblies have, over the years, been collaborating with departments such as the EPA, Ghana Education Service, Forestry Commission and NGOs in the development and implementation of their Medium Term Development Plans (Musah, 2009).

2.6 Negative Impact of Gravel winning on Local Communities

There is a litany of negative effects of gravel winning on the community members of gravel winning sites across the world. According to Weigand (1991), removal of large woody debris from the source during gravel extraction activities negatively affects the plant community. This is because large woody debris is important in protecting and enhancing recovering vegetation in streamside areas. Some other adverse impacts of gravel winning may include: the loss of ability to hunt and gather, loss of freedom of movement, relocation of settlements, fundamental disrespect for traditions, and land use disputes between community members and mining companies, individuals and other industries.

Furthermore, Makweba &Ndonde (1996) maintain that operations of mining, whether small- or large scale, are inherently disruptive to the environment. Also, it has been observed that mining of aggregate frequently generates land use conflicts in populated areas due to its negative externalities including noise, dust, truck traffic, pollution and visually unpleasant landscapes (Willis & Garrod, 1999). It also can trigger conflicts with competing land uses such as farming, especially in areas where high-value farmland is scarce and

where post-mining restoration may not be feasible. As pointed out by social and environmental activists there are potential linkages between mineral resources and conflict and consequential underdevelopment (Ross, 2001).

Gravel extraction can cause changes to channel morphology in rivers through the lowering of the riverbed during extraction (Rinaldi, Wyzga & Surian, 2005). This is enhanced by the disruption to bed armor caused by excavations and the movement of machinery which makes the bed vulnerable to fluvial erosion (Mossa & McLean, 1997). The difference though is that in the Sagnarigu District, winning of gravel is done not on river banks but far away in open fields. Nonetheless, it has been reported to have catastrophic effects. For example in the East Gonja District (EGD), commercial gravel extraction to supply aggregate to the construction industry has been reported to have largely contributed to land degradation and desertification through the destruction of economically important trees, mostly indigenous in nature. This practice leaves behind bare soil and a large expanse of gullies which can collect water during rainy seasons. This can result not only in health-related problems for neighbourhood communities, but can cause negative impacts on the environment as well (Heath, Merefield & Paithankar, 1993; Veiga & Beinhoff, 1997; Warhurst, 1994, 1999).

Moreover, the effects of gravel winning can spark off serious health-related problems for neighboring communities or the communities where gravel is mined. It can also cause negative impacts on the environment as well (Heath, Merefield & Paithankar, 1993; Veiga & Beinhoff, 1997; Warhurst, 1994, 1999). Mereku-Gyimah (2015) bemoaning serious illegal damage sand and gravel winning was causing the environment called on the Ghanaian law enforcement authorities to prosecute people engaged in the act. He said that

the activity had reached alarming levels in the Amasaman and Dodowa areas, both in the Greater Accra Region, and at the Asakai Beach, in the Western Region.

Mereku-Gyimah (2015) further identified negative environmental impacts of mining as vegetation and land degradation, air pollution and noise generation, water pollution and social problems with negative attendant repercussions that called for extra national budgetary allocation to rectify.

In the view of Peprah (2013), gravel and sand winning lead to land degradation, sand winning destroys the soil profile, damages soil surface configuration and changes topography of the land Musah (2009) discussing the socio-ecological impact of gravel winning in the East Gonja District identifies, from the views of respondents, loss or reduction of farm lands as a major impact of gravel winning in the district. Other significant impacts of gravel winning in the area included pits serving as breeding grounds for mosquitoes and spread of other diseases, erosion and loss of vegetation, loss of economically viable trees, as well as root of conflicts. In Mexico, residents in Velarde located in the Rio Grande Valley on NM Highway 68 experienced negative effects tremendously on families especially in health and public nuisance from small particles.

Murray and Cerrillos (2004) report that in New Mexico, sand and gravel deposits abound in all counties and are mined based on several factors such as their proximity to the points of final use, quality of the materials in the deposit, and accessibility. Gravel and other minerals for road construction are mined from riverbeds and hillsides to serve the highway construction and building industries, leaving mines un-reclaimed. The adverse effects of this, they claim, is that local residents are burdened with noise, industrial traffic, which

cause real public nuisance. Environmental degradation accompanies mining operations and 'remains after they cease, with pollution, scars on the landscape, and threatens surface and ground waters.

2.6.1 Initiatives to Reduce Risk in the communities

Many mining companies put in a lot of measures to either minimize or eliminate potential risks in their operations (Williams and Campbell, 1998; Campbell and Williams, 1999). For example, at the heat of the HIV AIDS pandemic in the Republic of South Africa, many mines made substantial efforts to establish HIV/AIDS prevention programmes eventhough the efforts did not yield the needed results. One possible reason for this is the inability of the prevention programmes to take account of the psychosocial environment of the labour force. In Latin America, Foreit et al. (1991) described the costs and the benefits of implementing child survival services at a private mining company in Peru. Here, despite extensive outlays for medical services, few children under five years were vaccinated, and half of their illnesses went untreated. Children who attended the company clinic usually received unnecessary medication.

As a result of the study, the company hired additional staff to provide integrated maternal-child preventive health care and family planning as well as intensive training and periodic on-site supervision. In less than two years, vaccination coverage reached 75%, while all children below the age of one got enrolled in growth monitoring. Prescriptions were reduced by 24%, including a 67% drop in antimicrobials.

In Ghana, the Minerals Commission and Environmental Protection Council (1994) provides for health-related environmental monitoring in mining areas to include monitoring air, water, noise, emissions and food contamination. Further example is the Ghana Consolidated

Diamonds Limited which has established a hospital on its company's grounds to serve the healthcare requirements of its staff and their dependents. The service even extends to members of the community of operations in Akwatia (GCD, 2001). Other mining companies such as Anglo Gold Ashanti, Goldfields Ghana Limited do not only have hospitals and clinics to serve both workers and residents in the mining communities but also embark on other health education programmes. From the findings of their research, Stephens and Ahern (2001) have called for the need for more openness and transparency within the mining sector, particularly in countries of Latin America, Asia and Africa. There is a further need for in-depth long-term evaluation of the impacts of mining on health of workers and communities. This implies that the sector's activities currently undermine the human objectives of sustainable development, which are to protect the health of current and future generations.

2.6.2 Mining and Economic Development

According to Acheampong (2004), mining has an essential foundation for human development as it creates wealth. For instance, in 2001, the mining industry produced over 6 billion tons of raw product at the value of several trillion dollars (Mbendi, 2004). Furthermore, in 1993, the mining industry in Peru contributed $2400million paid in taxes, $400million spent on local purchases and $280million on imported goods. This accounted for over 11% of GDP (Acheampong, 2004). In North America, Raw mineral production of gold and silver in 1998 was valued at approximately US$ 70 billion, and employs about one million people. Gold, the largest mineral foreign income earner in South Africa alone contributes 27.4% in mineral revenues. The gold industry is also responsible for 56% of South Africa's mine labour force (Mbendi, 2002). However, the United Nations Industrial

Development Organisation (UNIDO) considers joblessness and landlessness (resulting from large scale mining) to have forced people into small-scale gold mining, and UNIDO estimates that there are over one million people directly involved in small-scale gold mining operations in Latin America. Africa and Asia alone host an estimated six million artisanal miners world-wide (UNIDO, 2001). For instance, there are no exact figures on the number of small-scale miners in Ghana, though it is 38 estimated that approximately 100,000 Ghanaians are legally engaged in mining (Aryee, 2003). 'Galamseys' involved in illegal mining activities also create challenges for monitoring and regulating small-scale mining activities in the country. A UN study on artisanal mining and poverty reduction reports that there may be between fifty thousand and eighty thousand (50,000 – 80,000) people engaged in illegal small-scale mining activities in Ghana (Carnegie, et al, 2000). The mining sector now accounts for 41% of the country's foreign exchange and is the leading foreign exchange earner. Gold, the most important mineral, which now earns over U$600 million and constituting almost 90% of the mineral output, has replaced cocoa as the principal foreign exchange earner (Awudi, 2002).

As a result of significant investment in the mining sector in Ghana, (Akabzaa and Darimani, 2001) reports that many benefits have been got including: foreign exchange which yields substantial government revenue, capital and social infrastructure to the general public, generation of direct and indirect employment, contribution to community development in mining areas. The mining industry further generates revenue for the internal economy in the form of salaries, wages and other payments made to workers and contractors, corporate income taxes, royalties, concession rents, services, customs and harbour duties, taxes on salaries of employees, and social security contributions from workers and their employers,

and dividends to shareholders. The benefits also include equipment and consumables purchased locally, import duty and purchase tax on vehicles, electricity and water charges, divestiture of state mining companies and sale of government shares.

Furthermore, since mining is usually done in remote sites, mining companies have had to invest in considerable physical and social infrastructure such as roads, schools, hospitals, electricity and water supplies. Communities within mine locations have generally been beneficiaries of some of these facilities. Thus, while mining projects usually have weak links with the rest of the host national economy, they can have a significant impact on the communities in which or near which the mines are located (Anyemedu, 1992). Awudi (2002) has, however, noted that despite the over U$2 billion FDI attracted in mineral exploration and development of mining, during the last decade, accounting for over 56% of total FDI flows to the country, the sector is yet to make any meaningful impact on the country's general economy. The sectors' contribution to the country's GDP is a meagre average of 1.5% since 1993. There is lack of linkage between the mineral sector and the rest of the internal economy. The massive investment has not been translated into significant increase in employment. Labour-intensive underground gold mines have been replaced by surface mining, which is capital intensive and employs relatively few people. Large-scale surface mines only employ about 20,000 workers while a double of this number are involved in small-scale mining. State mines, now privatized, aim to maximize profits and have retrenched more than 50% of their workforce many of whom have moved to the informal sector. Mining in the Sagnarigu District is limited to only gravel and at a very limited level compared to what happens in communities in Southern Ghana such as Obuasi

where gold is mined. But it also contributes to the economic wellbeing of the people engaged in gravel winning.

2.6.3 Mining and Health

There are associate health hazards in relation to mining wherever it is done just as the hazards result from a variety of other human activities such as industrialisation, farming, mining, migration and others. Available literature examines the impact of mining on the health of both mine workers and the people within the surrounding communities of the mines. According to Stephens and Ahern (2001), mining remains one of the most perilous occupations in the world, both in terms of short term injuries and fatalities, but also due to long term impacts such as cancers and respiratory conditions such as silicosis, asbestosis and pneumoconiosis. Studies of mining and health by type of mine process are divided into deep and open cast mines. Deep mines produce severe harms for employees in terms of their risks of high blood pressure; heat exhaustion; myocardial infarction and nervous system disorders. Studies of surface mining focus on coal, granite and rock mining and health risks related to dust breathing. In all levels of mining health risks occur with dust exposure (Stephens and Ahern, 2001). Respiratory impacts are the most studied and problematic of health impacts for mine workers. Injuries have declined in importance but continue to be an important safety issue in mines. Long-term effects include cancers, mental health impacts and some proof of impacts on genetic integrity of workers. The heated discussion on the impact of the mining and minerals sector on both worker and community health is polarized. On the one hand the industry tends to underscore the supposed benefits of the sector, while on the other, community groups and NGOs suggest that the sector is injurious to health and sustainable development (Stephens and Ahern, 2001).

Corbett, Churchyard et al. (2000) investigated the combined effects of HIV infection and silicosis on mycobacterial disease in a South African gold mine, and concluded that the danger of silicosis and HIV infection existed. This indicated that tuberculosis (TB) remains as much a silica-related 42 occupational disease in HIV-positive as in HIV-negative miners, and HIV- positive silicotics have by far higher TB prevalence rates than those reported from other HIVpositive Africans. The increasing impact of HIV over time may indicate epidemic TB transmission with swift disease development in HIV-infected miners. There were relatively few studies of policy initiatives by Stephens and Ahern (2001). According to them, health and safety improvements in mines have been developed over a long period of negotiation and struggle. Laws have come after union and management activities. Governments have supported organized labour in the improvements. Moreover, Stephens and Ahern (2001) stress that scientific evaluation of long-term impacts has grown. Employees have been able to use scientific evidence for improved "hazard visibility" and for shifts in health and safety legislation. However, much of the small-scale mining sector falls outside formal legislative shield or scientific analysis. Companies have provided a range of community initiatives including vaccination programmes and health services. These have mixed results. Companies have seldom addressed the community claims for damage made against them internationally. Communities have worked with scientists to understand some of the impacts associated with living near mines. Unions have scarcely played an overt role in support for community claims (Stephens and Ahern, 2001).

Biostatistics obtained from Obuasi hospital in a survey by Friends of the Earth-Ghana (FOE-Ghana) showed a high prevalence of upper respiratory tract infection (URTI) in the area which medical experts linked to the mining activities and associated pollution (Awudi,

2002). Clinical symptoms similar to arsenic poisoning have been observed in patients in AGC hospital at Obuasi and have been associated with aerial pollution from mineral procession by the AGC (Awudi, 2002). In the Tarkwa area, with the initiation of mining investment, mining impact related diseases such as malaria, diarrhoea, upper respiratory tract infections, skin disease, acute conjunctivitis and accidents constitute the top ten diseases in the area according to biostatistics, obtained by FOE – Ghana in Korle-Bu Hospital in a survey in 2001. The area has the highest incidence of malaria in the Western Region and the country as a whole. Skin rashes are widespread particularly among communities living along rivers and streams which regularly receive leaked cyanide waste waters and other mining wastes within concessions (Akabzaa and Darimani, 2001)

2.6.4 Mining and the Environment

The adverse environmental impact of mining activities on the environment is well documented especially on the impact of large and small scale gold mining activities on environmental contamination (Veiga and Beinhoff, 1997; Warhurst 1999). Yelpaala, (2004) explain that while land degradation caused by gold mining is pronounced, chemical contamination from gold extraction imposes a double burden on the environment, with harmful health implications for mining communities and people residing in close proximity to such activities. For instance, due to the informal nature of gold-mining in theAfrica and Latin America, most studies concentrate on mercury exposure and intoxication incurred in the extraction and processing stage of mining (Tirado et al. 2000; Drake et al. 2001).

Results of studies do indicate patterns of mercury intoxication during gold amalgamation process (Van Straaten 2000a; Drasch, Bose- O'Reilly et al. 2001). For example, in one site in the Philippines, a study of one hundred and two (102) workers and sixty-three (63) other

inhabitants (exposed from the environment), one hundred (100) persons living downstream of the mine, and forty-two (42) inhabitants of another site (serving as controls) was undertaken. Bio-monitors and medical scores for both workers and the surrounding communities were taken. The study by (Drasch et al. 2001) reported zero (0%) of the controls, 38% downstream, 27% from Mt. Diwata non-occupational exposed. Also, 71.6% of the workers were classified as Hg intoxicated. Another study in Tanzania by Harada, Nakachi et al. in 1999 with a similar design found lower levels of intoxication and a more complex mix of mining-related and environmental exposures to mercury through household items such as soap One study in Ecuador reports higher levels of intoxication in children involved in "gold washing" (Harari, Forastiere et al. 1997). One other study in Venezuela in 2001 found no mercury intoxication, despite occupational and community exposures.

In Ghana several studies in mining towns have revealed that environmental problems such as land degradation, pollution and others are associated with mining activities. Some of these are enumerated below. In my study area, however where gravel is wined, there is no use of mercury or any other chemical. Therefore, the land is not polluted by any chemicals.

2.6.5 Degradation of Land and Vegetation

According to Akabzaa and Darimani (2001), and Imoro (2010), extensive areas of land and vegetation in Tarkwa and the Northern Region respectively have been cleared to make way for surface mining activities. Currently, open pit mining concessions have taken over 70% of the total land area of Tarkwa. It is estimated that at the close of mining a company would have utilized 40-60% of its total concession space for activities such as siting of mines, heap leach facilities, tailings dump and open pits, mine camps, roads, and

resettlement for displaced communities (Akabzaa and Darimani, 2001). This has momentous adverse impact on the land and vegetation, the main sources of livelihood of the people. In the Sagnarigu District, to the contrary, only open pits are left behind after winning but leaving huge tracks of arable land degraded. In most parts of Tarkwa, the environment is undergoing rapid dreadful conditions and its immense economic value is dwindling from year to year, due mainly to the heavy concentration of mining activities in the area. Agricultural lands are not only generally degraded, but the loss of land for agricultural production has also led to a shortening of the fallow period from 10-15 years to 2-3 years. The traditional bush fallow system, which sufficiently recycled substantial amounts of nutrients and made the next cycle productive, can no longer be practised due to insufficiency of land. Akabzaa and Darimani (2001) report that large-scale mining activities generally continue to diminish the vegetation of the area to unacceptable levels that are vicious to biological diversity. The deforestation that has emanated from surface mining has long-term effects even when the soil is replaced and trees are planted after mine decommissioning. The new species that might be introduced have the potential to influence the composition of the topsoil and then determine soil fertility and fallow period for certain crops.

Furthermore, erosion resulting from surface vegetation has fast depleted the viability of the land for agricultural activities and loss of habitat for birds and other animals. This has degenerated into destruction of the luxuriant plant life, biodiversity, cultural sites and water bodies (Akabzaa and Darimani, IBD). It is predictable that by the time the four companies - GAG, TGL, GGL, and AGL-would have mined out all their concessions, a total of 16 ridges ranging between 120m and 340m high would have been twisted into huge craters

(Akabzaa and Darimani, 2001).

According to Akabzaa and Darimani (2001), extensive areas of land and vegetation in Tarkwa have been cleared to make way for surface mining activities. Currently, open pit mining concessions have taken over 70% of the total land area of Tarkwa. It is estimated that at the close of mining a company would have utilized 40-60% of its total concession space for activities such as siting of mines, heap leach facilities, tailings dump and open pits, mine camps, roads, and resettlement for displaced communities (Akabzaa and Darimani, 2001). This has momentous adverse impact on the land and vegetation, the main sources of livelihood of the people. There is already a scramble for farmlands in Atuabo and Dumasi. In most parts of Tarkwa, the environment is undergoing rapid dreadful conditions and its immense economic value is dwindling from year to year. This is, mainly as a result of heavy concentration of mining activities in the area. Agricultural lands are not only generally degraded, but the loss of land for agricultural production has also led to a shortening of the fallow period from 10-15 years to 2-3 years. The traditional bush fallow system, which sufficiently recycled substantial amounts of nutrients and made the next cycle 48 productive, can no longer be practised due to insufficiency of land. Large-scale mining activities generally continue to diminish leading to vegetation of the area deteriorating to levels that are vicious to biological diversity.

Deforestation that has emanated from surface mining has long-term effects even when the soil is replaced and trees are planted after mine decommissioning. The new species that might be introduced have the potential to influence the composition of the topsoil and then determine soil fertility and fallow period for certain crops. In addition to erosion when surface vegetation is depleted, there is deterioration in the viability of the land for

agricultural activities and loss of habitat for birds and other animals. This has degenerated into destruction of the luxuriant plant life, biodiversity, cultural sites and water bodies (Akabzaa and Darimani, 2001). It is estimated that by the time the four companies - GAG, TGL, GGL, and AGL finished up their concessions, a total of 16 ridges ranging between 120m and 340m high would have been twisted into huge craters (Akabzaa and Darimani, 2001).

2.6.6 Water Pollution

Many mines have set up programmes to reduce the water table or divert major watercourses away from the mines. These have reduced quality and availability of surface and ground water. Four main problems of water pollution have been identified in Tarkwa mining areas. These are chemical pollution of ground water and streams, siltation through increased sediment load, increased faecal matter and dewatering effects (Akabzaa and Darimani, 2001).

