Biofuels and Rural Development: A Case Study of the Mapfura-Makhura Incubator and Small-Scale Farmers in the Limpopo Province.

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Abstract

The primary objective of the study is to examine the livelihood impact of biofuel production on small-scale rural farmers participating in the MMI project in the local districts in Limpopo province.The study is theoretically underpinned by the sustainable livelihoods framework which provides a nuanced analysis of the complex nature of poverty and livelihoods. The framework was used to examine how MMI as a structure with its own processes (incubator model) plays a role in creating a means for farmers to have more access to livelihood assets which would help them achieve improved livelihoods outcome.

The findings of this study reflect what has already been articulated in literature about small-scale biofuel projects. This study shows that MMI's incubator plays an important role for 73% of the farmers to access all of the livelihood assets and ultimately improving their farm income and food security. Furthermore, 90% of the participants admitted to have received support from MMI in a number of ways. This includes the provision of farming inputs, labour and access to markets in addition to training, mentoring and coaching.

The study also found that despite the overwhelming support, both MMI and farmers face a number of challenges. Farmers still lack adequate farming inputs, transport, access to markets and vulnerability to natural disasters. MMI faces challenges in raising funds to provide inputs to all their incubatees and lack of adequate mechanization. Lack of transportation affects both farmers and MMI in that farmers find it difficult to access MMI service. In the same light, MMI has found it difficult to reach farmers for post-incubation, coaching and mentoring or delivering inputs; this can be challenging and a costly process. MMI's biofuel production project has the capability for improving rural livelihoods through agriculture. The study concludes by recommending that MMI should improve its own capacity in order for them to better the lives of the farmers they assist.

This study is significant for contributing to a field which has received less academic and research attention in South Africa. Its schorlarly contribution will enhance the existing body of knowledge on biofuels and rural development in South Africa.

List of figures

List of tables

Acronyms

ACB	African Centre for Biosafety
AgriSETA	Agricultural Sector Education and Training Authority
AIG	American International Group
ARC	Agricultural Research Council
Asgisa	Accelerated and Shared Growth Initiative of South Africa
BIC	Business Innovation Centres
CAMEC	Central African Mining and Exploration Company
CASP	Comprehensive Agricultural Support Programme
CBI	Corporate Business Incubators
CEF	Central Energy Fund
CHIETA	Chemical Industries Education & Training Authority
CSIR	Centre for Scientific and Industrial Research
DFID	Department for International Development
DME	Department of Minerals and Energy
DoA	Department of Agriculture
FAO	Food and Agricultural Organization
FAOSTAT	Food and Agricultural Organization Statistical Division
FDI	Foreign Direct Investment
GHS	Ghanaian Cedi Rates
IBI	Independent Business Incubators
IDC	Industrial Development Corporation
IDS	Institute of Development Studies
JPol	Johannesburg Plan of Implementation
LDA	Limpopo Department of Agriculture
LRAD	Land Redistribution for Agricultural Development
MDG	Millennium Development Goals
MMI	Mapfura-Makhura Incubator
NAFU	National African Farmers' Union
NBIA	National Business Incubation Association

NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
OPEC	Organisation of Petroleum Exporting Countries
PT MASPT	Mitra Austral Sejahtera
SAGIS	South African Grain Information Service
SANEDI	South African National Energy Development Institute
SEDASmall	Enterprise Business Agency's
SL	Sustainable Livelihood
SLAG	Settlement/Land Acquisition Grant
SLF	Sustainable Livelihoods Framework
SMME	Small Medium and Micro Enterprises
UBI	University Business Incubator
UNDP	United Nation Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USDA	United States Department of Agriculture
WARD	Women in Agriculture and Rural Development
WCED	World Commission on Environment and Development
YARD	Youth in Agriculture and Rural Development

Table of Contents

Chapter 1
Introduction

1.1 Context of the study

The primary objective of the study is to examine the livelihood impact of biofuel production on small-scale rural farmers participating in the MMI project in the local districts of the Limpopo province. The study is informed by the growing realization of biofuels as an alternative to fossil fuels to mitigate climate change and the potential socio-economic contributions of biofuels in less developed countries. Biofuels are defined as products made from agricultural crops such as sugar cane, sunflower and other sources such as olegianus plants, and forest biomass, and from other sources of organic matter (Escobar *et al*, 2009:1277). These resources are then used to make first-generation biofuels such as bioethanol and biodiesel.

Biofuels has emerged as a topical area of research spanning cross-cutting disciplines such as the environmental sciences, economics, sociology and political science. In South Africa there is a paucity of research in this area of study. Studies in South Africa have focused on policy (Letete and van Blonittz, 2009), agriculture and food (Brent, 2014) and chemistry of biofuels (Marvey, 2009). There are few studies focusing on biofuels, rural development and livelihoods (Banda, 2009; Musyoki, 2012). Internationally, there are studies which have looked at biofuels and rural livelihoods (Kalas, 2009; Beyene, 2011; Boamah, 2011). Therefore, this study will contribute to the growing body of knowledge on biofuels and rural development in South Africa.

Biofuels in developing countries have been surrounded by controversy. The debates are mainly on: the food versus fuel debate; the impact of biofuels on the environment and the potential socio-economic contribution of biofuels to development (Rosillo-Calle and Tschirley, 2010:8). There are two main arguments in the food vs fuel debate: on one side it is argued that there is sufficient land to produce biofuels (given modern agricultural management practices) and food without fuel production affecting food supply (Rosillo-Calle and Johnson, 2010:3). On the other side of the debate it is argued that biofuels cause malnutrition as a result of rising food prices and changing land use (Rosillo-Calle and Johnson, 2010:3).

The second debate on biofuels is about their impact on the environment. Biofuels are regarded as an alternative source of energy to fossil fuels for mitigating climate change. Fossil fuels as non-renewable energy sources are expected to run out in the next 30 to 100 years (Pimentel, 2012:*ix*). According to Demirbas (2009:2235) biofuels will diversify fuel use as liquid biofuels such as biodiesel can be used as substitutes for transport fuel. Studies in the USA have shown that biofuels could offer prospects of not only reducing emissions but reducing atmospheric CO2 levels (Phalan, 2009:522). In contrast, other studies have also shown that some biofuels made from crops that require nitrogen fertilizers such as corn and rapeseed are a source of nitrogen oxide which has a negative impact on the ozone layer (Scharlemann and Laurence, 2008:44). Some biofuels can either be good or bad for the environment but that will depend on what they are and the processes used to produce them.

The third debate is about how biofuels can benefit society which is the main focus of this study. One of the frequent promises made when biofuels are proposed are that employment will be increased and that will lead to the further development of rural areas. This is because 75% of the poor live in agriculturally dependent rural areas in Sub-Saharan Africa; although countries rely heavily on agriculture for growth, the sector is highly taxed but with only 4 % of government spending allocated to it (Ngepah, 2011:26). Therefore, biofuels production could improve the sector by boosting agricultural production opportunities for small-scale farmers and employment for the local people. For example, in Ghana, a company called Biofuels Africa Ltd which was responsible for biofuels production, relocated farmers to better land, promoted crop production and created employment for local villagers (Boamah, 2011:169-70). However, the potential socio-economic benefits of biofuels in some areas have been quite the opposite. For example, a study in Brazil shows a decrease of workers employed in the industry as a result of mechanization (German *et al*, 2011:3). In Indonesia, biofuels production has been criticised in relation to issues of land ownership and control. In this case, local communities' land and labour rights were undermined because they were limited access to their land and water by biofuel companies (Mariti cited in German *et al*, 2011:4).

South Africa is one of the countries that have recently entered biofuel production. In 2007, the Department of Energy (DME) published its first Biofuels Industrial Strategy. The aim of the strategy is to produce 400 million litres of biofuels which will constitute 2% of the national fuel supply (DME, 2007:3). The strategy highlights that the targeted crops for cultivation of biofuel will be sugar cane, sunflower, canola and soya (DME, 2007:3). This

will be done in the hope that thousands of jobs will be created; poverty will be alleviated and that cleaner and renewable energy sources will be developed. The strategy planned to invest in such projects in former Bantustan areas where they claim that arable land is being under-utilized. Former Bantustans are areas where a large number of small-scale farmers are based and where agriculture is neglected (DME, 2007:6).

The core focus of this strategy is improving farming in these previously disadvantaged areas by providing firm opportunities for small-scale farmers. According to the DME (2007:14) biofuels will create development in rural areas by creating markets for farmers to sell their produce. Small-scale farmers are particularly targeted because of their vulnerability in the agricultural sector and because they lack the ability to create sustainable livelihoods (Sishuta, 2004:2). They also lack the capacity for complex decision-making due to limited access to resources, support services and information (Thamaga-Chitja cited in Molefe *et al*, 2012:161). Therefore, the strategy is to bring these areas into agricultural production with small-scale farmers playing a key role in those projects.

There are a few biofuels projects that have already started in South Africa (e.g. Mafikeng biodiesel, 2003). Most of them are in their pilot phases (Hoedspruit and Makhathini ethanol,) and some have not started at all (Cradock sugar beet joint). MMI is one of the few operating biofuels production schemes in South Africa and the only one in the Limpopo Province. MMI was established by the Agricultural Research Council (ARC) in partnership with Limpopo's Department of Agriculture in 2006 (MMI, 2008:3). It was established in response to the Department of Science and Technology's call to empower small-scale farmers to take part in the new biofuels industry (African Centre for Biosafety (ACB), 2008:33).

The Project is focused on producing 1 million litres of biodiesel per annum at Tompi Seleka Farmer Development Centre. The aim is "to facilitate economic development by improving the entrepreneurial base of emerging farmers through the provision of infrastructure and a variety of business support services" (MMI, 2008:3).These farmers are trained for a period of a year to have business and technical skills such as business plan writing, financial management, record keeping, marketing and operating a farm (MMI, 2008:6). They are also assigned extension officers who will mentor and coach them and will be provided with technical support (MMI, 2008:6). This is done to turn farmers into established entrepreneurs and further transform them into self-sustaining commercial farmers.

The project is based on an incubator business model. The concept of incubator is reserved for organisations that supply joint location, services, business support and networks to early stage ventures (Bergek and Norrman, 2008:6). The Project started with farmers in the Greater Sekhukhune district in local municipalities such as Elias Motsoaledi, Tubatse, Marble Hall, Fetakgomo and Makhuduthamaga. According to a study conducted by ARC, it was found that "sunflower and soya are most suitable crops for biofuels in Limpopo as the farmers in that area are familiar with them" (ACB 2008:33). Farmers are provided with seeds and fertilizers and have to grow those crops on their own land. The feedstock is sold to the processing plant to make biodiesel that is then sold to local mines but the project has ambitions of exporting it in future (ACB, 2008:33-34).

1.2 Theoretical Framework

The study was framed and studied using the Sustainable Rural Livelihoods Framework. This is a framework that can be used to study rural development, poverty and sustainable rural livelihoods. A sustainable livelihood is when the means required to make a living (such as capabilities, assets and activities) are able to cope with and recover from stress and shocks, maintain its capabilities and assets and while at the same time not undermining its natural resources base (Scoones, 1998:5). The framework can be applied to a wide range of scales such as on the level of an individual, household, village, region or even nation (Scoones, 1998:5). The framework requires a combination of five aspects of livelihoods which are: human, social, physical, financial and natural and how key processes such as laws and policies and structure such as the government or private sector affect these aspects (Dorward *et al*, 2001:2). Farming as an activity carried out by small-scale farmers will be examined in terms of the different livelihood aspects and how it can cope and recover from stresses and shocks that may arise.

1.3 Research Goals

The primary objective of the study is to examine the livelihood impact of biofuel production on small-scale rural farmers participating in the MMI project in the local districts in Limpopo province. This will be achieved through a number of secondary goals which are:

- To explore the relationship between MMI and small-scale farmers with a particular focus on rural livelihoods.
- To explore MMI's Incubator model on biofuel processing and production, evaluate how it is used, as well as its aims and objectives.

- To identify key challenges, constraints and opportunities that may arise as a result of this joint venture between the Incubator and small-scale farmers.

1.4 Research Design

This section describes the methods and tools used to collect data for this research. A research design is a guide or a plan used to direct the course of the study and outline how data is collected and what tools or procedures are used to gather that data (Tracy, 2013). This section will discuss orientation and planning of the research, the methodology of the research including target population, sampling, and how data was analysed.

1.4.1 Orientation and planning

After the approval of the research proposal in June 2014, the study commenced thereafter. The first step was gathering literature on the subject of biofuels. Literature was collected from various primary and secondary sources including books, academic journal articles, newspaper articles, internet sources, newsletters, annual reports and policy documents. Access to these sources of information was not difficult at all: books were easily accessible at the Rhodes University's main library; newspaper articles, journal articles, internet sources, newsletters, reports, and policy documents were easily searched and retrieved from the internet with the exception of the latest annual reports and newsletters (2013-2014) which were collected directly on site during fieldwork. These were used to become familiar with the issues surrounding this topic and most importantly, this literature assisted with the formulation of specific interview questions.

The second step of the planning process was negotiating access to the field site. Access to the field site was important in three ways: firstly, it was to provide access to negotiate interviewing MMI key personnel; secondly to negotiate access to incubatees (farmers) and thirdly to collect recent newsletters and annual reports (2013-2014) from MMI. Access was negotiated via telephone weeks before the planned fieldwork date and access was communicated again for reaffirmation a week before the commencing of the fieldwork which was in September 2014. Upon arrival at the field site, a letter outlining the research project intention and the research proposal were produced to the manager for final approval to commence with the interviews.

1.4.2 Data collection

This research is mainly qualitative but also included a quantitative element through the quantification of socio-economic data of participants. The qualitative aspect of the study included the use of in-depth interviews and document research. In-depth interviews were conducted with three types of participants: firstly with three of MMI's key personnel; secondly with 11 farmers involved in the project and thirdly one of the personnel in the Limpopo Department of Agriculture. In-depth interviews provide opportunities for explanations and getting at the core of issues by strengthening data (Tracy, 2013:133). These interviews were conducted in a semi-structured way; this means that there was an interview guide with a list of questions which worked as the agenda for the interview (Matthews and Ross, 2010: 254). This interview guide helps the researcher to remember points to cover, reminds the interviewer about probes, ensures all topics are covered and allows people to respond in their own way (Matthews and Ross, 2010: 254).

The interview guide included questions on the participant's biographical information, farming experience, livelihood strategies, experience as an MMI incubatee including challenges and opportunities. The interviews with MMI personnel were done face-to-face. Farmers were interviewed in two ways: firstly through a focus group which was a face-to-face interaction and secondly through telephone interviews. The interview with the manager of Rural Development in the Limpopo Department of Agriculture was done face-to-face. All the interviews were conducted in Northern Sotho of which I'm fluent in and they were recorded on a tape recorder.

1.4.3 Sampling procedure

The main participants for this study were the farmers who are and who were incubated by MMI. The total population of those farmers is 250. A sample was taken from this group to participate in individual telephone interviews and a focus group. From the 250 incubatees involved in the project a sample of 5% was selected to participate in the study. A total of 11 farmers was selected from the population: six of them participated in individual telephone interviews and five participated in a focus group. A purposive sampling technique was employed to select the farmers participating in the study. Purposive sampling is associated with small, in-depth studies with research designs that are based on the gathering of qualitative data and focused on the exploration and interpretation of experiences and perceptions (Matthews and Ross, 2010: 167). With this sampling method, people or cases are

chosen ‘with purpose’ to enable the researcher to explore the research questions or develop a theory (Matthews and Ross, 2010: 167).

1.4.4 Method for data analysis

After the interviews were conducted, the recorded material was transferred to a computer. The data was then translated and transcribed. After all the transcriptions were completed, they were read, edited and categorized into themes which correlated to emerging issues, the literature and the goals of the research.

1.4.5 Research ethics

Before the process of data collection commenced there were a few ethics that had to be considered. Firstly, prior approval was required with the Business manager at MMI before interviews can proceed. A letter from my institution and a copy of the research proposal was presented. It was explained that the participants’ identities will be kept anonymous and the data will be kept confidential. This information was communicated to the participants too. The participants were also informed about the objectives of the study and the extent of their participation: ability to withdraw from the interview. Participants were made to understand that their participation was completely voluntary. After the data was collected, the researcher needs to maintain the reliability and validity of the data by representing their views in an accurate manner not only during the data collection process but during the analysis stage as well.

1.5 Challenges

Conducting research is not a smooth and fluid process; it sometimes comes with its challenges and pitfalls. It is the researcher’s duty to ensure that such challenges are overcome to maintain the reliability and integrity of the data collection process for the overall success of the research project. The first challenge was that participants were expecting something to come out as a result of their participation in the research. Participants were informed that the research was for academic purposes only and that they should not expect more from the researcher. Secondly, as a result of lack of funding the initial method of collecting data from farmers through individual in-depth face-to-face interviews had to be modified to telephone interviews and a focus group. This was because some of the participants for the study could not make it due to lack of transportation therefore conducting interviews via telephone was a viable option.

1.6 Thesis Outline

This thesis consists of seven chapters.

Chapter One is an introductory chapter.

Chapter Two gives a background to biofuels and explore the three main biofuel debates in detail and look at two African case studies where biofuel production had previously taken place.

Chapter Three looks at the energy policy which gave the impetus for biofuel policy in South Africa.

Chapter Four examines MMI as an incubator, its aims and objectives and its incubator model.

Chapter Five is the theoretical framework which underpins this study.

Chapter Six analyses how MMI's incubator influenced access to livelihoods assets and improved farmers' livelihood outcomes.

Chapter Seven concludes the thesis.

Chapter 2

Biofuels, the Environment, Land and Socio-Economic Issues: A Debate

2.1 Introduction

The late twentieth century leading to the 21st century was a period of increasing globalization where issues of environmental destruction, poverty and starvation, economic growth and other developmental challenges were becoming global concerns requiring unified global solutions. In 2000, the United Nation introduced the Millennium Development Goals which were formulated as global efforts to tackle issues of global concern such as extreme poverty, environmental sustainability and global development. Furthermore, energy security concerns, high oil prices and increasing global commitments created an interest in the need to invest in renewable energy with particular emphasis placed on biofuels to secure energy needs and reduce global carbon emissions (Rosillo-Calle and Tschirley, 2010:7).

The re-emergence of biofuel production in the late 20th century and further prospects in the early 21st century was foreseen. It was in 1925 in the New York Times that Henry Ford predicted that: "*The fuel of the future is going to come from fruit like that sumac out by the road, or from apples, weeds, sawdust – almost anything. There is fuel in every bit of vegetable matter that can be fermented*" (Webb and Coates, 2012: 2). Is biodiesel made from sunflower and soya bean or ethanol made from corn or sugar cane or any other agricultural or organic matter the fuel for the future just as Ford had predicted? The follow up to this question can be: are biofuels the better energy alternative? This is a key question that this chapter will address. This chapter is divided into three sections. The first section discusses the rediscovery of biofuels in the early 21st century as replacement for fossil fuels. The second section will explore the various debates surrounding biofuels with the core focus centred on environmental issues such as greenhouse gas emissions and climate change and socio-economic issues relating to access to land, food security, rural development and livelihoods. The last section will demonstrate issues and debates through various case studies in African countries.

Section A: History of Biofuels

2.2. Background

Biofuels were the first sources of energy for early civilizations. Solid biofuels such as wood, dung and charcoal have been used ever since man discovered fire (Webb, 2013). These are still used by many people in most developing countries as energy sources for heating and cooking even up to this day. Biofuels were also the first type of fuels used for transportation because the first engines were invented to run on fuel created from vegetable oils (Webb, 2013). The first engine invented in the US in 1826 ran on ethanol from pine trees; Henry Ford designed his model T to also run on ethanol and Rudolf Diesel[1] invented his engine to run on vegetable oil (Webb, 2013). The diesel engine designed by Diesel was used widely for agriculture in remote areas at a period where petroleum was not known (Pacific Biodiesel, 2014). Therefore biofuels were widely used before fossil fuels.

