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# LAND GRABBING FOR JATROPHA BIO-FUEL IN GHANA; ASSESSING THE IMPACT ON HOUSEHOLDS' LIVELIHOOD IN NORTHERN GHANA.

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**Declaration**

I, hereby declare that this thesis is an outcome of my research work and findings. Information which were included in the research which were not my own have been acknowledged and references being appended. This research work has not been produce and submitted for academic purpose in any University for an award.

Signature..... Date.....

Wilson Danso.

**Dedication**

I dedicate this research to my sweet wife Joyce Antwi and my parents; Mr. Foster Yaw Danso and Elizabeth Kraah.

**Acknowledgment**

I thank the Almighty God for His direction and protection throughout the period of my course for giving me the strength to overcome all the obstacles that I encountered in accomplishing this course successfully.

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**Abstract**

The research focus on the impacts of large scale production of jatropha cultivation for bio-fuel and it effects it has on the local farmers in their access to land, ensuring food security and their livelihoods in the four selected local communities in the Yendi district of northern Ghana. The local communities in which the research carried out were Jimle, Kpachaa, Kpalkore and Chegu. The research analyzed jatropha production and the effects on local livelihoods with the use of sustainable livelihood approach in accessing the various assets available to the households. The Bio-fuel Africa Ltd acquired 15000 hectares of land for the production of jatropha with 400 hectares at the research area. Hundred of households were conducted for an interview to obtain information relating to some of the positive and negative impacts the company's activities have brought onto the local people's livelihoods. Twenty five households were selected from each community for the interview. In addition to the households who were interviewed, the management of bio-fuel Company and the local chiefs were also interviewed.

A sustainable livelihood framework was used to analyze how the production of jatropha could improve or worsen the human, financial, physical, social and natural assets of the local people in the face of external shock. The research findings indicted that majority of the local farmers who lost their land to the jatropha project experienced negative impact in their farming activities and other economic activities which affected their income level and livelihoods. The research findings also indicated that most of the households were poor with an income level less than a dollar a day. Despite the economic challenges that the households faces, those who were employed by the company had a positive impact in their income level and livelihood. The company activities also generated other social facilities such as grind-mill, dams, and a clinic for the local people which have improved their livelihoods to a certain level. It was noted from the research findings that jatropha production could be used as a means to developing rural communities if the traditional land tenure system of the local communities are adhered to and given consideration and the engagement of the local people in the project. However, when land acquisition for bio-fuel production by the foreign companies are not treated with care, it could denied the local people of their farmlands which could leads to food insecurity and worsening of their livelihoods.

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## Chapter One

### 1.0 Introduction

**1.1** Background

The thesis will examine the impacts of land grabbing for jatropha bio-fuel on households in Yendi district of northern Ghana. The climatic pattern in recent years has made it necessary to come up with strategic policies and means of curbing the adverse effects it has on the environment. These effects on the environment have a negative impact on agriculture which serves as a main source of food and employment in most rural areas has become more affected by the changes in climate in recent years. In an attempt to promote development, improve in the living standard, energy security and reduce poverty level in rural areas, has created a massive interest in bio-fuels since the past few decades ( Dufey, 2006, Lutaladio and Brittaine , 2010).

However, the investment in bio-fuel has its own ups and downs in terms of land acquisition and its production effects on the environment and the community as a whole. The sudden interest in bio-fuel investments and the size of land areas required for large scale production have resulted in a debate among interested groups such as the environmental agencies, government agencies, and policy makers concerning food security, the environment and livelihoods in such local communities in the country.

The production of jatropha for bio-fuel has been on-going in India and most parts of African countries such as Kenya, Malawi, Ethiopia, Senegal, South Africa and Ghana. Ghana is currently noted as among the countries in the forefront of bio-fuel investments. Among the feedstock identified for bio-fuel production in the country include jatropha and cassava but the former is more predominant (Public Agenda, 2010). The intended purpose for the production of jatropha is for commercial plantation to generate ethanol and bio-fuel which will demand large areas of land for its production. There have been large areas of land already acquired and other areas of land are under negotiation for the production of jatropha in the country. Investments in the production in bio-fuel in the country are largely influenced by foreign capital. Foreign bio-fuel companies operating in Ghana include Bio-fuel Africa Ltd in northern Ghana and Norwegian companies Scan Fuel AS and Solar Harvest which was established in 2009 for jatropha bio-diesel production in the Asante Akim North Municipal Assembly and Solar Harvest AS through its African affiliate, Bio-fuel Africa Ltd in northern

Ghana. The European Union has come out with a £2 million project for 500 hectares of land for jatropha cultivation at Walewale Mamprusi district in northern Ghana (Ghana Business News, 2010). Bio-fuel investors reported to be requesting for land for jatropha bio-fuel investments include company from Israeli, Galten and a company from India demanding for a land area of 50,000 hectares to cultivate jatropha (Public Agenda, 2010). An increase of jatropha cultivation is due to the widespread perception of production viability on marginal land areas, lack of competition with food crops and high economic returns for small scale farmers (Ariza-Montobbio et al., 2010).

There are also Ghanaian bio-fuel investments which are either privately owned or affiliated with foreign companies. These include Biodiesel 1 Ghana Ltd. in Kwame Danso in the Sene district of Brong Ahafo, the bio-fuel company Caltech with its Ghanaian associate, Banket Ltd working on a land size of 1,180 hectares for cassava production into ethanol in the Volta region of Ghana. Many small scale production of bio-fuel are taking in most parts of the country by Universities and research centers in a form of pilot basis.

There have been many controversies on the investment of bio-fuel in the country by foreign investors due to the scale of operation and the demand for large areas of land from the local communities. There is the fear of exploitation through alienation of the people from their land which they cultivate their farming activities and survive from it.

The debates about the quick emerging bio-fuel industry heightened when Scan Fuel AS and Bio-fuel Africa Ltd. acquired 400,000 and 23, 000 hectares of land area, respectively, in 2008 in the Central Gonja and Yendi districts of northern Ghana for jatropha plantation. This controversial debate was due to the fact that the country's food production was not able to meet the demand of the populace let alone releasing such vast land to foreigners for jatropha production. This situation makes the importation of food into the country inevitable and which also has its own negative implication to the economy of the country. The necessity of supplying food in critical situation with the accompanying high food prices in the country is presume to worsen given the spate of bio-fuel investments and consequent outsourcing of large land areas (Action Aid-Ghana, 2011).

The production of bio-fuel is undoubtedly a step in the right direction for reducing carbon dioxide emissions related with fossil fuels and their negative impact on the environment. It also reduces our dependency on fossil fuels. Bio-fuel production as one of its numerous advantages can serve as a form of energy and as a substitute wood and dung used which are

used in most rural communities as a form of energy. It will also help in reducing the health risk of inhaling the smoke that comes out from the use of wood and also help to curb deforestation when bio-fuel are widely used as a form of energy instead of wood. The other importance of bio-fuel production is the anticipated job creation it will provide to the local communities. This will provide a source of income to the local farmers and improve their living standard and thus, reduce the poverty level of the households.

With some of the benefits mentioned for the production of bio-fuel, the acquisition of land for the production of bio-fuel has meted out with criticism with the fear of creating food shortage due to the competition of land meant for food production, being allocated for the production of jatropha. The production of bio-fuel demands vast areas of land which are mostly being used for the cultivation of food crops by farmers mostly in third world countries such as Ghana.

Many environmentalists have also shown concern on the impact of bio-fuel to the environment. The clearing of land for bio-fuel production leads to the loss of biodiversity. For instance, about 18million hectares of forest in Indonesia have been cleared over the past 25years for the production of oil palm-derived bio-fuel but only 6 million hectares have actually been put under cultivation (Colchester et al., 2006 cited in Cotula et al., 2008). Indonesia is known to be holding the record of the fastest deforestation which is partly due to the cultivation of more oil palm plantations for bio-diesel. Furthermore, an efficient production of bio-fuel demands the consumption of large quantities of nitrogen fertilizers and herbicides which will have a negative impact on the environment. The release of nitrogen oxide into the atmosphere from nitrogen turns to contribute to greenhouse gas which leads to global warming. The nitrogen could also be washed into aquatic habitat such as lakes, streams, rivers and other water bodies which could cause eutrophication and affect the habitat of the aquatic species as well as human health. The cultivation of bio-fuel plantation will have the tendency to promote mono-culture which can result to soil erosion. It is reported that the production of corn products can lead to a more soil erosion and uses more herbicides, insecticides and nitrogen fertilizers causing water pollution than any other crops (Pimentel, 2003). The ethical aspect of using corn which is a widely consumed food in the world for the production of ethanol when most countries especially in developing countries are facing malnutrition and starvation gives much thought of concern (Pimentel, 2003).

The effectiveness of bio-fuel production relies on the price of crude oil in the world market. The higher the price of crude oil in the world market encourages, for the production of bio-fuel to reduce the cost of energy. However, a fall in crude oil in the world market can reduce the zeal of engaging into bio-fuel production.

## 1.2 Problem Statement

The increase in population and quick expansion of transport has necessitated for the demand for fuel as a form of energy particularly in developing countries. The energy is required to provide power for electricity for the consumption of millions of people in their various homes and also for industrial consumption to boost the economic growth of countries thereby reducing poverty. The demand for energy with reduction in world oil reserves, coupled with the environmental effects with the use of fossil fuel has made it necessary for an alternative source of energy which is less damaging to the environment (Pandey, 2009). The production of jatropha for bio-fuel demands the acquisition of vast areas of land. The lands are normally taken from the farmers which are meant for food production. This gives concern to food security, environmental pollution, etc. The production of jatropha in the country has become an issue for various bodies such as the policy makers, government agencies, Non-governmental Organizations and the local communities due to the implication involved with the production of jatropha for bio-fuel. To this respect, there is the need to examine the instances of success of the production of jatropha for bio-fuel to the people in the communities, how it has helped to impact positively in poverty reduction and the livelihoods of the people in northern region of Ghana.

## 1.3 Objectives of the research:

The overall objective of the study is to understand the livelihoods transformation in the local communities in which the research took place and the consequences encountered due to the establishment of bio-fuel plantation. The thesis is aimed to examine how jatropha project has helped to improve the livelihoods of the affected farmers and its impact on the poverty level in the local communities. The objectives of the thesis have been categorized into three sections, followed by the research questions relating to the specific objectives.

**Objective 1**. **To study the benefits of jatropha plantation to the local communities.**

I will examine the benefits that the local communities had gained from the production of jatropha. I will also look at the impact of production of jatropha in the transformation of the households' livelihoods in relation to poverty reduction.

Research questions:

1. How has the establishment of jatropha plantation benefited the households in the community?
2. How has the establishment of jatropha project for bio-fuel been able to reduce poverty level in the local communities?
3. Have the households' livelihoods improved as a result of jatropha plantation?

**Objective 2**. **To study the food security of households involved in bio-fuel project.**

This objective aimed at examining food security in the local communities with the inception of jatropha production for bio-fuel. As land for food crops were given out for jatropha project by the local farmers, it is relevant to investigate whether some measures were taken to ensure that food security is not being threatened.

Research questions:

1. How has the establishment of jatropha project affected food security in the local communities?
2. What measures are taken to secure food production in relation to the bio-fuel plantation?

**Objective 3**. **To study the impact of jatropha project on the land rights and other related land resource activities in the local communities.**

This objective aimed to investigate the impact of jatropha project on the land rights of the local communities. I will also examine the land tenure system that govern the local communities and how lands are being accessed in the region, the other related economic activities that are done in the communities and also examine effects of the project on the environment of the communities.

Research questions:

1. How many households have released their farm land for the project?
2. What other economic activities are the farmers who lost their land to the project engaged in afterward?
3. What measures has been taken to curtail any harmful effects to the environment that may occur as a result of jatropha production?

### 1.4 The structure of the thesis

The thesis is grouped into four chapters. The first chapter gives background information about the thesis. It also gives information about the study area. It explains the general features of the district such as the demography characteristics of the area, social-infrastructural features etc. It also gives information on jatropha bio-fuel production in the area. The thesis has three major objectives in which a brief explanation will be provided for each section. Chapter two gives information about the theoretical framework used to analysis jatropha plantation. It captured the literature which has already discussed on the thesis topic before and also reviewed the land tenure system in the research area. Chapter three provides the methodology adopted for the thesis. Qualitative method was used for data collection with the use of questionnaire survey. The procedures of data collection and ethical consideration are among the things to be discussed under this chapter. Chapter four is the main aspect of the research. It provides information on sustainable livelihoods approach being used to analyze the various assets of the households. The chapter gives information about the members of the households, the impact of jatropha project on the communities, the relationship that exists between the local communities and the company and livelihood in general. The last part of the chapter provides the summary and findings of the research. It also provides suggestions which could help promote a cordial relationship between the local communities and the company and ensure a win-win benefit for both the Bio-fuel companies and the local communities.

