ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

INSTTUTE OF REGIONAL AND LOCAL DEVELOPMENT STUDIES

THE IMPACT OF AGRO-FUEL INVESTMENT ON LIVELIHOODS OF THE LOCAL COMMUNITY: THE CASE OF MIDHEGA TOLLA WOREDA, EASTERN HARARGHE ZONE, ETHIOPIA

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A THESIS SUBMITTED TO THE INSTITUTE OF REGIONAL AND LOCAL DEVELOPMENT STUDIES, ADDIS ABABA UNIVERSITY, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF ARTS IN REGIONAL AND LOCAL DEVELOPMENT STUDIES.

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ACRONYMS AND ABBREVATIONS

ANPPA	African Non-Petroleum Producers Associations
CBPP	Contagious Bovine Pleura Pneumonia black leg
CCPP	contagious cisprinephro phenorid
EARO	Ethiopian Agricultural Research Organization
ECA	Economic Commission for Africa
EHOARD	Eastern Hararghe Office of Agriculture and Rural Development
EIAR	Ethiopian Institute of Agricultural Research
EPA	Environmental Protection Authority
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
FEP	Flora Eco-Power
FMD	Foot and mouth disease
GHG	Green House Gas
GTZ	German Technical Co-operation
HHH	Household Head
IEA	International Energy Agency
IFPRI	International Food, Policy, and Research Institute
ILRI	International Livestock Research Institute
IUCN	International Union For Conservation of Nature and Natural Resource
LSD	Anthrax, Lumpiness disease (LSD)
Masl	Meter above sea level
MTOE	Million tons of oil equivalents
MTWAO	Middle Tolla Woreda Administration Office
NEB	Net Energy Balance
OECD	Organization for Economic Co-operation and Development
PIPs	Policies, Institutions and Processes
TLU	Tropical Livestock Unit
WOARD	Woreda Office of Agriculture and Rural Development

ABSTRACT

Agro-fuels investment in Ethiopia is a recent phenomenon initiated not only as a response for the current increasing energy demand, but also to decrease the expense for petroleum import and as a potential of job creation for the local economies thereby as a means to income generations particularly where labour intensive feedstock can be utilized. Hence, the country designed a strategy for developing alternative energy source and allowed inventors to produce agro-fuel from which Flora Eco-Power is one. The study was conducted to assess the impact of the agro-fuel investment of the Flora Eco-Power project on the livelihoods of the local community in Midhega Tolla woreda. Data were collected from 200 randomly selected farmers through structured interview questionnaire. Focus group discussions and key informants interviews were also used as techniques of data collection. Descriptive statistics such as mean, percentages, and t-tests were used to analyze the data. The study identified that the Flora Eco-Power project has negatively affected the crop and livestock production in the study area due to the fact that castor bean production competed the farm and grazing lands. As far as employment is concerned it has created job opportunities to the local people which slightly helped them to cope up the recurrent drought which is common in the study area. The study also indicated that the project did not bring a positive impact on basic social services of the study community which projects are expected to do so. The overall positive impact of the Flora Eco-power castor bean production project is minimal and farmers in the study area are facing economic loss due to the low price of the castor bean fixed by the Company. The results suggest that policy aimed to accelerate agro-fuel development in the study area could be successful and to ripe the benefits from the agro-fuel investments, if the key stakeholders in general and the local community in particular participate actively in all aspects.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Energy is an essential prerequisite for the development of any country. It is also one of the critical areas where technology, economics, and politics intersect (Legesse and Meskir, 2008). It is essential to achieve overall economic, social, and even political development of any society. In this regard, the International Atomic Energy (IAE) argues that socio-economic development requires energy for improved living standards, enhanced productivity, the transportation of goods to markets, and as input to a wide range of other economic activities (Gebremedhin, 2008). However, the unavailability and high cost of modern energy supplies in many developing countries impede production, growth and development, and debilitate their efforts to meet the basic needs of their peoples.

The International Energy Agency (IEA) did an analysis and projection of oil consumption measured in million tons of oil equivalent (Mtoe) from 1971 to 2030. In 1971, transport consumption of oil to total oil was roughly 50%, whereas by 2030 transport will account for around two thirds of oil consumption. More concerning, total oil consumption is predicted to increase to 5,000 Mtoe, more than doubling the total consumption of the 1971 (Fulton, 2005). A significant portion of this increase in consumption is driven by the developing economies and is therefore very difficult to reduce due to their rapid economic growth.

Both in terms of reduction of carbon-dioxide emission from this increasing consumption as well as reducing the dependency on oil, the demand for viable bio-fuels will increase in the years to come. The demand is thus clearly there for a substitute to oil and would be even more pronounced if this substitute could be "greener". It is from this stand point that agro-fuels development and expansion

have become a recent phenomenon worldwide. While the environmental benefits of agro-fuels are specifically important for the European Union, Americans view this as a way to help them achieve energy independence. When it comes to the rapidly industrializing nations such as India, Brazil, China and other developing countries, they see bio-fuels as a source of jobs and wealth particularly where labour intensive feedstock can be utilized.

Although Africa is lagging behind the world on agro-fuels development and expansion, there was no any other way out to the continent rather than to accept and adopt the agro-fuels development strategies and programs. In line with this, in June 2006, more than thirteen African poorest countries joined forces to become global suppliers of agro-fuels. In a meeting in Senegal, they formed the African Non-Petroleum Producers Associations (ANPPA) or Green OPEC, aimed at developing alternative energy sources (http:// www.english, algazeera.net).

Agro-fuels investment in Ethiopia is also a recent phenomenon initiated not only as a response for the current increasing energy demand, but also to decrease the crippling expense for petroleum import and as a potential of job creation for the local economies thereby as a means to income generations particularly where labour intensive feedstock can be utilized. Ethiopia imports its entire petroleum requirements and the demand for petroleum fuel is rising rapidly due to a growing economy and expanding infrastructure. For instance, over the last decade alone, the country's oil demand has grown at an annual average rate of 5%, and the volume of imported petroleum reached 1.37 million tons in 2004/05 (Legesse and Meskir, 2008). Hence, the country designed a strategy for developing alternative energy source including the promotion of agro-fuel feed stock production, processing, and use and export (MoME, 2007).

Agro-fuels can be produced from non-food crops such as Jatropha, castor bean and palm oils. Previous studies indicated that despite the various benefits of agro-fuel productions, there are also shortcomings in that it shares land that could have been utilized for food crops. To this effect, this study was designed to identify the impact of agro-fuel investment on the livelihoods of rural communities. Thus, the study raveled that castor bean production has both negative and positive impacts on the livelihoods of the rural community in the study area.

1.2 Statement of the Problem

The sustainable growth of the Ethiopia's economy depends on availability and security of energy, of which agro-fuel is an important part. In Ethiopia, agro-fuel investment in general and bio-diesel investment in particular started in 2006/07 (ARARI, 2007). Since then, the country allocated about 24 million hectares of land for the agro-fuel investment. The rationale behind the agro-fuel investment in Ethiopia include: expansion of agribusiness and agro-industries; efforts to improve social wellbeing and poverty reduction through access to energy services in rural areas; assurance of energy security; creation of job opportunities; conservation of soil (from the cultivation of agro-fuel feedstock crops on degraded lands),water and forests; and reduction of air pollution.

The most notable policies of the country which encourage the development of agro-fuel development are the energy and environment policies. These policies emphasize the importance of agro-fuel investments both for energy security and for friendly environment. However, assessing its impact on the environment in general and on the community where the investment took place in particular is indispensable.

Some studies (Legesse and Meskir, 2008; Gebremedhin and Yasin, 2008; and Yimed and Negusu, 2008) were conducted on socio-economic aspect of agro-fuel investment. The results of these studies revealed that the socio-economic benefits of land outweighs if food crops have been grown rather than the expected advantages from agro-fuel crop production (i.e., castor bean, Jatropha, palm oil, etc).

Shimeles and Techane (2008), Mahlet (2008), and Tena and Getachew (2008) also carried out research on socio-economic and ecological aspects of agro-fuel investment and indicated that the social, economic and ecological costs are neglected at the expense of short term benefits of the project. Furthermore, they concluded that the projects on their respective research areas have brought disastrous effects in all aspects.

However, other similar studies (Eyob and Temesgen, 2008 for Bati area; Lisanework et al., 2008 for Midhega Tolla) concluded that agro-fuel investment has brought socio-economic advantages to the communities with in and around the project areas. In addition the Ministry of Mines and Energy (MoME, 2007) emphasized agro-fuel investment and production, under adequate socially responsible frameworks, a sustainable process of local or rural economic growth and development would gradually result in broad poverty alleviation impacts.

The above studies indicated the existence of debate among scholars on the impact of agro-fuel investments. Besides, the above studies are location specific and their focuses were on either socio-economic or environmental impacts of ago-fuel investments. This facts call for detail investigations to identify the impacts of agro-fuel investments on the livelihoods of the local communities of Midhega Tolla woreda where the Flora Eco-Power Company is engaged in castor bean production.

1.3 Objectives of the Study

General Objective

The overall objective of the study is to investigate the impact of the Flora Eco-Power agro-fuel investment project on the livelihood of the local communities of Midhega Tolla woreda where the project is situated.

Specific Objectives

The specific objectives of the study include:

1. To identify the impact of the project on the community's access and ownership of assets
2. To determine whether the project has an influence on livelihood strategies of the community
3. To identify the drought resistance capabilities of the local people after the introduction of the project
4. To see the impact of agro-fuel policy implementation on the area allocated to food crop production
5. To investigate the impact of the project on income of the people involved in the project

1.4 Research Questions

To make the research more rigorous and address the objectives, the following specific questions are raised.

1. What is the impact of the project on accessing assets?
2. Are the livelihood strategies diversified after the project?
3. Does the project have an impact on income of the community?
4. What is the drought resistance power of the local community after the introduction of castor bean production?
5. Did the project's activity (castor bean production) bring a significant influence on farm land?

6. What is the contribution of the project for basic infrastructure development and provision of basic social services in the study area?

1.5 Significance of the Study

The outcome of this study provides a multitude of information for major stakeholders in the process of energy development. For government as a maker of enabling environment, provides valuable information for designing future strategies for bio-fuel investment projects and to adopt appropriate policies at large. It also provides useful information for executing organs as implementers of energy development programs in solving their implementation problems, if any. In addition, investors who want to engage in agro-fuel investment could get better information for their investment decisions. It may also be used as a source of information for future studies in the area and may also add some to the existing knowledge in the area of agro-fuel.

1.6 Scope and Limitation of the Study

Agro-fuel can be produced from different oil crops. But this study focuses on agro-fuels that are produced from castor bean by the Flora Eco-Power Company in Midehga Tolla woreda. Agro-fuel investments may have various impacts on any community such as impact on environment, ecology, and socio-economic impacts. The study on hand, however, focuses on the assessment of the impact of Flora Eco-Power agro-fuel investment on the livelihoods of the local community.

Flora Eco-Power Company started operation since the year 2006/07. This shows that the project is new and operated only three years. Therefore, the time gap to be assessed by this study limited to deeply assess its impacts and consequences on the local communities. Finally, it is important to note that because of the fact that the agro-fuel investments in the country are pursued within diversified agro-ecological, socio-economic, cultural, and institutional environment, the

study being location specific in nature and limited only to one project; its results could not be generalized to the regional or country level. However, the recommendations and policy implications of the study can be used for other areas of similar contexts and as a basis for further studies.

1.7 Organization of the Thesis

The thesis is divided into six chapters. In chapter one, background, statement of the problem and objectives of the study are presented. Chapter two deals with the review of theoretical and empirical literatures relevant to the major theme of the study. Chapter three presents brief description of the study area. The fourth chapter deals with methodology of the study. Chapter five presents results of the study and discusses the results by giving due emphasis on purpose of the research objectives. The final chapter presents summary, conclusions and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1 Concepts of Agro-fuel Development

2.1.1 Historical Background of Bio-fuels

Humans have used solid bio-fuel (such as wood and other biomass) for heating and cooking since the discovery of fire. Following the development of ways to produce electricity, it became possible to use bio-fuels to generate electrical power as well. However, the fluctuations of supply and demand, energy policy, military conflict and the environmental impacts, have all contributed to a highly complex and volatile market for energy and fuel.

Later on, the discovery of large supplies of fossil fuels (coal, natural-gas and oil) led to dramatic reductions in the use of biomass fuel in the developed world for transport, heat, and power. Because petroleum based fuels became inexpressive and soon were widely used to operate cars and trucks (EREDPC, 2006).

EREDPC (2006) also stated that before World War II, and during high demand wartime period, bio-fuels were valued as a strategic alternative to imported petroleum oil. Wartime Germany experienced extreme oil shortages and pursued many energy innovations, including the powering of some vehicles using a blend of gasoline with alcohol fermented from potatoes, called monopolin. In Britain, grain alcohol was blended with petrol by the Distillers Company Limited under the name Discol.

After the war, inexpensive oil from the Middle East contributed in part to the lessened economic and geopolitical interests in bio-fuels. Then in 1973 and 1979 during the two oil crisis periods, geopolitical conflict in the Middle East caused Oil Producing and Exporting Countries (OPEC) to cut exports and non-OPEC nations experienced a very large decrease in oil supply.

These "energy crisis" resulted in severe shortages and a sharp increase in the prices of oil based products, notably gasoline. This instability of oil supplies and escalating oil prices has led many people and governments to look to other sources for liquid fuel (Doney and Theurer, 1984). As a result of all these, bio-fuels instead of fossil fuels were developed.

Throughout the 1990s, plants were opened in many European countries, including the Czech Republic, Germany and Sweden. France launched local production of bio-diesel (referred to as Diester) from rapeseed oil, which is mixed into regular diesel fuel at a level of 5%, public transportation at a level of 30%.

Renault, Peugeot and other manufacturers have certified frock engines for use with up to the level of partial diesel. During the same period, nations in other parts of the world also saw local production of bio-fuel starting up (EREDPC, 2006).

By 1998, the Australian Bio-fuel institute had identified 21 countries with commercial bio-diesel projects. Since the year 2000, there had been renewed interest in bio-fuels. At present 100% bio-diesel is available at many normal service stations across Europe (Seegler, 1983).

In 2005, Minnesota becomes the first US state to mandate that all diesel fuel sold in the state contain part biodiesel, requiring a content of at least 2%.
The reasons for bio-fuels research and development includes that the world's oil reserves are concentrated in just a few countries, while the potential for producing bio-fuels from energy crops is as widely diffused as agriculture itself (Schaffert and Gourly, 1982). Moreover, poor oil importing countries spend a large part of their foreign currency reserve to buy oil (de Fraiture et al., 2008).

Therefore, the use of bio-fuels firstly reduces dependence on foreign petroleum and benefits domestic economy (Sheehan et. al., 1998). The second reason of using bio-fuels is fuel quality benefits. Bio-fuels have positive performance attributes such as an increased cetane rating and high fuel lubricity (Bultzen, 2006).

The third reason is that liquid bio-fuel is a renewable resource (Schaffert and Gourley 1982; Core, 2002) and hence has the potential to leverage the use of limited supplies of fossil fuels (Sheehan et.al., 1998).

Fourth, it reduces air- polluting green house gas (GHG) emissions by fossil fuel engines (Sheehan et. al., 1998, Core, 2002) and related public health risks (Sheehan et. al., 1998) because bio-diesel contains no sulfur or aromatics, and use of biodiesel in a conventional diesel engine results in substantial reduction of unburned hydrocarbons, carbon-monoxide and particulate matter (Bultzen, 2006).

Fifth, alcohol as a fuel is clean burning when used alone and when mixed with gasoline. It acts to increase the cetane rating (Schafter and Gourley, 1992). Sixth, the potential benefits to rural livelihood (Dufey, 2006). Seventh, energy crops production and alcohol distillation will require more labor than oil production and refining and thus aids to unemployment problems reduction and mass migration to the cities (Schafter and Gourley, 1982). Finally the French-fry aroma, a mother typical trait of current biodiesel fuels is an added bonus (Core, 2002).

2.1.2 Definitions of Agro-fuels

Agro-fuel, the key term in this study, is defined by many scholars and writers in many ways.

According to EREDPC(2006), agro-fuel is defined as solid, liquid or gaseous fuel derived from relatively recently dead biological material and is distinguished from fossil fuels, which are derived from long dead biological material.

According to OECD-FAO (2007-2016) bio-fuels in the wider sense are defined as all solid, fluid, or gaseous fuels produced from biomass (any plant matter used directly as fuel or converted into other forms before combustion).

According to another scholar (de Fraiture et al., 2008), agro-fuels are transportation (or heating) fuels derived from biological sources such as grains, sugar crops, oil crops, starch, cellulosic materials (grasses and trees) and organic waste.

Furthermore, according to EIAR (2008) agro-fuel is a generic term and includes a large number of fuels. The definition of agro-fuel according to EIAR is concerned with bio-fuels that will be used in the transport sector. So agro-fuels are defined as a renewable liquid fuels coming from biological raw materials and have been proved to be good substitutes for oil in the transportation sector.

From the above definitions it is possible to define bio-fuels in the wider and narrow sense. Agro-fuels in the wider sense can be defined as all solid, fluid or gaseous fuels produced from biomass. In this case, it is a generic term and includes a large number of fuels like biodiesel, Bio-alcohols, Biogas, Sun gas, Solid bio-fuels, Vegetable oil, Ethanol, algae fuel, etc. Agro-fuels in a narrow sense can mean a renewable liquid fuels coming from the most common source (photosynthetic plants) that have been proved to be good substitute for fossil oil in the transportation sector. In other words, agro fuels are bio-fuels which are produced from agricultural products specifically grown for bio-diesel or bio-ethanol production mainly for the purpose of transportation.

In this age of pollution, high unemployment rate, and energy source deficit, the first characteristics of bio-fuels is that these fuels (ethanol and bio-diesel) are obtained from agricultural crops, they are renewable- and farmers typically produce them domestically, decreasing our dependence on unstable foreign sources of oil. Moreover, ethanol and bio-diesel discharge less harsh pollution emissions than petroleum-based gasoline and diesel. They also do not add to global warming as they only discharge back the carbon dioxide (Co_2) to the environment that their source plants absorbed out of the atmosphere.

In short, bio-fuels are widely available resources, have potential to contribute to green house gas reductions and other environmental objectives, is a source of rural livelihoods in that much of the value added and income-generation from bio-fuel systems is retained locally and can help to reduce rural poverty-in sharp contrast to fossil fuels or central electricity production and distribution systems, and to many other renewable energy technologies.

This paper is, therefore, concerned with agro-fuels that have been defined in its narrow sense-mainly on agro-fuels that can be produced from principal feedstock, castor bean (castor-oil).

Fundire (1991) states castor oil as "colorless or pale yellowish oil extracted from the seeds of the castor oil plant, used pharmaceutically as a laxative and skin softener and industrially as a lubricant". Weiss (1983) also describes castor oil as natural plant oil obtained from the seed of the castor plant. The castor seed, or bean, is the source of numerous economically important products as one of the world's most important industrial oils, and was one of the earliest commercial products. Castor beans have been found in ancient Egyptian tombs dating back to 4000 B.C. The oil from the bean was used thousands of years ago in facial oils and in wick lamps for lighting.

Castor grows well with in temperatures of 20-26^{0}c, clear sunny days, cloudy and humid days irrespective of temperature reduces yield. Temperature of above 35^{0}c and below 15^{0}c reduces oil content and alters composition. Castor produces good seed yield with rain fall of 600-700 mm provided that there is no shortage of moisture during flowering. It requires well drained soil with medium fertility. On fertile soils it reduces massive vegetative growth but is responsive to fertilizers on less fertile soils (Seegler, 1983).