The wide usage of biofuels at those times did not mean that fossil fuel did not exist. Fossil fuels have also been around since ancient times but on a small scale (Webb, 2013).It was only during the middle of the 19th century and early 20th century that petroleum products such as kerosene and gasoline gained prominent use as primary fuels for oil lamps and as automotive fuels respectively (Kovarik, 2013). This is also a period where commercial oil drilling began. Although there was some form of biofuels production in the early 20th century in developed countries such as France, USA, and Germany and in developing countries such as Brazil and Philippines most of it was abandoned because of cheap oil imports from the East after the Second World War. For example in Germany, 54 % of fuel production before the war was derived from non-petroleum sources (Eglof cited in Kovarik, 2013). After the war ended, cheap oil was readily available prompting governments in those respective countries to abandon plans and prospects to re-engage in biofuel production (Kovarik, 2013). Biofuel production became minimal as a result of cheap oil gaining prominence and overtaking biofuels as the main source of energy at the time.

Despite the efficiency and cost-effectiveness of fossil fuels, the large supply and consumption levels of oil resulted in its over-dependence which ultimately led to the creation of a new set of problems. Global consumption grew five times and the world became increasingly dependent on oil to which production was mainly focused on one main region; the Middle-East (Kovarik, 2013). With the Middle East being the main producer and supplier of oil, the

[1]Rudolf Diesel was a German inventor famous for inventing the diesel fueled internal combustion engine. His engines powered automobiles, trucks, power pipelines, water and electric plants (Webb, 2013).

over-dependence of other countries on its oil created new developments in geopolitics which had political repercussions particularly to the USA. The Organisation of Petroleum Exporting Countries (OPEC)[2] launched an embargo against the USA after it had intervened in a matter to side against the majority of those Oil producing countries; a move which proved to be costly for the US economy as the GNP declined and the unemployment rate double to 9% after oil prices quadrupled (Kovarik, 2013). This was known as the oil crisis of 1973; it was not the only crises that occurred in that decade as it was followed by another one in 1979 which was caused by the Iranian Revolution (Webb, 2013). It did not take long for people to realise that oil usage and consumption is not sustainable after its wide usage after the second World War.

Marion King Hubbert (1903-1989) was a geologist who first coined the term 'peak oil', which he defines as the period in time when the extraction of petroleum has reached its maximum after its production had declined (Skarstein, 2011:60). He used his models to predict the US oil would peak between the years (1965-1970) (Skarstein, 2011:60). The US oil actually peaked in 1970 with 9.5 million barrels produced per day meaning that his prediction was accurate (Skarstein, 2011:60). He also projected that the global oil production would peak between 1995-2000; although that was not the case the projection was not entirely wrong because 69% of the 48 greatest oil producing countries had already reached their peak. This included countries such as Indonesia, Australia, Norway, Mexico, UK and obviously the US (Skarstein, 2011:60).

Even though the global production of oil did not decline, this became a wake-up call for developed countries like the US to start initiating plans for immediate alternative energy sources. They did not need to look far or innovate new ways of sourcing energy because the solution was simply a retrograde in history to produce fuels that they used to produce before the world went to war. This is when countries such as the US and Brazil began modern large-scale biofuel production (Webb, 2013). However, the re-emergence of biofuel received mixed reactions ranging from being welcomed and accepted to being dismissed and skeptical about. Political and scientific debates have been taking place ever since those countries started producing biofuels.

[2]OPEC is a permanent intergovernmental organization of 12 oil-expoting developing countries. Countries include Angola, Algeria, Iran Ecuador, Iraq, Kuwait, Libya, United Arab Emirates, Saudi Arabia, Nigeria and Qatar. These countries coordinate and unify petroleum policies of member countries (OPEC, 2015).

Section B: Debates Surrounding Biofuels

The reasons for re-engaging in biofuel production in the 21st century as discussed in the previous sections stems from the oil crises of the 1970s and the continued dependence of unsustainable fossil fuel induced energy. The 21st century has its own challenges to deal with energy security, but this recent interest in biofuel production entails more than securing global security needs. Fuel shortages, high oil prices and international commitment to combat climate change are some of the other reasons for the renewed interest in biofuels (Rosillo-Calle and Tschirley, 2010b:7). Biofuels are regarded as the solution to minimize greenhouse gas emissions, contribute to rural development and reduce the dependence on imported oil (Rosillo-Calle and Tschirley, 2010b:7). However, the issue of biofuel production in this regard is not an obvious one. There are two opposing views on the potential of biofuels as the appropriate alternative fuel to fossil fuels.

There are two main opposing schools of thought on the biofuel debate whose arguments can be summed up as follows: the anti-biofuels lobby argue that biofuels will cause food insecurity, land competition and environmental problems (Rosillo-Calle and Tschirley, 2010b: 10). The pro-biofuel lobby on the other hand argues that food and fuel can be produced simultaneously, biofuels can open up opportunities for investments, and they have social and environmental benefits (Rosillo-Calle and Tschirley, 2010b:11). Now, we can clearly see that the two main schools of thought differ on a number of issues which can be categorised as follows: environmental issues, food versus fuel, land issues and the socio-economic benefits of biofuels. This section will explore the arguments of those two opposing schools of thought and identify where they overlap and divert.

2.3 Environmental issues

One of the main reasons to be interested in biofuels production again is arguably to minimise the environmental impact. Climate change comes first in mind when discussing environmental issues and it has been an issue of global concern with a considerable amount of media attention, research output and policy debates. Other environmental issues include, water shortages, erosion, degradation which are related to agricultural production. This section will discuss the debates of whether to use or not to use biofuels from an environmental perspective.

2.3.1 Climate change and greenhouse gases

Climate change is one of the issues of global concern. Governments have met on a number of occasions such as climate change negotiations to discuss the best ways to mitigate the

potential threats of this phenomenon and come up with the best solutions to reduce greenhouse gases emitted by fossil fuels in the atmosphere. Biofuels which are proposed as alternatives to fossil fuels are seen as the solution to the greenhouse gas problem. However, such a belief has been countered with scepticism and criticism from different angles. This leaves us to question the role of biofuels on climate change and whether it has positive or negative impacts.

According to the Royal Society cited in (Rosillo-Calle and Tschirley 2010b: 12) the contribution or lack thereof of biofuels to reducing greenhouse gases depends on a number of factors including the energy balance, the specific feedstock and the circumstances of production and processing. Energy balance[3] refers to the ratio of energy contained in a fuel as compared to the energy used in its production (Rosillo-Calle and Tschirley, 2010b: 20). Petrol and diesel from fossil fuels have a negative energy balance because they consume more energy than they produces because some energy is consumed in refining and in transportation of those respective fuels (Rosillo-Calle and Tschirley, 2010b: 20). The argument here is that all biofuels have a positive energy balance which exceed that of fossil fuels; biodiesel from soybean contains four times the amount of energy required to produce it, oil palm contains nine times the energy required and ethanol from sugar cane produces eight times more energy (Rosillo-Calle and Tschirley, 2010b: 20). But this is one side of the story that the anti-biofuel lobby disagrees on.

According to Pimentel *et al* (2010:35) the energy balance of biofuels such as ethanol and biodiesel from feedstock such as corn and soya bean consume more energy and are economically costly. It requires 46 % more energy to produce ethanol from corn; soya bean has 63 % net loss of fossil energy (Pimentel *et al*, 2010:35-44). According to this argument it is biofuels that have a negative energy balance as compared to fossil fuels because they consume more energy and they are economically costly. This is further fuelled by the fact that they require huge amounts of fossil fuel energy and most importantly and of concern is that they also require food sources; this will intensify conflict over those resources (Pimentel *et al*, 2010:48). The type of feedstock used to produce biofuels is essential because they yield different greenhouse gas balances, they have different production methods and thus give differing environmental impacts.

[3] Energy balance is the balance of energy that a fuel produces as compared to the energy that it consumes. A positive energy balance is characterized by when the energy that a fuel produces exceeds that energy it consumes during its production. the less energy used to produce a fuel the less greenhouse gases emitted in the atmosphere.

Greenhouse gas balance uses life-cycle analysis to measure emissions of greenhouse gases from different biofuel production process to compare to fossil fuel production process (Rosillo-Calle and Tschirley, 2010b:12). Different feedstock types will yield different results. However, the most important question to ask is how this biofuel feedstock and production processes compare to those of fossil fuel? Do biofuels use less energy just as the pro-biofuel lobby has argued or are they detrimental to the environment and contribute to further greenhouse gas emission just as the anti-biofuel lobby had argued? This is dependent upon which type of biofuel is produced. Biofuels are not homogenous, they are grouped categorically, they are produced from different types of crops and thus their environmental impact and how they compare with other fossil fuels will be dissimilar.

A study conducted by Zah *et al* the life-cycle of fossil fuels such as diesel, natural gas and gasoline with that of 26 different biofuels produced from a variety of crops in Switzerland (Scharlemann and Lauren, 2008). The study investigated the contribution of fossil fuels and biofuels in reducing greenhouse gas emissions and as well as their impacts on the environment. It was shown that 21 of the 26 biofuels reduce greenhouse gases by more than 30% as compared to gasoline but 12 of those biofuels including ethanol and biodiesel from soya bean have a greater environmental impact (Schalermann and Lauren, 2008: 44). This supports the arguments by the pro-biofuel lobby who had argued that biofuels reduce greenhouse gases because of the low energy they produce during their production and processing but at the same time also supports the argument by the anti-biofuel lobby that have raised concerns about the environmental impact caused by biofuels. This leads us to a very important question on how biofuels has an impact on the environment.

2.3.2 Environmental impact of biofuels

According to Schalermann and Lauren (2008:44) the greatest environmental impact occurs during agricultural cultivation through using machinery, fertilizers and pesticides; this may lead to soil acidification, nutrient leaching and biodiversity loss. It is not only agricultural practices which are responsible for the impact; it is their combination with the type of biofuel crop that is cultivated. Different crops have different environmental impacts; they do not have an impact in a similar manner. Corn ethanol causes more soil erosion than any other crop; it uses more fertilizers, insecticides, and herbicides (Pimentel *et al*, 2010:38). In addition, it is also argued that it uses more than 6443 litres of water just to produce 3.79 litres of ethanol (Pimentel and Patzek cited in Pimentel *et al*, 2010:38). Soy diesel causes soil erosion, it uses herbicides and pesticides second to corn ethanol (USDA cited in Pimentel *et al*, 2010:45).

These are the arguments of the anti-biofuel lobby who argue that we should re-engage with biofuels because of their environmental impacts, this could be worsened if biofuels completely replace fossil fuels and are produced on a very large scale. They cite that we simply could not afford to do that since agricultural practices of producing biofuels cause degradation, erosion, emit more carbon, use a lot of water and most importantly require large tracts of land to be used.

2.4 Land Issues

The issue of land in biofuels is of utmost importance. Whether there is adequate land to grow biofuel crops is debatable. Studies have attempted to estimate the land requirements for biofuel production. The world has a total of 13 billion hectares of land which are used as follows: 11% for cropland, 27% for pasture land; 32% forests, 9% for urban use and 21% for other uses (FAOSTAT cited in Pimentel *et al*, 2010:30). It is stated that the remaining land is unsuitable for cropping for various reasons ranging from harsh climate, topography to soil infertility; it is also further argued that most of the suitable cropland is already being used (Pimentel *et al*, 2010:30). Statistics are presented as supporting evidence for the claim that there is no extra available cropland for growing biofuels as it is already being used for growing food crops. According to Pimentel et al (2010:30) most of the suitable cropland is already being used without substantiating further on how much is used already and how much is available. This is an argument made by the anti-biofuel group who believe biofuel cropping would take up most of the land and result in land conflicts if biofuels were to replace fossil fuels.

The pro-biofuel lobby has attempted to give estimates on the availability of land which can be used for further cropping of biofuel crops to be precise. The estimates for land availability vary from 250-800 million hectares excluding forests, protected areas and land for growing food and livestock (Rosillo-Calle and Tschirley, 2010b:16). They further argue that large scale biofuel production which requires large tracts of land will not affect land which is already being used to produce food currently and which may be used in future. They are quite adamant that between now and 2050, the land required to grow food, land for urban development as well as infrastructure is estimated to be 300 Mha to which according to them is adequate to cope with population growth (Cortez *et al*, 2010:66). The majority of this available land is concentrated in countries such as Angola, DRC, Sudan, Argentina, Brazil and Colombia (Cortez *et al*, 2010:66). The countries listed are located in developing countries and a new wave of Foreign Direct Investment (FDI) is increasingly becoming

concentrated in Africa and Latin American countries. These countries are targeted because it is believed that land for biofuel production is available.

2.4.1 Foreign Direct Investment and land in Africa

Land is an important source of livelihood in Africa. With Africa facing many developmental challenges, governments are under pressure to ensure economic growth and development in their countries while at the same time protecting rights of their people. One way of improving economic development and growth is through attracting investment from foreign companies to assist in development especially in rural areas. A new wave of investment opportunities has recently emerged from the biofuel production sector. Many foreign companies like Central African Mining and Exploration Company (CAMEC) and PT Mitra Austral Sejahtera (PT MAS) in Mozambique and Tanzania seek to invest in Africa and buy large tracts of land for biofuel production because of the speculation of the availability of land. As African governments compete to secure FDI in their countries there is risk of neglecting local people's right to land by awarding and allowing huge land purchases for foreign companies to take place (Matondi and Mutopo, 2011:68). Africa is not only targeted for the availability of land but firstly because of weak land policies and land tenure insecurities and secondly because of non-existent legal and administrative framework for land and resource rights (Matondi and Mutopo, 2011:68).

Biofuel companies and investors like the Procana biofuel project in Mozambique have persuaded governments to sell them land for biofuel production. The promises sound laudable for government and local communities because of hopes of poverty alleviation and rural development in the long term (Nhantumbo and Salamao, 2010:32). Procana promised to create local jobs and construct social infrastructure such as clinics and schools with a further possibility of economic partnerships between investors and communities (Nhantumbo and Salamao, 2010:32). However, Matondi and Mutopo (2011:71) are critical of the perceived benefits and argue that jobs created for locals will be on a small-scale and require no skills while better jobs will be reserved for foreign technical experts. Although these two commentators do not downplay the positive impacts that FDI might bring to rural areas in Africa such as farmers diversifying and creating new income source for local people (Matondi and Mutopo, 2011:71-2) but they are however cautious on the issue of local people being robbed of their land to convert them into wage labourers in a new form of colonialism. There is also lack of prioritization of social and environmental issues in the case of Procana

because environmental issues are rarely raised and social issues such as resettlement are presented as positive results for the communities with promises of better houses, schools and clinics at the relocation areas (Nhantumbo and Salamao, 2010:33). However, resettlement programmes are problematic because monitoring improvements in living conditions are usually absent (Nhantumbo and Salamao, 2010:33). As discussed earlier, the contribution of biofuels on land access depends on a number of factors including type of feedstock, tenure system, which leads to different models of biofuel production systems (Cotula *et al*, 2008:32).

It has been demonstrated that different biofuel crops have different impact on the environment and on the amount of greenhouse gases emitted in the atmosphere. The same could be said about the impact of different crops on the scale that biofuel production takes place. The choice of the correct crop will have an impact on the amount of land required for biofuel production (Cortez *et al*, 2010:67). This is because different crops have different land requirements; some crops need more land to yield a visible output and some crop do not require too much land because they already yield more (see table).

Table 2.4.1: Biofuel feedstock, yield and land requirements

Biofuel	Feedstock	Yield (litres/ha)	Land requirement (Mha)
Ethanol[a]	Sugarcane	6,000	25
	Maize	3,750	40
Biodiesel[b]	Soybeans	550	245
	Castor beans	500	270
	Oil palm	4,700	45

(Source Cortez *et al*, 2010:67)

From the table we can see that ethanol from sugar cane requires less land to yield over 6000 litres of fuel per ha; this is the most viable biofuel crop as compared to others. Biodiesel made from soybeans and castor oil are not viable because of the high land requirements and poor yield in litres per ha; but oil palm can be considered for biodiesel production. Soy bean and castor oil cannot be considered for future production but maize and oil can be considered but for the medium term (Cortez *et al*, 2010:67). More studies are needed to estimate the land requirements and yield of crops such as jatropha, canola and sunflower which have been targeted to be used for biofuel production in many countries where biofuels have been proposed to be produced.

With the choice of a biofuel crop in mind for determining the land requirement for cropping, another important issue is that of scale of production which can have implications for tenure system and local land rights. The scale in which biofuels are produced can determine the tenure system and also have far reaching implications for local land rights. Small-scale and large-scale biofuel feedstock projects also demonstrate the diversity of biofuel production models, control and use (Cotula *et al*, 2008:32).

2.4.2 Biofuels and land access

There is a huge contrast between large-scale and small-scale biofuel production even though less has been written on small scale biofuel production especially on its implications for land access. Small-scale projects are usually better portrayed because they are characterized by collaboration and consultation and they ultimately do not compromise local people's access to land (Cotula *et al*, 2008:34). This is because access to land for biofuel production is based on agreements with local villagers and those villagers collectively agreed to allocate communal lands for production (Cotula *et al*, 2008:34). Such an agreement will be influenced by the benefits that will be received for allowing biofuel production to take place on their lands; the benefits are usually having an improved access to local energy needs. This was the case in Mali. The project was a collaboration between government authorities and development agencies for jatropha production to supply to nearby villages (Cotula *et al*, 2008:33). The same occurred in Mozambique where about 150 ha of land was used to produce jatropha for rural energy generation in 2005 (De Jongh cited in Cotula *et al*, 2008:32).

On the contrary, large-scale biofuel production projects have been receiving most of the attention in the media and from academia. These are the projects largely favoured by investment opportunities and African government have defended such initiatives to the extent of even formulating policies to attract such FDI in their countries (Matondi and Mutopo, 2011:75). Large-scale projects are fundamentally different from small-scale projects in that there is limited consultation and collaboration with local people, they involve acquisitions of large tracts of land which may ultimately lead to local people losing their access to land. It usually argued that large land acquisitions are justified because of availability of land and degraded land would be revitalized though rehabilitation of soil (Mwakasonda and Farioli, 2012:26). But such arguments have proven to be flawed because of the evidence that commercially viable yields can be achieved on fertile soil with adequate water availability (Cotula *et al*, 2008).

Large-scale projects have a huge impact on and access, a characteristic that they are usually criticized for. An example was Mozambique's Procana project which was allocated 30 000 ha of land for sugar cane plantations; the project was responsible for the displacement of 1000 families who were promised housing, running water, grazing land and electricity on a new site (Cotula *et al*, 2008:36). This displacement occurs because of weak land legislation and unclear tenure system for local communities. In Brazil, large pieces of sugar cane lands are owned by industrial mills while small-scale farmers access the land through customary land rights which are partially recognised by law and their ownership is not substantiated by any official documentation (Cotula *et al*, 2008:37-8). The chances of employment are very low and once land is disposed from the locals they are promised compensation which usually does not come to fruition. In their quest to receive FDI, governments side more with biofuel companies than their own people and through local proxies (chiefs and councils) land can be expropriated from smallholder farmers to biofuel companies, sometimes without compensation (Matondi and Mutopo, 2011:76). Therefore customary land rights or the unofficial land rights that the locals hold are replaced by freehold title of land awarded to these biofuel companies.