### 1.5 The significance of the study

The study is important for various reasons. There is a wide spread of publications and research on the cultivation of jatropha and its relevance in promoting poverty reduction, ensuring food security and the livelihoods diversification with much emphasis on the rural

poor and their communities. The study is centered on how jatropha cultivation has been able to transform the livelihoods of the rural poor in the selected communities: Kpachaa, Jimle, Kpalkore and Chegu. These communities are among the most affected areas in the country in which rural farmers have had to lose their lands on which their livelihoods depended to jatropha project. The study will emphasize on whether jatropha cultivation has benefited or worsened the livelihoods of the rural farmers and their communities. It will also make suggestions for policies which could help the local communities in promoting their living standard in future policies that Bio-fuel Africa Ltd engaged may adopt.

### 1.6 The jatropha plant and its features

Jolatropha curcas is a strong drought resistant and a perennial crop belonging to the family tree of Euphorbiaceae. It is a short tree with a smooth grey bark, which produces whitish sap and latex when cut. The height of the plant when it gets to its peak growth generally ranges between 3 to 5 meters (Kaushik et al., 2007). In my research field however, it was noticed that some of the jatropha could grow beyond that range to heights ranging 8 to 10 meters. Jatropha production could be established on marginal soils and can grow easily and quicker as compare to other plants in euphorbiaceae family. The propagation of the plant could either be in the form of stem cuttings or by seed. The seeds can be sown directly on the field or on a seed bed and in plastic bags in a nursery before being transferred into the field (Nyamai and Omuodo, 2007). The propagation of jatropha plant in a form of seed usually develops a four lateral roots and a tap root which supports the plant and also absorbs moisture from the deeper layers of the soil. On the other hand, the propagation of the plant through stem cutting results in the development of lateral root (Henning, 2003). According to Kaushik et al., (2007), stem cutting is recommended when jatropha hedges and plantations are demanded to check erosion whereas propagation by seed is recommended when the plants are meant for oil production. Direct seeding is believed not to have a long lifespan and survives only when it is done under moist conditions and on a well prepared soil with more seeds planted per hole (FACT, 2006). According to Nyamai and Omuodo (2007), the lifespan of the jatropha ranges from 10 to 15 years when it is propagated by stem cutting. Jatropha plant is grown in many parts of African countries and it is associated with the name jatropha curcas L. However, the originality of the plant is yet to be known. According to Heller (1996), the plant' origin is believed to have come from Mexico and Central America. It is also believed to have come from the Caribbean

where its distribution began by the Portuguese seafarers through Cape Verde and Guinea Bissau which expanded to other part of the world mostly in the tropic areas. Jatropha plant is a crop that is able to stand against drought and it is well adapted to arid and semi-arid environment (Heller, 1996). The plant demands an annual rainfall of 600 to 700mm to survive well. In the dry period, the plant's sheds it leaves in even though it has a strong resistance to drought (Henning, 2003). The annual temperature conducive for jatropha is 20$^{o}$c and can still function under light frost conditions (Henning, 2003). Drained soils with a good aeration also provide a good ground for jatropha to grow well but are able to accommodate in a poor soil for its growth (Nyamai and Muodo, 2007). The plant does not demand irrigation system for a long duration to keep it in a well shape. The beginning stage of the plantation might require irrigation especially in the dry season. The plant is cultivated in between a distance of 2-3meters and 2500 plants could be cultivated by per hectare. Jatropha grow quick and bear fruits within the second year and continue to bear fruits for the next thirty to fifty years. The peak stage harvest of jatropha is attained from the fifth year. The wet period is the stage at which jatropha plants develop flowers and subsequently develop its maturity stage of bearing fruits within three to four months. The flowerings of the plant are normally observed twice in the season but in some cases the flowering can be observed throughout the year when the soil contains all the necessary nutrients and good environmental condition. Jatropha seeds yield within the range of 0.5 to 12tones per hectare annually as being reported by several literatures. The yield of jatropha mostly depends on the nature of the soil and the rainfall pattern (Jonschaap et al., 2007).

Jatropha is considered to be the most suitable crop for the production of bio-fuel as a result of the many benefits that is derived from it than other bio-fuel crops. Even though jatropha could grow on marginal land with little nutrients content, it is able to adapt well to some main nutrients like Nitrogen, Phosphorus, Potassium and Potassium and a limitation of these nutrients can negatively affect the growth and production of the crop (Jongschaap et al., 2007). The seeds of the plant generate much oil content ranging from 25% to 35% and 50% to 60% in the kernel (Nyamai and Omuodo, 2007). More than 318,000 litres of oil yield can be obtained per 259 hectares per year as against corn which yield 31800 litres and rice 159000 litres per 259 hectares per year (Renewable Energy, U.K). The oil from jatropha is considered to be clean for use as it is believed not to contain sulphur which thus, gives very low sulphur emission fuel. The impact of jatropha in its technological transformation to the environment is much better of as compare to renewable source of energy like mini-hydro power, solar energy

and biomass gasification (Kaushik et al., 2007). This analysis is quite controversial and has therefore led to a further debate on the issue. As other bio-fuel crops such as sugarcane and corn which demand irrigation in most of the time, jatropha cultivation is able to do away with irrigation and yet able to grow well. This makes it easy for rural farmers who are poor in acquiring sophisticated machines to erect irrigation system and sole rely on natural rainfall to cultivate the crop. Jatropha generate oil which could be used to substitute for diesel and paraffin to serve as power for local lanterns by the rural farmers, light generators for pumping water and also for local milling machines. Jatropha plant is believed to have medicinal values which are mostly used in local medicine in most tropic areas. The plant also serves as a raw material for fishing net and dying cloths (Nyamai and Omuodo, 2007). The leaves of jatropha shed off from their trees during the dry season in order to ensure the reduction of loss of transpiration and to maintain moisture. The shed leaves help to prevent soil erosion by forming mulch around the base of the tree. The mulch also helps to improve the soil fertility after its decomposition. Jatropha is able to be farmed alongside other cash crops such as sugar, coffee, fruits and vegetables. It thus, entertains inter-cropping.

**Figure 1.0 Jatropha plantation inter-cropped with maize**

Source: www.jatropha.pro

Jatropha plant could also be served as a hedge to secure gardens and fields from animals on astray since cattle and other livestock do not browsed on the plant. According to Heller (1996), the cake from jatropha could be served as a good source of organic fertilizer which enhances soil fertility. The oil pressed cake which come out from jatropha and has been detoxified could also be used for animal feeding. Soap and pharmaceuticals could also be made out of the by-product of jatropha called bio-glycerol. The jatropha plant also helps to reduce the amount of carbon dioxide in the atmosphere by the absorption of it and thereby helping to reduce environmental pollution. This makes jatropha stand the position of earning carbon credits as countries signed to the Kyoto Protocol consider biofuels as way of achieving the aims of emission reduction.

## 1.7 Study area

The thesis examines the features of the municipality by looking at the climatic, physical, socio-economic, political and other characteristics which are important and peculiar to the communities where the study is being carried out. These features gives much reasons why those communities where considered as a conducive environment for jatropha plantation in the Northern region of Ghana.

### 1.7.1 Location and area size

The district of Yendi is found in the eastern part of the northern region of Ghana. It is located between latitudes 90 to 350$^{o}$ North and 00-300$^{o}$ West and 00-150$^{o}$ East. The district and other towns around it such as Lumpua, Yendi, Laatam,Nakpachei and Gbetobu serve as a path-way for the Greenwich Meridian. The municipality shares boundaries with 9 districts; Nanumba and East Gonja to the South, Saboba, Chereponi and Zabzugu/Tatale districts to the east. To the west it shares boundaries with Savelugu/Nanton and Tamale Municipality and to the north with the Gusheigu and Karaga districts. The municipality is considered as the sixth largest municipality in the northern region with regards to the land size of 5350Sq.km.

### 1.7.2 Climatic conditions of the area

The mean annual rainfall in Yendi district is 1130mm. The district experiences two major seasons within the year. They have rainy season and dry season. The rainy season begins from May to October and the dry season starts from November to April. The pattern of the rainy season is not reliable in most cases. The mean annual rainfall is within 500 to 600mm. The temperature of the district ranges from 20 to 35$^{o}$c. The weather condition in the area is unbearable during the dry season with scorch sun and very high temperature accompanied by warm wind during the day. The district area is covered with grassland and vegetation of savanna trees in a vast area due to the sparsely population of the district. This makes the area prone to bush burning due to the dry nature of the environment. The area is also supported with trees such as dawadawa, mango, baobao, shea nut trees and cashew that generate economic activities in the district.

### 1.7.3 Demography

The Yendi district is one of the biggest districts in the northern region with a population of 199,592 according to the latest population census which took place in the country in 2010 (http://www.citypopulation.de/php/ghana-admin.php?adm2id=0619). The populace could be categorized as being rural dominates with 62% of the populace living in rural area and 37.4% of the populace living in towns. The district is mostly occupied by ethnic groups being referred as northerners such as the Dagombas, Moshie, Kokombas, Hausa and minority of ethnic groups such as Ewe, Akan who are not originated from the region but came and settled in the environment due to other economic factors. The district is being identified by the ethnic of Dagombas as the original settlers who form the majority of the population.

### 1.7.4 Soil characteristics of the research communities

The soils in the region are predominantly sandy soil, laterite, alluvial soil, ochrosol and clay soil were formed from sedimentary rocks such as voltarian sandstone, shales and mudstones (www.ghanadistricts.com). The organic content in the soil is very low at the research area and this could be attributed to bad agriculture practices and extensive bush burning that occurs during the dry season. This situation contributed to the reason why the area always experiences low yield in their production of food crops and thereby affect food security in the communities.

### 1.7.5 Economic Activities in the district

The dominant economic activity in the district is subsistence farming. It constitutes about 85% of the entire economic activities in the district (G://www.ghanadistricts.com/districts/?news&r=91). The other economic activities in the district are Shea butter processing, groundnut production for oil extraction, smock weaving, meat production, commercial transport, fishery, whole sale and retail of general goods and services. The district has a large area of land for agricultural production which could enhance food security in the region. The size of the land area is 535,000 hectares of which 90% forms arable land for the production of various food crops (www.ghanadistricts.com). The major crops cultivated in the district are yam, maize, cassava, sorghum, millet, groundnut and cowpea. Due to the subsistence farming system in the district, most of the crops produced are consumed by the households and the left over are sold to generate income for the households. In addition to crop farming by the farmers or the households, they engaged in livestock rearing such as cattle, goats, sheep, pigs and poultry. The animals serve as a nutritional value to the households and also as an additional income through the sale of some of them. The farmers in the region place much emphasis on animals in determining of one's wealth especially cattle rearing. The northern region and its districts are considered to be the backbone of cereal production in the country.

### 1.7.6 Political features of Yendi municipality

The Yendi Municipal Assembly was established in 1988 by PNDC Law 207, Act 462, and LI1443. The Municipal Assembly was transformed into a Municipality status in 2007. The Municipality is one of the Forty (40) Municipal Assemblies in the country. Yendi Municipality is the only municipality in the region and the capital of the Dagbon Kingdom and the seat of the Ya -Na the Over Lord of Dagbon. The Municipal Assembly is created with one Urban council and five Zonal Councils; Yendi Urban Council, Jimle Area council, Kpabia Area Council, Malzeri Area council, Sang Area council and Gbungbaliga Area council. The Municipal Assembly has 57 unit committees.

### 1.7.7 Socio-infrastructural development in the area

The infrastructure development of the municipality is not much to be desired due to lack of essential facilities which demand much attention for improvement. The Yendi Township as a major urban center has taken much attention in terms of infrastructure development to the

neglect of the rural areas surrounding it. These villages are occupied by a large number of the populace in the region which makes it important that infrastructural development is extended to most of the villages to enhance the living conditions of the people. The region has only one hospital under the government which is located in Yendi with five health centers located in Sang and Jimle, Bunbonayili, Gnani and Adibo. The The municipality has four (4) other Community Health and Planning Services (CHPS) at Sunson, Dabogni, Kuni and Bofoyili. The national electricity grid is gradually extending to some of the villages in the municipality apart from Yendi such as Nakpachie, Gukpegu, Zang etc. Water supply in the region comes from Ghana Water Company Limited with about 320 boreholes provided to about 165 communities in the region which are being supported by Non-Governmental Organizations, UNICEF and other church organizations. The Yendi municipality is endowed with a total of three hundred and eighty-six kilometers (386km) road network. The road network consists of 57km major roads (first class roads) 146km secondary roads and 183km feeder roads (second-class roads). The Yendi municipality has twelve (12) markets located in Yendi, Jimle, Sakpe,Bunbonayili, Adibo,Sang, Kpabia,

Ghani,Nadundo, Nakpachei, Sambu and Gbungbaliga.

**Figure 1.1 Map of Ghana showing the research area**


Source: Worldtravels.com

## 1.8 Bio-fuel Production in Ghana

Ghana has always been referred as 'the gate way to Africa'. This is due to the peaceful environment and hospitality the country enjoys. The country's population is about 25million. It is a country which has majority of the populace engaged in agricultural activities. The agric sector used to be the largest economic sector in terms of it contribution to the GDP. The service sector has now taken over and thus, employs about 60 to 70% of the total work force in the country and contributes 35% of the gross domestic product of the country (Caminiti et al., 2007). The country is blessed with natural resources such as bauxite, diamond, gold and manganese. The country recently engaged in the extraction of oil which has become an

additional source of revenue for the government. The country major exports are gold and cocoa.

