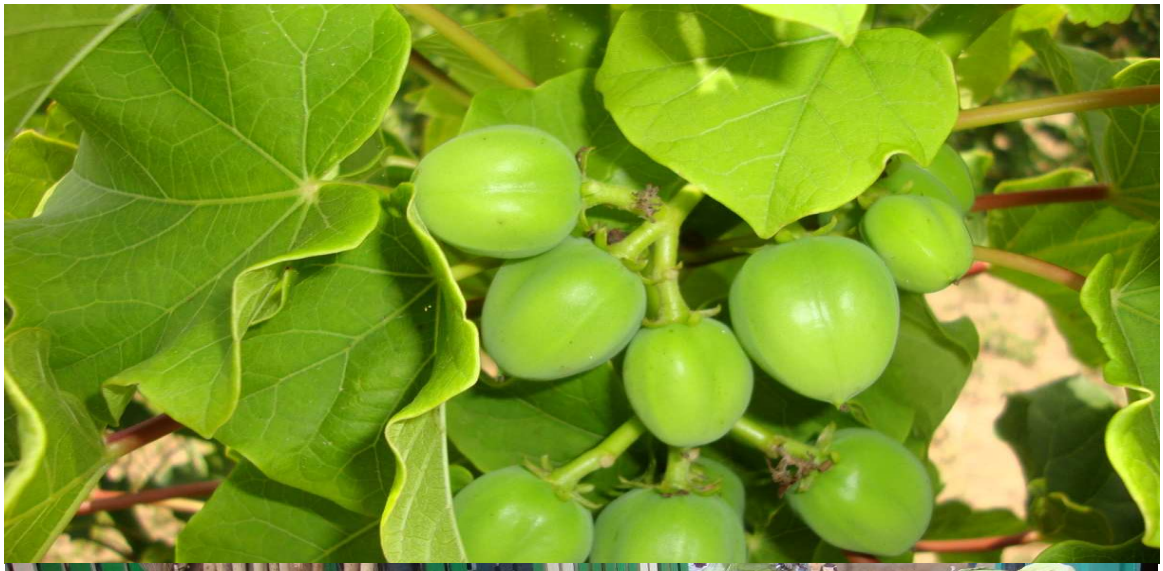
Competition between biofuel and food?

The case of a jatropha biodiesel project and its effects on food security in the affected communities in Northern Ghana



Festus Boamah

Masters in Resources and Human Adaptations

Department of Geography, University of Bergen, May 2010

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ABSTRACT

Biofuels have become an issue of much concern to policy makers, national governments and the international agencies amid discussions on climate change. Debates and discussions about the implications of biofuels are underpinned by the managerial and populist discourses that offer policy directions to address climates change issues in the 21st century. In Ghana, opponents of biofuels adhere to the populist discourses to describe daunting implications of biofuels on local environmental resources and livelihoods whereas proponents adhere to managerial discourses to express optimism in biofuels as the means to mitigate the impacts of climate change through technology transfer and local improved livelihoods.

The examines the food security implications of jatropha biodiesel project by BioFuel Africa Ltd. in the Central Gonja and Yendi Districts of Northern Ghana. The project aims to produce jatropha biodiesel both for use in Ghana as well as for export and also contribute to improved livelihoods and food security in the affected communities in Northern Ghana. This study examines the effects of the jatropha project on the food security of households in three villages in Yendi district, whose livelihoods depend on cultivating food crops on the lands earmarked for the project. The study found that the jatropha project improved household food security through employment creation, improved petty trading as well as increased food production on an otherwise abandoned farmland. However, the global economic crunch coupled with negative publications by interests groups in Ghana led to loss of funding sources for the company and the subsequent layoff of almost the entire workers. The evidence presented shows that, the discourses underpinning biofuel debates are expressed by the use of narratives. The narratives within the discourses are re-told by constructing a more nuanced knowledge on biofuels and food security by bringing to the spotlight a wide range of different context-specific cases of biofuel investments and the conditions under which biofuels influence food security.

It is then argued that, the extent of competition between biofuels and food depends on the local conditions, social responsibility and production models of biofuel investors and the type of biofuel feedstock used. These decisive factors should be given a high priority in the assessment of food security implications of biofuels, instead of adhering to discourses.

Key words: biofuel, biodiesel, discourse, ethanol, food security, jatropha, interest groups, livelihoods, local context, narratives.

DEDICATION

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ABBREVIATIONS

AAG - Action Aid- Ghana

AAI -Action Aid International

ADB -Agricultural Development Bank

CCC - Central consultative committee

EPA - Environmental Protection Agency

GHC - Ghana cedi

GHG - Greenhouse gas emissions

Ha - Hectares

IFPR - International Food Policy Research Institute

MOFA - Ministry of Food and Agriculture

NGO - Non-Governmental Organization

OECD - Organization for Economic Co-operation and Development

RAINS - Regional Advisory and Information Network Systems

SEKAB - Swedish Ethanol Chemistry AB

SPSS - Statistical Package for the Social Sciences

WWF - World Wide Fund for Nature

WFS -World Food Summit

GLOSSARY

Alipe -A village in the Cntral Gonja district of Northern Ghana

Alipe Wura - the title of the chief of Alipe

B100 - crude or undiluted biodiesel

Dagomba -One of the dominant ethnic groups in Northern Ghana

Dawadawa - An important economic tree in Northern Ghana.

Flex-fuels - Fuels produced by blending either ethanol with gasoline or biodiesel with petroleum-based diesel

Flexible fuel vehicles - Vehicles that are designed with engines that can run on different fuel types.

Gonja - One of the dominant ethnic groups in Northern Ghana

Heroes - Agencies, companies or individuals that respond to emergency situations to bring relief to marginalized or poor people

Jaashie - A village in the Yendi district of Northern Ghana

Jimle - A village in the Yendi district of Northern Ghana

Kusawgu - A town in the Central Gonja district of Northern Ghana

Kusawgu-Wura - The title of the paramount chief of Kusawgu

Kete Krachi -The name of a district and a town in the Volta region of Ghana.

Kpachaa - A village in the Yendi district of Northern Ghana

Sang - One of the towns in Yendi Municipal Assembly.

Tijo-Naa - The title of the paramount chieif of Tijo

Twi - A language spoken by the Akan ethnic group and most residents of Southern Ghana.

Victims - People who suffer the consequences of projects

Villain(s) - Agencies, companies that bring suffering to innocent people.

1 INTRODUCTION

Discussions and debates about the quest for biofuels as an alternative energy source are not recent as they date back to the early 1970s. However, there has been an upsurge in this alternative energy since the past few decades to supplement fossil fuels to meet the high global demand for fuels. The rejuvenated interest primarily stems from the need to achieve energy security and the global urge for environmental sustainability due to the high greenhouse gas emissions associated with fossil fuels causing global climate change. As a consequence, there has been an increase in biofuel investments across the world to produce biodiesel and ethanol primarily for transport purposes. One such investor is a Stavanger-based oil company, BioFuel Africa Ltd., which is an African affiliate of BioFuel AS (now Solar Harvest AS). BioFuel Africa Ltd. gained approval from Environmental Protection Agency (EPA)-Ghana to undertake jatropha project in Northern Ghana to produce biodiesel. Land areas belonging to the affected communities in the project area has been leased out to the company for large scale cultivation of the oil-rich jatropha curcas plant.

However, because it is a fundamental factor of production in the economies of developing countries, outsourcing of land areas for biofuel production is a delicate issue for policy makers, environmental activists and land users due to the perceived implications on food security, the environment and livelihoods. As a result, there are debates about the food security and livelihood implications of the jatropha biodiesel project among governmental and non-governmental agencies in Ghana (RAINS, 2008, Action Aid-Ghana, 2009, Rural Consult Ltd., 2009). The debates are underpinned by the ideas of the mainstream Global Environmental Managerial (GEM) (Adger et al, 2001) and populist discourses. A discourse refers to a shared meaning of a phenomenon (Dryzek, 1997, Adger et al, 2001, Svarstad, 2002). The Global Environmental Managerial (GEM) discourses, hereafter called managerial discourses, espouse the need for external interventionist projects in the form of financial payments to contribute to development and improve livelihoods of local communities and also encourage the promotion of clean technologies to address climate change problems (Adger et al, 2001). Populist discourses, on the other hand react to the managerial discourses by rather explaining climate change as a consequence of the institutions of capitalism (ibid.) and thus, criticize so-called development projects such as large-scale biofuel investments due to their perilous impacts on the local environment and livelihoods.

In Ghana, biofuel debates are underpinned by the two competing discourses to inform policies about its implications on food security. For instance, whilst the proponents of the jatropha biodiesel project adhere to the managerial discourses to express optimism in improved livelihoods and food security in the affected communities, the opponents subscribe to the populist discourse to explain dire consequences on farming and land resources. Narratives are adopted as an expressive means in the debates about the implications of the project on food security in the affected communities. Narratives begin as a story with a beginning, middle and end or an argument with premises and conclusions where an event follows from another or from which something develops (Roe, 1991:288). The proponents and the opponents of the jatropha biodiesel project subscribe to the two mainstream discourses by adopting narratives to communicate their messages about the implications of the project and as the study will show, such narratives resounds the complexities that are taken for granted in biofuel debates.

In other words, the debates about the implications of the jatropha project are fraught with controversies underpinned by the ideas of the two competing mainstream discourses. In the midst of such controversies surrounding the establishment of the BioFuel Africa project in Northern Ghana, an empirical study was conducted to discern the implications of this project on food security and livelihoods by focusing on three Yendi villages whose livelihoods largely depend on cultivating food crops on the land areas acquired for the jatropha plantation. By exploring the implications of the project in the three villages, the study will tease out the rhetoric with much emphasis on the demarcation line between concern and empirical evidence and hopes to refine the biofuel debates adhering to the mainstream discourses for an informed biofuel policy.

1.1 Background of Biofuels

BioFuels refers to solid, liquid and gaseous energy sources derived from living organisms. In the case of this study, the use of the term biofuel refers to liguid-biofuel produced from plants sources. The liquid biofuel comprises fuels produced primarily from crop plants rich in starch (maize, wheat, barley, cassava) or sugars (sugarcane) and oil-rich plants (jatropha, rapeseed, palm oil, soya bean and sunflower). Prominent liquid-biofuels are ethanol and biodiesel. Ethanol and biodiesel account for approximately 84% and 16% of total global biofuel production respectively (OECD 2008, Fischer, et al, 2009: 41), and the former is projected to increase in the near future at a much higher rate (Dufey et al, 2007: 24). Ethanol is produced

from both starch starch-rich and sugar-rich plants whereas biodiesel is produced from oil-rich plants. The two liquid fuels are used mostly for transport purposes either in their original form or in blends. Biodiesel blended with petroleum-based diesel or ethanol blended with gasoline is called flex-fuels and the mixes usually range between 25% and 85%. These hybrid fuels are suitable for flexible fuel vehicles which are designed with engines that can run on more than one particular fuel type.

In Europe, biodiesel is available in both neat forms (100% biodiesel also known as B100) or in blends with petroleum-based diesel (Sheehan et al, 1998). Because it can be used directly in existing diesel engines, biodiesel is viewed as a potential fuel source to reduce the high demand for petroleum-based diesel in the transport sector (ibid). Germany, France and Italy are the European countries in the forefront of biodiesel production using primarily rapeseed (De Fraiture et al, 2007, Dufey et al, 2007).

Ethanol-producing countries predominantly use sugarcane and maize. In Asia, China and India are the leading producers of biofuels mostly using maize and sugarcane respectively to produce ethanol (De Fraiture et al, 2007). In North America, the United States is the dominant producer of maize ethanol using nearly 4 million ha to biofuel crops accounting for 4% of the total cropped area (ibid.). In South America, Brazil is the leading producer and exporter of biofuels producing mostly ethanol from sugarcane. Brazil produces ethanol using 2.5 million ha of land representing 5% of the cropped land mostly from sugarcane (ibid.) with its ethanol exports of about 50% of international demand (Dufey et al, 2007:9). The situation of biofuels in Africa is a mixed one. Some countries (Ghana, Kenya, Mali, Tanzania and South Africa) are experiencing both foreign and local investments for the production of both biodiesel and ethanol produced mainly from jatropha and sugarcane (Hamisi, 2009, Nelson and Sulle, 2008, WWF, 2008). From the information presented above, the surge in biofuels is a global phenomenon.

The surge in interest in biofuels stems from a number of reasons including, energy security, and concerns about trade balances, desire to decrease greenhouse gas emissions and potential benefits to rural livelihoods (Dufey, 2006). However, the renewed interest in biofuels has coincided with food security emergencies worldwide in the 21st century. For instance, fears of starvation caused poverty-stricken individuals to embark on demonstration in countries including Cote D'ivoire, Ethiopia, Cameroon, Guinea, Morocco, Senegal, Mexico, Thailand,

and Pakistan demanding sound policies to stabilize soaring prices of food in the year 2008. In Haiti, the Prime Minister was forced to resign after weeks of continuing demonstrations over soaring food prices (Daily Graphic, April 2008). The increases in global food prices are attributed to the high oil prices and the consequent increases in the production and transport cost of agricultural commodities (Flammini, 2008:8). The food supply emergencies are predicted to worsen by the surge in biofuels (Flammini, 2008:9). For instance, it is estimated that, global food prices increased by about 140% between 2002 and 2007 due to a number of factors including increased demand for biofuel feedstocks and agricultural prices are even estimated to further increase by 30 % due to biofuel targets by 2020 (Fischer, et al, 2009: 22).

As a result of the global surge in biofuel production, concerns are expressed over its implications on food security. The International Food Policy Research Institute (IFPRI, 2007) reports that, the diversion of crops and agricultural land away from food production into fuel production is anti-poor as this implies a "tax on the basic food" through price increases. Such a burden is borne by the poor people as food forms the largest share of their expenditures (IFPRI, 2007:14). Action Aid International (AAI, 2008) has recommended the imposition of moratorium on biofuel production until the full range of impacts are known or the adoption of technology that make efficient use of energy to reduce demand due to the current perilous effects of biofuels on food security. Oxfam (2008) sees biofuels as compounding food supply problems in developing countries. Beside direct competition with food crops, biofuels also compete with it for land, water, and other inputs, pushing up prices further and eventually making the achievement of the first Millennium Development Goal of eradicating poverty and hunger less realizable (ibid.). In addition, the Organization for Economic Co-operation and Development (OECD, 2008) estimates that between 2005 and 2007, almost 60% of the increase in consumption of cereals and edible oils was due to biofuels.

Implicit in these reports are the daunting implications of biofuels on food security. These concerns have received much attention in most roundtable discussions on sustainable development since the past decade. The renewed interest in biofuels coupled with scanty empirical research has generated divergent research findings and policy reports addressing the implications of biofuels. Whilst proponents view biofuel as an alternative to achieve energy security and spur economic development, opponents see biofuels as a threat to local livelihoods and food security. The above controversies motivated my interest to enquire the

effects of the jatropha biodiesel project on food security in the affected villages in Northern Ghana.

1.2 Background of the jatropha project in Northern Ghana

"The environmental benefits of biofuel are well-recognized and acknowledged throughout the world: carbon emission reductions, increased fuel economy, reduction of dependence on fossil fuels. But the creations of a biofuel industry in developing economies, like Africa, go far beyond environmental concerns. Jobs are being created, economies are being impacted, infrastructure is being built, services provided, and lives profoundly changed. … We believe in partnering with communities, tribes and governments to create lasting economic infrastructures and change lives" (BioFuel Africa Ltd., 2008). The above quote is the rationale for the biofuel investment by BioFuel Africa Ltd. Inspired by the managerial discourse, BioFuel Africa Ltd.**,** gained the approval of EPA-Ghana in February, 2008 for jatropha biodiesel project on land areas of area of 23,762 hectares in the Central Gonja and Yendi districts in Northern Ghana **(**ibid.).

BioFuel Africal Ltd. was formerly owned by BioFuel AS. However, the two founders of BioFuel AS, Arne Helvig and Steinar Kolnes, acquired 100% of the shares in BioFuel Africa Ltd. on March, 13, 2009 when the mother company was forced to file for bankruptcy on the grounds of corruption allegations (BioFuel Africa Ltd., 2009). The two founders bought all shares of BioFuel Africa Ltd. to assume all its debts as well as acquiring all assets. This paved the way for BioFuel Africa Ltd. to continue its operations in Ghana. A new company, Solar Harvest AS, has been formed in Norway and is now the sole owner of BioFuel Africa Ltd. The current owners of BioFuel Africa Ltd. seek to bring to the global market a socially and environmentally responsible product to distinguish themselves as concerned businessmen in biofuels. The company's aim is to undertake environmentally friendly jatropha project to produce biodiesel for both local use (Ghana) as well as for export. The biodiesel for the global oil market is intended to augment fossil fuels and also reduce greenhouse gas emissions identified as a cause of climate change. BioFuel Africa Ltd. aims to meet the challenges of the high global energy demand whilst promoting local development and boosting food security in the affected communities in Northern Ghana.

BioFuel Africa Ltd. intends to produce biodiesel from jatropha nuts because of the plant's outstanding biological characteristics. The company first began the jatropha project in Alipe, a village in the Central Gonja district of Northern Ghana in 2007 but met local opposition in Ghana from NGOs, individual environmental activists and a section of the Ghanaian press media on the grounds of perceived dire implications on local livelihoods and food security. The project was abandoned in the village after a month-long of operation. After the abandonment of the project, the company moved to a new project site in the Yendi district in Northern Ghana where the jatropha plantation was established.

1.2.1 Biological characteristics of jatropha feedstock

Jatropha curcas plant is native to Central America. It is a wild plant with long lifespan of about 50 years. The plant grows well under tropical and sub-tropical climate and thrives best in low rainfall regions and degraded land seeds (Pandey et al, 2006:222). For instance, the plant is said to thrive under environments with as little as 10 inches (25 centimetres) of rain per year Cocks (2009: 139). Currently, the plant is found in almost all ecological zones of the world, including Asia, Africa and North America. Jatropha plant contains highly toxic compounds which makes it non-edible not even for livestock. The plant is rich in oil between 35-40% from which diesel can be produced after combustion without being refined. Because of the plant's rich oil content as well as its suitability to most ecological zones and soil conditions, it has been identified by investors, researchers and energy security agencies as an important feedstock to produce biodiesel.

As an oil-rich plant that thrives on marginal land under different ecological zones, jatropha has been christened the *wonder plant* because of its potential as a biofuel feedstock compared to prominent biofuel feedstock such as sugarcane, maize, soybean, wheat, cassava. This is because, the above mentioned prominent biofuel feedstocks are important edible food crops consumed by majority of the world population. More so, those feedstocks especially sugarcane require good arable land conditions with good drainage for proper growth. As the study will show, the type of feedstock used for the production of biofuel has a profound effect on food security.

1.2.2 The Land acquisition process

The management of BioFuel Africa Ltd. initially made contacts with some local people of Northern Ghana through advertisement in a leading Ghanaian newspaper (Daily Graphic) about their search for land areas to undertake jatropha project. These individuals communicated to BioFuel Africa Ltd. (by e-mail) that, there are vast unused land areas in the Northern Ghana. These "land contactors" explained the influential role of chiefs in land acquisition in Northern Ghana. The management of BioFuel Africa Ltd. left Norway for Ghana to make land acquisition negotiations with the chiefs of the current project areas. Permission for the jatropha project was thus, sought from Kusawgu-Wura and Tijo-Naa, the title of the chief of Kusawgu in central Gonja District and Tijo inYendi districts respectively. In the course of the project, these local people served as the intermediaries between the company, the chiefs and well as the affected communities. Currently, these individuals who led the company into the Northern Ghana for the land acquisition are employed as the land contracting managers of BioFuel Africa Ltd.

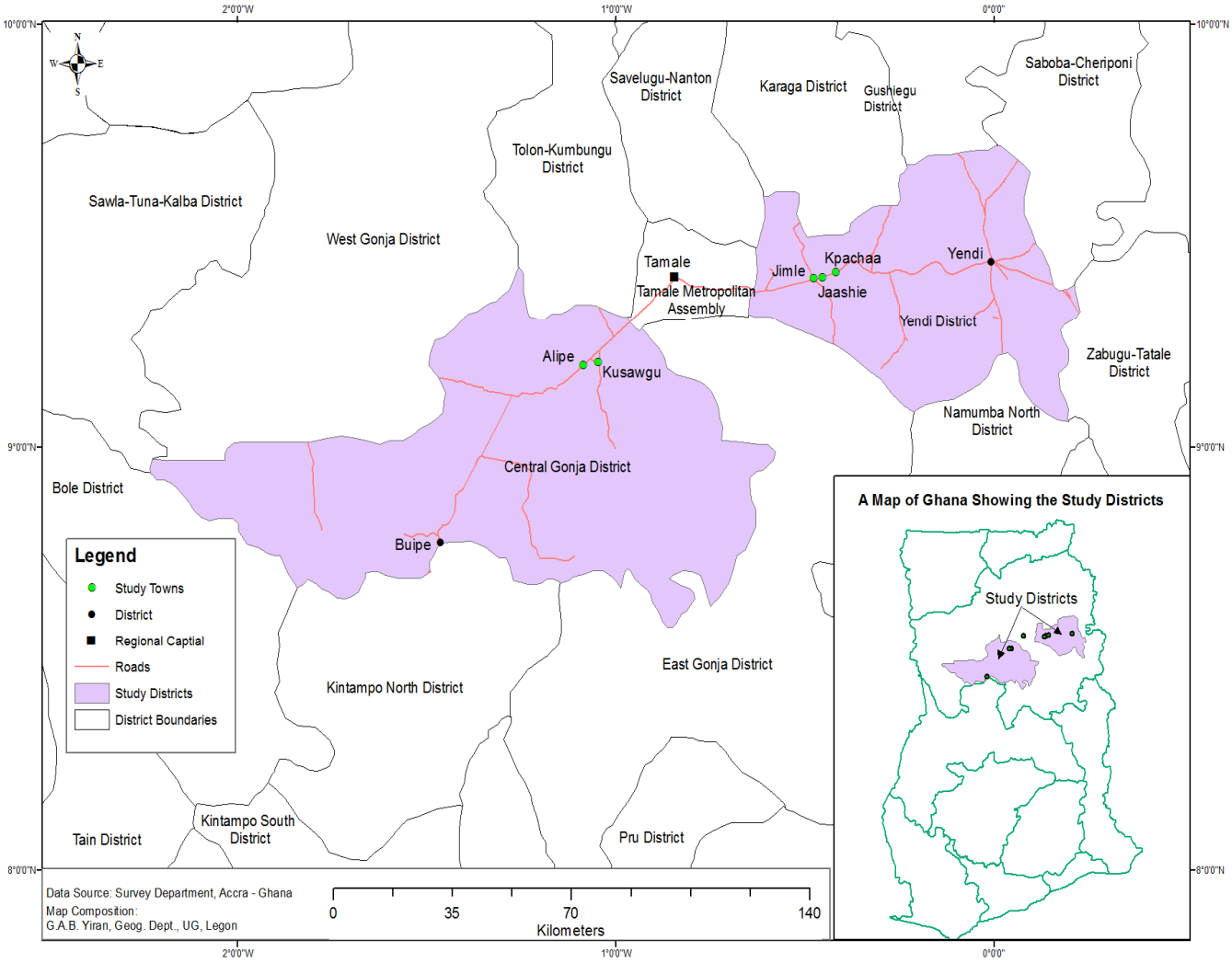
Local people of Alipe assembled with the management of BioFuel Africa Ltd. in a durbar at the palace of Kusawgu-wura for negotiations to ensure win-win effects of the project for both parties. The durbar was attended by Alipe-wura (chief of Alipe), local farmers, shea nut business women and some environmental activist groups. The local people whose livelihoods depend on crop cultivation on the land leased out for the project were informed at the durbar. Kusawgu-Wura expressed optimism in the spin-off effects of the project in the Alipe village and thus, leased out a land size of 300 ha initially for the start of the project and promised to lease out larger land areas for the project upon seeing signs of development potentials in the affected community. Similarly, in the current project site in Yendi, the paramount chief of the area, Tijo-Naa consulted his sub-chiefs (chief of Jimle, Jaashie, Juro, and other village chiefs) taking care of "his land" at the village level, a biofuel company has expressed interest in the land for the jatropha project. The chiefs in turn consulted their elders and community members. When the village chiefs together with the elders of their respective communities confirmed their willingness to lease out the land areas to BioFuel Africa Ltd., Tijo-Naa asked the company to compensate the farmers in any land area that will be cleared and must also commit itself to development projects in the affected communities. When these guidelines are followed, Tijo-Naa also promised the lease out of additional vast land areas for the expansion of the project.

However, despite formal notice to the Land Commission and Environmental Protection Agency-Ghana, little efforts were made by BioFuel Africa Ltd. for the formal documentation of the land acquisition due to some delays in the release of the land acquisition authorization documents. The 'local land contractors' encouraged BioFuel Africa Ltd. to start the project while waiting for the formal documentation from EPA. These individuals argued that, because chiefs play an important role in the acquisition of land titles, once permission is sought from them, there is enough authorization to use the land. Thus, after gaining the approval of Kusawgu-wura, BioFuel Africa Ltd. began the land preparations for the Project in Alipe. In short, the land use authorization for the project in Alipe was sought from only the two chiefs (Alipe-Wura and Kusawgu-Wura). Debates by interest groups about the perceived "land grabbing" and its daunting implications on livelihoods and farmland areas climaxed with the abandonment of the project in Alipe. Before leaving for the new project site in the Yendi district, BioFuel Africa Ltd. sought for the formal approval from the EPA. In February 2008, the company gained the approval of EPA-Ghana in addition to the consent of the chiefs (Tijo-Naa and his sub-chiefs) before the establishment of the jatropha plantation. In the same month, the company gained approval from EPA to resume the project in Alipe.