Given the differences of land access between small-scale and large-scale production, there are other alternatives such as contract farming and joint ventures. Contract farming involves a relationship between biofuel companies and local farmers; the company outsources farming activities to farmers and provides them with farming implements (Cotula *et al*, 2008:51-2). A joint venture on the other hand is a partnership between companies and farmers where both parties have shares in the venture (Cotula *et al*, 2008:51-2). Such alternative ways can have positive effects of biofuel whether on a large or small-scale without affecting local land rights and access and also not compromising food production and food security.

2.5 The food versus fuel debate

The food and fuel debate just like the debates discussed above is polarised into two schools of thought. Those who are against biofuels argue that biofuel production will worsen the challenges of food insecurity and malnutrition while those who are pro-biofuels argue that both food and fuel can be produced at the same time without one compromising the other. This section will discuss the impact of biofuel production on food security and food prices with a critical discussion of both schools of thought.

2.5.1 Food security

It has already been established that biofuels production involves an agricultural process. Biofuels offer farmers the opportunity to produce new or existing incentives to diversify their own farm income (Rosillo-Calle and Tschirley, 2010b:11). Even though that is the case, some people find it difficult to understand why and how biofuel production can take place especially in food insecure regions like Sub-Saharan Africa. Food security refers to the availability and accessibility of food from domestic production, imports or donors to individuals who should be within a close proximity to them and have adequate income or resources to obtain food (Rutz and Janssen, 2012:313). Biofuels may contribute to increased or reduced food security but that depends on a wide range of factors including policies, agricultural systems, markets, prices and income levels of the poorest; hence the debate is still ongoing (Rutz and Janssen, 2012:313). For example, increased food prices maybe an opportunity for farmers to increase income and therefore there will be increased food access for them; on the contrary, food prices may not make food to be accessible for everyone; that depends on the affordability of the price of food (Rutz and Janssen, 2012:313).

The type of feedstock or crop used for biofuel production is still fundamental in this debate as well. The anti-biofuel lobby argues that the continued use of food crops such as corn raises many nutritional and ethical concerns (Pimentel, 2012:8). This is because over 400 million tons of food are required to produce biofuels and in a world where 70 % of the population is already malnourished, biofuel production is exacerbating the problem even further (Pimentel, 2012:8). In fact, according to Diouf (cited in Pimentel *et al*, 2010:48) the use of food crops is already causing food shortages for the poor. With population on the rise and the demand for food increasing, food crops will be needed primarily for consumption to minimise malnourishment.

The pro-biofuel lobby disagrees with much of the arguments raised above. Firstly, they argue that food insecurity should not be reduced to biofuel production. This is because issues of food insecurity and malnourishment are complex and demand a slightly nuanced analysis. It is argued that the reason why people go hungry has little to do with food or land availability but more to do with poverty and income inequality (Rosillo-Calle and Tschirley, 2010b:12). In fact, given the proper conditions (financing, markets, and skills) farmers can produce more food than it is generally assumed (Rosillo-Calle and Tschirley, 2010b:12). It is also important to acknowledge that this school of thought regards biofuel as immediate alternative rather than calling for a complete and immediate replacement of fossil fuels. This means that,

biofuels can be used simultaneously with fossil fuels without completely replacing them. They argue that there is adequate land available to provide a proportion of 10 to 20 % of biofuels without an impact on food production provided that proper policies are put in place (Cortez *et al*, 2010:58). For example, the case of the Minister of Agriculture in Mozambique illustrates the point. The Minister for Agriculture has reiterated that the government will not allow biofuel production to compromise food security; this will be done by identifying land for commercial biofuel feedstock production and exclude land that is fit for food production (Agencia de Informaçao deMozambique, cited in Cotulo *et al*, 2008:60).

2.5.2 Food prices

As a result of feedstock being used for fuel production, there is less food being produced and this leads to food prices to incline dramatically. This argument emphasized by the anti-biofuel lobby accuses biofuel production as the major cause of escalating food prices (Rosillo-Calle and Tschirley, 2010:14). However, this argument is rather flawed and there is little evidence to substantiate this. Although biofuels might have played a role in the rising food prices, their role was minimal and accompanied by other causal factors such as changing consumption patterns, agricultural markets, low investments in agriculture, poverty and inequality as well as increasing cost of inputs (Diaz Chavez, 2010:15). According to Connor and Hernandez (cited in Diaz-Chavez, 2010:122), it is viable to grow both food and fuel crops. Growing crops for biofuels does not necessarily lead to food prices. However, Connor and Hernandez (cited in Diaz Chavez, 2010:122) emphasize that the use of food crops to produce biofuels will remain problematic in the long term if food crops are continually used to produce fuel.

All these factors play a vital role in the fluctuations of food prices and it is reductionist to put the blame solely on biofuel production. For example, in terms of agricultural markets, there is a level of distortion caused by developed countries subsidizing domestic production and dumping surplus production in the world market; levels of investment have shrunk from 17 % in the 1980s to a mere 3% in 2005; and increasing cost of inputs such as fertilizers and pesticides coupled with other costs in processing and distribution squeezes farmers and puts them under pressure (Rosillo-Calle and Tschirley, 2010b:15). Food price increases is a complex phenomenon caused by a variety of factors which have little to do with biofuel production; the pro-biofuel lobby further argues that prices caused by land competition are

unlikely because of it is only about 1 per cent of land dedicated to biofuel feedstock production (Rosillo-Calle and Tschirley, 2010b:15).

Food price increases happens in two ways; it has both its advantages and disadvantages. Although food price increases may be detrimental to the poor because of issues of affordability but it can also be an opportunity for farmers because high food prices will mean that an increased access to food due to increased income (Rutz and Janssen, 2012:313). The anti-biofuel lobby had argued that land used for biofuels in food-insecure countries would be unethical because it is the wealthy people who benefit (Rosillo-Calle and Tschirley, 2010b:11). The same goes for food, the problem is not that food is unavailable but it is unaffordable (Rosillo-Calle and Tschirley, 2010b:12) this is because of food prices increases caused by the various factors discussed above.

2.6 Socio-economic contributions of biofuels

One of the most important reasons for re-engaging in biofuels in the early 21st century is the anticipated social benefits of biofuels. Biofuels are seen as a means to alleviate poverty and create employment especially in rural areas where there is little development taking place. The anti-biofuel school of thought argues that those benefits have not been fully proven, the pro-biofuel lobby contends that biofuels can outweigh potential negative impacts if good management practices are applied (Rosillo-Calle and Tschirley, 2010b:10-1). This section will explore the debate about biofuel pertaining to issues of employment, poverty alleviation, rural development and livelihoods as well as income generation.

2.6.1 Employment

African governments agree for biofuels projects to take place in their countries with the belief that better employment opportunities will be created for their people. Local people are also of the belief that biofuel project will protect existing jobs, generate new ones and offer better wages. Employment is related to all stages of the value chain from the agricultural feedstock production to the conversion process and finally to the end use (Rutz and Janssen, 2012:313). There has been severe shortage of employment in rural areas, a problem which still continues even to this day (World Bank cited in Matondi and Mutopo, 2011:73). However, it is argued that the jobs created by large-scale biofuel project are of poor quality and quantity to address this challenge in rural areas (Matondi and Mutopo, 2011:73). But this is not the overall picture of the sector in terms of employment opportunities created. Employment is also dependent on the type of energy crop used, the scale of production and technology used (Mwakasonda and Farioli, 2012:331-332).

The type of crop used can determine the scale of production and it can also determine the type of technology used. For example, soy used for biodiesel is usually highly mechanized, requires huge land areas and most importantly generates a low number of jobs while sugarcane for ethanol is non-mechanised it can have high potential of unskilled jobs (Mwakasonda and Farioli, 2012:332). The sugarcane industry in Brazil in the 1990s employed over 380 000 people in a single state of Sao Paulo, the number increased by 18 percent by 2002 (Diaz-Chavez, 2010:118). Mechanization is an important determinant factor of employment and its introduction in a highly employable sector can lead to job losses and low employment of most unskilled job generation like the sugarcane industry in Brazil (German *et al,* 2011:3).

2.6.2 Livelihoods and rural development

Biofuel production is dependent on agriculture and people in rural areas depend on agriculture for their livelihoods. With agriculture being the backbone of livelihoods for rural people in Africa with reduced government spending, biofuels are regarded as the means to which agriculture can be revitalized and new income sources can be generated for rural people in this regard. This could be attributed to neoliberal policies which foster market-based development with minimal intervention from governments. Therefore, the agriculture of biofuels is within the confines of such policies and models of agro-exportation based on privatization and transformation of natural resources (Matondi *et al*, 2011:180). It is no surprise that African governments have come to embrace FDI in their countries because they are seen as poor and backward and in need of financial resources to stimulate development (Matondi *et al*, 2011:180).

Rural livelihoods and income generation from biofuel production could only be successful if it is done properly through good policies and management. It has been widely agreed in literature that large-scale biofuel projects are problematic and are a detriment to rural people's livelihoods and do little to alleviate poverty; in fact they worsen it. The use of marginal lands is one such problematic aspect of biofuel production. It has been argued elsewhere that marginal lands are the most appropriate for biofuel projects; in reality such lands are of utmost importance especially for rural women's livelihoods because they use these lands for cropping farming, herding and gathering other wild products (Mwakasonda and Farioli, 2012:331). The labelling and targeting of such lands for biofuels use could worsen poverty and hinder prospect for rural development in those areas.

It is argued that biofuel projects that are positive for livelihoods and poverty alleviation do not involve large-scale land acquisitions, are characterized by collaborative arrangements between investors and local small scale farmers and communities at large (Mwakasonda and Farioli, 2012:330). Business models that can be successful for biofuels production include arrangements such as contract farming schemes, joint ventures, management contracts and supply chain relationships (Vermulen and Cotula cited in Mwakasonda and Farioli, 2012:330). These models can be adopted for a large-scale or small-scale project. However, models have to be implemented in such a way that biofuel processing are near to farms and people have a stake in parts of the production value chain (Mwakasonda and Farioli, 2012:330). There are a few case studies across Sub-Saharan Africa such Ghana, Tanzania and South Africa where these models have been put into action.

Section C Selected Case Studies

2.7

The two case studies namely Ghana and Tanzania are selected on the basis that they cover issues that have been debated as discussed in the previous section. These cases cover the use of different biofuel feedstock crops; different biofuel produced different models and also cover the success and failures of biofuels projects where lessons for future biofuel projects can be learned.

2.7.1 Ghana

Ghana is one of the countries that have embraced biofuel investments by foreign companies. As a result, large tracts of land have been outsourced by traditional land owners for biofuel production (Boamah, 2011:159). Biofuels production became an important area of investment in the country because of the availability of rural lands and the need to uplift rural communities through agriculture. In a country where food insecurity is a problem and where food prices are spiralling, it was anticipated that the introduction of biofuels would aggravate the situation especially if the country is affected by droughts and inadequate rainfall (Boamah, 2011:159). Food prices were already high partly due to the cost of oil imports and also the cost of farming inputs such as seeds, fertilizers, pesticides and insecticides. The introduction of biofuel in Ghana sought to address these challenges as well as creating income generation for the local people through employment.

Biofuels Ltd was the biofuel company which was given a go ahead for investing and fuelling biofuel production in three villages in the Gonja and Yendi districts of northern Ghana. The company was allocated 23 762 ha of land in those districts to produce biodiesel made from

jatropha (Boamah, 2011:161). In its accordance with the company's food first policy, jatropha was cropped simultaneously with other food crops. This was because jatropha was tolerant of other crops such as maize and thus they could be grown alongside each other. The biofuel project was believed to have little negative impacts on the environment; the biodiesel was for energy use in Ghana and for export purposes (Boamah, 2011:161). Biofuel Ltd allocated land to farmers to be relocated and most of the farmers remarked that moving to new farm lands increased their yields (Boamah, 2011:169). Because farmers were involved in the project, and because of contract farming model there was little risk of them losing their land or their livelihoods being negatively affected.

The project created employment with sixty percent of the workers coming from the three villages. The monthly wages became an important source of income generation in rural areas, the wages for skilled workers ranged from 200 GHS to 1000 GHS (US$138-600) and unskilled workers getting a range of 77-150 GHS (Boamah, 2011:162). The project benefitted the community in a number of ways, firstly because farmers were relocated to new better lands without the old one being taken gave them an opportunity to farm both food and fuel crops without one affecting the other and having a negative impact on their livelihoods. However, the project collapsed because of funding and other financial problems as well as the global recession of 2008 and as a consequence residents were laid off work but because their lands were not lost they did not become worse-off as they went to their previous livelihoods (Boamah, 2011:171).

2.7.2 Tanzania

Tanzania is also one of the Sub-Saharan countries that were targeted for biofuel production because of the large amount of land deemed suitable for biofuel production. The government has estimated that the country has 44 million ha of arable land to which only 10 million are under cultivation (Sulle and Nelson, 2009:15). This has resulted in a large number of biofuel companies such as FELISA, Diligent Ltd, SEKAB Bioenergy Ltd and Sun Biofuels from foreign nations such as Belgium, Sweden, Netherlands and UK scrambling for Tanzania's land to grow biofuels. Tanzania has energy challenges; it imports a lot of petroleum at very high cost because it lacks petroleum reserves (Sulle and Nelson, 2009:15). The country has also an increasing consumption of energy and rising costs of existing energy sources. Therefore biofuels were introduced to curb the energy problems that the country faced.

There are many biofuels companies with existing and proposing biofuel investments in Tanzania such as Bioshape, Donesta Ltd & Savannah Biofuels Ltd, Trinity Consultants, Shanta Estates Ltd etc (Kamanga cited in Sulle and Nelson, 2009). However, the study conducted by Sulle and Nelson (2009) only focuses on the four companies listed in the previous paragraph. The crops that are targeted for biofuel production include jatropha, oil palm and sugarcane which they produce under three different business models such as plantations, contract farming and hybrid models. FELISA grows oil palm while Diligent Ltd processes jatropha; both these companies use hybrid and outgrower models respectively. FELISA has targeted 10 000ha to which half of this is expected to come from outgrower and Diligent Ltd has contracted 5000 local farmers on 3500 ha of land in Northern Tanzania (Sulle and Nelson, 2009:12). SEKAB Ltd was pursuing large-scale sugarcane plantations; It has acquired 22 000ha in the Rufiji District while Sun Biofuels Ltd has acquired 8211 ha using the same model of large-scale land acquisition (Sulle and Nelson, 2009:12).The choice of models as already argued can be influenced by the crop used for production.

The study revealed that different models yield different impacts especially with regards to land access. Diligent Ltd uses an outgrower business model, which according to Sulle and Nelson (2009:59) has no direct impact on local land access and the model is deemed the most promising for local livelihoods and land access. On the other hand, there is risk of land alienation over long periods of time through large-scale land acquisitions. These types of biofuel investments are likely to create negative local impacts and grievance in terms of land access and livelihoods (Sulle and Nelson, 2009:63). Villagers are at risk of permanently losing their customary lands through such models where large areas of land are transferred from villagers to investors (Sulle and Nelson, 2009:63). As a response, the Tanzanian Government through input of NGOs such as WWF-Tanzania and other stakeholders drafted the National Biofuels Guideline released in November 2008 as a way to support biofuel development and promote the biofuel industry in the country (Sulle and Nelson, 2009:63). The National Biofuels Guideline highlights the following provisions on land purchasing issues:

- Land acquisition process should be transparent and coordinated on a national level
- Investors should not directly negotiate with communities to purchase land
- Adequate compensation for land is required

- Communities affected by biofuels investments should know their rights and no projects should work against those rights
- Government will encourage outgrowers to form associations and cooperatives
    - Investors should stipulate how outgrowers will be involved in their projects
    - Local land holders should become co-investors using land as their equity

The development of such guidelines is a way for the government to support biofuel investment and at the same time address the concerns attributed to biofuels production to satisfy both the investors and local communities. Even though that is the case, there are certain shortcomings that are not addressed by the National Biofuels Guidelines such as the calculation of compensation to be given to communities for land, how short term land leases for biofuel companies (25 years) will not be adequate because after the lease expires lands will revert to Ministry of lands rather than the communities (Sulle and Nelson, 2009:64). Addressing such challenges is fundamental for the government to ensure the viability of biofuel investments and its impact on local communities.

2.8 Conclusion

Biofuels are the first fuels that mankind has used throughout history for energy purposes. In the early 20th century when the world was undergoing change through industrialization the role of biofuels as sources became minimal giving opportunity for fossil fuels to gain prominence and dominance in the energy market. The supply of cheap oil to many developed and developing countries totally eliminated the biofuel market. The consumption and oversupply of fossil fuel created new problems and was deemed unsustainable due to the crisis that were created and the geopolitical tensions it caused. The late 20th century and early 21tst century was a period dedicated to rediscovering biofuels as a primary means to solve the energy challenges and to solve global problems such as climate change and underdevelopment in developing countries. However, biofuels production was not welcomed with both open arms, biofuels became a topic of debate, research and land policy. This chapter touched on the major categories of debates such as the impact of biofuels on the environment, on land access, food production and most importantly on rural development and livelihoods. From the various arguments that emerged from both sides of the debate it can be concluded that the debate should not be about whether to use biofuels or not but which biofuels could we use, at what scale and which model could be adopted. Indeed, biofuels production is centred on the type of crop used, the dichotomy between small-scale or large

scale and the business model used for production. It was demonstrated that biofuel production is most successful when it is done on a small-scale and when local farmers and communities are consulted and collaborated with. We could see that from the Ghanaian case study that was the case, biofuels can play a role in improving livelihoods and developing rural areas without compromising food production or minimising the local people's right to access land. The Tanzanian SEKAB case study, on the other hand, demonstrated the negative impact attributed to large-scale biofuel production such loss of land for communities and lack of compensation for lost land. African governments who wish to attract biofuel investments should do so without compromising communities' access to land. Biofuel companies can play a major role in improving livelihoods for poor rural communities as long as their current livelihoods are not disturbed.

Chapter 3

Biofuel Production and Policy Development in South Africa

3.1 Introduction

South Africa has a history of poor energy policy formulation. Before the dawn of the new democratic dispensation, the energy sector was facilitated by a single piece of policy legislation, the Petroleum Act of 1977. Now, the beginning of the 21st century was a period where South Africa faced challenges in its energy development path (Winkler, 2007:26). With the lack of policy development combined with the intensive nature of the energy sector, the new government was faced with a mammoth task of supplying energy to industries and previously disadvantaged households. The economy of the country relied upon fossil fuels and the provision of energy needed not to neglect the environmental concerns of climate change and rising CO2 levels which were issues of global concern at the beginning of the century. South Africa started introducing energy policies in 1998 starting with the White Paper on Energy Policy. A series of policies which followed thereafter addressed ways to improve energy security and most importantly provided an impetus for the use of renewable energy especially through biofuels production for the country.

The Biofuel Industrial Strategy was a policy document introduced in 2007 which was proposed to serve a number of purposes and address challenges. Firstly, it addressed issues of global concern by advocating the use of cleaner renewable energy that will replace fossil fuels to curb greenhouse gas emissions and mitigate climate change; secondly, by addressing alternative fuel for South Africa's transport sector; and finally, by addressing socio-economic issues of rural development and livelihood improvement of farmers in previously disadvantaged areas through biofuel production. The chapter is divided into two sections. The first section is discusses the history of biofuel production in the country and secondly of dispossession of land, proletarianization and destruction of black farming to which the recent biofuel policy is aiming to address. The second section will focus on the development of biofuel production in South Africa with the core focus on the policies that have been adopted. The chapter will trace the development of government policy on energy (including renewable energy and biofuels) which gave the momentum for the development of the final Biofuels Strategy of 2007. The chapter will also discuss and analyse the key points of the Biofuel Strategy looking closely at its aims and objectives, the need for biofuels, crops which will be

used, biofuels which will be produced, the model of production and the progress of some of the projects which commenced as a result of this strategy.