2.6.7 Air and Noise Pollution

Mining activities and mining support companies discharge particulate matter into the ambient air. The grievances of the affected communities on air quality have been the airborne particulate matter, emissions of black smoke, noise and vibration. Airborne particulates of major concern within the Tarkwa area include respirable dust, sulphur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO) and black smoke. The activities that produce this particulate matter include site clearance and road building, open-pit drilling and blasting, loading and haulage, vehicular movement, ore and waste rock handling as well as heap leach crushing by companies during heap leach processing. Some others are fumes from the roasting of sulphide ores by assay laboratories and in

refining processes. The discharge of airborne particulate matter into the environment -- principally minute dust particles of less than 10 microns -- poses health threats to the people of the people in mining communities. All fine dust at a high level of exposure has the potential to cause respiratory diseases and disorders and can exacerbate the condition of people with asthma and arthritis. Dust from gold mining operations has a high silica content which has been responsible for silicosis and silico-tuberculosis in the area.

Measures to reduce dust emission are restricted to occasional spraying of roads within the premises of the mining concessions. This seems to be a misplaced effort because road dust does not appear to be the main source of dust pollution. Furthermore, the EPA acknowledged that dust suppression on the haulage roads is ineffective and the frequency of spraying is inadequate. Further in Ghana, black smoke from fuel burning, fumes from the assay laboratories and ore roasting at Prestea make up additional sources of airborne pollutants in the Tarkwa mining district. There were cases where the values recorded for smoke exceeded the acceptable and tolerable levels of the EC, WHO and EPA. The uppermost value recorded was 207 gm-3 as against the tolerable levels of 100 gm-3 for the EC, 85 gm-3 for the WHO and 40 gm-3 for EPA-Ghana (Akabzaa and Darimani, 2001).

Eventhough the level of dust and smoke emissions in the gravel pits is minimal since much of the digging and loading is done manually, the people are still at the risk especially from dust from moving loaded tipper trucks from the gravel winning sites through the communities to their various places of sale.

2.6.8 Noise and Vibration

Literature on negative environmental and health effects of mining activities with regards to noise and vibration has been documented. The sources of noise and vibration in the area

comprise mobile equipment, air blasts and vibration from blasting and other machinery. The impact of high-pitched and other noises is known to include damage to the auditory system, cracks in buildings, stress and discomfort (Akabzaa and Darimani, 2001). These noises can also terrify animals, hinder their mating processes and also cause abortions, therefore adversely affecting the animal population. However, the measures being put in place by the mining companies have not sufficiently addressed the problem of noise pollution in the area.

2.7 Strategies to Protect Smallholder Farmers

In the light of the situation where smallholder farmers are unable to feed themselves and meet their basic needs, alternative livelihood strategies are earnestly sought to augment the little income from the principal agricultural livelihood source. Smallholder farmers across the world have relied on many alternative livelihood sources of income to complement income got from their traditional income sources. The vulnerability of smallholder farmers in sand and gravel winning communities is a serious one and suggestions as to how the effects could be mitigated are put forward by scholars. Peprah (2013) suggests that instead of agriculture, the sand winning communities could derive livelihoods from local tourism as the sand winning sites could be converted into gardens and parks, golf courses, fish ponds and swimming pools.

Another way out as practised in Afghanistan, the cultivation of opium, an illicit drug, has been a major income earner for smallholder farmers. Because of the illegality of the crop, the government and non- governmental organisations introduced the farmers to on farm and off farm activities for extra income in order to cater for their daily necessities.

In the Philippines where aqua culture is their traditional source of livelihood, fishermen are encouraged and trained in boat making and repairs for supplementary income (Asong, R.H., Mabunay, M.L., Aure, D., Seraspe, E., Bra-ganza, R. and Corda, D.E.(2002). The authorities hope that the engagement in these areas will help minimise the pressure on fish and its accompanying pollution of the water bodies. Other alternative livelihoods include: Cane rats farming, sea weed farming to alleviate fishing pressure within sensitive marine areas, artisanship for marine fishermen etc.

Langer (2013) in line with Peprah (2013) suggests reclamation as one way of mitigating the effects of gravel winning on smallholder farmers. Mined-out aggregate pits and quarries are converted into second uses, such as wildlife habitat, recreational areas, agricultural areas, parks, school grounds, high-quality lakefront housing sites, and a myriad of other land uses. A plan for reclaiming the disturbed land and its ecosystem should be a part of every plan to mine natural aggregate. There is a growing appreciation for the reversionary value of sand and gravel operations. Reclamation is becoming a major factor in sustaining the environment and in creating habitat biodiversity. And the need for specific post-mining land uses such as water storage is becoming an important consideration in mining. For example, local municipalities have condemned alluvial land and leased the land to aggregate operations for gravel extraction, with the end goal of creating water storage reservoirs. The post-mining land use is being offered as justification for gravel extraction permits (Langer, 2003)

One strategy used by Farm Business School (FBS) to overcome smallholder farmers' food and income inadequacies that worsened the poverty situation in some parts of Africa is training services and record keeping of their farm activities. In Western and Central Africa,

cocoa is one of the most important agricultural products and sources of foreign currency. It is grown mainly by smallholder farmers on plots of land of up to two hectares in size, with a total cultivation area of five to six million hectares with other crops as supplementary sources of income.

2.8 Reclamation of Land

Preliminary figures of 1991 Handbook for Reclaiming Sand and Gravel Pits in Minnesota compiled by the United States Bureau of Mines indicate that Minnesota ranks eighth nationally in sand and gravel production as it produced 26.5 million tons at a value of $6 million. Production was reported in 77 of 87 counties by 206 companies (State of Minnesota Department of Natural Resources 1992)

Local communities benefit since companies engaged in gravel winning may contribute to the development of key socioeconomic infrastructure such as roads, hospitals, schools and housing. While revenues accruing from mining activities contribute positively to the economy of the community, gravel winning activities serve as a major source of employment for local people, and trigger the establishment of a wide range of small businesses such as catering, transport and cleaning services.

2.9 Conceptual Framework

Land is central to the socioeconomic life of smallholder farmers in Ghana. This is because agriculture plays a pivotal role in their livelihoods, income and food security. Population growth and market development have created pressure and competition for land resources, especially close to towns and cities which are fast expanding and ever requiring more land

for development (Quan et al. 2004). As a result, tenure and land use in peri-urban areas and cities is changing fast in response to the rapid urbanization (Sjaastad and Bromley 1997).

Fertile agricultural lands are being converted for urban use depriving indigenous members of these communities of their livelihoods (Quan et al. 2004). Land rights are further eroded by the growing desire for home ownership that has fuelled a construction boom in cities and other urban areas, requiring enormous amounts of land both for the construction and also for gravel winning. When gravel is winned from the top soil of fertile lands for construction around cities, there are few productive uses for the hard pan left around such cities which has direct consequences on the livelihood and food security of farmers and the urban poor (Quan et al. 2004). \

Large-scale land acquisitions can result in local people losing access to the resources on which they depend for their food security and livelihoods as well as dispossessed of land they live on which is often tied to their identity (Cotula et al. 2009; De Zoysa 2013). Secure land rights are key to household food security and shelter, and also provide a safety net in case of unemployment or retirement (Ubink et al. 2009). For this reason, principles of customary land ownership require that access to land can only be granted to non-indigenous individuals with the prior consent of the person using the land(Kasanga and Kotey 2001).

Smallholder farmers often involve themselves in alternative sources of income generating activities to supplement income they get from their farms. This is especially so for communities located in the Savannah agro-ecological zone where rainfall is unimodal and there is only one farming season. Alternative livelihoods can lead to poverty alleviation for smallholder farmers because of the additional income it brings to the household. Gravel

winning as an alternative source of livelihood degrades the land on which gravel is wined making such lands less suitable for agricultural production(Quan et al. 2004). Engagement of smallholder farmers in gravel winning also moves labour away from agricultural production and does decrease both agricultural production and productivity. Figure 1 is a schematic representation of the cause and effects of gravel winning on smallholder farmers.

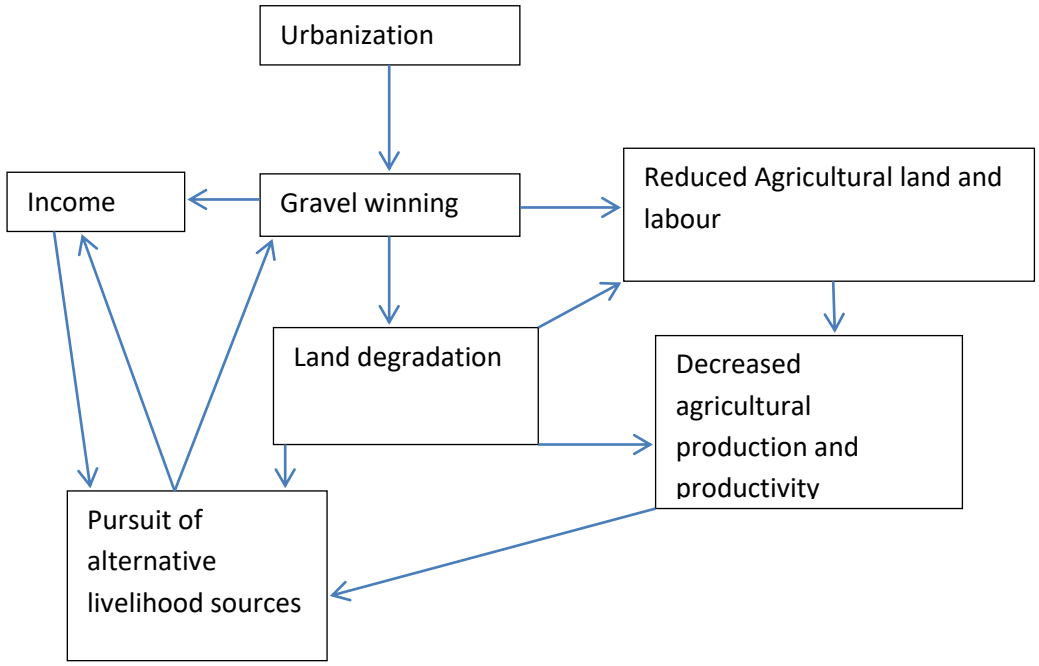


Figure 1: Schematic representation of the cause and effects of gravel winning

Source: Author's Representation

In figure 1, urbanization leads to high demand of gravel which is needed for development of infrastructure in the urban centres. This high demand for gravel increases gravel winning activities in the communities around the urban centres whose main livelihood is farming. Smallholder farmers in these communities in which gravel winning takes place engage in

the activity as an alternative source of income to supplement the income from their farming activities. Gravel winning degrades the land by removing the top soil which is the part that supports crop cultivation and thereby reducing the amount of agricultural land available to the farmers. The reduction in agricultural land leads to reduced agricultural output for the smallholder farmers. Reduced agricultural output for smallholder farmers make them engage further in gravel winning in order to get income to supplement the reduced earnings from farming. As farmers engage in gravel winning to supplement income from their farming activities, labour for farming activities is also reduced. The reduction and degradation of agricultural land, and the reduction in agricultural labour lead to decrease in agricultural production and productivity. This further reinforces farmers' participation in gravel winning as an alternative source of livelihood.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

A research methodology defines what the activity of research is, how to proceed, how to measure progress and what constitutes success (Yin, 2003). Kumekpor (2002) on his part, defines research methodology as the method, procedures and techniques used in an attempt to discover what we want to know. It is worth stating that using appropriate data collection methods helps the researcher to evaluate his/her data sources and detect inconsistent answers. It gives the researcher the opportunity to collect valuable data, analyse and present the data in an orderly manner.

Consequently, this chapter explains the methodology employed in the study. It describes the type of research design used, the methodology for data collection, the sources of data, sampling techniques, sample size and procedures for data analysis.

3.2 Profile of the Sagnarigu District

The Sagnarigu District, by legislative instrument (LI) 2066 was carved out from the Tamale Metropolitan Assembly on the 24th of June, 2012 (Ghana Statistical Service, 2014). The district has its capital in Sagnarigu. One of the reasons for the creation of the district was to redirect developmental projects to the communities North and West of the Tamale Metropolis which were relatively underdeveloped compared to the urban areas in the metropolis. The district has a largely rural population with a majority of the people being smallholder farmers. This population is totally dependent on subsistent agriculture. With increasing urbanization and construction works, the people increasingly gain less farm yields especially from crop production, which is their main source of livelihood.

Furthermore, because of the tendency of the growing urbanization, the demand for gravel in the construction sector has increased in recent years as more houses, roads, schools and hospitals are needed to cater for the equally growing population (Musah, 2009 and Peprah, 2013).

Some people in the district have, therefore, found solace in gravel winning in some communities in the Sagnarigu District where gravel is harvested in quantities for sale. This has provided a supplementary source of income for them especially the youth who go to the gravel pits to dig and load tipper trucks that come to cart the gravel away at a fee. Apart from those who dig and load, the chiefs, drivers and truck owners also fetch some cash. There are even gravel contractors who neither load nor drive but who contract customers for the drivers at a fee.

3.2.1 Geographical Location of the Sagnarigu District

According to the Ghana Statistical Services (2014), the Sagnarigu District covers a total land size of 20,041,901km^2 and shares boundaries with Savelugu-Nanton Municipality to the North, Tamale Metropolis to the South, Tolon District to the West, and the Kumbungu District to the North-West.

The Sagnarigu District lies between Latitude 9.34^0 North and Longitudes 0.36^0 and 0.57^0 West. The topography is generally flat with some shallow valleys serving as stream courses. The Northern Region, and the Sagnarigu District showing study communities are shown in figure 1 in page 57.

3.2.2 Development Challenges of the Sagnarigu District

The development records of Ghana suggest that the country witnessed a substantial economic growth and a steady decline in poverty and hunger from the early 1990s. Unfortunately, this development has not got down equally across the country with particular reference to the people in northern Ghana. Undoubtedly, there is a dramatic north-south divide (from the colonial era). In this part of the country described as northern savannah, according to IFAD (2011) poverty, as well as food and nutrition insecurity remains widespread and common phenomena. In the three northern regions (Northern, Upper East and Upper West) making up the northern savannah, the prevalence of poverty is at 52 to 88%, compared to around 30% in the Brong-Ahafo and Volta regions, and 12 to 20% in the five southern regions (Greater Accra, Ashanti, Central, Eastern and Western) (Al-Hassan and Poulton, 2009).

A good number of studies on development conducted in Ghana conclude that improved agricultural production—the livelihood for over 70% of inhabitants in Northern Ghana and Sagnarigu for that matter— is necessary to bring northern Ghana out of poverty (Al-Hassan and Poulton 2009, Al-Hassan and Diao 2007, Shepherd 2005). The causes of poverty and hunger in the district, and northern Ghana as a whole, are numerous and complex. Socioeconomic issues, such as inadequate education and health care, fewer economic opportunities, poor infrastructure impede agricultural development. Environmental issues, such as soil infertility and degradation, harsh and erratic climatic conditions and pest pressures create additional challenges to increasing agricultural production. In addition to these challenges is the unreliable availability of advanced agricultural technologies, and the

limited knowledge on improved agronomic production and management practices among farmers.

Another major cause of the underdevelopment of the Northern Belt, is inadequate communication and collaboration among the Ministry of Food and Agriculture (MOFA) and the Ministry of Education (MOE). This has resulted in a significant gap between research, education and extension. This gap has certainly created significant challenges for agricultural development, and improved livelihoods for smallholder farmers. In an effort to support equal development, several European countries, Canada and the United States continue to support pro-poor development projects in Ghana's northern regions (CIA 2013 and USAID, 2013).

3.2.3 Literacy and Education Trends in the Sagnarigu District

According to the Ghana Statistics Service (2014), the Sagnarigu District has a significant number of illiterates. The total literate population of the District is 62,856 and the non-literate stands at 41,498. This implies that about 40 percent of the population in the district is not literate in any language. Of the number that are literate (representing sixty percent (60%) of the population), thirty-eight point six percent (38.6%) is literate in English only, one and a quarter percent (1.4%) percent in Ghanaian Language only and more than half of them, fifty-nine point one (59.1%) are literate in English and Ghanaian language.

A similar pattern is shown by age where literacy in both English and Ghanaian language is the highest within each age group for either males or females, followed by literacy in English language only. The only exception is in the 11-14 year group

where the proportion that is literate in English language only is the highest followed by English and Ghanaian language. It is also observed that at all ages, literacy in French is almost absent with less than one percent recorded as being literate in English and French at the same time.

3.2.4 Level of Education and School Attendance

The Ghana Statistical Service (2014) further shows that both females and males of the population in primary school is the highest forty point eight percent (40.8%). Also, 18.9 percent are currently attending junior high schools while eleven point nine percent (11.9%) and six point four percent (6.4%) are in senior high and tertiary institutions respectively. In terms of sex differential, a relatively higher proportion of females forty-two point four percent (42.4%) than males thirty-nine point four percent (39.4%) are reported to be currently attending primary school in the district. However, at higher levels of schooling, the proportion of males currently in school is higher compared to females. For example, nineteen point four percent (19.4%) and seven point four percent (7.4%) of the males reported to be currently attending junior high and tertiary schools respectively compared to eighteen point three percent (18.3%) and five point two percent (5.2%) respectively of their female counterparts.

School attendance in the past also showed some variation by sex. What is quite visible however, is that a much higher proportion of the population attending school in the past did so at the tertiary level compared to current school attendance. For example, school attendance at the tertiary level in the past constitute twenty point seven percent (20.7%) twenty-four point five percent (24.5%) for the males compared to fifteen point

four percent (15.4%) among the females, suggesting a relatively lower school attendance in the past at the tertiary level among the females relative to the males. In contrast, however, a relatively higher proportion of the females attended Primary, Junior and Senior high schools in the past compared to their male counterparts. On the other hand, with reference to middle and secondary school education, a higher proportion of the males compared to the females attended in the past. It appears that between the past and the present, the gap in educational attendance between the males and females is closing.

3.2.5 Political and Administrative Structure

The Sagnarigu District hitherto had been part of the erstwhile Tamale Metropolis. It comprises of the people of Gukpegu and Sagnarigu. The district has a total population of about 160,000 (Ghana Statistical Service (2014) The Sagnaarigu district has seventy-nine (79) communities comprising of twenty (20) urban, six (6) peri-urban, and fifty-three (53). The District Chief Executive is the political head. The district is divided into three Area Councils namely Choggu-Sanarigu, Kalpohini and Kanvili. It is further sub-divided into twenty-two (22) Electoral Areas. The district hosts two constituencies namely: Tamale North Constituency and the Sagnarigu Constituency. Each of the two is represented by a Member of Parliament elected into the Ghana Legislature (Parliament) situated in Accra, the nation's capital city (Sagnarigu District Profile 2014).

Furthermore, a very important administrative system in the district is the traditional administrative setup as far as gravel harvesting is concerned. There are two key customary administrative chiefs namely the Sagnarigu-Naa and the Gukpegu-Naa. The Gukpeɣu-Naa has a number of his subjects in the Sagnarigu District but many others in the Tamale

Metropolis. Gravel fetched from any of these communities must be sanctioned by the Gukpegu-Naa or by his subject chief in charge of the given traditional area. The Sagnari-Naa, who has all of his subjects in the Sagnarigu District, also owns the rest of the land in the district, and any gravel winning activity must have his consent or a subordinate chief in the community on his behalf.

3.2.6 Climatic Conditions of the Area

The area, as a result of its location in the guinea savanna belt, experiences only one rainy season. The rainy season usually starts from April/May to September/ October, with its peak in July/August. The dry season is normally from November to March and is influenced by the dry North East winds (Harmattan). Daily temperatures vary from season to season. During the rainy season there is high humidity with relatively less sunshine and heavy thunder storms. The mean day temperatures range from 28ºC (December - mid-April) to about 38ºC (April - June) while mean night temperatures ranges from 18ºC (December) to 25ºC (February, March). The dry season (November – March) is characterized by the dry Harmattan winds; the Harmattan season presents two extreme weather conditions, the extreme dry cold temperature of the early dawn and morning and the very warm afternoon. The district is poorly endowed with water bodies; this is attributed to the high underground water table.

The Sagnarigu District has both wet and dry lands. The vegetation of the district is characterized by tall grasses and drought resistant trees such as Dawadawa, Shea-nut trees, among others. The area practises bush burning in the dry season. This is usually done by some hunters and farmers and often leads to the destruction of the vegetation cover. The main soil types in the district are sandstone, gravel, mudstone and shale that have weathered

into different soil grades. Due to seasonal erosion, soil types emanating from this phenomenon are sand, clay and laterite ochrosols. The availability of these soil types have contributed to rapid real estate development in the area where estate developers have resorted to the use of local building materials such as 'river sand', gravel and clay.