Bio-fuel production is a recent development in the country. The bio-fuel industry in the country has the potential of building the economy of Ghana in a positive direction. A bio-fuel company, having all the necessary inputs that will ensure massive production could help the country to produce its own fuel rather than importing. This will also boost employment opportunity in the country by engaging of farmers into massive crop production such as cassava for ethanol, oil palm and jatropha for bio-fuel. However, the use of cassava to produce ethanol instead of food consumption as it is one of the staple foods in the country will be a subject of debate as it will raise the concern of food security in the country. For the country to get into the production of cassava for bio-ethanol, then there must be a structure put in place to ensure that there is an increase in the production of cassava with less cost of production. The production of oil palm for bio-diesel is also not different from the negative implication which could possibly hit the country if strong measures are not taken for converting food crop into bio-diesel in respect to food security. The government has encouraged farmers to engage in a massive production of oil palm for this development which has led to an increase in oil palm cultivation in the country. It is also assumed that encouraging farmers to engage in large production of oil palm crop will create a good market and good price for the product as the farmers have alternative in selling the crop as food crop and also for the production of bio-fuel. This situation can also force prices to rise up depending on which market is on high demand for oil palm. There could be an increase in prices for oil palm for food consumption when there is an increase in demand for oil palm for bio-fuel and this could lead to food insecurity.

Jatropha has become a recent production for bio-fuel in Ghana. Jatropha plant was used in the country in different form before the idea of cultivating it for bio-fuel. Jatropha was locally used for lighting in rural areas as a form of candle in an absent of electricity and also for fending around homes and gardens by rural farmers in Ghana. The tree of jatropha was used to serve as a border in demarcating farms with no much interest with the seeds of it. The plant is available in most part of the communities in the country but its commercial cultivation for bio-fuel was a recent phenomenon which is spreading gradually in various part of the country. The first company to have entered into commercial production of jatropha for bio-fuel was Anuanom Industry Projects which was operated at the central region of Ghana. The company started its operation in 1982 with the purpose of extracting oil from the seeds of jatropha for

bio-diesel. The company also committed into production of other products from the by-product of jatropha plant such as organic fertilizer from the pressed cake and the compost of the fruits from the plant. The company was with the vision of cultivating around one million hectares of land for jatropha within a period of five years on degraded and idle lands but could only achieve around 220,000 hectares of cultivation as production took place. According to Grados and Janssen (2008), the company was able to fixed about 500 tons unit capacity equipment for the operation of 500 hectares of land for bio-diesel through the cultivation of jatropha seeds and 2000 tons of equipment for the processing of organic fertilizer. It is believed by most researchers that Ghana would need to increase its production from its bio-fuel industry if it has the desire to compete with the world market price in diesel. This could be possible by an increase of individuals and farmers engaging in jatropha production and the government giving 5% rebate on blended fuel and also reducing the price of jatropha seeds by 55% to jatropha growers (Caminiti et al., 2007).

### 1.8.1 The Bio-fuel Africa Ltd. Project in northern Ghana

Bio-fuel Africa Ltd. which is currently known as Solar Harvest AS became the first company to be given the Environmental Protection Agency (EPA) approval for a Jatropha production. Its main focus is the cultivation of jatropha curcas for the extraction of bio-diesel. It has expanded its production to northern region in the country. It has jatropha plantations in Yendi, Yeji and Sogakope in the country. The company began its activities in the northern region for the first time at Alipe in 2007, a community near Kusawgu in the Central Gonja District of the northern Ghana but was put to a stop due to the community and other NGOs disapproval. The company's activities on the land were discovered by a team from RAINS in 2007 where heavy agriculture machinery was being used to fell down trees. It came to notice that the land was to be used for the cultivation of jatropha for bio-fuel fuel by Bio-fuel Africa Ltd., a subsidiary of Bio-fuel Norway (RAINS 2008). RAINS was able to stop the activities of company in which a land of 2600 hectares had been stripped bare already of its vegetation by the company's activities. Due to the illiteracy of the traditional chief and elders, made the chief to thumb print some documents which were submitted to him by the company members and the assembly member of the area which confirmed that the company can start the cultivation but in actual fact, the chief was not in agreement to the company's activities when

it came to his notice as to what they were to do on the land (http://www.wrm.org.uy/bulletin/129/Ghana.html).

A thorough discussions with the community revealed that it was Bio-fuel Africa Ltd. which was behind the destruction of the environment under the pretext of establishing the largest jatropha plantation in the world as claimed by Finn Byberg, Director of Land Acquisition for Bio-fuel Africa. With joint efforts of the EPA and the Central Gonja District Assembly, all activities on the site were suspended (RAINS 2008). This made the company to relocate to the communities in the Yendi Municipality. Bio-fuel Africa Ltd. started its operation in 2008 in the Yendi municipality in the northern of Ghana for the cultivation of jatropha curcas. The company has acquired 15000 hectares of land area in the northern region for the production of jatropha. The plantation is located in different villages in the Yendi municipality including Chegu, Kpakore, Kpachaa and Jimle where the research took place. These communities are endowed with large areas of agricultural lands which are suitable for commercial purposes. However, these lands are mostly under-utilized with subsistence farming system being dominant in the area which has not produced much benefit to the communities in terms of large production. The communities have always relied on traditional methods of farming without the application of scientific agricultural knowledge which could have yielded much in production such as irrigation system. The agricultural activities in the northern region of the country are largely rain-fed and much of irrigational systems are yet to be tapped (Wolter, 2008). Schoneveld et al. (2010), conducted a similar research in the Ashanti region and Brong Ahafo Region reviewed that land acquisition in the region were based on customary tenure system in which the company have to deal with the chiefs and the traditional authorities directly in their acquisition of land for the project. The land tenure system in acquisition of land for agricultural and commercial activities is the same practice in the northern region in which the company has to engage with the traditional authorities in their acquisition of land for the project. The economic activities of the people are mostly farming, animal rearing and small commercial activities. The district is being headed by a district chief executive who sees to the day-to-day running and implementation of government policies. The district also has various chiefs who handle traditional affairs.

The vast area of land as well as the favorable climatic condition in the northern region has made it conducive for the establishment of the jatropha cultivation. This has played a major role in influencing most foreign investors and local companies to take such investment in the jatropha cultivation in the area. The first pilot project of the production of jatropha was in

operation in a small community of Walewale district called Gbimsi in the northern region. This was established by women in the village with the aim of improving the livelihoods of the women and improving their level of income.

## Chapter Two

### 2.0 Analytical Framework, Literature and Land Tenure System

This thesis makes use of existing theories and concepts. The same way as the methodology and the research questions which were adopted for the research. The outcomes are affected by theories which have been established and analytical frameworks based on those theories. The thesis adopted a single analytical approach to address all the research questions carried out and linked it to the local communities' livelihoods and resources at their disposal in connection to jatropha production. It also entails literature relating to some of the main concepts found in the topic and studies which have already been carried out which are similar to the topic and how it was conducted. The chapter also considered the land tenure system in the region and how land acquisition and ownership are obtained for viable projects in the region.

### 2.1 Sustainable Livelihoods Framework Approach

A livelihood can be defined as a means of living and should have the capability of sustaining the lives of the people in the community. The livelihood of the people in a community is very vital to decision makers when any form of project which has the potential to change the economic situation of the people is to be undertaken. This raises much concern during the assessment of the activities of investors to ascertain their relevance and the impact they will have on the local people.

The various definitions of livelihoods available in academic literatures, makes it complex in defining and knowing the exact meaning of livelihood (Ellis, 2000). According to Chambers and Conway (1992:7), ''A sustainable livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and resources or assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term''. According to Jongschaap et al., (2007), these assets could be in a form of physical assets such as infrastructure, housing, equipment and livestock. It could also be in a form of human assets such as education, health, knowledge and skills. It could also be in a form of social assets which include community relationships, being involve

in political and social activities, involvement in making decision and having the platform of representation while the natural assets which entails water, land, and environment resources. An asset is a resource in a form of material or capital that can generate benefit for the survival or sustenance of an individual or the community at large. ‘‘Assets may be described as stocks capital that can be utilized directly, or indirectly to generate the means of survival of the household or to sustain its material well-being at different levels above survival’’ (Ellis, 2000). Scoones (1998:5), gave a definition of livelihood which was drawn from Chambers and Conway (1992): “A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resource base.”

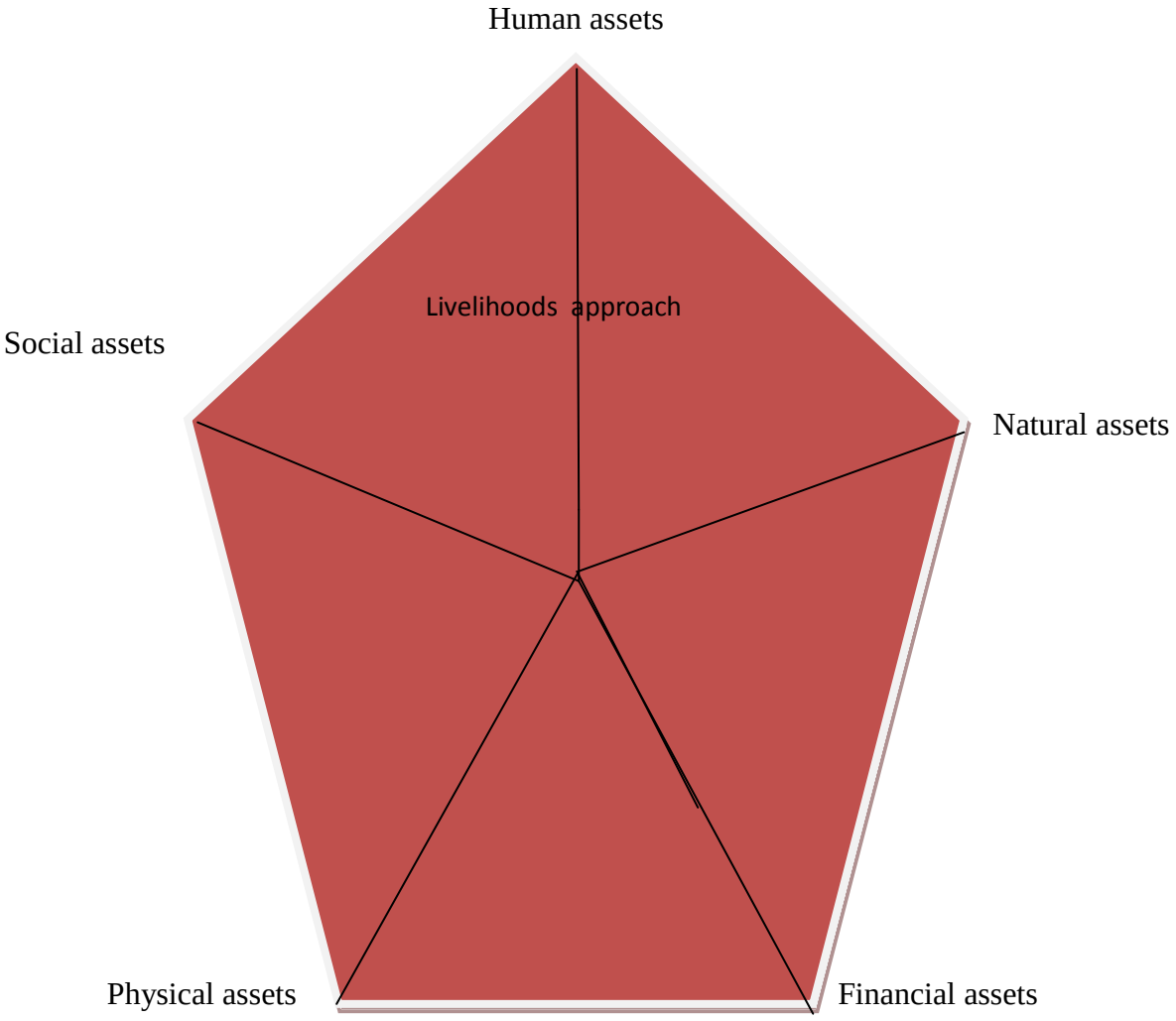
The above definitions might give an indication that the meaning of livelihood is simple in it assessment and analysis but the complexity of it is shown on the real situation of analysing rural livelihoods when it is being carried out. The positions of the researchers used in the meaning of the theoretical approach is centred on the same point but with different interpretation such as the importance of resources to the linkage of daily life of people and other social factors and norms that function for rural livelihoods. Despite some of the divergent views of the theory, many researchers and development agencies have used the sustainable livelihood approach to investigate various local communities’ livelihoods. The most challenging task in the use of sustainable livelihood approach is how to achieve durable and stable sustainable livelihoods under shocks and unforeseen circumstances in the long term (Scoones, 2009).

These analyses are vital to sustainable livelihood approach research which gives grounds and guidelines in answering the research questions on jatropha production. A full utilization of the theory cannot be exhausted by the scope of this thesis. The thesis is mainly keen on exploring capitals, access to capital and assets which are available and form the core elements to the meaning of livelihoods to local communities as far as jatropha project is concerned in the region. The main function of sustainable livelihood approap is to analyze the outcomes as a result of households’ activities in respect to the available assets at their disposal.