1.3 Background of study areas

The section describes the geographical background of the study areas; location, climate, vegetation, livelihoods and the governance systems. Although, the three Yendi villages (Kpachaa, Jimle and Jaasie) is the focus of the study, however, brief background information will be given about the Alipe village where the project first began as the study will make reference to the village as the starting point of the debates about the jatropha project.

1.3.1 Geography of the study areas



Map1: *The study areas in the central Gonja and Yendi districts, (Survey Dept, Accra).*

The three study villages of Kpachaa, Jimle and Jaashie are in the Yendi Municipal Assembly (formerly Yendi District Assembly). The Yendi Municipality has population of 142,504 (population and Housing census, 2000) with a total landmass of 5350 sq. km. The municipality has a population density of 26.6 persons per square kilometers. Mean annual rainfall for the district is (Jan- Dec.) – 1,125mm. Mean wet season rainfall for the district is (April- Oct.) 1,150 mm. Mean dry season rainfall (Nov. – March) 75mm. Mean annual deficit is between 500 mm and 600 mm. Rainfall is seasonal and unreliable.

The soils are basically laterite, ochrosols, sandy soils, alluvial soils and clay. The low organic content of the soils is further destroyed by the extensive rampant bush burning and bad agricultural practices that characterize the municipality. This to a large extent accounts for the low yield per acre and the consequent food shortage during the dry seasons. The soils in the

municipality, climate as well as poor farming practices such as bush burning have a profound effect on the vegetation characteristics. The vegetation is tree savannah type in areas that are not affected by settlements and farming activities. Economic trees in the district include shea trees, dawadawa, mango and cashew. Alipe is about 3 kilometres from Kusawgu, which is the seat of the paramount. It shares the characteristics of the Central Gonja district.

1.3.2 Governance systems in the study areas

The study areas have two-tier governance systems; chieftaincy and local Government systems. The governance systems in the study areas provide a good understanding of the land use right and land tenure system in the study communities. The traditional authority of the three Yendi villages is headed by Tijo-Naa, the paramount chief of the Tijo. The relationship between the chiefs is a hierarchical one. The sub-chiefs of the communities Jimle, Jaashie, Tuya, Kpalkore, Juro answers to Tijo-Naa. However, the chief of Kpachaa takes authority from chief of Jimle. The sub-chiefs in turn have elders at the village levels who serve as the intermediaries between them and the local people. Similarly, Alipe is under the authority of Kuswagu who is the owner of the land areas under his jurisdiction. Alipe-Wura, the chief of Alipe, answers to Kusawgu-Wura who is a paramount chief of the surrounding communities including Alipe. The hierarchical order of power relations between the chiefs is extended to the control over land use. For instance, the land under the Tijo town is controlled by Tijo-Naa who has in turn empowered the village chiefs under him as the custodians of the respective land areas under their areas of jurisdiction. Thus, any land use activity in any of the above mentioned Yendi villages must be reported to the Tijo-Naa through the sub-chiefs at the village level. Land areas in the villages are not for sale unless otherwise decided by Tijo-Naa. Similarly, land use right in Alipe is determined by Kusawgu-Wura with Alipe-wura as the custodian of the village land.

Beside the traditional political governance, the Yendi Municipal Assembly serves as the local government structure that oversees activities in the areas on official platforms. The capital of the Yendi Municipal Assembly is Yendi. The communities elect a member (Assemblyman), usually an educated person to represent their interest. There are also unit committees that represent the interest of the surrounding communities. The Assemblymen of the communities

and the unit committees work together to represent the interest of all the communities during meetings of the Yendi Municipal Assembly in Yendi. Alipe has an Assemblyman who represents the interest of the people in the Central Gonja District Assembly. Although, land use right must be sought from the two governance systems, however, in practice, in Northern Ghana, land use right usually requires consultation from chiefs.

1.3.3 Major livelihoods

The main livelihood in the study areas is farming. Crops cultivated include maize, yam, groundnut, cassava, rice, millet as well as ingredients like pepper, onion and okro. Farming is predominantly undertaken by men. Women on the other hand, are engaged in shea nut, firewood as well as charcoal businesses. Women also undertake petty trading in food sales. The livelihoods in the two study areas are almost the same except that, shea nut business is most predominant in Alipe, whilst livestock rearing is common in the three Yendi villages. Livestock rearing mostly cattle, sheep and goats is an important source of income in most households in the three Yendi villages.

1.4 Research Problem

Extensive literature has raised concerns about the implications of biofuels on food security. As explained earlier, the concerns adhere to the ideas of the managerial and populist discourses. Whilst the adherents of the managerial discourses express optimism in biofuels through its economic spin-off effects in affected communities, the adherents of the populist discourses express pessimism in the implications of biofuels on local livelihood and food security. However, biofuels are produced under a wide range of systems and conditions, including different feedstock used, varying production schemes and management practices, land ownership and land use systems (Fischer et al, 2009: 24). Different countries produce biofuels from different biofuel feedstocks including sugarcane (Tanzania), maize (USA), jatropha (India), and rapeseed (European Union). These feedstocks have different soil requirements for proper growth. Whilst some require dry soil conditions (jatropha), others require waterlogged conditions (sugarcane). Moreover, whilst some biofuel investments are undertaken on publicly owned-land areas, others are undertaken on land areas belonging to

village residents. Because of the difference in the above conditions under which biofuels are produced, biofuel investments by different investors in project areas with different local conditions, using different feedstocks may have different implications on food security and livelihoods. It is noteworthy that, in spite of the above mentioned contextual variations, narratives are used as the expressive means by the interest groups adhering to the ideas of the two discourses to make presumed claims about the implications of biofuels. Nonetheless, as explained above, in the communities affected by the BioFuel Africa jatropha project, livelihoods are primarily based on land resources for farming, shea nut collection as well as firewood and charcoal businesses. Land is thus, of important economic value in the affected villages. Moreover, the biofuel feedstock (jatropha) which is used for the biodiesel project has different land or soil requirements for growth. As a result, such a project undertaken on large areas of land will thus inevitably have certain effects on local livelihoods and food security.

1. 5 Objective of the study

The study sought to examine the effects of the jatropha project on the food security of households whose livelihoods depend on the land earmarked for the project.

The study focused on the case of three affected communities, Kpachaa, Jimle and Jaashie in Yendi District with a historical backdrop of the incipient phase of the project in Alipe under Central Gonja Disttrict in Northern Ghana where the project first began. Specifically, the study sought to provide answers to the following research questions;

- ✓ *How did BioFuel Africa Ltd. access the land for the jatropha project?*
- ✓ *Do the jatropha plantations compete with food crops for land?*
- ✓ *In what ways have changes in purchasing power influenced household food security*
- ✓ *Are the ideas of the competing discourses surrounding the jatropha project consistent with the empirical evidence on the effects of the project on food security?*

1.6 Organization of the thesis chapters

The thesis is made of seven chapters. **Chapter One** has introduced the study by identifying the hegemonic discourses underpinning debates about the implications of biofuels. And these debates have necessitated the study. After this introduction chapter (Chapter one), the study proceeds to the remaining chapters of the study.

Chapter Two provides the theoretical underpinnings of the study. Discourse analysis concept provides a framework for the analysis of the managerial and populist discourses underpinning the debates about the implications of the jatropha biodisesel in Northern Ghana. The food security concept explains household food security situation in the study villages before and during the project. The gender and households introduce into the study the gender division of labour in the study areas and the contribution of men and women to household food security during the jatropha project.

Chapter Three which is the methodology chapter discusses the research methods and approaches, data collection techniques and instruments used during the fieldwork. The fieldwork challenges are also discussed in this chapter.

Chapter Four provides the incipient stage of the project in Alipe where the project first began which also serves as the starting point of the debates about the implications of the jatropha project in Ghana. The events that led to the abandonment of the project in Alipe and the subsequent relocation to the Yendi district are also explained in this chapter.

Chapter Five presents the empirical evidence of the effects of the jatropha project on household food security in the three affected Yendi villages.

Chapter Six discusses the findings of the study. The complexities surrounding biofuel narratives are identified based on empirical evidence from the study. The chapter constructs a better knowledge to improve the narratives by exploring the conditions under which biofuels influence food security.

Chapter Seven concludes the study by providing answers to the research questions based on findings from the study. Recommendations are teased out from the concluding remarks to guide further research on biofuels as well as to inform biofuel policies.

2 THEORY

Social scientists explain social phenomena through a framework of theories, concepts and models in order to observe, organize and analyze experience. Theoretical underpinnings serve as the lens through which social scientists conceptualize experience of social phenomena. The study drew insights from three theoretical perspectives including discourse analysis, the concept of food security and gender theory and households. Food security concept provides a framework about the food security situation in the study villages, gender theory provided insights into the analysis of the contribution of men and women to household food security, whilst discourse analysis provides framework for the analysis of the managerial and populist discourses underpinning the debates about the jatropha project in Ghana.

2.1 Discourse Analysis

The study adopts the discourse analysis concept to provide a framework for the analyses of the discourses that underpins the debates about the implications of the BioFuel Africa jatropha project in Northern Ghana. The relevance of the discourse analysis concepts for the study is to analyze the consistency of the managerial and populist discourses underpinning the jatropha project debate in Ghana with empirical evidence on food security effects in the study villages.

Dryzek sees a discourse as “a shared way of apprehending the world. Embedded in a language, it enables those who subscribe to it to interpret bits of information and put them together into coherent stories or accounts. Each discourse rests on assumptions, judgments, and contentions that provide the basic terms for analysis, debates, arguments, and disagreements…” (Dryzek, 1997: 8). In short, discourse refers to a specific delimitation of the shared meaning of a phenomenon (Svarstad, 2002: 67). Such a shared meaning, for instance about the effects of biofuel projects, may be adhered to either by a small or large group of people at different geographical scales, ranging from the local, national to international or global level (Adger et al, 2001: 683).

While some discourses are weaker, others are stronger (ibid.:685). When stronger or leading discourses dominate thinking and become translated into institutional arrangements, they are called hegemonic discourses (ibid.). The adherents of a discourse contribute to it in various degrees regarding its production, reproduction and transformation through written and statements (ibid.). It is noteworthy that, ‘’these statements possess certain regularities not only as to content (or message), but also by the use of some shared expressive means in terms of, for instance, certain meta-narratives and rhetorical devices such as metaphors’’ (Svarstad, 2002:68).

Meta-narrative is used to conceptualize an abstract structure or pattern to which specific narratives within a discourse may belong (ibid.: 77). However, Svarstad concentrate on narratives production in accordance with meta-narratives and delimit attention to the role of other expressive means (ibid: 68). The expressive means here refers to the ways the message of a discourse is communicated (Adger et al., 2001: 685). Narratives are important expressive means of discourses. Narratives are pragmatic in the sense that, they compel the audience or listeners to act or believe in something by creating a scenario that, something will inevitably happen given certain sets of conditions. The incontrovertible logic in narratives authenticates development action (Leach and Fairhead, 1995:1024). The use of narratives as an expressive means in discourses is evident in its usefulness to simplify the uncertainties and ambiguities that bureaucrats and policy or decision-makers face in development issues (Roe, 1991: 288). Explaining the tendency to meet complexity with narratives, Roe (1999) asserts that “one of the abiding ironies of rural development practice – and not just in Africa – is that narrative and complexity are deeply reciprocal. The more complex things are and the more things there are to be complex, the more widespread complexity becomes at the macro-level and the greater the demand for standardized approaches with wide application to deal with complexity” (ibid.: 2).

Discourse analysis simply means the analysis of discourses. Discourse analysis is a product of constructionist approaches to the study of the social world, which focus rather on claims, claims-makers as well as the claims-making process on a phenomenon instead of the phenomenon itself (Best, 1989, Hannigan, 1995 in: Adger et al, 2001). Today, the concept has proven to be useful in uncovering unequal interests in the ways the problems of the environment and development are understood. Discourse analysis is an important tool for

social scientists because it facilitates critical examination of social constructions which take for granted certain aspects of the world, especially in developing countries where people commonly adhere to discourses and narratives despite the absence of valid empirical foundation (Svarstad, 2002:87).

Adger et al (2001) espouse the ideas of the Global Managerial Discourses (GEM) and populist discourses to address the causes and the solutions to climate change and their associated narrative structures (that is, the cast of actors "victims", "heroes" and "villains" that emerge in the narratives). Although, both discourses claim the existence of climate change as an environmental problem, they offer different explanations to the causes and the appropriate mitigation measures. Debates about the implications of biofuel crop production on food security are underpinned by the two discourses and their implied messages are expressed through the use of narratives.

2.1.1 Managerial discourses

Adger et al (2001) espouse the different climate change discursive regimes and biodiversity loss as a reality and brings forth 'managerial discourse' as drawing its authority from science. The Global Environmental Managerial (GEM) discourses, which in short called managerial discourses address the above environmental problems from macro level solutions and bases actions on external policy interventions (Adger et al, 2001, see also Boykoff, 2007).

The managerial discourses express optimism in external projects through transfer of technology and financial payments to address climate change problems. Financial payments, according to this discourse should be encouraged for the conservation of forests, biodiversity and to support the adoption of 'clean technologies' (Adger et al, 2001). The term "clean technology" refers to technology that does not compromise environmental sustainability. Financial support, it is argued will revive local economies through employment creation and improved livelihoods and solve environmental degradation such as deforestation and biodiversity loss. Within the managerial discourses, local farmers, peasants and landless poor become 'victims' and 'villains' of climate change whilst scientists, aid bureaucrats and civil

servants become ‘heroes’ by calling for urgent intervention (Adger et al, 2001). Proponents of the managerial discourses see environmental problems as symptoms of poverty, underdevelopment and population pressure (Hermann and Hutchinson, 2005). Managerial discourses thus, echo the efficacy of modernization discourses.

In the biofuel debates, managerial discourses see biofuel investments as way of mitigating the impacts of climate change through the reduction of global GHG emissions in the atmosphere whilst improving livelihoods through employment creation. Thus, renewed interest in biofuels is inspired by managerial discourses and as result, proponents of biofuels adhere to the managerial discourses. In Ghana the proponents of the jatropha project adhering to the managerial discourses include, BioFuel Africa Ltd., chiefs and majority of residents in the project areas as well as a Non-governmental Organization, Rural consult Ltd. BioFuel Africa Ltd. claims that, biofuel investment contributes to environmental sustainability whilst improving food security and livelihoods in the affected communities (BioFuel Africa Ltd., 2008). Inspired by the managerial discourses, the policy of BioFuel Africa Ltd. is to undertake an environmentally friendly jatropha biodiesel project for the global oil market and also create sustainable livelihoods for affected communities. “…our policy is further to increase food production in terms of volume and land area to ensure food security on a local level. …BioFuel Africa is helping to transform economies and the environment to create a more sustainable future for us all” (BioFuel Africa Ltd., 2008).

The chiefs of Tijo (Tijo-Naa) and Kusawgu (Kusawgu-Wura), who leased out the land areas to BioFuel Africa Ltd., also expressed optimism in the jatropha project because the vulnerability of livelihoods in the affected communities. More so, because the communities have large areas of unused land, the chiefs hoped the project will improve livelihoods without creating competition with land-based livelihoods such as farming and other local livelihoods. Explaining the perceived spin-off effects of the jatropha project on local livelihoods, Kusawgu-Wura remarked; *I decided to lease a land size of 300 ha initially for the start of the project and if I find out any sign of positive development, then part of the vast idle land will be given to them to continue their operations”… we need them because, we believe that, their operations will generate employment for our people and create development for us*” (interview with Kusawgu-Wura, 2009).

In addition, the NGO, Rural Consult Ltd. conducted research in the communities affected by the project to investigate the consequences on livelihoods. Their article which was published in Ghana's leading newspaper, Daily Graphic, opined that, despite the land use changes and some losses in the affected communities, the positive impacts on livelihoods outstrip the negative impacts (Daily Graphic, 2009). It concluded that, there is the need to weigh both impacts before drawing conclusions on the implication of the biofuel project (ibid.). The NGO emphasized win-win effects of the jatropha project for both the company and the affected communities. As the study will show, many local people in the project areas also adhered to the project optimism expressed in the managerial discourses. Some residents of the three Yendi villages also hoped of job creation during the project and petty traders argued similarly about job creation to supplement their traditional livelihoods.

2.1.2 Populist discourses

Populist discourses, however, bring forth perilous local environmental effects of development projects to arrest the problems of climate change and biodiversity loss. This discourse sees biodiversity loss and climate change as the consequence of the interest and institutions of capitalism (Adger et al, 2001). Within the populist discourses, International Non-Governmental Organizations and local community organizations who work to avoid environmental degradation become 'heroes', Global capitalism, transnational corporations and colonial power become 'villains' whilst local people become 'victims' (ibid.). The formation of community-based approaches to conservation and forest management are promoted under this discourse to protect the right of local people and empower them as well (ibid.). In other words, the discourse implies the deepening of environmental problems at the local level as a result of the external interventions and hence, local communities will be better off when left to their own devices (Hermann and Hutchinson, 2005). In the biofuel debates, the populist discourses see biofuel investment as a potential threat to climate change as well as the destruction of local livelihoods through "land grabbing". Opponents of biofuels subscribe to the populist discourses. In Ghana, the opponents of the jatropha biodiesel project adhering to the populist discourse include interest groups such as Action Aid-Ghana, RAINS, Directorate of Crop Services under MOFA and some local farmers.

Inspired by the ideas of the populist discourses, the first reaction to the jatropha project came from a resident of Kusawgu (near Alipe) who works with a Ghanaian NGO, Regional Advisory and Information Network Systems (RAINS). Their article captioned "Biofuel land grabbing in Northern Ghana" begins with a crisis scenario that,

"*… This is the story of how a Norwegian biofuel company took advantage of Africa's traditional system of communal land ownership and current climate and economic pressure to claim and deforest large tracts of land in Kusawgu, Northern Ghana with the intention of creating "the largest jatropha plantation in the world"*. The article continues that "*… when given all the information the community successfully fought to send the investors packing but not before 2,600 hectares of land had been deforested. Many have now lost their incomes from the forest and face a bleak future"* (RAINS, 2008:1).

The texts and statements from above quote carries negative connotation by describing the jatropha project in Alipe as a threat to local livelihoods through the destruction of shea nuts from which majority make a living. The article made much impact on the global biofuel debates as it was well circulated throughout the world on the internet.

The above article by RAINS incited Action Aid-Ghana (AAG) to express concerns about the implications of the jatropha project. AAG is a Ghanaian affiliate of Action Aid international. The NGO published an article on the destruction of shea nut trees during the jatropha project by BioFuel Africa Ltd. without the notice of local people (Daily Graphic July, 2009). The article begins that;

"*AAG works with poor and excluded people to eradicate poverty. Consequently, right to food is one of our four thematic areas. It is in furtherance of that, when we noticed that large tracts of land were being taken for biofuel production we (AAG) initiated the research to determine its implications for food security in particular and development in general. The results indicate that, the plantations pose a potential threat to food security of the people…Because the destruction of the economic trees has become an issue, the company has the intention to replant them. What happens to the poor women and their families who hitherto earned their livelihoods from these economic trees after the good number of them have been destroyed? They now have no choice but wait and go hungry for the 20 years during which the replanted trees grow…"* (Action Aid-Ghana, in: Daily Graphic, 2009).

The quote above was taken from an article captioned 'The biofuel debate' published by the NGO in a leading Ghanaian newspaper (Daily Graphic) addressing livelihood destruction and food insecurity through economic trees loss as a result of the jatropha project. The publication by RAINS and Action Aid-Ghana initiated concerns on the implications of biofuels among interest groups in Ghana both at the national and community levels. The debates about the jatropha project in Ghana were instigated by the publications by the two NGOs mentioned above.

In Ghana, investments that influence food production are steered by the Directorate of Crop Services under the Ministry of Food and Agriculture (MOFA). At the time of the study (2009), there was only a draft policy on biofuels spearheaded by the Centre for Renewable Energy under the Ghana Energy commission. Because there is no codified policy on biofuels in Ghana, the Directorate relies on the reports by Action Aid-Ghana and other publications on biofuels. The Director of Crop Services admitted the country's need for alternative energy like biofuels, but asserted that, Ghana will not promote biofuels at the expense of food security. During interview, the director remarked;

"*I am told the jatropha plant thrives on marginal soils. If an investment is made on marginal soils, it yields marginal output ... therefore jatropha plant must be undertaken on arable land to reap maximum yields. Cultivating the plant, however, on such arable land poses a threat to food security through competition with edible food crops for land. With this ... I think the jatropha investment should not be encouraged* ", he added.

Before the project, in Alipe and the three Yendi villages (where the project was implemented), some farmers with very large households and a heavy dependency burden perceived the jatropha project as a threat to food security. Due to the limited income-generating activities in the study areas, these farmers see land use change that diverts resources from food crop production poses a threat to food security and local livelihoods. Other residents mentioned their dependence on environmental resources like shea nuts and other economic trees and the need to prevent encroachments from the biofuels investment. For instance, one resident of Alipe lamented shea nut destruction by BioFuel Africa Ltd. in Alipe and remarked that …'*Shea nut is the cocoa in this community'* (interview with

Assemblyman of Alipe, 2009). This structural metaphor was used to express the importance of Shea nuts as a major livelihood strategy to the rural economy of Alipe by referring to the economic value of cocoa cash crop. Cocoa is the highest foreign exchange earner for Ghana and an importance source of income to farmers engaged in it especially in forest zones in southern Ghana. In southern Ghana, owning cocoa farms connotes affluence. Due to its economic importance for local women, reduction in the shea nut trees through land clearings by BioFuel Africa Ltd. was perceived to have perilous implications on livelihoods. Thus, the use of this structural metaphor supports the perceived dire consequences of the jatropha project on local livelihoods espoused by the opponents of the project. In other words, in Ghana, the opposing opinions about the jatropha project were not only found among the interest groups, but also among the local people.

2.1.3 Narratives associated with the two discourses

As explained above, narratives are used as the expressive means of the two discourses surrounding the biofuel (jatropha) project. In the debates about the jatropha project in Northern Ghana, the food security implications are expressed in a story form as described by Roe (1991:288). The messages in the narratives thus, convey the consequences of the jatropha project on food security and the appropriate policy responses to be adopted on such projects. Narratives identified in the debates about the jatropha project include the narrative of 'land grabbing leads to food insecurity' associated with the populist discourses and the narrative of development projects lead to improved livelihoods' associated with the managerial discourses.

2.1.3.1 Narrative of "land grabbing leads to food insecurity"

As explained above, Action Aid-Ghana RAINS, the Directorate of Crop Services expressing as well as some local people from the study areas adhere to the populist discourse by telling a story to explain daunting implications of the jatropha project in the affected communities in Northern Ghana. The story begins by setting or assuming the premise that: '*Before the jatropha project, there was harmony between the local livelihoods and land resources. The*

local people depend on the land for farming and economic trees to make a living. The jatropha project implementation causes land use change through land grabbing'. In the middle of the story, the consequences of the jatropha project are expressed this way: *Land use change interferes with local livelihoods through the encroachment of farmland and destruction of economic trees such as shea nuts. The 'dead end' comes when the local people's command over food is at stake leading to food insecurity"*.

Local people especially farmers are represented as "victims" as they are the ones who suffer the consequences of the jatropha project, BioFuel Africa Ltd. becomes the villain as they contribute to the destruction of the livelihoods through encroachment of farmland and destruction of shea nut trees whilst NGOs like Action Aid-Ghana and RAINS, the Directorate of crop services and local environmental activist groups calling for the abandonment of the jatropha project become "heroes". The role of these "heroes" in the case of the jatropha project in Northern Ghana is to protect land resources from being diverted into jatropha (biofuel) production by BioFuel Africa Ltd. and then empower local people from marginalization.

2.1.3.2 Narrative of "development projects lead to improved livelihood"

BioFuel Africa Ltd., Rural Consult Ltd. (NGO), the chiefs and some residents of the study areas adhere to the managerial discourses to explain the economic spin-offs of the jatropha project on livelihoods. The above mentioned proponents express optimism in the project by also telling a story. The story begins by claiming that: '*the livelihoods in the affected communities are vulnerable. The establishment of the jatropha plantation creates spin-off effects in the affected communities'*. In the middle of the story, it is claimed that, *'the spin-off affects lead to livelihood diversification through employment creation in addition to a boost in the traditional local livelihoods'*. The story ends by concluding that, *'diversified livelihoods lead to improved livelihoods'*. In the narrative of the managerial discourse, the interest groups see local people as "beneficiaries" instead of "victims" through the jatropha project investment. NGOs such as Action Aid-Ghana and RAINS opposing the jatropha project are seen as 'villains' and BioFuel Africa Ltd. as the 'heroes' as they intervene to undertake an environmentally friendly biodiesel project whilst boosting local livelihoods. Implied in the managerial discourses, biofuel investments should be encouraged because of its positive presumed spin-off effects on the local economy.

The study focuses on the analysis of the discourses that underpins the jatropha biodiesel project debate by analyzing the messages and narrative structures associated with the managerial and populist discourses based on empirical evidence from the study areas.