Section A: History of Biofuels in South Africa

3.2 Brief history of biofuels in South Africa

Biofuels are not new in South Africa. South Africa has a long history of biofuel usage. Biofuels have been used long before fossil fuels. The recent introduction of biofuels in South Africa is aligned with global trends. South Africa has gone through three stages of biofuel development characterized by biofuel usage pre-world war II, massive consumption of fossil fuels after the world war and the re-engagement of renewable energy after the oil crisis of the 1970's and global challenges in the 1990's leading up to the present moment. In the 1930's vegetable oil was used to fuel heavy vehicles, and renewable energy was still extensively used (Berkeley Biodiesel, 2015).

After the oil crisis of the 1970's South Africa was looking for alternative sources of energy and this came through an investigation of sunflower oil as a possible alternative; the aim was to develop a chemical method to allow the converted sunflower oil to run in diesel engines (Berkeley Biodiesel, 2015). According to Berkeley Biodiesel (2015) researching the convertibility of sunflower oil into biodiesel began in 1979, and after the process of manufacturing fuel and testing engines was completed and published internationally an Austrian Company named Gaskoks put up the first pilot plant to produce biodisel in 1987. These were the first steps South Africa took as part of its rediscovery of the possibility of using biofuels as renewable energy sources after the oil crisis of the 70's.

In the 1990s biofuel development and production was driven by a new set of factors including climate change and the global need for alternative energy. South Africa, as a response to global commitments of renewable energy, embarked on an expansive policy formulation process which would inform renewable energy usage. This includes the White Paper on Energy Policy in 1998, the outcomes of the 2002 World Summit on Sustainable Development, the 2003 White Paper on Renewable Energy culminating in the drafting of the final Biofuel Strategy Policy of 2007. All these set of policies advance the need for the use of clean renewable energy to propagate for the use of clean renewable energy to curb fossil fuel reliance, tackle global challenges such as climate change while at the same time addressing socio-economic problems.

Socio-economic challenges in South Africa are vast, they include food insecurity, inequality and overwhelming poverty especially in former reserves or Bantustan areas which represent spatial dichotomies of the past apartheid system which was largely responsible for the collapse of black farming. Therefore, it is not possible to discuss biofuel production as a means of revitalizing agriculture in former Bantustans without firstly discussing the conditions and factors that led to the deterioration of black farming.

3.3 Brief history of land dispossession and deterioration of black farming

South Africa has a long history of oppression and land dispossession; this is the reference point if we want to understand biofuel production development as an agricultural strategy for African agricultural development. Oppression and land dispossession became very beneficial for white commercial agriculture which was a crucial sector of the economy at that time. White commercial agriculture rested on three important elements which include massive state support, cheap labour from the reserves and favourable land laws (Helliker, 2013:75). Commercial agriculture was massively supported by the interventionist government through massive state assistance that came in a form of land, credit, input and output markets which also involved subsidies and financial assistance (Helliker, 2013:75). The interventionist process was along racial lines because the success of commercial agriculture was at the expense of the black population whose land was dispossessed for white commercial use and whose labour was exploited for the benefit of a thriving white commercial sector.

The dispossession of land and cheap labour are the second and third elements which were important for white commercial agriculture. These two are intrinsically linked to the extent that one cannot be discussed without the other. Dispossession of African lands through conquest and annexation led to the creation of reserves which can be described as eroded, overstocked and overcrowded rural ghettoes which mainly functioned for purposes of providing migratory labour to the so-called white areas including white farms (Bundy, 1988:1).

Before the process of land dispossession took place, Africans existed as pastoralist-cultivators who had strong ties to the land as a source of livelihood (Bundy, 1979). Bundy (1988) argues that in the Transkei and Ciskei African peasant farmers competed and out-produced their white counterparts. This period was followed by industrialization which according to Bundy (1988) was responsible for the collapse of African farming. The discovery of diamonds and gold mines in the late 19th century engendered new needs in the economy, specifically for

more labour on mines and farms. There was a shortage of labour in those sectors and this was of major concern to the white farmers and mine owners to the point of asking for government to intervene to restrict African competition in the market as well as to force Africans into wage labour (World Bank, 1994:46). This was followed by a series of laws such as taxation, pass laws, vagrancy laws, location laws, and the restriction of Africans' access to land which best suited the farmers' demands (Bundy, 1988). One of the laws which restricted Africans to access land was the 1913 Native Land Act which attempted to tackle the labour shortage problem (Lacey, 1981:125). The aim of this Act was to eliminate 'Kaffir farming' and keep Africans in White areas primarily for their labour on the farms (Lacey, 1981). This created a phenomenon of African tenancy on white farms and as a result of land shortages, the Africans were forced to rent land from farmers at high rates which could either be paid in cash or labour (Lacey, 1981:125).

Colonial advances which led to the loss of land for the natives had devastating effects for their subsistence economy (Bundy, 1979:2). Walter Stanford, the Chief Magistrate of Tembuland, was quoted saying that "the man who has no land and no trade must work for someone else who has" (Lacey, 1981:121). This quote clearly depicts the land-labour relations of the time and demonstrates how previous owners of the land were quickly turned into cheap wage labourers through the process of proletarianization. This cheap labour was sourced from the reserves created through the Natives Land Act where blacks owned 13% of the land as compared to the 87% that the whites owned. The reserves could not be regarded as areas of successful agricultural production and had to resort to import food from elsewhere. Small-scale farming which was quite significant in the reserves faced huge challenges and as a consequence could not meet the needs of the rural population and had to import from the white agricultural sector (World Bank, 1994:22).

In this light, the policy measures undertaken by the apartheid government, as well as its interventionist role coupled with financial assistance, subsidies and other measures created favourable conditions for white agriculture to thrive. With the decline of African agricultural production, the differences between white and African farming were massive. The 1980s saw the withdrawal of state subsidies to the white commercial sector as a result of the adoption of neoliberal policies which demanded less state intervention in the economy; this minimised the role and importance of this sector in the economy towards the end of apartheid and in the new democratic state. Even though that was the case, white commercial farming has been

globally integrated within the capitalist system and has shifted from farming to processing and agribusiness dominated by corporations as a result of the modernisation of agriculture through technology (mechanization, agrichemicals, fertilizers and GM seeds) as well as organization and institutions (Bernstein, 2013:32).

African agriculture, deteriorated as it was during apartheid, remains the same after 1994. This is because best agricultural lands are still under white ownership; former homelands continue to have poor production outputs and farm workers are still exploited on white farms. Even though the new democratic government committed to re-regulate agriculture, part of the re-regulation meant new labour laws such as the Basic Conditions of Employment Act and the Extension of Security of Tenure act were passed (Helliker, 2013:78-79). It was anticipated the democratic government will recuperate African agriculture through these favourable laws, a fast land redistribution programme, financial assistance and subsidies, the same conditions that the apartheid government created for their commercial agriculture; but this is not the case. Th legislation did not help to dramatically improve the wages of farmers workers on commercial farm and the the Extension of Security of tenure Act has also not been successful in preventing evictions on the farms (Helliker, 2013:79-81). In 2005 it was only 3.5 million hectares of land through all aspects of land reform which add up to 4% of the agricultural land which is way below the targetted 30% (Hall, 2007:87). The government continues with neoliberal policies, the same policies which dismantled white commercial agriculture in the name of global capitalist integration.

Perhaps biofuel production is a way for the government to integrate the previously neglected African farmers into the global capitalist system and to also bridge the gap between white commercial farmers and black farmers. It is also about transforming previously disadvantaged areas to be productive through bringing black farmers into the agricultural manifold using various agricultural support programmes. The new democratic government was tasked with making all of these possible and the first step to be taken was to develop policies for a sector which was previously underdeveloped in terms of policies.

Section B: Energy Policy in South Africa

This section will briefly deal with the development of the government's energy policy in South Africa with the core focus placed on renewable energy and biofuels. These are the policies which paved the way for the development of the biofuels industrial strategy of the country which serves as the blueprint of biofuel production leading up to the future of renewable energy in the country.

3.4 Development of energy policy in South Africa

South Africa has a history of energy policy dating back to 1977, a period where biofuels production was in its initial stages following the global oil crisis of that decade. The Petroleum Product Act, No. 120 of 1977, was an important legislative vehicle for the biofuel development in the country (Fischer, 2011:1). The Act was introduced to provide licensing to people involved in the manufacturing or sale of petroleum products and also to promote the transformation of the petroleum industry (Government Gazette, 2004:3). It was amended in 2003, for purposes of defining certain expressions and to substitute and delete certain definitions and to also add more sections to the act (Government Gazette, 2004:3-4). The first legislation after 1994 was the White Paper on Energy policy of 1998 which gave the impetus for the country's energy policy and recognized the importance of having a diversity of fuels which can be used as alternative transport fuels (DME, 2007:6).

The White Paper on Energy Policy (hereafter referred to as the White Paper) views energy policy from two perspectives: supply and demand. It argues that previously legislation tended to focus more on issues of supply with less attention being paid to issues of demand (DME, 1998:6). It further reiterates that demand is about energy requirement which comes from various sectors including the household, industry, commerce, mining, transport and agriculture; supply sectors include coal, liquid fuels, electricity, nuclear and gas (DME, 1998:6). The White Paper suggests that both supply and demand should be addressed because social problems relating to energy can come from both of those sides.

This White Paper also discusses the significance of agriculture in providing raw-materials for biofuels and also acknowledges the importance of fuel-wood as the main energy source for many people residing in rural areas (Damm cited in Fischer, 2011:1). The main highlight of the White Paper is to recognize the demand from the different sectors and how they can be addressed through supplying energy in different forms and ways. And of particular interest is

the production of energy through agriculture. The paper acknowledges the strong links between agriculture and livelihoods as well as how by-products and residues can be processed into modern biofuels for combined heat and power generation (DME, 1998:40).

Following the release of the White Paper on Energy Policy was the Gas Act, No. 48 of 2001. The Gas Act serves to promote the development of the gas industry with the gas regulator playing a critical role in enforcing the regulatory framework (Government Gazette, 2004: 2). This Gas Act along with the Petroleum Product Act of 1977 gives authority to the Minister of Minerals and Energy to demand licensed liquid fuel wholesalers and producers to supply and sell petroleum products made from vegetable matter (Fischer, 2011:1). Interestingly, the Gas Act does not address the recommendations of the White Paper on Energy Policy especially the issue of renewable energy such as biogas as a viable energy option. Interestingly, the White Paper promotes to address thermal energy needs, however, the Gas Act does not mention biogas as a viable energy option.

In 2001 there was a technology audit of the transport fuel sector carried out by the Department of Arts and Culture, and the Department of Science and Technology to investigate fuel consumption and ways to minimise its impact in the transport sector. Transport was responsible for 24 % of the total energy consumption and 90 % of fuel was in a form of liquid fuel derived from imported crude oil (DME, 1998). With the transport sector responsible for such amounts of energy consumption measures had to be taken to reduce this. The technology audit concluded that the energy saving potential lies in improving vehicle efficiencies, and one of the ways was to consider biofuels and determine the level of government support (Fischer, 2011:5).

In 2002, Johannesburg was the host city for the World Summit on Sustainable Development. The outcome of this summit was the Johannesburg Plan of Implementation (JPol) which promised to uphold the principles of the Rio Declaration as well as to promote integration of the economy, societal development and the environment with the overall aim being to achieve sustainable development (Fischer, 2011:1). The JPol also commits to renewable energy including biofuels. After this international summit the DME developed the Integrated Energy Plan in 2003 which mentions the importance of biomass created from fuels but does not necessarily deal much with issues of biogas and biofuels (Fischer, 2011:1).

In the latter part of 2003, a second White Paper on Energy Policy, but this one focusing specifically on renewable energy, was passed. This White Paper supplements the first White paper on Energy policy but it focuses solely on promoting the use of renewable and clean energy (DME, 2002:v). The purpose of the policy is driven by issues of global concern relating to the reduction of carbon emission to minimise the global threat of climate change (DME, 2002:v). It also intends to explore other ways of generating energy. The following quote sums it up perfectly:

> *"Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels…An additional 10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2012, to be produced mainly from biomass, wind, solar and small-scale hydro.*

In terms of biomass, the policy also mentions that there is considerable potential for producing biofuels from energy crops such as maize, sunflower and Jatropha (DME, 2002:6). This supplements what was said in the White Paper on Energy policy about using agriculture to produce energy to supply and also meeting energy demands.

In February of 2005, following the adoption of the Kyoto protocol in 1997 the United Nations Framework Convention on Climate Change (UNFCCC) came into effect (DME, 2007:6). The Kyoto protocol was adopted primarily to make it obligatory for developed countries to reduce their greenhouse gas emissions through investing in cleaner technologies in developing countries (Fischer, 2011:6). Even though South Africa is not one of the countries committed to the Kyoto Protocol, it is committed for reducing emissions for future purposes.

In the third quarter of 2005, the national Treasury approved the increase of the Fuel Levy exemption for biodiesel from 30% to 40 %; this also meant that biofuel investments qualify for tax-depreciation (DME, 2007:7). The Department of Science and Technology formulated a Biodiesel committee which conducted a study which concluded that government will support biodiesel production because of the anticipated environmental and socio-economic benefits (DME, 2007:7).

3.5 The Draft National Biofuel Industrial Strategy of 2006

In 2005 the first draft of a national biofuel policy strategy draft was adopted. In the last quarter of 2005, the government established an interdepartmental Biofuel Task Team[4] to draft the country's biofuel strategy (ACB, 2008:11). In 2006 a draft of the National Biofuel Strategy was submitted to cabinet and also released to the public for comment until May 2007 (DME, 2007:8).

The draft National Biofuel Strategy of 2006 was the first attempt biofuel policy for the country. This draft strategy was based on the findings of the feasibility study that was done by the Biofuel Task Team in October 2006 before the draft report was released in November 2006. The feasibility study found that South Africa has a limited availability of arable land which only takes up 14% of the total land available and moreover there are million hectares of underutilized and high potential land mainly in the former Bantustans areas (DME, 2007:9). The study also determined that production of biofuel feedstock would differ from region to region based on climate and soil characteristics; it proposed that it was feasible for biofuels to make up 2% of the national fuel supply through the use of local grown crops which will be cultivated in former Bantustan areas (DME, 2007:9). The priority of biofuel production is to be socially and economically beneficial; the feasibility study revealed that biofuel production can create jobs with adequate investment in place. The 2 % of biofuel to the national fuel supply was predicted to create 25 000 jobs, and therefore decreasing unemployment by 0.6 % and boosting economic growth by 0.05 % if R4 billion is invested over the initial 5 year period of the project (DME, 2007:9).

In November 2006, the Biofuel Task Force proceeded to draft the National Biofuel Strategy without the public having an opportunity to have a say on the findings of the feasibility study. The strategy emphasised the viability of biodiesel made from soya and bioethanol from maize and sugar and anticipated greater commercial returns for farmers without having to be provided any subsidies (DME, 2006:iii). Furthermore, the draft strategy proposed that by 2013 at least 4.5 % of the total liquid used should be from biofuels and an establishment of such a biofuel industry will contribute R1,7 billion to the GDP or 0.11 % and will increase economic growth by 2 % (DME, 2006:iv). Although the figures look impressive, the draft strategy did not impress the public because of the mixed reactions it received.

[4] Biofuel Task Team is a team of experts appointed by cabinet in December 2005 with a mandate to develop a national Biofuels Industrial Strategy targeted at creating jobs in the energy-crop and biofuels value chain, and to act as a bridge between the first and second economy (DME, 2007).

Several agribusinesses were particularly pleased with the draft strategy as some (e. g Sterling Waterford and Lereko Holdings) were quick to start investing millions of rands for ethanol produced from maize in the Free State (ACB, 2008:13). But in contrast, the public at large was rather appalled by the policy document as they expressed feelings of dismay and disappointments. NGOs, farmers' organizations, individuals and rural communities from KwaZulu-Natal, Limpopo, Eastern Cape and Mpumalanga were amongst the first commentators of the draft strategy; they believed that the strategy and the public consultation were flawed because communities had not been properly informed and consulted about the strategy (ACB, 2007:1). Moreover, the communities are not content with the contents of the draft National Biofuel Strategy and have called on government to redraft it in its entirety.

Communities were concerned about the participation of women in those projects; they rejected large-scale projects and were concerned about food security because of the proposed use of food crops for biofuels production. They also made suggestion on what the draft strategy should include. This includes addressing the need for energy with participation of the community especially women, integrating energy planning to include biofuels such as biogas and ethanol gel, enabling community-owned biofuel plants for energy security and food security, and excluding the use of staple foods such as maize as well as using genetically modified organisms and prime agricultural land for biofuel (ACB, 2007:2). They further called for a placement of a moratorium to stop large-scale projects as they believed constitute land grabs (Ibid).

3.6 Biofuel Industrial Strategy of 2007

In December 2007, Cabinet approved the final Biofuel Industrial Strategy which was going to serve as the blueprint for biofuel production in the country. It differs significantly from the draft strategy firstly because it adopted a short-term focus of 5 years to achieve its objectives and secondly, it adopted some of the suggestions from the public such as the exclusion and prohibition of staple foods such as maize for biofuel production (ACB, 2008:15). This move was met with utter dismay this time from the agribusinesses such as Omnia and Grain SA who were interested in investing on ethanol created from maize; they continuously lobbied the government to re-open this issue for further discussion and pleaded for the prohibition to the re-examined, but without success (ACB, 2008:15). The final strategy covers a wide range

of issues just like the draft, such as participation of farmers, the types of crops to be used, the land to be used and the level of government support which will be the focus of the following section.

3.6.1 Key issues of the Biofuel Industrial Strategy

In 2007 the Department of Minerals and Energy published its first Biofuels Industrial Strategy. The aim of the strategy is to produce 400 million litres of biofuels which will constitute 2% of the national fuel supply in the initial 5-year pilot phase (DME, 2007:3).The Biofuel Industrial Strategy's main goal is to revitalize African farming by utilizing land deemed as under-utilized to be agriculturally productive. This driver for biofuels production in South Africa differs significantly with the global drive for biofuel production which is steered by the need to reduce carbon emissions and develop an alternative source of energy to curb fossil fuel reliance. South Africa's drive for biofuels is because of the need to create a connection between the first economy (characterized by modern industries and global integration) with second economies (characterized by poverty, underdevelopment and marginalization from years of apartheid rule) (Letete and Blonitz, 2012:192). The government is aiming to alleviate poverty and underdevelopment in rural areas especially the previously disadvantaged former Bantustan areas.

3.6.2 Participation of farmers in Biofuel projects

Biofuels development is about rural development and the provision of firm opportunities to the rural poor by creating a market for farmers to sell their produce (DME, 2007:13). With that being said, the strategy focuses on developing agriculture for small-scale farmers who reside in former Bantustan areas. Small-scale farmers are particularly targeted because of their vulnerability in the agricultural sector and because they lack the ability to create sustainable livelihoods (Sishuta, 2004:2). South Africa has former Bantustan areas in seven of its nine provinces; this means that the Western Cape and Northern Cape Provinces will not form part of the initiative as a consequence farmers in those provinces will be excluded (Letete and Blonitz 2012:195). Also excluded are the commercial farmers who might have been interested in forming part of the venture.

Long before the Biofuel Industrial Strategy was even drafted, commercial farmers were amongst the first to lobby for bioethanol production from maize in the heart of South Africa's maize triangle, in Bothaville (Letete and Blonitz 2012:195). These commercial farmers will not form part of the strategy for two reasons; firstly, these farmers are not disadvantaged nor are they from previously disadvantaged areas of the former Bantustan area. Secondly, the use of maize for biofuel is strictly prohibited by the strategy.