In this thesis, I used sustainable livelihoods framework as a tool to understand the households’ livelihoods in the local communities. The sustainable livelihoods approach concept shows the fact that individuals and households have assets or resources which sustain

them for their living. The assets of individuals form the bases for their production and sustainability. The rural dwellers in most cases use various survival strategies through diversification to earn a living. The concept of diversification according to Ellis (2000) is ‘‘the process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living’’. Even though most of the rural people are involved in one major occupation, the income generate from these source of occupation could be used to invest in other ventures as a means of generating additional source of income such as buying a vehicle for commercial purposes and building a house for renting or using land to access loan.

**Figure 2.0 Diagram showing Sustainable livelihood Framework**




Source: Jongschaap et al., (2007).

### 2.1.1 Assets or capital as element to Sustainable Livelihood Approach

The surviving and livelihoods of a households rest on capitals or assets that are at their disposal. The efficiency of the assets of the households determines the better living condition of the households. According to Ellis (2008), capital consists of land, water and biological resources that serve as a means of surviving for people. The assets and capitals of sustainable livelihood approach are put into the following categories according to Jongschaap et al. (2007): **Human assets** involve health, education, skills and knowledge available to the households. This means, the labour which is at the disposal of local communities geared into productive ventures to ensure sustainable livelihood. **Physical assets** consist of housing, infrastructure, equipment and livestock. The physical assets are the creation of capital out of economic production such as irrigation system, tools, roads etc. **Social assets** deal with the good relationship in a community, decision making, involvement in political and social activities and having access to representation. **Natural assets** consist of land, water bodies and environmental resources and the **Financial assets** which include credit accessibility, remittances, earning and savings. These are resources that are utilized by local communities to promote their existing. The cultivation of jatropha project will no doubt have an implication to the assets in local communities and their livelihoods in terms of its availability, accessibility and distribution to local communities.

### 2.1.2 Outcomes

The adoption of any livelihood strategy by local communities normally creates a result which is the outcome of achieving sustainable livelihood. Those outcomes are being grouped into two main categories; the outcome which seeks the well-being of households through various products and cash income; and other activities that turn to maintain the sustainable livelihood approach itself. These outcomes relate to the increase in employment, reducing poverty, food security, protection of the environment etc.

## 2.2 Literature review

Bio-fuel production has received a huge growth in recent period. According to Coyle (2007), world production of bio-fuel tripled in quantity from the year 2000 to 2008, ethanol in gasoline increased from 3.8% to 5.5% while the share of bio-diesel in diesel increased from 0.9 to 1.5% (UNEP,2009). The desire for most countries for the production of bio-fuel rest on two vital shift in the countries' energy policies. The first is the frantic efforts by countries to reduce the reliance on crude oil as a source of energy (IEA, 2009). The second issue is the increasing concerned about the environment and the global warming. For instance, Ethanol releases 70% less carbon dioxide than fossil during combustion (UNEP, 2009). This gives an indication that the production of bio-fuels is friendlier to the environment than fossil fuel.

According to Hausmann, (2007), the engagement of bio-fuel by developing countries is a way forward of not relying on the developed countries for foreign oil by involving farmers in the growth process. There is also an evidence of optimism in other countries for the need to encourage the production of bio-fuel which has the potential of improving economic growth and reducing of poverty according to some school of taught. For instance, Arndt et al., (2009), believed that the production of bio-fuel by Mozambique has the capacity to increase their economic growth by 0.5% every year over the coming years which will lead to a fall in the country's poverty rate by 5%. This positive assertion is no doubt encountered with uncertainty over the tendency to switch off from the production of food crops to bio-fuel with the effect that the reduction in food production may lead to food insecurity and poverty. This has led to many debates on the issue around the globe which has raised much concern and the necessary attention for bio-fuel debate (Oxfam International, 2007). Indeed, moving resources from the production of food to bio-fuel production could compel households to rely heavily on marketed food whereby bio-fuel may not be able to generate enough incomes for the households who are mostly poor with lower standard of living to deal with the rising of food prices. The concerns for food security are therefore necessary and justified in relation to production of bio-fuel in a country. The cultivation of jatropha for bio-fuel is no doubt demands a large area of land for such activity. These lands which form the natural assets of the communities are mostly used by the local communities for their farming activities which their livelihoods depends on. Cultivating bio-fuels on these lands instead of food crops will in no doubt have consequences on food production. For example, some bio-fuels feedstock such as maize and cassava are used as food for consumption and feed for animals. An increase in the production of bio-fuels may directly have an impact on the quantity supply and prices of

meats and agriculture produce. The competition of natural asset (land) and labour for bio-fuels feedstock could affect food production. There is a belief that an increased in bio-fuels production was the main drive in the high prices of soybean, wheat and corn observed in the year 2006 (Rosegrant 2008; Headey and Fan 2008). Also the use of cereal grains as food crops such as maize for the production of ethanol has created an open debate for food insecurity. For instance, cereal grains such as maize used for the production of ethanol formed 80 to 90% food consumption for the people in the world (Pimentel, 2003). Many researchers have voiced out about the likelihood of bio-fuel impeding food security in the world and affecting the livelihood situation of the poor in the world negatively as they spend most of their earning on food (Naylor et al., 2007, Senauer and Runge, 2008;).

However, while Naylor et al., (2007) and the rest argued about the possibility of bio-fuel causing food insecurity and raising of food pricing, they admits that the implementation of the right policies could avoid the possibility. There is a wide perception held by large group of people that African agricultural land has the ability for increasing productivity (Diao et al. 2007), implies that bio-fuels feedstock might not necessarily put off food crops, and even if it happens, production of foods can be maintained on small land through enhancements of productivity. According to Ariza-Montobbio et al., (2010), an increase of jatropha cultivation for bio-fuel is due to the widespread perception of production viability on marginal land areas; lack of competition with food crops and economic returns for small scale farmers especially in developing countries has been the major topic of debates.

In Ghana however, there are challenges with regards to attaining vast land for operating bio-fuels project as majority of the land are operated under traditional or customary land tenure system (Deininger, 2003). Bio-fuels projects which will requires vast land for its operation will requires bio-fuels investors to get in touch with the local community element. According to Kasanga and Kotey (2001), traditional lands in Ghana are owned by at least one tribal leader. The customary sector carries about 90% of lands which are not developed or underdeveloped in Ghana. In order for land to be acquired for developmental project, there must be a negotiation with the local chiefs and council of elders in the local area. The land tenure system in Ghana can be categorized into two forms based on the above system as public and customary (WaterAid, 2009). The public lands are owned completely by the state or partially while customary are owned by families and clans, stools, under the control of the chiefs and family heads.

While there is a clear connection between jatropha production and food security, particularly through food security and rural development, this linkage has not been well dealt with. Within the field of academic literature on jatropha, much investigation are being carried out and well analyzed for the linkage that exist between the production of jatropha and food security (Jongschaap et al., 2007 Kumar and Sharma, 2008; Hunsberger, 2009). This development of exploration of jatropha production for bio-fuel and food security is being extended through other channels of media online such as blog and websites where food security always is being emphasized as jatropha production is increasing rapidly in the world; (Time, 2009; Ghana Business News, 2009; Earth Times, 2009; Amankwah, 2009). In an attempt to make such a thorough investigation on this linkage, Asselberg et al., (2006), examined how jatropha bio-fuel could be produce in Cambodia to improve the livelihood situation of the rural people without necessarily affecting food security. Even though that was worth recommending, this was only peculiar to Cambodia and the experiment might not be the same when tested in another country. This calls for further research to fully understand the benefit of jatropha bio-fuel on food security as there is constant increase in jatropha production in the world. It must be noticed that the issues of bio-fuel and food security are controversial debate and it is widely known across the globe that bio-fuels form an integral part of world energy strategy with the implementation of the right policy.

The thesis will also examine the land tenure system in the local communities to elaborate on how Bio-fuels Africa Ltd operates under the customary land tenure system in the northern region of Ghana. The study will examine the challenges that falls under this customary (informal) land tenure system in the local communities. The livelihoods approach will be used as a framework to assess the livelihoods of the people and food security in the communities. It will examine the challenges posed by the shift of vast land from the production of food crops by the local farmers to the jatropha project in relation to food security in the northern region of Ghana.

### 2.3 Land possession and administration in Ghana

The process involved in the acquisition of land for productive ventures or other activities can be categorized under customary laws and state laws. Under the customary law, one could possess land without any documentation. The land are located to individuals or households by the local chiefs with objects like mountains, streams, hills, trees etc. serving as a boundary for

one's ownership of land. This method of demarcating land has in most cases resulted in conflict among individuals and families especially in urban areas where land is very difficult and expensive to acquire due to no documentation to prove of one's ownership and with controversy surrounding with the use of these physical objects as a form of locating boundaries.

The state laws were meant to overcome the challenges related to the customary laws of land ownership. The state law under land ownership was structured to ensure that lands are registered to secure one's ownership. This brought the introduction of the Land registration Act (Act 122) in 1962 by the government to enforce all lands being registered to clarify one's ownership. The introduction of the land registry was met with other challenges which could not eliminate the entire problem faced under the customary laws. Single land was registered by multiple parties claiming ownership and thereby compounding the already existing problem which it was meant to solve. The deed registration did not created proper surveys and accurate maps to give authentic allocation of lands to rightful owners (Sittie, 2006). The government realizing these problems introduced another deed known as the Land Title Registration Law (PNDC Law 152) in 1986 to solve these challenges. The land title registry is aimed at ensuring safety in land transaction and to guarantee security of the land. The land title registry was also aimed to facilitate accurate maps and land surveys to eliminate multiple registration of land. The land title registry is currently facing difficulties due to logistics and funding to achieve its purpose.

### 2.3.1 Land Tenure System in Ghana

Land ownership in Ghana is mostly in the hands of the communities under the supervision of the elders and the chiefs. The chiefs take custody of the land. The government defines the nature of the land tenure system in Ghana. The land tenure system in Ghana is categorized into three systems; customary ownership, State ownership and customarily owned land under state management of the land (NGGL, 2005). An investor or a company that needs land for productive venture could be granted by the government when the land is under government supervision or the traditional chief of the area when the land is under customary ownership.

With the customary land ownership, the local chiefs served as the main administrators of the land. The chiefs in the communities are seen as political heads in the traditional set up of the

country. The chiefs take relevant decision concerning land allocation with the involvement of their elders (NGGL, 2005). Families in the community are provided with land under the supervision of the family heads to ensure that all members have small portion of the family land for cultivation. Individuals in the family have no right to sell the land which is meant for the entire family but with the right to cultivate. A portion of land belonging to a member of the family can be leased out or rented to an individual outside the family but not completely sold. It is believed that the ancestors are the custodian to the family land and therefore cannot be sold. The ownership of the community land entails all members who form membership of the community. The customary ownership of land are mostly not written down or documented. They are orally documented from generation to generation and it is mostly understood by all members forming the community. This system of land tenure in Ghana has provided large number of members to possessed land in small areas. According to Kasanga and Kotey (2001), traditional lands in Ghana are owned by at least one tribal leader. The customary sector carries about 90% of lands which are not developed or underdeveloped in Ghana. This has resulted in most land being idle yet no idle land in Ghana is free for one's possession. In order for land to be acquired for developmental projects, there must be a negotiation with the local chief and his council of elders. The traditional ownership ensures that land is fairly distributed and has continued to function well in most rural set up. However, the traditional system has taken a different dimension in urban centers. This is due to the high value place on land for developmental project in urban centers and has compelled most chiefs to assume ownership of the community land instead of acting as custodians of the land on behalf of the entire community. The chief take decision on land and sale of it without any involvement of the community and most of the time, consume all the benefits that come out of the sale of lands.

The state ownership of land deals with land, that has been possessed by the government under the State Lands Act of 1962 (Act 125). Under the Act, ownership of land is absolutely under the control and administration of the state. The government has a full authority to use the land for developmental projects or lease out to private institutions and state institutions. The State Land Act makes provisions for all those who for some reasons are being affected by the act to be compensated. The compensation is either in a form of open market value of the land or possible reallocation of different land for the affected individuals. The state's lands are well demarcated, surveyed, mapped and registered.

Customarily owned land but managed by the state on behalf of the traditional owners are quite different from the state ownership land. The lands that are ascribed to customarily owned but managed by the state are mostly larger in size as compare to the state owned lands. Such lands are rarely demarcated and surveyed but are documented formally. The customarily owned land but managed by the government gives licenses for the state to lease the land, manage it and rent it out to individuals or private institutions. However, the real owner which is the traditional authorities enjoys any benefits that come out of the land managed by the state. This system is also known as vested land. The state manages such lands with the sole interest of taking any action on it that will promote the interest of the public.

In the rural areas in Ghana, land plays a major factor when it comes to farming activities. The size of an individual land determines his capacity of food production. Most of the rural farmers lack the technological know-how in the improvement of a fixed land to increase production. The demand for an increase in production therefore rest mostly on the expansion of the size of one's land. This method of ensuring increase in production is not mostly recommended for farmers as it leads to deforestation as a result of the cutting of trees to expand the land area. It also leads to emission of carbon dioxide, destruction of wildlife habitats and the ecosystem of the environment (Aune and Lal, 1995). With an increase in the population size in the rural areas which are dominated with farming activities, land becomes an important issue to deal with.