2.2 The Concept of Food Security

The definitional scope of food security concept has been in the state of constant flux with time as different scholars and agencies espouse different ways of achieving food security. This has made the application of the concept a difficult task. In the case of this study, the concept expatiates the conditions under which a group of could be described food secure by focusing on food entitlement (Sen, 1981) and livelihood diversification concepts (Maxwell and Smith, 1992, Swift and Hamilton, in: Devereux and Maxwell, 2001). The relevance of the concept to the study was that, it provided a framework to examine the resilience of the various means of accessing food in the study areas before and during the jatropha project.

Earlier definitions of food security focused on adequacy of food supplies at the national and international levels. These early ideas focused primarily on the balance between adequate global food supply and the demand by the global population. During the period, hunger was attributed to the decline in food availability and these are echoes of neo-Malthusianism.

From 1980s, the focus shifted to the issues of food access with the household and individual as the focus of analysis which is evident in the works by Sen (1981), World Bank (1986), World Food Summit (1996) and others. World Bank (1986) defined food security as “access by all people at all times to enough food for an active, healthy life”. Moreover, World Food Summit (WFS,1996) “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. These definitions complement Sen’s food entitlement concept which defines food security as a consequence of the extent to which an individual can access food. Whilst Malthus and his contemporaries like Adam Smith attributed food insecurity to food decline at the aggregate level, Sen (1981), World Bank (1986) and WFS (1996) explains food insecurity as a consequence of limited access to food at the individual or the micro level.

However, Sen made a path-breaking contribution to famine causation by explaining that, food insecurity is a consequence of food access by individuals irrespective of food availability. To Sen, "scarcity is the characteristics of people not having enough…, not the characteristics of there not being enough" (Sen, 1981:1). To provide a framework to determine the extent of a person's vulnerability to food insecurity, Sen used the concept of entitlement which is defined by his endowment such as land or labour power and how they can be transferred into a form exchangeable for food. Individual's food entitlement is achievable through his or her production (food cultivation), trade (food purchase), labour service (working for food) or inheritance or food transfer (receiving food from others) having met the agreed terms with a willing party or parties (1981:2). Should a person's "commodity bundle" lack any of these entitlements forms, entitlement failure is said to have occurred (Leach et al, 1999). Hunger or famine becomes the inevitable consequence (ibid.).

Therefore, to Sen, food insecurity is not a consequence of food unavailability but rather a result of what he terms "entitlements failure". The contribution of Sen's intellectual work is seen from his explanation of how people become victims of famine despite food availability. The relevance of the concept is evident in the possibility of mismatch that may exist between food security at the national and individual levels even in the face of abundant food supply (Kurien, 2004). This is because, even if food security is achieved at the national level, individuals may become victims of malnourishment or starvation as a result of the lack of any of the four food entitlements explained above (ibid: 9). In the study areas, people access food through the categories of food entitlement identified by Sen. Land areas are accessible to all residents for farming provided permission is sought from the community chief. Farmers cultivate yam, maize, groundnut, rice and other local food stuffs and they are entitled to their produce to meet household food provisioning. As agriculture-dependent communities, the basic source of food in the households is farm produce. More so, residents sell their labour services either as hired labours in farms or on labour migration especially during the dry seasons in any of the surrounding towns to make a living. Women engage in shea nut, firewood and charcoal business. Women sometimes engage in sale of food on small scale to community residents. These livelihoods undertaken by women serve as important income-generating activities to purchase food to supplement farm produce.

However, the local livelihoods in the study areas which serve as the source of food entitlements are highly vulnerable especially in the case of farming which is the dominant livelihood. Characteristic of all areas in Northern Ghana, the dry season is longer (November to March-April) than the short, single rainy season which begins in May until October. With low and erratic rainfall pattern, the climate limits food crop production to only the rainy season. The climate is characterized by a single maxima rainfall pattern between May to October being the period for the cultivation of maize, groundnut, yam and more especially rice. Farming activities before or after the rainy season involves the risk of crop loss. Farmers are thus compelled to cultivate only once a year. After crop harvest, farmers sell only a small portion of the farm produce with the remaining for domestic consumption until the next farming season.

Farmers thus experience 6-7 months of no work (idle period) during the dry season. The residents of the study communities mentioned dry season as the period of extreme hunger. Livelihoods that sustain households during the season are the firewood and charcoal business, seasonal shea nut business and small petty trading undertaken by women. Beside these livelihoods, there is no income generating activity in the study communities, making men more financially vulnerable during the dry season because there is no farming activity. Even the income generating activities fetch meager and irregular incomes. For instance, the shea nut business is characterized by price fluctuations and also the volume of the collection is irregular as it depends on seasons. A similar situation of livelihood vulnerabilities applies to the firewood and charcoal business. In other words, accessing food through the food entitlement categories noted by Sen is less effective to improve food security in the study areas.

Indeed, despite its relevance to identify causes of food insecurity, Sen's food entitlement concept has been criticized for its passive view of food insecure households and individuals and downplays the ingenious and sometimes effective strategies that are adopted (Swift and Hamilton, in: Devereux and Maxwell, 2001: 81). The importance of social capital and social networks which serve as "safety nets" for individuals and households are not included in the entitlement concept which is more concerned with formal exchange mechanisms (ibid). A

household comprises either one person living alone or a group of people, who may or may not be related, living (or staying temporarily) at the same address, with common housekeeping, who either share at least one meal a day or share common living accommodation (that is a living room or sitting room) (Jenkinson,1998). Households in the study areas are knitted together by close relations or a form of social bond such as marriage and "food sharing or food transfer" is an important moral value among household members. The study areas are characterised by a patrilineal social system with patrilocal residence pattern. Household compositions in the study areas consist of people mostly of the same blood relations or at least with some form of social bond such as marriage. It usually consists of the husband, the wife or the wives (sometimes 3 in polygamous households), children and the parents of the couples, and in some cases the, brothers, nieces and nephews of the husband. In such a patrilineal social system usually sharing the same shelter, there is high level of dependency in the households. To this end, sharing of resources is an important moral value.

As this study will show, the moral value of sharing in the households implies that, when there is an opportunity for one member, it becomes a moral obligation to provide for the entire household. The common resource usually shared among the household members is food. These were found in both the Dagomba and Gonja households during the study. Household members cook and eat from the same bowls in groups according to their gender and age group; the same bowls for wives or women, the children and the men. This household characteristic of the study areas confirms the relevance of informal mechanisms such as social networks in food transfers at both the household and individual levels which were not included in sen's food entitlement concept.

Sen's work and other food security definitions have been criticized by Maxwell and Smith (1992) due to some surrounding complexities. They explain that, food security is not about mere "quantity of food entitlements" but also the "quality of the entitlements" (ibid: 41). "Thus, the highest state of food security requires not just secure and stable access to sufficient quantity of food, but also access to food that is nutritionally of adequate quality, culturally acceptable, procured without any loss of dignity and self-determination, and consistent with the realization of other basic needs". These raises the problems of measuring food security

and the balance between quantity and quality cannot be decided without reference to the food insecure people themselves" (ibid.).

Maxwell and Smith add that, defining food security as a secure access to enough food at all time is problematic (Maxwell and Smith, 1992) when applied to the household level. The households are made of made up of people with different coping strategies and objectives towards food security including current and future access to food (ibid.: 50). Because of the complexities and difficulty to apply the term to households especially, Maxwell and Smith emphasize rather the resilience, sensitivity and sustainability of livelihood systems to achieve food security. Flexibility, adaptability, reliability, resilience and diversification of livelihoods are the issues worth discussing in measuring food security (ibid.). These characteristics of livelihoods determine how much a household can withstand food crisis, how seasonal and cylcical variations in access to food can be minmized and to guarantee future access to food (ibid). The positive effects of livelihood diversification towards achieving food security is evident in rural Africa where non-farm income constitutes up to about 50% of household income (Swift and Hamilton, in: Devereux and Maxwell, 2001). Livelihood diversification refers to the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standards of living (Ellis, 1998). It usually involves a situation where households spread their economic activities away from reliance on the primary enterprise whether livestock or cropping activities, typically seeking a wider range of on-and off-farm sources of income (Swift and Hamilton, in: Devereux and Maxwell, 2001: 86).

During the project, livelihoods improved as a result of the employment of plantation workers and the consequent spin-off effects on petty trading. As said earlier, in such households knitted together with high level of dependency, improved livelihoods have effective spin-off effects on the entire household members. Improved, diversified and sustainable livelihoods during the project relatively contributed to household food provisioning and welfare in the form of food purchases to supplement farm produce. Food purchases including vegetables (onion, pepper, salt etc), fish, and even some foodstuffs contribute to dietary diversity.

2.3 Gender and households

The gender theory aims to introduce gender sensitivity to the study in terms of the roles and status of men at the community level and the power relations in households. Because men and women play different but complementary roles towards household food security, the gender theory provided a framework for the analysis of the gender division of labour in the study villages to discern men's and women's contribution to household food security during the jatropha project. This helped to provide an answer to the research question about the effects of the project on household food security.

Gender refers to the social and cultural understanding of what it means to be a woman or a man (Moore 1988). Certain roles or expectations are attached to every men and women in every society. Appropriate or acceptable behavior of men and women is called gender ideology (McDowell, 1999). Because a particular behavior is attached gender, men and women relate to each other in a particular way. The relationship between men and women is called gender relations (Moore 1988). In the gender relations, there is asymmetry of power to the disadvantage of women as they are regarded as subordinates to men (ibid.: 2). These gender concepts bring forth the differences between men and women which are socially constructed and hence, their different roles and statuses both in society and within households. The relevance of the gender concepts is evident in how they serve as a basic structure in society that defines the division of duties and rights, work tasks, power, honour, time, money, care and property, inheritance both within households and the societal levels.

In the study areas, household organization, livelihoods as well as contributions to household welfare are gendered. Within the households are hierarchies based on gender with men at the apex and women as subordinates. For instance, men are household heads in the three villages. Women only become household heads when men travel outside home. The gender ideologies in the households define livelihoods and household tasks. In terms of farming, because of the difficulty of the of farm work, males are predominantly farmers with women playing only assisting role in the farm work by cooking for labors, sowing seeds as well as harvesting the farm produce. Although, there is undifferentiated access to land for farming along gender lines, however, family farms are owned by men who are usually husbands or the male elderly

persons. In effect, farm proceeds are controlled by men, although the entire household members are entitled to it. Some women sometimes interplant vegetables such pepper, okro and onion either in their husbands' farms or family farms or in their own farms, nonetheless, it is only a handful of them with usually smaller farm sizes in the form of backyard farms. Farm produce is thus, men's major contribution to farm household provisioning.

As said earlier, women on the other hand, are engaged in trading. Women in the three villages are actively engaged in charcoal, firewood, shea nut and petty trading businesses. Shea nut business women either collect the nuts and sell them in their fresh state or process them into shea butter either as pomade for sale or as cooking oil. As a result of the gender division of labour in the study areas explained above, gender defines economic status in different times of the year. Because farms produce are mainly meant for domestic consumption, livelihoods of women are the main income sources for households. Moreover, because of their economic undertakings, women have relatively regular incomes throughout the year whilst because farming is limited to only rainy seasons, men who are predominantly farmers become financially vulnerable during the long dry seasons. Although, men sell part of their farm produce or offer their labour service in the nearby towns and use the income to purchase food for the household, however, because food preparation is the traditional task of females in the households, a large part of the incomes of women are spent on cooking food in the households. Thus, women play an active role in household welfare in general and food securities in particular especially in the dry season when most men become idle (unemployed).

During the jatropha project, both men and women in the active working age (between 20 and 50 years) were employed in the plantations. Nonetheless, due to the aforementioned pre-existing gender ideologies in the study areas, men and women benefited from the project differently and thus, contributed differently to household food security. Women for instance, were employed to do jobs like planting of jatropha seedlings, harvesting and removing the jatropha nuts which are in accordance with their routine livelihood of shea nut collection. Female plantation workers and other female residents were allowed to intercrop in the rows as well as on the edges of the plantation which was a much easier way of farming. Male residents on the other hand, were mainly employed for tasks as security personnel fire

volunteers as well as weeding in the plantation. Most men hired the services of the company's tractors for ploughing of land areas for farming. Both men and women employed in the plantation mainly worked as fieldworkers earning almost the same wages. However, the marked difference in terms of the spin-off effects of the project for men and women is the petty trading activities that accompanied the establishment of the plantation. Because of the gender ideology of trading associated with females, women invested in petty trading activities. The petty trading of women took the form of food and groceries sales to the workers in the plantation as well as in their communities. The gender theory provided a framework to analyze the consequences of the jatropha project on the livelihoods of women and men and their contribution to household food security.

3 METHODOLOGY

Methodology has been defined by as the rationale supporting the choice of methods adopted by a researcher (Wisker, 2008). The methodology chapter discusses the research methods, techniques, strategies, tools and instruments adopted to study the effects of the jatropha biodiesel project on food security in the affected communities in Northern Ghana.

3.1 Selection of study areas and key informants

Three areas were selected for the study. These areas are in the Yendi and central Gonja districts in Northern Ghana. The first study area is Alipe village where BioFuel Africa Ltd. first began land preparations for the jatropha project until its abandonment. Although, Alipe is not my main study area, because initial debates about the project began in the village, brief observations and interviews were done there. As a result, some key informants such as the chief (Alipe-Wura), the Assemblyman and 10 others were selected from Alipe for interviews.

In the Yendi district where the project was implemented, the three villages, Jaashie, Kpachaa and Jimle surrounding the jatropha plantations were selected. These three Yendi villages are my main study areas. The majority of key informants were selected from these villages. These include the paramount chief of the villages surrounding the jatropha plantation in Yendi (Tijo-Naa) and his elders, 3 village chiefs (Kpachaa-Naa, Jaashie-Naa and Jurolana) and their elders. Because the three villages were my main study areas, the number of key informants selected was not predetermined as the community members led me to contact other residents who knew much about the project. Even in some cases, I obtained information from some key informants indirectly through long conversations. Thus, I cannot give the exact number of key informants selected from the three study areas.

Finally, some key informants were selected from Kusawgu which is about 3 kilometers distance from Alipe. As the seat of the paramount chief, Kusawgu-wura, Suleman Jakpa 1, the durbar on the land acquisition by BioFuel Africa Ltd. was summoned in Kusawgu. Because of its closeness to Alipe, the residents of Kusawgu were well informed about the jatropha project. More so, the land acquisition process and subsequent opposition of the company started in Kusawgu town. During a visit to Kusawgu, I intentionally selected 3 key

informants, the chief (Kusawgu-Wura) and two shea nut businesswomen. However, when I arrived in the town, I indirectly gathered information from some residents through long conversation which was also not predetermined.

3.2 My status and role in the study areas

The status of an individual refers to the sum of his rights and duties (Linton, 1936). The behavior one chooses in a particular status is called his "role". Thus, Linton defines "role" as the dynamic aspect of the status (ibid.: 114). In other words, the more roles a person plays, the more dynamic the status becomes. There are thus, no roles without statuses or statuses without roles (ibid.).

As a first time visit to Northern Ghana, I was completely an "alien" in the study areas. My knowledge about Northern Ghana was based on second hand information read from textbooks and newsletters or based on hearsay. As an outsider, I had to play different roles and assume different status to ensure a smooth cultural integration into the study areas. In addition, southern Ghana has characteristics that are completely different from the North in terms of languages spoken, land tenure system and land use pattern which are largely cultural constructions. Therefore, as a native from southern Ghana, I was completely an 'outsider' in my study area. Because the study areas speak Gonja and Dagbani languages, I foresaw that, language communication will be a major problem to me as a twi-speaking Ghanaian. Because of this language barrier, I engaged the service of an interpreter. One of the parents of my interpreter comes from Kete Krachi in Volta region of Ghana and the father comes from the Ashanti region of Ghana. He had his basic level education in Krachi. The krachi town has a large influx of people from Northern Ghana. Moreover, he has stayed in Tamale (Northern Ghana) for over 15 years and has, thus developed high level of proficiency in both the Dagbani and Gonja languages. My interpreter is my church member and also my school mate at the University of Ghana. When I returned to Ghana for the field in Ghana, he expressed his willingness to join me as a research assistant and also keep himself abreast with graduate research. Because he had stayed in the Northern Ghana for quite a long time, he did not only interpret the languages to me but also taught me the Northern Ghana culture especially when

going to the palace of a chief. Whilst I had a status of an outsider, the status of my interpreter was more an insider.

3.2.1 My new status; insider or outsider? Positional space in the study areas

Insider is a researcher studying about the group to whom he or she belongs (Abu-Lughod, 1988 and Hill-Collins, 1990 in: Mullings, 1999). These researchers are able to use their knowledge of the group to gain in-depth insights into their opinions (ibid). Outsiders on the other hand, refer to the researchers studying about a group they do not belong to and it is argued that, by virtue of being non-members, they will be perceived neutral and thus, be given information not accessible by an outsider (ibid). However, there are some inherent problems when a researcher assumes either of the two extreme statuses explained above. "The 'insider/outsider' binary in reality is a boundary that is not only highly unstable but also one that ignores the dynamism of "positionalities" in time and through space. No individual can consistently remain an insider and few ever remain complete outsiders" (Millings, 1999:340). To overcome the problems of being either an 'outsider' or an 'insider', Mullings (1999) coins the term "positional spaces" which refer to areas where the situated knowledges of both parties in the interview encounter, engender a level of trust and co-operation. These positional spaces, however, are usually transitory and thus, transcends the seemingly fixed boundaries of 'insider- outsider' privilege based on visible attributes such as gender, race or ethnicity (ibid.). Based on the idea of positional space, I therefore, had to assume a neutral status that straddles the 'insider-outsider' statuses by playing different roles at different settings of the data collection in relation to my respondents, key informants and interest groups who have different backgrounds.

The first laid-off exercise happened before my arrival in the study areas in June, 2009. As said earlier, the negative publications by Action Aid-Ghana, RAINS and other environmental activist groups partly caused loss of funding from donors for BioFuel Africa Ltd. and the consequent effects worker lay-offs. There were thus, tensions between the interest groups, and the remaining workers in the plantation as well as the residents of the three villages. The residents of the villages were worried over relatives and friends who were laid-off. The villagers and plantation workers became suspicious of strangers who visited either the

plantation or any of the surrounding communities. I observed this immediately after my arrival in the plantation site and the Kpachaa village. Having observed such a high level of suspicion, I then had to assume a status that will enhance cordial interactions with the affected communities, the workers in the plantations as well as the operations manager of BioFuel Africa Ltd.

When I met the manager of the plantation in Ghana, Per Ragnar Moen, he was also suspicious of me. I therefore, assumed a new status by downplaying gestures or actions that may raise suspicion of affiliation to an NGO or government agency. I introduced myself as a Ghanaian student from University of Bergen in Norway without any affiliations with NGOs. Also I explained to him about my personal acquaintance with the head of the company in Norway, Steinar Kolnes. I decided to twist the theme of my thesis that, I have read about the goodwill of BioFuel Africa Ltd. and I have decided to document about how biofuels can benefit local communities. When I showed to the manager an introductory letter from my academic supervisor from University of Bergen confirming that I am a Ghanaian student in Norway, the manager became less suspicious of me. I also introduced my interpreter as a friend who has joined me to know more about the BioFuel Africa jatropha plantation. The manager also began introducing himself to me, about his family and his place of residence in Norway (Osterøy). After establishing some form of friendship with the manager, the remaining days of my visit to the plantation was welcoming as he became anxious to tell me more about the jatropha project, the workers and the future plans of the company for the affected communities. My personal acquaintances and familiarity with the manager of the plantation created an atmosphere of trust and that ushered us into long conversation and the interview began. The manager later asked the field supervisor, called Baba to give me the needed information whenever I visited the plantations. This paved way to make acquaintances with the workers of the company who also gave me relevant pieces of information about the project, the number of workers employed, wages of workers and other labour conditions.

During interviews with farmers in the study areas, I introduced myself as a young student who wants to know about how food crop production has been affected since the establishment of the jatropha plantation. I assured them that, the data will not be used for any negative purpose

but rather as a requirement for my school work. The farmers thus, availed themselves to give me the necessary data for my study. In Alipe where the project was abandoned, I introduced myself to the farmers as a student but I asked slightly different questions. I asked farmers to tell me about the crops destroyed, the farmland areas encroached during the land preparation stages of the project as well as how they benefited from the project.

Similarly, in my interactions with the residents of the study communities, I sought to introduce myself as fellow Ghanaian studying abroad who wants to know about how their livelihoods are affected by the jatropha project as a requirement for a school work. I also made friends with some community members who introduced me to other residents as a student who will communicate their concerns to the main manager of BioFuel Africa Ltd. in Norway because I am studying in the headquarters (Norway) of BioFuel Africa Ltd. As a result, I gained much trust and respect from the community members as I made more friends in the study areas. Cordial relationship with the community members coupled with my interpreter's fluency in the Dagbani and Gonja languages further facilitated a smooth integration into the local communities. The community members were thus, willing to converge and avail themselves for interviews and also answer the questionnaires.

During interview with the Director of crop services, workers of Action Aid-Ghana, Yendi Municipal Assembly, Environmental Protection Agency (EPA)-Ghana, Centre for Renewable Energy, I emphasized my original status as a student studying in biofuels but who needs their valuable knowledge on biofuels for my academic work. This initiated discussions about biofuels in Ghana and the jatropha project in Northern Ghana.

During interview with the chiefs, I learnt the procedures involved to access the palace of a chief. Either presenting cola or a token to the secretary to the chief to buy cola, sitting down as a subject of the chief, greeting in their local dialect (Dagbani or Gonja) made the interview process most welcoming. Learning these customs in Northern Ghana ensured a smooth interview with the chiefs. I introduced myself as student who is not affiliated to any NGO, government agency or not a journalist but willing to know about the jatroha project taking

place on his land. I accorded the chiefs much respect by creating the impression that, I cannot know much about the project without his valuable knowledge about the project. Presenting myself thus, as a submissive young Ghanaian student during interviews with the chiefs created enough room for a smooth interview with less suspicion.

Figure 1: *Kusawgu-wura who leased out the land areas in Alipe to BioFuel Africa Ltd.*

Photo: Author, 2009

I therefore devised different strategies to assume different statuses to obtain data from respondents, key informants and interest groups. My status during the study was thus, a dynamic one. And as I assumed different statuses, my interpreter was very co-operative. Such a dynamic status reduced suspicion from people during the data collection process of the study instead of the fixed original status as a "student or researcher and also as an "outsider in Northern Ghana". Overcoming suspicion facilitated the research because it was a major challenge during the early days of the fieldwork period in Northern Ghana when controversies surrounding the jatropha project had climaxed.

3.3 Metaphors

Metaphors are communicative devices that explain "unknown" thing or situation in terms of something else (Lakoff and Johnson, 1980). Because rhetorical device is also used as an

expressive means of discourses (Svarstad, 2002: 68), I interpreted metaphors in the speeches of the speeches of speeches of the respondents, key informants and during interviews as well as texts from published newsletters and article publications interest groups about the implications of the jatropha (biofuel) project. Interpretation of these metaphors helped me to decipher the meaning of statements in speeches and published documents. There are many types of metaphors; however, structural metaphors were used by the interest groups as well as the local people in the study areas.Structural metaphors refer to the situation when one concept is metaphorical structured in terms of another (Lakoff and Johnson, 1980b:461). One of such metaphors was…"Shea nut is the cocoa in this community". In addition, some resident farmers employed by BioFuel Africa Ltd happily remarked that; *now we can kill two birds with one stone.* One female laid off worker remarked that, "*when you are laid off, it seems like you have lost something precious forever*. Interpretation of these metaphorical statements helped me to discern the multiple viewpoints about the jatropha project.

3.4 Sampling procedures

3.4.1 Snowballing

A snowball sample is assembled by referral, as persons having the characteristics of interest identify others (Stark et al, 2000: 90). The selection of respondents, key informants and interest groups was achieved snowballing sample techniques as individuals directed me to people who could best give me the necessary information about the jatropha project. Because the samples were achieved based as I made new contacts with people by referral by earlier groups of people, new events were emerging in the course of interviewing different respondents and key informants. As a result, the pieces of information and knowledge accumulated from previous interviews were used to re-adjust the interview guide to obtain suitable data relevant for my research questions. Cumulative interviewing proved useful to be pragmatic on the type of questions to be asked when preparing to meet with the next group of respondents and key informants or interviewees.

3.4.2 Stratified and purposive sampling procedures

In the study areas, stratified sampling technique was employed in order to select respondents that will be adequately representative of the study population. When samples are independently selected from a large population into groups with similar characteristics of individuals or elements, such a sample is called stratified random samples (ibid: 79). Under this strategy, the study population is divided into homogenous units in order to lower known variances in the population depending on the objective of the study (Twumasi, 2001:23). During the study, respondents were selected from the villages by putting them into homogenous groups. The stratification and the selection of the respondents were not pre-determined before the fieldwork, but rather a strategy adopted after making some observations in the three study villages. The stratification of the respondents was based on the place of residence as well as gender.

Place of residence			Total
	Male	Female	
Kpachaa	26	12	38
Jimle	11	12	23
Jaashie	10	11	21
Tamale	12	2	14
Other	7	3	10
Total	66	40	106

Table 1: G*ender of respondents and place of residence* (Fieldwork, 2009).

In terms of place of residence, respondents were selected from the three study villages Kpachaa, Jimle and Jaashie in the Yendi District. More so, individuals from the communities surrounding the project areas and distant places like Tamale who migrated to the project area for employment were also selected as part of the respondents making a total of 106 respondents. To take into consideration issues of gender, men and women were also included in the respondents as shown in the table above.