3.6.3 Crops

There are many crops that can be used to produce biofuels, but their utilization depends upon various factors such as climate, soil suitability and most importantly their energy balance. In South Africa, the biofuel strategy has placed a list of crops that can be suitable for biofuel crop production in the country not only depending on the factors listed above but related to other factors including land requirements, farmers' familiarity with the crop as well as for food security reasons. The strategy highlights that the targeted crops for cultivation of biofuel will be sugar cane, sugar beet, sunflower, canola and soya (DME, 2007:3). Maize and Jatropha are well known crops for producing biofuels which were considered in the draft strategy but had been excluded and prohibited in the final strategy. Maize has been excluded, for a number of reasons despite interest shown by investors to establish and develop a bioethanol plant using maize as feedstock in the Free State. Firstly, the price of maize has significantly increased over the years both locally and globally; this has largely been because of the USA which produces 50 % of the maize traded globally and diverting 25 % of it to ethanol production (DME, 2007:10). Therefore as a result of less maize being exported some countries have experienced food shortages directly linked to biofuel investments according to the DME (2007:10). This has prompted South Africa to exclude maize in its initial stages of biofuel development. Secondly, the energy balance of producing bioethanol from maize is negative because the industry does not generate its own energy (DME, 2007:11).

Sugar cane is one of the crops that can be used for producing bioethanol as stipulated in the strategy. The reason for using sugar cane is firstly because some sugar industry players are already producing bioethanol for export in alcohol markets and developing fuel for ethanol capacity in neighbouring countries (DME, 2007:10). Canola is one of the crops that will be used to produce biodiesel. It is relatively new in South Africa and as a result of its production being lower than the demand; favourable prices could be achieved (Department of

Agriculture, Forestry and Fisheries, 2010:2). Sunflower, on the other hand, is an annual summer crop grown in Limpopo, Mpumalanga, North West, Gauteng and Free State provinces (MMI, 2010:2). It is the main oil crop in South Africa as it constitutes 70 % of the total land area used for oil crops (SAGIS cited in MMI, 2010:2). The consumption of sunflower in South Africa is lower to that of soya bean and as a consequence the price of sunflower meal is lower than that of canola and soya; sunflower also has higher oil content than the other oil crops used for biodiesel (MMI, 2010:2). The selection of this crop for biofuel production is influenced by factors such as prices, consumption, land requirements, and the fact that they have already being cultivated and farmers are already familiar with them.

3.6.4 The issues of land availability

According to the South African Grain Information Service (SAGIS, 2006) South Africa's cropland has decreased by 40 % from about 6.4 million hectares to about 3.7 million hectares. It is assumed that this decline was because of the cultivation of maize and the total area for oil crops has remained fairly constant; it is speculated that there is about 2.7 million hectares of unutilized land (MMI, 2010:2). The plan is to take advantage and utilize the land again for agricultural production. The question is how much of this land is arable and conducive for agriculture. The government states that currently, 14 % of the land is arable and most of it is located in former Bantustan areas (DME, 2007:3) but does not specify the percentage of that land in those areas citing only that 10 % of this land is irrigated. From the feasibility study[5], the government found that there are 3 million hectares of land and they would only need 1 million hectares to make biofuels feasible (DME, 2007:9). The final strategy insists that only 1.4 % of the 14 % is required to make biofuels possible at the same time avoiding food security and land access issues.

Letete and Blonitz (2012:196) argue that there are ambiguities relating to the type of land that the strategy is targeting because the strategy talks about "currently underutilized land" and later talks about "new additional land". It is not clear which type of land takes precedence or perhaps the strategy aims to target them both. In an attempt to understand this Letete (2009) investigated the land types in the former homeland of Qwaqwa and found that there are three land types that could be classified as currently underutilized: Firstly, there is land owned by

[5] See page 34.

emerging black farmers who are beneficiaries of land reform programmes, but because of lack of financial management and technical skills, they have been struggling to operate the farms even to the point of abandoning them. Secondly, there are communal lands which are generally used by the whole community for grazing and other subsistence agricultural activities. Thirdly, there is land which is state owned, this type of land is usually left unused or illegally used by the community for various activities. Now, for the first and second types of land Letete and Blonitz (2012:196) argue that they have the potential of creating food insecurity because emerging farmers with the little that they produce still contributed to the national food industry by sending their produce to silos; and land used for communal activities is essential for the communities' livelihoods. The state- owned land could be the best option for biofuel production because of its underutilization but could be hindered because firstly, it is not clear how much of this land is in former homelands and secondly the demarcation of state-owned land is usually a lengthy process where decision are made by national decision authorities (Letete and Blonitz, 2012:196). These ambiguities in the classification of the targeted land for biofuel production can make it difficult for the projects to take off. Moreover, land which is referred as underutilized can unnecessarily be targeted even though it might be of great importance to communities' livelihoods. Government should make it clear which types of land is targeted because the current classification is narrow and confusing.

3.6.5 Government involvement and support

The Biofuels Industrial Strategy has been developed and adopted with the government playing a central role. Within the strategy, the government also highlights its plans and the level of support that it will give to meet the aims and objectives of the strategy. The success or failure of biofuels varies from country to country depending on the extent to which government support is given (DME, 2007:11). It is through the strategy that we can gauge if the level of support from the government is adequate for the success of the biofuel projects in the country. The strategy emphasizes that government support must be justified by maximising benefits and minimising costs and unintended consequences (DME, 2007:9).

The government is planning to support biofuel development generally through a number of state entities and state departments. These institutions were tasked by the government with

the responsibility to facilitate the development of biofuels through investing in infrastructure and biofuels projects (DME, 2007:24-25). One such institution is the Industrial Development Corporation (IDC) which is a state-owned institution governed by a Board of Directors appointed the Department of Trade and Industry (ACB, 2008:21). It has been mandated to invest in large industries, small and medium enterprises to fulfil government's initiatives of creating jobs and addressing economic imbalances of the past (ACB, 2008:21). The Central Energy Fund (CEF) and AsgiSA are also central players in the drive for biofuels in South Africa. The CEF has been tasked to research, develop, finance and distribute energy solution for South and Southern Africa while AsgiSA has been supporting infrastructural development for biofuel projects in various provinces such as Free State, KwaZulu-Natal, Eastern Cape and Mpumalanga (ACB, 2008:22). These entities are working together with the various state departments to drive biofuel development in South Africa.

The various state departments have also been crucial and have collaborated with other state entities to drive biofuel production. The Department of Agriculture (DoA) and the Department of Land Affairs in particular play a critical role as supporting entities for the strategy's objectives because of the overlap and connections of the departments' programmes with that of the strategy. For example, the strategy outlines that the support for developing biofuel feedstock supply will be achieved through the use of existing agricultural support programmes such as the Comprehensive Agricultural Support Programme (CASP) [6]which will prioritize effective aspects of cropping for biofuel production (DME, 2007:14). In terms of the link between the strategy and the Department of Land Affairs' land reform programmes the strategy emphasizes that the production of biofuels will contribute to the objectives of land reform through the provision of market access to farmers (DME, 2007:15). For biofuels to be successful the existing government support programmes that will be used to support biofuel development should also have some level of success, however this is not so. The Parliamentary Monitoring Group has regarded the CASP programme as a dismal failure because of the inadequate support to emerging farmers (Parliamentary Monitoring Group, 2008). With the land reform programme also being slower than anticipated; this

[6] The aim of the Comprehensive Agriculture Support Programme (CASP) is to make provision for agricultural support to targeted beneficiaries of the land reform and agrarian reform programme within six priority areas including knowledge management, technical assistance, training and capacity building, financing mechanisms, marketing, on and off farm infrastructure (Department of Agriculture, 2004:7)

leaves a shadow of doubt over the development of biofuel through these existing failing programmes. This is coupled with the fact that the Biofuel Strategy is formulated along neoliberal lines whereby the government is wary of level of support to the projects. The strategy reiterates that government support must not be excessive because it might endanger food security (DME, 2007:17). Furthermore, the DME (2007) explains that the amount of subsidies that the state will make available for the farmers will be little. The strategy emphasises that South Africa will not envisage massive subsidies just like in European biofuel production because subsidies are limited (DME, 2007:13) but will instead depend on existing agricultural and other state programmes to drive biofuel projects across the country.

3.6.6 Status of biofuel projects in South Africa

There are a number of proposed biofuel projects in South Africa based in provinces where former homeland areas were based. There are a total of ten biofuel projects; five projects are biodiesel projects while the remaining five are focused on producing bioethanol. The Eastern Cape is the hype of biofuel activity with four out of the ten projects; this may be related to the Eastern Cape government's facilitation of the agrarian reform process of converting small holder farmers to industrialized agriculture since 2004 (ACB, 2008:36). The projects proposed for the Eastern Cape which are to be run by different biofuel companies; the first one is a sorghum-based bioethanol project based in Cradock run by Arengo 316 (Pty) Ltd; the second is run by Rainbow Nation Renewable Fuel Ltd (see table below), it is a soy-based biodiesel project based in Port Elizabeth; there is also a canola based biodiesel project by Phyto Energy which is also based in Port Elizabeth; and lastly a water-vegetable oil based biodiesel by Basfour 3528 (Pty) Ltd based in Berlin (Mkhize, 2013). The Free State, because of the exclusion of maize has now a sorghum-based bioethanol project ran by Mabele Fuels; KwaZulu-Natal has a sugar-cane based bioethanol project by Ubuhle Renewable Energy and Gauteng has two projects, one is a biodiesel project by Exol Oil Refinery and one is a bioethanol project by E10 Petroleum Africa CC based in Krugersdorp and Germiston respectively (Mkhize, 2013).

Table 3.6.6 Update on licensing of biofuel manufacturing facilities

No.	Company Name	Plant Type (bioethanol/biodiesel)	Capacity (million liters per annum)	Location	License status
1	Arengo 316 (Pty) Ltd.	Sorghum-based Bioethanol	90	Cradock, Eastern Cape	Granted
2	Mabele Fuels	Sorghum-based Bioethanol	158	Bothaville, Free State	Issued
3	Ubuhle Renewable Energy	Sugarcane-based Bioethanol	50	Jozini, KZN	Granted
4	Rainbow Nation Renewable Fuels Ltd.	Soybean-based Biodiesel	288	Port Elizabeth, Eastern Cape	Issued
5	Exol Oil Refinery	Waste Vegetable Oil-based Biodiesel	12	Krugersdorp, Gauteng	Granted
6	Phyto Energy	Canola-based Biodiesel	> 500	Port Elizabeth, Eastern Cape	Initial stages of license application
7	Basfour 3528 (Pty) Ltd	Waste Vegetable Oil-based Biodiesel	50	Berlin, Eastern Cape	Granted
8	E10 Petroleum Africa CC	Bioethanol	4.2	Gauteng , Germiston	Granted
TOTAL			> 1,000		

(Source: Mkhize 2013)

The projects listed in Table 3.6.6 are an outcome of the 2007 Biofuel Industrial Strategy. The projects were supposed to begin in the same year. However, most of the projects have not started at all as they are still in the process of being issued and granted licences. Only Mabele Fuels and Rainbow Nation Renewable Fuels Ltd have been issued with manufacturing licenses. Phyto Energy is still in the initial stages of a license application. Phyto Energy has not been granted licensing meaning they have not met all the requirements but do hold a conditional manufacturing license (Mkhize, 2013). It is not yet understood why the projects have not taken-off as stipulated in the strategy; it is at this point that the 400 million litres should have been produced but so far this has not been the case as most of the companies are still at various stages of license applications.

The **Cradock bioethanol project** in particular has been sparked by controversy as too many people in the town did not even want to talk about the project which they had previously seen as an exciting prospect (Kings, 2012). The farms targeted for production of sugar beet were the source of contention; this was because the Department of Rural Development and Land Reform was planning to buy 6000 ha of land from the local farmers which were going to be under the control of a local consortium, the Agrarian Research and Development Agency

(Kings, 2012). But farmers were not happy with the way farms were evaluated and given a price and from the 31 targeted farms only 10 were willing to sell; one farmer reiterated that "…they (the Department of Land Affairs) will not find more farms to buy and they will not have enough land to harvest the amount of sugar beet they need" (Kings, 2012). As a result, the project was way below schedule even to this day the license application has not been fully completed.

The **soy bean project** by Rainbow Nation Renewable Fuels Ltd in Port Elizabeth had its environmental impact assessment approved and a manufacturing license issued for its 400 ha site (Mkhize, 2013). However, it was reported that a major shareholder (AIG) pulled out because of the global financial crisis and the project was put under hibernation in 2012 (Payne, 2013). The fund-raising for the project was put on hold in 2012 because AIG was uncertain about the level of government support and ceased fund-raising activities until greater clarity was available (Payne, 2013). The project which aimed to produce 280 million litres of biodiesel from soya has yet to begin production but this project is well ahead of other projects in terms of capital funding, plant design, black economic empowerment participation, land tenure and off-take agreements (Payne, 2013).

The Mafikeng Biodiesel Company in Mafikeng and the Mapfura-Makhura Incubator in Marble Hall are the two projects which were initiated before the formulation of the Biofuel Industrial Strategy and one of the two projects (MMI) is fully operational. The Mafikeng Biodiesel Company kicked off in 2003 while MMI was initiated three years later in 2006.

The **biodiesel project** in Mafikeng was funded by Invest North West and by the provincial Department of Economic Development and Tourism and the Barolong-Bo-Rratshidi Development Company is the leading shareholder (ACB, 2008: 34). The project has 45 000 ha of land south of the Setumo Dam; the first phase of the project involved establishing a nursery studying oil bearing trees such as Jatropha, Moringa, sour plum and jacket plum (ACB, 2008: 35). Although the project was not formally part of the Biofuel Industrial Strategy, it was affected by the strategy. The project was put on hold in 2007 because of the exclusion of Jatropha in the strategy. The Director of the Project claimed that Jatropha did not grow in Mafikeng because it was too cold, subsequently, the project folded because the DoA refused to issue a permit to grow the plant (Groenewald, 2007). The government argues that the production of plant is not considered a high-income generating opportunity as compared

to other sub-tropical fruits such as mangos; but D1 oils a UK based company which grows the plant in various African countries disagrees and is continuously lobbying the government to review the plant's exclusion. D1 oils had engaged Invest North West to access 10 000 ha of land to grow Jatropha in exchange for their expertise in establishing nurseries and growing the plant (ACB, 2008:35). They believe the plant can solve many problems such as unemployment in rural areas.

From these recent updates, there is a clear shift from the strategy's aims and objectives in terms of the types of crops used, where and by whom they will be produced. The use of sorghum and waste vegetable oil has not been mentioned in the strategy as potential crops for feedstock. Therefore, there are additional sources of feedstock for biofuel production which were not mentioned in the strategy. The proposed use of land in Cradock and Port Elizabeth which are well away from former homeland areas drifts away from the objective of the strategy to involve disadvantaged farmers from those areas. This could also be related to the poor classification of land in the former homeland areas to which the strategy was not very clear in this regard.

3.7 Conclusion

This chapter demonstrated how African farming was dismantled and how that legacy still persists even to this day. But as a consequence the new democratic government did not aim to uplift African agriculture through land bank loans and huge financial assistance and subsidies just like the apartheid government did for their farmers but instead the government is doing it through biofuel production. Biofuels are not entirely new in South Africa as there is a history of recorded usage before cheap fossil fuels became widely used. The renewed interest in biofuels for South Africa came from issues of global concern (such as energy security and the use of cleaner energy) but which later became issues of national interest. This came about through a series of legislation which started in the late 90s which propagated the use of renewable energy as alternatives to the currently used fuels. The set of policies suggested the use of fuel made from vegetable matter which could be used in key economic sectors including transport and industries as a means to diversify sources of energy used. These policies, although national, they were still aligned with global concerns of reducing carbon emission through alternative cleaner energy sources as suggested by the Kyoto Protocol and the outcomes of World Summit on Sustainable Development.

The energy legislation in South Africa was a fundamental building block that paved a way for South Africa's first piece of policy document which will serve as the country's blueprint for biofuel production. The nature of the projects and the level of government support to those projects has been outlined in the Biofuel Industrial Strategy. However, the recent updates regarding the status of the projects reveals dichotomies between what the strategy says and what has been done on the ground to date. The poor classification of land in the former homeland areas and the lack of clarity in terms of the available targeted land could have contributed to the shifts away from the original plans of the final biofuel strategy. The biofuels strategy programme is now way behind schedule and has failed to meet its own 5-year pilot phase targets. It remains a matter concern as to when the projects might take-off as we await announcement of the progress of other projects' application status from the government; but as things are at the moments it does not look like take-off is going to happen anytime soon.

Chapter 4

The Mapfura-Makhura Incubator Case Study

4.1 Introduction

Despite the lack of take-off from the Biofuels Industrial Strategy projects, the Mapfura-Makhura Incubator (MMI) is one of the few, if not the only biofuel production project, which is fully functional and running. The MMI project was initiated before the Biofuel Industrial Strategy was even drafted. MMI started in 2006 and is the only biofuel production project running in the Limpopo Province. Even though it is not a product of the government's biofuel strategy it does resemble some of the objectives of the Biofuels Industrial Strategy in terms of participation of farmers, the crops used, biofuel produced, the model of production and the level of government involvement and support.

MMI was established by the Agricultural Research Council (ARC) in partnership with the Limpopo's Department of Agriculture and it was influenced by the Department of Science and Technology's call to empower small-scale farmers and to tap into the new biofuel industry (ACB, 2008:33).This project aims to produce 1 million litres of biodiesel per annum at Tompi Seleka Farmer Development Centre (MMI, 2008:3). The project also involves farmers from rural areas from three of Limpopo's municipal districts which are (Greater Sekhukhune, Waterberg and Capricorn). The farmers are trained in business and technical skills such as formulating a business plan, managing finances, record keeping, marketing and operating a farm (MMI, 2008:6). This chapter is dedicated to exploring MMI as an institution. The focus will be on its aims and objectives, its relationship with Tompi Seleka, its business support service to the farmers as well as its incubation model for biofuel production.

4.2 About MMI

MMI is situated approximately 35 km outside the small town of Marble Hall which is within the Greater Sekhukhune Municipal District in the southern region of the Limpopo Province; it is located behind the Flag Boshielo dam inside the Tompi Seleka Agricultural Training Centre grounds (Maluleke, 2008:2). It was established and registered as a section 21 company in 2006, and its main funders at that time was the Limpopo Department of

Agriculture (LDA) and the Small Enterprise Business Agency's (SEDA) technology program[7]. It is also partnered by the Universities of Limpopo and Venda, ARC, Trade and Investment Limpopo, National African Farmers' Union (NAFU), and the Centre for Scientific and Industrial Research (CSIR) (Ibid). The list of sponsors has been changing over the years but the main funders remained the same. Currently, MMI is partnered by the Chemical Industries Education & Training Authority (CHIETA), Agricultural Sector Education and Training Authority (*AgriSETA*), Productivity SA and the South African National Energy Development Institute (SANEDI). These organizations help fund and conduct programmes with MMI such as funding for new oil refinery or conducting learnerships (MMI, 2014:12).