## Chapter Three

### 3.0 Research design and methodology

This chapter describes the methods that were used to collect data for the study. Qualitative method was employed in the collection of data for the study with the use of other approaches like interviews, focus group discussion, primary and secondary data collection, transcription etc. Interviews were conducted with some key members in the communities such as the chiefs, households' members and some management of the company. Qualitative data were collected with the use of households' questionnaire survey with a total of 100 households with women forming 10% of the respondents.

### 3.1 Methodology

Methodology according to Kothari (2004), is the procedures and techniques that are adopted by a researcher in order to deal with a research problem in a scientific manner. The adoption of a particular method to solve the research problem together with the techniques constitutes methodology. This means that the base of a research rest on the choice of method that a researcher adopts which also gives an in-depth knowledge about the research problem.

#### 3.1.1 Methods of data collection and analysis

The research was conducted with the adoption of qualitative method for the data collection with the use of questionnaire survey. I used the qualitative research methodology to obtain an in-depth information and understanding of the situation in which the local farmers and the entire communities experienced before and after the operation of the jatropha cultivation by Bio-fuel Africa Ltd. According to Flick et al. (2004), qualitative research describes phenomena "from the point of view of people who participate to contribute to a better understanding of social realities and to draw attention to processes, meaning patterns and structural features" (p.3). I sought to understand the lived experience of the affected farmers whose lands were taken for the jatropha project from their own perspective in terms of their livelihoods. I adopted qualitative research method to enable me analyze the jatropha production for bio-diesel and the situation at hand in the various local communities in relation to food security and poverty reduction. Field observation was carried out on the jatropha plantation to have a face-to-face contact with the informants to access the real situation on the

ground. Interviews were also conducted to access information from households on how the jatropha plantation has affected their livelihoods. An interview according to Berg (2006) 'is a conversation with a purpose'. The purpose of an interview is to access information. According to Banner (2010), there are three different types of interview; structured, semi-structured and un-structured interview. Structured interviews deal with the use of prepared questionnaires with the researcher focusing mainly to the topic guide which has a predetermined response or answers (Banner2010). Unstructured interviews deal with conversations, where the interviewer and respondent know the topic with no set responses (Baumbusch 2010). The researcher considered the use of semi-structured interviews which are found in between as advantageous in that, it allows the researcher to identify broad themes which will guide the interview process while at the same time preserving flexibility in the pursuit of interesting leads and descriptions (Charmaz 2006).

Focus group discussion was also carried out among the various households to obtain their views and conditions after losing their lands for the jatropha project. Focus interview is a type of interview which involves small groups of people who are not related and being organized by an investigator who leads in a group discussion on a particular topic(s) (Schutt, 2003). It could be guided or unguided group discussion meant to address a particular issue or topic. Focus group discussion mainly uses the interactions of group members as part of collecting data. The discussions mostly focus on topic of interest and relevant to the group members in the community and to the researcher (Edmunds, 2000). Krueger (1994), suggested that for complex situations or problems, focus groups should be limited to not more than seven participants. This means that large participants may be divided into smaller focus groups and the researcher has to tap out information from the respondents regarding topic of importance to a given research. One important aspect of focus group discussion is that, it creates an informal discussion atmosphere which encourages respondents to freely express their views. The use of focus group interview (discussion) in a well conducted manner, stimulate a discussion in which one member of the group reacts to comment made by another. This dynamic interactions has been referred as ''synergistic group effect'' (Stewart and Shamdasani, 1990; Sussman et al., 1991). The outcome of the synergy is a collective brainstorming. A lot of ideas, topics, issues and solutions to problems are generated from this focus discussion as compare to individual face to face interview.

The thesis used this strategy in conducting focus group discussion in the various local communities relating to the jatropha project. The research study under focus interview was

structured in two groups. There was one which was conducted for men alone and another one for women alone. I created a platform for women to come out with their views relating to the company's operation in the area as the custom of the area does not permit women to par-take in decision making or express their view fully when issues arises in the family or in the community when they are in the midst of the men. This form of interview was to find out the challenges they encountered and their economic situation before and after the project. The total number of the respondents was 100 in which 10% formed women and 90% forming men. The women were divided into two groups with each group holding five members for the focus group discussion. I also adopted the selection of group of individuals on the basis of ethnical background under the focus interview to find out if there was any bias in the accessing of land from individuals for the project. An in-depth interview was also conducted among the households individually to avoid any influences from other members. An in-depth interviewing is a research technique which involve an intensive individual interview with a small number of interviewees to access their view on a particular situation or topic. This will involve their experience and their expectation to the situation. Secondary source of information was also accessed through Google search to attain further information on the project. Finally, triangulation methods were conducted to cross check information accessed from each informant to ascertain the truth from other sources.

### 3.1.2 Data collection process

### 3.1.3 Entry into the communities

An entry into a community is a major factor in determining a credible research. It is a process that could facilitate proper data collection in terms of accessing quality and quantity of data. A credible source of information for data collection and research demands a good entry into a community. According to Bailey (2007), community entry is a complex process and the means through which one can negotiate entry contributes to defining the research outcome.

Before the collection of the data in the four designated communities- Kpachaa, Jimle, Kalkpore and Chegu, the researcher made an immediate contact with Awal Mohammed who is the operation's Manager and member of the board of Bio-fuel African Ltd. in Tamale for in-depth information about the company, Jatropha project, the company's contributions and relationship with the communities. After an interview with the operation's manager, I

proceeded to the four research communities. The key informants I got in touched with in the communities were the chiefs at the various communities, the farmers, and households.

### 3.2. Sample Size

The research covered a group of population of households whose farm land were lost to the jatropha project. The research also targeted population who benefited from the company's operation in the various communities. The other group was the Bio-fuel Africa Ltd currently known as Solar Harvest Ltd. and the chiefs who granted the land to the company.

The selection of the sample population in the various four communities; Kpachaa, Jimle, Chegu and Kpalkore was based on random sampling. Twenty five farming households were selected from each of the communities to go through with the research questionnaire. This gave a total of 100 households who were selected as the sampling size. The Bio-fuel Africa Ltd and the chiefs were also granted an interview with questionnaire relating to the jatropha project and the relationship that exist between the jatropha company and the local communities.

### 3.3 Research Assistants

In the entry of the researcher into the four communities (research areas), the researcher was accompanied by two assistants who were employed to carry out with the local language interpretation and to also guide the researcher to the prominent leaders in the communities and the respondents. Fortunately, these research assistants were native of the region and trained teachers of the two communities; Kpachaa and Jimle which made the research process less difficult in accessing information. The research assistants were very helpful in the data collection process. The local people were not ready to cooperate at first as they were not certain about the implication of their response to the questionnaire. But the quick involvement of the research assistants and their native identification with the local people made the members of the households to cooperative. The research assistants were being guided on how the research should be conducted by the researcher. In the conversation process, the research assistants asked questions relating to the questionnaire to the households in their local language (Dagbani) and then translated their responses in English on the questionnaires. The

researcher and the research assistants went along with two motor bikes which made it less difficult to visit all the four selected areas for the field work. On the first day the whole questionnaire was discussed. The meaning of each question was well clarified and the way of asking them was agreed on so as to reduce different interpretations and understanding. The research assistants' efforts in some of the research questionnaire helped to speed up the whole exercise.

### 3.4 Primary data

The primary data collected from the study area was obtained through various interviews by the researcher to all the respondents. The key informants such as the chiefs, the households' heads and officials of the Bio-fuel African Ltd (Solar Harvest Ltd.) expressed their views with a fixed set of questions and with both open and closed answers being used. The opened answered questions were meant to give room for free expression by the respondents. Unstructured interviews and informal discussion were also conducted with the respondents.

### 3.5 Secondary Data

Secondary data was also collected from different sources of books, website, journals and articles on jatropha project with much detail on its impacts on livelihoods, food security and land administration to supplement with the primary source of data collection. The secondary source of data provided much information on the literature review.

### 3.6 Household data collection

The household questionnaires were designed to access information mainly from the heads of the households as they occupy the position of ensuring the upkeep of their entire members. The questionnaires begin with the background information of the entire household's members. This includes the size of the household, sex, age, education, marital status, education, occupation, dependence size which the head of the household cater for. The questionnaires also entail how the households manage their farming activities and acquisition of land for farming. The questionnaires for the household survey also entail the activities of the company

and its impacts on the households and the entire community. It considered the effects of the company access to land and its activities, farming, livelihood and the company's contribution to the development in the communities. The relationship between the company and the communities was also emphasized and how to strengthen it. I was introduced to the correspondents and the essence of the research by the research assistants. The research assistants made it known to the correspondents about the relevance of maintaining confidentiality of correspondents' responses before the interview took place.

### 3.6.1 Management Questionnaire

Questionnaire was made for the management of Bio-fuel African Ltd (Solar Harvest Ltd) to access information concerning the acquisition of land for the jatropha project. The questionnaire also seeks to find out the impact the company activities had on the farming activities and other resource activities. It also accessed the impact of the company on developmental activities in the communities and how to maintain a good relationship with the communities involved in the project areas.

### 3.6.2 Questionnaire for Local Chiefs

Since the local chiefs are in charge of land administration in the communities, it became prudent to design a questionnaire for them in accessing information relating to their relationship with the company and how the company acquired land for the project. The questionnaire was also meant to find from the chiefs in terms of the challenges they have encountered in relation to food security, the benefits the communities have attained from the operation of the company and what they expect to achieve in the near future.

## 3.7 Direct Observation

The researcher had a direct observation to the activities of the jatropha project in all the four communities to access the reality on the ground and also to find out some of the key issues that respondents emphasized in relation to the project. The direct observation enabled the

researcher to observe the practical processes involve in jatropha cultivation and the development carried out by the company in the communities.

**Figure 3.0 Jatropha plantation at Jimle**

Source: Fieldwork 2014

### 3.8 Transcription analysis of data

Atkinson (1998) identified two major steps in qualitative data analysis, namely, transcription and interpretation of data in accordance with set objectives of the study. According to Halcomb and Davidson (2006), transcription refers to ‘‘the process of reproducing spoken words, such as those from an audio taped interview, into written text" (p. 38). I transcribed the interviews conducted with the key informants in both English language and local language (Dagbani) word-for-word. All other individual interviews, as well as focus group discussions which were held in Dagbani language were translated and transcribed into English for the

purposes of standardization and easy interpretation with the help of my two research assistants. In order not to misrepresent respondents, I listened to the audio recordings over and over again, and compared it with my field notes. The transcribed data was then categorized into themes - patterns of ideas, behaviours, concepts, interactions, key words, and phrases used. These themes emerged naturally in the course of thorough and repeated reading of the transcribed text.

After the themes had emerged, texts from the different interview transcripts were then collated under the identified themes. I then analyzed the positioning, ascription, and constructions of informants with regard to norms, values, belief systems, status, and socio-cultural ideologies of informants. Finally, I interpreted the data in relation to the research objectives, theory, and available literature.

### 3.9 Ethical consideration

A research is considered as a scientific base in human activity which is carried out on a range of protocol, legislation, guidelines and methods (Gerrish and Lacey, 2010). Research ethics is that field of inquiring that highlights the challenges involve in ethical issues by developing procedures and guidelines that will protect and safeguard any harm that could result in the cause of a research against the respondent and protecting the rights of respondents in the research process (Rogers 2008). Informed consent is a fundamental of ethical research (Casssell & Young 2002), and relevant part of this is the quality of information provided to potential subjects. The researcher provided the subjects with an information sheet containing all information about the research process in a vivid and concise manner with a personal explanation to any part of the research process which sounded ambiguous or demanded further meaning. A consent form was given with subjects having the right to append to it by their own will without any enforcement. The respondents were given the free will to discontinue with the research process at any point in time when any of the information was against their beliefs. The respondents were also given the platform to access further clarification when demanded while research was on-going. The researcher was conscious of the fact that the respondents or participants were not to experience any pain or harm in the cause of the research process as the ethical principle of non-maleficence implies that no harm should come to participants (Cormack 2000). The researcher was also aware of how the interview could have unpleasant memory to the respondents. The researcher was therefore

mindful of when to continue or stop the interview with the respondent depending on the mood of the respondent. Confidentiality is also relevant to research according to Polit and Beck (2010), but the confidentiality was treated to a certain degree to this proposed study. This was due to the collection of data which became accessible with the involvement of focus group interview in the research study. However, the participants were assured to be protected from being disclose of their personality to the public in the cause of the research process with the use of coding them with numerals instead of their personal identity. The principle of truth (Cormack 2010) is vital in research work and therefore, the researcher made it known to the respondents the aims of the research and the need for respondents to provide information base on truth and facts.