2.1.3 Types of Agro-fuels

There are four common types of agro-fuel: namely, first generation, second generation, third generation, and fourth generation agro-fuels.

a) First generation agro-fuels: these are agro-fuels made from sugar, starch, vegetable oil or animal fats using conventional technology. The basic feed stocks for the production of first generation bio-fuels are often seeds or grains such as wheat, which yields starch that is fermented into bio-ethanol or sunflower seeds which are pressed to yield vegetable oil that can be used in bio-diesel. These feed stocks could enter the animal or human food chain and as the global population has raised their use in producing. Agro-fuels has been criticized for diverting food away from the human food chain leading to food shortages and price rise (http://esa.unorg/un-energy/pdf/).

b) Second generation agro-fuels: are fuels that can be produced from waste (cellulosic bio-mass like straw, agricultural waste, woods and grasses). Second generation agro-fuels are sustainable and energy efficient. However, the technologies needed to break-down them are not yet commercially available due to their high cost and hence are unlikely to be affordable for the poor (IUCN, 2008).

c) Third generation agro-fuels: are agro-fuels from algae. Algae are low-input high-yield feed stocks to produce agro-fuels. It produces 30 times more energy per acre than land crops such as soybeans (Lester, 2007). With the higher prices of fossil fuels (petroleum), there is much interest in algae culture (farming algae). One advantage of algae agro-fuels over most other fuel types is that they are biodegradable and so relatively harmless to the environment if spilled (http:// www.globeco.co.uk).

d) Fourth generation agro-fuels: this generation is based on the conversion of vegetable oil and bio-diesel into gasoline.

From all the above stated types the one mostly used is the first generation. In this first generation, the two widely used agro-fuels are ethanol and bio-diesel.

Despite the various benefits of agro-fuels, they may have negative impact on greenhouse gas emissions, ecosystems, and livelihoods depend on the type of feed stock used, how and where it is grown, how and where the bio-fuel is processed and transported and for whom.

2.1.4 Debates on Agro-fuels

Development of agro-fuel production has risen rapidly to the top of the policy agendas in many countries. Most of the objectives of bio-fuel production can be grouped with in three broad categories (OECD; FAO, 2007-2016).

1) Concerns about future energy supplies expectations of limited availability of crude oil and increasing reliance on oil imports from countries considered as less reliable suppliers;
2) Environmental concerns most notably the increased emissions of CO_2 as one of the main causes of climate change and

3) The development of new markets for agricultural products and hence increased revenue for farmers are the main objectives for agro-fuel development.

Although still a lot of efforts for the development of bio-fuels, there are also views and debates among scholars. All the debates revolve around three main issues namely, food versus fuel; agro-fuel versus energy security and balance and agro-fuels versus environment.

Arguments against and for the development of agro-fuels:

I) "Food Vs Fuel" Dilemma

According to Grain (2007), agro-fuels expansions are direct causes of a shift of a large amount of farm lands and food crops into bio-fuels production and then this reduces the supply of food stocks leading to rising the prices of food crops. Furthermore, Grain (2007) argues agro-fuels development by shifting food grade vegetable oils into bio-diesel causes an increase in price of food oils, as food in general. Another argument by the International Food, policy, Research Institute (IFPRI) (2006) stated that poor people in both rural and urban areas are disproportionately vulnerable to these agro-fuel forces because they spend a large share of their incomes on food.

In addition, agro-fuel expansion creates increased pressure on fragile natural resources and forests on which poor farmers depend on. Potentially, it explains, bio-fuels further degrade land and stress limited water supplies.

Another scholar Lester (2007) argues that the unprecedented diversion of the world's leading grain crops (USA) to the production of fuel will affect food prices everywhere. As the world corn price rises, so too do those of wheat and rice. Consumer substitution among grains and the same crops compete for the same land.

The views of the proponents of agro-fuel development on the "food versus fuel" dilemma are discussed here in this section. Accordingly, agro-fuels production can increase the demand for agricultural inputs such as land and water and this can jeopardize the production of food staffs, the so-called" fuel Vs food dilemma. A number of studies done in past years under the RPTES program shows that the sealing up of agricultural crops for bio-fuels can be done without competing with food production and without resulting in incremental forest clearing. The estimate of the land area that would be required in Africa to set up new plantations (sugar cane, sweet potato, sorghum, cassava, maize, and sweet potatoes) is equivalent to scaling up crop production by 25% and 50% over actual 2000-01 harvest levels, show that even a 50% scale up would be possible without necessarily creating food-energy trade-off problems (Utria, 2004). Furthermore, proponents argue, in some place it may well be a problem: while fuel- food competition can be avoided by growing energy crops on marginal or "waste" land, doing so may mean high production input and costs to achieve financially-acceptable crop yields. Conversely, the best net returns and profits for energy crop producers may arise from using good quality, though expensive, crop land. Given these divergent situations, it is crucial that bio-fuel crop projects and programs base their design and site selection on sound, local information about the relative merits of bio-fuel crops and alternative crop production and do so using a broad, rural development- based perspective.

In addition, proponents explain not all production of bio-fuels would require the use of land. The situation of the sugar production industries in Africa show that there is a huge surplus of molasses that do not find their way to the market. There are means by which bio-fuels can be produced not only from non-edible crops that may compete to land but also from algae that does not necessarily use land.

Finally, the proponents recommended that adequate policy and regulatory frameworks would be required to ensure that no conflicts- if any- could arise.
Another argument by the opponents stated that world food stocks (particularly cereals) are approaching to a significant decrease leading many analysts to conclude that any significant expansion of agro-fuels production will directly impact on global food security (Bell, 2005; Monibot, 2005). These concerns are based on the premise that bio-fuels production would lead to a competition for land that would otherwise be used for food production, further reducing global food stocks and marginalizing the poor. Bio-fuel proponents dispute the logic of coupling global food stocks to bio-fuels pointing out that much of the decline in the stocks are a result of the highly inefficient agricultural production subsidies in Europe and USA (Morales, 2003).

ii) Agro-fuels Vs energy security and energy balance

The main problem with agro-fuels is that it does not address the one issue that should be central to this whole discussion- Energy security, or energy balance (Grain, 2007).

Agro-fuels cannot totally replace petroleum fuels because of their limitation in that agro-fuels are grown in a limited agro-climatic conditions and can not be expanded to the extent they can replace the amount of petroleum. To explain it the other way, even though bio-fuel may be renewable, crops are not enough.
Another problem with agro-fuels according to the opponents' view is agro-fuels consume more energy to produce them than they produce (give). There are heavy discussions around the issue of whether bio-fuels have a positive energy balance i.e. that they deliver more energy than the energy which is put into their production.

Net energy Balance (NEB) equates to energy input versus energy output of the production cycle (life cycle cost analysis covers the costs incurred" from cradle to

grave of the project". According to the above, the production of ethanol from corn in the USA' are overly negative. Many argue that the ethanol production program in the USA are another avenue to subsidize mid west farmers that otherwise would have gone out of business because of lack of competitiveness for their corn without large protectionary subsidies.

The amount of subsidies to the farming system and ethanol industry is so high that the same policy objectives (energy security environmental benefits, etc) could be attained with much lesser inputs (Doug, 2006).

One USA government study (www.ethanol.org/pdf) examined subsidies historically given to the oil industry and to the ethanol industry and found that the amounts of those to the oil industry are far higher although all have negative energy balance. Based on the above fact and others, opponents concluded that bio-fuels use more energy than they can produce.

The proponents view towards agro-fuels Vs energy security and balance argued that world market prices for conventional energy sources in particular oil, are quite volatile. This poses great risks for the world's economic and political stability, with (sometimes dramatic effects on energy- importing developing countries, even more than on developed countries. In this context, proponents say, bio-fuels can help diversity energy supply and reduce the reliance on fossil fuel with impacts on energy security i.e. the availability of energy at all times, in sufficient quantities and at affordable price (Julio, 2007).

Developing countries and especially in Africa (besides for a number of exceptions such as, sub-Saharan countries, Angola, Gabon, Cameroon, Congo etc) are particularly vulnerable because they are dependent from oil imports, and are often landlocked and due to their limited internal demand dependent from one supplier (country or company). Most of these countries have the potential to

even become bio-fuel exporters and this would much improve their balance of payment and boost the economy (Julio, 2007).

Regarding to the argument that bio-fuels uses more energy than they can produce, a lot of researches and tests had been done to check this according to the proponents view. As a result of the test, they say, the findings for warded were: ethanol puts out about 1.5 units of energy for every unit of energy used in processing it. In addition, proponents argued, bio-diesel even has an output of 3.2 units of energy used on its production (Julio, 2007).

From all the above argument for agro-fuels development, proponents concluded that bio-fuels (bio-ethanol and biodiesel) have a positive energy balance and least greenhouse gas emissions as compared to petroleum-fuels.

iii) Agro-fuels Vs environmental effects

From among the opponents of bio-fuel development Grain (2007) argues that none of the policy makers go back to the question of what the main cause, of green house gas emissions are.

All attention is Grain (2007) adds, focused on growing crops to run cars. According to the premises of Grain (2007), agriculture and especially the industrial agriculture model, is the main factor behind global warming and this is the type of agriculture that is being promoted by agro-fuels.

Stern (2007) cited in Grain (2007) reviewed a major report on the economics of climate change commissioned by the British government, fertilizers are the largest single sources of emissions from agriculture (followed by livestock and wetland rice cultivation) as they bring huge amounts of nitrogen into the soil which is latter emitted into the atmosphere as nitrous oxide. Another serious and

Another scholar defined livelihood as:

> A livelihood comprises of the capabilities, assets (stores, resources, claims and access) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks maintain or enhance its capabilities and assets and provide sustainable livelihood opportunities for the next generation (Chambers and Conway, 1992).

All the different definitions refer to the same concept and consist of similar core elements of a livelihood. The main components of a livelihood include the assets, strategies or activities, policy, institutions and processes, vulnerabilities and outcomes (Carry, 1998).

2.2.1 Livelihood Assets

The terms livelihood assets and capital are interchangeably used in conceptualizing a livelihood as they refer to the same resources. Assets/capitals are the building blocks of a livelihood (DFID, 1999).

Types of Assets/Capitals

Livelihood assets are categorized in to five main types. Natural capitals, human capital, physical capital, financial capitals and social capitals are the main types of livelihood resources upon which a livelihood is built (Carrey 1998; DFID 1999).

Concepts of Livelihood Assets/Capitals

The different types of assets are defined as follows.

Natural capital: is the natural resource stock from which resource flows useful for livelihood are derived (examples include: land, water, wildlife, biodiversity, environmental resources).

Human capital: is the skill, knowledge, ability to labour and good health important to the ability to pursue the different livelihood strategies. Physical capital: refers to the basic infrastructure (road, transport, shelter, water, energy and communication) and the production equipment and means which enable people to pursue their livelihood.

Financial capital is the financial resources which are available to people (whether savings, supplies of credit or regular remittances or pensions) and which provide them with different livelihood options.
Social capital: refers to the social resources such as network, membership of groups, relationships of trust, access to wider institutions of society upon which people draw in pursuit of livelihoods (Sconces, 1998 cited in Carney, 1998).

Livelihood resources include natural, human, financial/economic, social and other capitals (Scones, 1998). Livelihood assets are also understood as peoples' strengths (DFID, 1999). Assets are the basis to achieve the positive livelihood outcomes. No single category of assets is sufficient to produce all the main and various livelihood outcomes that people seek to have. Assets lie at the center of livelihood analysis. Assets are analyzed in terms of ownership or access/right to use (DFID, 1999).

The livelihood resources vary from individual to individual, from household to household, from community to community and from place to place. Livelihood assets can be eroded and built. Livelihood assets are influenced by a number of factors (DFID, 1999; Carney 1998). The access to the different types of assets is presented in the shape of a pentagon. As access to assets changes, the shape of the pentagon also varies and changes constantly. It means that individuals, households or communities with different level of access to assets will have different shape of pentagon.

or permanently. Livelihood strategies transform assets to livelihood outcomes through policies, institutions and processes.

The choice of livelihood strategies is influenced by the people's access to different levels and combinations of assets. Some activities require particular skill (human capital), start up financial capital, physical capital, natural capital and social capital. Different livelihood activities have different requirements. But the general principle is that those who are endowed with ample assets are more likely to make positive livelihood choices. The more choice and flexibility that people have in their livelihood strategies, the greater is their ability to withstand or adapt to the shocks and stresses of vulnerability contexts. In analyzing a livelihood, it is important to consider the livelihood strategies of the different social groups. People compete for livelihood strategies (example, jobs, markets, prices) which makes difficult for everyone to achieve simultaneous improvements in their livelihoods (DFID, 1999).

Types of Livelihood Strategies

Broadly, there are three types of livelihood strategies: Agricultural intensification /extensification, livelihood diversification and migration. It means that livelihood strategies cover broad range of options. An individual or a household can pursue their livelihood through agriculture (agricultural intensification or extensification) or though diversification of livelihood in terms of off-farm and non-farm income generating/earning activities, or by moving elsewhere either temporarily or permanently or pursue a combination of strategies (Scones, 1998). Livelihood strategies depend on livelihood resources. Livelihood strategies are greatly influenced by policies, institution and processes (DFID, 1999).

2.2.3 Policy, Institutions and Processes

Policies, institutions and processes (PIPS) are elements of the livelihood framework and cover the complex social, economic and political contexts within which people pursue their livelihood strategies. PIPS determine the people's livelihoods (DFID, 1999)

Policies, institutions and processes include the inter-related issues of social relations, social and political organization, governance, service delivery, resource access institutions, policy and processes.

Social relations: the way in which gender, ethnicity, culture, history, religion and kinship affect the livelihoods of different groups with a community.
Social and political organization: decision making processes, civic bodies, social rules and norms, democracy, leadership, power and authority, and rent-seeking behavior.

Governance: the form and quality of government systems including structure, power, efficiency and effectiveness and rights and representation.

Service delivery: the effectiveness and responsiveness of state and private sector agencies engaged in service delivery such as education, health, water and sanitation.

Resource access institutions: the social norms, customs and behaviors (or rules of the game) that define people's access to resources.

Policy and processes: the processes by which policy and legislation is determined and implemented and their effects on people's livelihoods.

PIPS operate at global, national, regional and local levels. The important thing to understand their impact on local livelihoods is to analyze the operation or

absence of links between micro, meso and macro levels. PIPS have direct and indirect relationships and influences on the different elements of livelihood. It has direct link with vulnerability contexts and affects trends directly or indirectly. It also determines livelihood strategies and livelihood outcomes (DFID, 1999).

2.2.4 Vulnerability Context

Vulnerability context is the external environment in which people exist. People's livelihoods and the wider availability of assets are basically affected by shocks, trends and secondarily. Vulnerability contexts (shocks, tends and seasonally) are mostly beyond the capacity of people to control as they are the external factors. Factors that make up the vulnerability context have direct impact upon people's asset status and the options that are open to them in pursuit of positive livelihood outcomes. Broadly, shocks, trends and seasonality are the main categories of vulnerability context.

Shocks: include the natural disaster, human death, economic crisis, conflict, crop failure, and livestock death. Trends: Involves population trend, natural resource trends, economic trends, governance and technological trends. Seasonality: Includes production, prices, health, and employment opportunities fluctuations. Different components of the vulnerability context affect different people in different ways. Understanding the nature of vulnerability is a key step in analyzing livelihood (DFID, 1999). Not all trends are negative or cause vulnerability. For example, new technologies, medical advances or positive economic trends can help to improve people's livelihood (DFID, 1999).

2.2.5 Livelihood Outcomes

Livelihood outcomes are the achievements or outputs of livelihood strategies. Increased income, improved food security, reduced vulnerability, improved

wellbeing and more sustainable use of natural resource base are the main elements of livelihood outcomes (DFID, 1999).

2.2.6 Rural Livelihoods in Ethiopia

The livelihood and food security of the majority of the rural people of Ethiopia depends on agriculture (Yared, 2002). For the last several decades, agriculture has served as the basis for food security (Getahun, 2003). However, agriculture cannot meet the food requirement of the rural households because of its low-level productivity due to recurrent drought, erratic rainfall, natural resource degradation, population pressure, land fragmentation/small size of land holdings, land scarcity and crop pests. In short, the inexorable declines in the size and productivity of landholdings as well as the unfavorable climatic conditions have made agriculture to be increasingly unreliable bases for rural livelihoods (Getahun, 2003; Yared, 2003).

Despite the long tradition of farming and the most important source of food security, agricultural productivity and production in Ethiopia is below the national requirement. The overall growth is not encouraging. Agricultural productivity is generally constrained by backward agricultural technologies, population pressure, environmental and natural resource degradation, poverty, weak institutional capacity to uproot the causes of food insecurity, inadequate infrastructure and social services and inappropriate policies which in turn causes food insecurity (Getahun, 2003; FDRE, 2003).

The use of low level improved and modern agricultural inputs such as fertilizer, improved seeds, pesticides and herbicides; traditional farm implements and tools; post harvest technologies and inadequate extension service in general hamper the growth of agricultural production in general and of food production in particular (Getahun, 2003).

The high population pressure in rural areas leads to high land fragmentation which again leads to the shortage of cultivated land and reduction in per capita land size available for farming. This brings low agricultural production and productivity. Households with small plots can not produce enough grain to meet their consumption requirement. As a result of population pressure, deforestation, over cultivation, over grazing, declining of productive farm land unemployment has been dramatically increased in rural Ethiopia (FDRE, 2003; Getahun, 2003; Yared 2003).

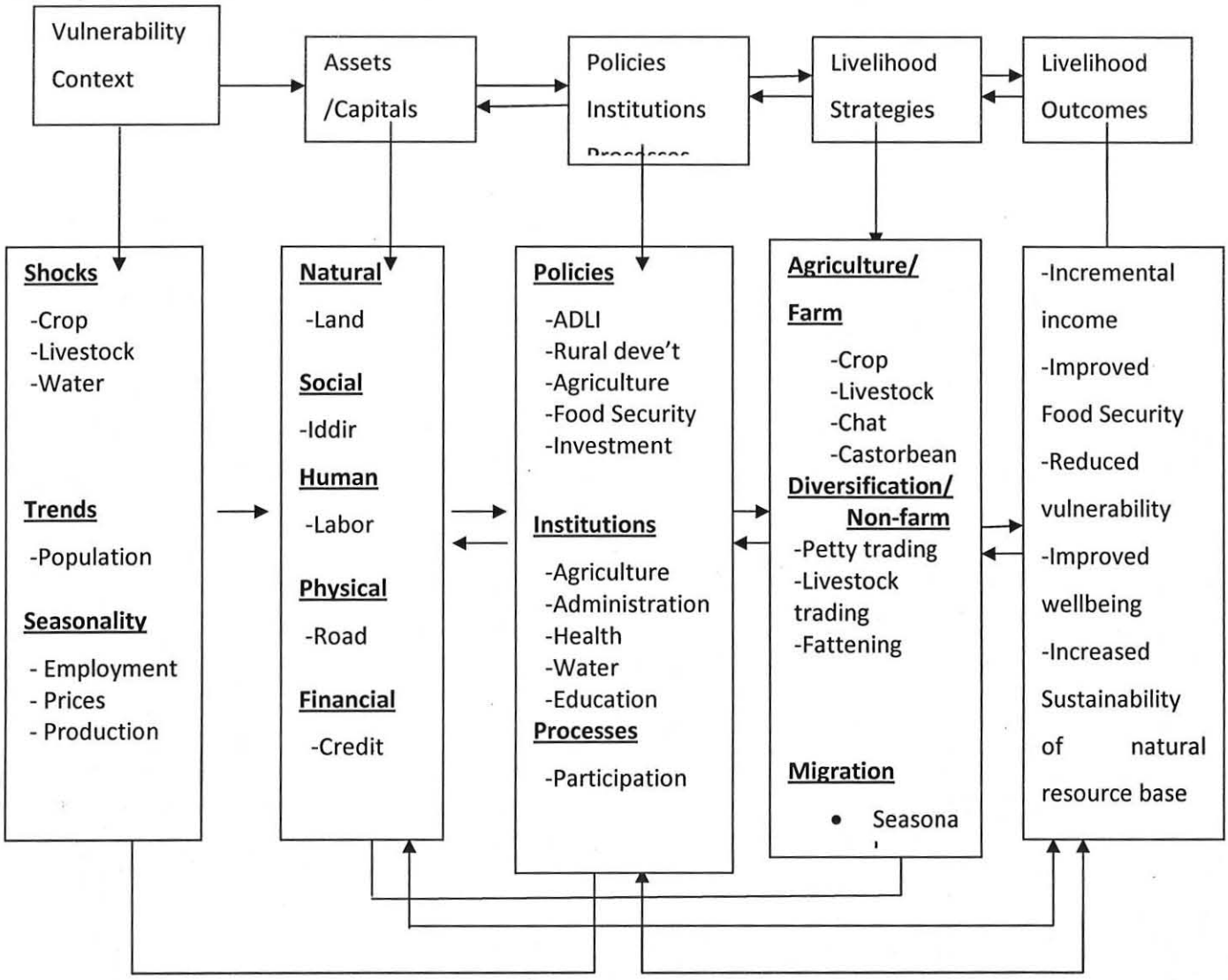
Environmental and natural resource degradation reduces food production through recurrent drought, ecological imbalance, soil erosion and loss of soil fertility. In Ethiopia, the most important negative impact of land degradation on food production is manifested in stagnating and declining yields and high levels of poverty (Getahun, 2003; FDRE, 2003).