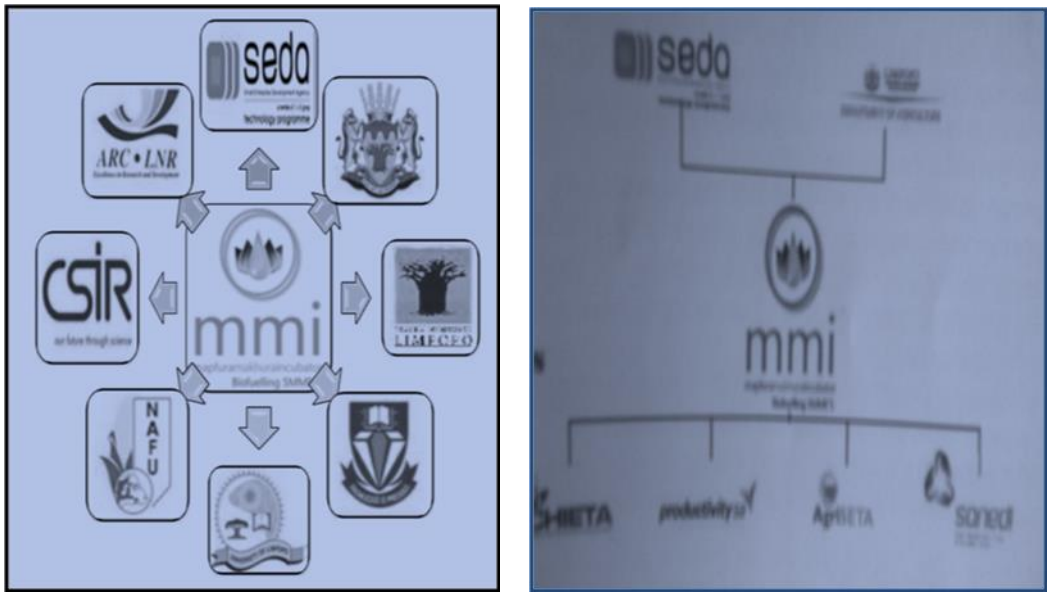


Figure 4.2a MMI's sponsors and funders in 2008 and in 2014 respectively .

The establishment of MMI precede the adoption of the Biofuel Industrial Strategy but it resembles the goals and objective of the strategy. The first similarity between the strategy's objectives and MMIs objectives is the involvement of disadvantaged farmers from former homeland areas. MMI is based in the Greater Sekhukhune Municipality which formed a larger part of the former homeland of Lebowa (See map below). The project started with farmers from this municipal district but today it has extended to other neighbouring districts such as Waterberg and Capricorn. MMI has not only involved farmers from former homeland areas but it also accommodates disadvantaged rural farmers in those particular municipalities.

[7] A section 21 company is a company that is registered to provide a service and does not intend to make profits. They are also referred to as "Association with no gain"; they are funded by donations and foreign funding (CIPC, 2011).

The incubator has ambitions of infiltrating and growing to other provinces as well. According to the 2014 annual report, MMI is attracting provinces such as Gauteng, North West and Mpumalanga which have shown keen interest to have an incubation partnership with MMI, discussion are at an advanced stage (MMI, 2014:11).

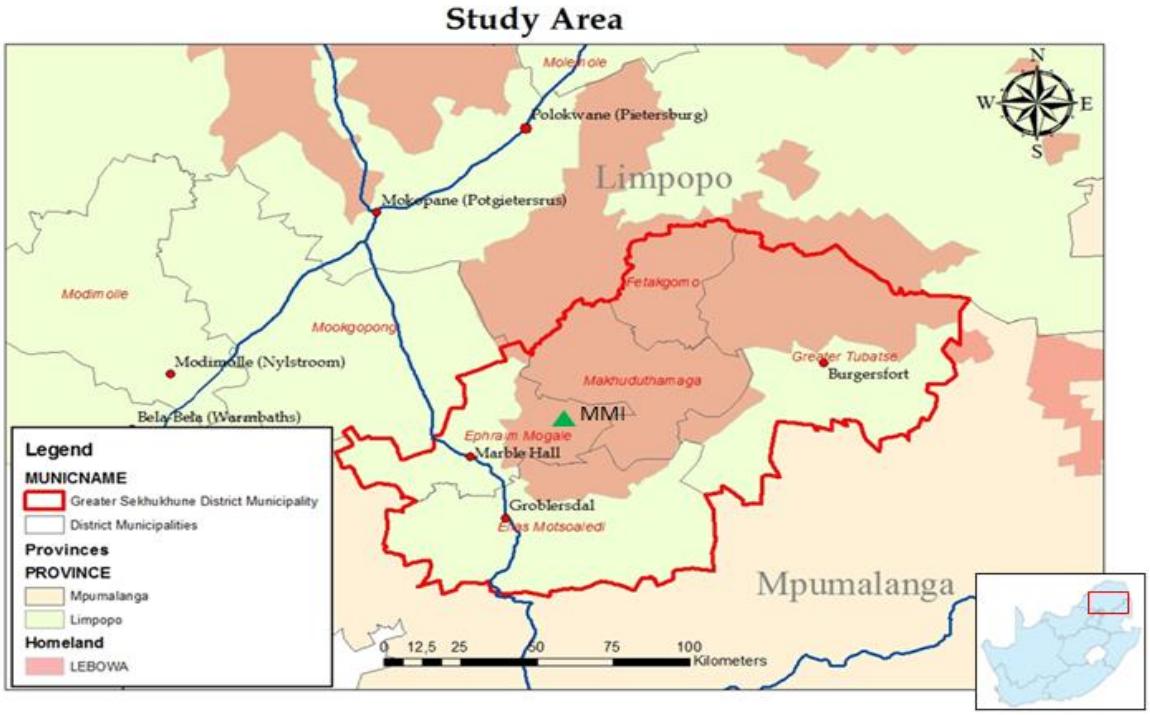


Figure 4.2b: Map of district municipalities where MMI is currently operating.

The second similarity that the biofuel strategy shares with MMI is the type of crops used for producing biofuels. MMI is dedicated to producing biodiesel from sunflower and soya. These are two of the three crops the Biofuels Industrial Strategy targeted for biodiesel production. In the 2008/09 season the project made up of 27 incubatees was cultivating both crops on 632 hectares of land with sunflower making up the majority of the cultivation with 90% of the land dedicated to growing it (MMI, 2008:10). In 2014, the project cultivated on 1772 hectares involving 68 farmers and 962 hectares of land was dedicated for growing sunflower from 19 farmers (MMI, 2014:16). Thirdly, the strategy had emphasized contract farming as the model of production of biofuels between farmers and biofuels producers (DME, 2007:12). MMI adopts the same model of production. Farmers who own a farm or have access to one qualify as incubatees for MMI and can be able to receive training, technical advice and inputs from the incubator in return for feedstock.

4.2.1 Contract farming

Contract farming or outgrower schemes are one of the models used by biofuel companies in collaboration with farmers to produce feedstock for biofuel processing. Both concepts are used interchangeably to describe ways of vertical integration between small-scale farmers and agro-processors or traders (Rutz and Jansen, 2012:316). The relationship between the two parties is made possible by the agreements that are reached among them. Typically, the farmer agrees to provide an established quantity of specific agricultural product (in this case, sunflower and soya bean feedstock), meeting quality standards and delivery schedule set by the agro processor (Rutz and Jansen, 2012:316). The agro-processor on the other hand commits to purchase the product often at a pre-determined price, supplies farming input, training, land preparation, provides technical advice and arranges transport to the buyer's premises (FAO cited in (Rutz and Jansen, 2012:316).

There are certain advantages and disadvantages pertaining to the nature of this relationship. Contract farming may take different forms and arrangements which will depend on duration, price guarantee for products and share of products (Beyene, 2011:96). According to Watts (cited in Beyene, 2011), the advantage of contract farming is that it allows actors (growers and agro-processors) to directly shape productions decision through market obligations (by volume, value, quality and price determination); provide inputs, exercise some control at the point of production (i.e. a division of management functions between contractor and contractee). Therefore in this case, contract farming has the potential of incorporating low-income growers into the modern and industrial agricultural sectors and create economies of scale, access to regional and global markets and dissemination of skills and techniques (Beyene, 2011:97). However, as with any contractual agreement there are disadvantages.

The relationship between growers and agro-processors is in a top-down basis. Companies that purchase products from growers are more powerful than those farmers because they use their bargaining power to their short-term advantage (Rutz and Jansen, 2012:316). This is a frequent criticism of contract farming; there can be contractual problems including farmers selling to different buyer and companies refusing to buy products at the agreed price or downgrading products quality (Rutz and Jansen, 2012:316). This leads to an uneven relationship between the two parties

4.2.2 MMI's aims and objectives

The overall aim of MMI is to alleviate poverty through the incubation of farmers and uplift their communities through job creation, develop Small Medium and Micro Enterprises (SMMEs) into sustainable businesses and create a link and a smooth transition from second economy into the first economy[8] (MMI, 2008:2). This aim will be achieved through a number of objectives such as providing market-driven solutions to ensure economic development in Sekhukhune district; providing food security measures for empowering SMMEs to generate income and alleviate poverty; creating more jobs through the facilitation of a biodiesel value chain; provide a value chain based on training in business, management and technical skills; and providing after care support through mentoring and coaching farmers (MMI, 2008:1). The support of farmers occurs through existing government support services such as agricultural support services like CASP and other land reform programmes just as the strategy had stipulated.

The MMI project is focusing on producing 1 million litres of biodiesel per annum at Tompi Seleka Agricultural Development Centre. The centre was established in the 1980s by the Department of Agriculture in Limpopo but it was not operational until it reopened in 2004, two years before MMI initiated its biofuel project. MMI is currently renting office space within the grounds of the centre. The relationship between the Tompi Seleka and MMI is strategic, with the LDA being the main partner for both, MMI and LDA took it upon themselves to assist each other with agricultural activities for the province. The marketing officer of MMI summarizes the relationship between MMI and Tompi Seleka below:

> *"Our relationship with Tompi Seleka is the issue of…we are renting the office spaces, we are leasing the office space right now. But we are not paying for it that's why…because Tompi Seleka is under the Limpopo Department of Agriculture (LDA) that is why when you see our profile we say that we are currently being partnered by SEDA and the LDA. So we are renting the office space here but we are not paying for it; it is almost like it's a strategic relationship. They are training farmers and we are also training farmers too and we are also able to use the college facilities to have our trainings there…in terms of training farmers how to plant, business skills and all those other things. We are able to use their classes… we assist each other in terms of the resources that they have and the resources that we have, in terms of capacity."*

Both Tompi Seleka and MMI are doing completely different activities but related to agriculture. Tompi Seleka trains its own farmers to do crop production, animal production,

[8]The first economy is integrated with the global economy through modern industrialization and produces the bulk of the country's wealth, while the second economy is isolated from the first and global economies and is characterized by poverty, underdevelopment and marginalization resulting from years of apartheid rule (Letete and Blottnitz, 2012:3).

agricultural economics and agro-processing while MMI on the other hand focuses on training its own farmers in a wide range of aspects including business management, financial management, marketing and technical farming (MMI, 2008: 3). The activities and the two complement each other because they focus on the production of food and fuel through agricultural education and activities. With MMI aiming to develop farmers to have fully operational sustainable commercial farms, there is an emphasis on farming as a business; this is how they encourage their farmers and this is what their training programme is based on.
This is why they regard themselves as an incubator; their project is based on an incubator business model which an organisation endeavours itself to provide business support to upcoming business ventures, in this case small-scale emerging farms.

4.3 The concept of business incubation

Business incubation is regarded as an infant industry in South Africa and as a consequence it is hindered by many challenges (MMI, 2008: 3). The industry is still small in South Africa, as a result, there is little being written on the subject in the country. This section will focus on unpacking the concept of incubation, the focus will be on what incubation is and what it entails, the different types of incubator and the various factors which lead to their distinction, and finally examine the incubation models that exist and which of the models best represent MMI as an incubator for farming and biofuel production in Limpopo.

There is no one clear universal definition of what an incubator is because the concept can mean different things to different people and the difference also depends on the objectives of a business incubation program and the conditions in which it is implemented (Bergek and Norrman, 2008). But what most literature agrees on is that an incubator is an organisation that helps nurture and groom small enterprises to be successful independent entities. According to Bergek and Norrman (2008:21) there are four common components of the definition of an incubator throughout most of the literature: firstly, incubators have shared office space rented under favourable conditions for incubatees; secondly, they have a pool of shared support services to reduce overhead costs; thirdly, incubators offer business support or advice and finally, they provide internal and/or external networks. The definition of an incubator has changed over the years, initially focusing on facilities and administrative services to focus and emphasize the importance of business support (Bergek and Norrman, 2008:21). The general definition of an incubator from the National Business Incubation Association (NBIA) reads as follows:

> *"Business incubators nurture the development of entrepreneurial companies, helping them survive and grow during the start-up period, when they are most vulnerable. A business incubator's main goal is to produce successful firms that will leave the program financially viable and freestanding. The most common goals of incubation programs are creating jobs in a community, enhancing a community's entrepreneurial climate, retaining businesses in a community, and building or accelerating growth in a local industry and diversifying local economies" (NBIA cited in Mutambi, 2014: 25).*

The above definition of an incubator places huge emphasis on the importance of the time of intervention which is in the initial stages of a business venture. There established differences on incubators regarding at which stage of the development of the venture the incubator intervenes; in the early stages, on business development level or in the maturity stage; but now most researchers agree that incubation is related to the early stage of the venture's life (Bergek and Norrman, 2008:21). This is because small entrepreneurial ventures are deemed vulnerable in this stage due to under-capitalization, lack of proper management and business skills (Mutambi, 2014:*iv*). Therefore incubators are aimed at bridging the gap between the small venture's ideas with its attempted stage of business development (Bergek and Norrman, 2008:22). The manner in which incubators go about doing this is different and dependent on many factors; this creates the existence of different types of incubators.

4.4 Types of incubators

There are different types of incubators in the business world. They mainly stem from the different objectives, aims and goals that an incubator hopes to achieve. Incubators may have multiple goals mainly because of the different stakeholders that have different interests; regardless of whether an incubator aims for profit or not there are two types of goals they may want to achieve: firstly, incubators may aim to enhance economic development, reduce unemployment in a region through assisting small businesses to grow and secondly, incubators can simulate firms involved in emerging technologies or the transfer of research done in universities and other institutions (Bergek and Norrman, 2008:22). Although this might be a simplistic categorization of incubators' goals as some incubators may want to merge both types of goals, goals alone are not adequate to influence the different types of incubators. There are other factors at play here.

Grimaldi and Grandi (2005:115) list factors or "incubator characterizing variables" that distinguish incubators from one another, the focus will be on a few important ones. Firstly, incubators have *institutional mission/strategies.* On the basis of these it is possible to differentiate between profit-oriented and non-profit-oriented incubators. Secondly, the

physical *location* of the incubator can portray a lot about their objectives. Thirdly, the *phase of intervention* as already discussed earlier refers to the period of time when incubators provide assistance, it might be in the early phase or in some cases it might develop specific skills at given phases of the business life cycle. Fourthly, the *incubation period* is the period an incubator may want to spend incubating; this depends on various factors such as its strategy and targeted markets. Finally, the *source of revenue* or funding differentiates incubators from one another, public incubators are usually non-profit as they cover their expenses through regional/national or international funding and partly through the fees that incubatees pay and private incubator do not benefit from public funding but they buy equity which might lead them to control the majority of the incubatees' ventures coupled with the fees that they make incubatees pay for the services they render (Grimaldi and Grandi, 2005:115). These varieties of factors create different types of incubators.

According to Grimaldi and Grandi (2005) there are four types of incubators which are categorised into groups of two (public and private). The first group consists of two public incubators namely the Business Innovation Centres (BICs) and the University Business Incubator (UBI). The BIC was the first and most popular type of public incubator in Europe back in the 1980s; this type of incubator offered basic services such as provision of space, infrastructure, communication channels and information about external funding opportunities to its incubatees (Grimaldi and Grandi, 2005:112). Another public incubator is the UBIs, universities can be focused on education but they can also make significant contribution to local economies through research which can lead to inventions and discoveries and technology transfers (Mansfield, 1990). UBIs provide support and services just like traditional BICs but they focus more on transfer of scientific knowledge from universities to the ventures they support (Heydebrek *et al* cited in Grimaldi and Grandi, 2005:112). BICs and UBIs as public incubators are usually funded by governments to develop local economies and they are also usually non-profit oriented; this makes them distinct from their private incubators who have a totally different approach to incubation.

There are two types of private incubators namely Corporate Business Incubators (CBIs) and Independent Business Incubators (IBIs). CBIs are owned by large companies with the aim of supporting new independent business units (Piccaluga cited in Grimaldi and Grandi, 2005:112). IBIs, on the other hand, are incubators which are established by individuals or groups of individuals who have intention to help upcoming entrepreneurs create and grow their business (Von Zedtwitz cited in Grimaldi and Grandi, 2005:113). Unlike public

incubators and CBIs IBIs don't intervene in the early stages of a business venture but at a later stage when the business has already commenced and when it only needs specific injections such as capital or know-how (Grimaldi and Grandi, 2005:113). Private incubators such as IBIs and CBIs are usually profit-oriented institutions which are established by individuals or organizations with the aim of generating a profit; they don't receive public funding therefore they depend on fees they charge incubatees and the equity they buy from incubatees' business (Grimaldi and Grandi, 2008: 113). MMI does not fit into the two types of private incubators.

MMI is a public incubator because it receives public regional funding from the Limpopo Department of Agriculture and SEDA which are government entities. The incubator is aiming to develop the province through business growth and agriculture and alleviate poverty in rural areas. This is done through providing assistance to farmers in the early phases of the project in their business. The period of incubation is three years; farmers are freely trained for that period to have business and technical skills such as business plan writing, financial management, record keeping, marketing and operating a farm (MMI, 2008:6). There is an additional two years of post-incubation where farmers can still ask for assistance if they still encounter challenges. MMI as a public incubator also receives its funding by the fees paid by incubatees for the services they receive from MMI. Incubatees pay 10 % of turnover fees for five years starting from incubation period as payments to MMI. Farmers are also charged for using MMI's equipment and machinery such as tractors. MMI's agronomist explains:

> *"The sort of mechanization that we have and help them with includes a tractor, we plough for them for a fee right now, but when we started the project we did not charge them. But due to the challenges that some people are misusing our services, we came to agree that let's charge them because they are misusing our resources".*

MMI resembles both types of public incubators (BIC and UBI); in terms of BIC MMI provides basic services to its incubatees such as free training, coaching and mentoring and it is also continuously looking for donations externally. In its first few years (2006-2009), MMI was partnered by Universities of Limpopo and Venda which contributed scientific knowledge and provided facilities for conducting agricultural research. In 2009, MMI and the department of Agriculture, Food & Resource Economics from the Michigan State University finalized a formal scientific research agreement and partnership for future and current agribusiness research on biofuels and SMMEs in Limpopo Province (MMI, 2008:2). MMI is a combination of both types of public incubators, it offers both tangible (mechanization, provision of inputs) and intangible (training, coaching and mentoring) services just like UBIs

do (Grimaldi and Grandi, 2008: 115). MMI has been identified as a public, non-profit-oriented incubator with ambitions of local economic development its model of incubation demands a broad analysis.

4.5 Incubation model

An incubation model refers to how and in what way do incubators provide support to their incubatees (Bergek and Norrman, 2008:22). There is less literature written on this subject. Drawing from the framework by Bergek and Norrman, (2008) on incubator models, MMI's model will be analysed. The literature on incubators comprises of five components namely: selection, infrastructure, business support, mediation and graduation but the framework by (Bergek and Norrman, 2008) only consists of three of these elements which includes: selection, business support and mediation. This is because not all of the elements are equally important when separating different incubator models from each other (Bergek and Norrman, 2008:23). In terms of infrastructure, the incubator seems to supply more or less the same set of general administrative services such as shared office space and equipment (Chan and Lau, 2005; Colombo and Delmastro, 2002; Lyons and Li, 2003). There are also no significant differences in terms of how graduations are conducted by incubators. According to CSES (cited in Bergek and Norrman, 2008) most incubators have formal exit rules requiring incubatees to leave the incubator after 3-5 years. This is why the incubation model focuses on selection, business support and mediation because there is variety and complexity adopted by incubators with regards to those elements.

Selection refers to the decision made by the incubator about which venture should be accepted to be incubatees; business support refers to coaching/mentoring or training activities to develop incubatees; and finally mediation refers to how the incubator connects incubatees with one another and the rest of the world (Bergek and Norrman, 2008:22). MMI's incubator model will be assessed using these three components.