### 3.10 Limitations

The research was encountered with numerous challenges in the area of survey due to high illiteracy rate of the households on how to keep proper records of their farming activities. There was a problem on how to come out with the exact hectares of land which was taken by the company for the project. The individual farmers could not be able to quantify the land size in hectares in order to cross check with the figures gotten from the company. The research assistance helped them to ascertain their annual income and losses of land for the jatropha project. This gave the researcher and his assistants a tough moment to deal with. Also, language barrier between the researcher and the local individual farmers created a distortion of communication as information could not be accurate through such channel of communication with a third party (interpreter). There has been a similar exercise conducted by various Non-governmental Organizations with the farmers previously without the farmers receiving any benefits. The demand for their full cooperation during the interview was a challenge especially when they have not benefited from such exercise before and also the tiredness they experienced after they returned from their farms made it difficult to assemble them on time.

## Chapter Four

### 4.0 Sustainable Livelihoods Approach in Analyzing Jatropha: Discussion

This chapter presents the livelihood activities of the households in the research area. It also highlights the livelihood analysis with the use of sustainable livelihood approach for the various assets and outcome base of the capitals in the area. The chapter also presents simple tables showing educational level of the households, income level, age, employment and other economic related activities in the study area.

### 4.1 Household information

The household in the region is dominated by extended family system. The extended family consists of the immediate nuclear family which involves the father, mother and children and then uncles, unties grandparents, cousins and nephews. The minimum size of the household is 4 and a maximum of 10. In most cases, the head of the household sees to the upkeep of the members in the family in a form of providing food and other basic needs. This becomes a huge burden on household's heads whose members are large to cater for especially on financial aspect and food supply to the household. Even though, large members in a households goes with high financial burden to the heads of the households, it also creates an opportunity for families to possess large area of farm land for cultivation as rural communities mostly rely on family members as their labour force. A household with large members turns to enjoy increase in productivity and thereby ensure food security as there are large labour forces to work on the farms. The ages of the household heads that were interviewed ranges from 25 to 70 years. This is illustrated on the diagram below.

**Table 4.0 Age of household heads**

| Age | Number | Percentage |
|---|---|---|
| 25-44 | 43 | 43 |
| 45-54 | 30 | 30 |
| 55-70 | 27 | 27 |
| Total | 100 | 100 |

Source: Fieldwork 2014

From the table above, the entire sample population indicates that the majority of the labour force of the local communities falls within the age group of 25 to 54years. This age group which formed 73% of the entire population of the region are those very active with the energy to work and increase productivity in their farming activities. The age group from 55-70 formed the population who are aged and with little energy to work actively on their farms to increase productivity. They cultivate in small farm lands and are more dependent on their children for their livelihoods as they are not able to farm large area. They formed 27% of the respondents interviewed in the research area. Family heads from this age group are mostly burdened with economic hardship in providing for their households. Their situation is further worsened when they have no additional source of income or assets such as livestock to support the household. Most of the heads of the households in the research area are men with few women being households' heads as a result of being divorced or widowed and have to cater for the family. Out of the 100 households who formed the population sample, 10 were women which formed 10% and 90 being men which formed 90% of the sample population. This is common in Ghanaian rural communities whereby men take decision in the family without involving women to share ideas.

The illiteracy rates of the households are very high in the research area. Most of the households are illiterate and few of them with primary and junior level education. Out of 100 households who were interviewed, 25% had primary education, 5% had junior level education and 70% having no formal education. Educational level of the households could have much influence in their progress in life and their way of farming practices that could influence food production and their economic standard of living. This could also go down to explain the poverty level of the farmers.

**Table 4.1 Educational level of households**

| Educational Level | Percentage | Number of Populace |
|---|---|---|
| Primary School | 25 | 25 |
| Junior High School | 5 | 5 |
| No Formal School | 70 | 70 |
| Total | 100 | 100 |

Source: Fieldwork, 2014

In the four communities in which the research took place, it was noticed that the local farmers were not only engaged in food crops such as maize, rice, yam, sorghum cowpea and millet but

with other forms of farming practices which served as additional source of income to the farmers. Most of the farmers engaged in mixed farming with rearing of animals such as cattle, goat, sheep and rearing of poultry alongside with the food crops. The kind of farming practice in the area of the research is based on shifting method of cultivation. This is where the local farmers acquire the land and cultivate it for a period of time and then move their settlement to another place when the land becomes infertile. The land tenure system in the research area is based on communal system of ownership in which the entire land area is subject into the hands of the local chief who by his own jurisdiction apportion part of the land to the various families in the communities for farming purpose. The land owned by the families could also be possessed by individuals in the various families through inheritance. This system of ownership has made the individual farmers not to have full control of the land they possess for their farming activities or to have legal title to the land they own. Land for the area are basically not for sale and for that matter, people who come to settle in the communities access land for farming from the chiefs but do not buy the land. This system of ownership has given the chiefs the autonomy to decide on land issues and the power to give out land to companies for any project in the community without much involvement of the people.

### 4.2 The impact of jatropha project on the communities

The impact of jatropha project operated by the Bio-fuel African Ltd. was one of the vital objectives of the research in order to ascertain how far the company's activities has affected the communities and the rural farmers as they lost their lands to the project. The rural farmers' livelihoods depend on the land which they use for their farming activities. The establishment of a company which operates in a large-scale of land could result in economic difficulties for the households as land becomes difficult to access closer to their inhabitant. The release of large portions of agricultural lands which were used by the local farmers for food crops to the company has more or less impacted negatively to the economic situation of the households in the research communities and has made it difficult for the households to access land close to their home.

**Table 4.2 Respondents whose lands were lost to jatropha project**

| **Communities** | **Number of resp.** | **Number of people who lost their land.** | **Hectares of lost land** |
|---|---|---|---|
| Kpachaa | 20 | 20 | **130** |
| Kpalkore | 30 | 25 | **150** |
| Chegu | 30 | 15 | **50** |
| Jimle | 20 | 16 | **70** |
| **total** | 100 | 76 | **400** |

Source: Fieldwork 2014

With a total number of 100 respondents who were interviewed, majority of the respondents admitted that they have lost their land to the jatropha project. Many of the households lost part or entire of their farm land to the project while some households had their farm land secured without being accessed by the company. With the total number of household's heads who were interviewed, 76% lost their land to the project while 24% had their land secured. A total of 400 hectares of land where lost to jatropha project. These losses of land ranged from 2 to 20 hectares of land for individual households heads. The lost land form part of the jatropha project cultivation in the region. The loss of land to the project necessitated the heads of households to look for another place for their farming activities. Accessibility of new land by the affected farmers created some difficulties. The relocation of their farming activities to a new site became a problem to the farmers as they mostly farm close to their communities. Losing land to the jatropha project will mean that the affected households' heads have to relocate to new lands which are not closer to their habitat. The difficulties of land accessibility was not necessarily based on farmers inability to get land to farm but to get a land closer to their habitat to make it easier for the local farmers to attend to their farming activities. The local farmers who lost their land to the project were also hesitant to be relocated to a new land in a remote area due to poor road accessibility to convey their farm products to the market.

The company's operation in the research area has brought unbearable hardship to the people especially to those who lost their land to the project. The women who are households heads were also hit by the activities of the project as some of the work they were engaged in besides the cultivation of the land for food crops, came to a halt or difficult to operate. Most of the women were engaged in other forms of business which generated additional income to the family such as charcoal production, Shea nut picking, collection and selling of firewood

which involve the cutting of the trees in their farms and on the land which are not under cultivation. The money that came out of these activities helped the households to improve in their livelihoods situation before the setting in of the company's project. The establishment of the project has forced the women to limit their activities of these kind of businesses as much of the trees were fell down to create way for the jatropha project. This has compelled most of the affected women to abandon such business activities and the few women who continued to engage in such business activities have to walk a very long distance in order to fetch firewood, charcoal and Shea nuts to supplement the household's income. Some of the male households heads who rear animals such as goat, sheep and cattle as an additional source of generating income from the sale of these animals were not left out from the hardship suffered from the company's activities as land meant for the animals for grazing where covered with jatropha project.

**Table 4.3 Effect of the jatropha project on other related land activities**

| Land activities | Percentage |
|---|---|
| Collecting of firewood and charcoal | 31 |
| Shea nut picking | 28 |
| Not affected | 41 |
| Total | 100 |

Source: Fieldwork 2014

Out of 100 households' heads who were interviewed, 59% of the respondents were affected negatively on other forms of land activities that generate income to the households apart from their farming activities as shown in the table above (Table 4.4) with the inception of jatropha project. Forty one percent (41%) of the respondents were only affected with the lost of their farm land to the project and were not engaged in other forms of economic activities.

The local farmers who lost their farm land to the project were however provided with a new place of land for farming by the chiefs as the land in the area are customarily in the hands of the chiefs who ensure that each households had a portion of land to farm. This system gives much power to the chiefs to have much control of the land and thereby gives little say by the local farmers. This situation denies the local people from any form of monetary compensation from the company as anything of such form was directed to the traditional chiefs. The chiefs were given some token of cash by the company to access the vast area of land for the project. The local farmers together with the traditional chiefs where however promise of

developmental projects in the communities. The local farmers were promised to be employed to tap their labour force into the operation of the project. These incentives as assured by the company to the traditional chiefs made them to release the land to the company without any hesitation.

Due to the illiteracy of the local chiefs, no written documents were signed between them and the management of the company and this affected their understanding of the compensation which was given to them by the management of the company. The chiefs understood that additional money as a form of compensation would have been given to them in a subsequent period but that did not happened. The local farmers were given only 2 Ghana cedis (0.6 dollar) as a compensation for the lost of their land by the local chief.

I strongly believe that the compensation would have gone down well if it was given to the affected local farmers rather than the chiefs. This could have been successful if the management had put an effort to locate the farmers individually and present to them the compensation package. The local farmers were promised with jobs creation and based on this assurance from the company in creating jobs for them, it became necessary for a survey to be conducted to ascertain the number of households' members who were employed in the company.

### 4.3 Employment opportunities created by the company

The employment opportunities created by the company were benefited by some members of the households in the communities. The table below shows the percentage of beneficiaries among the households in the communities.

**Table 4.4 Household who benefited from jatropha project**

| Employment | Percentage |
|---|---|
| Yes | 30 |
| No | 70 |
| Total | 100 |

Source: Fieldwork 2014

The employment opportunity created by the company in the communities was beneficial to some of the local households. Thirty percent (30%) of the people interviewed stated that they

were employed by the company. The households who were interviewed mentioned that the majority of the employees in the company were from outside the research study area and that; few of the households whose land were affected by the jatropha project had the opportunity to be employed. Even though not many of the households were employed by the company in the research area, the livelihoods situation of the beneficiaries was improved but lasted for a short while. Their income level was increased and that reflected in their living standards as was mentioned by the beneficiaries. The beneficiaries mentioned that they began to receive a monthly salary which was not the case before the project started as their incomes were only determined at the end of the cultivation season when they sell out their produce and sometimes their livestock. The households who did not benefit from the employment opportunities created by the company stated that, they did not see any improvement in their livelihoods but rather their situation got worsened from the beginning of the project. Seventy percent (70%) of the respondents stated that they could not get the opportunity to be employ by the company after losing their land to the project and that has affected their living condition negatively. This has led to the reduction of their income level and their livelihood being unbearable.

**Table 4.5 Number of respondents who earn additional income from other related activities**

| **Income earning** | **Percentage** |
|---|---|
| Yes | 77 |
| No | 23 |
| Total | 100 |

Source: Fieldwork 2014

From the table above (Table 4.6), it indicated that the household's members who were doing other related economic activities in addition to their farming activities before the project started was 77% and those who limited their economic activities to only farming without additional economic activities was 23%. These related economic activities contributed a lot to the income level of the household's members which had a positive impact on their livelihoods.

As demonstrated in (Table 4.4), household's members who were affected negatively in their other related economic activities was 59% which means that, their economic activities such as

shea nut picking, firewood etc., dropped from 77% to 22% due to the clearing of land for jatropha project. This reduction has affected their income level and purchasing power. Even though, some of the household's members were employed by the company, many of the household's economic related activities were shut down.

**Table 4.6 Net annual incomes of household heads (in Ghana Cedis)**

| Income | Percentage |
|---|---|
| 250-400 | 59.8 |
| 450-700 | 29.4 |
| 750-1100 | 10.8 |
| Total | 100 |

All amounts are shown in Ghana Cedis. 1 Ghana Cedi is equivalent to 0.33 US Dollars
Source: Fieldwork (2014).

The annual income of the households in the research area depicted a minimum of 250 Ghana Cedis and maximum 1100 Ghana Cedis. The annual net income of all the households who were interviewed was 37540 Ghana Cedis with an average net annual income being 375.4 Ghana Cedis. The respondents were asked to give their impression about their annual income and 86% felt that their earning is not enough in sustaining them for a better living. Generally, the net annual income level of the household's heads shows how poor they are as they live below the poverty line of 1 dollar a day according to Work bank's stipulation.

### 4.4 The contribution of the jatropha project in ensuring livelihood security

Development is a priority to every government in a country. Government put in structures in place and policies that will ensure that massive investment are attracted into the country with the sole aim to promote and improve the economic situation and living standard of its populace. Ghana government in its effort to promote developmental agenda has instituted an enabling environment that paves way for private investors to operate in the country. The major concern of the government is to bridge the gap between the rural areas and the urban areas in terms of job opportunities and social amenities such as schools, provision of potable water and health facilities. The inception of the jatropha project in the region was something that the government had desired for it for a long time. The essence of government to ensure rapid development in the rural areas is to reduce rural-urban migration especially by the youth

who form the back bone in agricultural production in the rural areas. With the provision of social facilities, it is believed that the youth would be encouraged to remain in the rural areas and improve their livelihoods.