The inability of agriculture to satisfy the livelihood and food security of the rural community calls for the diversified income sources to reduce farmers' vulnerability. In order to ensure survival from year to year, rural people are forced to complement and supplement their income from different non-farm income generating activities such as selling of fuel wood, charcoal, rope, trading, and handicrafts and engage in wage labor (Yared, 2002 and 2003).

2.3 Conceptual Framework of the Study

The livelihood framework (Figure 2.1) is developed by DFID to analyze and understand livelihood. It is a tool to analyze livelihoods. The framework is holistic and dynamic and considers the interaction of livelihoods. The objective of the framework is to provide the analytical basis for livelihood analysis and is read as situated in particular settings (historical, environmental, policy and other), particular assets or forms of capital are accessed by households, and used to construct livelihood strategies, which result in positive or negative outcomes.

Figure 2.1 Livelihood Framework



Source: DFID's Sustainable Livelihood Guidance Sheets (1999)

CHAPTER THREE: DESCRIPTION OF THE STUDY AREA

3.1 Overview of Eastern Hararghe Zone

Following the down fall of the Derg regime, the country is subdivided into different administrative regions with in a framework of federal and regional administrative states. In line with this Oromia Regional State was established. Currently, the state is subdivided into 18 administrative zones. Eastern Hararghe zone is one of the 18 zones of Oromia Regional State.

Eastern Hararghe zone is located at the eastern part of Oromia regional state. The zone is currently subdivided into 19 woredas. The zone is geographically located between $7^{0}32'$-$9^{0}44'$ North latitude and $41^{0}10'$-$43^{0}16'$ East longitudes. The zone is bounded by west Haraghe zone from the west, Bale zone from the south, Somali Regional State from the east and south-east and Dire Dawa administrative council from the north. Harari Regional state is engulfed by the zone. The zone is estimated to have a total length of 824 km (Eastern Hararghe Office of Agriculture, 2000).

The South eastern low land, where Midhega Tolla woreda is found, is mainly characterized by extensive low land with elevation ranging between 500 and 1500 masl. This area is a region of high tectonic stability. It is estimated to constitute about 50% of the total area of the zone.

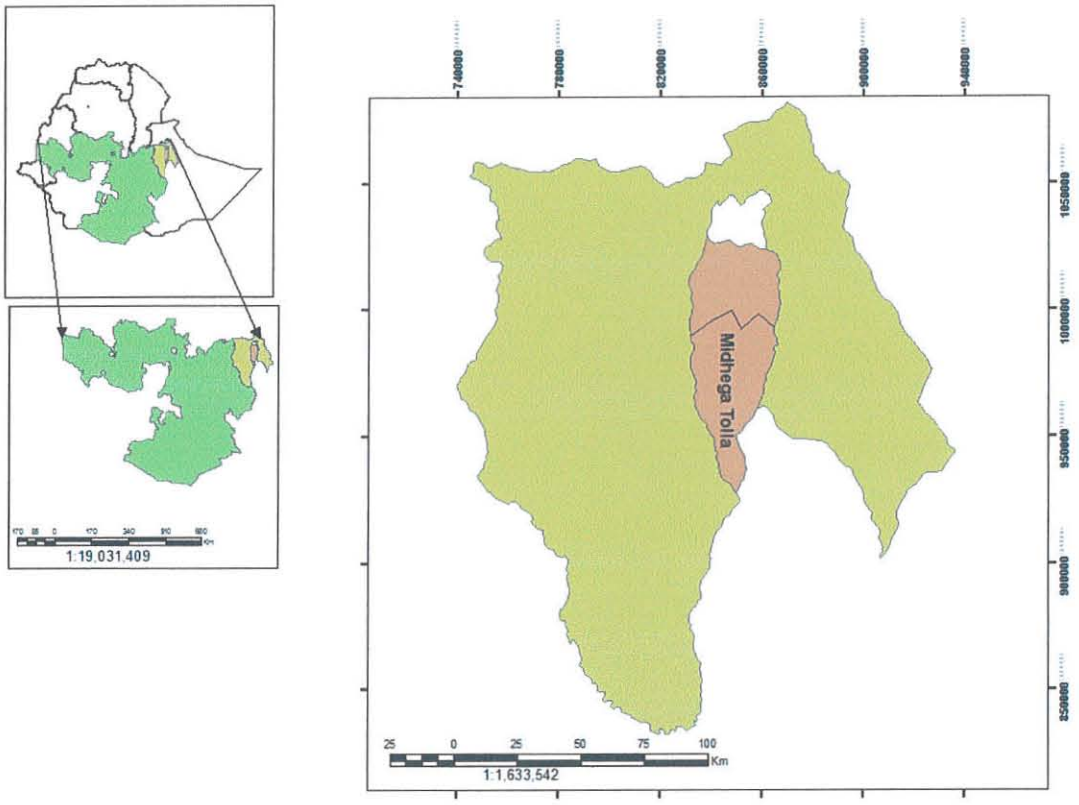
Midhega Tolla woreda which is the study area is one of the 18 woredas of Eastern Hararghe zone after 2005. Before May 2005, Fedis and Midhega Tolla together were formed as one woreda and known by the name Fedis. However, starting from the date mentioned above, they became separate and two independent woredas. The newly organized woreda, Midhega Tolla is therefore, the main concern in this study.

3.2 Description of Midhega Tolla Woreda

3.2.1 Geographic Location, Topography and Climate

Midhega Tolla woreda is one among the 18 woredas of Eastern Hararghe Zone of Oromia Regional State. It is located about 566kms away from Addis Ababa and about 466 km to the east of Adama city, the capital of Oromia Regional State. The woreda is located on the geographic coordinates of 08^0, 54,229 North latitude and 042^0, 06'858 East longitude. The altitude varies between 1511 to 1580 masl indicating that the whole woreda is topographically plain without any barrier for the use of mechanized agriculture. The topography of the woreda is also suitable to connect the majority of the rural kebeles. The woreda is ago-ecologically classified as 100% lowland (*Kolla*). There are 18 rural and 1 urban kebele in the woreda. The woreda is bounded by Fedis woreda in the north; Babile woreda in the east; Meyu Muluke and Somali Regional state in the south and Girawa woreda in the west. The map of the woreda is shown below.

Location Map of the Study Area



Source: Ethio GIS Adindan_UTM_Zone_37N Transverse_Mercator using ESRI ArcCatalog Software

Fig 3.1 Location Map of the Study Area

The mean annual rainfall ranges from 450mm to 650 mm. The woreda experiences bimodal rainfall (*Belg* and *Meher*). For the belg production season, the rain lasts for about only 23 days i.e., it starts in the month of January and ends in early March. The summer months (June to August) are the second raining months for meher production. However, the woreda is challenged due to irregularities of the raining seasons, in timing and volume and is becoming one of the drought prone areas in the zone. The rest months are dry seasons in the study area (WOARD, 2007). The same report indicated that mean annual temperature of the study area is 28.5^{0}c with minimum and maximum temperature of 18^{0}c and 39^{0}c respectively.

3.2.2 Soil and water resources

The physical and chemical composition of soils is very important in determining the occurrence, growth, diversity and distribution of plant species of the area. The major soil types of the study are Luvisols, Nitosolos, Acrisols, and Vertisols in association with Eutric Fluvisols. Land degradation and subsequent development of deep gullies are one of the serious bottlenecks of the district (Lisanework et al., 2008).

The very dark gray, dark brown, very dark gray brown to black soils starting north of Midhega Tolla and extending south ward 35-40 km a more nearly level terrain. It is less developed agriculturally than the reddish blown soil area which may be partly because the area receives less rainfall. A considerable extent of this area is under thorn-bush acacia and short grass species. The soils are generally clay in texture with water appearing to be the major problem for agriculture. Where the land is cultivated, sorghum is the major crop followed by maize cultivation.

Four major rivers, the Gobele, Eror, Daketa, and Faten are flowing south wards through the sanctuary into the wabishebele river basin. The rivers have the lengths of 92, 95,152 and 45km, respectively (WOARO, 2007).

3.2.3 Demographic Characteristics

Midhega Tolla woreda has an estimated population of 122,905, of which 61,077(49.7%) are males and 61,828 (50.3%) are females. From the total population of the woreda, rural population constitutes about 95.85% and the remaining 4.15% resides in the urban kebele. About 19,900 household heads of which 16, 865 male headed and 3,035 female headed live in the woreda. Most of the female headed households are found the urban kebele. The population density of the woreda is about 110 people per square kilometer (WOARD, 2007).

3.2.4 Economic Condition/ Farming Economy

Agriculture is the main stay of the community. Like in other parts of the country, the farming techniques used by the rural communities are traditional. The study area is characterized as mixed farming systems where the livelihood of the rural community depends both on livestock and crop farming.

3.2.4.1 Crop production

The faming system is dominated by subsistence small scale agriculture. Crop production is almost dependent on rain fed agriculture. The climatic condition varies over periods which deteriorate crop productivity in the woreda.

The dominant crops produced in the study area are maize and sorghum. The other commonly produced crops include pulses like haricot bean, oil crops (ground nut, line seed, sesames) and onion. According to woreda office of agriculture and rural development the current productivity of sorghum, maize, haricot bean, ground nut, and anion is 5, 6, 3,8,45 quintal per hectare respectively. This shows that the low productivity of the major crops grown in the woreda.

The woreda is working to improve the productivity through improving soil fertility and enhancing the natural resource management system via water and soil conservation practices.

3.2.4.2 Livestock Production

Livestock are integral component of the farming system in the woreda. The livestock population according to 2007/08 farm survey report, reported in terms of total livestock number, is 177,915. The cattle population accounts to 64,380; sheep and goat 64,932; camel 14,015; donkey 9,519; and poultry 20,491. Moreover, about 4,578 traditional hives of bees are found in the woreda.

Despite the large population of livestock, productivity is very low as in many other parts of the Ethiopia. As the woreda is located in the low land, it is suitable for small ruminants, both sheep and goats, production. Productivity of the livestock is low due to inadequate and low quality feed supply, and the prevalence of various animal diseases among others.

The major livestock diseases in the study area include: ovine pastureolosis, Bovine pastureolosis, Contagious Bovine Pleura Pneumonia (CBPP), contagious cisprinephro phenorid (CCPP), black leg, Foot and mouth disease (FMD), Anthrax, Lumphine disease (LSD).

In general, the dominant source of the livelihood of the rural community is agriculture that accounts about 98% of the total population where crop, livestock and natural resource are the dominant agricultural activities. Different secondary livelihood strategies such as trading, salary employment, and other miscellaneous activities cover for about 2% of the yearly income earned (WOARD, 2007).

3.2.5 Infrastructure

3.2.5.1 Road and Telephone

Roads and telecommunication facilities are among the infrastructures needed for development.

The road out let in the woreda encompasses 53kms of all weather roads and there is also a dry weather access road constructed by safety net projects and the community. In general, there is poor road facility, no electric city provision and no postal services in the woreda.

As far as telecommunication service is concerned, there is only one wireless telephone line serving the woreda which is found in Midhega town.

3.2.5.2 Education and Health

Social service like education and health are the crucial elements for livelihood development of a society. Education is an instrument for facilitating the progress of development creating an educated and more productive society in general and trained and skilled man power that contribute for the development of a country in particular. In order to produce such type of society and man power, the existence and efficiency of educational institutions are pre-requisite factors.

Currently, the total number of schools in the woreda is 24. These include a secondary school (9-10) and 23 primary schools (17 first cycle and 6 second cycle). In general, the education coverage in the woreda is about 59% (Woreda Education Bureau, 2008/09).

Healthy society is the basic and decisive factors for the development of a society and hence the health status of a society is seen as one of the indicators of the level of development of any society. Currently, one health center, three clinics and five health stations are found in the woreda. The total health coverage is about 65% (Woreda Health Bureau, 2008/09).

3.2.5.3 Potable water

The development of portable water supply increases the health and sanitation and generally the welfare of the society. Midhega Tolla woreda is characterized by shortage of portable water. In this woreda, there are 6 blow hole, motorized but only 4 are functional. Accordingly, the portable water coverage of the woreda in only 38.7%,

3.2.6 Institutions

Institutions are the rule of game for development endeavors. In rural areas, one can find a number of locally available rural institutions with varying objectives and degree of comprehensiveness. In the study area, however, *'Debo'* is the common institution practiced by the local community by which the people help each other on farming activities such as weeding and harvesting. In addition, there are traditional ceremonies which the youth help each others.

Nowadays, a number of modern rural institutions are increasing over time. These modern rural institutions play a leading role in the development arena of the study community. Among the modern rural institutions agricultural extension activities such as input supply and veterinary service are discussed in the following section.

Input Supply: Commercial fertilizer use in the woreda is low (0.5%). Seed supply in the woreda is also reported to be below the need and not arriving in time (WOARD, 2007).

Veterinary services: Despite the huge number of livestock production, veterinary services in the woreda are very low. There are only 3 veterinary centers in the woreda which are type D category and they are inadequately staffed.

3.2.7 Food Security

Decades ago, Fedis woreda (Fedis and Midhega Tolla) was known for its productivity and by ensuring food security. There was also time when the rain in Fedis woreda, now Midhega Tolla is taken as implication of food security and surplus production in the whole of east Hararghe. However, shortage of rainfall/moisture stress in the woreda led to food insecurity for the past three decades (WOARD, 2007).

On the other hand, during the Somalia war in 1978 and during the durg regime, there were social unrest and people have lost many of their animals during this unrest. Because of such and other reasons, (soil fertility loss, animal diseases), the last three decades are characterized by drought and malnutrition of the people of the woreda. To this effect, about 45% of the people of the woreda suffered from chronic food insecurity. People have been migrating to the nearest towns and abroad to enhance their food security and in search of job opportunities.

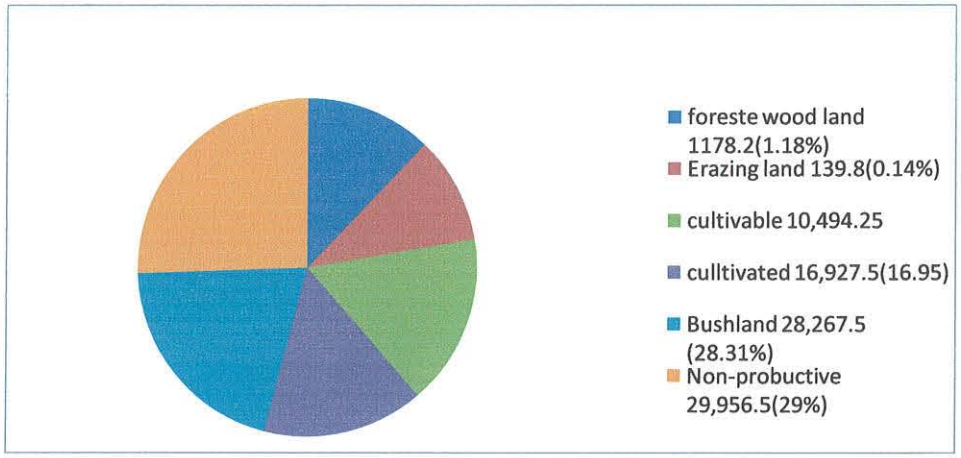
Currently, efforts have been made to reduce the above problems. Among the various efforts introduction of the safety net programs, food security programs, soil and water conservation schemes and promotion of new investment project such as the Flora Eco Power projects to generate employment opportunity for the local community.

The Flora Eco Power was introduced with the expectation, particularly, to the local community, of generating adequate employment opportunity and for creating adequate market for farmers producing castor been thereby ensure food security despite the actual impact of the project is in a paramount debate.

3.2. 8 Land Use Pattern

The land use pattern comprises cultivated land, cultivable land, grazing land, forest and bush land, non productive land. Figure 3.2 shows the size of each category of land use and their percentage from the total land of the woreda.

Fig. 3.2 Land use patter of Midhega Tolla woreda (Area in ha)



Source: Midhega Tolla Woreda Office of Agriculture, 2007/08

3.3 Description of Flora Eco Power Company (FEP)

Flora Eco Power Company is a private limited company (PLC) with its headquarters in Munich, Germany. The company is a spin-off from the highly successful 43 years old Hove Group which at present conducts investments/ production dials in Ethiopia, Italy, China and Israel (FEP, 2007).

3.3.1 Vision and Mission of FEP

The main vision of the company is to become globally integrated, low cost bio-diesel producer. On the other hand, the mission of the company is to create an end –to-end bio-energy supply chain. Moreover, it provides consultancy services for bio-diesel projects. The company also involves in research and development aimed at increasing oil yield and production through development of a variety of growing methods for bio-diesel crops, reducing costs, of raw material and enhancing production of high quality and quantity bio-diesel (FEP,2007).

3.3.2 Goals of FEP

The core business of the Flora Eco Power Company is to grow bio-oil producing crops in different regions of the world including Asia, Eastern Europe, Africa and other regions and/ or continents (FEP, 2007). This diversity is considered to assume the company a steady supply of bio-oil to the bio-diesel market world-wide with a plan to reach an annual production of 700,000 tons of bio-oil by the year 2011.

Objectives and strategy of the Flora Eco power Co. according to the report of FEP (2007) the strategy of the company is to control the full bio- diesel production chain through control of the world wide growing crops for oil by direct plantation, joint ventures and partnership; ownership of oil crushing plant/factory; partnership with bio-oil refineries and end-users and marketing and sales of bio-diesel to leading end-users.

To achieve their objectives and strategies, the company currently focuses on cultivation of two high oil yielding non-food crops namely Jatropha and castor Bean. The company considers these two bio-oil producing crops as the best alternatives to rapeseed canola, sunflower, and palm oil crops which are the current main oil suppliers for the bio-diesel industry. This is apparent because unlike these currently oil supplying crops, Jatropha and castor Bean can grow well both in warm and dry climates, infertile soils and marginal lands in addition to being high yielding and non-food crops.

The company believes to obtain a yield of about 4.5 to 5.0 tons/ha (45 to 50 Qt/ha) of castor oil per year will be obtained. Production using agricultural machineries, crushing the castor oil and all other feed stock oil with crushing plants located at farm sites, and refining and blending of bio-diesel from

different feed stock are considered to make the business cost-effective and profitable.

3.3.3 Production Strategy and/or Options of Operation of FEP

The Flora Eco-Power Company is currently operating under four different production options to cultivate castor bean for industrial use in the study woreda (FEP, 2007). These options are briefly discussed below.

Option 1 and Its Terms

Option 1 represents a category whereby farmers agree to use their land holding which is at present cultivated for other crops for the cultivation of castor bean crop. In this option, the farmers entered into the contract are responsible for carrying out the required land preparation. On the other hand the Company supplies fertilizer (up to one quintal/ha) and seed on his account.