3.2.7 People in the District

The Sagnarigu District has ethnic diversity; Dagbamba constitute about ninety percent (90%) according to the Ghana Statistical Service (2014) of the population of one hundred and sixty thousand (160,000). Other ethnic groups such as Nanumba, Gonja, and Mamprusi live in their minorities in the district. The population of the district consists of a Muslim majority making up of about eighty- four (84) percent of the population (Ghana Statistical Service 2014).

Festivals are very important events in the calendar of the Sagnarigu District. Like many other districts in the Northern Region, the district celebrates a number of festivals. The most prominent ones are the Damba, Fire (Buɣim) and the two (2) Eid festivals celebrated by the Muslim majority.

Agriculture is the major economic activity in the district. They are mainly subsistent farmers but they do sell some of the produce to feed their families and for other purposes. The crops cultivated are cereals like rice, millet, maize and sorghum, and legumes such as cowpea, soya beans and groundnut. Tubers such as yam, cassava and potatoes are also cultivated in these areas. The farming systems prevalent in the district are the Continuous Cropping and Mono Cropping. Farmers in these areas rely solely on rain water for their farming activities since irrigational facilities are scarce. The area enjoys a very conducive climatic condition

the rearing of ruminants and birds. The animals reared include, birds like guinea fouls, ducks, among others and livestock like sheep, cattle and goats.

Apart from farming, the people (mostly women) engage in activities such as soap making, Shea butter extraction, groundnut processing, blacksmithing, and cotton spinning, seam stressing, hairdressing and milling (Ghana Statistical Service 2014). The main industrial activities in the district are mainly agro-processing activities such as rice milling, Shea butter processing and vegetable oil extraction, cotton spinning and textile or smock making. Others are engaged in vehicle repairs, pre-fabrication of spare parts and manufacturing of farm implements. These are usually done on small scale basis and are owned by individuals and therefore self-financing. The poverty situation in the Sagnarigu District can aptly be described as very extreme due to the fact that most of the people have lost their farm lands to urbanization, and have virtually no other skills for livelihood. As a district located in a chauvinistic community, the economic activities are mainly prescribed by gender in that there are some specialized works which are preserves for men and others for women.

3.3 Profile of Communities under Study

3.3.1 Tampe-Kukuo Yapalsi.

Kukuo-Yapalsi is a village in the Sagnarigu District is located approximately ten (10) kilometres away from Tamale Central, the Regional Capital of Ghana's Northern Region. The village has a population of roughly six hundred (600) people, most of whom are immigrants. It has, in recent times, become a prominent community in Northern Ghana through mainly its hosting of the Bi-water project and Deco fertilizer.

In terms of religion, this town until the early 1980s had the African traditional Region as its main form of religion. Thus, the people worship the Supreme God, through their ancestors. At the heart of the centre of the religious set-up is the belief in small shrine believed to have been discovered by the earliest ancestor to have settled in the community, named Neindoo. The relevance of this shrine is based on the oral tradition that Neindoo found a mysterious stone at that particular setting 'Buguli gaa' and upon consultation of soothsayers, was told that it was a god that needed to be worshipped. Sacrifices are offered to the said shrine in terms of difficulties and also to honour the ancestors for the assistance and protection. The traditional leader of this community, named Dohin-Naa, (eskinned by Kukuko Naa, the people who own the land on which Yapalsis is and believed to have accepted the earliest ancestors to settle on that land) oversees the sacrifices but in cases that he happens not to be eldest in the community because of the paternal system of inheritance, any other person can lead the sacrifice, though under his supervision. In terms of hardships such as poor rain patterns or emergence of strange diseases, soothsayers are consulted and the gods are appropriately offered their required sacrifices.

However, in the early 80s, the community witnessed the influx of the Islamic Region, brought in mainly by Islamic scholars from Mbanaayili. The main Islamic scholar who supervised the introduction of the Islamic Region into the community was popularly called Afa Acheampong, who finally relocated to the community to settle, and died and was buried in this very community. The attempts to introduce Islam into Yapalsi were restricted by the Traditionalists who thought allowing the entry of the religion was not only a threat to their worship of their ancestors, but also could potentially lead to loss of control over their children. Prominent among the people who resisted this were Zoo-Naa Sheini and Dohin-

Naa Abu (both of blessed memory). This was rather tasking as the youth found that religion more appealing than what was practiced by their fathers. Today, Islam is the mainly religion of the town, with a few Christians. However, Traditional African Religion is still practised by some of the community members who feel they cannot abandon what was started by their ancestors. Even interesting is the fact that most of the community members combine the worship of their ancestors with the newly accepted religion. Religion in whatever forms is central in the lives of the inhabitants and indicates the interdependencies between human identities and supernatural beings either in the form of the Supreme God or the ancestral world.

The main form of marriage is polygamy and one man can marry up to five (5) wives. Women still have not been given the required place they deserve in society because formal education has not gained grounds in the community. Accordingly, most parents either think it is too expensive an undertaking or do not see why their children should undergo formal education at the expense of learning their religious beliefs. The girl-child is even more disadvantaged as her prescribed place in society appears to be child birth and the kitchen. As prototypical of African societies, the number of children a man has is still viewed as the main parameter in determining one's success and boys are generally preferred because of the chauvinistic characterization of the society. Early marriage is a key feature of this community in both males and females probably favoured by two factors: the prevalence of the Islamic religion and lack of formal education.

In terms of economic activities, there is a sharp contrast in what one does clearly defined by one's sex. The men who are viewed as providers of the family engage in subsistent farming, (where the main type practiced is mixed farming) and animal rearing on a small scale. The

types of crops mainly grown in the community include cereals such as: maize, maize, guinea corn, and tubers like yam and cassava. This has however, seemingly disappeared in the community either due to the rent attitudes towards the sale of land in the community or motivated by the search for alternative livelihood strategies triggered by the infertility of the land. This idea of livelihood strategies would be given detailed attention later in this thesis. Women do not generally involve in farming activities, and even when they do, it is done in the name of the husband, brother or another trusted male relation, since culturally women are not to owe properties. Most of these traditional values we hope would fade off as more people, especially women, have access to formal education. Women on the other hand engage in petty trade which mostly they use to augment the provisions of their husbands. Shea butter trade is the major economic activity that women in Tamape-Kukuo Yapalsi engaged in.

3.3.2 Galinkpegu

The community came by its name as a result of the behaviour of the founder. The founder of this community by name Dasankurili was at Banvum with a wife and a child. Unfortunately a fight broke between him and the chief of Banvum. This misunderstanding could not be settled and he was forced to move to Sagnarigu. When he moved to Sagnarigu, there were problems there also because he was so stubborn. This stubborn behaviour made the chief of Sagnarigu move him to settle alone in the midst of lions. He survived the lions and other people joined him later. The name Galinkpegu came from the word ‘galing’ (go astray). But in recent times, the community has many people settling there because they sell land to them.

This community is located about fifteen kilometres away from Sagnarigu. It has a total population of about four hundred people. Majority of the people are Dagombas with a few of them being non Dagombas. The marriage system that exist there is polygeny, where one man can marry two more women. The dominant religion in Galinkpegu is Islam, but some of them still hold tight to traditional religion as they see any other religion to be alien, especially the older generation.

Education has not yet been given much attention in this community. The only school in this community is a primary school. Products of this school either go to Nyankpala or Gbulahigu to get Junior High School education before they can proceed to the next level of education. Many of them after Junior High School are not able to proceed with education with the complaint of financial problems. But sometimes, they don't see the need to 'waste time' for higher education. As for the issue of girls in education in this community, it is so disheartening. They only raise them to grow to a particular level so that they go down south to labour and buy things for marriage. This is popularly known as 'Kayayo'.

Their main source of drinking water is from a dam. There also exists a borehole in the community which supplements the dam. The borehole is found within the community but is stressful sometimes to fetch water from it.

In economic terms, their main source of livelihood is agriculture. The main crop cultivated are maize, millet, rice and sometimes pepper to end a living. Women in Galinkpegu are not much involved in petty trading few of them are into agriculture with their husbands. Gravel winning of resent times has become their alternative livelihood source. Their main means of

transport of sending their produce and even human beings to the market are motor king and yellow (tricycle). They either go to Nyankpala or Tamale market to sell and buy.

3.3.3 Shiɣu

Shigu is a community founded by a lady called Gundogu. She settled by a tick forest which was closer to a water source. There were animals in this forest which they killed for food. Gundogu settled with her sons, and these sons became the official leaders of the community because women don't lead traditionally.

This community is located about ten kilometres away from the District capital Sagnarigu. It has a population of about five hundred people. Women form majority of this people with men being the minority. Shiɣu is dominated by Dagombas with few other tribes who have migrated to the place. Islam is the main religion in this community but there are Christians too from two different church denominations (Catholic and Christ Apostolic). In terms of education, the people are left far behind. They have Primary School without a Junior High School. Girls in this community do not either go to school or they end at the primary school level. What they are mostly found in is 'Kayayo' business. They labour down South for their personal needs to the disadvantage of their future development. Health wise, there is a clinic in the community with Nurses Quarters to help satisfy their health needs. Some of these health workers live in the community as they have accommodation there, so that some health issues can be managed within. There is no specific health problem that worries community members only malaria especially raining season. Economically, people of this community depend on agriculture for their livelihood. The main crops cultivated are maize, rice, millet and pepper for cash. Means for sending them and their product to market are motor king and yellow yellow (tricycle). They sell and buy either in Tamale or Nankpala

market. Women in this community are not into any recognised business. Gravel winning is an alternative livelihood source discovered by people in this community.

Their sources of water are stand pipes and boreholes. This stand pipes do not flow effectively because members are reluctant on payment of water bills. This puts pressure on the boreholes because everybody surrounds it for water to avoid the payment. The sand type found in this community is sandy loam which promotes crop cultivation. The landscape there is undulating.

3.3.4 Tampe-Kukuo

Tampe-Kukuo, one of the study communities is located about ten (10) kilometres away from Tamale. The community has a population of about eighty hundred people. The main religion in this community is Christianity followed by Islam. Monogamy is more prevalent in Tampe-Kukuo with only a handful having more than one wife. However, there are a few of the people who are into African Traditional Region alongside the pronounced Christianity and Islam.

The community is inhabited mainly by Dagombas with an appreciable migrants of varied ethnic backgrounds for job, business, and other personal issues. Kukuo has no any health facility eventhough Community Health Nurses have scheduled visits during which health issues are attended to especially mothers and children. There is also a private clinic which is close to the community, and attends to the health needs of those who visit there for health care. Though private, the clinic accepts the National Health Insurance Scheme. In terms of education, the community has a sizeable literate population and boast of highly educated individuals from the community in the health, teaching and other fields of endeavor. The

people there embraced formal education very early due mostly to the efforts of the early Catholic missionaries in the area. Tampe-Kukuo's Primary school is located in Malishegu where there is a Junior High School. The Primary school started in Kukuo but later moved to Malshegu for easy access to other communities in the vicinity. It is therefore located in the same premises with the Junior High School.

The Kayayo manace in most Dagbang, and northern Ghana as a whole, is very scarce there as the girls are in school, and some of those who have completed are employed. Economically, Tampe-Kukuo depends mainly on agriculture as its source of livelihood. The main crops cultivated are maize, millet, rice, some tomatoes and pepper. Apart from the maize, the rest are sold to cater for their needs. The crops are cultivated at subsistent level. Many of the women are into Shea butter extraction. There are two Shea butter processing centres in Tampe-Kukuo that help the women to get market for their products, raw materials for processing and even new technology to improve the quality of Shea butter. The centres even support the women with new ideas that help reduce pressure and the long procedure in Shea butter processing.

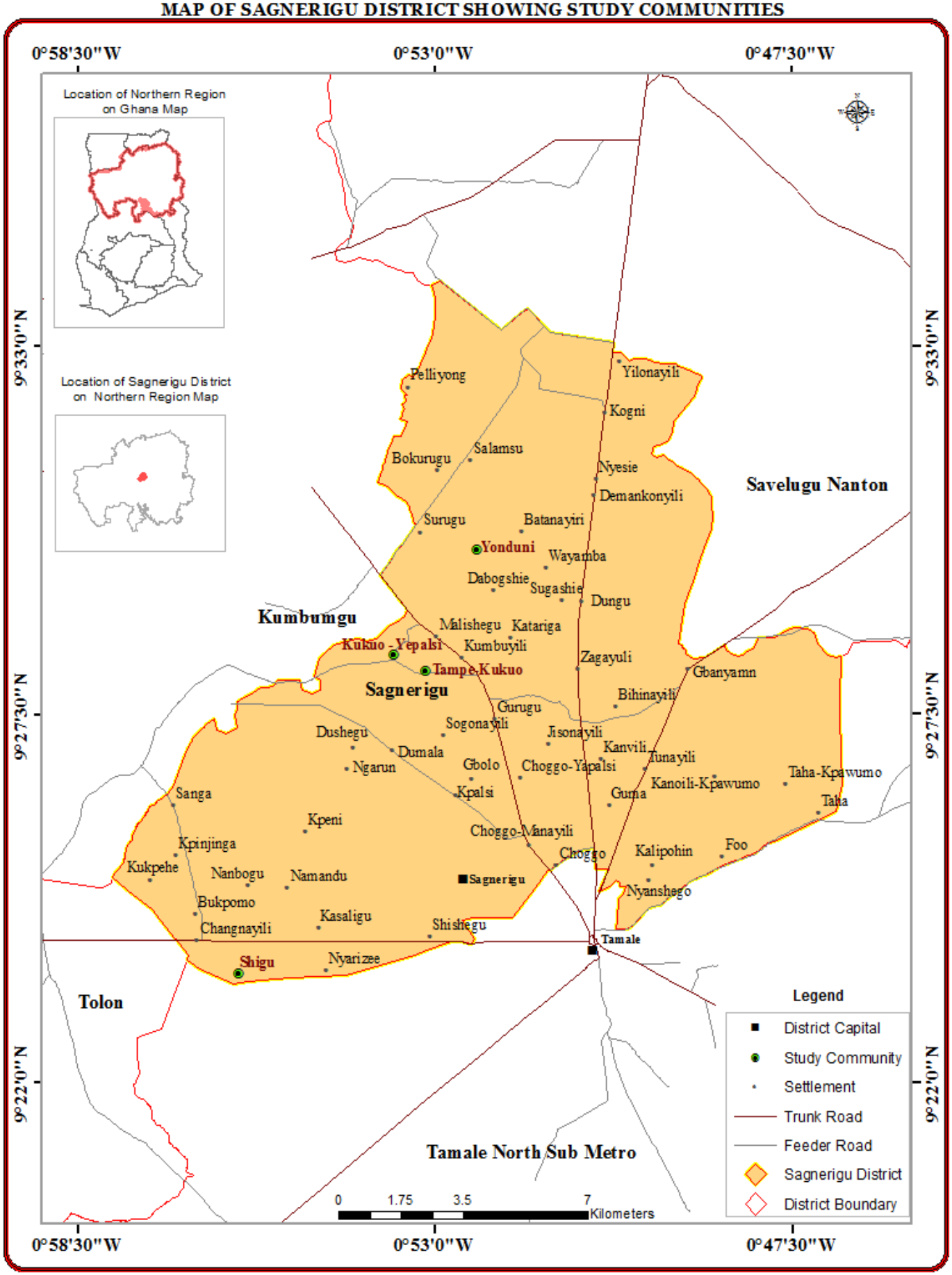
3.3.5 Yong-Duuni

Yong-Duuni is a fetish village with a Tindana. It is inhabited by about people. The inhabitants are mostly Dagombas (95%) and some other people from different parts of Ghana. Leadership in the village is by the Tindana-Zuli invested in the Tindana (Burili-Gbewaa) who usually is spiritually appointed from children of daughters of former Tindaanba.

It is maternal given the history dating back to Naa Nyagsi's wars of conquests where all male children of the then Tindana were killed leaving only daughters. There is an annual sacrifice to the shrine of Yong-Duuni where the King of Dagbang sends his sacrifice but cannot appear in person because he does not see the Tindana eye to eye.

Farming is the mainstay of the people in Yong-Duuni with men doing crop cultivation, and some animal rearing. Subsistent cropping of maize, groundnuts, some yam, Soya beans, rice, some pepper and tomatoes is done. They rear cattle, goats, fowls, guinea-fowls, sheep etc. Women engage in a number of economic activities, seasonal though they are. The women pick Shea-nuts between May – July, and harvest groundnuts from August – October. However, processing of these two major activities is done anytime of the year but it not all women who are involved in this because it has some financial demands which all of the women cannot afford. Level of education is very low in Yong-Duuni as many of the men are illiterate, and almost all the females are illiterate. They now have a Primary school but yet to have a JHS in the community. For now, they travel to Malishegu, about two and half kilometres away towards Tamale.

MAP OF SAGNERIGU DISTRICT SHOWING STUDY COMMUNITIES



Source: Ghana Statistical Service (2014)

3.4 Research Design

Gwimbi and Dirwai (2003) consider a research design as a structure or plan of the research which provides glue that holds a project together, groups or samples, observations or measures, programmes or treatments and other aspects of methodology.

A similar view of a research design is put forward by Emory (1985). He describes a research design as a plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance. A research design contains how data is collected, the instruments that are employed, how to apply the instruments and the intended means for analyzing data collected.

A research design is therefore, a blue print or a plan which specifies how data relating to a given problem is collected and analysed. It provides a procedural outline for the conduct of a given investigation.

The study used a cross sectional design. A cross sectional research design is a one measurement moment with no changes being detected. The cross sectional study was used because this was a one- time study carried out within a short period of time. This was adopted because the study measured the state of affairs of gravel winning in the Sagnarigu District within a specific period (2015), and more so within specific academic programme. Since the study sought both qualitative and quantitative data, the methodology considered the two major research methods in the literature.

A qualitative research method takes a descriptive approach when there is documentation of what is exactly said, observing behaviour or even studying written documents. A qualitative

researcher gets ideas from people being studied. Data collected is presented in the form of maps, photos, graphs or tables. Brannen (1992:4) opines that 'qualitative research concerns itself with concepts and categories but not their incidence and frequency. The approach deals with peoples' perceptions and the understandings of things.' In other words the way people look at issues and address them. Quantitative research on the other hand, seeks to discover how many and what kind of people are in a general or parent population, their particular features which have been found to exist in the sample population (Brannen, 1992).

Another informed view of a qualitative research comes from Hoepffl (1997). He considers it as a method when applied in any research will produce knowledge that cannot be derived from statistical procedure. Also, proponents of qualitative research method argue that qualitative researchers often enter into the natural fields of people who are studied and have face-to-face interactions with them. In the case of Kvale (1996),qualitative research bases the outcomes of a research on the perspectives of the subjects who have first- hand experiences on the subject matter. On the other hand, a quantitative research deals with the application of experimental methods and also quantitative measures to test hypothetical generalization .Qualitative methods contribute to finding that which cannot be derived from quantitative research (Hoepfl, 1997).

According to Polit and Beck (2008), a quantitative research method is not only explorative but also non- experimental. This method uses quantifying relationships between variables. The method deals with figures and quantities. The method involves precise measurements and statistical analysis of data using computer packages. A good design should ensure that

there is maximum control over factors that adversely affect the reliability and validity of research results (Gwimbi and Dirwai, 2003).

This study used both approaches to data collection to maximize the quality of the work by getting optimal data. In this study, qualitative data were collected from the narrations of the stakeholders especially smallholder farmers in gravel winning while quantitative data were collected using numbers to measure specific features of respondents and phenomena. For example, the age group of smallholder farmers who engage more in gravel winning was identified using quantitative research method. Qualitative data on land acquisition for gravel winning was got from the narrations of the subjects.