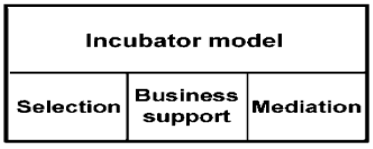


Figure 4.5Incubator model

Source: (Bergek and Norrman, 2008:23)

4.5.1 Selection

MMI works close with LDA's extension officers to select farmers that can be incubatees (Maluleke, 2008b:3). There is a selection criteria adopted by MMI to select its farmers. According to the framework by Bergek and Norrman (2008) the selection process is characterized by selection strategies which are made up of a combination of four different approaches.

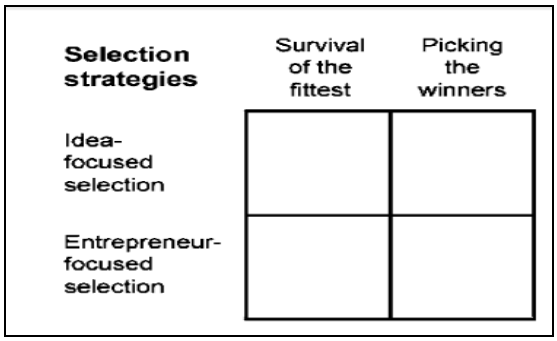


Figure 4.5.1Selection Strategies Source: (Bergek and Norrman, 2008:24)

The technical expertise of the entrepreneur and the employment experience of the targeted venture or incubatee is divided into the two approaches presented on the left (y-axis) which forms part of the selection criteria; an idea-based approach is when the incubator manager have extensive knowledge in order to evaluate the viability of ideas i.e. the product, market and the profit; the entrepreneur-focused approach requires the incubators to judge personality as well as the experience, skills, characteristics and driving forces of entrepreneurs (Bergek and Norrman, 2008:24). The two approaches presented on the left are the selection criteria adopted by the incubator based on flexibility and strictness; picking-the-winners approach refers to when incubator managers select a few potential successful venture before the incubation process and the survival of the fittest approach has a less strict criteria where incubator managers take a larger number of ventures and rely on markets to provide the selection process and from this winners will be separated from losers (Bergek and Norrman, 2008:24). Both sets of approaches intersect with each other to create four types of selection strategies presented by Bergek and Norrman (2008).

- *Survival-of-the-fittest and idea*: The portfolio is made up of a large number of idea owners (or upcoming entrepreneurs) with immature ideas which need to be polished by the incubator.

- *Survival-of-the-fittest and entrepreneur*: This strategy consists of a complex network, consisting of entrepreneurs/teams with strong driving forces representing abroad set of ventures.
- *Picking-the-winners and idea*: This consists of highly positioned ideas within a narrow technological area often came subsequently from the research conducted by highly ranked universities.
- *Picking-the-winners and entrepreneur*: The strategy comprises a few handpicked and carefully evaluated entrepreneurs.

MMI has a selection criterion which is followed before the incubation process begins. Firstly, MMI is looking for farmers that either grow sunflower or soybean and according to them these farmers should have passion and understanding of what farming-for-profit entails and be willing to work for their business (Maluleke, 2008b:3). The individual should have at least 10 ha of land which is fenced and have a functional irrigation system; beneficiaries of government programmes such as CASP, Land Redistribution for Agricultural Development (LRAD)[9] and Settlement\Land Acquisition Grant (SLAG)[10] are highly recommended (Maluleke, 2008b:3). The MMI selection criterion is quite strict as it places more emphasis on entrepreneurship and treating farming as a business. The incubator adopts a picking-the-winners approach where farmers are picked because of their willingness and passion and have the potential to become successful. Below is an account of a farmer explaining how he knew MMI and the reasons for him being selected.

> *"I first met MMI officials as they were passing by. My place is next to a main road...they saw how we worked; they were impressed in how we worked. When they first arrived they found me; they were looking for the farm owner, I told them it was me. At that time I was planting cabbages, there were certain insects that were feeding from it. They told me that my plantation was good but there was something still lacking; they asked me if I went to school, I told them I did go, they asked what they taught me there and I explained. They told me they were from MMI in Tompi Seleka so, they said: we have a school where we can assist you, to learn more than you did previously because we can see you have a problem with insects... They told me that they can train me for free, how to manage my budget to see if I'm gaining or losing."*

From the four selection strategies listed above, MMI would fall under the category of *picking-the –winners and entrepreneur*, because it is only a few farmers who show the

[9]LRAD was launched with the aim to establish a class of black commercial farmers through grants. The grants ranged from R20 000 to R100 000 depending on the amount of cash the farmer can contribute.

[10]From 1995 to 1999 land redistribution aimed to benefit the poor under a programme called Settlements and Land Acquisition Grant (SLAG) which made it possible for poor households to apply for state grants of R16 000 to enable them to buy land and have little start-up capital (Hall, 2007:89).

determination to farm and have the potential of becoming successful that are selected. The incubator recently aims to graduate 30 incubatees annually and help incubatees register their business (MMI, 2010:7). The number of incubatees MMI graduated has varied over the years but so did the targeted graduation numbers. In 2010 and 2011 respectively MMI targeted to graduate 15 incubatees for both years to which they met their expectations by graduating 15 in both those years (MMI, 2010; MMI, 2011). In 2014, the target number of graduating incubatees was 20 which they managed to exceed by graduating 35 incubatees (MMI, 2014). The project started with 25 incubatees in 2006 and in 2014 the number of incubatees has inclined ten-fold to 250.

4.5.2 Business support

As mentioned earlier, business support refers to how incubators support incubatees during the process through training, coaching and mentoring. Business Support can come in various forms and can include business planning, personnel recruiting, marketing, accessing financial capital, legal matters, advertising and business development advice (Smilor and Gill, 1986; Scillitoe and Chakrabarti, 2010; Bergek and Norrman, 2008). According to Bhabra-Remedios and Cornelius (2003) the success of incubatees does not only depend on services listed above but by how they are provided; it depends on the time (working hours dedicated to monitoring and assisting incubatees), comprehensiveness (the level to which assistance involves strategic and operational services) and the quality (value of assistance) (Bergek and Norrman, 2008:24). There is also an extreme outlying business support termed laissez-faire by Bergek and Norrman (2008:24), this is when incubatees are left on their own and provided with very little assistance unless they take the initiative. However, this is not the case with MMI.

MMI has a strong business support initiative. They aim to support their incubatees in various ways. The incubator's support service includes training incubatees for a period of up to three years in business and technical skills, running mentorship and coaching programmes, offering business advice, fundraising, providing farming inputs for free, and marketing of incubatees' produce (MMI, 2011; MMI, 2014). This is done with the hope that incubatees can be empowered and after the incubation period can be able to sustain themselves with minimal intervention from the incubator. However, it is not always about how an incubator supports its incubatees but it is about the effectiveness of the incubation process and how it is beneficial for uplifting incubatees' small ventures.

4.5.3 Mediation

One of the roles of an incubator is to act as a middleman or intermediary between the incubatees and relevant innovation systems (Peters *et al*, 2004). The incubator fills the gaps opened between incubatees and other external actors that would play a critical role in business development of incubatees' ventures (Bergek and Norrman, 2008:24). External actor can provide critical knowledge and technology, financial capital, market-related resources and human capital (Begley, *et al* cited in Bergek and Norrman, 2008:24). There are two types of mediation an incubator can provide: network mediation and institutional mediation. Network mediation refers to linking or connecting incubatees with other actors with the intention of reimbursing for the incubatees' lack of business connections (Peter *et al*, 2004). These networks are vital for the development of small ventures and it is also important for social capital building (Aernoudt cited in Bergek and Norrman, 2008:25). Institutional mediation refers to the mediation of the impact that institutions have on incubatees; incubators help with incubatees to understand and interpret institutional demands introduced by the government's laws, traditions, values, norms and rules (Scott cited in Bergek and Norrman, 2008:25).

MMI leans more on the side of network mediation because of the relations it creates between its incubators which are partnered with it and those ones which are not. MMI graduates are linked with SEDA branches to receive additional business support; incubatees are also linked with potential funders for funding to purchase production inputs; incubatees are also linked with mainstream markets and have contract markets signed (MMI, 2014:11). This is demonstrated by MMI holding annual information days attended by its incubatees and other various stakeholders depending on the theme of the information day. The information days have been held annually since the project started in 2006 and have tackled different topics which benefit incubatees in their farming ventures through attaining knowledge and necessary skills.

In 2008, there was an information day held within Tompi Seleka training centre; the theme for that particular information day was cultivating sunflower and soy bean (Maluleke, 2008c:3). This was attended by representatives of Monsanto[11], Structa-Power[12], LDA,

[11] Monsanto is an agricultural company and input supplier. It is part of the food chain and supports non-governmental organisations; particularly community based developmental organizations that work to develop practical solutions to the problem of food security, agricultural training, unemployment solutions and environmental issues (Monsanto, 2015).

[12] Structa Power is a Black Empowered Company specialising in the supply of Towers and power systems for both urban and remote areas (Urban Sprout, 2015).

Mabeleng Grain who were also speakers for the day (Maluleke, 2008c:3). During the 2009 information day, farmers shared their experiences of growing sunflower and soy bean; farmers were informed about the importance of soil fertility and using correct methods in producing those crops (Maluleke, 2009:4). Farmers were also informed on how to access funds to finance their farming businesses (Maluleke, 2009:4). These annual information days are a way for MMI to create links and networks between their incubatees and other institutions related to agriculture. They are meant to educate, inform and provide knowledge and skills for farmers to be better equipped to overcome challenges and succeed in their farming ventures.

Table 4.5.3: MMI's Incubation model

MMI Incubation Model		
Selection	**Business Support**	**Mediation**
Picking-winning entrepreneurs ✓ Sunflower and soybean farmers ✓ Beneficiaries of CASP, LRAD and SLAG ✓ 10 ha or more of land ✓ Limpopo province residents ✓ hardworking and passionate farmers	*Training, Coaching & Mentoring* ✓ training in business and technical skills ✓ running mentorship and coaching programmes ✓ offering business advice ✓ fundraising ✓ providing farming inputs for free ✓ marketing of incubatees' produce	*Network mediation: linking incubatees with:* ✓ SEDA branches for additional business support ✓ potential funders for funding to purchase production inputs ✓ mainstream markets

Modified from (Bergek and Norrman, 2008)

4.6 Conclusion

Business incubation is still a small industry in South Africa attracting less attention from academia. MMI is one of the few incubators assisting small ventures grow and prosper. This chapter started by establishing what an incubator is and what it is expected to do. Different types of incubator were discussed and MMI was established as a public non-profit with ambitions of regional economic development and job creation for rural communities through agricultural development. This chapter also analysed the incubation model that MMI has adopted using Bergek and Norrman's incubation model framework which was based on three components namely selection, business support and mediation. MMI adopts a rigorous selection criteria and an extensive business support service with considerable assistance to incubatees to uplift themselves and become independent, and self-sustaining farmers post-incubation period. However, the structure of the incubation model is not adequate to inform us of the effectiveness of the incubation process and the quality of the incubation process and how it is executed will need careful evaluation and analysis. The role and the effectiveness of the incubator in uplifting and having a positive impact on the small ventures is an important element which needs to be analysed in order to determining the success and influence of incubators.

Chapter 5

The Sustainable Livelihoods Framework

5.1 Introduction

Poverty has been a previously misunderstood phenomenon both in definition and in practice. As a result, the mitigation and alleviation strategies that have been employed were largely unsuccessful and subsequently may have further aggravated the problem. After decades of limited success in reducing the impact of poverty, new ideas about development were emerging (Ashley and Carney, 1999:4). One of the ideas of understanding developmental issues relating to poverty were the Sustainable livelihoods approaches of the 1980s which dominated much of the developmental thinking of that time (Ashley and Carney, 1999:4). These approaches were responsible for changing the thinking about poverty and developmental issues as well as proposing ways to deal with them in practice.

This chapter will discuss the Sustainable Livelihoods Framework (SLF) which is a framework on which this study is based. This is a framework that can be used to study rural development, poverty and sustainable rural livelihoods, although, at recent times, the framework has been applied to study urban areas. The framework, in this regard, places more emphasis on the concept of sustainable livelihoods; a livelihood is sustainable when the means required to make a living (such as capabilities, assets and activities) are able to cope with and recover from stress and shocks, maintain its capabilities and assets and while at the same time not undermining its natural resources base (Scoones, 1998:5). Furthermore, the framework can be applied to a wide range of scales such on the level of an individual, household, village, region or even nation (Scoones, 1998:5).

This chapter is divided into three sections. It will firstly trace the evolution of the sustainable livelihoods approaches, how they evolved the concept of poverty and their relation and relevance to the concept of poverty. The second section will discuss the sustainable livelihoods framework and unpack its different components. The last section will discuss the weaknesses that the framework still has.

5.2 Sustainable Livelihoods Approaches

Poverty is one of the important concepts in development theory. However, this concept was poorly understood in the past and as a consequence there was little success achieved in reducing it. Poverty was defined in income and consumption terms (Krantz, 2001:6). This was a narrow way of looking at poverty because when poor people are asked about what the concept means to them they list other factors which include: a sense of insecurity, voicelessness, poor levels of health, literacy, education, and access to assets; this provides a broader view and multidimensional perspective of poverty (Farrington *et al*, 1999:2). The dissatisfaction with the income/consumption definition of poverty gave rise to basic needs approach which places more emphasis on basic needs such as health, clean water and other services which can prevent people from getting poor (Farrington *et al*, 1999:2). It is within this broader context SLF emerged.

In 1997, the UK Government adopted a White Paper on International Development which committed the UK to the International Development Target of reducing the people living in poverty by one-half by 2015 (Farrington et al, 1999:2). One of the objectives for achieving this was a better understanding of poverty and how it can be addressed; one of the outcomes of this meeting was the sustainable livelihoods approaches (Ibid).

Sustainable livelihood (SL) has been introduced as a tool to better understand the concept of poverty and its eradication. There are diverse SL approaches, however, they do share basic common features such as the focus on poor people's livelihoods and placing a greater emphasis on a people-centred approach and involving people in the identification and implementation of developmental activities where appropriate (Krantz, 2001:2). Indeed, the SL Framework provided the first step towards this initiative spearheaded by research institutes such as the Institute of Development Studies (IDS), NGOs such as (CARE and Oxfam) and donors such as (DFID and UNDP) (Ashley and Carney, 1994:5). These institutions use the SL approach in different ways. The UNDP views the SL as a framework which is integral to support the improvement of sustainable livelihoods among poor and vulnerable groups through strengthening their resilience and coping strategies (Krantz, 2001:2). CARE as an international NGO places emphasis on strengthening poor people's capabilities and enable them to take initiatives to secure their livelihoods; DFID's SL approach aims to increase agency effectiveness in poverty eradication firstly through an adoption of principles which propose poverty reduction based on people-centred responsiveness and participation and secondly through applying a holistic perspective to

support activities that relate to improving poor people's livelihoods (Ibid). All the three institutions have different ideas of the SL approach but what they have in common is the need to improve poor people livelihoods. The concept of sustainable livelihoods is fundamental in order to understand the SL approach.

5.3 The Sustainable Livelihoods Framework (SLF)

This section will explore the SLF in its entirety and dissect its most important components. As it has already been established, the SLF is mainly backed up and structurally supported by concepts such as sustainable livelihoods. The idea of sustainable livelihood was first introduced by the Brundtland Commission on Environment and Development, and it was further expanded by the United Nations Conference on Environment and Development in 1992 (Krantz, 2001:1). Ever since those two events, the task was to define what sustainable livelihoods would be comprised of. The coining of the definition proved to be an uneasy task as the definition has been modified repeatedly to make it inclusive to all the relevant aspects of livelihoods as much as it can. The first definition of the concept was coined by the World Commission on Environment and Development (WCED) and it defined SL as follows[13]:

> *"Livelihood is defined as adequate stocks and flow of food and cash to meet basic needs. Security refers to secure ownership of, or access to, resources and income earning activities, including reserves and assets to offset risk, ease shocks and meet contingencies. Sustainable refers to the maintenance or enhancement of resource productivity on a long term basis. A household may be enabled to gain sustainable livelihood security in many ways through ownership of land, livestock or trees; rights to grazing, fishing, hunting or gathering; through stable employment with adequate remuneration; or through varied repertoires of activities."*

Two problems can be identified from the definition coined by the WCED; firstly, it lacked emphasis on sustainability as it was thin on detail as to how livelihoods were to be sustained in the long run and, secondly, it was limited to a smaller scale, the household. Based on these criticisms Chambers and Conway (1991) proposed a new practical definition:

> *"A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term."*

[13]WCED it is also known as the Brundtland Commission. It aims to unite countries to achieve sustainable development. "Our Common future" is a report which laid a foundation for the United Nations Conference on Environment and Development in 1992.

This definition by the Chambers and Conway is very distinct from the WCED definition because firstly, it goes beyond the household level and instead looks at how livelihoods can contribute benefits to other livelihoods whether locally or globally (Krantz, 2001). Secondly, the definition from WCED talks about minimising risks and easing shocks and the definition by Chambers and Conway (1992) argues that any definition of a sustainable livelihoods should include livelihoods being able to recover from those stresses and shocks (Krantz, 2001:1). The WCED definition can be understood as trying to be preventative of stresses and shocks while the definition by Chambers and Conway acknowledges them and regard livelihoods as sustainable. The most recent definition of sustainable livelihoods is from the IDS and the DFID and Ian Scoones (1998:5) of the IDS proposed the following definition:

> *"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resource base.*"

This new definition omits the requirement for livelihoods to be beneficial to other livelihoods but instead it includes three more elements which are not contained in any of the two previous definitions; the elements are: livelihood resources, livelihood strategies and institutional processes and organizational structure (Krantz, 2001:1-2). The elements can be seen on the DFID SL framework on the diagram below.

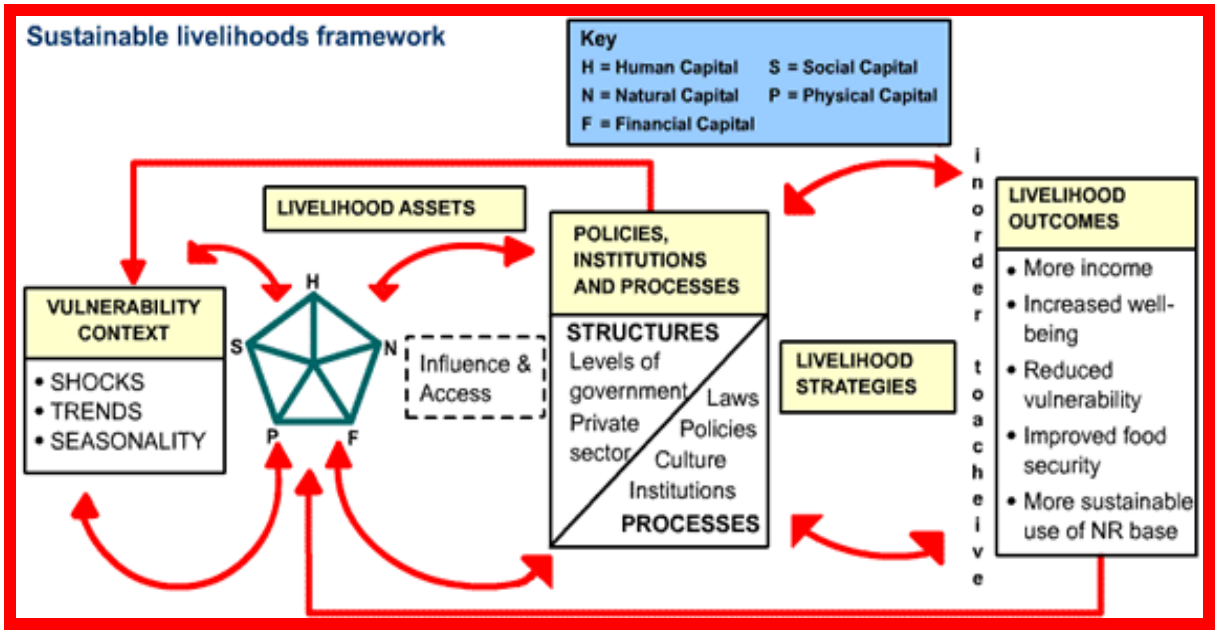


Figure 5.3 The DFID's Sustainable Livelihoods Framework (source: DFID, 2000)

The SL framework depicted above is a diagram which shows the complex nature of livelihoods in a simplified manner. It is an analytical structure which captures the diversity of livelihoods, understands the influences of poverty and recognizes where interventions can be made (Farrington *et al*, 1999: 3). Its aim is to help stakeholders engage in coherent debates about many factors that affect livelihoods, their relative importance and the way in which they interact. The framework, at the first glance, looks like a complicated cycle which shows complex interactions of different components through a number of directional arrows. The arrows simply direct and link components to one another depending on how they influence each other (Farrington *et al*, 1999: 3).