As far as payment is concerned, growers producing between 4.2 and 5 tons/ha per annum are entitled for payment of 2000 Birr. Farmers producing more than 5 tons/ha per annum will be paid 400 Birr and an additional of 20% (80 Birr) of the price of one ton. The Company guarantees 70% (1400 Birr) of Birr 2000 per ha per annum for a castor bean yield of 3.5 tons/ha and below. For yield levels between 3.5 and 4.2 to 5.0 tons/ha, the percentage be increased from 70 to 100% accordingly (FEP, 20007).

Option 2 and Its Terms

In this option, the Company signs contractual agreement with individual farmers to use the land which is not cultivated at the crop season (fallow land) the agreement is signed. In this option, FEP will carry land preparation by clearing and plowing the plot with tractor and will also provide all the necessary inputs

at its own costs. However, the Company will share the income with the growers on a 60% to 40% basis that is 60% of the income will go to the growers while the remaining 40% of the income shall be the share of the Company. In addition, growers shall provide the available land and labour, as may be required especially during the seeding, weeding and harvesting seasons, and growers are not allowed to intercrop and any crop in this option (FEP, 2007).

The term of the payment in this option include growers producing between 4.2 and 5 tons/ha per annum are entitled for payment of 1,200 Birr. Farmers producing more than 5 tons/ha per annum will be paid 216 Birr and an additional of 20%(43 Birr) of the price of one ton. The Company guarantees 70% (840 Birr) of Birr 1,200/ha per annum for a castor bean yield of 3.5 tons/ha and below. For yield levels between 3.5 and 4.2 to 5 tons/ha, the percentage be increased from 70 to 100% accordingly.

Option 3 and Its Terms

Under this option, the Company uses farmers' owned bush and/or forest land which require land clearing by heavy duty farm machinery/tractor without any charge. The terms and conditions of contractual agreement between the FEP Company and the land owners (farmers) stipulate that the FEP will clear and prepare the land for cultivation by plowing the plot with its own tractors and will also provide all the necessary inputs at its own costs. However, the Company will use the land for its own need without sharing the income with the growers for the first two years. In addition, growers shall work on these plots as indicated options 1 and 2 above and will receive a daily salary for works performed as and when required. On top of this, growers shall have the right to choose between the three options indicated above as of the beginning of the third year and entered a new agreement with the Company as per their choices (FEP, 2007).

With regard to the payment conditions, the Company will not share the income with growers for the first two years. Moreover, after two years, farmers are still bound with this agreement unless they switched into option 1 or option 2 by their own decision. The Company will pay 15 Birr for every full working day of 8 hours a day.

Option 4 and Its Terms

In this option, the Company uses government owned forest and/or bush/shrub lands without the consent or any prior discussion and agreement with local people. However, these lands were allocated with the consent of the Zonal and woreda level land use and natural resource development offices of the Bureaus of agriculture. In this option, local farmers are not entitled for any kind of payments as the Company use government owned land. However, farmers may be employed as daily laborers with a daily wage of 15 Ethiopian Birr.

CHAPTER FOUR: RESAERCH METHODOLOGY

4.1 Study Design

Study design may vary depending on the purpose, objective and nature of the research. Survey design which is mostly used in social science research is applied in this study. Survey design may be cross sectional and longitudinal. A cross-survey is appropriate because of its one-time data collection and analysis which in turn makes it time-saving and cost effective hence, it is efficient (Yeraswork, 2005).

This study, therefore, is primarily designed to undertake a cross-sectional survey design with the objective of assessing the impact of agro-fuel investment on the livelihood of the local community of Middega Tolla woreda.

Under this study, the researcher made an initial contact with the woreda administrators. This enabled him to identify the appropriate kebele office sites where the actual survey is to be made. After that the researcher made contact with the kebele administrators who highlighted him about the respondents. Once the researcher has identified where the sample households were found, interviews were made through trained enumerators and two supervisors in the months of February and March, 2009.

A total of 203 sample household heads selected from five kebeles of the woreda were used for the survey. Key informant discussions were made with woreda administrators, experts from bureau of Agriculture and managers from the Flora Eco Power Company. Five focus group discussions with 7-10 group members were held. At least 2 hours per kebele were elapsed to conduct the focus group discussion this was to strengthen to gather more explanations for the data collected under the other methods. While administering interviews with the key

informants and discussions, the information was recorded manually and photography was also used.

4.2 Sampling Frame, Sampling Technique and Sample Size

4.2.1 Sampling Frame

Smith (1995) noted that a sampling frame consists of the totality of elements or units within a given population. With in this context, the sampling frame for this study was the lists of communal farmer households living in the five kebeles with in the woreda (population) involved in castor bean production for agro-fuel purposes and others who never participated in castor bean production within this woreda. The head of the farm household who actually makes the day-to-day decisions on farm activities was used as the basic sampling unit for this study.

There is difference among the population living in the woreda in terms of participation. Some households are engaged in castor been production for agro-fuel purposes under the contractual agreement with the Flora Eco-Power company. Others have refused to produce castor bean for agro-fuel purpose and hence did not enter into the contractual agreement with the company. Because of the existence of this difference,the researcher chose to study whether agro-fuel production has brought an impact on the livelihood of the local community who participated in castor bean production by comparing the two groups (experimental and control group) against the livelihood components (parameters). The study used the with and without the project comparison approach in identifying the impact of the project on the local community.

The list of names of the Kebeles obtained from the Middega Tolla woreda administration office (MTWAO) was used as a frame to select the sample area (Kebeles) in the woreda. A fresh list of households from both villages of the sample kebeles was prepared by the woreda and kebele officials at the beginning

of the survey period. This list was, thus, used as a frame in order to select sample households from the sample kebeles.

4.2.2 Sampling Techniques

Since Midhega Tolla woreda consists of 19 kebeles and 170 villages of both participants and non participants, it was essential for the study to select representative kebeles and households for inclusion in the research. In this respect, a multistage sampling approach was used to select the farm households to be surveyed.

Although all the kebeles in the woreda consist of participants and non participants in castor bean production for agro-fuels, the degree and extent of the participation and non-participation among the kebeles differ to some extent.

In the first stage, the population of the woreda was stratified into two sub-groups-participant and non-participant kebeles, based on their participation and non-participation in castor bean production.

In the second stage, the participants were clustered into 11 kebeles and the non-participants into 8 kebeles being one cluster one kebele.

In the third stage, each kebele from the participants and non-participants was written in small pieces of papers and these papers placed in a hut and three kebeles from participants, namely Mudi Tolla, Roba and Lencha were selected randomly and from the non-participants, two kebeles namely Urgii and Qrensa were selected randomly. Three participant kebeles were selected in order to see the available options of castor bean production.

In the fourth stage, a systematic random sample of the study unit (household head) was selected from each kebele.

"The more confidents we are that the sample that we study is representative of the population, the more confident we can be in the generalization we make about the population (Rubin, 1993).

4.3.3 Sample Size

Sample size is mostly determined by variability of the population, considering financial constraints, and availability and adequacy of other resources such as trained man power and time (Assefa, 1995). Taking these issues into consideration, a total of 203 farm household heads (103 participants and 100 non-participants) were sampled. The total sample size was determined using the following formula (Kinfe, 2002 in Dagnew, 2006).

a) $n_o = \frac{z^2pq}{d^2}$ b) $n = \frac{n_o}{1 + \frac{no-1}{N}}$

Where n_o – is the desired sample size when the population is greater than 10,000

n- is the number of sample size when the population is less than 10,000

z-is 95% confidence limit, i.e., 1.96

p-is proportion of the population to be included in the sample, i.e., 17%)

q-is 1-p i.e., 1-0.17=0.83

N- is the total number of the population

d- is margin of error or degree of accuracy desired usually at o.o5

The method resulted in a sample size of about 203. These sampled households were selected randomly from the respective list of farmers in the selected five kebeles using probability proportional to the size of the population of each kebele from which the sample households were to be drawn (Table 3.1). However, a valid sample size of 197 households was entered in the analysis from all the five kebeles. The remaining sample is accounted to be invalid because some of the required variables were missed by the enumerators at the start of the data collection and it was difficult to get the farmers for the second time.

Table 3.1: Distribution of sampled households in the study area, Midhega Tolla, 2009.

Kebele Name	Total HHHs	Percentage (%)	Sampled HH
Mudi Tolla	541	16.4	33
Roba	555	16.8	34
Lencha	577	17.5	36
Urgii	745	22.6	46
Qerensa	882	26.7	54
Total	3300	100%	203

3.4 Data collection

Before collecting data, it is unequivocal to identify the source, types of data to be collected and the tools used to collect the data. These issues are discussed in the following sections.

4.4.1 Data Source

The study utilized both primary and secondary data sources. The primary sources were the sample household heads, woreda administrators and Flora Eco Power managers. It is believed that the use of these different sources helps to triangulate the information collected from these sources. The secondary data sources include different published journals and pamphlets published by the relevant woreda offices, zonal and regional bureaus particularly from the woreda Office of Agriculture and Rural Development.

3.4.2 Data Type

This study used both quantitative and qualitative data types. Qualitative data of the study include information from the focus group discussions, key informants

interviews and responses from the structured and semi-structured questionnaires that cannot be quantified numerically. The quantitative data of the study were information collected from the different sources which can be quantified numerically such as amount of livestock, land size, family size, income of households, and so on.

3.4.3 Data Collection Techniques

Leedy (1980) defines research instruments as data gathering tools used to collect the required data at a specific time and for specific needs. In this study, structured and semi structured interview questionnaire, focus group discussions, key informants interview and participant observation techniques were employed to collect the necessary data.

Structured interview schedule

A structured questionnaire consisting of both open and closed ended questions was used or administered to the 203 households in Midhega Tolla woreda through the administration office of the woreda using eight enumerators and two supervisions. Before the actual data collection process started, the questionnaire was translated into Oromiffa (native language) and also back to English language to check the translation's reliability. This questionnaire was pre-tested to take corrective measures and the survey was done by trained enumerators who were chosen from the woreda based on their educational and experience merits.

Semi structured interviews

Semi structures interviews were conducted with key stakeholders and these include Flora Eco Power Company administrator, investment officer of the Eastern Hararghe Zone, woreda administration and the zonal agriculture Bureau among others. Issues discussed were mainly related to the impact of the agro-fuel project on the local community both negatively and positively, the

company's relation with the community and government bureaus, the sustainability of the project, and so on.

Focus Group discussion

These were discussions that took place between the researchers and groups of individuals taken from a particular community using particular demographic characteristics, such as age, sex area from which individual reside, group membership etc. This was held with about 8-10 formers and issues discussed were drawn from the mainstream structured interview schedule.

4.5 Methods of Data Processing and Presenting

Data processing: the data processing activities were undertaken in Addis Ababa at Fasika SPSS Training Center around Menen area of Sidist killo. These activities included manual editing, coding, verification, and data entry.

Data editing coding and capturing: this was carried out at the SPSS training center by the staff members who are specialized in this field. This was completed in 16 days.

In addition to data, editing, coding and capturing, and data validity checking and data cleaning activities, the data was fed into a computer system to produce the out puts using statistical package for social scientist (SPSS version 15.0)

4.6 Presentation of Results

The main concern of this study is to assess the impact of agro-fuel investment on the livelihood of the Midhega Tolla community. This question is answered on five fronts, firstly by assessing the effects of agro-fuel development in terms of offering more choices and flexibility that people have in their livelihood strategies, secondly to investigate the effects of agro-fuel development (expanding castor bean production) on the existing livelihood assets of the rural community under the study area in terms access ad ownership rights of capitals.

CHAPTER FIVE: RESULTS AND DISCUSSION

The crux of the matter in this study is to assess the impact of the agro-fuel investment of the Flora Eco-Power project on the livelihoods of the rural community in the Midhega Tolla woreda. This assessment was undertaken on five fronts namely, livelihood strategies, livelihood assets, policies, vulnerability contexts and livelihood outcomes. Hence, this chapter presents the results and discuses the results by giving due emphasis on the purpose of the research objectives. For the sake of clarity and ease of understanding, the households demographic characteristics followed by the above five aspects are discussed separately.

5.1 Description of the Household Characteristics

The household data are disaggregated by participation category to provide the first impression of the difference between the categories (participants and non-participants).

5.1.1 Sex and Age of the Sample Households

A. Sex of Household Head

Crop choices in African agriculture are often done along gender lines. Thus, there are certain crops which are referred to as women crops and other crops that are identified with males (AREX, 2004). The issue of gender is raised here to see whether male headed or female headed households are more engaged in castor bean production in the study area. Table 5.1 shows the gender and age distribution of the sample households.

The majority of the overall respondents (94.9 %) were males while about 5.1 % were females. With regard to the sex distribution of the sample households for with the project group about 91.8 % and 8.2 % were male and female headed

households respectively. Likewise, for the without group the proportion of male headed and female headed household respondents were about 98 % and 2 % correspondingly (Table 5.1). In both cases the proportion of male headed households was higher than the female headed households.

Table 5.1 Gender and age distribution of sample household heads

Characteristics	With(N=97)		Without(N=100)		Total(N=197)	
	No.	%	No.	%	No.	%
Sex of HHH						
Male	89	91.8	98	98.0	187	94.9
Female	8	8.2	2	2.0	10	5.1
Total	**97**	**100**	**100**	**100**	**197**	**100**
Age of HHH						
18-30	36	37.1	37	37	73	37.2
31-40	38	39.2	40	40	78	39.6
41-50	15	15.7	20	20	35	18.8
51-60	6	6	3	3	9	4.6
>=61	2	2	0	0	2	1.0
Total	**97**		**100**		**197**	**100**
Average	**37**		**35**		**36**	

Source: Household Survey, 2009

B. Age of the Household Head

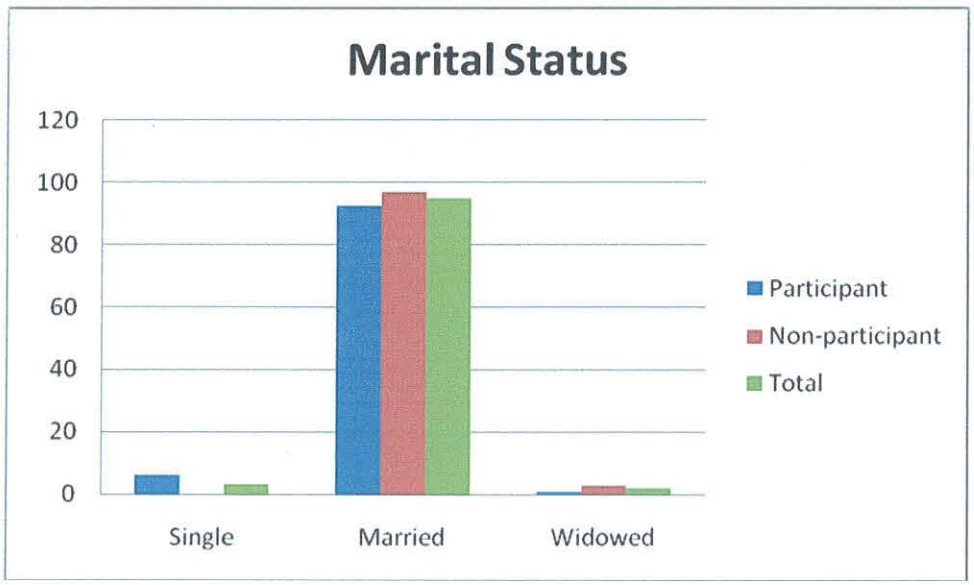
Several studies (Young, 1991; Adesina, 1993 and Feder, 1985) have shown that relatively older farmers are not willing to accept new technologies. Since castor bean production for agro-fuel is new phenomena in the study area, age of the household head may have an influence on households' involvement for its production. Age distribution of the household head is shown in Table 5.1 above. €The Table indicated that the average age of the sample households was 36. The minimum and maximum age range for the total sample households was 18 and 70 years respectively. The large proportion (99 %) of the sample households were found between the productive age of 18 to 60 years. The average age (37 years) for the with the project group is higher than that of the without group (35 years). This implies that most of the sample households in the study area are found in

the productive age category which in turn is considered as a crucial element for their livelihood improvement.

5.1.2 Marital Status of the Household Heads

As far as marital status is concerned, married households are assumed to be risk averters in accepting new technologies than the other categories. Marital status of the household heads was considered to visualize its influence on castor bean production. Figure 5.1 depicts the marital status of the sample households in the study area.

Figure 5.1: Marital status of sample households



Source: Household Survey, 2009

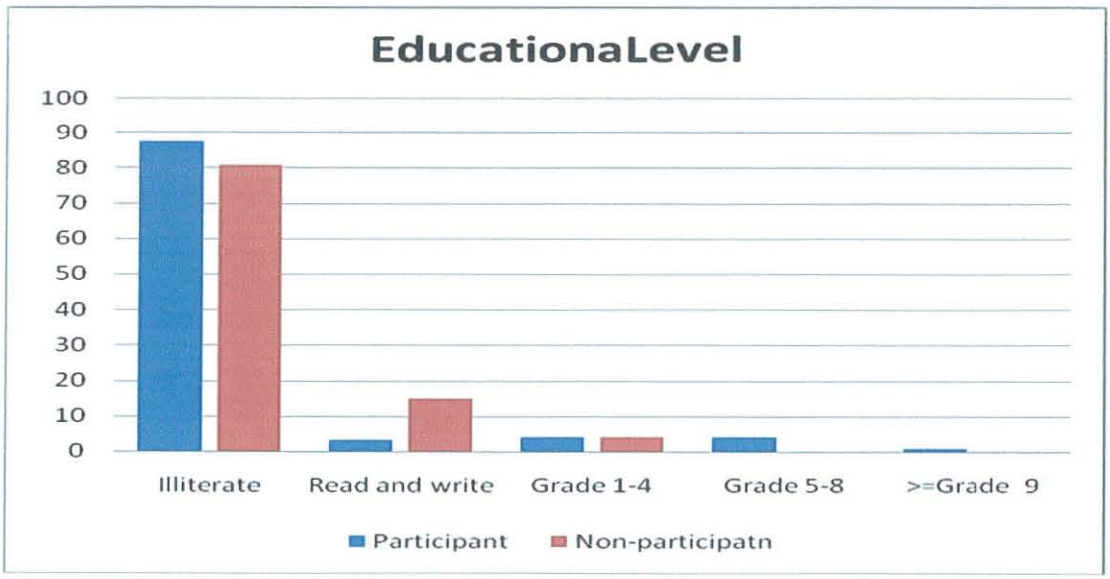
With regard to the distribution of the sample respondents with their marital status a large proportion (94.9 %) of them were married followed by single (3.1 %) and widowed (2.0 %). For the with the project group most (92.8 %) of the respondents were married while only 1 % were widowed. Similarly for the without the project group about 97 % of the sample households were married followed by widowed respondents which accounts for 3 % only(Figure 5.1). This situation enables most respondents to have family labor which is a key asset to

improve the livelihood of the household through employment. In general, the largest proportion of respondents was married while the case of widowed households was minimal in the study area. This may be due to the Muslim religion factor as a man can marry more than one woman.

5.1.3 Educational Level of the Household Head

Education is often identified as important variable influencing incomes of households and status of human capital (Young, 1999).It is one of the most important human capital elements to pursue the livelihood as it provides the basis for better employment opportunity for the betterment of individual as well as household life. Education is the key component of the human development. The following (Figure 5.2) shows the educational status of the sample households.