3.5 Sampling Procedures and sample size

The population for the study included smallholder farmers in the Sagnarigu District, tipper truck drivers who took part in the gravel winning business in the district, chiefs and opinion leaders of the five communities where the activity had become an alternative livelihood strategy. According to Polit and Beck (2008), sampling is the process of selecting elements which are the basic unit from which data and information will be collected to represent the entire population. Sampling is the process of selecting a group of subjects for a study in such a way that the individuals represent the larger group from which they were selected (Gay, 1987). This representative portion of a population is called a sample.

What makes sampling important is that within many models of scientific research, it is impossible (from both a strategic and a resource perspective) to study all the members of a target population for a research project. It would not only be expensive, but also time-

consuming. Instead, a selected few participants (who make up the sample) are chosen to ensure that the sample is representative of the population. And, if this is the case, then the results from the sample can be inferred to the population, which is exactly the purpose of inferential statistics—using information on a smaller group of participants to infer to the group of all participants.

Both probability and non-probability techniques were used to sample respondents for the study. This was done by the use of multi-stage sampling. Purposive sampling was used to select the district for study. The Sagnarigu District was selected because inland gravel winning was common there. Also, smallholder farmers devoted time in this activity to supplement their traditional source of income. Among the numerous communities in the district, five communities were purposively selected for the study, namely: Tampe-Kukuo, Kukuo-Yepalsi, Shiɣu, Yong-Duuni and Galinkpeɣu (See Table 3.2).

The selection of those communities was based on the prevalence of the winning activities in those communities. Simple random sampling was used to select thirty smallholder farmers each from the communities for the interview. Since the farmers were mostly illiterate in nature, I used the lottery method to sample the interviewees. All farmers in the communities were numbered. The numbered farmers were written onto pieces of paper for each community. Thirty of the folded pieces of paper were picked by a little girl each for Shiɣu, Yong-Duuni and Kukuo-Yepalsi. Then a little boy of six years each was made to pick the thirty (30) for Tampe-Kukuo, and Galinkpeɣu. The children were from each of the communities, and the exercise was done right at the chief's palace of each of the communities. The thirty selected farmers were those considered for the interview. This was done to give everybody equal chance/opportunity of being part of the sample. It was also to

avoid bias in the selection. A purposive sampling was also employed to select some chiefs and elders. Ten drivers were taken from each community, a chief and elders, assembly man and a representative from the district assembly. This sampling procedure resulted in a total sample size of two hundred and twenty (220).

Table 3.1 Details of Respondents

Name of Community	Category of Respondents	Number selected
Tampe-Kukuo	Chiefs and opinion leaders	4
	Smallholder farmers	30
	Tipper truck drivers	10
Kukuo-Yapalsi	Chiefs and opinion leaders	4
	Smallholder farmers	30
	Tipper truck drivers	10
Yong-Duuni	Chiefs and opinion leaders	4
	Smallholder farmers	30
	Tipper truck drivers	10
Shiɣu	Chiefs and opinion leaders	4
	Smallholder farmers	30
	Tipper truck drivers	10
Galinkpeɣu	Chiefs and opinion leaders	4
	Smallholder farmers	30
	Tipper truck drivers	10
Total		**220**

Source: Field Work, June 2015

3.6 Data Collection Instruments

Various primary data collection tools were used to collect information from respondents. These included a questionnaire, interview, field observation and recording tools. A Samsung

Galaxy Note 4 tablet was used to capture photographs of gravel pits in the five sampled communities. In addition, a blend of qualitative and quantitative tools were used for data collection .These were interviews, focus group discussion and personal observation. The instruments used were questionnaire and interview guide

3.6.1 Interviews

An interview is an oral conversation with a research respondent for the specific purpose of obtaining research-relevant information, based on the content of the specified research objectives which are systematically described, predicted or explained. This instrument was used to gather data from two groups of respondents namely leadership in the communities where gravel winning took place and the participants in digging and loading. Leadership included the chief, elders, assembly-person and Imams of each of the communities. These people served as key informants to enable me get data on commission paid, how the funds helped in the development of the community, sustainability of gravel winning in the communities and how it supplemented their traditional income sources. The other interview was for the actors. The interview guide was interpreted into the local dialect in order to help them provide the researcher with appropriate answers. This was because majority of the respondents could neither read nor write. They did not also speak English. This opened up the interaction between respondents and researcher but with some control.

3.6.2 Focus Group Discussion

This was a structured discussion aimed at stimulating conversation around the topic. Being a native speaker of Dagbani, the dominant language in the area, I facilitated the discussion. The participants, in response to questions asked, expressed not only their opinion but also

what they knew about the issue(s). The participants were the smallholder farmers (men and women) who participated in gravel winning by digging and loading at a fee from the truck drivers. These groups of respondents were put into groups of five (5) to ten (10). Two groups each of the males were met from Shiɣu, Galinkpeɣu, Kukuo-Yapalsi, Tampe-Kukuo and Young-Duuni. The female respondents were few so a group each was formed from each community. Issues discussed covered nature of gravel winning, negative effects of gravel winning, benefits and mitigating factors of gravel winning. This was done to get their views for triangulation purpose to come out with accurate data. The participants were guided by a facilitator (researcher). Somebody was tasked to take notes. They were grouped based on age and sex to enhance free flow of information

3.6.3 Questionnaire

This is a research instrument with a systematically prepared list of questions which are deliberately so structured in order to elicit responses from research informants aimed at gathering relevant information for a study. The questionnaires were given to gravel contractors and drivers (some of them are former truck drivers who got customers for truck drivers), and truck drivers for their views on the issues. These numbered ten each from the communities. So a total of fifty questionnaires were sent out.

A questionnaire which consisted of both closed and open ended questions with reference to the problem identified and objectives set. Gwimbi and Dirwai (2003) advise that a well-designed questionnaire should meet objectives of the enquiry, fit between contents and research problem. The questionnaires were administered to the tipper-truck drivers and Assembly men/women in Tampe-Kukuo, Tampe-Kukuo- Yepalisi, Yoŋ-Duuni, Galinkpeɣu

and Shiɣu, all in the Sagnarigu District. A questionnaire survey was chosen for this category of respondents because it allowed, as Polit and Beck (2008) intimate, participants to give their views anonymously thus reducing bias of the researcher in interpreting the data.

The questionnaire was administered to determine a variety of aspects from drivers of tipper-trucks that cart the gravel to their various destinations of demand. The data got from the questionnaires included beliefs, thoughts and knowledge about gravel extraction in their communities. The researcher visited the literate sampled drivers and explained the purpose and benefits of the study to them. They also understood the importance of their participation and involvement. I explained each of the questions to them until there was an indication of understanding of the questions on the part of the participants. After that, the questionnaire were administered through a drop and pick survey. On distributing questionnaires, I repeated benefits and the need to answer questions truthfully. I further assured them of the anonymity and confidentiality of the answers that they would provide. Respondents were given a two-week maximum grace to complete the questionnaire.

After the grace period, the researcher collected the completed questionnaire from the respondents. Nature of the questionnaire was that both open and close ended questions comprising of four parts. Information paragraph at the top was to introduce researcher, purpose and title of research. The next section had questions that dealt with the demography of the respondents. Next were general questions on gravel extraction. The batch of questions collected data on perceived negative and positive impact of gravel winning with the last part requesting for views on remedies to the negative impacts.

3.6.4 Personal Observation

Observation was used to gather primary data for the purpose of the study. The researcher visited the gravel pits at the time of digging and loading to see how the activities were carried out. This included how the digging was done, loading, payment of those involved, commission to chiefs and other related activities. Personal observation became necessary because the researcher wanted to experience it and really see for herself what the people did and cleared doubts in data.

The above instruments (questionnaire survey, interview guides to interview key informants and focus groups etc, and taking photographs from mining sites) were employed. All these were undertaken since each had its own set of assumptions, strategies, strengths and weaknesses regarding the study of the social world and the kind of data that can be produced to increase knowledge. Use of various methods helped to improve quality of research findings since conclusions from one method were used to check validity of results from another method.

3.7 Sources of Data

Data was taken from primary and secondary sources. Primary data was gotten from the field through interviews, FGD (Focused Group Discussion) and personal observation. Secondary data was also gathered from related published articles, district profile and documents from regional and the district offices relevant for the work.

3.8 Reliability and Validity

3.8.1 Reliability

A good research design should be valid and be able to produce reliable results because it meets all the requirements as such. Gwimbi and Dirwai (2003) defined reliability as the repeatability and consistency of the findings. A reliable measure does not fluctuate randomly and is used to discover relationships between variables. In this research, quantitative and qualitative methods were chosen to assess the impact of gravel winning on the inhabitants of the Sagnarigu District. The reliability of the data was boosted with field-tested instruments such as FGD and personal observation. The reliability of the study was boosted by pre-testing questionnaire and also through use of multiple methods to collect information in a process known as triangulation (Yin, 2003). In this regard, questionnaire administration was complemented by focus group discussions and personal observations.

3.8.2 Validity

Internal Validity

Polit and Beck (2008) defined validity as the ability of an instrument to accurately measure a concept under study in such a way that any observed differences are true and not the result of random or constant errors. Instrument validity determines whether an instrument accurately measures that which it is supposed to measure. Gwimbi and Dirwai (2003) highlighted types of validity as content that is how well an instrument represents all the components of variables being measured. In this study, content validity was done by doing a thorough related literature search on which the contents of questionnaire and interview guides were based.

According to Polit and Beck (2008), face validity is a judgement done to determine whether an instrument appears to measure what it is supposed to measure. It ensures that the tool is readable and checks clarity of the content. I complied with this principle by conducting a pilot test before setting out on the study. In the pilot, the questions were administered to a group of respondents before the actual data collection to get a general impression about the kind of answers that could be expected. Gwimbi and Dirwai (2003) defined analytical validity as the ability to achieve correct data analysis of raw data collected.

In this research, to ensure validity and reliability, the research questions were pre-tested in the Savelegu/Nanton District which has very similar features with the study district, Sagnarigu District. The pre-test helped to identify weaknesses in the questions. These weaknesses were identified and corrected before going into the field.

3.8.3 Generalisability of the Study (External Validity)

According to Gwimbi and Dirwai (2003), external validity is when results obtained in a study can be generalised with other research findings in different and similar contexts. Generalisation is made considering the degree of confidence in sample findings in relation to the population and whether similar findings can be obtained at other times and places. The researcher met most of the respondents for the first time to explain the purpose of study, the relationship was formal and therefore the effect was minimal. In this research external validity was influenced by the sampling methods used; that is purposive sampling, therefore findings could not be generalised to other settings.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the results of the study. The chapter is organized under sections and subsections based on the research questions that defined data collection and analysis. I start with a description of the background characteristics of the respondents who took part in the study in order to contextualize the discussion.

4.2 Background Characteristics of Respondents

In this subsection, I present and discuss the characteristics of the respondents of the study. The study included one hundred and fifty (150) smallholder farmers, fifty (50) tipper truck drivers, and twenty (20) chiefs and opinion leaders in the communities where gravel winning took place.

4.2.1 Age of Smallholder Farmers

Six age groups were considered in this study. The age range of 30-39 recorded the highest percentage of (42.7%) followed by the 20-29 age group with (28.0%) (See Table 4.1).

Interviews and focus group discussion with respondents revealed that gravel winning needs strong and active young men between the ages of 20 and 39 because the work is quite physical. This revelation, however, contradicts Madyise, (2013) finding in the Democratic Republic of Congo that indicated that age range of 51-55 years were more involved in gravel winning. What influenced Madyise's conclusion was that respondents in this age group were readily available and willing to take part in that study since they were most affected by sand and gravel winning in or near their farm lands. Another reason Madyise

assigned for his finding was that there were fewer respondents for the age group between 31 and 50 years because they were not present in villages at the time of study and mostly resided in towns where they worked. The present study did not suffer the setbacks Madyise encountered, and so more reliable than what Madyise found in the study area it is odd to see somebody from fifty years and above engaged in manual activity like gravel winning. This is especially so when one has children. My findings also differed from that found by the Mining Industry Human Resources Council (2012) on the British Colombia situation where the dominant age groups were the 45 – 54 followed by the 35 – 44. In Table 4.1 are details of the age groups of the smallholder farmers in gravel winning in the Sagnarigu District.

4.2.2 Age of Drivers

The study further considered the ages of the drivers in the gravel winning enterprise in the district, and Table 4.1below presents the data. The age range of 40- 49 was the most involved in driving with forty percent (40%) of the fifty (50) respondents. This was closely followed by the 30-39 age group with thirty- eight percent (38%) of the driver subjects (see Table 4.1 for details). The higher percentage associated with these age groups could be explained by the fact that they are family men and hence the need for them to work in order to cater for their families.

4.2.3 Age of Chiefs and Opinion Leaders

The results showed no clear dominant age group in this category of respondents. Though the ages between 20 and 29 recorded the least percentage of five percent (5%), the rest of the age groups did not differ much in terms of percentages. This is in line with the traditional practice in the area where the people do not encourage enskinning young people or assigning young people heavy responsibility as that of a chief. Furthermore, the age range of

40 – 49 recorded the highest percentage of thirty percent (30%). This goes to buttress the belief in those study communities that age goes with wisdom, and those with wisdom can serve as chiefs for the smooth governance of society. In Table 4.1 are details of the age ranges of Chiefs and opinion leaders.

Table 4.1 Age Groups of Stakeholders in Gravel Winning

Age Group	Farmers		Drivers		Chiefs & Elders	
	Freq.	%	Freq.	%	Freq.	%
Less than 20	1	0.6	-	-	-	-
20 – 29	42	28	8	16	1	5
30 – 39	64	42.7	19	38	5	25
40 – 49	31	20.7	20	40	6	30
50 – 59	10	6.7	3	6	4	20
60+	2	1.3	-	-	4	20
Total	150	100	50	100	20	100

Source: Field work, June, 2015

4.1.3 From Table 4.1, we can infer that the ages between 20 – 39 are most active in digging and loading of gravel in the Sagnarigu District accounting for about seventy-one (71%). This is as a result of the energy required for digging and loading of gravel in the district. In addition, the age range of drivers most active in gravel winning in the district was between 30 – 49 which did not differ from that of chiefs and opinion leaders. At this age, the drivers have had enough experience yet still have the needed strength to manipulate the heavy tipper trucks with ease.

4.3 Level of Education

4.3.1 Farmers

The study revealed that 58.7% of the respondents had no formal education, with only 2% having tertiary education while the rest had basic and secondary education (see Table 4.2). This indicates that people engaged in gravel winning for lack of the requisite skills to be employed in the formal sector, and hence their reliance on gravel winning for income. Another explanation is that those with high education had not yet been drawn into it as happens in the mining of other minerals in other parts of Ghana and the world over where skillful technicians and geologists form the bulk of the labour force. This is because though gravel is in high demand in the district, it cannot, in any way, be compared to gold, diamond and other minerals mined elsewhere. The mode of the activity does also require 'man power' and not any skilled expertise. This is also a possible explanation as to why most of the people engaged in it have not had any formal education.

It is important to point out that in the case of Canada, as reported by the Mining Industry Resources Council (2012:13), 'the mining industry rather attracts high educational level workforce. Individuals with a university certificate, diploma or degree account for the

largest segment of British Cooperation's mining labour force...' This is likely due to the prominence of the exploration sector, which has many occupations that require time-intensive post-secondary education and training. As explained earlier, the gravel winning enterprise is certainly less prominent in the Sagnarigu District than mining in Canada and also does not require any formal training.

4.3.2 Level of Education of Drivers

It was revealed that fifty percent (50%) of the drivers had basic education but no driver respondent had tertiary education. Informal and secondary education recorded twenty-two percent (22%) and twenty-eight percent (28%) respectively. This implies that most the tipper truck driver respondents had some amount of formal education. The descriptive statistics are illustrated in table 4.2 below. The drivers explained that basic education was a key requirement for them to have Driving License. It further suggests that driving in the gravel winning industry in the district is not attractive to products of the tertiary institutions in Ghana.

4.3.3 Level of Education of Chiefs and Opinion Leaders

On education, the study revealed that most of the respondents in this category (50%) had informal education with only 5% going through tertiary education and the remaining 45% was shared between those with basic and secondary education. This indicates that the respondents had low level of formal education. The low level of formal education seen with the chiefs and opinion leaders is similar to that of the farmers. That regarding the drivers is better with only 22% having informal education as seen in Table 4.2 below. This matches well with the data in the Ghana Statistical Service (2014) in the Sagnarigu District Profile which recorded low level of formal education.

Table 4.2 Level of Education of Stakeholders in Gravel Winning

Educational Level	Farmers		Drivers		Chiefs & Opinion Leaders	
	Freq.	%	Freq.	%	Freq.	%
Informal	88	58.7	11	22	10	50
Basic	26	17.3	25	50	5	25
Secondary	33	22	14	28	4	20
Tertiary	3	2	0	0	1	5
Total	**150**	**100**	**50**	**100**	**20**	**100**

Source: Field work, June, 2015

4.4 Sex of Respondents

This section presents sex information of the respondents in this study. It categorises the sex of the various groups of respondents as that has some amount of influence on gravel wining in the District.

4.4.1 Sex of Smallholder Farmers

Out of the one hundred and fifty (150) smallholder farmers who were involved in the study, eighty-three percent (83.3%) were male while sixteen-point seven percent (16.7%) were female (see Table 4.3). These results affirm the common belief that it is uncommon for women in this part of the country to own farms (Mahama, 2004, Nabila, 2000). It is a

further confirmation of the popular belief that mining is a male domain as it requires lots of energy. Findings of Hinton, J. J. Veiga, M. M. and Beinhoff, C.(2003) confirm the assertion that fewer women engage in artisanal mining in other parts of the world such as Latin America and Asia. Hinton et al (2003) report that less than 10% of miners were women, and approximately 10-20% in Latin America. The findings further tally well with the British Colombia Mining experience where only some 16% (even less than the 16.7% in the Sagnarigu District) of the mining labour are women.

However, the present study contradicts the findings of Hinton et al (2003) when it comes to Africa where she reports that female artisanal miners ranging between forty and fifty percent (40% and 50%) with the percentage rising even higher, in some regions of Africa, as high as 60- 100% (ILO, 1999; Amutabi and Lutta-Mukhebi, 2001; Onuh, 2002 “,”Hinton et al (2003). But the fact still remains that gravel winning activities in the Sagnarigu District is labour intensive which is not female friendly, at all, thus the little number of women found in the study. It is also a cultural prescription that some kinds of jobs are ‘reserves’ for specific gender, and jobs that mainly require physical power within the study area, are reserved for males.

4.4.2 Sex of Drivers

The data revealed that all the tipper truck drivers engaged in gravel winning in the Sagnarigu District were males.

The data confirm the male dominance in the driving career not only in the Northern Region but also in Ghana as a whole. It should be noted however, that the kind of vehicles used in gravel winning could be a motivating factor for the non-participation of females. Just like

digging at the pit, using a truck requires more physical energy, a job that culturally is not prescribed for women.

4.4.3 Sex of Chiefs and Opinion Leaders

A total of twenty (20) respondents were interviewed in this category. It was shown that most of the chiefs and opinion leaders were males constituting seventy-five percent (75%) with the remaining twenty-five percent (25%) being female. This is typical of the Northern part of Ghana where a greater number of opinion leaders and chiefs are male.

The result from the three categories of people (respondents) showed that gravel winning in the District was male dominated. Details of these can be seen in Table 4.3.

The findings in this study did not differ from findings of Hinton, J.J Veiga M.M and Beinhoff, C (2003), which confirms the assertion that fewer women engage in artisanal mining in other parts of the world such as Latin America and Asia.