After I had made contact with respondents through snowballing, purposive sampling techniques was adopted to select the specific respondents from the three study villages. Purposive sampling is a sampling procedure whereby respondents are decisively selected from cases that are judged to typify the views of the group(s) they represent so as to answer research questions of a study (ibid.:27). Thus, to examine the effects of the project on the livelihoods, I intentionally selected the respondents from the categories of ordinary farmers, compensated farmers, worker in the plantations, people who were not employed in the plantations, farmers who were also employed in the plantations and laid-off workers. The diverse responses from the respondents with different statuses proved useful to examine the effect of the project on livelihoods and food security of different people.

3.5 Methods, Approaches and Instruments for data collection

3.5.1 Questionnaires

Questionnaires gather information directly by asking people questions and using the responses as data for analysis (Wisker, 2008: 187). The type of information often obtained from questionnaires includes facts, attitudes, behaviors, activities and responses to events usually using a list of written questions (ibid.). Semi-structured questionnaires were used to obtain data on household characteristics, farm sizes, crops cultivated before and during the project, as well as information about the workers employed by BioFuel Africa Ltd. (monthly wages, dependants etc.). Before field work for the study, knowledge on the jatropha project was based on internet and other secondary sources. However, new events such as layoffs, ploughing of farmland of some residents were emerging in the affected communities during the fieldwork period and these events were not initially included in the questionnaires. The questionnaires were thus, re-adjusted to obtain data such emerging events. The SPSS Software was used to generate the data questionnaires into descriptive statistics for data presentation and interpretation.

3.5.2. Interviews

Because a large proportion of human knowledge is hidden in the sub-conscious mind, interviews bring out this hidden knowledge during long conversations. Unstructured or

informal interviews were mostly used. This type of interview is modeled on a conversation and like conversation, is a social event, in this instance, two participants (ibid: 185). This interview format provided me detailed data on the effect of the plantations on food security in the affected communities. However, during interview with EPA, manager of the plantation Ltd. in Ghana and Chiefs, structured interviews were used to gather specific data relevant to my research objectives.

I also employed group interviews. Group interviews focusing on homogenous group like men, women, workers in the plantations, laid off workers and people who were not employed provided me with relevant information on group interests during the project. Though the interviews were unstructured and took the form of conversation; I directed the interviews to provide suitable data to my research questions. It worth mentioning that, one of the important means of interviews was phone calls especially in all my interviews with the founders of the company in Norway, Steinar Kolnes and Ove Martins Kolnes.

3.5.3 Household Survey

The study also conducted household survey through the use of questionnaires coupled with in-depth interviews. Household survey gathers information about the welfare or the living conditions of a household by collecting data on household consumption, income-generating activities and income transfers and non-monetary indicators such as educational, nutritional and health status as well as housing conditions (Grosh and Glewwe, 2000). Although, there is no universally accepted definition of a household, however, in the case of this study, because individuals knitted together by kinship ties or social bond like marriage share the same shelter, common place of residence was adopted as my definition of a household. The household survey took the form of the household head answering the questionnaires and later joined by other members usually forming a total number of people between 5 and 10 household members. In most cases, interviews and answering of the questionnaires are conducted simultaneously. A total of 50 households were included in the survey in the three study villages. 20 households from Kpachaa, and 15 households each from Jimle and Jaashie.

Because the study aimed at examining the effects of the project on household food security, the questionnaires gathered data on household sizes and livelihoods of household members in the study areas. Within households, survey gathered data about total number of household members, the gender and the number of household members responsible for farm work and those noted for non-farm work. These questions provided data on the gender division of labour as well as household structure in the study areas. More so, in the households that had a member or two employed to work in the plantation, questions were asked to determine the contribution of those wage-earning members to household welfare. As the basic unit of analysis for the study, data gathered from households was relevant to examine both the problems as well as the pin-off economic effects that accompanied the establishment of the jatropha plantation. In addition, data from household interviews served as a crosschecking mechanism for the different data sources obtained from individual respondents and key informants in the study areas on the implications of the project on household food security. In Alipe, 10 households were briefly interviewed about both the constraints and spin-off effects resulting from the jatropha project until its abandonment.

3.5.4 Case studies

"Case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon in its real life context using multiple sources of evidence" (Robson, 1993). Under this method, few cases are selected from many examples of a situation to represent a version of variation of the issues under study (Wisker, 2008:216). An advantage of the method is that, detailed information about a situation or individual can be explored fully (ibid). A case study method was adopted to obtain a detailed qualitative data to examine the extent of the effect of the project on food security. Because the three Yendi villages were equally incorporated into the project and also share many commonalities in terms of farming system, livelihoods and culture, the case study focused on the specific cases of residents who were victims or beneficiaries of the project. As the use of multiple cases helps establish a range and increase the likelihood of "generalisability" (ibid.), case studies of four people from the three Yendi villages affected by the project were explored to establish the pattern of the effects of the project.

3.5.5 Photo interpretation

Snapshots of crop types cultivated in the jatropha rows and on the side of the plantations, soil characteristic of the acquired land as well as the density of the vegetation were taken from the field and interpreted. These visual images were interpreted with the help of background information on the land use pattern and the farming system in the areas by some residents. For instance, the snapshots of bare uncultivated areas observed in the study areas imply relocation of farmers to new land due to the bush fallowing system of farming practiced.

3.5.6 Participant observation

Participation observation refers to "the transfer of the whole person into an imaginative and emotional experience in which the fieldworker learned to live in and understand the new world" (Lacey, 1976). During the fieldwork, I made friends and had acquaintances with community members as well as the workers in the plantations. Because the researcher is an important instrument in qualitative research (Creswell, 2009), I made careful and independent observations himself. I carefully observed emerging events such as the second layoff exercise in July, 2009, ploughing of land for farmers either for free or at a reduced price by BioFuel Africa Ltd as well as confrontations at the plantation site during a visit of the by some NGOs. I made a personal observation of the number and type of trees (usually economic trees) on uncultivated land areas in the study communities and the areas cleared by BioFuel Africa Ltd for the project. I also made observation of the soil characteristics of the land used for the jatropha plantations and the uncultivated farmland within the cleared land (1100 ha). I did not only observe but also participated in some activities in the plantations such as harvesting of the jatropha fruit with some female workers as well as the removal of the nuts from the shells.

3.5.7 Triangulation

In social science, triangulation is defined as the mixing of data or methods so that diverse viewpoints or standpoints cast light upon a topic (Olsen, 2004).The use of the approach helps to reduce biases through cross-verification of multiple data sources and methods. As Jakob puts it "by combining multiple observers, theories, methods, and empirical materials, researchers can hope to overcome the weakness or intrinsic biases and the problems that come

from single-method, single-observer, single-theory studies. Often the purpose of triangulation in specific contexts is to obtain confirmation of findings through convergence of different perspectives. The point at which the perspectives converge is seen to represent reality." (Jakob, 2001).

Different types of data from respondents, key informants, household survey, case studies, fieldwork photo interpretation and participant observation and reports by interest groups (newsletters and articles) were combined through the triangulation technique. Data from the above sources provided information about the crops cultivated before and during the project in the study areas, livelihoods, economic trees, and the land use pattern of the land earmarked for the jatropha project. Information from the different data sources were used as the cross-checking mechanism for all other data sources. For instance, as custodians of land in the study communities, no permission can be sought by natives from the chiefs without any cash payment. Farmers show appreciation in return by giving part of the farm produce to the chiefs during harvesting. To this end, chiefs have accurate data on the land use pattern, crops cultivated as well as the number of farmers cultivating a particular piece of land.

More so, information from the article publications and newspaper reports about the implications of the jatropha project were cross-checked with the data from the study areas. In other words, triangulation facilitated the combination of different data types which checked the accuracy of fieldwork data. Therefore, triangulation technique which combines data sources such as case studies, group interviews, photo interpretation, questionnaire survey and participant observation helped to cross-check the data sources from chiefs, farmers and key informants about livelihoods, economic trees and the land use pattern on the land in the study areas before and during the jatropha project. Combining different data types helped me to examine the consistency in the information presented in the reports by interest groups including Action Aid-Ghana, RAINS, Rural Consult, and the Directorate of Crop Services with empirical evidence from the study areas.

3.6 Validity of field data

Reliability of data refers to the accuracy of field data (Cresswell, 2009). Because every research method has its inherent weakness, the use of multiple methods and data sources through triangulation technique reduces errors in field data. This is because, by using multiple methods, the weaknesses of one method are reduced by the other method and other data sources. This increases the trustworthiness of field data.As explained above, the use of triangulation proved useful to cross-check the data sources on the land use change caused by the project, land tenure system, farmers previously farming on the acquired land and economic trees by using different methods. Under the qualitative methods interviews and case studies, group interviews were used. Under quantitative methods, questionnaires were administered. I also employed participant observation as I participated in some activities in the plantation whilst making some observations. These different methods were used to obtain data from key informants such as chiefs, community leaders, and the respondents such as farmers, workers in the plantation and other community members. By serving as a cross-checking mechanism, these different data sources increased the accuracy of field data.

3.7 Limitations of the study

As illiterate villages, majority of the farmers could not give accurate data on annual crop yields from. However, the farmers asserted that, increases in farm sizes usually increases crop yields. Because of this problem of data availability, increases in farm sizes were used as proxy indicator of increased farm produce or crop yields.

Mores so, funding problems faced by BioFuel Africa Ltd and the consequent lay off of workers within a brief period of less than 2years after the plantations reduced the gains of the jatropha project. Because of this problem of temporal hold-up of activities in the plantations after a short period of about two years, it is quite difficult to give a better assessment of the impacts of the project on household food security. The funding problems faced by BioFuel Africa Ltd eluded the anticipated targets and plans of the company. I think, a better assessment of the food security implications of the project could have been given if the activities in the plantations had continued for a period longer than the two years.

However, despite these challenges, it is not my main priority to tease out every detail about the food security implications of the jatropha project but rather to bring to the spotlight how the consequences of biofuels can be in different in different local communities given certain conditions.

4 THE INCIPIENT STAGE OF THE JATROPHA PROJECT IN ALIPE

This chapter provides the background of the jatropha Project in Northern Ghana, tracing the incipient stage of the project from Alipe where the project first began. The controversies surrounding the start of the project in Alipe until its abandonment amid local opposition by Non-Governmental Organizations, environmental activists and the Press media in Ghana is also encapsulated in this chapter. The debates are underpinned by managerial and populist discourses. The intent of the chapter is to set the stage for the analysis of the consistency of the ideas of the two discourses underpinning the debates with empirical evidence on the effects in the three Yendi Villages where the project was moved to.

4.1 Controversies surrounding the start of the project in Alipe

Alipe is a settler village near Kusawgu town under central Gonja district. A settler village is a place where people live temporally due to a particular economic undertaking and then go back to their permanent place of residence during off-seasons. In the case of Alipe, many residents of Kusawgu, and some people from Tamale and other surrounding towns have farms there and thus switch between the village and their permanent places of residence during farming and off-season (dry seasons). The few people who live in the village also travel to any of the nearby towns for work during the dry seasons and come back during the farming season. BioFuel Africa Ltd. first began operations for jatropha project in November, 2007 in Alipe village. A land size of approximately 200 hectares was cleared to begin the jatropha cultivation. As said earlier (see chapter one), the company initially sought approval for the project from only the paramount chief of Kusawgu-Wura whilst waiting for the formal authorization from EPA-Ghana. However, in Ghana, land use activity that requires a land size of 40 hectares or more needs the approval of Environmental Protection Agency (EPA) and Land commission. These agencies evaluate the environmental consequences of investment projects so that, environmental quality and local livelihoods are not compromised.

In the course of the land preparation, the initial debates about the implications of the jatropha project began in Alipe by (RIANS, 2008) and later joined by (Action Aid-Ghana, 2009) in the

form of internet publications and media reports. Influenced by reports pointing to the daunting implications of the project, some local people of Alipe were alarmed due to the perceived threat of livelihoods destruction. Through their negative reports against the jatropha project, RAINS had the support of other environmental activities groups in Ghana about the need to fight land grabbing in the country. *''We need a more aggressive campaign to halt land grabbing''* (RAINS, 2008:6). Although, BioFuel Africa Ltd., the two chiefs (Kusawgu-Wura and Alipe-Wura) as well as some local people of Alipe expressed optimism in the project to boost livelihoods with less damaging environmental effects. However, the project was abandoned because the report by the opponents of the project was so influential in Ghana that, the Environmental Protection Agency-Ghana issued an order for the suspension of the project. The project was thus, abandoned afterwards.

4.2 Brief field interviews and observations in Alipe

To gain empirical evidence on the extent of the actual effects of the project perceived by interest groups that led to the abandonment of the project, a brief field observations and interviews were conducted in Alipe.

4.2.1 The fate of the Shea nut business during the jatropha project

As said earlier, although, it is an important livelihood for women in Alipe, however, local people opined that, prices and the volume of collection of shea nuts vary according to seasons. The shea nut business women complained of sharp decline in the shea nut collection since the past few years. Some attributed the decline partly to the trees pulled down by the company during land preparation stages of the BioFuel Africa jatropha project, leading to the destruction of many shea nut trees. The destruction of some shea nuts trees in Alipe was confirmed by the manager of the plantation in Ghana, Per Ragnar Moen.

Nonetheless, the local people themselves admitted their contribution to trees destruction including shea nut trees over the past years through farming and the charcoal business. Because the vegetation is dominated by shea nut trees and shrubs, land clearings contribute to shea nut destruction. Farmers clear land areas to create enough space for farming. My personal observation confirmed the local farmers' contribution to trees destruction. Shea nut trees are wild plants and are thus, found standing in the vegetation at irregular intervals. When such plants are found standing at regular distances or interval from each other, such a situation implies interference by man. The local people explained that, during land preparation for farming, some trees are cut to allow sunlight penetration for crops and leave few behind for shade.

Figures 2 & 3: *Farmers' contribution to shea nut trees destruction in Alipe*

Photo: Author, 2009

In figure 3, the uncultivated land is dominated by shea trees and some shrubs with grasses. Figure 3 is a cultivated land planted with groundnut and some local food crops. The

impression I intend to create is that, if the uncultivated land (Figure 2) undergoes continuous cultivation, its tree species including shea nut trees will be depleted and thus, assume a similar condition as the second one (Figure 3). Both land areas were found in the Alipe village. This observation implies that, although BioFuel Africa Ltd. destroyed some trees including shea nut trees, most of the trees had been destroyed by the local farmers themselves. This raises questions about the reports explaining "livelihood destruction" through loss of shea nut trees during the jatropha project. Indeed, I observed myself during the fieldwork that, women were still plying their shea nut businesses in Alipe.

Figure 4: *Shea nut business woman in Alipe processing the shea nuts into shea butter.* Photo: Author, 2009

Interview with some shea nut business women from Kusawgu revealed similar responses. The women explained importance of incomes realized from the sales of shea nuts including buying food and food items, payment of children's school fees as well as supporting their husbands. The women mentioned acute reduction in shea nuts collection this year (2009) and the previous year due to heavy rains and its accompanying destructive storms which blew off a large number of the nuts prematurely.

Figure 5: *Shea nut business women in Kusawgu.* Photo, Author, 2009

4.2.2 Petty trading during the jatropha project

During the one month-long of the project in Alipe, some petty trading activities sprang up. These trading activities include sale of *kenkey* (food from maize) *koko* (porridge), fried yam and some local dough nuts. This was a result of increased purchasing power that accompanied employment of the local people during the land preparation stage of the jatropha project. The food sales were thus, an increased them by the workers. During interviews with the manager of BioFuel Africa Ltd., Steinar Kolnes, although the project was suspended after one month of operation, the company paid most of the workers for about three months because they had already engaged them. More so, some people such as the security men taking of the machines and the tools had to be paid and even up till now, the security personnel are still paid.

4.2.2 The situation of farmland areas during the jatropha project

During the land preparation stage of the project, about 20 farmland areas were encroached. *The area cleared by the company was a threat to our farms because; it was few kilometers from our houses* (interview with Assemblyman of Alipe, 2009). However, during interviews with some of the 20 affected farmers, they expressed a win-win situation. Although three farmers complained of encroachment of the farmland areas, majority still called for the return of the company, despite encroachment of farmland. As said earlier, the land preparation period was the month of November during which the farmers had finished harvesting of their crops from the farm. The farmers said that, they saw their farmland areas being cleared by the

company but there was no food crop plant in the farm field. In addition, in all the 10 households I interviewed, I found that, some of the affected farmers could have as many as 4 different farmland areas, noted for different crops. The residents dismissed the reports explaining that, the project has caused complete loss of farmland areas. The household members mentioned meagre income from farm to buy other food items for household's consumption. ''*We need money to buy because my husband brings no income from the farm. We ... need money for the upkeep of the household*, (interview with Lansa, a farmer from Alipe, 2009).

Interviews and observations in Alipe show that, despite the problems of encroachment of farmland areas and shea nut trees destruction by the company, majority of the local people expressed optimism in the project due to some spin-off effects during the brief period of operation of the company. However, as explained above, the negative reports against the project were influential and were also circulated widely in Ghana and abroad through the internet publications. As a result, the project had to be abandoned at the peak of local opposition. The project was moved to new site under Yendi district and even after project was moved to the new site in the Yendi district, debates continued as the attention of the same interest groups shifted to the new project area where the plantation was established.

5 PROJECT IMPLEMENTATION AND EFFECTS

The previous chapter (chapter four) discussed the happenings in Alipe under the central Gonja district where BioFuel Africa Ltd. began operations but abandoned few months afterwards amid local opposition. After abandoning the project at Alipe, BioFuel Africa Ltd. moved to a new project site under Yendi district which is part of the 23, 000 hectares of land approved by the Environmental Protection Agency (EPA), Ghana. This chapter delves into the experiences with the implementations of the jatropha project on food security in the new project site focusing on three the affected communities including Kpachaa, Jimle and Jaashie. The chapter seeks to bring to the spotlight the consistency of the reports on the implications of the project adhering to the two mainstream discourses with empirical evidence of the implications on food household in the three villages.

Figure 6: *One of the blocks of the jatropha plantation in the Yendi District*

Photo: Author, 2009.

5.1 The establishment of the jatropha project in the Yendi District

5.1.1 The location of the jatropha plantation

The jatropha plantation is located along the Tamale-Yendi road. The location of the plantation is about 55km distance from Tamale, the regional capital of Northern Ghana. The three study villages live within about 5 kilometers radius from the plantation site with Kpachaa as the closest village. BioFuel Africa Ltd. initially cleared a land area of 1100 hectares in the new project site in the Yendi district. Before the project, there were 42 farmers in the 1100 ha cleared land area. The company initially cultivated the jatropha plant on a land size of 400ha out of the 1100ha cleared area and then expands it gradually with time. 25 farmers had their farmland in the area (400ha) planted with jatropha.

5.1.2 Central Consultative committee (CCC)

To maintain a cordial relationship with the communities, central consultative committee was proposed by BioFuel Africa Ltd. There nine communities in the project area, including Jimle, Kpachaa, Kpalkori, Tijo, Tuya, Chugu, Jaashie, Jahinjarigu and Sagbarigu formed the committee. Community committees comprising village chiefs, community leaders and the youth in each of the above mentioned communities in the project area were formed. The central consultative committee is made up of three representative of each of the community committees (usually representative of the community chief, women and youth groups), local government representative as well as representatives from BioFuel Africa Ltd. As said earlier, the owners of the company have muc experience in biofuel business and thus, adopt participatory approach to ensure the involvement of the affected communities in their projects. The central consultative committee became the pivot machinery around which the company organized numerous bargaining and negotiation as well as seminars with the affected communities; with the chiefs and other community leaders and the affected farmers.

The affected communities pledged to lease the land whole-heartedly to BioFuel Africa Ltd. for the jatropha plantation. In return, BioFuel Africa Ltd. made promises of undertaking a project that is environmentally friendly whilst improving livelihoods, food security and social infrastructure in the affected communities. BioFuel Africa Ltd. aims to commit itself to undertaking environmentally friendly and socially responsible project because of two main reasons. First, the company had promises from donors for funding if the project incorporated issues of environmental sustainability and food security in the affected communities. One such organization is an Environmental Activist NGO called Pro-forest, which visited the plantations to set some standards for the operation of the project to ensure sustainability of the environment and local livelihoods. When these standards are followed, the NGO promised to recommend BioFuel Africa Ltd to Neste Oil (a Finnish-based oil refinery and marketing company) for funding and also to buy the crude jatropha from BioFuel Africa Ltd. during the oil pressing stage. Statoil Hydro also promised funding for the jatropha project during oil pressing stage (Interview with Ove Martins Kolnes, 2009). As the study will show, the investment strategy of the company has a profound effect on the food security implications of the project in the three study villages.

5.1.3 Social responsibility of BioFuel Africa Ltd. in the affected communities

Affected farmers were asked to choose between relocation to new land areas with compensation or to continue farming in the jatropha plantation without compensation. Some affected farmers were relocated whilst others continued cultivation in the plantations in 2008. Relocated farmers received compensation. The compensation took the form of ploughing of 2 acres each for the affected farmers and the farmer were allowed to expand them on their own within the 1100 ha land. The affected farmers who continued farming in the plantation were also encouraged to intercrop in the jatropha rows. More so, 19 out of the 25 affected farmers were employed in the plantation. These are part of the company's "food first strategy" that focuses on improving food production in the villages surrounding the jatropha plantations. By the second project year (2009), almost all the farmers had willingly accepted relocation to new farmland of choice and received compensation from BioFuel Africa Ltd.

5.1.4 Recruitment of workers and subsequent layoffs

At the peak of activities in the plantation, about 400 people, both skilled and unskilled, had been employed. The skilled workers including mechanics, building and field supervisors, machine operators and fieldworkers, mechanics, building and field supervisors, machine operators earned monthly wages of between GH C 200 and 1000. The unskilled workers include fieldworkers, security men as well as those providing essential services like fire volunteers, cleaners, health worker and others. Fieldworkers were charged with tasks such as weeding in the plantation, planting of the jatropha plants, harvesting of the fruits and the removal of the nuts from the jatropha fruits. Other working categories include those providing essential services like fire volunteers, security personnel. These above mentioned categories of unskilled workers earn monthly wages of between GHC 77 and 150. In addition to the wages, insurance payments and other tax obligations are paid by the company.

However, by November, 2008, BioFuel Africa Ltd. faced financial crisis due to funding problems caused partly by global financial crisis and the negative publications by the interest groups in Ghana especially the reports that were circulated on the internet on grounds of livelihood destruction in the affected communities. As said earlier, after the abandonment of the project in Alipe, reports by Action Aid-Ghana and RAINS subscribing to the populist discourses continued depicting crisis scenarios when the project was implemented in the Yendi district. To this end, funders and potential investors in the company withdrew their support thereby, making it difficult to continue the project. As a consequence, by the middle of July, 2009, BioFuel Africa Ltd. had laid off about 300 out of the 400 workers. During the time of the fieldwork (June-August, 2009), the number of workers were below 100, out of which 11 were compensated farmers.

5.1.5 The current state of the jatropha project in Yendi District

Currently, although, the project has come to a standstill, BioFuel Africa Ltd. is the first Biofuel Company to produce crude jatropha oil from jatropha nuts in Ghana. The company produced 80 metric tonnes of crude jatropha oil in 2009 (interview with the Manager of

BioFuel Africa Ltd, Steinar Kolnes, 2010). The crude jatropha oil is now meant for the Ghanaian market and sells at $0.82-0.87 (GHC 1.16-1.22) per liter (ibid.). Ghanaian consumers buy the oil for soap making and as lamp oil (ibid). The company is also using some of the crude oil in their machines in the plantations (ibid.).

More so, during the beginning of this year (2010), the company has gained a loan from Agricultural Development Bank-Ghana (ADB) to support its "food first policy" in the project areas in the Yendi district. BioFuel Africa Ltd. has now began Soya bean cultivation in the plantation in Yendi which is a directive attached to the loan from ADB (Interview with Steinar Kolnes, 2010). As at now, BioFuel Africa Ltd. continues to solicit for funding to resume the project. In spite of the temporal hold-up of the expansion of the plantations, currently (2010), there are about 70 workers in the plantations harvesting the jatropha nuts with others providing essential services such as security personnel, field and machine supervisors as well as drivers. About 40 of these remaining workers are residents from the three study villages.

5.2 Effects of the project in the study villages

To examine the effects of the jatropha project on food security in the three villages, the section below presents and interprets field work data about the establishment of the jatropha plantation by highlighting five main themes. First, the organization of the project within the context of the three study villages, second, the effects of the project on livelihoods, third, the ecological effects of the project, fourth, community development and finally, effects of the project on household food security.

5.2.1 Organization of the project within the context of the three villages

This section provides a detailed description of the characteristics of the three villages in terms of household composition, livelihoods, gender division of labour, population density and how the villages were incorporated into the jatropha project.

Place of residence	Educational level of respondents				Total	Percentage
	Illiterate	Elementary Education	Secondary School	Tertiary		
Kpachaa	33	2	3	0	38	35.8
Jimle	14	4	5	0	23	21.7
Jaashie	15	5	1	0	21	19.8
Tamale	0	3	7	4	14	13.2
Other	7	1	1	1	10	9.4
Total	**68**	**15**	**17**	**5**	**106**	**100**

Table 2: *Educational level respondents and their places of residence* (Fieldwork, 2009)

The table above shows that, majority of the respondents from the three villages are predominantly illiterates whilst most of the respondents from Tamale and "other" (people from some surrounding towns) are literates. The data above suggests the level of education in the study areas and as the study will show, this was an important criterion adopted for the recruitment of workers into the plantations.