Figure 5.2: Distribution of sample households by educational level



Source: Household Survey, 2009

The educational status of sample households varied across households. The majority (84. 3%) of the respondents were illiterate. About 9.1% of the total sample households can read and write. Only 4.1% and 2% of respondents were found in grade 1-4 and 5-8 respectively. In general, 84.3 % and 15.7% of the total

sample households were illiterate and literate. For the with the project group a large proportion (81%) of the respondents were illiterate followed by read and write (15%) and grade 1-4 (4.2%). On the contrary, about 87.6% of the respondents were illiterate. The proportions of households who can read and write constitute only 3.1%(Figure 5.2). This shows that the educational status of the people of the study area is at low level. This might be due to the influence of the religion and culture as most of the residents might want the religion affiliated education rather than the formal and modern education. The educational level of with the project households is relatively higher than that of the without groups. This might enable the respondents to be employed in different income generating employment opportunities so as to improve the livelihood at household level.

5.1.4 Family Size of the Households

The definition of household was adopted from Stack (2002) who argues that it is a group of people staying together and sharing the same pot for at least six months of a year. Family size of the household is an important parameter as it influences labour supply and subsistence requirement. Table 5.2 shows the family size of the sample households.

Table 5.2: Family Size of Households

Characteristics	With(N=97)		Without(N=100)		Total(N=197)	
	No.	%	No.	%	No.	%
Family size						
1-3	15	15.4	11	11	26	13
4-6	39	40.2	48	48	87	44
7-9	38	39	34	34	72	37
>=10	5	5	7	7	12	6
Total	**97**	**100**	**100**	**100**	**197**	**100**
Average	**6.1**		**6.1**		**6.1**	

Source: Household Survey, 2009

Regarding the family size of sample households the majority (81 %) of them have the family size that ranges between 4-9 persons per household. About 13 % and 6 % of the overall respondents have family size of 1-3 and more than 6 persons in a household respectively. The average family size of the total sample households is 6 persons per household (Table 5.2).

Table 5.2 indicates that the average family size of with the project is about 6 persons per household. The large proportion (79.2 %) of with the project respondents has the family size of 4-9 persons per household. On the other hand, 15.4 % and 5 % have the family size of 1-3 and more than 9 persons per household.

Most (82 %)of the respondents of the without the project group have the family size of 4-9 persons in a household. Households with the family size of 1-3 and more than 9 persons per household account for 11 % and 7 % correspondingly. The average family size of this group is 6 persons (Table 5.2). It is similar with the average family size of the with the project group as well as the overall sample

households. It suggests that the family size of the with the project group is similar when it is compared with the regional average family size (CSA, 2007).

5.1.5 Religion of the Households

The result of the survey indicates that all (100 %) sample households in the study area are muslim in religion. The information obtained from the key informant interview, focus group discussion and review of secondary data also reveals that the whole community of the study area is muslim religion follower. As a result, the respondents of the with and without the project groups are also muslims. Religion may be one of the factors for the livelihood of the households.

5.2 Livelihood Activities/Strategies

The three livelihood activities or strategies namely, agriculture, livelihood diversifications (off-farm and non-farm activities) and migration are briefly discussed in this section.

5.2.1 Agriculture

Agricultural extensification and intensification is the main livelihood strategy of the people of the study area. It is the building block of the livelihood of the local people in general and the sample households in particular. Mixed farming which includes both crop and livestock production is the typical farming system of the people in the area. As crop production and livestock production are the most commonly practiced agricultural activities in the study area, discussing them separately is indispensible.

5.2.1.1 Crop Production

Annual crop production and cash crop production are the agricultural activities that all respondents are undertaking to enhance their livelihood. Crop production of the sample households is shown in Table 5.3

Fig 5.3 Focus group Discussion

Source: Survey 2009

Sorghum, maize, ground nut and sweet potato are the main annual crop types grown widely in the area. Likewise, coffee, chat and castor bean are also the major cash crops grown in the study area as source of people's livelihood. A large number of livestock are reared as there is grazing land and the area is suitable for livestock production. The information obtained from key informant interview, focus group discussion (Figure 5.3) and review of secondary documents the contribution of crop production is higher than that of livestock rearing.

As shown in Table 5.3, all sample households engage in farming activities upon which their livelihood is completely build on. The same table also indicates that about 100 %, 86.3 %, 24.4 % and 14.2 % of the total sample households were engaged in sorghum, maize, ground nut and sweet potato production activities respectively. With regard to the engagement of the respondents in the different livelihood activities particularly in farming components about 100%, 85.6 %,24 % and 13.4 % of with the project sample households engage in sorghum, maize, ground nut and sweet potato production activities correspondingly. Similarly,

without the project respondents who have been participated in sorghum, maize, ground nut and sweet potato production activities constitute 100 %, 87 %,25 and 15 respectively(Table 5.3). This indicates that in terms of the portfolios of livelihood activities that both groups are engaged are similar and there is no difference in this regard. It implies that for the overall sample households, for the with the project and without the project groups sorghum production is the main livelihood activity followed by maize production, ground nut production and sweet potato production activities.

Table 5.3: Crop production of the sample households

Crop production	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Annual Crop production						
Sorghum production	97	100	100	100	197	100
Maize production	83	85.6	87	87	170	86.3
Ground nut production	23	24.0	25	25	48	24.4
Sweet potato production	13	13.4	15	15	28	14.2
Cash crop production						
Coffee production	26	26.8	24	24	50	25.4
Chat production	88	90.7	90	90	178	90.4
Castor bean production	97	100	0	0	97	49.2

Source: Household Survey, 2009

In terms of the participation of the overall sample households in the cash crop production activities about 90.4 %, 49 .2 % and 25.4 % have undertaken chat, castor bean and coffee production practices. About 90.7 %, 100 % and 26.8 % of with the project groups were involved in the chat, castor bean and coffee production activities correspondingly. When the data is investigated disaggregated the largest proportion (90.4 %) of the sample households has been

participated in the chat production followed by castor bean production (49.4 %) and coffee production (25.4 %). On the other hand all (100 %) respondents of the with the project group were engaged in castor bean production activity followed by chat production and coffee production respectively. This implies that castor bean production is the most important livelihood activity of the entire sample households for the with the project group. Likewise, for without the project group most of the respondents (90 %) were participated in chat production (24 %) activity followed by coffee production activity (Table 5.3). In this case/group that chat production is the predominant livelihood activity for the majority of the sample households. No respondent is engaged in the castor bean production in the study area. This makes a big and significant difference between with the project and without the project groups.

5.2.1.2 Livestock Production

Livestock production is one of the main farming activities in the study area. It is crucial in improving the livelihood of households in aspects. Many people in this study area undertake livestock rearing activity in integration with crop production for their livelihood. Livestock are considered as the main natural asset as they are the source of food and income.

Table 5.4 shows that ox, cow, bull, heifer, calf, goat, sheep and donkey are the main livestock types reared widely in the study area. Both the with and without the project groups engage in livestock rearing activities as a main source of livelihood activities. As the study area is suitable for livestock production almost all households of the study area undertake livestock rearing activity. The size of livestock is estimated through Tropical Livestock Unit (TLU), the standard measurement of livestock size. Each livestock size was converted in to TLU through the conversion factor. TLU is 250 kg body weight of livestock.

Table 5.4: Livestock Size of Sample Households

Livestock	**With(N=97)**			**Without(N=100)**		
	TLU**			**TLU****		
	Before	**After**	**Diff**	**Before**	**After**	**Diff.**
Ox	38	14	-24	30	44	14
Cow	204	126	-78	96	98	2
Bull	61.8	41.4	-20.4	26.4	45	18.6
Heifer	36.6	16.8	19.8	15	13.8	1.2
Calf	8.6	4.8	-3.8	3.7	4.7	1
Goat	88.05	39.15	-48.9	48.6	63.3	14.7
Sheep	25.2	11.55	-13.65	14.55	22.05	7.5
Donkey	61.75	47.44	-14.31	53.95	78	24.05
Total	**524.95**	**301.15**	**-223.8**	**288.2**	**368.85**	**80.65**
Average	**5.78**	**3.1**	**-2.68**	**2.90**	**3.7**	**0.8**
t-test	5.19* (before)			-1.164 (after)		

Source: Household Survey, 2009 * refers significant at 5%

**Conversion factor for TLU equivalent are: ox/cow=1, bull/heifer=0.75, calf=0.25, goat/sheep=0.13 and donkey=0.70 (Strock et al., 1991 in Kebede, 2006)

The average livestock size of the participants and non-participants before the project was 5.78 TLU and 2.90 TLU respectively indicating that the average size of livestock owned by the participant households is higher than that of the non-participant respondents (Table 5.4). An independent sample t-test was conducted to compare the mean difference in TLU owned between participants and non-participants before the project intervention. The result shows that there is statistical significant (t=5.19) difference between two categories in livestock

holding before the project intervention. It implies that the participants had better livestock production capacity than the non-participants.

After the project intervention, the average livestock size of the participants decreased to 3.1TLU while the non-participants livestock holding increased to 3.7 TLU. This means the non-participants livestock holding size is relatively higher than the participants after the project intervention. An independent sample t-test was conducted to compare the mean difference in TLU owned between participants and non-participants after the project intervention. The result of statistical test (t=-1.164) shows non-significant but negative difference between two categories in livestock holding after the project intervention indicating that the project has no positive impact on the size, access to and ownership of livestock. The reason could participants allocated their land holding to castor bean production that could have been used for livestock rearing.

5.2.2 Livelihood Diversifications

Livelihood diversification includes both off-farm and non-farm activities which are rarely undertaken in the study area. Table 5.5 shows sample household who have been engaged in different livelihood diversification activities.

Table 5.5: Distribution of sample households involved in livelihood diversification and migration

Livelihood Diversification	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Off-farm Activities						
Selling of livestock products	22	22.6	11	11.0	33	16.8
Selling of crops	17	17.5	8	8.0	25	12.7
Non-farm Activities						
Food aid	14	14.7	24	24	38	19
Migration	**6**	**6.2**	**0**	**0**	**6**	**6.2**

Source: Household survey, 2009

As indicated in Table 5.5, from the total sample households (N=197) only 29.5% and 19% have been involved in off-farm and non-farm activities, respectively, in the study area. The same Table also revealed that only 6.2% of the total sample households have been migrated temporarily to earn additional income. This shows that most of the households in the study area are not engaged in income diversification activities.

About 40% of participants and only 19% of the non-participants have been engaged in off-farm activities. The major type of off-farm activities in which households were engaged was selling of livestock products where 22.6%and 11.0% of participants and non-participants respectively (Table 5.5). Selling of crop was also one of the off-farm activities in which some (17.5%) of participant and 8% of the non-participant households are engaged in. As far as non-farm activities are concerned, 14.7% of the participants and 24% of the non-participants have been involved in food aid activity which is the only non-farm activity where the sample households participated (Table 5.5). This implies that the non-participant households are not food secured than that of the participant households in Midhega Tolla woreda. Furthermore, Table 5.5 indicted that only 6.2% of the participant households migrated temporarily for better income but no one from the non-participants migrated either temporarily or permanently implying that participants had better opportunity in getting more income from temporary migration.

5.3 Livelihood Assets

Assets are the basic to achieve positive livelihood outcomes. No single category of asset is sufficient to produce the entire main and various livelihood outcomes that people seek to have. Assets are analyzed in terms of ownership or access/right to use. Hence, in this section access to land, labour availability, access to financial, social, and human capitals are analyzed.

5.3.1 Households Access to Land

Land is one of the key natural capitals from which the livelihood is depend on. It is the basis for the livelihood of an individual or a household particularly in the rural context. It is the important resource from which livelihood activities such as crop production and livestock rearing takes place. Besides, social services are also provided being constructed on the available land. Table 5.6 shows land access of the sample households.

Table 5.6: Distribution of Sample Households by land Access

Land Category	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Farmland						
Yes	97	100	100	100	197	
No	0	0	0	0	0	
Total	**97**	**100**	**100**	**100**	**197**	
Grazing land						
Yes	97	100	100	100	197	
No	0	0	0	0	0	
Total	**97**	**100**	**100**	**100**	**197**	

Source: Household Survey, 2009

As Table 5.6 shows all sample households have access to farmland which is used for production of various crops. Regarding the grazing land access, both groups have owned grazing land. Access to grazing land is a crucial factor for the livestock rearing which in turn determines the livelihood situation of a household. In many cases access to grazing land is considered as a basis for livestock production.

The average land holding size of cultivated land per household is 14 timad. The average size of farm land for with the project and without the project groups was 15 timad and 14 timad respectively (Table 5.7). The majority of respondents for

the with the project group have relatively higher land holding size than that of the without groups. However, the land holding size difference between the with and without the project groups is slight and negligible. The reason for the relatively higher size of the plot size for the with the project groups is due to the fact that these respondents are engaged in castor bean production which has some added value to improve their livelihood. This implies that the project has influenced beneficiaries to have a little bit larger size of cultivated land as compared to the without the project group.

Table 5.7: Land holding sizes of Sample Households

Land Category	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Size of farmland (timad*)						
< 5	7	7.2	11	11	18	9.1
5-10	34	35.1	37	37	71	36
10-15	46	47.4	43	43	89	45.2
>15	10	10.3	9	9	19	9.7
Total	**97**		**100**		**197**	**100**
Average	**15**		**14**		**14**	
Size of grazing land (timad)						
< 5	49	50.5	42	42	91	46.2
5-10	40	41.2	42	42	82	41.7
10-15	8	8.3	10	10	18	9.1
>15	0	0	6	6	6	7
Total	**97**	**100**	**100**	**100**	**197**	
Average	**8**		**9**		**8**	

Source: Household Survey, 2009 * 1 timad=0.25 hectares

As can be seen from the Table 5.7, a large proportion (47.4%) of with the project sample households has cultivated land that ranges 10-15 timad. About 35.1%, 10.3 5 and 7.2% of respondents have owned 10-15 timad, more than 15 timad and less than 5 timad respectively. In the same way, respondents of the without the project group who have 10-15 timad, 5-10 timad, more than 15 timad and less than 5 timad account for 43%, 37%, 11% and 9% correspondingly. This shows that the large proportion of the without the project respondents have owned cultivated land ranged between 10-15 timad.

The average grazing land size for the overall sample households is 8 timad. It is relatively higher for the without the project group though the difference is slight. The reason may be with the project respondents were engaged in castor bean production by cultivating some of their plot. Most (91%) of the sample households have grazing land which is less than 5 timad. About 50.5 and 42% of the with the project and without the project groups have grazing land which is less than 5 timad respectively (Table 5.7).

Table 5.8: Average Farm Land Size Allocation by Crop Type

Plot Size (Timad) by Crop	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	Timad	**%**	**Timad**	**%**	**No.**	**%**
Annual Crop production						
Sorghum production	6	40	8	57.1	7	50
Maize production	3.5	23.3	3	21.4	3	21.4
Total Average	**9.5**	**63.3**	**11**	**78.6**		**71.4**
Cash crop production						
Coffee production	1	6.7	1	7.1	1	7.1
Chat production	3	20	2	14.3	2	14.3
Castor bean production	1.5	10	0	0	1	7.1
Total Average	**5.5**	**36.7**	**3**	**21.4**		**28.5**
Total average	**15**	**100**	**14**	**100**	**14**	**100**

Source: Household Survey, 2009

As the cropping pattern varies from household to household depending on the preference of the household, the allocation of cultivated land varies accordingly.

Farm land allocated for annual crops production and cash crop production varies between the two groups. Table 5.8 reveals that the largest proportion (71.4 %) of cultivated land of the total respondents is allocated for annual crop production while the cash crop production covers only 28.5 % of cultivated land. this clearly reveals that annual crops are the main livelihood activities and resources in the study area. About 50 % of the cultivated land of the sample households is covered by sorghum production followed by maize (21.4 %) and chat production (14.3 %).

In the case the with the project group the large proportion of farmland is covered by annual crops(63.3 %) followed by cash crops (36.7 %). Under the category of annual crop production largest proportion (40 %) of farm land was allocated to sorghum production followed by maize production (23.3 %). Under the cash crop production category chat production covers the large size (20 %) of the cultivated land followed by castor bean production which covers about 10 % timad of farmland (Table 5.8). This implies that a large number of households are engaged in castor bean production activity so as to improve their livelihood as a result of the operation of the bio-fuel project in the study area. Key informants and focus group discussants revealed that castor bean production is a new livelihood activity introduced by the project. Many key informants and focus group discussion members revealed that castor bean production activity is considered as a positive impact of the project as it benefits many households in improving their livelihood by providing employment opportunities in several aspects.

In the case of the without the project group the greater size (78.6 %) of farmland is allocated to annual crops production. Sorghum takes the share of 57.1 % followed by maize production (21.4 %). The large proportion of cultivated land size is allocated to *chat* production followed by the coffee production under the

cash crop production category. In this group there is no cultivated land allocated for castor bean production as there is no castor bean production activity. The difference between the two cases is therefore the practice of castor bean production. One of the changes/impacts of the project in the study area is the introduction and practice of castor bean production as a diversified livelihood activity by many community members in the study area.

5.3.2 Labour Availability

Labour availability is an economic factor of production that is considered as basic resource in the overall production process of the farming units. Household labour is an essential asset for the livelihood of the household. It does not always mean that too large and too small family size is important. Rather, it could be a challenge to improve the household livelihood. However, optimal size of family size enables households to enhance their households. Family size is the key for human capital which in turn is the main determinant factor of the people's livelihood. Table 5.9 indicates the sample households' family size.

Table 5.9: Family Size of Households

Family size	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
1-3	15	15.4	11	11	26	13
4-6	39	40.2	48	48	87	44
7-9	38	39	34	34	72	37
>=10	5	5	7	7	12	6
Total	**97**	**100**	**100**	**100**	**197**	**100**
Average	**6.1**		**6.1**		**6.1**	

Source: Household Survey, 2009

Regarding the family size of sample households the majority (81 %) of them have the family size that ranges between 4-9 persons per household. About 13 %

and 6 % of the overall respondents have family size of 1-3 and more than 9 persons in a household respectively. The average family size of the total sample households is 6 persons per household (Table 5.9).

Table 5.9 indicates that the average family size of with the project is about 6 persons per household. The large proportion (79.2 %) of with the project respondents has the family size of 4-9 persons per household. On the other hand, 15.4 % and 5 % have the family size of 1-3 and more than 9 persons per household.

Most (82 %) of the respondents of the without the project group have the family size of 4-9 persons in a household. Households with the family size of 1-3 and more than 9 persons per household account for 11 % and 7 % correspondingly. The average family size of this group is 6 persons (Table 5.2). It is similar with the average family size of the with the project group as well as the overall sample households. It suggests that the family size of the with the project group is similar when it is compared with the regional average family size (CSA, 2007).

5.3.3 Human Capital

Education is a key element for human capacity development. It is an essential strategy for human capital development. It can be ensured through formal as well as non-formal education system. The education system is broadly categorized as illiterate and literate. Literate status includes reading and writing acquired through different education systems. In this study a person who is 10 years old and able to read and write through any mechanisms is included in the literate category.