Table 4.3 Sex of Stakeholders in Gravel Winning

Sex	Farmers		Chiefs & Opinion Leaders	
	Freq.	**%**	**Freq.**	**%**
Male	125	83.3	15	75
Female	25	16.7	5	25
Total	**150**	**100**	**20**	**100**

Source: Field work, June, 2015

4.5 Crops Cultivated by Farmers

Maize was the most cultivated crop (98%) followed by rice (39.3%), with millet being the least (1.3%). To a typical Dagomba man any crop, apart from maize, is secondary because it cannot be used to prepare "Kopielim[1]". The crops captured in the data are similar to those in the Sagnarigu District 2015 Composite Budget (2014:7) issued by the Ministry of Agriculture. The document identifies that the main crops cultivated in the district are cereals such as millet, maize, sorghum, groundnuts, vegetables and rice. The fact that 98% of the smallholder farmers indicated that they engaged in maize production, in part, illustrates that it is a major crop grown in the district. Maize is a staple food which is used to prepare T.Z. Though maize is not the best ingredient for another popular staple, porridge (kukɔgli/koko), it is the grain mostly used as it is more readily available and cheaper than millet. Figure 4.1 below presents the crops produced in the study communities as reported by the respondents

[1] A mixture of water and porridge that serves as drinking water and could be served to special visitors

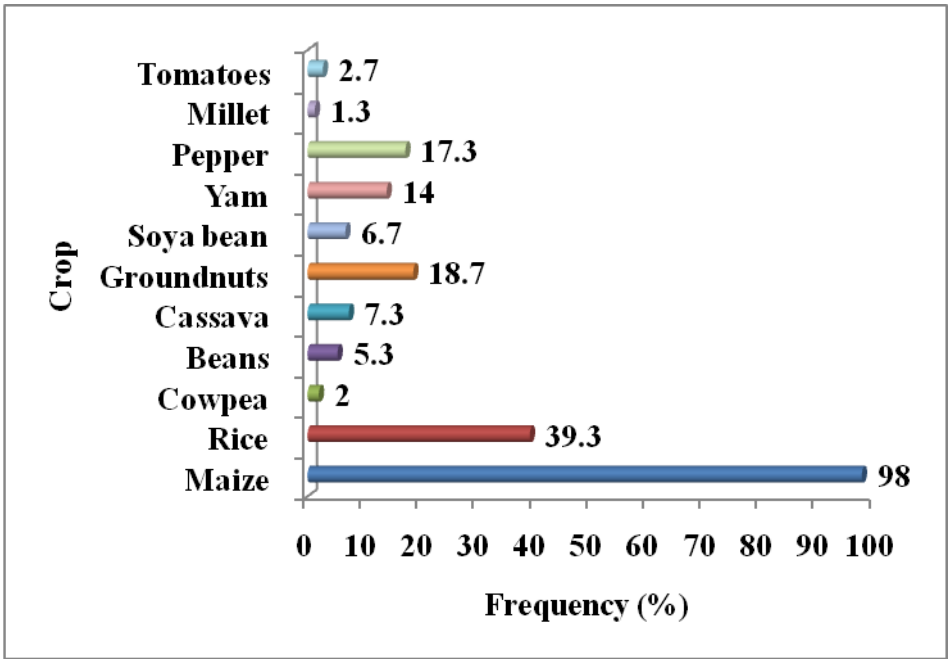


Figure 4.1 Crops cultivated by smallholder farmers

Source: Field work (June, 2015)

4.6 Nature and Extent of Gravel Winning in the Sagnarigu District.

I describe, in this section, the nature and extent of gravel winning in the Sagnarigu District with the view of shedding light on the activity from the perspectives of stakeholders in the communities where gravel is winned.

4.6.1 Category of People Involved in Gravel winning in the Sagnarigu District

This section, presents the various stakeholders and the specific role each played in gravel winning in the Sagnarigu District of the Northern Region of Ghana. They included smallholder farmers, tipper truck drivers, chiefs and opinion leaders. The smallholder farmers used the land to cultivate crops. They also were in control of the non- customary plants such as the Shea and Nim-trees. The farmers did not pay for the use of the farm lands and usually passed on these farm lands to their next generations in succession. The tipper

truck drivers cart the gravel to their customers for sale and the chiefs and opinion leaders being 'owners'/custodians of the land.

4.6.2 Role Played in Gravel winning by stakeholders in the Sagnarigu District

It was important to consider also the role each individual played at the mining sites since there are varied roles played by the various players in the industry. There were three major roles played by the stakeholders namely carting of the gravel, commission collection, and digging and loading of gravel. The carting was done by the tipper truck drivers from the pit to their customers. The commission was taken by a representative of the Sagnarigu District Assembly and a representative of the chief of the community. The last role was that of digging and loading of gravel. This was done by the smallholder farmers. They did this in groups of five to load a tipper truck at a fee of twenty (20) Ghana Cedis.

4.7 Reasons Smallholder Farmers Engaged in Gravel winning

Smallholder Farmers cited a number of reasons for which they got involved in gravel winning. But the most critical of them all were that there were no readily available income-earning jobs that they could use to supplement their meager earning from farming which is their traditional source of income and livelihood. Some of the respondents explained that they hardly had enough to feed let alone sell any surplus for income. Michael, for example explained that,

Ti nima kuli kperi la ziɣa bɔɣili ŋɔ ni ni ti gbaa bela na, dama ti ka tuma sheli n pahi di zuɣu. yela maa ni kuli n nye shem mbala.

(We only go to the gravel pit in order to get something small (money). The reason is that we have no other source for ready cash apart from that).

Another reason for their involvement in gravel winning was that they had very limited farm lands on which to engage effectively in agriculture. Moreover, the animals they reared were also on small scale basis due to animal diseases and lack of capital to rear on large scale. But now even the limited farmlands were converted into gravel pits. M-ma Awaabu of Yong-Duuni lamented by using this proverb; *Be yin a nyuhiri a mini bihi ka a tahira, be dii nyuhiri la a mini bahi.* (If you complain being dishonoured by being served food in the same bowl to eat with children, your tormentors make it worse by serving you with dogs).

Another cause of the poor earnings from agriculture was attributed to the bad weather patterns which made rainfall patterns and amounts just unfavourable for healthy agricultural production.

In this situation, the smallholder farmers had no skills to work in the scarce well-paying ventures. Given their circumstance, they could perform only menial jobs. But even these were not available. The respondents explained that the only readily available alternative was to go to the gravel pits for the *saabulo* (digging and loading of gravel) job. Though the daily earnings from this job were more than the National Daily Minimum Wage in 2015 (Gh¢7), they still said it was difficult for them because of the associated risks.

The respondents further explained that poverty could make one do anything for self-sustenance since man needed to live and attended to pressing needs. Since gravel winning was readily available, they resorted to it in order to supplement the little earning from their agricultural activities. Zaaku had this to say:

Ti ni gbiri garabuli maa zaa nyela fukumsi bieri ŋo zugu. Tuma mi kani ŋo n su di zaa.

A yi yi bieɣu ka kobo ka a surigu ni kaa nye wunidabili faarigu maa, ma a niŋ ni nyem mi (We get involved in gravel winning because of poverty. This is because we have no jobs doing. As a result, when one wakes up in the morning and there is no money in the pocket and this 'savior' (gravel winning) comes around, one gets motivated to jump on it.)

The respondents said being in the gravel pits was the only readily available alternative left for them since they were not trained in any profession.

This affirms the fact that those who engage in gravel winning in the Sagnarigu District have low level of formal education (Ghana Statistical Service 2014) which limits them in their search for the few available jobs in the economy. Low level of education brings about low income levels and increases the level of poverty among the people which affects them in so many aspects of life. It further affirms the aggravation of the unemployment situation in the district with some farmlands being converted into gravel winning pits.

Unlike other places such as the USA, Canada and South Africa where it is a privilege to engage in mining of gold, diamond etc. because of the accompanying rich rewards, the smallholder farmers in this study got into gravel winning because that was what was available since their farms had been seized for gravel winning to meet the fast urbanisation construction needs of the district and the suburbs of the Tamale Metropolis. This was clearly demonstrated in the lamentations of M-ba Nakoha of Galinkpeɣu thus:

Ti ya ŋɔ lana kohiti puri zaa n ti bani mali liɣiri ni ziga gbiriba. Wula ka ti yen niŋ ka ti mini ti maliba di; ti yi bi chaŋ n ti labi saabuli? Ti ka niŋdili, dama bana n su be tingbani'. (The chief of our village has sold our farms to rich people and gravel miners. What can we

do in order to sustain our families if we do not go to the gravel pits to dig and load gravel? We cannot challenge them (the chief and elders) because the land is theirs.)

Land is owned by the chief and his elders but the farmers use the land for crop production free of charge. Since the chief and his elders have absolute ownership over land, they give it out for gravel winning without even consulting the farmers. Master Musah of Galinkpuɣu complained thus:

So mi n mali bimbila o puuni gba, amaa ka tipa doraba nima maa kana n ti sagim di zaa k ache polo n too garabuli. A mi ku too yeli sheli dama naa bahi o noli ni o too ma. (Sometimes you have your crops on the land but they (tipper truck drivers) come and start destroying them and you cannot say anything because the chief has permitted them.)

4.8 Contractual Agreements for Winning Gravel in the Communities

There are laws guiding mining by the Environmental Protection Agency Act, 1994. But as Mireku-Gyimah (2015) explains, the laws are simply not enforced. Echoing this lawlessness, Imoru (2010:) of RUMNET, laments that though permission is sought normally from the village chief, gravel winning is 'highly unregulated and uncontrolled in the Northern Region' and is being carried out at an alarming rate. All that the contractors need to do to get approval for the creation of gravel pits is to enter into verbal agreements with the chiefs concerned as they are the sole beneficiaries of the operation. He affirms that the chiefs are the sole authorities in the release of land for mining.

Imoru (2010) quotes some community members, in his study, that "Chiefs give out land for monetary gains and caring less about the effects of the mining activities on the people and the environment." I must also add that the Sagnarigu District had a representative at all the

pits anytime I visited. But that officer was there only to collect the toll for the district assembly. Table 4.4 illustrates the payment options between drivers and chiefs to enable drivers fetch gravel at the pits in the Sagnarigu District.

Table 4.4 Payment Options for Fetching Gravel

Condition	Frequency	Percent
Truck load of gravel	2	10
Palace Protocol	6	30
Payment of Royalties	12	60
Total	**20**	**100**

Source: Field work (June, 2015)

The results indicated that two procedures were used in the conditions of engagement between the truck drivers and the owners of the land before gravel winning began. It could be realised, in both procedures, that money exchanges hands from the drivers to the chiefs before fetching was done. The problem is that the ordinary people (smallholder farmers) are not involved. Yet they are the most affected by the consequences of the activity. This sentiment is carried in M ma Awaabu's comment below:

Ti nima yi kuli ʒi ya mi ka be ti daari taansi, dohi, ni tihi n luri ra ka gbiri girabuli maa ti koya maa ni. Ti kuli yen ʃini mi ka lihiri ba. Dama a ka yeligu, a bi su tiŋgbani. (We usually sit down and suddenly see them (pay loaders) felling Shea-trees, Dawadawa trees and other trees and fetching gravel from our farmlands. We will just keep quiet and look on. This is because we do not own the land)

4.9 Land given Out for Gravel Winning

The number of hectares given out for gravel winning was sought from four groups of respondents namely chiefs and elders, assemblymen, representative of the chief at the gravel winning sites, and representative of the Sagnarigu District Assembly. The figures given by them were different from one another as they had different opinions on the subject. This made it difficult to get the exact quantity of land given out for gravel winning in the communities under study. For example, Land offered for gravel winning, according to the chief and elders in Shiɣu, was seventy (70) hectares from the data. This was disputed by the Assemblyman who estimated two hundred (200) hectares instead. Meanwhile, the two representatives for the chief, and the Sagnarigu District Assembly gave a figure of one hundred (100) hectares each. In the light of this discrepancies, the mean of the figures was worked out and got ninety-two and half (92.5) hectares as land given out for gravel winning in the Shiɣu community. This figure was got after dividing the sum of the figures given by the four groups which by four.

In the case of Galinkpeɣu, whereas the Assemblyman reported that two hundred hectares (200) of land was given out for gavel winning, the chief and his elders estimated seventy (70) hectares of land just like in the Shiɣu's case. The figure given by the representatives was one hundred and fifty (150) hectares which disputed both figures by the chief and elders on one hand, and the Assemblyman on the other. The mean figure of the three figures stood at one hundred and five (105).

The figures given in Tampe-Kukuo were similar to the ones got in Shiɣu with the same mean figure of ninety-two and half (92.5). For the chief and his elders on one hand, and representatives of the chief, the number of hectares given for gravel winning was ninety

(90) hectares. This sharply contrasted the view of the Assemblyman who said that the number was one hundred and eighty (180) hectares for gavel winning. When it came to the representative of the Assembly, he had a figure close to the one hundred (100) figure given by the chiefs and elders, and representative of the chief.

The mean figure of the different figures projected in the Kukuo-Yepalsi community was thirty-five (35) hectares of land given out for gravel winning. The Assemblyman gave a figure of seventy (70) while the representatives of the Assembly and the chief projected forty (40). The chief and his elders, however, reported ten hectares (10) but other members of the community said twenty hectares (20) were covered by the gravel winning activity.

The number of hectares that was wined for gravel in Yong-Duuni was similar to that of Kukuo-Yepalsi with the same mean figure of thirty-five (35). The Assemblyman reported sixty-five (65) hectares, and the chief and his elders gave fifteen (15) while the representative of the chef reported forty hectares (40). Meanwhile, representative of the Assembly projected twenty (20) hectares.

We can infer, from the data, that vast tracks of land get leased for gravel winning purposes. Unfortunately, these are farmlands being converted for the purpose. These farm lands, which prior to the winning activities were used for agricultural purposes to support livelihoods of thousands of people are lost to gravel winners. Yet, it is done without any prior notice or any involvement of the smallholder farmers. On this, Alhassan of Galinkpeɣu said: *Aayi, nanima maa bi yeri ti ka naanyi che ka be gbiri ziɣa maa. Be baɣa ka ti binbila ni di yi niŋ mi ka ti pu n ko gba (*the chiefs do no not consult with us before giving out land for mining. They do not even care about crops we have on the land).

4.10 Cost of Fetching and Selling Gravel to Drivers

The cost of gravel depended on the size of the tipper truck. Tipper trucks were of different sizes. There were two main sizes; single and double axil. Payment to chiefs, loading boys and District Assembly depended on the number of trips of the standard tipper truck size needed to fill the other ones. However, the single axil was used as the standard measure which was estimated by the number of the standard size that would fill the other truck sizes. The cost was then multiplied to get the cost for the others.

The tolls were; GH¢5 for chiefs, GH¢20 for loading boys and Gh¢1 for the District Assembly. This information was got from a focus group discussion held with the respondents.

Table 4.16 reveals that each driver paid an amount of GH5 to the chief for each trip fetched. Also, each driver paid an amount of GH20 to the loading boys for each trip and GH 1.00 paid to the District Assembly. Hence the total cost of each trip at the pit is GH26. However, a trip of gravel was sold at GH100. Table 4.5 emphatically confirms that the chiefs and the assembly took money for the gravel carted away from the pits hence the same amount being quoted by all the respondents to this question.

Table 4.5 Cost Drivers Incurred per Trip of Gravel

Cost Per Trip	Amount(Gh Cedis)
Chiefs	5
Loading Boys/Payloader	20
District Assembly	1
Total	**26**

Source: Field work (June, 2015)

The findings show that the chiefs and the district assembly took their share of the proceeds from the drivers. They, however, refused to reveal the daily earnings they got from the gravel winning. It is worth noting that in other jurisdictions as in the USA, Canada, Mexico etc, there are no chiefs involved in the business only local authorities (Richardson1999). This is because the concept of chieftaincy, as it happens in the study area, does not exist in these cultures (Richardson 1999). But in the Ghanaian setting, especially among the Dagombas of Northern Ghana, chiefs appear to occupy a central aspect of day to day activities of their communities especially in land ownership.

4.10.1 Daily Individual Earnings – smallholder farmer

From the survey conducted, it was realized that all the respondents received more money than the national minimum wage at the time which was GHC7 from the gravel pit (see Table 4.6). This could be the reason many of the smallholder farmers got attracted to it.

Table 4.6 Daily Earnings per Individual Smallholder Farmer

Amount in Ghana Cedis	Frequency	Percent
8-14	12	8
15-19	60	40
20-24	48	32
25	30	20
Total	**150**	**100**

Source: Field work (June, 2015)

Forty (40%) of the respondents got a daily earning of fifteen Ghana Cedis (GHS 15.00) closely followed by twenty Ghana Cedis (GHS 20.00) daily earning. The lowest daily earning, from Table 4.6 above, is eight Ghana Cedis (GHS 8.00). This indicates that though the farmers deemed gravel winning not dignifying, it was a good alternative livelihood strategy as they made some good money from it. In fact, only twelve of the one hundred and fifty respondents made GHS 8.00 daily wage. Even this was more than the Minimum Wage in Ghana for 2015(Gh¢7) reached by the National Tripartite Committee (Myjoyonline.com 20th January, 2015.). Indeed, the rest of the respondents got more than twice the minimum daily wage.

4.11 Number of Trips in a Day

4.11.1 Drivers

From Table 4.7 it was observed that forty percent (40) of the drivers did between two and three trips, forty-two percent (42%) did four (4) trips daily with only six percent (18%) of the drivers doing more than four (4) trips a day.

Table 4.7 Number of Trips in a Day from Perspectives of Drivers

Number of Trips	Frequency	Percent
2	10	20
3	10	20
4	21	42
5	3	6
7	3	6
8	3	6
Total	**150**	**100**

Source: Field work (June, 2015)

Several factors influenced the number of trips made per day. In the first place, the distance between the mining site and destination of carted gavel was a significant factor in determining the number of trips a driver could make per day. Again, the condition of truck (vehicle) played a role in regulating the number of trips that a driver could potentially make. The better the condition of the truck, the more trips of gravel fetched in a day. Above all, the gravel was sold to private individuals, and it was possible for a driver to do only four trips because that was what was requested for by his clients. This means that the demand was equally crucial in determining the number of trips that were fetched in a day.

4.11.2 Chiefs and Opinion Leaders

Table 4.8 below shows total number of trips of gravel that was fetched daily from the gravel sites as reported by chiefs and opinion leaders who were interviewed. The responses received ranged from 40 trips to 300 trips. 40% of the responses showed that 50 trips were fetched daily with only 5% indicating that 300 trips were fetched in a day. The commission

that accrued from gravel winning depended directly on the number of trips fetched. That is, the higher the number of trips fetched, the greater the commission.

Table 4.8 Number of Trips Made in a Day from Chiefs and Opinion Leaders

Number of Trips	Frequency	Percentage
1 - 40	4	20
41- 70	11	55
71 -100	4	20
101 and above	1	5
Total	**20**	**100**

Source: Field work (2015)

The exact number of trips fetched daily from a pit was not definite but significantly ranged from forty (40) to 300. This suggests that the amount of gravel carted away from the sites was huge. In effect, between a minimum of 200 and 1500 tipper truckloads of gravel was lost from across the Sagnarigu District on daily basis. This is so much and the authorities must put up instruments to measure the real quantum of gravel fetched in a given period so that accurate statistics are kept.

4.11.3 Smallholder Farmers (Loading Boys)

This study also investigated the number of trips smallholder farmer respondents loaded daily. It was revealed that 49% of the respondents loaded two trips a day while 44% loaded an average of four trips in a day. Only 7% loaded five trips per day. It was further revealed that the people came together in fives to fill a truck and then shared the proceeds at the end of the day since the work is done through manual digging. The respondents explained that

this was preferred so that they are able to load the truck evenly with the gravel. This illustrated in Table 4.9 below.

Table 4.9 Daily Trips Made from Smallholder Farmers' View

Number of Trips	Frequency	Percent
2	73	49
4	67	44
5	10	7
Total	**150**	**100**

Source: Field work (June, 2015)

4.12 Number of Days Respondents Spend Digging Gravel by Season

4.12.1 Days Engaged in a Week in Gravel Activity during Dry Season

Majority of the respondents (95.4%) were of the view that in the dry season, they are unable to dig and load gravel on daily bases since the land gets so hard during this period. Digging therefore, becomes extremely difficult through the manual way even though there is a high demand for gravel in the dry season; because building and construction is mostly done during this period. Caterpillars and excavators were then used to speed up and ease the work. Also, most customers feel that tipper tracks are not well filled with the gravel through the manual operation, hence the use of a machine (pay loader) which was gaining grounds in most of the communities. Table 4.10 shows details of the daily/weekly engagement in gravel winning across the study communities. Farming is done once a year in the study communities. In the dry season, farming activities are reduced for want of rain. Unfortunately, the smallholder farmers cannot use that to engage more in the gravel winning business.