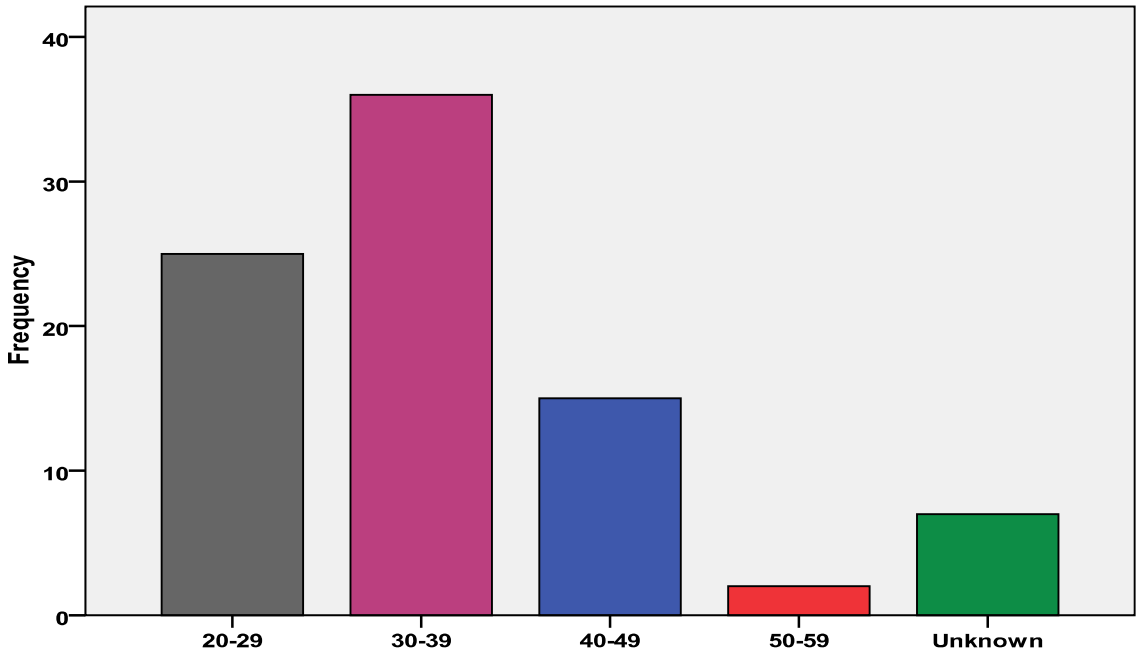


Figure 7: *The age range of workers employed in the plantation* (Fieldwork, 2009)

As shown in the table, majority of the workers employed in the plantations belong to the active working age. In short, the younger generation (below 20 years) and the elderly (above 50 years) were not employed in the plantations.

Place of residence	Mechanic	Field-workers	Machine Operator	Supervisor	Transport worker	Security personnel	Other services
Kpacha	0	22	0	0	1	3	5
Jimle	0	10	2	0	0	0	
Jaashie	1	10	1	0	0	0	5
Tamale	3	2	4	3	2	0	
other	1	4	1	0	0	0	5
							5
Total	**5**	**48**	**8**	**3**	**3**	**3**	**15**

Table 3: *Type of work and the place of residence of workers* (Fieldwork, 2009).

From the above table, 42 of these respondents were fieldworkers recruited from Kpachaa, Jimle and Jaashie. The 'other services' category of workers refers to the fire volunteers, the people employed to register affected farmers for compensation and hammer mill workers. Three security personnel were also employed. Residents from the three villages were recruited for these unskilled jobs because of the high illiteracy rates in the villages and as said earlier, these tasks attract the least of the wages (between GHC 120 and 150) of the workers in the plantation.

However, tasks such as machine operating, supervisory roles, mechanical works and drivers of the vehicles of the company attracts higher salaries of between GHC 200 and GHC 1000. As shown in the table above, such workers were mainly recruited from Tamale and the surrounding communities due to their high level of education. In short, higher wages were paid to workers recruited from outside the study communities due to the differences in skills and level of education.

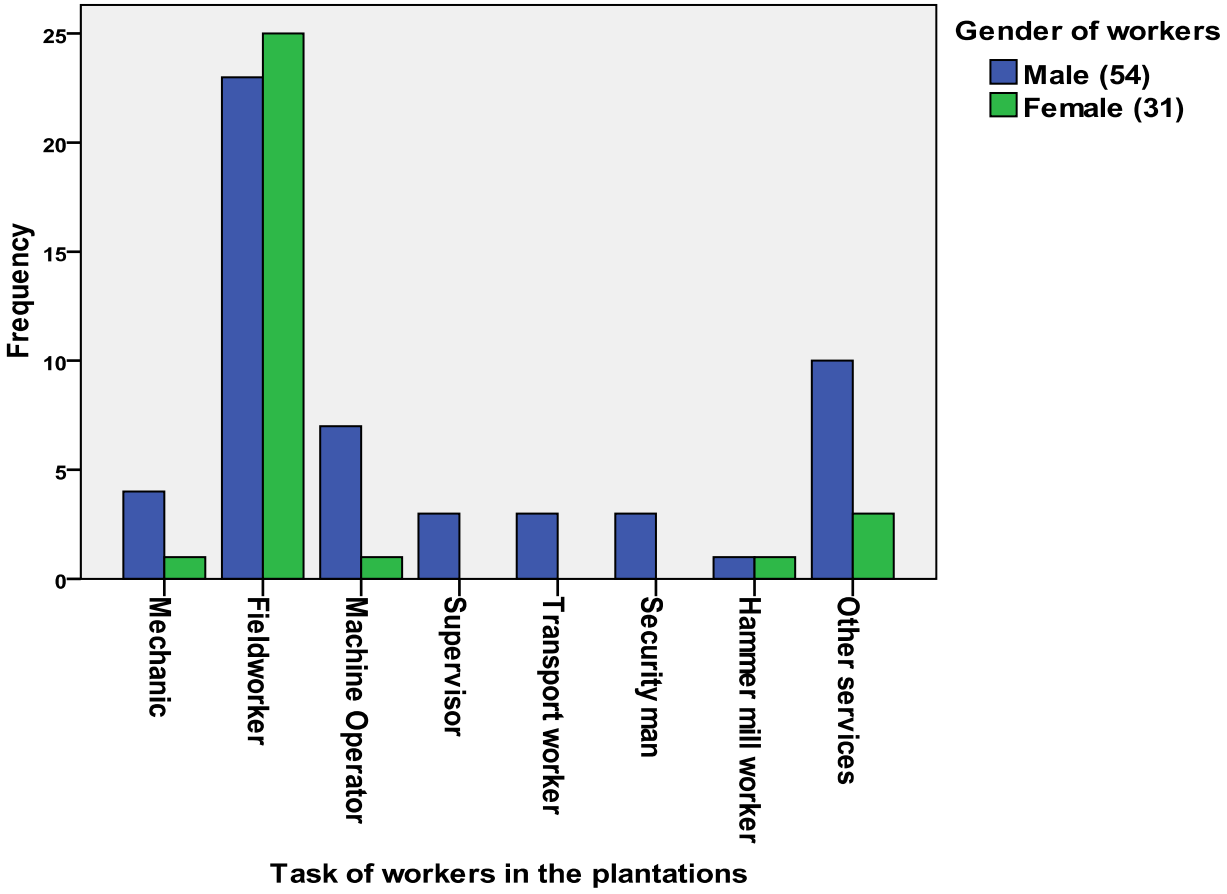


Figure 8.: *Gendered tasks of workers in the plantations* (Fieldwork, 2009).

From the figure above, majority of the plantation workers were men who were also recruited for skilled jobs like mechanical works, machine operating, transport works and supervsiory works. As already said, higher salaries were paid to these skilled workers who were mainly recruited from outside the three study villages. As a result, alhtough, the majority of men employed in the plantation were residents from the study villages, both men and women were employed in the plantation as fieldworkers earning similar wages. Beside educational level, the criterion for the recruitment of the men and women as fieldworkers was based on the gender division of labour in the study villages (see chapter 2). In other words, although, men dominated both in the number of workers employed in the plantation and higher monthly wage earnings, however, in the study areas, the direct spin-off effects of the project for men and women was almost the same.

5.2.2 The effect of the project on livelihoods

The project had consequences on the livelihoods in the study villages. These livelihoods include farming and petty trading. This section illustrates the consequences of the project on the livelihoods in the study areas livelihoods by focusing on the changes in food production and purchasing power during the project.

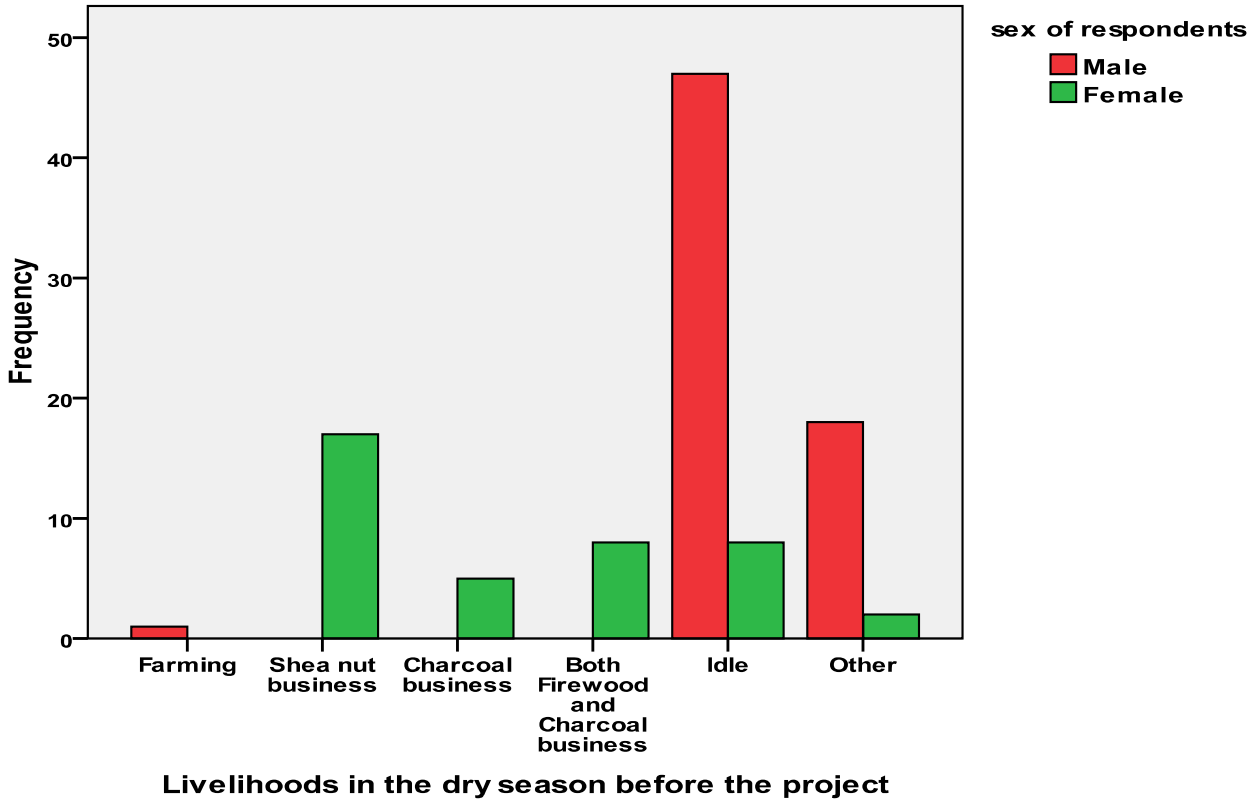


Figure 9: *Gendered livelihoods during the dry season* (Fieldwork, 2009).

As said earlier, livelihoods in the study villages are constructed along gender lines. Men are predominantly farmers whilst women mainly undertake charcoal, firewood, shea nut and sometimes petty trading businesses. Few women undertake farming. The long dry seasons that characterizes climate of the study villages just like other parts of Northern Ghana permits farming only in the rainy season during which men become active in farm work. Gendered differentiation of livelihoods thus, becomes more pronounced during the dry seasons.

As shown in the diagram above, most males become idle during the 7 month-long dry season characterized by severe drought when farming become impossible. Nonetheless, women are less vulnerable financially compared to men because their predominant livelihood of firewood, charcoal and Shea nut businesses is not limited to a particular season of the year. Because of the strategic location of the three villages along the Tamale-Yendi major road, market for shea nuts, firewood and charcoal are offered by the passengers that use this major road. The income from these businesses is used for the upkeep of the households. It is worth noting that, women become breadwinners in their households during dry seasons. However, in

the years when the volume of shea nut collection reduces or the prices take a nosedive, or the sales of firewood and charcoal reduce, living conditions become worse in the households.

In such times of extreme poverty in the households, men escape economic hardships that characterize the dry seasons by engaging themselves in seasonal labour migration to Tamale and sometimes, neighboring towns and come back during the next farming season. There are even cases of some residents of Jimle and Kpachaa villages who have their permanent place of residence in Tamale but come to the villages only in the farming (rainy) seasons. This refers to the category of workers labeled "other" in the diagram above. In short, livelihoods in the three villages are less resilient and thus, vulnerable especially in dry seasons.

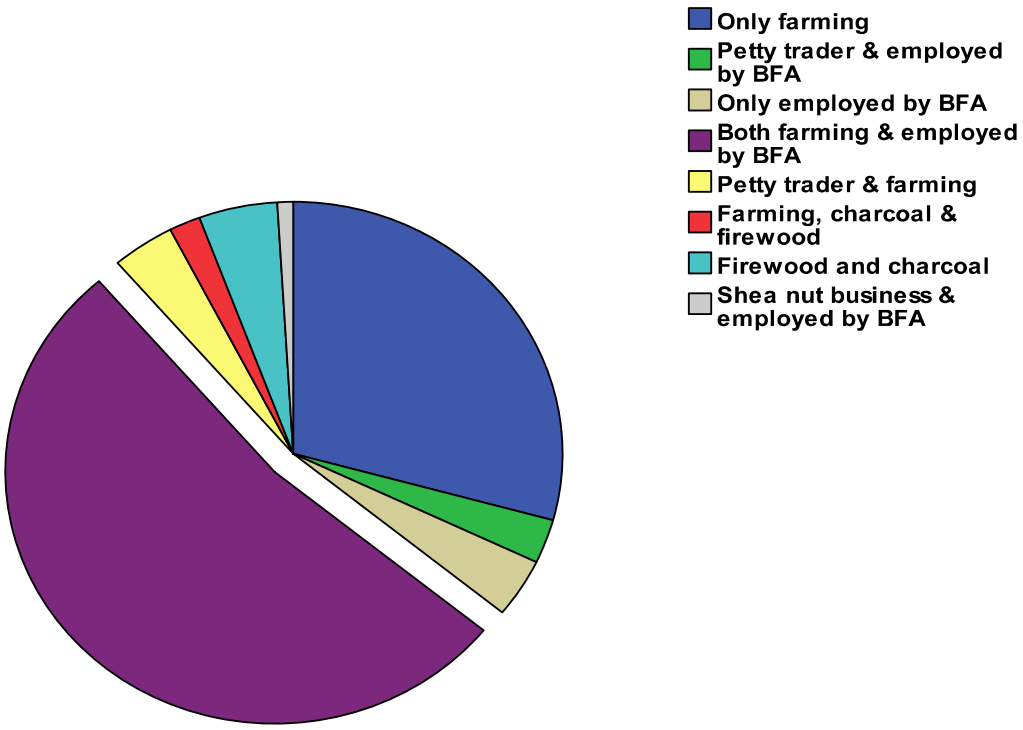


Figure 10: *Livelihoods of respondents during the project* (Fieldwork, 2009).

As the figure above, the jatropha plantation added a new livelihood of paid employment to the majority of residents of the study villages. Most people secured employment with BioFuel Africa Ltd. whilst continuing with their traditional livelihoods of farming, petty trading as

well as firewood, charcoal and shea nut businesses. As indicated in the previous figure (figure 9), there were little income-generating activities in the villages before the jatropha project. However, by earning monthly wages in addition to their traditional livelihoods which was hitherto unavailable in the villages, the establishment of the plantation provided another livelihood opportunity to the residents who secured employment in the plantations.

Workers in the plantations could combine the work effectively with their traditional livelihoods. Explaining the economic importance of the dual job creation during the project, one farmer from Jimle happily remarked, "… *now we can kill two birds with one stone since the company came"* (Interview with a farmer from Jimle, 2009). This structural metaphor means that, during the project, the local people employed by the company are enjoying both monthly wages by working in the plantations whilst continuing with their traditional livelihoods. This metaphor elicits the economic benefits of the jatropha plantations by referring livelihood diversification to hunting (*killing two birds at the same time*). This statement adheres to the ideas of the managerial discourses.

However, the working hours from Monday to Friday between 7am and 3pm posed a problem to some farmers employed in the plantation especially the security men and fire volunteers who spent much longer hours of between 6am and 6pm throughout the week. More so, farms of the residents are usually are far from their homes. Thus, long working hours coupled with long walking distance to farms posed a problem to some farmers who were employed in the plantations. Nonetheless, in spite of the above seemingly conflicting hours, some male farmers working in the plantations said, hired labors or family labors are needed in their farms because of tight work schedule when switching between farm work and work in the plantations. In addition, the farming practice in the study villages contained a solution to the problem. The Dagomba villages usually go to farm twice a day, early in morning and late in the afternoon. Wives thus, cook food and send their children to give food to their husbands in the farm or children are sent to work in their farms during working days and then males themselves go to farm during weekends.

Female residents were immune to this problem of conflicting work period between plantation work and their traditional livelihoods. Because female workers in the plantations were allowed to intercrop maize in the jatropha rows, they could conveniently combine farming and work in the plantations. More so, their livelihoods such as petty trading in food, charcoal and firewood are flexible as their children can take over from them in their absence. In short, the livelihood opportunity source for the residents of the three villages during the project which was "compatible" with their traditional livelihoods.

5.2.2.1 Effects on livelihood diversification

Women had diversified income sources during the project. This is because, in addition to their numerous income-generating activities such as firewood, charcoal and shea nut business, women employed in the plantations earned wages as a new income sources. The wages were used for many purposes. The monthly wages for women who secured permanent employment in the plantation was used not only for meeting household food supply but also investment in other economic activities like petty trading, farming and livestock. As a result, purchasing power of women relatively increased during the project through diversified livelihoods compared to men. The case of Mata Zuberu illustrates this.

Case study 1: Women and livelihood diversification-Mata Zuberu. Photo: Author, 2009.

This is the success story of how a native of Kpachaa transformed her economic status through livelihood diversifciation during the jatropha project. Mata is in her early twenties. She is married with three children. She was formerly engaged in firewood and charcoal business as well as farm work. The money realized from the sales of firewood and charcoal was used to buy food to supplement the produce from her small farm and that of the husband. She started working with BioFuel Africa Ltd. in October 2008 as fieldworker receiving a monthly wage of 77 GHC. She works between the hours, 7am to 4pm, from Monday to Friday and uses the weekends in her small farm. *BioFuel Africa Africa Ltd. has been good to me because… before joining the company, I had a small farm size less than 2 acres. When I joined the company, they ploughed part of their acquired land of 2 acres for me,* Mata added. Mata cultivates crops like maize, rice, and groundnut in her farm. Now, she has a bigger farm size of over 3 acres and also uses part of her monthly wages to buy other food stuffs for the household. Mata does not use her wages only for food provisioning in the household but also other investments. '*I even own 7 goats and 5 sheep bought from my monthly salary from BioFuel Africa Ltd. … now, I also give money to my husband to hire tractor and other things in the farm'*, she added. The husband also cultivates crops like rice, groundnut and maize but could not secure employment in the plantations.

Mata further added that, during the dry season, the husband becomes unemployed. However, since she secured employment in the jatropha plantation, the entire household including the husband depends on her. Currently (2009), Mata takes care of the mother and her three children by providing food and money for the upkeep of the household. When I asked that will be her reaction when sacked by the company, she said, she will not know what to do then. '' *I will go back to do my small work*''. Mata had diversified income sources as a result of her diversified livelihoods during the project. This is a success story, showing the spin-off effects of the jatropha project in the affected communities which lends support to the ideas of the managerial discourses underpinning the jatropha project debate.

5.2.2.2 Effects on petty trading

The improved purchasing power in the three study villages during establishment of the plantation led to increased demand for goods and services both by the plantation workers as

well as the village residents. One of the consequences of the increased purchasing power was the springing up of petty trading activities especially during the peak of the project. Common petty trading activities were grocery shops and the sale of cooked food. However, during lay-offs, the demand for cooked food, and groceries drastically reduced with the consequent effect of shrinking of the petty trading activities. A case of Alimatu from Kpachaa illustrates this.

Case Study 2: Lay-offs and petty trading-Alimatu. Photo: Author, 2009

Alimatu is a petty trader and a native of the Kpachaa village. She is in her late twenties. She started the petty trading together with the elder sister some years before the establishment of jatropha plantation. Initially, they were selling biscuits, toffee, tea, milo and Milk and other provisions in a small shop in the house. *It was selling well but the profits were so meager that, it is easy to incur losses*" she said. During the start of the project, she foresaw the demand for food by the workers. Alimatu and her sister, therefore, moved to a place close to the jatropha plantation and started selling food like fried yam, local rice called 'Waakye', white rice and dough nut called 'sweet bar', but on a small scale initially. At the peak of employment in the plantations, the demand for food increased and they expanded the business. Alimatu later secured a work in the plantation as a fieldworker. She said, I *was employed to be part of the harvesting team in the plantations. I was thus, switching between harvesting on the field and attending to my customers in the shop during break time*, she said.

Alimatu together with the sister are the breadwinners for their household of about 15 people comprising the parents, the sister's children and their siblings. She said that, a large part of the household expenditure is food including maize, ingredients like salt, pepper, tomatoes, onion, as well as meat and fish. Although, other family members provide foodstuffs for the household consumption, a large part of the food are bought from the market. They prepare food and eat together. Her contribution to household food provisioning increased due to diversified incomes sources, from the monthly wages of GHC 77 as well as the food sales.

During the layoff exercise by the company in the beginning of 2009, Alimatu was not affected. However, the layoff had an indirect negative effect on the business through a declined in the demand for her food sales and the consequent effects on her profits. "*Our businesses have not collapsed totally but we feel like enjoying today and crying the next day. We have closed the shop near the plantation and now gone back to the previous small shop in the house*", she lamented. Alimatu and the sister are still selling the food but on a relatively smaller scale in the Kpachaa community reaping smaller profits. Because Alimatu was not laid off, the only source of money to the household is her monthly wages. The case of Alimatu illustrates the indirect spin-off economic effects of the jatropha plantation on petty trading before the layoffs. The shrinking of her business due to the layoffs renders ample evidence to the effect of the plantations on purchasing power during the project.

Other local people lamented the layoffs as causing sudden change in their income sources. One female worker who was laid off in addition to the mother complained bitterly about how they will be generating income to supplement farm produce. She remarked; "*when you are laid off, it seems like you have lost something precious forever"*. This structural metaphor explains how dejected Alimatu became after the lay-offs by relating the layoff exercise to a lost in a game or competition (losing something forever).The metaphor implies the importance of the new income-generating opportunities that accompanied the project until the layoffs. This evidence supports the ideas of the managerial discourses underpinning the jatropha project debates.

5.2.2.3 Effects on food production

The effect on food production took the form of changes in farm sizes of the residents of the villages before and during the project. The section presents data on the effects of the project on food production.

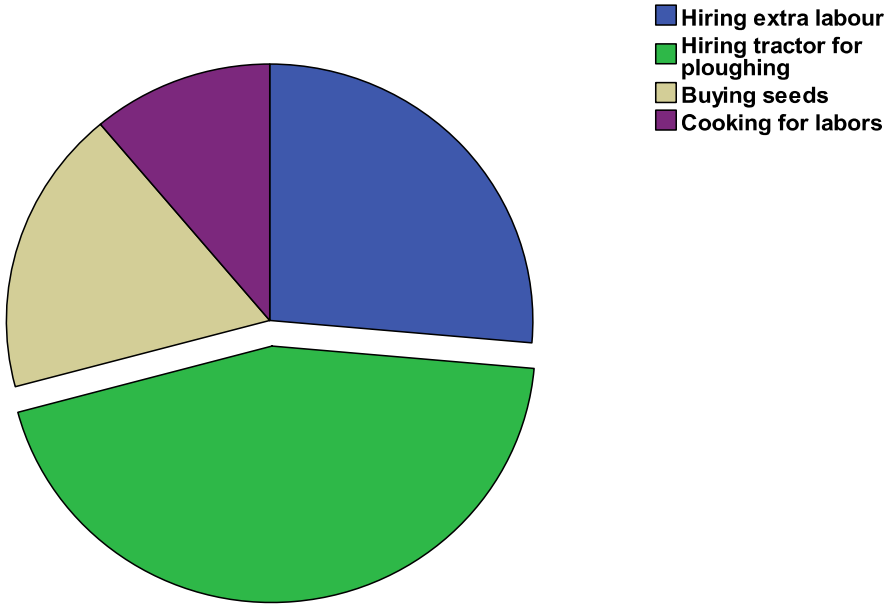


Figure 11: *Contribution of wages to crop production.* (Fieldwork, 2009)

Although, majority of the workers recruited from the study villages in the plantation were fieldworkers receiving the least wages, however, part of the wages were spent on farm work. The contribution of the wages to food production took the form hiring extra labour into the farm, buying seeds and as well as hiring tractor to plough the farm. During the project, majority of the farmers producing groundnut and yam which involve raising mounds before cultivation of seeds switched to the services of the tractor for ploughing, which was hitherto done with crude implement like hoe, axe, mattock and cutlass. Until the time of the project, tractor service in the farms was expensive and thus, less accessible to most peasants. The

services of the tractors of BioFuel Africa Ltd. became more accessible to a large section of the farmers in the three villages as well as the surrounding communities.