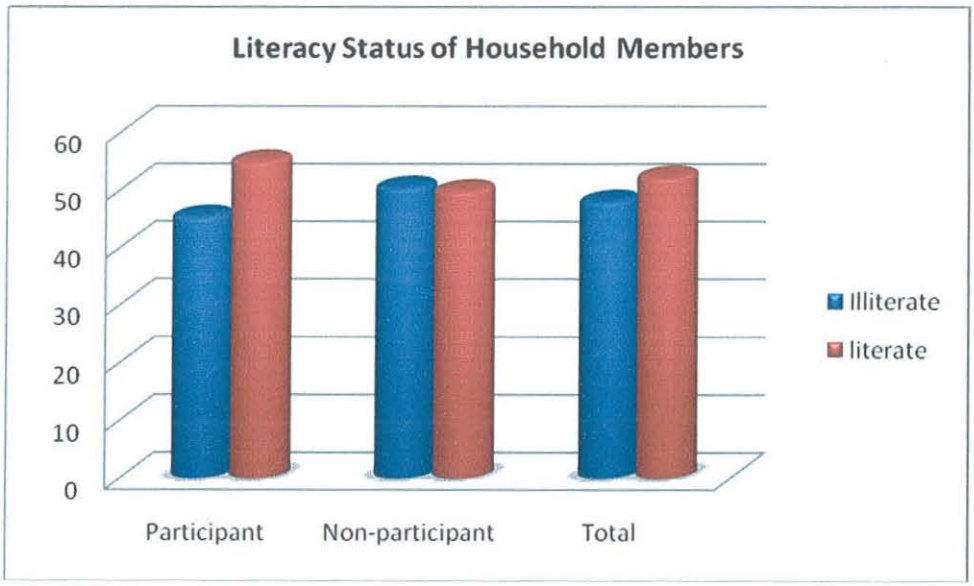
Table 5.10: Literacy Status of Household Head

Educational Status	With(N=97)		Without(N=100)		Total(N=197)	
	No.	%	No.	%	No.	%
Illiterate	85	87.6	81	81.0	166	84.3
Literate	12	12.4	19	19.0	31	15.7
Total	**97**	**100**	**100**	**100**	**197**	**100**

Source: Household Survey, 2009

As Table5.10 depicts, the majority (84.3 %) of the household heads were illiterate while only 15.7 % of the respondents were found to be literate. For the with the project group about 87.6 % and 12.4 % were illiterate and literate respectively. Similarly, about 81 % and 19 % of the without the project group respondents were illiterate and literate correspondingly. There is no difference in the literacy status of the two cases. This implies that the project intervention has no positive impact on the human capital development of the project beneficiaries through provision of education services in the area.

Figure 5.4: Literacy Status of Household Members



Source: Household Survey, 2009

A household with literate members is expected to have better employment opportunities which lead to improved livelihood. Figure 5.4, indicates that most

(52.1 %) of the members of sample households were literate. On the contrary, 47 % of the members of the overall sample households were illiterate. With regard to the literacy status of the members of the with the project respondents a large proportion of members were literate while about 45.2% remains illiterate. For the case of without the project respondents about 50% of the household members were illiterate whereas 49.9% were literate. There is no as such significant difference between the with and without the project groups on the educational status which is one of the most important element of human capital. This indicates that the project has no positive impact on the human capital of the local people in the study area.

5.3.4 Access to Basic Social Services

Basic social services are the main components of livelihood. Social services are the important livelihood capabilities that directly or indirectly influence the human capital through human development process. Education and health services are the key human development components. These services affect the human capital of a household or an individual. Better access to basic social services brings about increased productivity and better employment opportunity. In line with this access to primary school, access to health facility and access to drinking water are discussed.

Table 5.11: Access to the Nearest Primary School by Walking Distance (Time)

Services by Distance	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Primary school						
Yes	**72**	**74.2**	**71**	**71**	**143**	**72.6**
No	**25**	**25.8**	**29**	**29**	**54**	**27.4**
< 30 minutes	47	48.5	16	16	60	30.5
30-60 minutes	34	35.1	73	73	**107**	**54.3**
>60 minutes	16	16.5	11	11	**27**	**13.7**
Total	**97**	**100**	**100**	**100**	**197**	**100**

Source: Household Survey, 2009

As the Table 5.11 shows a total of 72.6 % of the sample households have access to primary education service while about 27.4 % have no access to primary education service in their locality. As can be seen from Table 5.11, a total of 74.2 % of the with the project respondents have access to primary education services while 25.8 % of them have no access to education service.

For the without the project sample households about 71 % of them have access to primary education service in their living area whereas 29 % of then do not have access to primary education. This result implies that there is no difference between the participants and non-participants with respect to access to primary education in the study area. The non-existence of difference between participants and non-participants implies both categories have more or less equal access to primary education and the project intervention did not bring positive impact in the provision of primary education facilities.

Table 5.12: Access to the Nearest Health Center by Walking Distance (Time)

Services by Distance	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Health facility						
Yes	**33**	**34.0**	**44**	**44**	**77**	**39.1**
No	**64**	**66.0**	**56**	**56**	**120**	**60.9**
< 30 minutes	24	24.7	22	22	46	23.4
30-60 minutes	66	68.0	68	68	134	68.0
>60 minutes	7	7.2	20	20	27	13.7
Total	**97**	**100**	**100**	**100**	**197**	**100**

Source: Household Survey, 2009

As far as primary health facility is concerned, 39.1 % of the overall respondents have access to primary health services whereas the large proportions (60.9 %) of households have no access to health service. Likewise, about 34 %of the participant households have access to health service where as 66% have no access

to primary health service in their residential areas. Similarly, 44% of the non-participants have access to health service while 56 % have no access to primary health services (Table 5.12). Hence, both the participant and non-participant households have low level of health facility access in the study area.

Table 5.13: Access to the Nearest Drinking Water by Walking Distance (Time)

Services by Distance	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Clean Drinking Water source						
Yes	**7**	**7.2**	**0**	**0**	**7**	**3.6**
No	**90**	**92.8**	**100**	**100**	**190**	**96.5**
< 30 minutes	1	1.0	0	0	**1**	**0.5**
30-60 minutes	2	2.1	0	0	**2**	**1.0**
>60 minutes	95	97.9	100	100	**195**	**99.0**
Total	**97**	**100**	**100**	**100**	**197**	**100**

Source: Household Survey, 2009

Regarding to the access of safe drinking water about 3.6 % of the total sample households have clean drinking water service whereas the majority (96.5 %) of the respondents have no any kind of clean water service in the study area. Similarly, only 7.2 % of the with the project sample households have access to clean drinking water access whereas the majority (92.8 %) of them have no safe drinking water service vicinity(Table 5.13). No household have access to clean drinking water i.e., all respondents of the without the project respondents have no access to safe drinking water at all. Here too, access to drinking water is a severe problem in the study area and the project intervention did not bring a positive impact in the provision of drinking water.

In general, there is no difference in the provision of basic social services between the with the project and without the project respondents because of the project intervention in the study area. This implies that the impact of the project in terms of the provision of social services to the local community is minimal.

Fig 5.5 Discussion with the Key informants

Source: Survey 2009

The household survey data as well as information from the key informants (figure 5.5) reveals that access to education, health and clean drinking water in the study area is at low level. The low level access of the service is more or less similar to the with the project and without the project respondents. This implies that there is no difference in the provision of the basic social services between the two groups. It implies that the impact of the castor bean intervention in the provision of these services is extremely little or no.

5.3.5 Access to Social Capital

In the study area there are different types of traditional institutional that people participate for support and networking. Traditional social institutions are important to support the livelihood of individuals or households. In this study area, there are *iddir, equib* and *wonfel/debo* institutions in which the different

community members take part in the system to get different benefits that is directly related to the wellbeing of the people.

As can be seen from the table 5.14, the largest proportion (95.4 %) of the sample households participates in iddir whereas only 4.6 % don't have access to participate in the iddir institution. Likewise, the majority (93.4 %) of respondents don't have access to participate in the equib institution. Only 6.6 % of them have access to involve in the equib system. With respect to the participation of the sample respondents in the debo/wonfel institutions, about 73.1 % have access to take part in the debo/wonfel institution while only 26.9 % of the respondents don't participate in the institution.

Table 5.14: Distribution of sample Households by Access to Traditional Institutions

Institutions	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Iddirs						
Yes	92	94.8	96	96	188	95.4
No	5	5.2	4	4	9	4.6
Total	97	100	100	100	197	100
Equib						
Yes	6	6.2	7	7	13	6.6
No	91	93.8	93	93	184	93.4
Total	97	100	100	100	197	100
Debo/Wonfel						
Yes	56	57.7	88	88	144	73.1
No	41	42.3	12	12	53	26.9
Total	97	100	100	100	197	100

Source: Household Survey, 2009

In the case of with the project respondents the majority of the respondents have got access to participate in iddir whereas only 5.2% of them don't take part in the institution. On the other hand, the low level proportion (6.2%) of respondents has participated in the equib institution while the greater proportion of them does not participate in the system of the institution. The proportions of respondents who have access to participate in debo/wonfel institution constitute 57.7 % whereas 42.3% of them do not involve in the system (Table 5.14).

For without the project respondents about 96 %, 7 % and 88 % have access to participate in the iddir, equib and debo/wonfel institutions respectively. On the contrary, about 4 %, 93 % and 12 % of the sample households don't involve in iddir, equib and debo/wonfel correspondingly. According to the key informants, it is the social obligation to actively participate in iddir since it has reciprocal benefit for every member particularly its benefit is magnificent at the time of funeral or death cases to support the families morally and financially. In both cases households' involvement in the equib institution is lower as most of them prefer to save and borrow their money personally or from relatives. Still, the participation of households in debo/wonfel is very high for both cases as most of the livelihood activities particularly farm operation is carried out through working together. In both cases the difference between the two groups in the participation of the respondents in iddir, equib and debo/wonfel is relatively negligible. It implies that the impact of the project in providing or improving of access to the participation of the sample households in different traditional institutions such as iddir, equib and debo/wonfel is extremely low.

5.3.6 Financial Capital

Access to financial resources is one of the strengths of the people so as to improve their livelihood in a long lasting way. It includes saving of money and credit service from different institutions that can be formal or non-formal institutions. Access to savings and credit service enable people to borrow and

save money to generate income as well as to increase agricultural productivity which in turn is able to improve the livelihood of households.

Table 5.15 Distribution of sample by Access to Financial Capital

Access to Saving and Credit	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Savings						
Yes	90	92.8	84	84	174	88.3
No	**7**	**7.2**	**16**	**16**	**23**	**11.7**
Total	**97**	**100**	**100**	**100**	**197**	**100**
Institution for Saving						
Equib	3	3.1	4	4	7	3.6
Saving & credit institution/MFI	3	3.1	5	5	8	4.1
Personal saving	91	93.8	91	91	182	92.4
Total	97	100	100	100	197	100
Access to Credit						
Yes	**31**	**32**	**35**	**35**	66	**33.5**
No	**66**	**68**	**65**	**65**	131	**66.5**
Total	**97**	**100**	**100**	**100**	**197**	**100**
Source of Credit						
Government	27	27.8	32	32	59	29.9
MFI	33	34	38	38	71	36
Relatives	37	38	30	30	67	34
Total	**97**	**100**	**100**	**100**	**197**	**100**
Access to use of Agric. Inputs						
Yes	10	10.3	15	15	25	12.7
No	87	89.7	85	85	172	87.3
Total	**97**	**100**	**100**	**100**	**197**	**100**
Types of Inputs used						
Improved seed	10	10.3	4	4	14	7.1
Fertilizer (synthetic)	0	0	7	7	7	3.6
Animals	0	0	1	1	1	0.5
Pesticides	0	0	3	3	3	1.5
Total	**10**	**10.3**	**15**	**15**	25	**12.7**

Source: Household Survey, 2009

As the table 5.15, indicates the majority (88.3 %) of the overall sample households in the study area save money while only 11.7 % don't have the habit of saving

money. About 92.8 % and 84 % of with the project and without the project respondents exercise saving of money correspondingly whereas 7.2% and 16 % of the with and without the project households don't save money respectively.

In the study area, people save their money through equib, saving and credit institutions and personal savings. As the table shows about 92.4 %, 4.1 % and 3.6 % of the sample households save their money through personal savings, micro finance and equib respectively. In the case of with the project about 93.8 %, 3.1 % and 3.1 % of the respondents save their money in personal savings, saving and credit institutions and equib respectively. Similarly, about 91 %, 5 % and 4 % of without the project respondents save their money in personal savings, MFIs and equib correspondingly (Table 5.15). In all the cases there is no difference in the culture of savings between the two groups.

As the table 5.15 depicts some (33.5 %) sample households do have credit access while the majority (66.5 %) of them has no credit access. The main sources of credit institutions in this study area are government, microfinance and relatives. About 29.9 %, 36 % and 34 5 of the sample households obtain credit service form government, MFI and relatives respectively. For the with the project respondents about 27.8 %, 34 % and 38 % of them derive credit from government, MFI and relatives correspondingly. The majority (38 %) of without the project households obtain their credit service from saving and credit institution followed by government (32 %) and relatives (30 %) (Table 5.15).

The survey households use different agricultural inputs to increase their agricultural productivity which is the most important livelihood activity of the people of the study area. From the total sample households only 12.7 % use agricultural inputs while the large proportion (87.3%) don't use it. Likewise, only 10 % and 15 % of with and without the project respondents use agricultural

inputs whereas 89.7 5 and 85 % of with and without the project households don't apply agricultural inputs. Improved seed, fertilizer, breading animals and pesticides were the main types of inputs used by the sample households in the study area. However, the utilization of the agricultural inputs is extremely at minimum level.

5.4 Policies, Institutions and Processes (PIPs)

Policies, institutions and processes operate at all levels form the household to the international arena and in all spheres- from the most private to the most pubic. The effectively determines access (to various types of capital, to livelihood strategies & to decision making bodies and sources of influence and the terms of exchange between different types of capital and returns (economic and otherwise to any given livelihood strategy. Hence, these are closely connected to social capital. Institutions are briefly discussed in the previous sections while discussing the sample households' access to social capital. In this section the impact of the agro-fuel development strategy on the livelihood of the community is discussed. This is analyzed in terms of land allocated to the various land owned by the participant households. Table 5.16 depicts the proportion of land allocated to the production of castor bean.

Table 5.16: Proportion of land Allocated to Castor bean production

Name of Keble	Total No of HHHs	HHs who cultivated castor bean on:		Land Allocated for castor (in timad)		Total
		Cultivated	Uncultivated	On cultivated	Uncultivated	
Roba	33	30(90.9)	3 (9.1)	103	5	108
Lencha	33	26(78.8)	7 (21.2)	243	87	330
Total	66	56(84.8	10 (15.2)	346	92	438

Source: Household survey, 2009 Numbers in bracket shows percentage

Table 5.16 shows that from the two kebele sample participant HHs, 56 (84.8%) of the households, cultivated castor on cultivated land while the rest 10 (15.2%) on

uncultivated land. This shows the implementation program of castor bean production in Midhega Tolla woreda violates agro-fuel production and utilization strategies/ policy/.

According to the focus group discussants, households have given land ownership right. They have also right to hold plot of land for crop production and grazing lands. According to the key informants, the Ethiopian agro-fuels production & utilization strategy emphasizes castor bean production should not complete to food coops and grazing lands.

Table 5.17: Distribution of HHs in different options of castor bean production

Options Engaged	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Option 1	52	53.6	0	0	52	26.4
Option 2	17	17.5	0	0	17	8.6
Option 3	5	5.2	0	0	5	2.5
Option 4	23	23.7	0	0	23	11.7
Total	97	100	0	0	197	100

Source: Household Survey, 2009

With regard to the participation of the with the project sample households the majority (53.6%) of them have been involved in the option 1 castor bean production system followed by option 4 and option 2 implying that castor bean production greatly competed land that could have been used for crop and livestock productions. This is also another violate of the agro-fuel development strategy and energy policy at large. Therefore, policies did not bring positive impact on the livelihoods of the community in Midhega Tolla woreda.

5.5 Vulnerability Contexts

This attention to vulnerability context arises from a conviction that development and change is path-dependent that previous events define and limit to some degree to potions available for contemporary livelihood such influence may widen or narrow the options available, the only general rule is that the specificities and dynamics of the context will inevitably play a role in shaping livelihood choices.

Table 5.17 Distribution of Sample Households by Employment Opportunity

Employment opportunity	**With(N=97)**		**Without(N=100)**		**Total(N=197)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Employment opportunity						
Yes	65	67	0	0	65	33
No	32	33	100	100	132	67
Total	**97**	**100**	**100**	**100**	**197**	**100**
No. of employees						
0	0	0	100	100	100	50.8
1	33	34	0	0	33	16.8
2	43	44.3	0	0	43	21.8
3	13	13.4	0	0	13	6.6
4	8	8.2	0	0	8	4
Total	97	100	100	0	197	100
Benefit from the project/Company						
Yes	90	92.8	0	0	90	45.7
No	7	7.2	100	100	107	54.3
Total	97	100	100	100	197	100
Types of Benefits						
Employment opportunity	45	46.4	0	0	45	22.8
Production and selling of castor bean	52	53.6	0	0	52	26.4
Total	97	100	0	0	97	49.2

The key component of vulnerability context in the study area is natural shock (drought) according to the respondents. Hence, the focus of the study was to see the role of the project on narrowing the adverse effect of the recurrent drought.

Table 5.17 shows the employment opportunity generated by the castor bean production in the study area.

Employment opportunity is through which people may be benefited from any development project. The project/company has provided employment to the local people in different aspects. Employment is used to generate income for livelihood thereby increases their drought resistance power.

5.6 Livelihood Outcomes

These are achievements or outputs of livelihood strategies. This includes more income, increased will being, reduced vulnerability, improved food security and more sustainable use of natural resource base.

The study investigated the cumulative impact of the project in order to the community to attain more income, increased wellbeing, reduced vulnerability, improved food security and more sustainable use of natural resource. Income is a key element of the livelihood outcomes. It determines the livelihood of a household or an individual. It is obtained from different livelihood or income generating activities. Table 5.18 shows households annual income generated from the various livelihood activities.

Table 5.17 reveals that about 67 % of the sample households have got employment opportunity in the project. On the contrary, 33% of them didn't get employment opportunity by the project. All respondents of the with the project group have got different benefits from the project. On the contrary, non-participants did not get employment opportunity by the project. This condition makes a big difference between the two groups on the employment opportunity. The employment opportunity includes selling of labor to work in the project farm activities and production and selling of castor bean to the project/company. As a result, about 53.6 % and 46.4 % of the project beneficiaries were participated in the production and selling of castor bean and labor selling in farm activities of

the project respectively. It means that the project has provided better employment opportunities to the local people. All respondents of the with the project household have participated in the castor bean production activity whereas no household is involved in the production of castor bean in the case of without the project households.

Table 5.18: Distribution of sample Households by Average Annual Income of Sample Households

Income Sources	**With(N=97)**			**Without(N=100)**			**Net Income (Birr/HH)**
	Income(Birr/HH)			**Income(Birr/HH)**			**Income(Birr/HH)**
	Before	**After**	**Diff**	**Before**	**After**	**Diff.**	**In Difference**
Annual Crop production							
Sorghum production	2940	1898	-1042	2508	2620	112	-903
Maize production	1134	1034	-134	1370	1153	-217	**-83**
Ground nut production	550	500	-50	391	384	-7	**-43**
Sweet potato production	320	260	40	345	350	5	35
Average (Mean)	**4944**	**3692**	**-1226**	**4614**	**4507**	**-107**	**-911**
t-test	-2.51*s		-3.9*m				
Cash crop production							
Coffee production	250	452	2	153	150	-3	-1
Chat production	100	165	65	384	396	12	53
Castor bean production	0	560	560	0	0	0	560
Total Average	**350**	**1177**	**627**	**513**	**546**	**9**	**612**
t-test		-5.31*					
Total	**5294**	**4869**	**-599**	**5127**	**5053**	**-98**	**-299**
t-test		-1.61n					

Source: Household Survey, 2009

*refers significant at 5%, s=t-test for income from sorghum, m=t-value for income from maize, n=not significant

In this study area, people perform different income generating activities to enhance their livelihood. Farm/agricultural activities which include both crop production and livestock rearing are the most important source of income of the people of the study area. As Table 5.18 indicates sorghum, maize production, ground nut production sweet potato production, coffee production, chat production, castor bean production and livestock rearing are the main livelihood activities from which income is generated.

Table 5.18 reveals that the average annual income generated from annual crop production for the without group before the project intervention was Birr 4944 per household while it was 3692 Birr/HH after the intervention. The average annual income obtained from sorghum, maize, ground nut and sweet potato for the with the project group before the project intervention was 2940, 1134, 550 and 320 Birr/HH respectively. After the project intervention the average income obtained from sorghum, maize, ground nut and sweet potato was 1898, 1034, 500 and 260 Birr/HH respectively. When the average annual income is compared before and after the project intervention the result shows that there is decrease in income for the main annual crops (sorghum, maize and ground nut crops). Paired sample t-test was conducted to see if there is significant mean difference in annual income from the major annual crop production before and after the project intervention. The result of the test shows that there is significant (t=-2.51) and (t=-3.90) difference for income from sorghum and maize respectively. The main reason for the decrease in income is that some of the cultivated land which was covered by the main crops particularly sorghum and maize before the project was shared and allocated for the castor bean production after the project intervention.