Table 4.10 Days Engaged in Gravel Activities in the Dry Season

Number of Trips	Frequency	Percent
0	143	95.4
2	1	0.7
3	1	0.7
4	2	1.3
5	1	0.7
7	2	1.3
Total	**150**	**100**

Source: Field work (June, 2015)

4.12.2 Days Engaged in Gravel winning during Raining Season

It can be observed from Table 4:11 that there was a significant increase in the number of days spent by respondents in gravel winning during the raining season (73.2%), though this season is expected to be the season for farming. This buttresses the fact that in the raining season, digging is much easier and can be done without much difficulty. Hence, there is a significant difference between the time spent on mining during the farming season and the dry season by the respondents. It is therefore, imperative to state that much of the farmers' time is spent on gravel winning to the detriment of crop cultivation as explained by Yakubu of Kukuo-Yepalsi:

Wuuni ŋuna tingbani kpaŋdi mi ka a yi zaŋ a yaa doli garabuli ŋo, a ni kpi.

(In the dry season, the pit becomes very dry and hard such that it becomes rather difficult to dig. If one does not take care and engages seriously in digging, the person will get weak and die.)

Table 4.11 Number Days Engaged in Gravel Winning during Raining Season

Number of Days	Frequency	Percent
2	9	6
5	31	20.8
7	109	73.2
Total	**150**	**100**

Source: Field work (June, 2015)

4.13 Use of Funds Accrued from the Commission by chiefs

The study also considered how funds raised from the commission from gravel winning were used. Out of the 20 respondents, 40% were of the view that commission accrued from gravel winning is used for the development of the community with the remaining 60% being shared among the chiefs and their elders.

Table 4.12 Uses of Funds Accrued from the Commission Collected from the Gravel Pits from the Perspectives of Chiefs and Opinion Leaders

Number of Trips	Frequency	Percent
Shared with Chief and Elders	12	60
Community Development Projects	4	20
Cultural Rituals	4	20
Total	**20**	**100**

Source: Field work (June, 2015)

The data in Table 4.12 indicate that the most frequent use to which the commission received by the chief is sharing of the proceeds by the chief with their elders. This is followed by

Community rituals and community projects. In effect, 60% of the proceeds are used on items that have no direct benefit to the people. The chiefs and their elders spend the money on their personal interests. Alaasan of Shiɣu summarises the use into which the chiefs put the tolls from the gravel pits in his response as follows:

Be mini be yiŋ nima n ti pahi kpambaliba maa n diri li. Liɣiri sheli nanima maa ni deeri maa yaa, di kuli sagiri la be ko. N bi chihi la suhiti ni baŋdiba tooni.

(They and their families together with their elders spend it. For the money that the chiefs collect, it is only enough for themselves. Except offering of sacrifices and consulting diviners)

4.14 Negative Effects of Gravel Winning

All of the respondents admitted that gravel winning posed some dangers. The most threatening of the dangers based on responses elicited from the participants are as follows:

4.14.1 Loss of Farm Lands

From the field survey, it came out that greater portion of farm lands were lost to gravel winning. Gravel winning rendered the land unproductive and for that matter no farming could be done on such lands. On the loss of farm lands, Abdulai had this to say:

Be gbiya n naai ti politi zaa, ti lahi ka kobu shee

(They have used all our lands to dig gravel. We have nowhere else to farm again.)

4.14.2 Loss of Economic Trees

Another worrying issue revealed from the survey conducted was lost of economic trees in the gravel winning communities. According to the respondents, trees like Dawadawa and Shea plants which were hitherto sources of livelihood for the women were being destroyed. They said the existence of those plants impacted positively on the entire communities, the district, region and nation as a whole. This is what Nma Memuna of Tampe-Kukuo had to say:

Siɣli, *ti kohiri la ti kpihi n dari bindira, ka ti yidaanima tooi nye faako n gbani tinga.Ti kulahi tooi n tooli, Dozim gba yi niŋdi koko din timsi be puni ka be kora. Di zaa lahi kani be di ti yeri kpaligu dini dugi zeri.Ti mabihi nyogni nimo paborila kpakahilimo ka di baa*?

(In the farming season (beginning stage of the farming season), we (house wives) used to sell our Shea nuts and buy food stuff from that. This supported our husbands so that they had a breathing space and peace of mind to concentrate on tilling the land. Now, we cannot do that.We also had Dawadawa powder for porridge which they (husbands) ate and got enough energy to till the land. None of these exists again let alone dawadawa to prepare soup with.) Our brothers and sisters in Southern Ghana now cherish Shea butter from us, but where can we get it again?

4.14.3 Reduced Yield in Crops

Again, respondents complained bitterly that gravel winning led to a reduction in their crop yield. Participants in the focus group discussions indicated that those who still had small parcels of land to cultivate did not get the best yield. They explained that that the gravel pits around the farms facilitated soil erosion and when there was a heavy down pour, water ran from the farm lands into the pit and moved the sand from the cultivated land into those pits.

The top soil was washed away and therefore left insufficient nutrients which affected the growth and yields of the crops. Apart from the loss of nutrients, roots of the plants were also exposed as a result of the erosion which made plants to suffer and therefore unable to yield as required. Relating to reduced yields from farms, James Naporow had this to say:

Ti ni ko bela sheli maa gba, saa ʒi tam maa n chaŋ ka che li ka di bi niŋ di yubu.

(Even the small parcel of land cultivated rain carried away the top soil resulting in poor yields.)

4.14.4 Conflicts

Further, it was revealed by respondents through focus group discussion that gravel winning generated conflicts between chiefs and their subjects. According to the respondents, the chiefs of the communities under study gave out the land for gravel winning without considering the crops that was on the land and the future problems of that on farming. The farmers in reacting to this had misunderstanding between them and the chiefs. This was clearly shown when I had a familiarization tour to young-Duuni and Shiɣu.

In Shiɣu, the farmers said they were not ready to listen to me at the chief's palace if it had to do with gravel winning and land issues. In Yong-Duuni there was a serious conflict among community members, tipper track drivers and the military at Bawa Barracks (Mile nine). The sharing of proceeds among chiefs and their elders was even more critical. Regarding this, the respondents said the chiefs of the communities had control over the land but had subjects who held titles to the various areas of the land.so in terms of any benefits a greater portion should be given because the elders paid for the land before the titles and must take responsibility of anything regarding the land including the benefits. The Assembly-man of Shiɣu, who spoke in English, had this to say:

Many people do not meet with the chief because crops were destroyed and farm lands given out for mining, and even sharing of proceeds among chiefs and their elders is worst.

4.14.5 Health Problems

The respondents also indicated that there were health problems regarding gravel winning. They stressed that the manual digging and loading gave them general body pains. This compelled some of them to take drugs which had further health implications for them. Also, the dust inhaled from the pits gave chest problems. Martin from Yong-Duni had this to say:

Ti *ni kuli pili sabulo labibu, n na ʒi n nya m maŋa. Daridari ka n valina biɛɣu kam ka naan yi n nya m maŋa.*

(Since we started this gravel work I have never been myself, I took ephedrine after every day's work before I got relief).

Alhaji Wahabu of Kukuo-Yepalsi said that:

Ti sheba nyɔri ni biɛri mi duɣu duɣu sheli tini vali na maa zugu.

(Some of us have chest pain because of the dust inhaled.).

4.14.6 Loss of vegetation

Respondents lamented the way the mining communities were left bare; trees were felled and grasses cleared which made it difficult for animals to graze. This has also exposed the communities to erosions.

Nantogma of Tampe-Kukuo complained:

"Ti nee luɣili kam kabinkobiri ku lahi nye mogu n ŋubi ka ko soya doni lugli kam"

(We (gravel miners) have cleared the whole area and our animals can't even get grass to graze with water ways created everywhere). The picture is clearly painted in Image 4.5 in appendix F.

4.14.7 Destruction of Roads

One critical issue that respondents unraveled in the course of this study was destruction of roads by the tipper trucks. The link roads were not tarred and the continuous use of the heavy trucks loaded with gravel left the roads in bad state making them not motorable. This affected access to markets with the little produce smallholder farmers had to sell. All these were to the benefit of a few privileged people within the communities.

Alhassan of Galinkpeɣu had this to say:

" loorinima ŋo saɣim ti pala zaa ka loori bihi kulahi too kpena zaŋ ti puzuri n yi"

(These trucks have destroyed the roads making it impossible for small cars to convey our produce to the market for sale). See Image 4.6 appendix f for such a road complained about.

The findings of this study about the adverse effects of gravel winning in the Sagnarigu District are quite similar to previous studies in the Northern Region and other communities (Musah 2009; Musah 2009; Maidyse 2013). These included conflicts, loss of farm lands, reduced farm size, deforestation etc.

Furthermore, Imoru (2010) complains that gravel winning in the Northern Region poses a threat not only to the environment but also to food security. A great portion of farm lands are lost to gravel winning and as agriculture, the respondents said is their main source of livelihood and losing the farm lands meant a lot to their communities, district, region and country at large. Apart from this, the issue of conflict among community members is worrying because there cannot be development with conflicts.

However, these findings contradict the findings of Peprah (2013) whose respondents were of the view that gravel and sand winning in the Wa Municipality had no any adverse effects

in the community but rather had very good advantages. One can only expect the findings he came out with since the respondents were all tipper truck drivers who made a lot of money from the sales of gravel.

4.14.8 Effects of Gravel winning on Yields and Acreage

This was done by looking at the yield got from an acre before going into gravel winning compared with yield per acre after five years of going into gravel winning. Two most cultivated staples, maize and rice, were selected to determine the effects of gravel winning on annual their yield. The results are shown in Table 4.13

Table 4.13 Acres and Yields before and after Gravel Winning (Maize)

Number of Acres	% Before (N=150)	% After (N=150)	Number of bags per Acre	% Before (N=150)	% After (N=150)
0-4.9	31	86	**0-4.9**	13	69
5-9.9	63	14	**5-9.9**	71	30
10-14.9	3	0	**10-14.9**	13	1
15-19.9	3	0	**15-19.9**	3	0
Total	**100**	**100**	**Total**	**100**	**100**

Source: Field work (June, 2015)

The percentage of farmers who cultivated between 0 – 4.9 acres of maize before gravel winning activities was just 31% but this grew up to 86% after the activity set in. According to the respondents, the reason was that there were no large tracks of land again and so they could only manage little portions of the land left. Dawuni of Galikpeɣu had this to say:

Garabuli ŋo ni daa na kani, ti pam daa tooi kori n gari ti yika ayo poin poin, Amaa punpo ŋo, ti ku tooi lahi ko lala dama koya lee la garabuli boɣa. (Before the gravel winning, many of us could farm up to about seven acres each. But now we can no more do that because the farmlands have been converted into gravel mines.)

A similar situation existed with the yields because whereas only 13% of the farmers got between 0 -4.9 bags per acre before the advent of gravel winning, as much as 69% got that after gravel winning of five years. The same trend is seen when the percentage of farmers before gravel winning who cultivated between 5 – 9.9 acres was 68 this percentage reduced to 14% after gravel winning. The table further explains the decreasing trend where 71% could harvest between 5 – 9.9 before the mining, this drastically decreased to 14% after the mining because the farms increasingly become less fertile. This finds expression Abukalijiya of Tampe-Kukuo's lamentation thus:

Pusheŋa be ni Ko sheŋa be ni kori garabuli ka che maa ka a yi ko n baɣili, ko sheli din deeri dini maa daari mi n ʒi di atam maa zaa n chaŋ ni yaa. Dina zuɣu, a yi ko ni di bi niŋ da ka dini daa yi pun niŋdi shem maa.

(The farms close by the pits get eroded as they are rendered infertile by strong overflowing water gathered in those pits and washes the top soil away. When one farms there, the yield is no longer as it was).

Table 4.14 Acres and Yields of Small-holder Farmers before and after Gravel Winning (Rice)

Number of Acres	% Before (N=150)	% After (N=150)	Number of Bags per Acres	% Before (N=150)	% After (N=150)
0-4.9	95	52	**0-4.9**	60	40
5-9.9	5	48	**5-9.9**	40	60
10-14.9	0	0	**10-14.9**	0	0
15-19.9	0	0	**15-19.9**	0	0
Total	**100**	**100**	**Total**	**100**	**100**

Source: Field work (June, 2015)

Gravel winning does not directly affect rice production because gravel is not mined in rice farms, gravel winning goes a long way to affect it. The energy and attention on the rice farms gets missing as gravel winning became the focus. Furthermore, because gravel winning denies farmers of places to cultivate maize, they compete for the rice farms thereby making the percentage of farmers in rice increased as indicated in Table 4.15. This was clearly indicated in Abdulai of Galinkpeɣu thus:

Ti nima ban daa bi kori shinkaafa kpalin kori li mi, dama ti kawana puri pa leena garabuli boga. Shinkaafa puri la bi zoo,amaa ti ti sheba kuli ŋagsira n kpera.

(Even some of us who previously did not plant rice now force ourselves into rice farming despite the fact that the rice farms are just not enough.) .

The percentage of those who harvested 0 – 4.9 bags per acre reduced from 60% to 40% after gravel winning. This was, according to the respondents, the farmers had more of their attention on gravel winning, the new found source of ready cash. However, the percentage of those who harvested 5 – 9.9 bags increased from 40% to 60%. The reason, according to the respondents, was that some of the farmers, after making some money from the mines invested some resources into fertilisers and weed control as M ma Awaabu of Yong-Duuni explained:

Ti ni kpe garabuli ni ka ti puzuri kpugibu labi nyaaŋa. Amaa tini sheba ni gbaa ligri bela bela dini,tooi pa dari patariza ka ni mori tima. Dini bo ŋo soŋda ka ti puzuri kpuɣibu zoora vienyela.

(When we started gravel winning, our harvest (in rice) was low. But when we got little money from it, we can now buy some fertilizer and weedicides for our farms. This has increased our yields a little).

The respondents were smallholder farmers who are constrained such that they cannot cultivate large farms up to ten or more. This explains the zero recordings in the table.

4.15 Suggestions to Mitigate Negative Effects of Gravel Winning

4.15.1 More Job Opportunities

The most critical suggestion among all was the creation of employment opportunities like cleaning, security, packaging and loading, petty trading and other unskilled jobs to absorb the youth. This, the respondents said, would earn them income thereby reducing the poverty level of the people in the study area. Michael had this to say:

Tuma yiri beni, ti naan nyeri lagiri ka fara bali ti yaŋɔ.

Dina boŋɔ ni che ka so baɣa lahi ka Saabulo labibu ni yaŋɔ.

Factirinima yi di beni ka ti nya tuma dini, ah ah, ti naan tam saabulo dina yela yom yom Din pahi nyami, ti yi di mali walima ka biela biela yirina, saabulo ŋuna, ti naan yi di yela ni ka nye jilima.

(If there were jobs, we would earn some income and reduced the poverty level in the community, and this would discourage digging or mining of gravel in the communities. If there were factories which will employ us as security, cleaners, loading boys and petty traders, "ah ah", we will forget Saabulo very fast.

Another thing is that if we had some trade from which we get some profit, we will leave saabulo alone)

It is however, amazing that this mitigating factor was given by people who mainly lack any formal skills to be employable in the formal sector. To the best of the author's knowledge, this suggestion is not suggested before by respondents as a mitigating factor against the negative effects of gravel winning. In addition, the job type suggested points to the earlier observation that they are mainly illiterate without employable skills in the formal and informal sectors. Considering the education backgrounds of the respondents, it is not surprising that they are suggesting menial jobs in the factories, and the buying and selling business.

4.15.2 Type of Land for gravel winning

One other suggestion by respondents to mitigate the negative effects of gravel winning was that chiefs should give out only land that is not suitable for agricultural purposes for mining. They felt if this was done, agriculture which is their main source of livelihood will not be negatively affected by mining activities. Abass of Shiɣu had this to say:

Be yi di zaŋ la tampima ŋo n tiri ka be gbira, di naan dii ku bobiri ti tama ŋo.

*(*If they will lease out the land not suitable for crops production for gravel winning, we would still have arable lands for our use.*)*

With a similar view, M ma Neinpaɣa of Yoŋ-Duuni suggested:

Mani di yelimi ni Naa yiri che mi ka be kperi zoya maa ni ha n ti gbira, di naan so gba.

(I was even saying that if Chief directed them to the hilly sides it would be better).

4.15.3 Reduction in quantity of Land given out for Gravel winning

Also, smallholder farmers suggested that the quantity of land given out for mining should be reduced. If the chiefs considered only land that was not suitable for agricultural purposes it could reduce the parcel of land used for mining. They could even agree on a required quantity that should be given out and nobody needed exceed that.

The Magazia of Kukuo-Yepalsi was keen on this issue as she argued that the activity could not be stopped all together given the important role of gravel in building infrastructure for the Tamale Metropolis and the district as well. Magazia said:

Garabul maa ŋuna,di ku tooi che toobu. Mani ni nye shem nye la tiŋ-naanima maa yi di filim di toobu ka be toori biɛlabiɛla.(For the gravel winning, it cannot be stopped completely. What I think is that our chiefs should reduce the amount of gravel that is fetched so that they will fetch in small quantities).

4.15.4 Intensification of Education

Another remedy from smallholder perspective to the problem of gravel winning was that there must be conscious effort at educating especially the chiefs and the tipper truck drivers to protect and preserve the environment. This, they said, could help the chief and elders

know that they and future generations would pay for the loss of plants, land and other vital natural resources on the land. They said they had already started suffering the loss of plants, land and other vital natural resources and the younger ones including those yet unborn would suffer more, the environmental implications of what is done today. They suggested that films of areas which had passed through this and the results could be shown in the communities and teachings in groups. On this the assembly man of Galinkpeɣu said:

ʒilinsi n diri ti maa, shee ka ti bo wuhibu pala ka kpaŋsi din pun beni maa zaŋ chaŋ ti tingban ŋo polo(We are suffering from ignorance and illiteracy)

4.15.5 Refilling of Pits

Participants in a focus group discussion suggested that pits, after mining, should be refilled. This, they said, could be done if authorities intensify the education on the hazards of gravel winning mentioned earlier on is given serious attention. People should be educated to understand that leaving the pits open after winning comes with negative implications. Accordingly, pouring of waste into the pits without plastics to refill them up can be done to reclaim mined fields.

Furthermore, it was suggested by respondents in the discussion that chiefs could liaise with Zoomlion to pour rubbish in the mined pits to fill them up. This they said could help prevent breeding of mosquitoes, waste of land and even loss of lives. Alima of Young-Duuni cited an example where a child got drown in a mined pit in Kataariga some years back. She narrated that a pit left after mining got filled up with water after a heavy down pour and a child fell into it and died when he went out to play.

4.15.6 Planting of Trees

It was further suggested by participants in focus group discussions that trees should be replanted to replace those that were uprooted. When this is done, the plantation lost would be replaced and the land would be put back to shape. This they said could be done by guiding the people to know the need of plants in the society. Not only this but that community members could mobilize themselves to embark on tree planting to replace lost plants. In the discussion members of Kukuo-Yepalsi and Tampe-Kukuo made mention of how government used to support them to take up tree planting in groups which kept their environment in good shape. This they said was done and food provided by government for them to eat while at work. Plants like Teak and Nim were provided so that they could transplant and take care up to a level it could strive without much attention. They cleared around the trees and prepared fire belts to avoid plants being destroyed by fire. This could be re-visited with trees like Shea and Dawadawa being included so that the lost plants would be replaced. The case is that once nature is disturbed and corrupted, the land and related natural resources are changed forever, unless it is given the needed care.