Unmarried women who often complained of the hard farm work usually hired the services of the tractors to plough land areas for them to start farming. Married women gave money to husbands to buy seeds and hire tractor to plough their fields for farming. One farmer from Kpachaa echoing the importance of the tractor services remarked, *we have more land to farm on, but… it is difficult to cut trees and remove stumps in the soil before cultivation. Most of the distant idle land is dominated by old and big trees. Farmers here like moving from one land to the other after some years but it is difficult in new land areas without tractors*, he said. This was emphasized by almost all respondents and key informants. The services of the company's tractors encouraged farming in the study villages. In the case of some of the workers, depending on the size of the land to be ploughed, the company only asked them to provide fuel for the ploughing without payment.

Figure 12: *Tractor ploughing the of land one farmer for maize production.* Photo: Author, 2009.

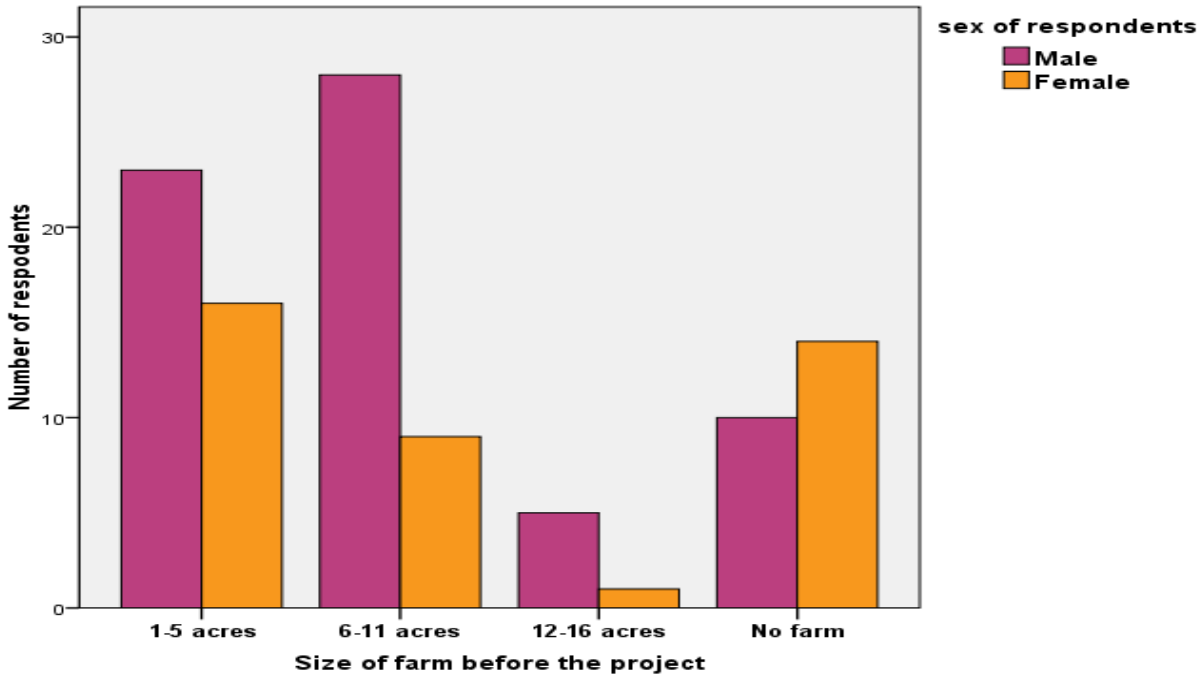


Figure 13:

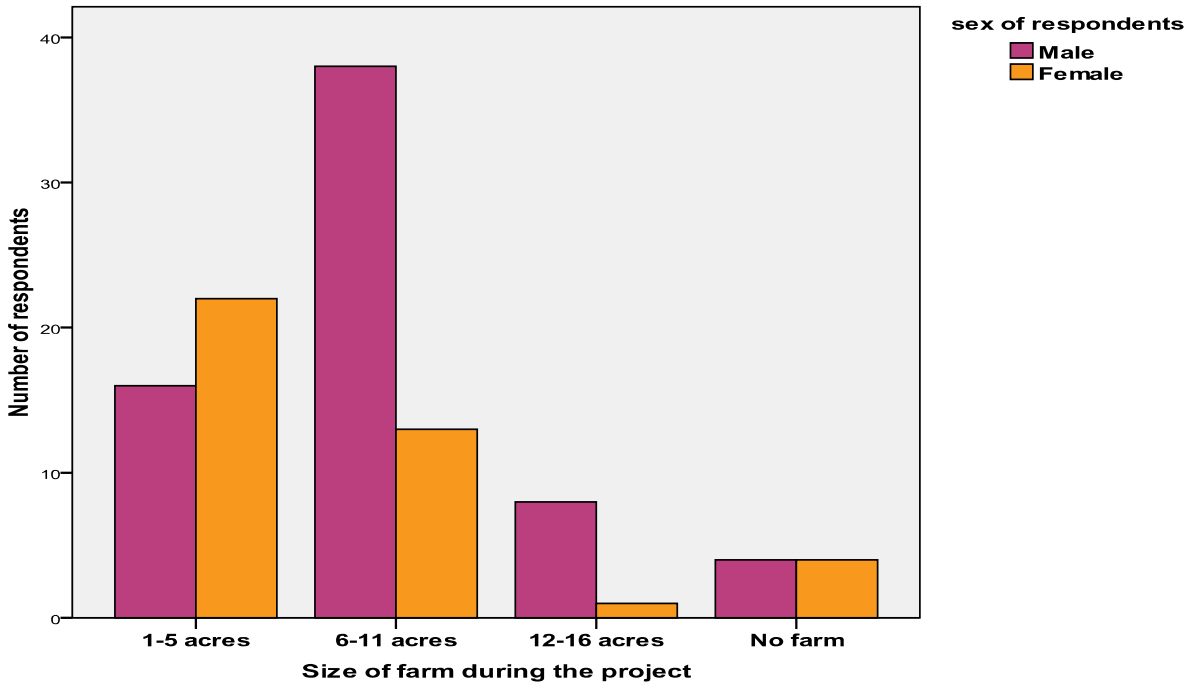


Figure 14:

Figures 13 & 14: *Changes in farm sizes during the project* (Fieldwork, 2009)

The above diagram (Figure 13) compared with the previous one (Figure 14) shows remarkable changes in farm sizes during the project. It is evident in the two diagrams that, the

number of respondents who had farms during the project increased and the increases in farm sizes were associated with men and women, although the former dominated. In other words, majority of the respondents had farms during the project.

Figure 15: *Maize farm on the edges of the plantation.* Photo: Author, 2009.

Despite men dominated in farming during the project, female farmers also increased. Female workers and some female residents from the study villages were allowed to intercrop in the jatropha rows and on the edges of the jatropha plantations.

In addition, farm sizes of about 25 acres of maize were done for the staff of the workers as well as 16 hectares of maize farm for the affected communities. This was an initiative of the BioFuel Africa Ltd. and during interviews with the plantation manager, he that, '*the maize from the community farm will be harvested and sold to the community members at a reduced price'* (interview with Per Ragnar Moen, 2009). The residents from the villages confirmed that, during the previous year (2008), maize from the community farm initiated by BioFuel Africa Ltd. was given to all the household members of chiefs whilst some were sold to residents of the communities at a much cheaper price.

Figure 16: *Community maize farm undertaken by BioFuel Africa Ltd.* Photo: Author, 2009

Figure 17: *Maize farm for plantation workers.* Photo: Author, 2009

Moreover, BioFuel Africa Ltd. ploughed land areas of between 5 and 10 acres for maize farm by the chiefs and the community leaders of Kpachaa, Jaashie, and Jurolana (based in Jimle), Jaashinjerigu, Kpalkore and Sagbarigu on the acquired land. During the project, BioFuel Africa Ltd. promoted the cultivation of two main crops, maize and rice, although the former dominated. The 'food first policy' initiatives of the company were much lauded by the community members because maize is the most important staple food.

Men in Kpachaa, jaashie and Jimle, lamented layoffs by the company. Majority of the farmers who were laid off expressed disappointment with the company on the grounds that, compensation was not paid to them. Some male farmers complained that, the time of the lay-off coincided with late cultivation period of the 2009 farming season. The case of two men, who were laid-off in April, 2009 illustrates this.

Case study 3: Lay-offs and food production- two laid-off workers. Photo: Author, 2009.

These two men are residents of Jaashie village and are mainly farmer. The two men are in their late forties. They were cultivating crops like maize, rice to feed their families of between 15 and 16 people each. They secured employment in the jatropha plantation in September 2008 receiving GHC 77 each. As security personnel in the plantation, they worked between

the hours 6am-6pm throughout the week and had enough time for farm work only in the weekends.

The two farmers emphasized that, they could reap high yields of about 30 bags of maize each in a year during the harvesting season. However, the farm yields are not enough for the household food demand due to the large household sizes. One jokingly remarked,' the *plenty maize from my farm was not enough because my children can eat one bag of maize within 10days.* The two residents of the jaashie village thus, became happy when they secured employment in the plantation because of the need for income to purchase food to supplement farm produce for their households.

Unfortunately for them, they were laid off in late April, 2009. During the layoffs, they could do nothing to increase their farms because it was past the cultivation period. *The lay-off will affect the size of my crop yields this season (2009) because I could not farm on a large scale like last year due to work schedule from 6am-6pm but…, meanwhile, the time of the lay-off is past the cultivation time. I don't know what to do now*, one of them lamented the lay-offs (personal interview, 2009). However, despite disappointment with the layoffs, during interview with them, I could discern that, their concern was "relative deprivation". In other words, they were more furious not necessarily because of complete loss of livelihoods during the layoffs but rather a sudden change in income source compared to the period they were in the employ of the company.

5.3 Ecological effects of the project

There was land use change in the three villages during the project. This section brings forth evidence about the consequences of the project on plant species and land resources.

Plant species	Frequency	Percent
Shea nut trees	2	1.9
Dawadawa trees	3	2.8
Moringa trees	6	5.7
Shea nuts and some local trees	15	14.2
shea nuts and dawadawa	9	8.5
Nil	12	11.3
Some local trees	59	55.7
Total	106	100.0

Table 4: *Plant species destroyed during the jatropha project.* (Fieldwork, 2009).

The above table shows that, respondents confirmed tree destruction during the land preparation stages of the jatropha project. However, majority confirmed that, among the trees that were destroyed, only a handful was shea nut trees. The remaining trees were mainly non-economic trees such as moringa trees, shrubs and other local plants.

5.3.1 Access to shea nuts during the project

As said earlier, shea nut business is undertaken by only women in the study villages. Out of the 40 women interviewed, 82.5% said there have been no changes in the access to shea nuts since the start of the project. Only a handful (17.5%) said that, access to shea nuts have reduced since the start of the project.

However, the study found that, the shea nut business is in decline in the villages mainly because of the gradual destruction of the shea nut trees some years ago through farming activities and the consequent reduction in the access to shea nuts. Although, some shea nut business women mentioned tree loss during the land preparation stages of the jatropha project,

majority said that, a large part of the land areas acquired for the jatropha plantation was once a farmland. As a result, there were few scattered trees on the land before the land preparation stages of the project. The residents explained that, groundnut and yam farmers usually clear trees and remove stumps before they can raise mounds for the cultivation of their crops and thus, contribute immensely to the destruction of trees including shea nuts trees. Some residens also attributed tree loss to charcoal business which involves the cutting of fresh trees to be burnt to produce the charcoal. Some women also pointed out that, in some seasons, they collect many shea nuts but the volume of the collection sharply decreases in seasons characterized by extremely high rainfall when storms blow off and destroy the nuts and a result, now the incomes realized from the sales of shea nuts are not meager but also irregular.

As a consequence of the declining shea nut business, the study found that, majority of women is engaged in petty trading, charcoal as well as firewood businesses. In fact, the women confirmed that, now charcoal and firewood business fetch regular income than the shea nuts business. Nonetheless, reports on the jatropha project in Ghana opined destructive effects on shea nut trees which are a major source of livelihoods in the Northern Ghana (Action Aid-Ghana, 2009, RAINS, 2008). These reports adhered to the ideas of the populist discourse to describe daunting implications of the jatropha plantations to the affected villages. Meanwhile, as explained above, evidence suggests the contrary and even despite the destruction of some trees by the company and the worker layoffs, majority of the residents in the three villages still expressed optimism in the development potentials of the company. They hope that, the benefits of the plantation will exceed the harms in the affected communities if it continues for a long time. This evidence supports the managerial discourse by emphasizing the spin-off effects of the project.

5.3.2 Tree re-planting by BioFuel Africa Ltd.

As said earlier, the land preparation stages of the jatropha plantation affected some trees including shea nuts dawadawa and moringa and other trees. Environmental Protection Agency-Ghana advocated for re-planting of the affected trees. However, central consultative committee recommended the planting of fast-growing plants like moringa and mango because dawadawa and shea have longer gestation periods. The BioFuel Africa Ltd. has mango and

moringa trees and in between the trees are intercropped with maize. Seedlings of shea nut tree are still in the nursery in a village called Kpalpori.

Figure 18: *Moringa trees re-planted by BioFuel Africa Ltd.* Photo: Author, 2009.

5.3.3 Land use size before and during the project.

As explained earlier, before the start of the jatropha plantations in the Yendi district, there were 42 farmers in the 1100 hectares cleared areas. The paramount chief, Tijo-Naa, and his sub-chiefs at the village level confirmed the 42 farmers in the acquired land because permission is permission is sought from them before farming. Land areas belonging to farmers in the acquired land were identified and registered with a GPS instrument. Based on the 42 farmers' own estimates, the farmers had an average farm size of between 5 and 10 acres each. Assuming each of the 42 farmers had a farm size of, at most10 acres, this will amount to a total of 420 acres (42x10) which is approximately 170 hectares. The 170 hectares represent only 15 % of the cleared land area (1100ha). In other words, about only 15% of the cleared land was in use for farming before the project.

5.3.4 The condition of the 400ha land used for the jatropha plantation

The residents from Kpachaa village said, before the establishment of the jatropha plantation, the 400 ha was dominated mainly by shrubs and sparse grasses interspersed with few isolated trees. There were 25 farm plots in land belonging to 25 farmers. The major crops cultivated include maize, rice and groundnuts. Due to the availability of large areas of unused land in the three villages, bush fallowing is practised especially when the fertility of the soil begins to decline. Resident farmers explained that, there were many farmers in the 400 ha land area but have relocated to new land areas due to declining soil fertility, leaving only the few (25 farmers) behind. In fact, I observed that, there were even some areas in the 400 ha land area with poor soils.

Figure 19: *'Caking' of the soil when dry.* Photo: Author, 2009.

Figure 20: *Poor drainage of soils when wet.* Photo: Author, 2009.

Figure 21: *Section of jatropha plantation with poor growth due to water logging.* Photo: Author, 2009.

Upon negotiations with the farmers, BioFuel Africa Ltd. relocated 20 out of the 25 affected farmers to new land areas outside the plantations. Thus, the project caused land use change. Because of its proximity to the land acquired for the plantations, majority of the relocated farmers were residents from Kpachaa. Four relocated farmers complained of reduction in farm sizes, changes in their way of farming and long walking distance before reaching their new farmland areas. The case of two farmers illustrates complaints some changes in farming after the relocation.

Case study 4: Relocation of farmers -two relocated farmers. Photo: Author, 2009.

The two farmers were cultivating on the acquired for the jatropha plantation which was very close to their place of residence. However, they were relocated to a new farmland during the project which is about 3 kilometers from their homes. They thus, had to walk some distances to their new farmland unlike before. More so, because the new farmland area is completely new to the farmers, they expressed fears of reduction in crop yields in the farming season (2009). One remarked, *'I like farming on a new land. We (farmers) move from one land to the other after some years of cultivation but it takes some years to get used to the conditions in a new land. This is my first time farming here and I don't know whether I will get the same yields like before…am afraid about my crop yields this year'*, he said. One also said, he had maize and yam farm of about 7 acres on the previous farmland but now farming, he has a farm size of about 5 acres. The two farmers expressed doubts about their crop yields for the season which is their only livelihood. The above concerns raised by the farmers adhere to the populist discourse as they express pessimism in the relocation to new farmland caused by the jatropha project.

With the exception of the two farmers above, the remaining relocated farmers revealed that, relocation to new areas is not problematic because it is consistent with the bush fallowing

system commonly practiced in the villages. The relocated farmers and other farmers from the study villages explained the declining fertility of the land used for the jatropha plantation. One farmer said, most farmers wish to relocate to new farmland areas due to declining soil fertility but clearing new farmland is always difficult because some stumps and trees are difficult to remove using crude implements like axe and cutlass. Once the new land areas are ploughed by the company, the relocation is good for them. The farmers referred to the poor fertility of the acquired land by referring to the few farmers (25) who were cultivating crops on the land before the project. In addition, as said earlier, BioFuel Africa Ltd. employed 19 out of the 25 affected farmers as an indirect form of compensation. Majority of the affected farmers expressed that, because farm work fetches meager income, earning regular monthly wages from employment in the plantation can make up for the losses, if any. The views by the relocated farmers point to a win-win situation during the jatropha project which in turn supports the managerial discourses.

5.3.5 Size of farmland under cultivation during the project

As mentioned earlier, about 15% of the acquired land was in use for farming before the project. During the project, out of 106 respondents, only about 10 had no farm during the project. The remaining 96 had farms, with the majority having total farm sizes averaging between 6 and 10 acres. Assuming each of the 96 respondents had an average farm size of, at most 5 acres, their total farm sizes would amount to 480 acres. In addition, as mentioned earlier, 25 acres of maize farm was done for the staff of the workers. Therefore, the average total size of farmland during the jatropha would amount to (480+ 25) 505 acres. The 505 acres of farmland is equivalent to 205. The 204 hectares of farmland plus the 16 hectares of maize farm for the communities totals 220 hectares representing 20 % of the cleared land of 1100 hectares. This excludes the land areas the company ploughed for the chiefs of Kpachaa, Jaashie, and Jurolana (based in Jimle), Jaashinjerigu, Kpalkore and Sagbarigu.

In short, during the project, the total size of farmland under cultivation increased by about 5% (that is, from 15% to 20%). Moreover, this further implies that, a large part of the 1100 ha acquired land (about 80%) still remains “unused” even during the project.

5.4 Effects of the project community development

The establishment of the jatropha plantations in the Yendi district was accompanied by community development in the three villages and its environs.

BioFuel Africa Ltd. provided hammer mill to grind food crops like dried maize, dried cassava, and other local foods. The company has employed two people working on the mill earning between GHC 80 and 120. Formerly, the community members had to travel to either Sang or Jimle to access the nearest mill. However, since the start of the jatropha project, residents of Jaashie and Kpachaa are served by this mill at a cheaper cost.

Figure 22: *Hammer mill provided by BioFuel Africa Ltd*. Photo: Author, 2009

Also, the residents of the villages, Jaashie, and Kpachaa were formerly drinking from the same water sources with their livestock. During the project, three water dams were constructed by the company, one for livestock with the remaining two serving the people. Water from the dams has reduced the acute water shortages which characterise the long dry seasons.

Figure 23: *One of the three water dams provided by BioFuel Africa Ltd.* Photo: Author, 2009.

Health post was provided by BioFuel Africa Ltd. to attend to minor ailments. It was accessible to residents and workers in the jatropha plantations. One female was employed to work in the health post but was laid off when the company had funding problems.

Figure 24: *Health post provided by BioFuel Africa Ltd.* Photo: Author, 2009.

5.5 Effects of the project on household food security

The characteristics of the households determine how resources are shared within the household. This section explores household characteristics in the study three villages and re-distribution of resources to members. The section explains the effects of the project in the food security of households in the three study villages.

Range of household size	Frequency	Percent
5-10	13	12.3
11-15	46	43.4
16-20	26	24.5
21-25	21	19.8
Total	**106**	**100.0**

Table 5: *Household sizes in the three villages* (Fieldwork, 2009)

From the table above, household sizes are high among in all the study communities. This is because of polygamous marriages associated with Islamic religion practiced in study communities. As village peasants coupled with such high household sizes, there is high level of abject poverty in most households in the study villages.

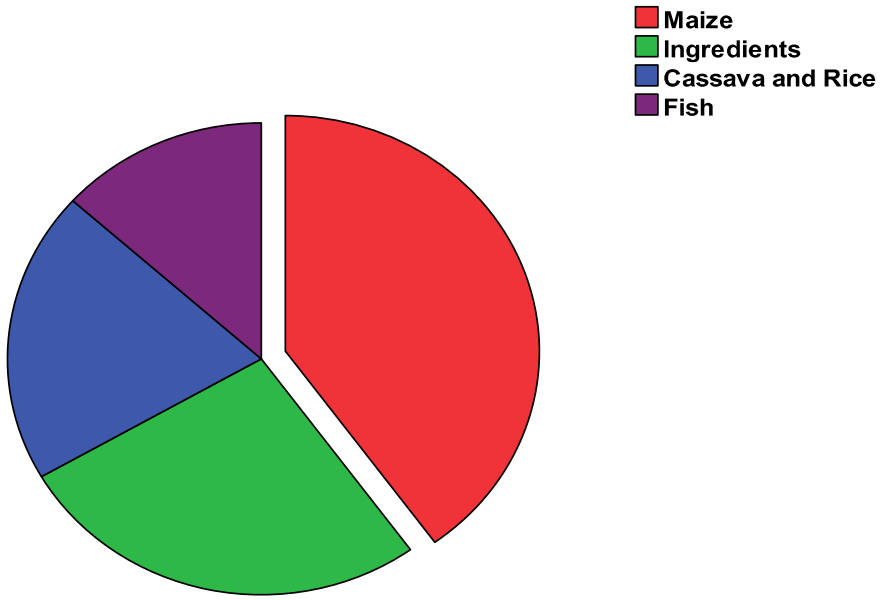


Figure 25: *Food purchases by the respondents*. (Fieldwork, 2009).

The study found that, three main items that figured prominently in the expenditure list of the respondent were food clothing, and the upkeep of the households. Food constituted the highest expenditure of the respondents. Although, the study communities are agriculture-dependent, respondents made mention of food purchases as inevitable in order to meet household food demand in a year.

Maize is the usual food purchased in all households as evident in the above diagram. Maize is used to prepare all kinds of food (*banku, tuo- zaafi, kenkey and koko*) for all year groups even more especially, children. Other food items purchased include fish, cassava, rice and ingredients. Example of the ingredients includes vegetables such as pepper, okro, onion, garden eggs to prepare local dishes. Money to buy food is thus, important for meeting household food demand in the study villages.

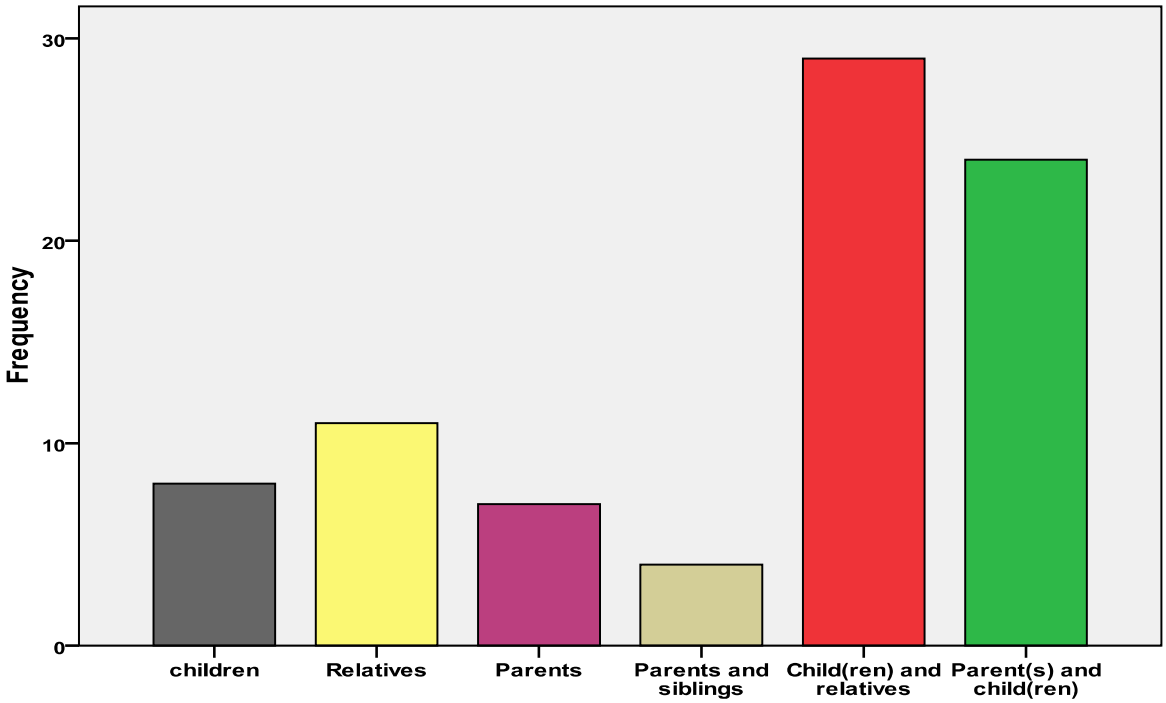


Figure 26: *Dependants of employees in the plantations.* (Fieldwork, 2009).