Livelihood income was also derived from cash crop production. As can be seen from the table 5.18, the average annual income earned from coffee, chat and

castor bean production before the project was 250, 100 and 0 Birr/HH respectively. On the other hand, after the project 452,165 and 560 Birr /HH was derived from coffee, chat and castor bean production correspondingly. The average annual income earned from cash crop production before and after the project were 350 and 1177 Birr/HH respectively. The average annual income of cash crops after the project is relatively higher than before because of the income obtained from castor bean production. Paired sample t-test was run to see if there is significance difference in mean annual cash production before and after the project. The t-test also shows that the difference in mean annual income from cash crop production is significant (t=-5.31) at 5% probability level.

The average annual income earned from annual crops production before and after the project for the without the project group were 4614 and 4507 Birr/HH respectively. The average income of the after the project was relatively lower than the average annual income of the before group. There is decrease in average annual income by 107 Birr/HH. The average annual income derived from cash crops before and after the project was 513 and 546 Birr/HH correspondingly. There is no income for this group before and after the project as there is no castor bean production for the without the project group. The contribution of income from the castor bean production was higher than the other cash crops for the with the project group.

The overall net annual average income of the with the project group is lower than that of the without the project group. An independent sample t-test was made to see if the there is significant mean difference for the incomes derived from the various livelihood activities. The result shows that there is insignificant (t=-1.61) difference between the incomes generated by the participants and non-participants. This is could be attributed to the fact that the market price for the castor bean is extremely lower than the other crops. Castor bean is sold at 0.70

cents per kilogram or 70 birr per quintal. This highly affects the annual income of the participant households. This implies that the impact of the project intervention in terms of income is extremely minimal.

Trends of the Outcomes

Table 5.19 analyses about the trend situation of the contexts. It explains whether there is an increase, decrease or no change in the study population before and after the intervention for the with the project households. In other words, this explains the overall impact of the castor bean production project on the households who participated in the production of castor bean in the study area.

Table 5.19: Trend of Contexts

Trend	Increase		Decrease		No change	
	No.	%	No.	%	No.	%
Livelihood	14	14.4	73	75.3	10	10.3
Positive effect of castor bean production	16	16.5	65	67	16	16.5
Negative Effect of Castor bean production	67	69	21	21.6	9	9.3
Farmland utilization	25	25.8	52	53.6	20	20.6
Grazing land	0	0	83	85.6	14	14.4
Livestock size	5	5.2	87	89.7	5	5.2
Crop production	5	5.2	70	72.2	22	22.7
Castor bean production	28	28.9	58	59.8	11	11.3
Income	33	34	32	33	32	33
Employment Opportunity	31	32	45	46.4	21	21.6

Source: Household Survey, 2009

As the table 5.19 shows the large proportion of with the project respondents reported that there is decrease in livelihood condition while 14.4 % and 10.3 % of them described as increase and no change of their living situation respectively.

Similarly, about 67 %, 16.5 % and 16.5 % of them said there is decrease, increase and no change of the positive effect/benefit of castor bean production in the area respectively. With regard to the negative effect of the castor bean production, about 21.6%, 69% and 9.3% revealed there is increase, decrease and no change of the negative effect of castor bean production in their locality correspondingly. Likewise, 25.8 %, 53 % and 20.6% of the explained that there is increase, decrease and no change of the farm land utilization in the area. More than 85 % and 14 % revealed that there is decrease and no change of the grazing land utilization. In the same way, about 5 %, 89 % and 5 % of the respondents justified that the size of livestock increase, decrease and no change respectively. Proportions of with the project respondents who revealed that there is an increase, decrease and no change in crop production accounting for 5.2%, 72.2 % and 22.7% respectively.

In the same way, those who said that there is an increase, decrease and no change in castor bean production constitute 28.9 %, 59.8 % and 11.3% respectively. With regard to the income trend about, 34 %, 33 % and 33 % of them revealed that there is an increase, decrease and no change in the income of the households. About, 32 %, 36.4 % and 21.6 % of the households mentioned that there is an increase, decrease and no change in employment opportunity in the study area. In all the contexts the without the project group reported that there is no change in all the trend contexts when it is compared with before and after the intervention of the project in the area. In this situation there is a big difference between the with and without the project group households.

CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

In this chapter, summary, conclusion and recommendations will be held based on the findings.

6.1 Summary and Conclusion

This study was designed to assess the impact of the agro-fuel investment of the Flora Eco-Power project on livelihood of the local community in Midhega Tolla woreda. The Flora Eco-Power project started its operation in 2006/07. Currently, the Company is operating under four different production options to cultivate castor bean for industrial use in the study area. The impact of the castor bean production on livelihood activities, livelihood assets, vulnerability contexts, policies and overall livelihood outcomes were identified.

The most common livelihood activities/strategies in the study area are crop production and livestock rearing. Other livelihood activities such as off-farm and non-farm activities are not common but practiced by some households in the study community. The impact of the project on crop and livestock production was analyzed in terms of whether an increase or decrease is achieved after the project intervention with the premises that castor bean production may compete both cultivated and grazing land which otherwise have been used for the major crops and livestock respectively. The major crops produced in the study area are sorghum, maize, and groundnut in order of importance. Likewise, coffee and chat are also the major cash crops grown in the study area as source of people's livelihood. A large number of livestock are reared as there is grazing land and the area is suitable for livestock production.

The study revealed that income derived from the annual crops (sorghum, maize, ground nut and sweet potato) and cash crops (chat and coffee) decreased after the project intervention. The main reason for the decrease in income is that some of the cultivated land which was covered by the main crops particularly sorghum and maize before the project was shared and allocated for the castor bean production after the project intervention. The study also shows that most (84.8%) of the participant households cultivated castor bean on farm land that have been used for crop production before the project intervention.

The result of the study indicated livestock holding, measured in TLU, of the participant households was about 5.78 TLU before the project where as the non-participants had about 2.91 TLU. A very significant difference was observed between participants and non-participants before the project intervention indicating that participants had more number of livestock than the non-participants. After the project intervention, the participants owned, on average, about 3.1 TLU where as the non-participants own 3.8 TLU. This clearly indicates that livestock production of the participant households' decrease by 2.38TLU implying that the project intervention negatively affected livestock production in the study area.

As far as livelihood diversifications and migration is concerned, participants have more or less gained opportunity to diversify their livelihood activities than the non-participants despite the difference is not pronounced indicating that the project intervention has brought positive but non-significant influence in livelihood diversification activities in the study area.

Both participants and non-participants have access to farm land and grazing land. The average farm land and grazing land for the overall sample households is 14 timad and 8 timad respectively. The average size of farm land for participants and the non-participants was 15 timad and 14 timad respectively.

The average grazing land was 8 timad and 9 timad for participants and non-participants respectively implying that the difference in land holding size between the two groups is slight and negligible. However, the participants allocated from their grazing and farm land holdings to castor bean production.

The study also indicated that both groups have lower educational level indicating that that the project intervention has no positive impact on the human capital development of the project beneficiaries through provision of education services in the area. The study further showed that both participants and non-participants have extremely low level of access to basic social services (primary education, health facility and drinking water). This implies the project intervention did not brig positive impact on basic social services in the study area.

The other finding of the study is that majority (53.6%) of the participant households have been involved in the option 1 castor bean production system followed by option 4 and option 2 implying that castor bean production greatly competed land that could have been used for crop and livestock productions. This contradicts with the agro-fuel development and utilization strategy and energy policy of the country.

The study further revealed that all respondents of the participant group have got employment opportunity in the project. On the contrary, no respondent from the non-participants has got employment opportunity by the project. The employment opportunity includes selling of labor to work in the project farm activities and production and selling of castor bean to the project/company. This indicates the project has created better employment opportunity to the participants and this reduces their vulnerability to the recurrent drought which is common in the study area.

Finally, the study indicated that the overall net annual average income of the participants is lower than that of the non-participants. This could be attributed to the fact that the market price for the castor bean is extremely lower than the other crops. Castor bean is sold at 0.70 cents per kilogram or 70 birr per quintal. This highly affects the annual income of the households. This implies that the impact of the project intervention in terms of income is extremely minimal.

In conclusion, the Flora Eco-Power castor bean production project has not brought a positive impact on livelihood of the community in the study area and farmers involved in this project exposed to economic loss due to the very minimum castor bean price fixed by the Company nevertheless the huge amount of land shift from food crop production to castor bean production.

6.2 Recommendations

The essence of any development project is to ensure that a human life of the community where the project is situated is improved. Based on this notion, the following are recommendations, based on the findings, which need to be considered in the study area to enjoy more benefits from the agro-fuel investment project.

- The concerned local government structure should advice the community to use marginal land for castor bean production. This reduces the competition between food crop production and agro-fuel/castor bean production.
- The Company should revise the whole production options according to the castor bean production and utilization strategy and regulatory rules with the concerned government and local representatives so that should take mitigation measures accordingly.
- The FEP Company should involve the active participation of the key stakeholders especially the surrounding community in its development activities and should adopt the culture of negotiation over mutual benefits.

- The concerned local government should act according to the land use policies and agro-fuel production and utilization regulations of the country.
- The concerned local government offices should be involved in designing the contractual agreements that will be enacted by the Company and the farmers in castor bean production.

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ANNEXES

Annex 1 Questionnaire for household Survey

General

Name of the Woreda _____ Name of the Kebele _____ Name of the Got/Village ___

_____

Name of the Household Head _____ Id. No of the house hold _____

Name of Enumerator _____ Name of Supervisor _____ Date of Interview _____

1. Household Characteristics

No	Name of Household members	Sex	Age	Religion	Marital Status	Educational Level	Occupation
				Code 1. Islam 2. Christian 3. Others	**Code** 1. Single 2. Married 3. Divorced 4. Widowed 5. Separated	**Code** 1.Illiterate 2.Read & write 3.Grade 1- 4 4.Grade 5-8 5.Grade 9 – 12 6. other (specify)	**Code** 1.Farmer 2.Trader 3.Student 4.unemployed 5.other (specify

2. Livelihood strategies/ Activities

What types of livelihood activities did you pursue before after the project/now? (multiple response)

Type of livelihood Strategies/Activities	**Before**	**After**	**What is the Trend?** **1. Increase** **2. Decrease** **3. No change**	**Reason for the trend (After)?** **1. Project intervention** **2. Government intervention** **3. Personal occupation**
	Yes No	**Yes No**		
Agriculture/Farming				
Crop Production	Yes No	Yes No	1 2 3	1 2 3
Sorghum production	Yes No	Yes No	1 2 3	1 2 3
Maize production	Yes No	Yes No	1 2 3	1 2 3
Ground nut production	Yes No	Yes No	1 2 3	1 2 3
Teff production	Yes No	Yes No	1 2 3	1 2 3
Fruit production	Yes No	Yes No	1 2 3	1 2 3
Vegetable production	Yes No	Yes No	1 2 3	1 2 3
Cash Crop Production	Yes No	Yes No	1 2 3	1 2 3
Chat production	Yes No	Yes No	1 2 3	1 2 3
Coffee production	Yes No	Yes No	1 2 3	1 2 3
Castor bean production	Yes No	Yes No	1 2 3	1 2 3
Others (please specify)			1 2 3	1 2 3
Livestock production	Yes No	Yes No	1 2 3	1 2 3
Cattle rearing	Yes No	Yes No	1 2 3	1 2 3
Goat & Sheep	Yes No	Yes No	1 2 3	1 2 3
Poultry rearing	Yes No	Yes	1 2 3	1 2 3

			No							
Beekeeping/beehive	Yes	No	Yes No	1	2	3		1	2	3
Equine rearing	Yes	No	Yes No	1	2	3		1	2	3
Others (pleas specify)				1	2	3		1	2	3
Non Farm/off Farm	Yes	No	Yes No	1	2	3		1	2	3
Petty trade/goods	Yes	No	Yes No	1	2	3		1	2	3
Selling of wood/tree	Yes	No	Yes No	1	2	3		1	2	3
Selling of charcoal	Yes	No	Yes No	1	2	3		1	2	3
Sealing of stone/sand	Yes	No	Yes No	1	2	3		1	2	3
Selling of grass/forage	Yes	No	Yes No	1	2	3		1	2	3
Selling of food	Yes	No	Yes No	1	2	3		1	2	3
Selling of drink	Yes	No	Yes No	1	2	3		1	2	3
Selling of egg	Yes	No	Yes No	1	2	3		1	2	3
Selling of milk	Yes	No	Yes No	1	2	3		1	2	3
Selling of meat	Yes	No	Yes No	1	2	3		1	2	3
Selling of honey	Yes	No	Yes No	1	2	3		1	2	3
Selling of hides & skin	Yes	No	Yes No	1	2	3		1	2	3
Metalwork/Blacksmith	Yes	No	Yes No	1	2	3		1	2	3
Carpentry/wood work	Yes	No	Yes No	1	2	3		1	2	3
Carpet making	Yes	No	Yes No	1	2	3		1	2	3
Embroidery	Yes	No	Yes No	1	2	3		1	2	3
Pottery	Yes	No	Yes No	1	2	3		1	2	3
Handcraft	Yes	No	Yes No	1	2	3		1	2	3
Weaving	Yes	No	Yes No	1	2	3		1	2	3

Grain Trade	Yes No	Yes No	1 2 3	1 2 3
Livestock trade	Yes No	Yes No	1 2 3	1 2 3
Employment	Yes No	Yes No	1 2 3	1 2 3
Renting out land	Yes No	Yes No	1 2 3	1 2 3
Sharecropping out land	Yes No	Yes No	1 2 3	1 2 3
Renting out oxen	Yes No	Yes No	1 2 3	1 2 3
Renting out other animals	Yes No	Yes No	1 2 3	1 2 3
Renting out house	Yes No	Yes No	1 2 3	1 2 3
Remittance	Yes No	Yes No	1 2 3	1 2 3
Pension	Yes No	Yes No	1 2 3	1 2 3
Food aid/relief	Yes No	Yes No	1 2 3	1 2 3
Others (please specify)			1 2 3	1 2 3
Migration	Yes No	Yes No	1 2 3	1 2 3
Temporary	Yes No	Yes No	1 2 3	1 2 3
Permanent	Yes No	Yes No	1 2 3	1 2 3
Others (please specify)			1 2 3	1 2 3

3. Livelihood Assets/Resources

What types of livelihood assets did you own/have access to before and after the project/now?

Type of Livelihood Assets/Resources	Before		After		What is the Trend? 1. Increase 2. Decrease 3. No change	Reason for the trend? 1. Project intervention 2. Government intervention 3. Personal occupation
	Yes No	If yes, what was the amount?	Yes No	If yes, what was the amount?		
Natural Capital	Yes No		Yes No		1 2 3	1 2 3
Farm land	Yes No		Yes No		1 2 3	1 2 3
Grazing land	Yes No		Yes No		1 2 3	1 2 3
Forest land	Yes No		Yes No		1 2 3	1 2 3
Communal land	Yes No		Yes No		1 2 3	1 2 3
Follow land	Yes No		Yes No		1 2 3	1 2 3
Crops	Yes No		Yes No		1 2 3	1 2 3
Livestock	Yes No		Yes No		1 2 3	1 2 3
Others (please specify)					1 2 3	1 2 3
Physical Capital	Yes No		Yes No		1 2 3	1 2 3
Equipment	Yes No		Yes No		1 2 3	1 2 3
Furniture	Yes No		Yes No		1 2 3	1 2 3
Road	Yes No		Yes No		1 2 3	1 2 3
Education Facilities	Yes No		Yes No		1 2 3	1 2 3
Health Facilities	Yes No		Yes No		1 2 3	1 2 3
Water Facilities	Yes No		Yes No		1 2 3	1 2 3
Vet. Facilities	Yes No		Yes No		1 2 3	1 2 3
Training centers	Yes No		Yes No		1 2 3	1 2 3
Market places	Yes		Yes		1 2 3	1 2 3

	No		No			
Telecommunication	Yes No		Yes No		1 2 3	1 2 3
Postal agent	Yes No		Yes No		1 2 3	1 2 3
Electricity	Yes No		Yes No		1 2 3	1 2 3
Other (please specify)	Yes No		Yes No		1 2 3	1 2 3
Human Capital	Yes No		Yes No		1 2 3	1 2 3
Knowledge	Yes No		Yes No		1 2 3	1 2 3
Skills	Yes No		Yes No		1 2 3	1 2 3
Educations service	Yes No		Yes No		1 2 3	1 2 3
Health service	Yes No		Yes No		1 2 3	1 2 3
Clean drinking water service	Yes No		Yes No		1 2 3	1 2 3
Others (please specify)					1 2 3	1 2 3
Financial/Economic Capital	Yes No		Yes No		1 2 3	1 2 3
Income Saving & credit	Yes No		Yes No		1 2 3	1 2 3
Other (specify)					1 2 3	1 2 3
Social Capital	Yes No		Yes No		1 2 3	1 2 3
Iddir	Yes No		Yes No		1 2 3	1 2 3
Equib	Yes No		Yes No		1 2 3	1 2 3
Others (specify)					1 2 3	1 2 3

4. Income Earned from Livelihood Strategies/Activities

What amount of annual income did you earn from the livelihood strategies before and after the project?

Type of livelihood strategies/Activities	Annual Income in Birr		What is the Trend? 1. Increase 2. Decrease 3. No change
	Before	After	
Agriculture/Farming			1 2 3
Crop Production			1 2 3
Sorghum Production			1 2 3
Maize production			1 2 3
Ground nut production			1 2 3
Teff production			1 2 3
Fruit production			1 2 3
Vegetable production			1 2 3
Cash Crop Production			1 2 3
Castor bean production			1 2 3
Chat production			1 2 3
Coffee production			1 2 3
Others (please specify)			1 2 3
Livestock production			1 2 3
Cattle rearing			1 2 3
Beekeeping/beehive			1 2 3
Equine rearing			1 2 3
Others (please specify)			1 2 3
Non Farm/Off Farm			1 2 3
Petty trade/goods			1 2 3
Selling of wood/tree			1 2 3
Selling of charcoal			1 2 3
Sealing of stone/sand			1 2 3
Selling of grass/forage			1 2 3
Selling of food			1 2 3
Selling of drink			1 2 3
Selling of egg			1 2 3
Selling of milk			1 2 3
Selling of meat			1 2 3
Selling of honey			1 2 3
Selling of hides & skin			1 2 3
Metalwork/Blacksmith			1 2 3
Carpentry/wood work			1 2 3
Carpet making			1 2 3
Embroidery			1 2 3
Pottery			1 2 3

Handcraft			1 2 3
Weaving			1 2 3
Grain Trade			1 2 3
Livestock trade			1 2 3
Employment			1 2 3
Renting out land			1 2 3
Sharecropping out land			1 2 3
Renting out oxen			1 2 3
Renting out other animals			1 2 3
Renting out house			1 2 3
Remittance			1 2 3
Pension			1 2 3
Food aid/relief			1 2 3
Others (please specify)			1 2 3
Migration			1 2 3
Temporary			1 2 3
Permanent			1 2 3
Others (please specify)			1 2 3

Access to and ownership of Livelihood Assets

1. Natural Capital

What was your own land use/cover system before and after the project?

Category of land	Size in Timad/hectare		What is the Trend? 1. Increase 2. Decrease 3. No change	Reason for the Trend
Farm land				
Grazing land				
Forest land				
Communal land				
Fallow land				
Others (specify)				

What was the land ownership system before and after the project?