The company as part of its social services provided certain social facilities to the communities to enhance the livelihoods of the people. The company was able to build a clinic at Kpachaa to service the four communities in order to provide medical care for the local people in emergency cases and for other minor treatment. The company was able to construct a dam near Jimle as an irrigation system for agricultural activities in the communities and also serve as a source of clean drinking water and domestic activities for the rural people. According to the women who were part of the respondents admitted that, before the construction of the dam, they used to walk a long distance in order to fetch water for their domestic activities. The construction of the dam became a relief to the women in the communities and also helped the local farmers especially in the dry season when the natural rain became unreliable for their crops. The company also installed a grinding mill in the research area to help the people facilitate their food processing for consumption such as corn maize, millet, cassava and other cereal products. The company in it corporate social responsibility, engaged in a rehabilitation exercise in the local school which was in a dilapidated state. The school which served the whole communities became a death trap as was said by one of the respondents and this discouraged a regular attendance by the children. The company was able to create job opportunities for the local people especially to those who lost their land to the project. Even though most of the respondents who were interviewed, felt that few of the people in the research area were employed, those who worked with the company admitted that their living situation were better. The income level of the local people who were employed by the company got increased as their monthly earning from the company was above what they used to generate from their farming activities and this increased their purchasing power and living standard. According to Adam Mohammed who is the assistant manager of the company, 240 people were employed since the inception of the company operation in the region. Unfortunately only few of the employees were from the research area. Most of the employees were from Tamale. This situation occurred according to the assistance manager as a result of technical know-how which the local people were lacking and that compelled the company to employ most of their workers outside the region. Most of the workers were engaged in planting of the jatropha seeds, weeding and harvesting of jatropha caucus. The women who were interviewed mentioned that, most of them who were employed by the company were

mainly engaged in the picking of jatropha fruits which served as a source of income and enhanced their contribution to the livelihood of their family. The households who were not employed by the company had a different view about the company and felt that their livelihoods situations have been worsened due to the fact that their land were given out for the project without any compensation and they have to be relocated to a far distance for their farming activities. This made things difficult for them to survive. The women who were interviewed also admitted that the company activity of cutting the trees on their farm land for the project also took away the job that they did supplement the family income by collecting firewood and picking of Shea nuts from the ground.

Livelihoods and food security for those who lost their lands entirely and have to move out from the research area could not be determined as there was no evidence of whether they were able to access land for farming elsewhere as their livelihoods depends on land cultivation.

### 4.5 Analysis of jatropha production to sustainable livelihood

Sustainable livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term (Chambers and Conway1991, 6). The research linked the sustainable livelihood approach to the production of jatropha in the research area. According to Chambers and Conway (1991), for an individual to improve and sustain his livelihood, his or her capability and activities must be geared towards improving his living standard in relation to resources available to him and also extend to the next generation. The study looked at how jatropha was able to provide sustainable livelihood security to the households in the research area and how its production has affected the individual farmers in relation to their resources at their disposal.

The production of jatropha in the research area was able to create job opportunities for some of the members in the communities. The local farmers who were employed indicated that their living conditions were improved with the coming of the company as their yearly earnings increased compared to what they used to earn from their farming activities. The company's

operation provided a regular income to the local farmers and other members in the local area who were engaged in the operation of ploughing and services with the use of machines such as tractors. .The beneficiaries who were interviewed also admitted that they were able to tap knowledge from the process of cultivating jatropha into bio-fuel which made some of them to cultivate in their small way to sell in the bio-fuel market. Jatropha production could create a strong cooperation among local farmers in their sharing of ideas and knowledge about the production. This can help the local farmers to make effective representation to make their concern be known (Jongschaapp et al, 2007). The jatropha production has the capacity to improve the livelihood of the local farmers especially the women with their involvement in fruit picking and the use of jatropha oil for the production of soap which has helped boost their income earning. The production of jatropha for bio-diesel is a step to ensure energy security. The company's installation of corn mill improved food processing activities of the local women for consumption and selling some of the processed food at the market. The production of jatropha plant could be another form which can be used to check on soil degradation and the cake from its fruits can also be used for the improvement of soil fertility. This can help to improve farming activities. The jatropha production could have a negative impact on the local farmers when bio-fuel price becomes unstable in the market making its production unattractive. This is one of the challenges currently being faced by the company in the research area. This has led to redundancy of the employees working for the company. This has also led to insecurity in their livelihoods as those who were employed, abandoned their farming activities making live unbearable for them. The affected employees committed their sustainable livelihood into jatropha project forcing them to stop working on their farms. The production of jatropha for bio-diesel has the possibility of creating problems among the members in the affected communities when there is no satisfaction in compensation from the company to the local people for giving away their land for the project. For instance, the local people who lost their land to Bio-Africa Ltd in the research area were being compensated with just a meager amount of 2GH Cedis a year by an acre of land equivalent to 1 Dollar in 2010 exchange rate. This was admitted by the assistant manager of the company and the affected farmers. The production of jatropha has also promoted with the destruction of biodiversity. There is also a possibility of friction among competitive investors operating in the same region when bio-fuel market is very lucrative. The negativity of jatropha production could also be observed when children are used as part of the labour force in its process.

### 4.6 Sustainable livelihood Approach in analyzing jatropha production

With the use of sustainable livelihood approach to analyze jatropha production in the research area, the thesis also examined how jatropha production has been able to improve or reduced the assets base of households' members and how it has affected their livelihoods. It also provides information about the relationship that existed between Jatropha Company and the households, the protection of economic trees and the current state of the company.

#### 4.6.1 Physical assets

Physical assets are those assets which are owned by the households such as infrastructure, equipment and livestock. The cultivation of jatropha for bio-diesel has the potential of ensuring electrification in rural communities with the use of bio-diesel in generators. This system can also be used to generate electricity and also as fuel for milling machines, transportation, water pumps and local shops. Jatropha plantation could also help to generate additional employment through establishment of processing industry. However, the cultivation of jatropha project has the possibility of reducing the physical assets such as water supply and energy if it becomes necessary to use huge quantities of such resources for jatropha production.

#### 4.6.2 Human assets

The establishment of jatropha project in the local areas, created job opportunities for some of the members. It also created a platform for some of the local farmers to acquire some skills involved in the production. The provision of corn mill by the company helped the local women to facilitate their food processing. When jatropha biofuel is able to provide energy to power light especially in rural areas, it can help to boost the interest of school children to learn at night to promote academic performance (Jongschaap et al., 2007). The use of jatropha oil for cooking helps to reduce inhalation of smoke which is linked with the use of firewood. Additionally, the oil from jatropha for processing can add value to the local products. Human assets from the local communities could however be negatively be affected when jatropha cultivation engages children as labour force. The human assets of the households were in no doubt affected by the level of education in the region as education gives the quality of human

assets of households. The skills and knowledge needed to boost the economic activities of the households which will lead to improvement of their livelihood were low as depicted in (Table 4.2) and (Table 4.5). This also affected their employment opportunities for lack of skills needed by the company for the project. The low standard of human assets in knowledge and education in the communities, made the local chiefs to append their thumb print on the contract they had with the management of Jatropha Company in accessing the land for the project. They received a sum amount of compensation which was contrary to their understanding of the contract but had already committed to the agreement.

### 4.6.3 Financial assets

The cultivation of jatropha has created jobs such as picking of jatropha seeds by the women, mechanics, tractor drivers etc., for some local farmers and other households by generating income to support their needs. The bringing in of local farmers as cooperative bodies into the jatropha industry will secure them into the bio-fuel market when they produce in large scale of jatropha bio-fuel for sale. There could be an increase in the prices of agricultural products due to additional values being added in their processing stage with the use of energy from jatropha oil which could indirectly increase the income of the local farmers. Farmers could however, lose their financial assets when there should be an occurrence of bad weather season for agricultural produce which could badly affect their livelihoods or when the jatropha company that employed them fall into financial difficulties resulting to its closure and thereby, laying off the workers.

### 4.6.4 Social assets

The engagement of farmers into cooperatives under jatropha production will create a sense of ownership to the farmers and representation. It will also present an opportunity for exchange of information and ideas. According to Jongschaap et al. (2007), it is difficult for poor people to access their social capital in a form of representation in order to voice their welfare. The livelihoods of the local people especially the women can be improved and their income level increased through the picking of jatropha fruits in the field, using the oil from jatropha to make soap to sell in the market as was the case in the research area. However, jatropha production has the tendency to generate social conflict between household's members and the jatropha companies especially, when there is no satisfaction in the compensation for land and property lost by the local communities.

### 4.6.5 Natural assets

Soil erosion can be controlled by jatropha plant while the soil can regain its fertility with the use of the jatropha cake. Jatropha plant helps to promote clean environment by absorbing carbon from the atmosphere. The production of jatropha in large scale could negatively affect farmers losing their land to the project and destruction of some vulnerable species on the land and its biodiversity. The cultivation of large scale commercial jatropha in monocultures could also lead to exhaustion of the soil.

## 4.7 Livelihood outcomes

The research area shows that, all the households are basically under agriculture activities such as food crops and livestock husbandry with other various dependencies. The households are engaged in farming and livestock activities which generate income and support their livelihoods. Observation in the field and livelihood analysis of households' activities shows that, households do not depend solely on one source of income but have various diversified livelihood sources. Most of the households invest in livestock from the income they generate from their food crops to sustain their livelihoods and increase their income. The majority of the farmers who lost their food crops' land to jatropha project had a drastic fall in their income which had an indirect effect on other diversified activities. The reduction in their income level affects their livelihoods and thus, explained the poverty level in the local communities.

## 4.8 The relationship that existed between the company and the local people.

The relationship between a company and the community in which it operate is very important in promoting a peaceful environment which has a positive effect on productivity. The local farmers and other members at the research area, who were interviewed, indicated that their relationship with the jatropha company's members was not the best as they had wanted it to be. They attributed the lukewarm relationship with the company due to how the company handled the disbursement of their compensation to those who lost their farm land to the project by channeling everything into the hands of the chiefs instead of dealing directly with the affected farmers. Some of the affected farmers indicated that they did not receive any

compensation at all. Those who had compensation received a meager sum of money which could not be measured to the land they have given out. Many of the members in the communities were not well informed about the aims and objectives of the company's operation and the benefits that were hoped to come from the company. The channel of communication between the local members and the company's management was not effective. For example, one member of the management of the company indicated that some section of the company's recruitment demands some skilled workers which they could not access from the local people and this compelled the company to employ a number of workers outside the local communities. This situation led to agitation by some members of the local famers and some of the local members for being left out in the company's recruitment. This agitation to my view could have been avoided if proper dissemination of information was carried out to the local members. A management of the company interviewed admitted that, the relationship with the company and the communities would have been much better if they had involved the entire members of the communities in dialogue and the purpose of their operation than limiting it to only the chiefs to disseminate the information to the communities. This situation led to distortion of information according to the assistant manager of the company.

### 4.9 Production of jatropha and protection of economic trees

Forest conservation is a vital issue when it comes to jatropha production in relation to the environment. The environmentalists and other environmental agencies are held with the fear that most developing countries will forego the preservation of the natural forests to the production of bio-fuel crops which will lead to the destruction of biodiversity. A scenario of such destruction of trees for the cultivation of bio-fuel occurred at Alipe in the Kasawgu traditional area in the northern part of Ghana. Bio-fuel Africa Limited acquired a vast area of land of about 5000 hectares for the cultivation of jatropha for bio-fuel. The land preparation for the cultivation of the jatropha was done without giving any consideration to the preservation of the various economic trees. The company initiated the clearing of the land with the use of bulldozers without any issue of permit from the Environmental Protection Agency (EPA). The cutting of these economic trees by the company without any assessment of the economic trees compelled the Gonja District Assembly and the Environmental Protection Agency to stop the company from its further activities. The stoppage of the

company's activities could not save the already cut down of trees which covered around 68 hectares of the land. The company could not operate in the area and had to abandon the project in that area due to the displeasure of the local people. Shea nuts trees which were not planted intentionally by anybody was one of the economic trees in the land which provided a source of income for the women in the local area who collect the fallen Shea nuts on the ground and process them into Shea butter oil for consumption and for sale. When the Shea nuts trees are cut down for the cultivation of jatropha, the implication will be the denying of the local women of their source of income and their livelihood. The Alipe incident provided a caution and the needs to avoid such destruction of the economic trees in the four selected areas for the research; Kpalkore, Chegu, Gimle and Kpachaa. Even though some of the economic trees were earmarked for protection in these areas such as Shea nuts,dawadawa and mango trees, much of the trees were cut down to make way for the cultivation of jatropha.