From the diagram above, the dependants of respondents employed in the plantations were usually either their children or relatives including siblings and parents and sometimes the relative of either the husband or the wife or in some cases both. As explained earlier, relatives usually share the same shelter. A large part of the monthly wages of the plantation workers were used for food purchases such, fish, salt, ingredients and food stuffs for households. The study found that, employees in the plantations had at least three persons depending on them for food to supplement farm produce. Out of the 50 households surveyed, 33 households had at least a relative employed or once employed by the company. These households depended on the members employed in the plantation for both food and sometimes material support.

Although, most of the plantation workers advocated for increment in their wages, they all admitted the contribution of the wages to household welfare especially during dry seasons. One female worker lamented, *am mad at layoffs…formerly my mum and I were employed but unfortunately, she was laid off three months ago. Now…all burdens are on me to provide for the entire family. My monthly wage is only GHC 120… I will be happy if my mum is re-employed because in this community, farm work does not bring money,* she said. This assertion amply reiterates the local people support for the ideas of the managerial discourses during the implementation of the project because of its spin-off effects on household welfare.

5.6 SUMMARY OF THE EMPIRICAL CHAPTER

A summary of the findings of the effects of the project is provided both in text and in the table below. The table shows the pattern of the responses from respondents, key informants and chiefs about the implications of the project in the three villages.

Farm activity	Period	Before the project	During the Project
Land preparation	March/April-June	mainly simple tools: cutlass, axe & hoe	Both simple tools and tractor from BFA
Sowing/planting of seeds	May-July	By hand & stick	By hand & stick
Farm weeding	June -July	All the days in the week	morning and late evenings, weekends with hired labours
Harvesting	September-October	Family Labour	Family Labour
Crop varieties cultivated	May-October	Men cultivated all crop varieties whilst women cultivated only ingredients & cultivating maize.	Both men and women increased the cultivation of maize and sometimes rice.
Farming seasons	May-October (Once a year)	farming in the rainy seasons but idle in dry seasons	Both Farming & working in the plantation
Farm sizes	***	Majority of men had had farms but only a few women had farms	Increased farm sizes of both men and women whilst the number of female farmers increased.

Table 6: *Summary of data on farming system before and during the project*

Photo: Author, 2009

*** Not applicable

Livelihoods	Women	Men	Before the project	During the project
Charcoal, firewood and	✓	***	Main livelihood	Previous works plus work in Plantations
Farming	Few women	Majority of men	Main livelihood	Both farming plus work in Plantations
Petty-trading activities	✓	***	Small capital & small in number	Both increased capital & in number
Shea nut business	✓	***	Already in decline	Still in decline
Food sources for households	Small food purchases	Mainly farm produce	Mostly farm produce	Both farm produce and food purchase

Table 7: *Summary of data on gender and livelihoods before and during the jatropha project*

Photo: Author, 2009

✓ Applicable, ***Not Applicable

Infrastructure	Before the project	During the project
Hammer Mill	Access the nearest mill at Jimle or sang	Hammer mill for Kpachaa and Jaashie at cheaper cost
Water sources	Sharing one water dam with livestock or buying water brought by cars from Tamale	Three water Dams & sometimes water supplied to the residents by BFA
Access to Health service	Walking some distances to access health centres at Sang, Yendi or Tamale	Health post provided by BFA providing first aid services

Table 8: *Summary of community infrastructure before and during the jatropha project*

Photo: Author, 2009.

The data presentation and interpretation on the effects of the project implementation highlights three main issues. First, the jatropha plantations increased land under cultivation

and boosted food production in the three villages. Second, despite increases in farmland (from 15% to 20 %), a large part of the acquired land (about 80%) remains “unused”. More so, the project boosted food production. Third, increased purchasing power contributed to food purchases to supplement farm produce to meet household food demand. It could be concluded from the empirical chapter that, although there was land use change during the jatropha project, however, these changes were compatible with the traditional livelihoods in the study villages which is evident in the remarkable improvements in household food security.

The empirical chapter has delved into effects of the project implementation in the three villages after its abandonment at an incipient stage in Alipe on grounds of perceived daunting implication on livelihoods and food security. Having identified the effects that accompanied the project in the three villages, the next chapter (chapter 6) gives a holistic account of the implications of the jatropha project by teasing out the rhetoric (initial debates and discussions that surrounded the biodiesel project in Alipe) from empirical evidence and bring to the spotlight the complexities surrounding the discourses underpinning the jatropha debates in Ghana.

6 DISCUSSION OF RESULTS AND FINDINGS

This chapter serves to bring to the spotlight the complexities surrounding the implications of biofuels based on empirical evidence from the study and to re-think biofuel polices and reports that subscribe strictly to the mainstream managerial and populist discourses. The chapter examines the debates and discussions about the implications of the jatropha project by tracing the historical backdrop of the incipient stage of the jatropha project in Alipe and their consistency with empirical evidence from the three Yendi villages where the project was implemented. The complexities surrounding the narratives associated with the two discourses underpinning the debate are brought forth and these narratives have been improved by constructing "better knowledge" as Roe puts it (1991).

6.1 Narratives and 'de-narrativization'

As explained earlier (in chapter 2), there are two narratives within the mainstream discourses surrounding the implications of the jatropha project, the narrative of 'land grabbing leads to food insecurity' and the narrative of 'development project leads to improved livelihoods'. Roe (1999) recommends the need to engage in the production of counter-narratives. In the production of counter-narratives, the conditions in narratives are subject to rigorous investigation to discern their true complexities through what Roe calls "de-narrativization" to bring forth the flaws or over-simplifications that emerge in the narratives (Roe, 1999). Similarly, the study seeks to examine the narratives surrounding the implications of jatropha project on food security based on the empirical findings from the study villages. The discussion below shows the complexities surrounding the two narratives.

6.1.1 De-narrativization of "land grabbing leads to food insecurity'' narrative

As already said, adherents of the populist discourse perceived "food insecurity" as an inevitable consequence of the jatropha project through the encroachment of farmland areas and destruction of economic trees. Economic trees such as shea nuts, dawadawa and other non-economic trees like moringa were claimed destroyed during the land preparation stage of

the project (RAINS, 2008, Action Aid Ghana, 2009). Because livelihoods in the affected communities of the jatropha project depend on land resources, 'land grabbing' implies dire consequences on food security in the affected communities (ibid.). The cast of actors that emerge in this narrative is that, BioFuel Africa Ltd. is presented as 'villain', the local people in the affected communities as the 'victims' of food insecurity whilst the interest groups claiming to address the food insecurity or livelihood destruction emerge as the 'heroes'.

The word 'grabbing' means seizing suddenly and roughly (Compact Oxford English Dictionary). Land grabbing thus, refers to a sudden seizure of land areas. However, the study found that, out of the 1100 cleared land cleared by BioFuel Africa Ltd., 400 ha was initially planted with the jatropha. More so, before the jatropha project, there were only 25 farmers in the 400 ha land acquired for the jatropha plantations. The land preparation period for the project was March (2008) which is the time farmers prepare their land for farming. Upon consultation and negotiations with the affected famers and the chiefs, the 25 farmers were asked either to relocate to new farmland areas in the cleared land or continue to farm in the jatropha plantation. 5 of the farmers continued farming in the plantation whereas 20 accepted relocation. The company ploughed 2 acres each for the farmers in the new land areas and encouraged them to expand on their own still in the cleared land.

4 out of the 20 relocated farmers expressed fear of reduction in yields in the 2009 farming season because it was the their first time of farming in the relocated farm fields as well as the reduction in farm sizes. However, the remaining relocated farmers (16) and other farmers from the study areas remarked that, relocation to new farmland is compatible with the bush fallowing system practiced in the study areas. This is because, the farming system is characterized by movement to new land areas. Under the bush fallowing system of farming, the farmer moves to a new land and allows the previous land to fallow for some years to regain its lost fertility. The farming system is a response to reduction in soil fertility. Residents pointed to the declining fertility of the 400ha land used for the jatropha plantations and added that, beside the difficulty in removing stumps and big trees using crude implements like axe and cutlass, relocation to new farmland usually increase crop yields because of the relatively high soil fertility levels. In short, the project was accompanied by relocation of

farmers to new farmland which did not distort the farming system. Therefore, the establishment of the jatropha plantations did not lead to the seizure of farm land from the residents in the study villages.

The story line of the narratives explains that …a consequence of the project is food insecurity through the encroachment of farmland areas. However, during the project, the jatropha rows were used for maize production by the female plantation workers and some female farmers from the Kpachaa village. Moreover, as said earlier, part of the 1100ha cleared land was used for 16ha and 25 acres of maize farms for the affected communities and workers in the plantation respectively. BioFuel Africa Ltd. promoted the crop production in accordance with its 'food first policy'. As explained earlier (in chapter five), during the project, land areas under cultivation within the cleared land (1100 ha) increased from 15% to 20%. The increased farmland areas during the project led to marked increases in crop production. In addition, even despite increases in farmland during the project, a large part of the cleared land (80%) still remains 'unused'. Even in the case of Alipe where the project was abandoned on the grounds of perceived land grabbing and encroachment of farms, the brief interviews and personal observations reveal some complexities in the reports by the interest groups. This is because BioFuel Africa Ltd. began the land preparation for the project in the month of November. The farmers confirmed that, they had finished harvesting of their crops during that period (the month of November). *Have the local people become 'victims' of food insecurity through farmland encroachment during the project?*

Another dimension of the story is that … shea nut destruction by the project leads to food insecurity. However, many factors contribute to the shea nut trees destruction in the study areas. The study found that, shea nuts trees destruction had begun some years even before the jatropha project. Although, the land preparation stage of the jatropha project affected some trees including shea nuts, the local farmers were said to have cleared a large part of the vegetation including economic trees like shea nuts during land preparation for farming activities. It is worth noting that, in the three villages the vegetation is dominated by many species of shea nut trees. Therefore, even a small land area cleared for farming destroys many shea nut trees. Village residents mentioned farmers as the main cause of the shea nut tree loss and the consequent decline in the access to shea nuts. More so, as the residents explained, the 400 ha land used for the jatropha plantation was once farm land areas and thus, farmers have

cleared-off most of the economic trees including shea nut trees. Some residents also mentioned tree cutting by the local people for charcoal for sale. As said earlier, the local women confirmed that, now the shea nut business is not even as lucrative as the firewood, charcoal and the petty trading activities due to the above mentioned factors.

Similarly, in Alipe, where the project first began, farmers admitted their contribution to the destruction of trees. These empirical findings do not necessarily disprove the loss of some economic trees through the jatropha project as reported by Action Aid-Ghana (Daily Graphic, 2009) and RAINS (2008). Nonetheless, relating tree loss during the jatropha project to livelihood destruction needs serious qualification because the local people attributed the loss of economic trees to so many factors. Indeed, despite the reduction in the shea nut trees, in both the three Yendi villages and Alipe, I observed that, women were still trading in the shea nut business. Thus, the central idea of the storyline line that, "land grabbing" by BioFuel Africa Ltd. causes food insecurity claimed by the adherents of the populist discourse in the debates about the jatropha project needs better qualification due to the above complexities.

6.1.2 De-narrativization of "development project leads to improved livelihoods" narrative

The proponents of the jatropha project adhering to the ideas of the managerial discourses claims that, development projects leads to improved livelihoods in the affected communities. The spin-off effects of projects revive local economies (BioFuel Africa Ltd., 2008, Rural Consult, 2009). The cast of actors introduced in this narrative is that, contrary to the claims of the populist discourses, local people of the affected communities become beneficiaries instead of 'victims', BioFuel Africa Ltd. emerges as 'heroes' whilst interest groups such as Acion Aid-Ghana, RAINS opposing the project become the 'villains'.

The study found that, an important consequence of the project was employment creation, both direct and indirect. As noted earlier, although majority of the workers were skilled professionals recruited from Tamale and other towns, about 60 % of the workers in the jatropha plantation were recruited mainly from the three villages and its environs earning

between GHC 77 and 150. As economically vulnerable villages depending only on seasonal agriculture, the wages provided an important income source. Income sources became diversified for the village residents directly through wage employment in the plantations and indirectly by boosting in petty trading. Women started petty trading activities such as food sales whilst those who secured employment in the plantation bought shea nuts in the villages and re-sold them at higher prices in Tamale and other towns and other also invested in livestock. The wages and other income sources during the project encouraged farming which is the main livelihood in the villages. First, farmers hired the services of the company's tractors for ploughing at a relatively cheaper cost compared to the period before. Second, part of the wages was used to buy groundnut and maize seeds. Third, wage earners were able to hire extra labour into their farms. Livelihood thus, improved.

However, as said earlier, the layoffs affected 300 out of the total 400 workers on the grounds of funding problems faced by BioFuel Africa Ltd. The layoffs reduced the gains from the project in the form of shrinking of petty trading activities and loss of wages for plantation workers. Most of the residents lamented over the sudden changes in the economic contribution to household welfare. *Did the project then lead to improved livelihoods and for how long?*

Although, during the layoffs, the residents did not become worse off than before because they went back to continue the previous livelihoods. However, the inability of the project to continue for quite a long time to create sustainable livelihoods for the affected villages raise questions about the sustainability of the so-called development project and its spin-off effects as claimed by the proponents of the managerial discourses. More so, BioFuel Africa Ltd. as rational entrepreneurs, they have profit-making motive and not merely concerned with improving livelihoods in the affected communities. It is therefore, difficult to see the company as "unselfish". Thus, the narrative that …'development project leads to improved livelihoods' needs better qualification on the grounds of sustainability of the jatropha project. The evidence presented above shows that, the messages and the narrative structures associated with the managerial and populist discourses underpinning the debates about the jatropha project needs better qualification as empirical evidence from the study reveals many complexities.

6.2 Constructing a 'better narrative'

As explained above, the study has identified the complexities surrounding the narratives about the jatropha project and food security. Roe further suggests that, we should construct a better narrative which represents a truer and more productive knowledge (Roe, 1991, 1999). However, Roe also cautions that, the better knowledge should not necessarily lead to the displacement of earlier narratives but provide an equally straightforward narrative that tells a better story (Roe, 1991:290). To Roe, this takes the form of reversing the old pattern of thinking (Roe, 1999). To this end, the narratives identified in both managerial and populist discourses on biofuels were not displaced but rather examined and improved. The study seeks to improve biofuel narratives by discussing the conditions under which biofuels influence food security. A comparison of the implications of the jatropha project in Northern Ghana with biofuel investments in USA, Brazil, China, India and Tanzania is done to improve the wide range of different context-specific cases of biofuel investments and food security.

6.2.1 Biological characteristics of the biofuel feedstock

The biological characteristics of the type of biofuel feedstock used for biofuel production affects on food security. The effects of biofuel feedstock on food security is two-fold, these are the effects on both food crop consumption and production.

On the side of consumption, food crops such as cereals (especially maize or corn), soybeans, millet, sugarcane, palm oil are important staple crops that have contributed immensely to the diets of people globally. Crop plants such as cereals (maize or corn and millet) are important global food sources due to their calorie contents in diets. However, most of these crops have been identified as potential feedstock for biofuel production. It is estimated that, to achieve biofuel targets in 2020 an additional cereal production of about 240 million tonnes are required (Fischer et al, 2009). Therefore, the conversion of crops especially cereals for the production of biofuel implies both current and long term perilous dietary consequences on poor people who usually depend on them. For instance, out of a total 72.5 million tonnes of grains (mainly maize and wheat) used for the production of ethanol in 2007, approximately 63 million tonnes were predominantly from USA (ibid.: 42). "After 2003, ethanol production has been expanding rapidly and consuming a growing share of the USA maize harvest" (ibid.:

90). The grave consequences of this liquid biofuel USA is that, it is depriving the poor people who depend on this cereal food crop as a result of soaring prices caused by the high demand for corn for ethanol (Barbara, 2007). The effect of soaring prices of corn is felt not only in USA but also other dependant nations. For instance in late 2006, the price of tortilla flour in Mexico doubled partly due to a rise in U.S. corn prices from $2.80 to $4.20 which is a sharp increase compared to the previous several months (ibid.:17). Because the poor spend a large part of their household income on food, soaring prices of food imply malnutrition and hunger (ibid.: 16).

However, biofuel from plants like sunflower and rapeseed which are not largely consumed by people have less noticeable effect of depriving people of food compared to feedstock such as corn, wheat and sugarcane. Rapeseed oil, for instance has been traditionally used for lightning and as a lubricant (Fischer et al, 2009: 103). Until the 1970s, rapeseed oil was not used for food consumption because of the high content of erucic acid which has high toxic doses (ibid.). Even currently, oil from the plant is not much used for food. In the case of jatropha feedstock, because of its poisonous nature, jatropha plant is inedible. The plant is not even browsed by livestock. Implicit in the biological differences is that, producing biodiesel from jatropha, sunflower and rapeseed feedstock do not deny people of food compared to the conversion of edible crops like maize and sugarcane or cassava for ethanol.

6.2.2 Agricultural productivity of the land areas used for biofuel

The type of land required for the production of the biofuel feedstock determines the extent of the effect of biofuel production on food production. Specific biofuel feedstocks have their own water and soil requirements which in turn define the specific land conditions required for proper growth. In other words, the growth requirement of the biofuel feedstock determines the agricultural productivity of the land that will be acquired for its production. For instance, the production of biofuel feedstock such as sugarcane or corn for ethanol requires fertile and irrigated land which is otherwise suitable for staple food crops. The cases of biofuel investments in Tanzania, India and China, Brazil illustrate this point.

In Tanzania, well-drained areas such as Rufiji District (in Rufiji river basin), Wami basin, Bagamoyo and Kilwa are acquired for sugarcane production. Sugarcane ethanol production in such areas implies threat to food crops because in Tanzania, wetland areas are useful for livestock and food crop production (Kangalawe and Liwenga, 2004). For instance, sugarcane production for ethanol is creating competition with food crops especially wetland crop plants like rice, millet which are important staple foods of the local people in the western portion of the lower Rufiji district (Hamisi, 2009). In addition, not only are wetland areas suitable for food crops but also other economic activities charcoal production and harvesting products such as traditional medicines, mushrooms, fuel wood and building materials (Sulle and Nelson, 2009). These economic activities which provide people with income to purchase food become threatened by biofuels investments.

Moreover, because of its demand for land areas with good water conditions, sugarcane production is suitable only on waterlogged areas. Therefore, in a dry environment like India, sugarcane production requires much irrigation which is also in direct competition with food production which cannot be done with irrigation (de Fraiture, 2007). In India, about 85% of the area under sugarcane production earmarked for ethanol production is irrigated (ibid.). Meanwhile, India depends largely on irrigation for most part of its food production. For instance, wheat and rice are produced on irrigated fields. In short, there is much competition between sugarcane for ethanol and foods crops due the type of land needed for sugarcane production.

Irrigation plays an important role in cereal production in China because of the high water shortages in the major food crop production regions (De Fraiture et al, 2007). Meanwhile, the country is pursuing the production of maize for ethanol. Given such an environment characterized by water shortage and unavailability of excess land, there is a great risk of further degrading water resources or causing major shifts in cropping pattern at the expense of other crops if there is any attempt for additional maize demand for biofuel (ibid.). “Under an aggressive biofuel program, China will have to import more maize (or the crop displaced by maize), which will undermine one of its primary objectives, that is, curbing import dependency” (ibid: 76). Similarly in USA, the use of corn for ethanol has caused double-edged effects of monopolising arable land which hitherto were used for food crops production

(Barbara, 2007). This has also affected the entire food chain as the price of beer is affected due to the conversion of land previously planted to barley is converted to corn for ethanol (ibid: 7). Similarly in Brazil, the production of sugarcane for ethanol in the 1970's and 1980's was marked by a shift in land use patterns from food crops to sugar cane production (Arnoldo et al, 2006). In the Sao Paulo region, additional 362,000 ha of sugar cane production between 1974 and 1979 led to the decline of land areas used for the production of food crops like maize and rice and eventual higher food prices (ibid). This is because, sugarcane production required equally good arable land like rice and maize and thus creating competition for land.

However, the case of jatropha biodiesel production shows remarkable differences. Jatropha plant is a drought-hardy perennial shrub, suitable to tropical and sub-tropical climate and thrives best in low rainfall regions and degraded land compared to other oil-producing seeds (Pandey et al in: Bhojvaid, 2006). During the jatropa project in Northern Ghana, marginal land areas less productive for crop production were still useful for jatropha cultivation. A large part of the land earmarked for the Jatropha production was once a farmland that had been abandoned by most farmers due to declining soil fertility.

The possibility to thrive under environments with as little as 10 inches of rain per year (Cocks, 2009: 139) makes jatropha cultivation suitable in drought prone Northern Ghana. This implies that, despite its long gestation period of about 50 years, biodiesel production from jatropha is less likely to monopolize arable land needed for the production of staple food crops like Millet, groundnut, yam, maize usually produced by farmers in Northern Ghana. More so, in Northern Tanzania, most farmers contracted by Diligent Energy systems to produce jatropha seeds plant jatropha as farm hedges, on contours, and degraded land (Sulle and Nelson, 2009: 27). Due to the plants' adaptability to the marginal soils, the jatropha cultivation does not compete with cash and food crops for fertile crop fields in the farms (ibid.).

6.2.3 Population density and availability of unused land

The availability of "unused land" is an important determinant of the impacts of biofuels on food security. When new investments encroach on land areas already used for food crop

production by densely populated community, the effects are different from sparsely populated areas endowed with large areas of unused land areas. In Tanzania, Brazil, USA, China and India, the land areas acquired for biofuel production was in active use for food crop production before the investments. Such a situation implies encroachment of farmland leading to competition with food crops for "arable land".

The Rufiji district of Tanzania has figured prominently in terms of land acquisition for biofuels. The district is endowed with fertile floodplains developed by major rivers from the Rufiji river basin. Because of the two fertile floodplains, the inner delta areas of the lower Rufiji river is densely populated with most of the peasant farmers (over 50,000 population) who grow rice, cassava, maize, peas, millets, sesame, coconut and cashew nuts (Hamisi, 2009). However, four village assemblies in the western portion of the lower Rufiji River have approved the lease out of their land to Swedish biofuel company, SEKAB for sugarcane production (Hamisi, 2009: 22). The residents of the four villages (Mloka, Nyaminywili, Kipugira and Kipo) are predominantly peasant farmers (ibid.). This case in point shows direct competition between biofuels and traditional food crops for fertile flood plains because there is pressure on the land cultivated by "densely populated" peasants.

In India, the government has initiated jatropha project in the Rajastan state where over 60% of the land has been categorized as desert and wasteland (Tompsett, 2010). The project aims to provide incomes for the rural people whilst promoting re-forestation (ibid.). However, despite that the land in the Rajastan state has been labeled waste, the area has a high population density of about 165 persons per square kilometer and the people depend on the land for agriculture and other livelihoods (ibid.). In such an environment, the land is categorized as wasteland but it is not a wasted land because it is inhabited by dense populated peasants (ibid.). This creates a direct competition between food crops and jatropha for land because of the scarcity of land.

However, the case of the jatropha project in Northern Ghana shows remarkable differences in terms of availability of "vast unused land areas". The Yendi municipal Assembly has a low population density of 26.6 persons per square kilometers. A similar low population density was observed in the three study villages, Kpachaa, Jimle and Jaashie. As said earlier, before

the jatropha project, only about 15% of the cleared land (1100 ha) was in use for food crop production and even during the establishment of the jatropha plantation, a large part of the acquired land (about 80%) still remains unused. In such an environment, investments that require large areas of land create little or no competition with already existing land use activity. Therefore, it is not surprising that, biofuel production in USA, Brazil, Tanzania China and India, bear different impacts on food crop production compared to the Jatropha project in Northern Ghana in terms of competition for arable land.

6.2.4 Social responsibility and production models of biofuel investors

The social responsibility and biofuel production model adopted by biofuel investors also influence the effects of biofuels on food security and livelihoods. The strategy of the investors determine how the biofuel investment will be compatible with previous livelihoods, food productions as well as the respect for the labour rights of the local people who will be employed. In other words, the food security implications of biofuels depend on the strategy adopted by the biofuel investors.

Tanzania for instance has experienced influx of biofuel investors such as SEKAB (Sweden), Sun Biofuel Tanzania Ltd., local branch of British company Sun Biofuels PLC, Diligent Energy Systems, a Dutch company, PROKON from German, D1 Oils Tanzania Ltd, a Tanzanian subsidiary of the UK Company D1 Oils. Three main biofuel production models are identified in Tanzania (Sulle and Nelson, 2009). These are the “large scale plantations”, whereby biofuel companies control all aspects of production and processing, the “contract farmers and independent suppliers” model, whereby biofuel companies enter into contracts with local farmers and the “hybrid models” which combine production from large plantations and small-scale farmers (ibid). These production models have different impacts on local livelihoods and food production.

Through its local affiliate, Sun Biofuels Tanzania Ltd, the Sun Biofuels has acquired 8,211 ha of land in Kisarawe District for biofuel production. Using the plantation models, rural people’s access to land have been compromised as village land areas are transferred into

general land for use by the biofuel company. This is depriving 10,000 village residents in 12 villages who are mainly peasants (Sulley and Nelson, 2009). There is also confusion over compensation payments as villagers do not know the criteria for the payment of the due compensation (ibid.).