Ownership System	Before		After		Reasons for the Change
	Yes	No	Yes	No	

Own			
Rent out			
Share out			
Others (specify)			

Land Market (land rent/share in)

Purpose	Before	After
	Yes No	Yes No
Did you cultivate land owned by others?	Yes No	Yes No
If yes what was the size of the land you cultivate per year?		
If yes, for what purpose did you cultivate the land?		
Crop production		
Sorghum		
Maize		
Ground nut		
Castor bean production		
Chat production		
Coffee production		
Other (specify)-----		
Livestock production		
Others (please specify)		

Crop Production

What types of crops did you cultivate before and after the project?

Corp type	Size in Timad/hectar		Production in Quintal		Price (Birr) per Quntal	Reason for the difference
	Before	After	Before	After		
Sorghum						
Maize						
Teff						
Wheat						
Barely						
Ground nut						
Sweet potato						
Fruits						
Vegetables						
Chat						
Coffee Castor bean						
Others (please specify)						

Farmland Fertility Condition

What was the soil fertility condition of your farm land before and after the project?

Soil fertility Category	Before		After		Reason
	Yes	No	Yes	No	
Fertile					
Medium					
Poor					
Very poor					
Others (please specify)					

Livestock production

What types of livestock did you rear before and after the project?

Type of Animal	Number/Size		Trend? 1. Increase 2. Decrease 3. No change	Reason the trend?
	Before	After		
Ox				
Cow				
Bull				
Heifer				
Calf				
Goat				
Sheep				
Horse				
Mule				
Donkey				
Chicken				
Beehive				
Others (specify)				

1. Physical Capital Infrastructure

Description	Before		After	
	Yes	No	Yes	No
Do you have your own house?	Yes	No	Yes	No
If yes, what is the type of the House?	1. Grass thatched 2. CIS 3. Other(specify)---			
Do you have access to electricity?	Yes	No	Yes	No
If yes, who constructed it?	1.Private 2.Public		1.Private 2.public	

	3.Government 4.NGO 5.Other (specify)---	3.Government 4.NGO 5.The company 6.Other (specify)---
Do you have access to telecommunication service?	Yes No	Yes No
If yes, who constructed it?	1.Private 2.Public 3.Government 4.NGO 5.Other (specify)---	1.Private 2.public 3.Government 4.NGO 5.The company 6.Other (specify)---
Do you have access to road?	Yes No	Yes No
If yes, who constructed it?	1.Private 2.Public 3.Government 4.NGO 5.Other (specify)---	6.Private 1.public 2.Government 3.NGO 4.The company 5.Other (specify)---

Household Assets: Equipment, Furniture and Tools

What types of physical assets did you have before and after the project?

Type of Physical Assets	Number/Size		What is the Trend? 1. Increase 2. Decrease 3. No change	Reason for the trend?
	Before	After		
Equipment				
TV				
Tape recorder/radio				
CD player/VCD				
Other (please specify)				
Furniture				
Sofa				
Bed				
Table				
Chair				
Other (please specify)				
House				
Grass roofed				
CIS roofed				

2. Human Capital

Knowledge and Skills

What was the educational level of the household members before and after the project?

Particulars	Number/size of HH members		What is the Trend? 1. Increase 2. Decrease 3. No change	Reason for the trend?
	Before	After		
Level of Education				
Illiterate				
Read and Write				
Grade 1- 4				
Grade 5-8				
Grade 9 and above				
Skill trainees				
Employees				
Other (please specify)				

Access to human Development Services

Description	Before	After
	Yes No	Yes No
Did you have access to education service?	Yes No	Yes No
If yes, what is the walking distance to reach the nearest school?	1. Less than 30 minutes 2. from 30-60 minutes 3. More than 60 minutes	1. Less than 30 minutes 2. from 30-60 minutes 3. More than 60 minutes
If yes, who constructed the school?	1. Private 2. Public 3. Government 4. NGO	1. Private 2. public 3. Government 4. NGO 5. The company
Did you have access to health service	**Yes No**	**Yes No**
If yes, what is the walking distance to reach the nearest health center?	1. Less than 30 minutes 2. from 30-60 minutes 3. More than 60 minutes	1. Less than 30 minutes 2. from 30-60 minutes 3. More than 60 minutes
If yes, who constructed the health facility?	1. Private 2. Public 3. Government 4. NGO	1. Private 2. public 3. Government 4. NGO 5. The company
Did you have access to clean drinking water service?	**Yes No**	**Yes No**
If yes, what is the walking distance to reach the nearest water source?	1. Less than 30 minutes 2. from 30-60 minutes 3. More than 60 minutes	1. Less than 30 minutes 2. from 30-60 minutes 3. More than 60 minutes
If yes, who constructed the water source?	1. Private 2. Public 3. Government 4. NGO	1. Private 2. public 3. Government 4. NGO 5. The company
Did you receive any kind of training on agriculture/castor bean production?	**Yes No**	**Yes No**
If yes, who organized the training?	1. Government 2. NGO 3. Other (specify)---	1. Government 2. NGO 3. The company 4. Other (specify) ---

3. Financial/Economic Capital

Saving and Income

What were the main source of credit and saving before and after the project?

Description	Before	After	Reason for the change
	Yes No	Yes No	
Did you save money?	Yes No	Yes No	
If yes, where did you save?	1. Bank 2. Equipb 3. Saving & Credit Inst. 4. Personal Saving 5. Other (specify)	1. Bank 2. Equipb 3. Saving & Credit Inst. 4. Personal Saving 5. Other (specify)	
Did you have access to credit service?	Yes No	Yes No	
If yes, where did you get credit?	1.Saving & Credit 2.Institutions 3.MFIs 4.Money lenders 5.Friends 6.Government 7.NGO 8.Relatives 9.Other (please specify)	1.Saving & Credit 2.Institutions 3.MFIs 4.Money lenders 5.Friends 6.Government 7.NGO 8.Relatives 9.Other (please specify)	
Did you use Agric. Inputs?	Yes No	Yes No	
If yes, what type of inputs	1. Fertilizer (Synthetic) 2. Improved seeds 3. Breeding animals 4. Pesticides 5. Farm tools/ machinery 6. Other (please specify)	1. Fertilizer (Synthetic) 2. Improved seeds 3. Breeding animals 4. Pesticides 5. Farm tools/ machinery 6. Other (please specify	
For how many months did you face food deficit/gaps per year?	_____	_____	

4. **Social Capital**

In which types of traditional institutions did you participate before and after the project?

Institutions	**Before**		**After**		**Reason for the change?**
	Yes	**No**	**Yes**	**No**	
Iddir					
Equib					
Debo/Wonfel					
Other (please specify)					

Vulnerability Context Analysis

Description	**Before**		**After**		**Trend?** **1. Increase** **2. Decrease** **3. No change**	**Reason for the change?**
	Yes	No	Yes	No		
Shock/Disaster	Yes	No	Yes	No	1 2 3	
Drought	Yes	No	Yes	No	1 2 3	
Loss of human life	Yes	No	Yes	No	1 2 3	
Crop failure	Yes	No	Yes	No	1 2 3	
Livestock death	Yes	No	Yes	No	1 2 3	
Trend	Yes	No	Yes	No	1 2 3	
Natural Resource	Yes	No	Yes	No	1 2 3	
Deforestation	Yes	No	Yes	No	1 2 3	
Soil erosion	Yes	No	Yes	No	1 2 3	
Soil fertility loss	Yes	No	Yes	No	1 2 3	
Livestock feed and forage shortage	Yes	No	Yes	No	1 2 3	
Water scarcity	Yes	No	Yes	No	1 2 3	
Soil pollution	Yes	No	Yes	No	1 2 3	

Water pollution	Yes No	Yes No	1 2 3	
Population	Yes No	Yes No	1 2 3	
Technology utilization/inputs	Yes No	Yes No	1 2 3	
Population trend	Yes No	Yes No	1 2 3	
Immigration	Yes No	Yes No	1 2 3	
Other (specify)	Yes No	Yes No	1 2 3	
Seasonality	Yes No	Yes No	1 2 3	
Price of crops and animals	Yes No	Yes No	1 2 3	
Crop production	Yes No	Yes No	1 2 3	
Coaster bean production	Yes No	Yes No	1 2 3	
Livestock production	Yes No	Yes No	1 2 3	
Employment opportunity	Yes No	Yes No	1 2 3	
Other (specify)				
Capability				
Where you capable to tolerate shocks, disaster and seasonalities	Yes No	Yes No	1 2 3	

Labor and Employment Opportunity with the Agro fuel Project (After)

Do you get any benefit from the project	Yes No
If yes, what types of benefits do you get from the company?	1. Employment opportunity 2. Production of castor bean 3. Others (specify)----
If yes, how do you get benefit from the project?	1. Through employment in the company 2. Through production of castor bean 3. Other (specify)----
Do you engage in castor bean production	Yes No
If yes, since when?	_____
If yes, in which option do you engage in the project?	1. Option 1 (to use farmers owned land for castor bean production) 2. Option 2 (to use uncultivated land owned by farmers for castor bean production) 3. Option 3 (to use farmers owned bush and/or forest land for castor bean production 4. option 4 (Government owned bush and/or forest land castor bean production)

Production of Castor bean

System/practice	Yes No	Plot size in Timad/hectare	Production in quintal per hectare	Annual production in quintal	Price per Quinta l
Castor bean production in cultivated land	Yes No				
Castor bean production in uncultivated land	Yes No				
Castor bean production in bush/forest land	Yes No				
Ground nut between the rows in option 1	Yes No				
Other (specify)					
What type of castor bean did you cultivate?	1.local 2.Improved				
For what purpose did you cultivate castor bean?	1.fore bio-fuel 2.for light 3.other (specify)				
Who engage in castor bean production?	1.Husband 2.Wife 3.Children 4.Servants 5.Others (specify)				
What is the main constraint in producing castor bean in the area?	1.labor shortage 2.land shortage 3.Inputs shortage 4.Market shortage 5.weather 6.other (specify)				

Employment Opportunity

Are any member of the household employee of the company?	Yes No
If yes, how many members are employed in the company?	1. One 2. Two 3. Three 4. Four 5. Five & above
How is the terms of employment?	1. full time/permanent 2. part time/contract
How many hour do you work in the company?	_____Hours
What is the monthly salary of an employee in Birr?	_____ Birr
Are you full time worker in the company?	Yes No
If no, what are the reasons?	1. The company has limited work/work seasonality 2. I have additional task 3. to run my own business 4. Not interested 5. Other (Specify) -----

Trends After the project (Castor bean production)

Description	Trend 1. Increase 2. Decrease 3. No change	A Key Reason?
What is the trend of you livelihood?	1 2 3	
What is the trend of the positive effect of castor bean production?	1 2 3	
What is the trend of the negative effect of castor bean production?	1 2 3	
What is the trend of the overall advantage of castor bean production?	1 2 3	
What is the trend of farm land utilization?	1 2 3	

What is the trend of grazing land?	1 2 3	
What is the trend of vegetation/forest cover?	1 2 3	
What is the trend of soil fertility loss?	1 2 3	
What is the trend of livestock size?	1 2 3	
What is the trend of varieties of feed and forage?	1 2 3	
What is the trend of feed and forage production?	1 2 3	
What is the trend of crop production?	1 2 3	
What is the trend of varieties of crop production	1 2 3	
What is the trend of castor bean production?	1 2 3	
What is the trend of income?	1 2 3	
What is the trend of food security?	1 2 3	
What is the trend of employment opportunity?	1 2 3	
What is the trend of income generating activities?	1 2 3	

Annex 2 Checklists for Key Informants Interview

1. Objective of the project
2. Duration of the project
3. Intervention woredas, kebelles, and beneficiary population of the project
4. working modality/agreement with the beneficiaries
5. Types of products of the project
6. Types of benefits obtained from the project
7. Positive effects of the project on individuals, households, groups, communities and natural resources
8. Negative effects of the project on individuals, households, groups, communities and natural resources
9. Baseline survey finding of the project
10. Environmental impacts assessment of the project
11. Environment policy of the project
12. Environment policy of the project Capacity of the project (Capital, staffs, material)

Situation and Trend of Livelihood, Activities Assets and Income

13. Livelihood situation of the people before and after the project
14. Types of livelihood strategies/activities pursued before and after the project
15. Access to /ownership to livelihood assets/capitals by types before and after the project
16. Land use/cover system before and after the project
17. Land market situation before and after the project
18. Farm land cultivation before and after the project
19. Cultivating bush/forest before and after the project
20. Grazing land before and after the project
21. Crop production before and after the project
22. Crop variety/diversification before and after the project
23. Castor bean production by types (local vs improved) before and after the project
24. Options in castor bean production
25. Land size used for castor bean production before and after the project per annum

26. Productivity of castor bean per hectare
27. Market price of castor bean per quintal
28. Annual income earned from castor bean production
29. Advantages and disadvantages of castor bean production
30. Livestock production before and after the project
31. Forage/feed production and varieties before and after the project
32. Natural resource degradation (soil, water, forest, soil fertility, pollution) before and after the project
33. Biodiversity/plants and wildlife condition before and after the project
34. Modern inputs/technology utilization before and after the project

Social Services and infrastructures

35. Type and number of education, health, water, etc services in the locality before and after the project
36. Type and number of infrastructures (road, tele, electricity, housing, etc) before and after the project

Employment Opportunity, Income, Food Security and Vulnerability situation

37. Employment opportunity before and after the project
38. Sources of income before and after the project
39. Total employees by the project by sex, terms of employment
40. Monthly income/salary form the project
41. Food deficit/gap months before and after the project
42. Overall impacts of the project on the livelihood of the local people
43. Vulnerability condition before and after the project
44. Capacity to tolerate vulnerability before and after the project
45. Sustainability condition of the project

Constraints and Coping mechanisms

46. Major constraints for castor bean production
47. major coping mechanisms of castor bean production
48. Coping mechanisms for shock of castor bean production
49. Major constraints of the project

Annex 3 Checklists for Focus Group Discussion

1. Objective of the project
2. Duration of the project
3. Intervention woredas, kebelles, and beneficiary population of the project
4. working modality/agreement with the beneficiaries
5. Types of products of the project
6. Types of benefits obtained from the project
7. Positive effects of the project on individuals, households, groups, communities and natural resources
8. Negative effects of the project on individuals, households, groups, communities and natural resources
9. Baseline survey finding of the project
10. Environmental impacts assessment of the project
11. Environment policy of the project
12. Environment policy of the project Capacity of the project (Capital, staffs, material)

Situation and Trend of Livelihood, Activities Assets and Income

13. Livelihood situation of the people before and after the project
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16. Land use/cover system before and after the project
17. Land market situation before and after the project
18. Farm land cultivation before and after the project
19. Cultivating bush/forest before and after the project
20. Grazing land before and after the project
21. Crop production before and after the project
22. Crop variety/diversification before and after the project
23. Castor bean production by types (local vs improved) before and after the project
24. Options in castor bean production
25. Land size used for castor bean production before and after the project per annum

26. Productivity of castor bean per hectare
27. Market price of castor bean per quintal
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29. Advantages and disadvantages of castor bean production
30. Livestock production before and after the project
31. Forage/feed production and varieties before and after the project
32. Natural resource degradation (soil, water, forest, soil fertility, pollution) before and after the project
33. Biodiversity/plants and wildlife condition before and after the project
34. Modern inputs/technology utilization before and after the project

Social Services and infrastructures

35. Type and number of education, health, water, etc services in the locality before and after the project
36. Type and number of infrastructures (road, tele, electricity, housing, etc) before and after the project

Employment Opportunity, Income, Food Security and Vulnerability situation

37. Employment opportunity before and after the project
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39. Total employees by the project by sex, terms of employment
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41. Food deficit/gap months before and after the project
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44. Capacity to tolerate vulnerability before and after the project
45. Sustainability condition of the project

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46. Major constraints for castor bean production
47. major coping mechanisms of castor bean production
48. Coping mechanisms for shock of castor bean production
49. Major constraints of the project

Annex 4 List of Figures

Figure 1. E numerators during the training in Midhega Tolla Town

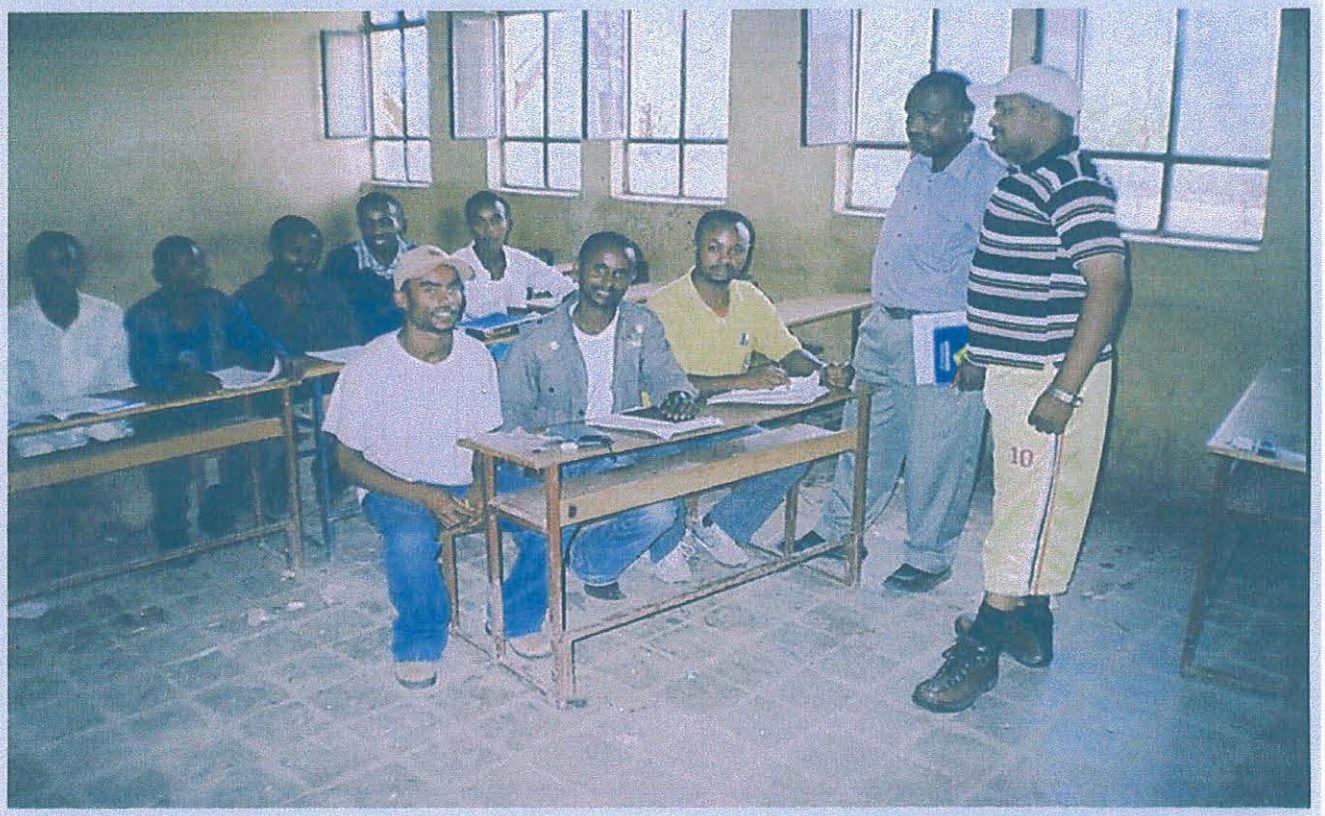


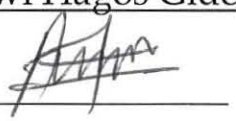
Figure 2. Castor bean Plantation of the Flora Eco-Power in the study Area

Figure 3. The flora Eco-process castor bean crushing mill at Fechatu Kebele

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any university, and all the sources of materials used for the thesis have been dully acknowledged.

Name Aregawi Hagos Gidey

Signature 

Date June, 2009

This thesis has been submitted for examination with my approval as a University advisor.

Woldeamlak Bewket (PhD)  

Advisor Signature Date