### 4.10 The current situation of Bio-fuel Africa Ltd.

Bio-fuel Africa Ltd. for the recent years has diverted its attention from the production of jatropha for bio-fuel to maize production and other cereal products in most parts of the country. The study area is one of the affected communities in which the company is gradually shifting from the production of jatropha to cereal products. The company has also changed its name from Bio-fuel Africa Ltd. to Solar Harvest Ltd. due to change of ownership of the company. The new company known as Solar Harvest AS in Norway currently runs the company in Ghana. According to the assistant manager Awal Mohammed, the current position of the company was due to the financial difficulties that it has encountered for the past years leading to the parent company in Norway (Bio-fuel AS) to file for bankruptcy. The bio-fuel Africa Ltd. was founded out of Bio-fuel AS in Stavanger, Norway. The Bio-fuel AS out of financial difficulty filed for bankruptcy in 2009 and this has affected the operation of Bio-fuel Africa Ltd in Ghana. This situation led to the disposal of the company's assets which were bought by Solar Harvest AS to defray its debt. This brought in Solar Harvest Ltd. to run the company after the acquisition of the entire assets of Bio-fuel Africa Ltd. As far as food security is concerned, the company realized that the jatropha was not really helping. The financial situation of the company and the need to ensure food security, led to the diversification as a company to maize and vegetable cultivation as well. Even though jatropha plantation was still in operation, maize and vegetable cultivation were included in their

operation to ensure food security The company's initiative of producing maize is in a right direction in ensuring food security but the process adopted by the company adopted in their maize production gives much concern on how it could avoid food insecurity in the area. The company rather produces the maize and exports it to the world market instead of selling some of the products in the local market and also engaging the farmers who have lost their land to jatropha project to involve in large production of maize so that the company could serve as a buyer from the farmers. This situation could have helped to create much job opportunities for many of the local people.

## 5.0 Summary and Conclusion

Generally, the production of bio-fuel feedstock especially jatropha and use of its by-products for feedstock could be a very effective way to curb poverty, improve livelihood and ensure energy security within the local region and the world in general. It could serve as a yardstick for development in rural areas particularly in Ghana where agriculture is the major occupation for the local people. The bio-fuel feedstock can help to improve the income level of the local farmers when there is high price and demand for bio-fuel at the world market. Another important area which bio-fuel industry could achieve success is the creation of employment to local communities and also served as option energy to fossil fuel.

The effectiveness of jatropha production in achieving its numerous benefits will also require effective structures to be put in place by the government in relation to the acquisition of large areas of land for bio-fuel crop production and proper land tenure system that provide security. This will help reduce the loss of land by the poor farmers in the communities whose livelihoods depend on and also help to reduce food insecurity. The commercial production of jatropha for bio-fuel in the world has generated numerous negative impacts to most countries which were into large scale commercial production of jatropha for bio-fuel such as Brazil, Tanzania, Mozambique, India, Indonesia and Columbia (Cotula et al., 2008). It should however, be noted that, the production of jatropha bio-fuel in large scale for commercial purposes does not necessarily result to negative impact but may achieve positive aspects in terms of job creation, development of skills if the necessary measures are taken into consideration such as the involvement of the local people, customary land rights and environmental sustainability are set up.

## 5.1 Findings at the research area

The findings at the research area regarding the production of jatropha for bio-fuel did not produced satisfactory in terms of its impact on the livelihood of the local communities. The research revealed that bio-fuel industry is not operating effectively as far as the objectives and the interest of the households are concerned. The institutions that suppose to function well to ensure the effectiveness of jatropha production are not carrying out to their task thereby making it a challenge for Bio-fuel Africa Ltd. in their operation. This has created friction between the local people and the management of the company.

The research observed that Bio-fuel Africa Ltd could not function well to achieve its targets. The local communities did not witness most of the positive aspects which Bio-fuel Africa Ltd. presented. The few jobs which the company created could not last long as the company decided to abandon jatropha production due to financial difficulties. The few development projects which were provided to the local communities such as corn mills and dams were not in good condition at the period of the research. The bio-fuel Africa Ltd was hit by retrogression in their production due to financial issues and friction between management of the company and the local communities. This compelled the company abandoned most of their machinery for jatropha cultivation in the research area and to gradually switch from large scale commercial production of jatropha to the production of maize and other cereal products at a village called Botanga.

The findings from the research area revealed that land for bio-fuel production was being accessed through the traditional land tenure system. Land for agricultural activities under this system also known as informal institution is mostly free but communally owned under the supervision of the local chiefs and elders of the communities. These institutions were found to be ineffective due to the lack of legal support. An instance is where promises made by the bio-fuel company as part of their agreement with the local people were not fulfilled fully and the company was not under any legal law to be charged for failing to honor its social obligation. Agencies such as, Environmental Protection Agency, Ministry of Agriculture, Land Commission, and the ministry of Local Government are some of the various formal institutions whose laws are being used to manage the operations of bio-fuel companies in the country. However, most of these laws are very weak and difficult in their application to monitor the operation of companies involved in the bio-fuel production in the country. The study revealed that apart from the Environmental Protection Agency the remaining agencies are ill functioning, a situation attributed to lack of clear definition of duties and responsibilities by the central government**.**

### 5.2 Suggestions made for future project

The following recommendations are made based on the research findings:

First, there should be proper consultation of land acquisition for large scale commercial production of bio-fuel feedstock. The research findings proved that proper consultation and

participatory in decision making should be made in the acquisition of vast land for such a project. The anticipated benefits and the negative effects from the bio-fuel project should be properly explained to the communities involved. The cultivation of jatropha bio-fuel should not be impose on the local people in order to access their lands for the project but there should be a consensus agreement between the management of bio-fuel companies and the local people to avoid any tension that might arise during the operation of the project. The local communities should have the legitimate right to decide for themselves as to whether to accept large scale commercial production of bio-fuel or not. Accessing of land for the jatropha project from the local people should be based on their free-will. The right form of compensation should be agreed by both the management of bio-fuel companies and the local people whose lands were acquired for the project.

Secondly, there should be a proper monitoring policy to check on bio-fuel companies to adhere to all local and national regulations which concern land rights and environmental sustainability and other duties indicated in the contract. These policies and regulations governing bio-fuel production should be reviewed always to suit the current situation of bio-fuel production in the world.

Thirdly, the provision of technical assistance from Bio-fuel Africa Ltd. to the local farmers is a step to promote large scale production of food crops. To ensure food security and job opportunities to the affected communities, the company should motivate affected farmers to form a cooperative body to cultivate maize in large quantities and then sell the harvest maize to the company. The company could then process the maize at the communities then sell some of the maize products to the local communities and export some of it. This will create job for some of the women and ensure food security after their food crops land have been given out for the jatropha project. In this way the company will be seen as part of the communities rather than being seen as an entity established to exploit the resources of the local people. The same concept could be done with jatropha cultivation in which the farmers will then serve as the producers while the company buys for resale locally or export. This will avoid ‘the winner takes it all concepts’. A practical experiment was conducted by International Tamale Food Company (ITFC) under this system and it has proven worthwhile.

Fourthly, there is the need to strengthened interested groups to check on bio-fuel companies and government to be accountable to their promises. Civil society groups, non-governmental organization and environmental protection agency should be encourage to take their task of

enforcing government and bio-fuel companies to deliver their promises and obligation to the protection of land, the communities and also ensuring that food security is not affected when food crops land are used for bio-fuel project.

Last but not the least, there is the need for government to campaign and educate the local people about the relevance of bio-fuel production in the country. It was revealed in the thesis that the policies that governed the bio-fuel production in the country are not well known to a larger portion of the populace. The policy recommendations and the type of agriculture crops that could be used to generate bio-fuel are not known by many of the people in the country. The use of electronic and print media, television broadcast, radio and the use of facilitators in rural communities could help to spread the information on bio-fuel and would deepen their understanding in the production of bio-fuel.

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# Appendices

## Household questionnaire

## Interview guide for heads of households

This questionnaire is strictly confidential. Any information given is basically for academic purposes

Name of the community..... Date.....

Respondent/Household no.....

### Section A- Background

### Information on household's members

1. Size of household ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8
2. Age of household head.....
3. Sex of household head ☐ Male ☐ Female
4. Marital status of household head ☐ Married ☐ Divorced ☐ Widowed ☐
5. Education of household head ☐ Primary ☐ JHS ☐ SHS ☐ None
6. Occupation of household head ☐ Farming ☐ Trading ☐ Housewife ☐ unemployed
7. Number of dependants.....
8. Are you an/a ☐ Indigene ☐ Migrant

### Section B- Livelihood activities

### Land access and Farming

9. Does your household own a land? ☐ Yes ☐ No
10. If yes, what is the size of the land?.....
11. How was the acquired? ☐ Inheritance ☐ Gift ☐ Purchase ☐ Other (specify).....
12. Do you have title to the land? ☐ Yes ☐ No
13. If no, what is the reason?.....
14. Does your household have access to land for farming? ☐ Yes ☐ No
15. If YES, what is the size of your land under cultivation?.....

16. What are the main crops cultivated by members of your household? ☐ Maize ☐ Rice ☐ Yam ☐ ground nut ☐ Mixed
17. What are the sources of your finance for your farming activities? ☐ Individuals ☐ Credit ☐ union ☐ Family ☐ Self finance ☐ Other (specify).....
18. Source of labour: ☐ Family ☐ Hired labour ☐ Nnoboa ☐ None
19. Do you have difficulties in accessing new land for farming? ☐ Yes ☐ No
20. If yes, can you explain.....
21. Household assets Livestock Equipment Transport Other (specify).....
22. Do members of your household earn income from other related economic activities such as charcoal, shea nut, basket weaving, fire wood etc. ☐ Yes ☐ No
23. What is your annual income?.....

**Section C- Impact of company's project**

24. Did your household lose any farmland to the jatropha project? ☐ Yes ☐ No
25. If yes, what was the size of land lost?.....
26. What has been the effect of the loss land on your farming activites?

    ☐ Huge effect ☐ No effect
27. How has the loss of land to the project also affected your household income from other resource related land activities such as charcoal, firewood, shea nut-picking etc.?

    ☐ The project has affected charcoal and firewood production

    ☐ The project has affected shea nut- picking

    ☐ No effect
28. If your household lost land to the project, how were you compensated? ☐ Relocated ☐ No compensation ☐ One-time lump sum payment ☐ Other (specify).....

29. Are you satisfied with the compensation for your lost farmland?

☐ Highly satisfied ☐ Fairly satisfied ☐ Highly dissatisfied

30. Do you still have access to enough farmland elsewhere? ☐ Yes ☐ No

31. Has your household farming activities benefited from the jatropha company in any way?

☐ Yes ☐ No

32. Has any of your household members been employed by the jatropha company? ☐ Yes ☐ No

33. If yes, how many?.....

**Section D- Company's contribution to rural development**

34. Has the level of your household income or living standard changed for the better since the company's started? ☐ Yes ☐ No Explain.....

35. What are some of the economic and social benefits that your community benefited from jatropha project? ☐ Clinic ☐ Corn mill ☐ Dam ☐ job opportunity ☐ School

36. What are some of the challenges you face in your community since jatropha project?

Land lost to the company ☐ Relocated farms far from village ☐ None

37. Do you think the company is fulfilling all its promises? ☐ Yes ☐ No. Give reason.....

38. What do you think the company needs to do to improve the livelihood of the local people in the communities? ☐ Reinstatement of the laid-off workers ☐ Construction of schools

☐ Employ more workers from the community

**Section- E Improving relations**

39. What is the existing relationship between the community and the company?

☐ Good ☐ Fair ☐ Bad

40. How can this relationship be improved? ☐ By fulfilling all their promises to the communities ☐ Regular meetings to know the people's problems if any

☐ Other (explain).....

**Appendix 2**

**Questionnaire for the management of Bio-fuel Africa Ltd.**

1. Position in the company.....
2. The company has been operating in this area for how long?.....
3. How many localities are affected by the jatropha project?.....

**Land acquisition by the company**

4. How was the land acquired? ☐ Purchase ☐ On lease ☐ Rented out ☐ Other (specify).....
5. How much amount of money was paid in the land acquisition?.....

**Impact of company's project**

1. What is the total size of land taken over by the your company?.....
2. Out of the total land taken by your company, what is the size of the land that was under cultivation?.....
3. How many farmers are affected by the land take over?.....
4. What form of compensation did your company give to the affected farmers?.....
5. How many people lost other economic related activities such as firewood, shea nut-picking due to your company's activities?.....
6. How does your company cater for the affected people?.....
7. What other negative impacts has the jatropha project had on food security and livelihoods in the affected communities?.....

**Trees Protection**

8. What economic trees has your company provided to the local communities?
9. What measures are taken in place to protect such trees (9)?

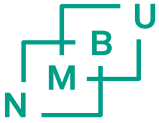
**Company's contribution to community development**

10. What development project(s) has your company provided to the communities?.....
11. How has these/this project benefited the people in the communities?.....
12. In your opinion, are the local people satisfied with the development project(s)?

    ☐ Yes ☐ No. Give reasons.....
13. What other developmental project does your company intend to provide for the communities in the near future?.....

**Questionnaire for local chiefs**

14. Name of community.....
15. What is the total area of farmland in your locality?.....
16. What is the size of land allocated to jatropha company?.....
17. What are the conditions attached to the release of land to the company?.....
18. How many farmers were affected in your locality?.....
19. What are the major problems created by the jatopha company?.....
20. What are the main challenges facing farming and other land resource related activities after the company's take off?.....



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