4.15.7 Reduction in the amount of gravel winned

For the drivers, the most obvious solution was to regulate and reduce the amount of gravel fetched in a day. In fact, all of the drivers contacted suggested this measure. This suggestion was not surprising as they simply did not want to stay out of employment. Furthermore, they knew that laws in Ghana did not work so they could always engage in mining since the laws regulating the reduction would not be enforced after all. Masa Bob in a relaxed indifferent manner said:

Nyama, gravel maa, ti nima dorabanim ku too che di toobu; ka di bo?

Redusimi ya quantity maa, amaa ka ti yima di yela ni.

(Look, we the drivers cannot stop mining the gravel; and eat what? Reduce the quantity fetched, but not that we stopped the activity.)

4.15.8 Intervention of the EPA

According to Ghana's Environmental Protection Act of 1994 (act 490), the Environmental Protection Agency is mandated to formulate environmental policy and make recommendations for the protection of the environment. In addition, the EPA is responsible for ensuring compliance with EIA procedures in the planning and implementation of development projects, including compliance with respect to existing projects. This requires that any project likely to have potential adverse effects on the environment be subjected to an EIA. Respondents expressed dissatisfaction with the EPA for relaxing on enforcing l regulations. They suggested that community authorities (Assemblymen and women, chiefs and Magazias) needed to urgently liaise with the EPA to have these regulations implemented without any further delay.

The respondents further suggested that the Environmental Protection Agency (EPA) and the Government (Local authorities) needed to formulate bye-laws to strictly regulate the activity in the Sagnarigu District. For example, the Shiɣu Assembly-man had this to say:

EPA mini asambul yi di yi n zani n zali zalti dini ni tum tuma, to ti naan nye faako.

(If EPA and the Assembly could pass bye-laws that will work to regulate gravel winning, we find some relief).

4.15.9 Use of gravel winning proceeds for Community Development

The respondents repeatedly lamented in my interactions with them that proceeds from the gravel winning that came to the community remained with only the chiefs and their families. They do not use it for the collective good of the communities. They, therefore, suggested that an important remedy to this would be that the dominance over the proceeds by the chiefs needed to stop so that the proceeds could be invested into development projects for the good of the whole community. Projects such as irrigational dams, clinics, Shea butter processing plants, groundnuts processing were cited.

Dawuni Neindoo of Galinkpeɣu said:

Mani ni nyeli shem nyela nanima maa mali garabul maa ligiri maa n tumdi tuma ka ti zaa diri di alifaani.

(To me, what I think is that the chiefs must use the gravel money to do projects that will benefit all the people.)

4.16 Benefits Derived from Gravel Winning According to Chiefs and Opinion Leaders

It was mentioned earlier that, gravel winning should not be seen as purely a negative enterprise. Accordingly, this section is devoted to investigating the benefits that are derived from gravel winning. I consider the benefits that come to participants in the gravel winning activity in the succeeding sub-sections (4.15.1, 4.15.2,and 4.15.3)

4.16.1 Benefits to the Community

This study further took into account the benefits of the gravel winning activity in the community. Varied responses were obtained from chiefs and opinion leaders perspectives to this question. Table 4.16 below provides details.

Table 4.15 Benefits of Gravel Winning to Community according to Chiefs and Opinion Leaders

Benefit	Frequency	Percent
Benefits only land owners	4	20
Community up keep	8	40
Payment of School fees	1	5
Development Project	7	35
Total	**20**	**100**

Source: Field work (June, 2015)

Forty percent (40%) of the chiefs and opinion leaders testified that the resources from gravel winning benefitted the community while 20% were of the opinion that the resources benefitted only land owners. Another 20% were of the view that resources from gravel winning were used for developmental projects. These included draining of dams, minor renovations in schools, and filling of potholes on their roads with gravel. Only 5% of the resources were spent on payment of school fees, and another 5% said it was a source of cheap gravel for the use of community members.

However, I conjecture that, the other opinion leaders besides the chiefs and their elders did not want to offend the chief and the elders by revealing that the proceeds were not used for the general good of the community but only for the chief and his sub-chiefs. My opinion of this is deduced from the response of Adambila of Galinkpeɣu:

Mani ŋuna, mani nua ka saabulo polo; dinzuɣu, di mali n anfaani bee di ka gba, di bi nya ma. Chemi ya n ti bɔ hi Salichi mini o bihi. Mani je vuri.

(For me, I am not part of the gravel winning enterprise; for that matter, whether it has benefits or not, I do not care. Go and ask chief and his children. I do not want any trouble.)

Also, Neindoo Soochi of Shiɣu agreed that gravel winning had some benefits but also points to the palace as the only beneficiary as he explains:

*Anfaani ŋuna, di mala. Amaa ti nima bi paari li. Naa mini o kpamba ko n diri be beni. Ti nima tarimba ŋɔ bana, buɣim ŋɔ n kuli nye li n wɔ*biri ti.

For benefits, it (gravel winning), has. But we the commoners (smallholder farmers) do not benefit from it. Only chief and his elders enjoy their proceeds. For us the commoners, it (gravel winning) is fire burning us.

4.16.2 Use of Proceeds by Smallholder Farmers from Gravel winning

Regarding the use of proceeds from gravel winning, 40.66% said they used part of it to finance their farm operations. About twenty-seven percent (26.66%) said the money realized was used for the upkeep of their families, followed by 19.33% respondents who said the money was used for building and maintaining their houses. This revealed that gravel winning was used as an alternative livelihood strategy as well as support agricultural activities. See Table 2. 17 below for details.

Table 4.16 Use of Proceeds from Gravel winning by smallholder farmers

Use	Frequency	Percent
Up keep	40	16.7
Children Education	20	13.3
Building/Maintain House	29	19.3
Farm Operation	61	40.7
Total	**150**	**100**

Source: Field work (June, 2015)

The figures from table 4.17 further confirm that smallholder farmers in the Sagnarigu District engage in gravel winning principally to get their daily bread, and for other necessities of life. According to Imoru (2010) gravel winning is done in other districts such as Tolon/ Kumbungu, Savelegu/Nantong, Karaga, Chereponi, Saboba, West Mamprusi, Yendi Municipality, Nanumba North and South of the Northern Region. But it is usually done by road contractors. Therefore, it is not on a large scale as in the study area. The people there do not depend on it for their livelihood as they still have vast tracks of fertile land for agriculture to support themselves with. But for the smallholder farmers in the study communities, it is an alternative source of livelihood for those who take part in the digging and loading of gravel in the pits, and the chiefs and elders. One can see this in Naporo Pukpara of Yɔŋ- Duuni's response to the question of what they use the money got from the business for.

Dina n kuli kpalim ti nima guzuli kati mali n maana ti yela ka dihiri ti malibui. Oii! Ti bihi shikuri! dina n kuli sɔŋ ni ti ka ti lihiri ba shikuri ni. That (proceeds from gravel winning) is our single enterprise which helps us solve our problems and feed our children. Exclamation (oii), our children schooling! It is that one (gravel winning) which supports us look after our children in school.

Respondents further explained that much of the income generated from gravel winning was used to solve pressing personal and social issues.

On the part of Abdulai Lansah of Yoŋ Duuni*:*

Ti mali li n dari kawana ka yori ti bihi shikuriti yori, (We use it to buy maize and pay school fees of our wards.)

This further suggests that proceeds from gravel winning enable smallholders keep their farm produce longer to benefit from higher prices later as they use some of the proceeds to buy food stuff when prices are very low. All the same, as much as 40.66% still said part of the proceeds is used in farm operations. This suggests that agriculture still benefits though there are negative effects of gravel winning.

4.16.3 Farming Activities smallholder farmers use proceeds from gravel winning to support

Though a number of the farmers do not use proceeds to boost their farming activities, 40.66% of the farmers used gravel winning proceeds to fund their farming activities. Weeding recorded the highest percentage of 100%. This means that all the sixty –one (61) farmers who said they used money got from the gravel winning helped them to undertake farming activities use some of the money to pay for weeding services while 88.52% said they used some for spraying weeds in their farms. Purchasing of chemical fertilisers ranked third while the least was buying of seeds which took only negligible percentage of 3.27% and purchase of farming tools taking only 9.83% of the spending made by smallholder farmers of the proceeds from gravel winning to them. Table 4.18 illustrates this.

Table 4.17 Uses of Proceeds from Gravel Winning in Farming Enterprise

Number of Trips	Frequency (N=61)	Percent
Weeding	61	100
Storage	10	16.4
Till Farm Land	23	37.7
Purchase Farm Inputs	42	68.9

Source: Field work (June, 2015) *Multiple responses allowed*

Weed control being the most predominant underscores the fact that labour is more needed within that time to keep the crops healthy so as to develop well. Since the farmers get very busy at the gravel winning sites, they have little time to attend to their farms. Consequently, they hire labour, and buy weedicides from part of their wages from the gravel winning activities. The second was Farm inputs with 68.85% spending some of the proceeds on it.

4.17 Prospects of Gravel winning in the Next 10-15 Years

Table 4.25 presents data on the prospects of gravel Winning in the area. Those respondents who said the activity was not something that could keep them for long were about 91%, but the fact there are no jobs they have to hang on this. Again 94.7% of the responses revealed that the activity is something they don't like. Their engagement in it was as a result of unemployment. They do it just to keep the family moving, but not for the love of it.

Table 4.18 Prospects of Gravel Winning in the Sagnarigu District

Question	Response (%)	
	Yes	No
Would you engage in gravel winning in the next 10-15 years	2.7	90.7
Do you like this activity?	1.3	94.7

Source: Field work (June, 2015)

Table 4.19 shows the views of respondents on the sustainability of gravel winning and love for the activity. The views of smallholder farmers on the sustainability of gravel winning in the near future could be summarized in the Assembly-man of Galinkpeɣu statement. He had it that:

Ti gba kuli mi ni saabulo ŋɔ ŋuna, zuŋɔ maa n kuli bala. Dama, be ni gbaa kɔri li naai ka ti zaa niŋ yim. Saabulo labiriba maa daŋ bo tuma shee. (We also just know that this gravel

winning is just for today alone. This is because they will soon finish fetching all of it and we will become the same. Gravel diggers and loaders must better find themselves more sustainable jobs).

From this, it is clear that the activity cannot be relied on for the development of the existing and future generations in the Sagnarigu District.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This final chapter of the study contains a summary of the study concerning the effects of gravel winning on smallholder farmers in the Sagnarigu District. Conclusion of the study is made and recommendations put forward. The last section of this chapter discusses potential research areas emanating from this study.

5.2 Summary

The study focused on making a holistic assessment of gravel winning in the Sagnarigu District of the Northern Region of Ghana. It set out to assess both negative and positive impact of gravel winning operations especially on smallholder farmers in the communities that the operations took place.

The study was done by using interviews, personal observation and focus group discussion to gather perspectives of smallholders in gravel winning in the district. These were done by the use of instruments like questionnaire and interview guide. The respondents were purposively and randomly selected from five communities where gravel winning was being carried out in the district.

On the question of nature and extent of gravel mining, Stakeholders in gravel winning in the Sagnarigu District were mainly smallholder farmers on one hand, and chiefs, elders, and tipper truck drivers on the other. The age range of 30-39 recorded the highest percentage of (42.7%) while most of the drivers aged between 40 – 49 years. In addition, most of the gravel winners either had no education or had very little education with most of them being

males. Maize was the most cultivated crop (98%) followed by rice (39.3%), with millet being the least (1.3%). In like manner, most gravel pits were started by road contractors who were offered the concessions by the chiefs without involving smallholder farmers who had farms on the land. It was clear also that farmlands and well- paying job opportunities were limited in the district.

The study revealed that there were equally many negative effects of gravel winning in the Sagnarigu District. These included losses of farmlands. The land that was usually used for the purpose of gravel winning happened to be the farm lands of smallholder farmers. Once the winning started, the farmers lost the land and consequently had n where to cultivate crops. Another finding about the negative effects of gravel winning in the Sagnarigu District was loss of vegetation for animal grazing. Gravel winning is done by clearing the topography of the land thus taking away the top soil fertile soil which support plant growth. This meant that livestock had nowhere to graze.

Closely related negative effect of gravel winning in the district was desertification. Once the grasses and trees were cleared, the land laid bare and lifeless inviting desert conditions to the area. The respondents also lamented over the health hazards that those who dug the gravel manually are exposed to. As the exert energy to disintegrate the solid and dusty gravel before lading it into the tipper truck, they get weak. But they would not stop and lose income –they were paid by loading. Some took to hard painkiller drugs to work harder. This resulted in health calamities. In another vein, they did not use nose and mouth guards while digging. They therefore inhaled the dust from the gravel leading to noisy and long bouts of cough as I engaged them in conversation.

Furthermore, exhausted pits facilitated erosion thus reducing crop yield. One serious effect identified was loss of economic trees. It was a sad sight to behold whenever I visited the sites. The numerous of Sheanut trees forcefully uprooted laid down mercilessly with all their oil (Sheanut oil) might. The smallholder farmers cried over this as we read in earlier pages f the work. Another sad reality of gravel winning in the Sagnarigu District discovered in the study was that the winning activity tended to be a source of conflict especially between the farmers and the chiefs and their elders. The chiefs usually did the winning in smallholder farms without any regard to the farm owner. This made the farmers helplessly angry with the chiefs and elders leading to non-cooperation and disinterest in the affairs of the village. Such disputes simply destabilized the villages as communal activities were badly affected. The other conflict situation was border disputes among the elders over pieces of land for gravel winning.

When it came to measures to improve upon the negativity of gravel winning, the stakeholders in the district, suggested that planting of trees, refilling of pits, creation of job opportunities, reduction in quantity of land leased out for gravel winning, and only non-agricultural land should be used for gravel winning. They also proposed that the players in the gravel winning industry be well conscientised on the need to preserve the environment.

The study further revealed that the activity did not impact only negatively in the smallholder farmers. Rather, gravel winning came with some gains such as funds for community development. The respondents said that they used some of the farms got from the gravel pits to engage in activities such as contributing money to support in school projects, maintaining the village road, and hand-dug dam. The activity also made some funds available for the payment of school fees of wards of gravel winners. The funds were also used for upkeep of

their families of the winners. They respondents further confessed that they used some of the funds they got from gravel winning to support farming operations in the form of ploughing/tilting the farms, acquisition of farm implements and seeds etc.

5.3 Conclusion

Results of the study suggest that smallholder farmers in the Saginarigu District had low levels of education with majority of them having no formal education. The few that had formal education ended up at the basic and secondary levels of education. This made it extremely difficult to compete for the few job opportunities available since they do not have the needed expertise. Gravel winning in the district is dominated by males.

The study further indicates that the chiefs grant permission for gravel winning without consulting the farmers though they are most affected as they have no places again for farming.

Royalties and palace protocol are paid to the chiefs, and the district authorities. These are largely unaccounted for as they have no records of payment.

Further, the smallholder farmers in the gravel pits made a minimum of Seven Ghana Cedis (GHS7.00). This amount was found to be higher than the National Minimum Wage in 2015 which was GHS 6.00. The smallholder farmers used the income to supplement their main income source. All the same, it affected the smallholders in some negative ways. The people could no longer rely on agriculture for their livelihood since farmlands had been converted into gravel pits and residential areas. Worse was that it had no future and could not be relied upon.

5.4 Recommendations

Having had a holistic insight into gravel winning activity in the Sagnarigu District, the researcher wishes to make the following recommendations:

1. With regards to low level of education in the communities where gravel is wined, the study suggests that efforts are made to liaise with the Saginagu District Assembly to intensify supervision and provision of learning materials in the schools so that the children in school will not grow up illiterate as those before them. The education authorities could also introduce Night Literacy Lessons for the adults. On the other hand, the chiefs and people need to invite NGOs such as School for Life, IBIS to set up Non-formal learning Centres across the district.

2. Given that land on which gravel winning takes place on the land that the smallholder farmers earn their livelihood, it is important that some compensation be given to such farmers when the land is given out for gravel winning. Compensation may come in the form of reallocation of land somewhere else for them to farm or some part of the proceeds that accrue from the gravel winning

3. It is also recommended that the chiefs who take royalties when they give land out for gravel winning spend some of the money in reclaiming the lands after gravel winning to reduce the environmental degrading effects of gravel winning. The study also recommends that proper records of the royalties to the chiefs and district authorities be kept for the sake accountability.

4. Where possible, only land which is not suitable for farming should be given out by chiefs for gravel winning. This will ensure farmlands are not affected by gravel winning and the livelihoods of smallholder farmers are protected.

5. The study further recommends that the Government, the chiefs and people, NGOs, and all other stakeholders need to device ways of introducing new and sustainable livelihoods. For example, animal husbandry, given its suitability in the Sagnarigu District climate be encouraged and well invested in. The case also is that the people are already very familiar with animal rearing, and this will be very easy for them to undertake. MASLOC and other funds could be train and fund trading and local small scale manufacturing of basic needs in the communities. These will boost income of smallholder farmers and thereby improve their livelihoods and life expectancy.

REFERENCES

Africa Progress Report, (2014). 'Grains, Fish Money; Financing Africa's Green and Blue Revolutions'. Africa Progress Panel.

Akabzaa, T.M. (2000). *Boom and Dislocation: The environmental and social impacts of mining in the Wassa West District of Ghana*. Accra: Third World Network – Africa.

Al-Hassan, R., and Diao, X. (2007). *Regional disparities in Ghana: Policy options and public investment implications.* IFPRI Discussion Paper No. 693. Washington, DC: International Food Policy Research Institute

Al-Hassan R, and Poulton, C (2009). *Agriculture and Social Protection in Ghana*. Future Agricultures. Working Paper No. 009

Amutabi, M. and Lutta-Mukhebi, M., (2001). Gender and Mining in Kenya: The Case of the Mukibira Mines in the Vihiga District, Jenda: A *Journal of Culture and African Women Studies*, Vol. 1, No. 2, 23p.

Anon, (1994). Project Memorandum: Lower Volta Mangrove Project: Phase l: P Assessment of Environmental, Economic and Social Factors. British High Commission, ODA, London and Accra

Aromolaran A. K. (2012). 'Effects of Sand Winning Activities on Land in Agraian Communities of Ogun State, Nigeria', *Continental Journal of Agricultural Science*, 6, 1, 41-49

.

Asong, R.H., Mabunay, M.L., Aure, D., Seraspe, E., Bra-ganza, R. and Corda, D.E. (2002). Alternative livelihoods in a coastal village. In: Global Symposium on Women in Fisheries, 6th Asian Fisheries Forum 25 –30 Nov 2001, Koahsiung, Taiwan (eds

M.J. Williams, N.H. Chao-Liao, K. Matics, M.C. Nandeesha, M. Shariff, I. Siason and E. Tech). World Fish Centre, Penang, Malaysia, pp. 97–111.

Awudi, G. (2002). The role of foreign direct investment in the mining sector of Ghana and the environment. *CCNM Global Forum on International Investment, 7–8 February 2002*. Paris: OECD

Banino, G.M. (1994). Construction aggregates—new sources and solutions. *Geotimes* 39(5):4.

Brannen, J. (1992). Mixing methods: Qualitative and quantitative research. London: Avebury.

(Reprinted)

Buttleman, C. G. (1992). A Handbook for Reclaiming Sand and Gravel Pits in Minnesota. *Department of Natural Resources, Division of Lands and Minerals.*

Central Intelligence Agency [CIA], (2013). The World Factbook: Ghana. https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html Retrieved 03/0215

Cotula, L., S. Vermeulen, R. Leonard, and J. Keeley. (2009). Land Grab or Development Opportunity? Agricultural Investment and International Land Deals in Africa. London/Rome: IIED/FAO/IFAD.

Cynthia G. Buttleman (1992). *A Handbook for Reclaiming for Reclaiming Sand and Gravel Pits Sand and Gravel Pits in Minnesot.* State of Minnesota Department of Natural Resources.

De Zoysa, R. (2013). The implications of large scale land acquisition on small landholder's food security. In DPU Working paper series, edited by C. Boano and B. Lipietz. London: Development Planning Unit, The Bartlett, University College London.

Dryer, R.M. (1976). Construction minerals. Pages 578–588 in *Economics of the Mineral Industries.* 3rd edition. Edited by W.A. Vogely. New York: AIME.