On the other hand, Diligent Energy Systems is investing in jatropha by taking seeds solely from contracted local farmers and out growers. The company has contracted over 5000 farmers in Arusha, Babati, Handeni Singida Monduli in the Northern Tanzania for jatropha cultivation (ibid.). Majority of these farmers planted jatropha as farm hedges, on contours and degraded land and not on their main "crop fields". Thus, farmers engaged in this contracted small holder production model earned incomes without compromising food and cash crop production in their farms. Diligent is already producing and selling fuel without directly involving in the production of the jatropha feedstock (ibid.). This is a classic case of biofuel production where local farmers have the autonomy in the production of biofuel feedstock. More so, as said earlier, in the Monduli district of Tanzania, jatropha has become an alternative source of income for women in Mto wa Mbu village through seed collection, oil extraction and soap making as well as jatropha seedling production and sales to processing companies and NGOs (ibid).

Similarly, BioFuel Africa Ltd. adopted a flexible corporate social responsibility. To carve a good name for its investment project, adopted a participatory approach with the affected communities to ensure a win-win consequences of the jatropha project. Out of the 25 affected farmers, 20 were relocated to new farmland areas whilst 5 continued farming in the jatropha plantation. More so, 19 out of the 25 affected farmers were also employed in the plantation as fieldworkers. Maize production (total size of about 26 ha) was undertaken by the company for both the affected communities and the workers in the plantations. Rice cultivation was also promoted in the waterlogged areas. Local people and some female workers in the plantations were also encouraged to farm in the jatropha rows as well as on the edges of the plantations. These initiatives of BioFuel Africa Ltd. are in accordance with their "food first policy" which is a sign of a good social responsibility. The land use change caused by the jatropha project was thus, compatible with the economic land use pattern in the three villages because of the humane social responsibility of BioFuel Africa Ltd. In addition, BioFuel Africa Ltd. provided

hammer mill to grind food crops like dried maize, dried cassava, and other local foods. The mill has helped to ease food processing by community members, two people are employed working on the mill earning between GHC 80 and 120. In other words, the socially responsible policy of BioFuel Africa Ltd. created spin-off effects on food production, food purchases as well as food processing in the three villages without compromising local livelihoods.

6.2.5 Contribution to livelihood diversification

The importance of livelihood diversification to achieving food security has been noted by many researchers (Swift and Hamilton: in Devereux and Maxwell, 2001) and Maxwell and Smith (1992). Livelihood diversification involves a spread of economic activities away from reliance on the primary enterprise whether livestock or cropping activities, typically seeking a wider range of on-and off-farm sources of income (Swift and Hamilton, in: Devereux and Maxwell, 2001: 86).

As explained earlier, in the three Yendi villages, livelihoods such as farming as well as firewood, charcoal and shea nut business fetch meager incomes. Meanwhile food purchases are needed to supplement farm produce to meet household food needs. Income sources are thus, needed in the villages to meet household food demand. During the project, there were new livelihood opportunities for the residence either through direct employment in the plantation or the boost in petty trading activities. More so, majority had the opportunity either to start farming or expand their farms during the project. The diversified livelihoods that accompanied the project created diversified income sources as well. Because the residents of Kpachaa, Jimle and Jaashie spend a large part of their incomes on food purchases, the diversified income sources improved household food security. Similarly, the contracted farmer's scheme in the jatropha investment by Diligent Biofuel Company in Northern Tanzania has been noted as an important income source for many women in Mondili district (Sulle and Nelson, 2009). The extent of contribution of biofuel investments to livelihood diversification is thus, an important indicator of its effects on food security.

The study has thus, contributed to the literature on biofuels and food security and has sought to improve biofuel narratives by showing the understanding of how different the consequences of biofuels on food security can be given certain conditions. I therefore, support Roe at this stage to insist that, "there is no story to tell until the facts are in" (Roe 1999: 10).

6.4 Why crisis scenarios in biofuel reports? *Interest and social construction of data*

The study found that, there is much interest in the reports about the implications of biofuels. There is the perception that, NGOs investigate potential problems and prospects of investment projects at the grass root level by identifying themselves with the poor. Because of this perception, NGOs are believed to adequately represent the plights of the poor and therefore, their published reports are widely circulated and well received with much trust of reliability of information especially when creating crisis scenarios in poor continents like Africa.

Action Aid-Ghana is a local representative of Action Aid International concerned with the plights of the poor and the marginalized. The NGO identify new projects that could affect the livelihoods of the poor and then bring to the spotlight their implications. When implications are perceived to be doomed by such an NGO, they solicit for funds from donors to arrest the situation. In the quest for funding, narratives are used as tool for lobbying by appealing to the emotions of donors, urging the need to act to restore a certain situation or avoid an impending agony. A thought-provoking question is; *will there be a basis to solicit for funding when there is no crisis*?

The study found that, regular visits were not paid to the affected communities to discern the consequences of the project. Rather, the NGO visits the plantation and takes snaps shots of farmland claimed to be encroached by the project to explain its daunting implications on local livelihoods. During interviews with Food Span and Food Rights Units under the Action Aid-Ghana, I could decipher myself that, the workers were bent on magnifying potential problems of the jatropha project whilst either concealing the benefits or even not informing themselves about the events in the plantation and the affected communities. Beside Action Aid-Ghana, there were other reports by some environmental activist groups who claimed dire consequences of the project because of material interests. There were even instances when some individuals campaigned against the jatropha project after some demands presented before BioFuel Africa Ltd. were turned down.

Beside the interest in crisis reports by interest groups, the experiences of devastating effects of biofuels and other capitalist investments on local livelihoods and food security elsewhere, out of fear, interest groups are compelled to oppose the jatropha project by creating crisis scenarios in order to ward off similar devastating effects in the affected villages. However, during the period of the study, in spite of the numerous reports circulating in the Ghanaian media about the destructive effects of the plantations on livelihoods, majority of the residents in the three villages mentioned positive the spin-off effects of the project on food crop production and purchasing power. Therefore, because of the fact that interest determines what is investigated, what is published and what is suppressed (Herring 2008), the information presented in reports about the implications of biofuels on food security should be treated with prudence.

7 CONCLUSION AND RECOMMENDATIONS

This chapter seeks to provide answers to the research questions for the study to achieve the main aim of the study. Recommendations will be teased out of the conclusions of the study to guide future research on biofuels and also inform biofuel policies.

7.1 Answering research questions of the study

To achieve the main objective of the study, the study sought to provide answers to the following research questions. This section thus, discusses the research questions in relation to the empirical findings of the study.

7.1.1 How did Biofuel Africa Ltd access the land for the jatropha Project?

As already noted, chiefs in Northern Ghana play an important role in land acquisition process. More so, because permission must be sought from chiefs before farming, farmers are always in regular contact with the chief of the particular community. The BioFuel Africa Ltd. consulted Tijo-Naa, the paramount (overlord) chief of the project area in Yendi district about the quest for land for the jatropha project. Tijo-Naa in turn summoned his subordinate chiefs who are custodians of his land at the village level. These sub-chiefs at the village levels answers to Tijo-Naa on matters within their areas of jurisdiction including land tenure issues. Local people were consulted by the village chiefs and the community leaders about the upcoming project by BioFuel Africa Ltd. on their land. The criterion for compensation payment was decided between the chiefs, the affected farmers and BioFuel Africa Ltd. Farmland within the land area earmarked for the project were located and registered with GPS instrument. This task was undertaken by the community leaders, some affected farmers and the management of BioFuel Africa Ltd. After the registration of the farms, compensation was paid to the affected farmers.

Formal permission was sought from Environmental Protection Agency (EPA), Ghana. Environmental Impact Assessment (EIA) was undertaken and the land use authorization permit was granted afterwards to the company in 2008. EPA-Ghana constantly monitors and evaluates the operations of the project in line with its set standards of environmental and livelihood sustainability in the affected communities. Moreover, the central consultative committee (CCC) also ensures that, environmental sustainability and livelihoods in the surrounding villages are protected in the course of the project. In short, the EPA and the local chiefs of the affected communities were involved in the land acquisition process for the jatropha project in the new project site in Yendi district unlike the situation that transpired in Alipe where the company initially had the authorization from only the chiefs. Involvement of these authorities helped to streamline the land use issues in the affected communities in line with the previous economic undertakings of the local people as well as the preservation of trees.

7.1.2 Does the jatropha plantation compete with food crops for land?

Land areas belonging to the local people of the three villages were taken by BioFuel Africa Ltd. for the establishment of the jatropha plantations. However, the organization of the jatropha plantation was compatible with the local conditions in the three villages to the extent that, farmland areas under crop production relatively increased during the project compared to the period before. Because of the jatropha plants' suitability to marginal land, the jatropha plantation was established on a land abandoned by most farmers. Moreover, as said earlier, some portions of the jatropha plantation such as the jatropha rows as well as the edges on the plantation were used for maize production during the project. In addition, part of the cleared land (1100ha) was used for 16 ha of maize farms for the communities as well as 25 acres of maize farm for workers of the company. In addition, because of the low population density of the study villages, even during the establishment of the jatropha plantation, a large part of the cleared land still remains "unused".

Moreover, majority of farmers cultivate different crops on different farmland areas. For instance, farmers cultivating crops like maize and rice usually had separate farmland areas for the production of the crops because of different water requirements of the crops. The study found that, some affected farmers had a farm in the area planted with jatropha and other

farmland elsewhere. Thus, even in the case of the affected farmers, the project did not cause loss of farms or farmland simultaneously. Therefore, although there were changes in land use pattern and land tenure system in the affected villages during the jatropha project, however, there was no significant competition between the jatropha plantation and the food crops for arable land.

7.1.3 In what ways have the changes in purchasing power influenced household food security?

Both men and women in the active working age had improved purchasing power during the project either directly through wage-earning workers employed in the plantation or indirectly through the petty trading activities that sprang up. Women had more diversified income sources during the project and thus, charged with the household task of food preparation, a large part of their income was used for food purchases. Men employed in the plantations also had a new income source from monthly wages for food purchases in addition to farm produce. The food purchases include the purchase of maize, rice, fish as well as ingredients such as pepper, salt, and onion. The importance of food purchases to household food security in the study villages is two-fold. First, with large household sizes dependant on farming limited to only the dry season, food purchases are inevitable in all households in the three villages. This explains acute hunger faced by households during dry seasons. Second, food purchases contributed to dietary diversity instead of the over-reliance on farm produce which are usually traditional staple foods like maize, yam, rice, and groundnut and dietary diversity contributes to improved nutrition (Johns and Sthapit, 2004).

Food sharing is an important moral value characteristic of all the households. As result, despite that the older generation (above 50years) and younger generation (below 20 years) did not benefit directly from the project, the existence of the moral of food sharing in the household facilitates spin-off economic effects from the beneficiaries to other members. The spin-off effects in the form of increased food purchases and farm produce during the project reduced vulnerabilities in household food provisioning and improved food security to the benefit of the entire household. The study further found that, smaller households with

majority of women employed in the plantations had improved food security better than households on the contrary. In effect, the effects of changes in purchasing had effects on food security on household level rather than at the individual level.

7.1.4 Are the ideas of the competing discourses surrounding the jatropha project consistent with the empirical evidence on the effects of the project on food security?

There is incontrovertible logic in the reports adhering to the ideas of the mainstream discourses about the implications of the jatropha project on food security. However, empirical evidence in the three Yendi villages reveals complexities surrounding the narrative structures and the messages associated with the managerial and populist discourses that underpin the debates.

In the populist discourses, the local people described as 'victims' of food insecurity during the project were not necessarily victims because the project improved food security in most households in the affected communities. Action Aid-Ghana, RAINS and other local environmental activists presented as "heroes" rather partly contributed to the loss of funding through negative publications against the jatropha project and the consequent layoffs of workers. More so, BioFuel Africa Ltd. described as "villains" rather committed itself to community development, and improved both livelihoods and household food security until the layoffs reduced most of these gains.

Similarly, within the managerial discourses, the opponents of the jatropha project were identified "villains", the local people become "beneficiaries" instead of "victims" whereas BioFuel Africa Ltd. emerges as "heroes". During the project, there were marked improvements in livelihoods, household food security as well as community development. However, to present BioFuel Africa Ltd. as "heroes" raises many questions on the grounds of sustainability of the jatropha project. The gains of the project were only temporal because about 80% of the workers were laid off only within two years of the jatropha project. The lay-offs reduced the gains of the project. Therefore, the local people described as "beneficiaries", only enjoyed the benefits temporally, although they did not become "victims" as well. The NGOs, environmental activists and other opponents of the project presented as "villains" were

not necessarily villains because their negative publications about the project partly challenged BioFuel Africa Ltd. to further enhance their "food first policy" and other environmentally friendly practices in order to ward off further criticisms of the project. Moreover, as rational investors or entrepreneurs, BioFuel Africa Ltd., have profit-making motive and not merely concerned with boosting livelihoods and food security in the project areas as claimed by the proponents of the managerial discourses. In short, BioFuel Africa Ltd. is neither a "hero" as described by the adherents of the managerial discourses nor a "villain" as described by the adherents of the populist discourse.

Nonetheless, due to the company's commitment to improved social infrastructure, livelihoods as well as food security in the three affected villages, the ideas of the managerial discourses could be said to be consistent with the empirical evidence to a large extent than the populist discourses.

7.2 Concluding remarks

The findings from the affected communities reveal that, the jatropha project reduced vulnerabilities in household food security in all the three Yendi villages whose livelihoods depended on the land areas earmarked for the jatropha project. This major finding from the three study villages in addition to evidence from the experiences of global biofuels (see chapter six) bring the study to a conclusion that, analyses of the effects of biofuels on food security should be situated within specific contexts. That is, the context that takes into consideration local variations in land use patterns, land availability, farming seasons, household composition, and the resilience of livelihoods in biofuel producing areas, the strategy of biofuel investors as well as the biological characteristics of the biofuel feedstock. This is because, the above mentioned factors determine the amount of resources diverted from food production to biofuel production which is in turn decisive of the extent of competition between biofuels and food.

7.3 Recommendations

Based on the empirical evidence from the jatropha project in Northern Ghana, the study makes the following recommendations.

First, because the study's main findings reveal that, the strategy of biofuel investors, local conditions in biofuel producing areas and the type of biofuel feedstock are the decisive factors of the food security implications of biofuels, I recommend comparative studies about the food security implications of biofuel investments in the different ecological zones of Ghana. Currently, there are many biofuel investments throughout Ghana by different biofuel companies in different ecological zones. One such investor is Scan Fuel AS, another Norwegian company that has acquired 400,000 hectares of land for jatropha project in Asante Akim North Municipality of the Ashanti Region to plant Jatropha for the production of biodiesel for export. The municipality has population density of 109 per sq. km. (Ghana population census report, 2000). More so, the municipality lies in the semi-equatorial climatic zone characterized by double maxima rainfall, with the first rainy season occurring from May to July and the second rainy season between September and November. The climates thus supports two farming seasons in a year. Therefore, biofuel investment in such an ecological zone with different farming seasons, population density under different land tenure regime by a different biofuel investor, could guide policies on the implications of biofuels in Ghana when compared with biofuel investment with completely different background like jatropha project by BioFuel Africa Ltd in Northern Ghana. Such comparative studies will determine the specific ecological zones that have the potential for particular biofuel and appropriate policy responses towards biofuels.

Second, I recommend effective monitoring and evaluative measures by environmental protection agencies and policy makers instead of relying on reports by NGOs and some interest groups because of material interests in the information presented in their reports.

Third, I also recommend future research on the cost-effectiveness of biofuels (either ethanol or biodiesel) to assess the opportunity costs involved in biofuels and fossil fuels. For instance, in Ghana, cars such as Nissan Urvan, Taxis and most privately owned cars, articulated tracks and other heavy vehicles use petroleum-based diesel. These cars which form a large majority of vehicles in Ghana incur high fuel expenditure as the price of one litre of diesel (GHC 1.18) as at march, 2009 has surpassed a litre price of petrol (GHC 1.07). However, as said earlier, diesel from plants could be blended with conventional petroleum-based diesel for use by diesel and flexible fuel vehicles. This implies that, when plant-derived biodiesel is produced at a cheaper cost, both biodiesel in blends or in neat form (B100) would be cheaper than the conventional petroleum-based diesel (fossil fuels) to reduce current fuel costs.

Finally, biofuel investors must assess the sustainability of funding sources before undertaking projects. Funding problems faced by BioFuel Africa Ltd. and the consequent lay-off of the entire workers within a brief period of less than 2years after the establishment of the plantation reduced the gains of the jatropha project in household welfare. Such situations make it difficult to give a better assessment of the effects of the project on household food security. The reliability of funding sources for Biofuel companies must be guaranteed so that, their anticipated targets could be reached to give enough room for a better assessment of the food security implications.

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APPENDICES

Appendix 1: Interview Guide

(**Unstructured interviews, for residents of the study areas**)

- Household Head and relationship with household members
- Detailed information about the gender, age, number and livelihoods of household members
- Detailed information about the livelihoods of household members during the project
- Agricultural Land use pattern before and during the project
- Land tenure system in the study communities
- Changes in crops yields before and during the start of the project
- Livelihoods of men and women
- Other livelihoods apart from farming
- Livelihood in both the rainy and dry seasons
- Consultation of local people before leasing the land to the company
- Wages offered to workers and changes in purchasing power
- Compensation to affected farmers and the community in general by the company
- Role played by the chiefs in the release of the lands to the company
- Major victims of the project and their status or background
- Major beneficiaries of the project and their status or background
- Living conditions before and during the project
- The importance of Economic trees to local people.

Chiefs of the affected communities

(Structured interview guide)

1. How did BioFuel Africa Ltd. seek approval from you before accessing the lands for the jatropha project?
2. Were the affected farmers consulted before the lease of the land to BioFuel Africa Ltd?
3. How did you know the affected farmers and their number?
4. What are the terms of the contract with the company?
5. How far have the Company attended to the terms of the contract?
6. In what ways has the company addressed the needs of this community?

Manager of the Plantation, BioFuel Africa Ltd.

(Structured interview guide)

1. Which authorities were involved in the negotiation process before accessing the land? I mean formal authorities and informal authorities

2. Why did you choose Northern Ghana for the jatropha project?

3. Which communities own the lands earmarked for the project?

4. How many years will the project take and what are your future plans on the project in Ghana in general?

5. Was the land under cultivation or idle?

6 How did you identify farmers whose lands are taken up by the project? Are they men or women?

7. How many affected farmers are employed in the plantations?

8. Do you give compensation to farmers whose lands are taken up by the project?

If any, what kind of compensation?

9. Which mitigation measures have you implemented or intend to implement to enhance food production

10. How many workers have you employed?

11. What is the monthly wages and what are the criteria used to determine wages of workers

12. Can you say something about the trees occupying the land before the establishment of the plantation?

13. What are the challenges so far since the implementation of the project?

14. The terms of the contract between the company and the affected communities

Environmental Protection Agency-Ghana (EPA)

(Structured interview guide)

1. How did you know something about the jatropha project in Northern Ghana?

2. What is the total land size (either in hectares or acres) of the land acquired by BioFuel Africa Ltd?

3. Under what conditions do you approve new projects that require such large areas of land?

4. Did you consult any other authority on the access and use of the land in the cultivation areas before approval of the project?

5. How do you intend to monitor the stages involved in the operation of the project such that, its impacts especially on food security will be a positive one?

6. What are your expectations from the project in terms of its effect on food security and Livelihoods in the cultivation area?

Action Aid-Ghana

(Structured interview guide)

1. How did you know about the jatropha project?

2. Do you know something about the size of the land acquired BioFuel Africa Ltd.?

3. How often do you visit the plantation site and the affected communities?

4. What are the likely problems and development potentials of the jatropha project?

Appendix 2: Questionnaire for respondents

This questionnaire is aimed at examining the effects of the jatropha project in Northern Ghana on the food security of households, whose livelihoods depend on the land earmarked for the project. The confidentiality of data is assured.

Questionnaire to farmers

Personal data of respondents

1. Place of residence …….

2. Age.....

3. Gender… a) Male b) Female

4. Marital status …….

If married,

5. Number of wives…….....

6. Number of children ……

7. What is your level of education? …….

Livelihoods before the project

8. Occupation in the rainy season…….

If farming,

Which crops do you cultivate?.....

What is the size of your farm?.....

9. Occupation in the dry season……

If farming, which crops do you cultivate?

10. Occupation of spouse……..

11. Major economic contribution from spouse? a) Cash b) food c) other (specify)……

Livelihoods during the project

12. Are you employed in the plantations?

If yes,

13. Role in the plantations…….

14. How long have you worked in the plantations……

15. How much are you paid?.....

16. Mention 3 main items you spend most of your wages on? ……

a)Food b) House rent c) electricity bills d) water e) other (specify)……...

If food,

17. Mention the type of food and food items……

18. Are you allowed to cultivate crops in the Jatropha plantations?

a) Yes b) No c) other (specify)……

19. Which crops do you cultivate in the jatropha plantations ……..

20. Farm size during the project……

21. Were there trees on the land cleared for the Jatropha Plantations?.....

a) Yes b) No

If yes,

22. Name them …….

23. How do the local people benefit from such trees?.....

24. Has the company replanted the trees destroyed?.....

a) Yes b) No c) other (specify)……..

Land tenure issues and land resources

25. How did you access your farmland? ……..

a). Family land b). Community land c). Leasehold d). Other (specify)…….

If communal,

26. Which authorities are the custodians or trustees of the land you cultivate?

a) Chiefs b) tribal leaders c) lineage heads) …….

27. Was your farm encroached by the project?.....

If yes,

28. Did you receive compensation before your land was taken up by the project?.....

a) Yes b) No

If yes,

30. What kind of compensation?.....

Household characteristics

31. Total number of household members……..

32. Relation to household member(s). a) Siblings b) Parents c) Nieces and nephews d) Friends

33. Dependants……. a) Siblings b) Parents c) Nieces and nephews d) Friends……..

34. Number of dependants ……...

35. Type of dependency. a) Food b) Clothings c) d) School fees d) e) Payment of utilities……

36. Number of household member(s) employed in the plantations……..

Workers in the plantations

Personal data of respondents

1. Place of residence …….

2. Age.....

3. Gender… a) Male b) Female……

4. Marital status …….

If married,

5. Number of wives…….....

6. Number of children ……..

7. What is your level of education? …….

Livelihoods before the project

8. Occupation in the rainy season…….

If farming,

9. Which crops do you cultivate?.....

11. What is your farm size?.....

12. Occupation in the dry season……..

13. Occupation of spouse…….

14. Major economic contribution from spouse? a) Cash b) food c) other (specify)……

Livelihoods during the project

15. Have you farmed on this land before?.....

a) Yes b) No

If yes,

What was the size of your farm?

Which crops were you cultivating?

Were you compensated?

If no,

Were there farmlands (farmers) on the acquired for the plantations?

11. Do you know crops cultivated before the project?……

Were they compensated?

Which kind of compensation was given to them?

12. Are farmers allowed to cultivate crops in the Jatropha plantations?

a) Yes b) No c) other (specify)……..

If yes,

13. Which crops are intercropped in the plantations?

14. Do you currently have a farm in the plantations?

a) Yes b) No c) other (specify)…….

If yes,

15. Which crop do you cultivate?.....

16. Were there trees on the land acquired for jatropha Plantations?.....

a) Yes b) No c) other (specify)

If yes,

17. Name them …….

18. How do people benefit from such trees?.....

19. Were the trees destroyed during the land preparation process of the project?.....

If yes,

20. Is the company re-planting trees to replace them?.....

Land tenure issues

21. What is the land tenure system in this community?.....

22. Which authorities are the custodians or trustees of the land you cultivate?.....

a) Chiefs b) tribal leaders c) lineage heads d) household heads e) other (specify)……...

Employment conditions

23. What is your task in the plantations?.....

24. How much are you paid per month?.....

25. How long have worked with the company?.....

26. Mention 3 main items you spend your monthly wages on?.....

a)Food b) House rent c) electricity bills d) water e) other (specify)……...

27. Which food items do you spend most of your wages on?.....

28. Do you enjoy any other benefit for working with BioFuel Africa Ltd?.....

Household characteristics

29. Total number of household members……

30. Relation to household member(s). a) Siblings b) Parents c) Nieces and nephews d) Friends

31. Dependants……. a) Siblings b) Parents c) Nieces and nephews d) Friends

32. Number of dependants ……..

33. Type of dependency. a) Food b) Clothing c) d) School fees d) e) Payment of utilities……..

34. Number of other household member(s) employed in the plantations…….....

Appendix 3: Household Questionnaire Survey

(50 Households in the three study villages)

Household composition

1. What is the total of number of household members?.....

2. What is the total number of women in the household?.....

3. What is the total number of men in the household?.....

4. What is the total number of children in the household?.....

5. What is the gender of the household head?.....

Livelihoods before the project

6. What is the main livelihood of men in the household in the dry season?.....

7. What is the main livelihood of women in the household in rainy season?.....

8. What are the alternative livelihoods of men in the during the dry season? …….

9. What are the alternative livelihoods of women in the during the dry season?.....

10. What are the major sources of food for the household?.....

11. Mention the common food purchases for the household……...

Livelihoods during the project

12. How many members lost their farmland during the project?.....

13. How many household members were employed during the project?.....

14. What is the gender of the members who were employed? …….

15. What is the major contribution of household members who were employed?.....

a) Food b) Clothing c) Household upkeep

16. What are the major sources of food for the household?.....

17. Mention the common food purchases for the household……...

18. Did the lay-off exercise affect any household member?.....

If yes,

19. How many household members were affected by the lay-offs?.....

20. What is the gender of the members who were affected by the lay off?.....

21. Beside direct employment in the plantation, which other livelihoods employed household members?.....