Ebenezer, L. (Ed.) (1991). *Ghana Environmental Action Plan*. Accra, Ghana: Environmental Protection Council.

Ecole Polytechnique Fédérale Lausanne [EPFL], (2013). 'Defining Smallholders,Suggestions for a RSB Smallholder Definitions.' Aidenvironment. energycenter.epfl.ch/files/content / sites/ energy-center/files/projets/BioenergyTeam/Definingsmallho. Retrieved: 12/08/15

conomic Report on Africa, (2009) Developing African Agriculture Through Regional Value Chains. Economic Commission for Africa

Emory, C.W. (1985). Business Research Methods. Illinois. Irwin.

Environmental Protection Agency, (1994). *The Ghana EPA Act 1994, Arrangement of Sections*. Retrieved from http://www.lexadin.nl/wlg/legis/nofr/oeur/arch/gha/490.pdf. 11 August, 2009.

Erskine, W.D. and Green, D. (2000). Geomorphic effects of extractive industries and their implications for river management: the case of the Hawkesbury–Nepean River, New South Wales. In Brizga, S. & Finlayson. B. (Eds.), *River Management: The Australian Experience.* (pp 123–149). Chichester, UK: Wiley.

Ethical Trading Initiative, (2005). Recommendations for Working with Smallholder Farmers. ETI Small Holder Farmers Guidelines: www.ethicaltrade.org

FAO, (2000). The State of Food Insecurity in the World, 2000. FAO, Rome.

FAO, (2002). *The State of Food and Agriculture*. Rome: FAO.

FAO, (2012a). *"Background document to the FAO e-mail conference on ensuring the full participation of family farmers in agricultural innovation systems: Key issues and case studies."* 2012a. www.fao.org/docrep/015/an906e/an906e00.pdf

FLO, (2011). *Fairtrade Standard for Small Producer Organizations.* Bonn, Version May 2011_v1.1.http://www.fairtrade.net/fileadmin/user_upload/content/2009/standards/documents/2012-07-11_SPO_EN.pdf

Food and Agriculture Organization of the United Nations, Rome, (2007). Farm Management Extension Services: A Review of Global Experience.

Gay, L. R. (1987). Educational Research: Competencies for Analysis and Application, 3rd ed., (Columbus, Ohio: Merrill Publishing Company, 1987), 101.

Ghana Statistical Service, (2014). 2010 Population and Housing Census- District Analytical Report; Sagnarigu District.

Gob, F. Houbrechts, G. Hiver, J. M. And Petit, F. (2005). River dredging, channel dynamics and bedload transport in an incised meandering channel (The River Semois Belgium), *River Research and Applications*, *21*, 791–804.

Goddard, J. (2007). *Land Degradation and Rehabilitation.* Sydney: University of South Wales Press.

Gwimbi P and Dirwai C (2003). *Research Methods in Geography and Environmental Studies.* Harare: Zimbabwe Open University

Heath, M. J. Merefield, J. R. and Paithankar, A. G. (1993). Environmental impact of mining on tropical forest. *Mining Environmental Management*, *37*, 14–16.

Hill L and Kleynrans C. J. (1999). Authorisation and Licensing of Sand Mining/Gravel Extraction, in terms of Impacts on In-stream and Riparian Habitats. *Journal of Mining Science*. 15, 17-19.

Hinton, J. J. Veiga, M. M. and Beinhoff, C. (2003). 'The Socio -Economic Impacts of Artisanal and Small-Scale Mining in Developing Countries'. Ed. G. Hilson, Pub. A.A. Balkema, Swets Publishers, Netherlands.

Hoepfl, M. C. (1997). Choosing qualitative research: A primer for technology education researchers. *Journal of Technology Education*, *9*(1).

Hull, D. N. (2001). 'Sand and Gravel', *GeoFacts*, (Ohio: Division of Geological Survey), 1-2 www.OhioGeology.com.

IFAD, (2011). Berdegué, Julio, A. and Ricardo Fuentealba. *Latin America: The State of Smallholders in Agriculture*. Conference on New Directions for Smallholder Agriculture. Rome, January 2011: IFAD HQ. http://193.194.138.127/events/agriculture/doc/papers/berdegue.pdf

IFPRI (2008). Chamberlin, Jordan. *It's a Small World After All: Defining Smallholder Agriculture in Ghana,* Development Strategy and Governance Division.

International Labour Organization (ILO), (1999). Social and Labour Issues in Small-scale Mines. Report for discussion at the Tripartite Meeting on Social and Labour Issues in Small-scale Mines, ILO, Geneva.

Imoru, A. (2010). 'The Impact of Gravel, Sand Mining on Communities in Northern Region'. *The ADVOCATE/ RUMNET* February, 2010

Indian Agricultural Census Report of (2000). All -India Report on Input Survey 1991-92. Department of Agriculture and Co-operation (Agricultural Census Division), Ministry Of Agriculture, Government of India, New Delhi.

International Monetary Fund [IMF], (2003). *Ghana poverty reduction strategy paper: An agenda for growth and prosperity*. IMF Country Report No. 03/56, March 2003, Washington, D.C.

International Monetary Fund, (2004). *Ghana poverty reduction strategy paper annual progress report*. IMF Country Report No. 04/207, July 2004, Washington, D.C.

Kasanga, K., and N. A. Kotey. (2001). Land Management in Ghana: Building on Tradition and Modernity. Land Tenure and Resource Access in West Africa. London: International Institute for Environment and Development.

Kindt, R and Lowthian K. (2012). Gravel winning. CIVE 717 www.engr.colostate.edu/~pierre/ce_old/classes/ce717/PPTFiles2012/GravelMining_4.11.12.pptx. Retrieved 20/10/2015

Kumekpor, T. K. B. (2002). Research Methods and Techniques of Social Research, Son Life Printing Press

Kvale, S. (1996). *Interviews: An Introduction to Qualitative Research Interviewing*. Thousand Oaks, CA: Sage Publishing.

Langer, W. H. (2003). A general overview of the technology of in-stream mining of sand and Gravel resources, associated potential environmental impacts, and methods to control Potential Impacts. USGS 02-153p

Madyise, T. (2013). *Case Studies of Environmental Impacts of Sand Mining and Gravel Extraction for Urban Development in Gaborone*. Master of Science Dissertation, University of South Africa.

Mahama, I. (2004). *History and Traditions of Dagbon.* Tamale: GILLBT Printing Press.

Makweba, M. M. and Ndonde, P. B. (1996). The mineral sector and the national environmental policy. In: M.J. Mwandosya *et al* (Eds.), *Proceedings of the workshop on the national environmental policy for Tanzania (Dar es Salaam, Tanzania), 1994; 1996*. *(*pp 164–173).

Minerals Commission and Environmental Protection Council, (1994). *Ghana's Mining and Environmental Guidelines*. Accra, Ghana.

Mining Industry Human Resources Council(2012). *British Columbia Hiring Requirements and Available Talent Forecasts Exploration, Mining, and Stone, Sand and Gravel.* Human Resource Forecast: Kanata, Ontario

Mireku-Gymaa (2015) "Prosecute illegal sand and gravel winners" "Mining and the Environment: the Economic Controversy". Accra, GNA

Mireku-Gyimah, D. and Tsidzi, K. E. N. (1996). Sand and gravel winning and environmental sustainability in Southern Ghana. *Ghana Mining Journal*, Vol. 2, No. 1, pp.46-52.

Mossa, J. and McLean, M. (1997). Channel planform and land cover changes on a mined river floodplain - Amite River, Louisiana, USA. *Applied Geography*, *17*(1), 43–54.

Multimedia group, (2015). *Minimum Daily Wage*. Joy FM. Myjoyonline.com. downloaded: 20/01/15

Murray, A. Cerrilos, L. (2004). Murray Copyright © 2012 Mining Industry Human Resources Council (MiHR). *'British Colombia Hiring Requirements and Available Talent Forecast Exploration, mining, and Stone, Gravel and Sand'.* Mining Industry Human Resources Council

Musah, A. J. (2009). Assessment of Sociological and Ecological Impacts of Sand and Gravel winning – A Case Study of East Gonja District (Ghana) and Gunnarsholt (Iceland) *Land Restoration Training Programme Keldnaholt, 112 Reykjavík, Iceland, Final project*

Nabila P. A. (2000). Traditional Socialization and Women‟s Empowerment: A Study of Adolescent Gender Socialization in Dagbon. – Unpublished MPhil Thesis, University of Ghana.

Onuh, B. (2002). alt Women of Keana, from Newswatch (Lagos) and reprinted at http://allafrica.com/stories/200211190755.html

Peprah, K. (2013). Sand Winning and Land Degradation: Perspective of Indigenous Sand Winners of Wa. *Ghana Journal of Environment and Earth Science* www .iiste.orgISSN 2224-3216 (Paper) ISSN 2225-0948 (Online). Vol.3, No.14

Petit, F. Poinsart, D. and Bravard, J. P. (1996). Channel incision, gravel winning and bedload transport in the Rhône river upstream of Lyon, France ("canal de Miribel"). *Catena*, *26*, 209–226.

Polit D. F. and Beck C. T. (2008). *Nursing Research, Principles and Methods.* Philadelphia: Lippincott Williams & Wilkins.

Quan, J., S. F. Tan, and C. Toulmin. 2004. Land in Africa: Market asset or secure livelihood? Paper read at Land in Africa Conference, at London.

Richardson, R. (1999). Governing Western Mineral Resources: the Emergence of Collaboration. *Natural Resources Journal. Vol, 43pp* 561 – 586. lawschool.unm.edu/nrj/volumes/43/2/07_richardson_mineral.pdf. Retrieved: 13/7/16

Rinaldi, M., Wyzga, B. and Surian, N. (2005). Sediment mining in alluvial channels: Physical effects and management perspectives. *River Research and Applications*, *21*(7), 805–828.

Ross, M. (2001). *Extractive resources and the poor*. Boston: Oxfam *America Report*.

Sagnarigu District Assembly (2015). *The Composite Budget of the Sagnarigu District Assembly for the 2015 Fiscal Year.* Accra: Ghana Ministry of Finance

Sear, D.A. and Archer, D.R. (1998). The effects of gravel extraction on the stability of gravel bed rivers: A case study from the Wooler Water, Northumberland, U.K. In Klingeman, P.C.

Shepherd, I. D. H. (2005). "Self marketing and personal branding in the marketing curriculum", Working Paper of the Academy of Marketing Conference, Dublin 2005.

Sjaastad, E., and D. W. Bromley. (1997). Indigenous Land Rights in Sub-Saharan Africa: Appropriation, Security and Investment Demand. World Development 25 (4): 549-562.

Surian, N. and Rinaldi, M. (2003). Morphological response to river engineering and management in alluvial channels in Italy. *Geomorphology*, *50*, 307–326.

Suzanne, R. F. (2002). *Instream Gravel winning and Related Issues in Southern Missouri***.** U.S. Geological Survey, U.S. Dept. of the Interior, [2002] [4] p.

Thorsen, D. (2012). 'Children in Mines and Quarries; Evidence from Central and West Africa'., Briefing Paper Number 4. UNICEF.

Ubink, J. M., A. J. Hoekema, and W. J. Assies. (2009). Legalising Land Rights: Local Practices, State Responses and Tenure Security in Africa, Asia and Latin America. Law, Governance, and Development Research: Leiden University Press.

USAID (United States Agency for International Development). (2013). Agriculture and food security. http://www.usaid.gov/ghana/agriculture-and-food-security (retrieved February 3, 2013).

Veiga, M.M. and Beinhoff, C. (1997). UNECA centers: A solution to reduce mercury pollution from artisanal gold mining activities. *UNEP Industry and Environment, 20*, 49–52.

Warhurst, A. (1994). *Environmental Degradation from Mining and Mineral Processing in Developing Countries: Corporate Responses and National Policies*. Paris: Development Centre, OECD.

Warhurst, A. (1999). Environmental Regulation, Innovation, and Sustainable Development. In Warhurst, A. (Ed.), *Mining and the Environment: Case-Studies from the Americas*. Ottawa: International Development Research Centre.

Weigand, D. C. (1991). Effects of Gravel Scalping on Juvenile Salmonid Habitat. Masters Thesis. University of Washington, Seattle.

Willis, K.G. and Garrod, D. (1999). Externalities from extraction of aggregates regulation by tax or land-use controls. *Resources Policy, 25*, 77–153.

Women in Informal Employment: Globalizing and Organizing (WIEGO), (2016). Empowering Informal Workers, Securing Informal Livelihoods. wiego.org/informal-economy/occupational-groups/smallholder-farmersRetrieved: 12/06/15

WMMF, (2000). Mining Communities Workshop: Artisanal Mining, In: Proceedings of the 1st WMMF, Toronto, Canada, March 8-11, 2000.

Yin, R. K. (2003). Case Study Research: Design and Methods 3rd Edition. *Sage, Google Books*

Zurek, M. Streck, C. Roe, S. and Haupt F. (2014). Climate Readiness in Smallholder Agricultural Systems: Lessons Learned from REDD+. CCAFS Working Paper no. 75. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org. Retrieved: 25/05/15

APPENDICES

APPENDIX A: Interview Guide for Smallholder Farmers Engaged in Gravel winning

1. Name:

2. Sex:

3. Age:

4. Level of Education:

5. Occupation: Smallholder Farmer

6. What crops do you cultivate?

7. How many acres do you devote for each of the crops you cultivate now?

8. Do you engage in gravel winning?

9. How long have you been engaged in gravel winning?

10. How did you come to engage in gravel winning?9. Before you engaged in gravel winning, how many acres did you cultivate?

10. How many bags/bowls of the produce did you harvest one/ two years ago?

11. How do you get money to support you in your farm work?

12. What categories of people engage in gravel winning in Kukuo-Yepalsi pitch? E.g traders, farmers, drivers, assembly-men etc

13. Why do you think these categories of people engage in gravel winning?

14. How many days in a week do you engage in gravel winning?

i. Dry season

ii. Farming season

15. What is your role in the gravel winning?

16. How many trips of gravel do you load per day?

18. How much are you paid for each load?

19. How much do you as an individual earn in a day?

20. What do you do with what you earn?

21. Do you use part of it in your farming activities?

22. What aspects of your farming activities are funded using money from gravel winning?

23. What challenges do you face in gravel winning?

24. What problems do you think gravel winning cause in your community?

25. What problems do you think gravel winning causes you as a person?

26. How can these problems be solved?

27. Do think gravel winning can keep you engaged in the next 10 – 15 years?

28. Do you like gravel winning?

APPENDIX B: Interview Guide for Chiefs and Opinion Leaders in Communities Engaged in Gravel winning

1. Name:

2. Sex:

3. Age:

4. Level of Education:

5. Occupation:

6. What categories of people engage in the gravel winning in this community?

7. How is land made available for gravel winning in this community?

8. How much land (in acres) did you give out?

9. To whom is commission for gravel winning paid?

10. What are the funds accruing from the commission used for?

11. How many trips of truck load are fetched per day?

12. How much commission is paid on each truck load?

13. What benefit do you get from the mining in this community?

14. What problems in your opinion does gravel mining cause in this community?

15. What other bad things does gravel winning bring to this community?

16. What steps can be taken so as to solve the problems associated with gravel winning in this community?

APPENDIX C: Interview Guide for Drivers Engaged in Gravel winning

1. Name:

2. Sex:

3. Age:

4. Level of Education:

5. Occupation:

6. Where do you fetch gravel from?

7. How do you get access to gravel sites?

8. How many trips do you go in a day?

9. What financial commitments are there in the fetching of gravel from the sites?

10. How much do you pay to the loading boys before fetching?

11. How much do you pay to the Sagnarigu District assembly before fetching each truck load of?

12. How much do you sell a trip for?

13. What are the benefits of gravel winning to you?

14. Are they any problems caused the communities from where gravel winning is done?

15. How can these problems be solved?

16. Do you enjoy the work?

APPENDIX D: Characteristics of Tipper truck Drivers by Community

Characteristic	Community											
	Tampe-kukuo		Kukuo-Yapalsi		Young-Duuni		Shiɣu		Galinkpeɣu		Total	
Sex	N	%	N	%	N	%	N	%	N	%	N	%
Male	10	20.0	10	20.0	10	20.0	10	20.0	10	20.0	50	**100**
Female	-	-	-	-	-	-	-	-	-	-	-	**-**
Age Group												
20-29	_	-	3	6.0	1	2.0	2	4.0	2	4.0	8	**16.0**
30-39	4	8	5	10	2	4	6	12	2	4	19	**38**
40-49	6	12	1	2	6	12	2	4	5	10	20	**40**
50-59	-	-	1	2	1	2	-	-	1	2	3	**6**
Education												
Informal	2	4.0	2	4.0	3	6.0	2	4.0	2	4.0	11	**22.0**
Basic	4	8	6	12	4	8	6	12	5	10	25	**50**
Secondary	4	8	2	4	3	6	2	4	3	6	14	**28**

Source: Field Work (June 2015)

APPENDIX E: Demography of Chiefs and Opinion Leaders

Characteristic	Community											
	Tampe-Kukuo		Kukuo-Yapalsi		Young-Duuni		Shiɣu		Galinkpeɣu		**Total**	
Sex	N	%	N	%	N	%	N	%	N	%	N	%
Male	3	15.0	2	10.0	3	15.0	4	20	3	15.0%	15	**75.0%**
Female	1	5	1	5	1	5	1	5	1	5	5	**25**
Age group												
20-29	-	-	-	-	1	5.0	-	-	-	-	1	**5.0**
30-39	-	-	1	5	1	5	1	5	2	10	5	**25**
40-49	1	5	1	5	-	-	3	15	1	5	6	**30**
50-59	3	15	1	5	-	-	-	-	-	-	4	**20**
60 &above	-	-	-	-	2	10	1	5	1	5	4	**20**
Education												
Informal	2	10	-	-	3	15.0	3	15.0	2	10.0	10	**50.0**
Basic	-	-	-	-	1	5	2	10	2	10	5	**25**
Secondary	2	10	2	10	-	-	-	-	-	-	4	**20**
Tertiary	-	-	1	5	-	-	-	-	-	-	1	**5**
Occupation												
Farming	3	15.0	2	10	4	20.0	5	25.0	4	20.0%	18	**90.0**

Characteristic	Community											
	Tampe-Kukuo		Kukuo-Yapalsi		Young-Duuni		Shiɣu		Galinkpeɣu		**Total**	
Sex	N	%	N	%	N	%	N	%	N	%	N	%
Male	3	15.0	2	10.0	3	15.0	4	20	3	15.0%	15	**75.0%**
Female	1	5	1	5	1	5	1	5	1	5	5	**25**
Age group												
20-29	-	-	-	-	1	5.0	-	-	-	-	1	**5.0**
chemical seller	1	5	-	-	-	-	-	-	-	-	1	**5**
Teacher	-	-	1	5	-	-	-	-	-	-	1	**5**
Position												
Assemblyman	1	5.0	1	5.0	1	5.0	1	5.0	1	5.0	5	**25.0**
Magazia	1	5.0	1	5.0	1	5.0	1	5.0	1	5.0	5	**25**
Chief	1	5.0	1	5.0	1	5.0	1	5.0	1	5.0	5	**25**
Elder	1	5.0	-	-	1	5.0	1	5.0	1	5.0	4	**20**
Youth Leader	-	-	-	-	-	-	1	5	-	-	1	**5**

Source: Field Work (June 2015)

APPENDIX F: Images Showing Negative Effects of Gravel Winning

Image 4.1 Huge Tracks of Land being Lost by Smallholder Farmers to Gravel Winning

Source: Field work 2015

Image 4.2 Logs of destroyed Shea Plants

Source: Field Trip June, 2015

Image 4.3 Eroded soil facilitated by pits of Gravel Mines.

Source: Field work ,(June 2015)

Image 4.4 Shows some gravel loaders with shovels at work.

Source: Field work (June, 2015)

Image 4.5 Cleared land leaving neither tree nor grass standing

Source: Field Work (June, 2015)

Image 4.6: A Road Destroyed by Heavy Tipper Trucks Plying the Roads to the Gravel Pits

Source: Field work (June, 2015)