There are various ways that components interact within the framework. The first interaction is when people obtain different types of livelihood outcomes by attaining a range of assets to pursue a variety of activities (Farrington *et al*, 1999: 3). The activities people take part in to achieve their assets attainment is dependent on their own preferences but also on vulnerability types which include shocks, trends and seasonal variations; their options are also determined by structures (e.g. the role of the government, or of the private sector) and processes such as institutional, cultural and policy) that people face (Farrington *et al*, 1999; Krantz, 2001; DFID, 2000). To put this into perspective, the success of an activity that people pursue depends on the availability and access to livelihood assets in order for livelihoods outcome to be achieved.

Since the concept of assets is central to the framework, this section will shift its focus to it. The framework displays five types of livelihood assets that can be regarded as needs or necessities which are vital in the processes of attaining or achieving livelihood outcomes. These assets are namely, human, natural, financial, physical and social capital. I will unpack them individually below.

5.3.1 Human Capital

Human capital refers to the skills, knowledge, ability to labour, good health and physical capability which are fundamental for the attainment of livelihood strategies and outcomes (Scoones, 1998:8). It is regarded as an important livelihood asset because it is required to make use of the other four types of assets (financial, natural, physical and social) (DFID, 1999:19). For instance, skills, knowledge and ability to labour are required for the improvement of social capital such as providing leadership or managing groups; or improving infrastructure (transport, secure shelter and building).

5.3.2 Natural Capital

This refers to the natural resource stocks (soil, water and genetic resources) and services (hydrological cycle, nutrient cycle, pollution and erosion protection) from which resource flows and services which are beneficial for livelihood are extracted from (Scoones, 1998; DFID, 2000). People derive and use resources for many things and some of these resources are basic human needs. Resources that make up natural capital are not homogenous and can either be renewable (able to reproduce e.g. water and crops) or non-renewable (unable to reproduce e.g. coal and gas); and can also be tangible (trees, land) or intangible (atmosphere) (DFID, 2000).

Natural capital is important for extracting resources from nature and it has strong links with the vulnerability context as many shocks that destroy livelihoods are natural processes (DFID). For instance, farming is an activity which depends directly on natural capital's environmental services such as hydrological cycle to produce food for people; but it is also in a vulnerable state because of natural disasters which can destroy livelihood capital.

5.3.3 Financial Capital

Financial capital refers to the financial resources or capital base (cash, credit/debt and savings) which people use to achieve livelihood objectives (DFID, 2000). These are important because they can be directly converted into other types of capital e.g. access to education (human capital), or purchasing land (natural capital). Financial capital can also be used for direct achievement of livelihood outcome, for example, reducing food insecurity through the purchasing of food (DFID, 2000). Despite the beneficial nature of this asset, it tends to be the asset which is least available to poor people (DFID, 1999:27).

5.3.4 Physical Capital

This asset is comprised of basic infrastructure such as affordable transport, shelter and buildings, water and sanitation, clean affordable energy and access to information which are needed to support livelihoods (DFID, 2000). Most of the physical capital assets listed above are public goods which are used without direct payment and the absence of such infrastructure can be strongly linked to poverty (DFID, 1999:25). As noted with the other livelihood assets, physical capital is beneficial to the functioning of other livelihood assets in that without it other assets' pursuit of livelihood outcomes will be disadvantaged. For example, without transport education (social capital) might not be accessed or fertilizers cannot be delivered to farms natural capital (DFID, 1999:25).

5.3.5 Social Capital

Social capital are the social resources (networks, social claims, social relations and affiliations associations) where people group themselves to attain various livelihood strategies which require coordinated collective action (Scoones, 1998:8). There are three types of social capital which are: networks and connectedness, membership of more formalised groups and relationships of trust, reciprocity and exchanges (DFID, 2000). Networks and connectedness refer to either vertical (clients) or horizontal (individual with common interests) relation that improve people's trust to work together to widen their access to institutions; membership of groups entails adherence to mutually-agreed rules, norms and sanctions; relationships of trust facilitate co-operation and may provide informal safety nets amongst the poor (DFID, 2000).

Social capital is important for a number of reasons. Firstly, it helps with lowering cost of people working together and it has impact upon other types of assets by increasing people's incomes (financial capital) and rates of savings; secondly, it can reduce free rider problem and help manage common resources effectively; finally, social networks facilitate innovation and sharing of knowledge therefore it has strong ties with human capital (DFID, 1999:21). It is important to also note that networks and relations are not always positive. Those excluded or not forming part of strong groups can be disadvantaged in many ways which can further culminate ties with other types of livelihood assets (e.g. landless women with few skills, uneducated people without access to finances) (DFID, 2000). Networks can also be based on hierarchical relations that limit mobility and do less to prevent people from slipping into poverty (DFID, 1999:21).

In this section, it was noted that livelihood assets are vital for the activities that people engage in in order to achieve livelihood outcomes. The SL framework has showed that different types of assets are only interconnected but are also interdependent to the extent that one type of asset cannot function without the others. In other words, the non-existence or unavailability of one type of asset can affect the pursued activities of other assets and can limit their chance of achieving livelihood outcomes.

5.4 Transforming Structures and Processes

This section will focus on one of the important components of the framework which is the structure and process which are made up of institutions, policies, organisations and legislation that shape and influence livelihoods. These are scale-free components which operate at all

levels; and are responsible for determining access to different types of capital, livelihood strategies and decision making bodies; they set terms of exchange between different types of capital and returns to any given livelihood strategy (DFID, 1999:29). Within the framework structures and process component is positioned in the centre to resemble its importance and also because of the integrative nature, the influence and links this component has with other components. Structures and processes have an influence on the vulnerability context, livelihood strategies and livelihood outcomes (DFID, 1999:29).

Structures are comprised of public (political bodies, executive agencies and courts) and private (civil society, commercial enterprises and NGOs) while processes include policies, institutions and cultures as seen on the framework. These two are both important in their own various ways and complement each other in that structures need processes to function and processes need structures for them to be implemented. Absence of appropriate structures can be problematic to development especially in rural areas where public and private sector structure do not reach; processes on the other hand can grant or deny access to assets and they also provide incentives for people to make particular choices about how manage their resources (DFID, 2000).

Structures and processes can be regarded as regulators because of the centralised role they play in influencing access between livelihood assets and livelihood outcomes and the vulnerability context. There is a direct link to the vulnerability context; process (policies) adopted and implemented through structures affect trends (economic trends) and indirectly (health policy and population trends) and also mitigate the impact of shocks (disaster management and policy on drought (DFID, 2000). Institutions can deny people's choice of livelihood strategies (access to land and natural resources) and as a result policies can affect the attractiveness of livelihood choice; political structures can implement pro-poor policies which can benefit people and improve their well-being (DFID, 1999:30). There is a combination of positive and negative impacts that structures and processes can have upon livelihoods. In the case of the SL framework, where poverty reduction is the focus, structures and processes should be transformed and developed appropriately to mitigate or prevent poor people from slipping further into poverty. They should find solutions and avoid worsening the situation and becoming part of the problem.

5.5 Livelihood Strategies

5.5.1 Agricultural intensification/extensification

Livelihood strategies can simply be defined as the range of activities people engage in to improve their livelihoods. Scoones (1998:9) explains that there are three broad categories of livelihood strategies namely: agricultural intensification/extensification, livelihood diversification and migration. These strategies can be applied to rural people. Rural people can either intensify their livelihood from agriculture by having more output per unit area through capital investment or through increasing labour input or they take an extensive approach by placing more land under cultivation or diversify a range of off farm activities or seek a new livelihood temporarily or permanently (Scoones, 1998:9).

Livelihood strategies are made up of a combination of livelihood resources (capital). Identifying the various combinations of capital is a key step for analysing the livelihood strategy (Scoones, 1998:9). For example, the process of agricultural intensification combines natural capital (land) and financial capital (credit) and also human capital (labour). The link between such complex and dynamic processes and the outcome of different strategy combinations is therefore significant in analysing sustainable livelihoods (Scoones, 1998).

5.5.2 Livelihood diversification

Livelihood diversification is when people engage in multiple activities to improve their livelihoods from various sources. Diversification is aimed at dealing with temporary adversity or permanent adaptation of livelihood activities when other options are becoming unsuccessful (Scoones, 1998:9). Agriculture is one of the most important livelihood activities that people in rural areas improve their livelihoods with. Most of the rural poor will be engaged in subsistence farming which provides a source of food consumption and selling of a few cash crops; however, this is not sustainable in the long run and as a result there are many challenges considering the vulnerability that rural agriculture is facing such as shocks (droughts and floods). Rural dwellers are aware of this and as a response they turn to other forms of livelihood improvement which can involve off-farm activities.

Agriculture is an important sector for rural people but the idea of farming on a full-time basis might not be possible for various reasons. Most farmers in southern Africa are part-time farmers combining agriculture with other livelihood activities both locally and afield (Scoones and Wolmer, 2003:4). Scoones and Wolmer (2003) argue that this has always been the case since the colonial era; there has been circular migration with remittance flows financing local investment and asset accumulation; it is further argued that this has dominated

rural livelihood strategies for the best part of the last century. Some commentators such as Bryceson *et al*, (2000) have regarded this as a process of de-agrarianization and in some areas part-time farming is a new phenomenon. Diversifying livelihood strategies can work well to sustain the nature of livelihoods. Rural people can make extra cash by starting off-farm small enterprises, sell other resources such as wood, grass, livestock and others; they also receive remittances, pension grants or some family members can migrate to the cities to find employment to sustain rural livelihoods.

5.5.3 Migration

Migration refers to the movement of people from one place to another to seek better opportunities. In the context of livelihoods, people migrate to seek better ways of improving their current livelihoods as well as seeking new livelihoods in their new destination. Migration can be voluntary or involuntary and the benefits of it may be reinvestment in agriculture, business, household or migration site (Scoones, 1998:9). In Southern Africa where farming is part time people continuously look for new ways to improve their livelihood and one of them is through migration. Within a household, members can migrate to different locations for different livelihood assets, be it education (human capital), a job to improve income and/or remittance flow (financial capital) and for other opportunities.

5.6 Weaknesses of SL framework

This chapter has demonstrated how the SL approaches evolved in their analysis of poverty since their inception. However, the SL framework has a number of limitations that can be a detriment to eliminating poverty in rural areas. The framework has good analysis of poverty on paper but poor practical implementation strategy.

Firstly, other SL approaches (CARE and UNDP) do not deal with the issue of identifying the poor people that they are trying to assist because of the all-encompassing definition of poverty that has been adopted; it is only DFID which is wary of the identification crisis and proposes that who the poor are in a locality should not be assumed but should come out in every process of analysing livelihoods according to the framework (Krantz, 2001:23). This is a very demanding proposal considering the variable nature of poverty which requires understanding economic, social, cultural and institutional locality before identification can proceed; this will be expensive and time-consuming as staff spends time studying and assessing the location before the poor can be identified (Krantz, 2001:24).

Secondly, although the SL approaches emphasize the need to put people at the centre of development, there is a lack of emphasis on the need to empower and increase the rights of

poor people to change social relations (Carney, 2002:23). The DFID's SL framework puts too much emphasis on transforming structures and processes to change and improve livelihoods for the better but the process is complicated by informal structures of social dominance and power within communities which influence people' access to resources and these are often invisible to outsiders (Krantz, 2001:24). This simply means that structure and processes are assumed to be outside or external phenomena which can either improve or restrict people's access to assets, however, this is not the case as structure can emerge within communities and can override the formal structures and processes' capacity to transform people's livelihoods.

Thirdly, SL framework and approaches are not sensitive to gender issues. They operate with the assumption that there is equality between men and women in poor rural societies. This is turning a blind eye on the realities that exist within these areas because one type of gender is more vulnerable than the other. Although the DFID's framework highlights the need to give attention to gender when analysing livelihoods this is however devoid of any practical implementation and planning.

Finally, Farrington *et al* (1999:12) argues that some aspects of livelihoods are difficult to quantify and as a result it will not be known if any progress is made. It will be difficult to measure the reduction of poverty if other assets which can lead to poverty reduction are not quantifiable. Changes in social capital and vulnerability are not easy to assess; for example, in terms of social capital simply counting the number of registered group in a community is not adequate to yield a measure of social capital (DFID, 1999:22). The SL approaches are good in displaying the complexity of poverty but offer little quantification mechanism than money-based approaches to poverty (Farrington et al, 1999:13).

5.7 Conclusion

This chapter has demonstrated the complex nature of the concept of poverty which can often be taken for granted and deemed easy to conceptualize. Poverty has been misunderstood for a long time and this chapter briefly traced its previous meaning by looking into history by examining how SL approaches came about and how they became different in their approach to conceptualize poverty and proposed effect ways of eliminating it. The chapter went further to dissect the different components formed part of the framework for analysing livelihoods and how these components interconnect and interdepend on each other to depict the complexity of livelihoods and how their sustainability could be achieved. The chapter ended

by looking at the shortcomings of the SL framework and where it can be improved. Despite its weaknesses, the SL framework offers a complex analysis and understanding of the nature of sustainable livelihoods and the link between different component that affect livelihood outcome which will be important throughout this study. SL framework is best suited to study how structures and processes have an impact on livelihood sustainability by exploring their impact upon livelihoods and achieving their outcomes. Therefore, MMI as a public sector institution with its own policies, rules and ways of doing things (incubation model) will be assessed on how it affects people's (Limpopo small-scale farmers) access to assets (five capitals) which they need to pursue activities (farming for biofuel production) which they engage in order to achieve livelihood outcomes (more income and food security).

Chapter 6
Data Presentation and Analysis

6.1 Introduction

Government-based biofuel projects are way behind schedule and as a result they have failed to achieve take-off and are yet to begin production. The Mapfura-Makhura Incubator (MMI) is one of the few, if not the only biofuel production project, which is fully functional and running. In a country where business incubation is still in its embryonic stages and where biofuel production is a new industry in the energy business, the role of incubators in facilitating economic development through assisting farmers (small-scale ventures) was particularly intriguing. It is through this interest and curiosity that prompted the nature of this study.

The primary objective of the study is to examine the livelihood impact of biofuel production on small-scale rural farmers participating in the MMI project in the local districts in Limpopo province. Using the sustainable livelihoods framework which theoretically underpins this study, the study assesses the relationship between MMI and its farmers (incubatees) and how efficient MMIs processes are helping in improving farmers' livelihood outcomes, minimising the impact of the challenges they face and creating viable opportunities for them to sustain their livelihoods.

This chapter presents and analyses the data collected (see Chapter One for research design and methodology). Firstly, the chapter presents quantitative data regarding the socio-economic background of farmers to get a broader picture of who they are, what they have and how they are doing. Secondly, the chapter presents, analyses and discusses qualitative data regarding farmers' experience and relationship with MMI and how it has contributed to the improvement of their livelihoods.

6.2 Biography and socio-economic background of farmers

Table 6.2: Biographic and socio-economic profile of farmers

Characteristic	Frequency	Percentage (%)
Age		
30-40	**2**	**18**
41-50	**2**	**18**
51-60	**4**	**37**
61+	**3**	**27**
Gender		
Male	6	**55**
Female	**5**	**45**
Level of education		
No schooling	**1**	**9**
Primary	**2**	**18**
Secondary	**0**	**0**
Tertiary	**8**	**73**
Farming experience(Years)		
1-5	**1**	**9**
5-10	**1**	**9**
10-15	**2**	**18**
15+	**7**	**64**
Sources of income		
Farming	**7**	64
Social grants	**3**	**27**
Remittances	**0**	**0**
Informal activities	**1**	**9**
Land ownership		
Lease	**4**	**37**
Inherit	**1**	**9**
Purchase	**2**	**18**
Communal	**2**	**18**
State beneficiary	**2**	**18**
Farm size (ha)		
0-20	**5**	**45**
21-40	**1**	**9**
41-60	**1**	**9**
60+	**4**	**37**
Year of incubation		
2006-2008	**4**	**37**
2009-2011	**5**	**45**
2012-2014	**2**	**18**

6.2.1 Age and gender

Table 1 shows the socio-economic profile of farmers from a range of characteristics. Of particular interest at this point, is the age and sex of the farmers. From the table it is clear that most of the farmers are old, they make up 64% of those aged 50 and above and 27 % of the farmers are over the age of 60. These however, are not surprising figures as it is also found in numerous studies that farming in rural areas is dominated by the elderly. One particular study

is by Nxumalo and Oladele (2013) who found that 47.40% of farmers participating in agricultural programmes in KwaZulu-Natal province are well above the age of 60 with only 3.3% of farmers being below 30. The issue of the lack of youth in agriculture has been of concern for the government and the agricultural sector. In table 1 there are no incubatees below the age of 30 but there are 18% of farmers between the ages of 30 and 40.

There are various factors that can be attributed for the poor number of youth engaged in agriculture. The lack of effective engagement with rural people especially the rural youth and indigenous youth is one of the major challenges faced during the development of agriculture in rural areas according to MMI (2010:2). The problem might also be attributed to lack of specific events and outreach programs into rural communities, cultural and traditional barriers, and the absence of recognition by decision-makers of youth potential as agents of social change (MMI, 2010:2). When I posed the question about the lack of youth in agriculture and outreach programmes to the manager of Rural Development from the Limpopo Department of Agriculture he informed me about the Youth in Agriculture and Rural Development (YARD) programme. This programme was launched nationally in mid-2008 and is committed to promote the development of youth in agriculture and land affairs through efficient and sustainable services which will enhance the environment and improve the quality of life of rural families (YARD, 2008:1). The Departments of Agriculture and Land Affairs are central to the commitment of this initiative and will aim to improve youth's access to land and other opportunities within the sector as a means of sustaining their livelihoods (YARD, 2008:2).

Table 1 also shows gender distribution. There was not much difference between the sexes as 55% of the farmers interviewed were male and the remaining 45 % were women. The study by Nxumalo and Oladele (2013) also shows that men dominated agricultural activities more than women. There are programmes that aim to empower and improve the number of women in agriculture and one of them is the Women in Agriculture and Rural Development (WARD). The purpose of this program is to mainstream gender issues in agriculture and land policies, programmes and projects locally, provincially and nationally (Free State Department of Agriculture, 2015). MMI has always been gender cautious in its recruitment of incubatees. In 2012, women made up 48 % of the farmers involved with the project.

6.2.2 Level of education

The level of education is significantly high. The table shows that only 9% of respondents have no schooling and only 18% of them have at least a primary level education with the vast

majority (73%) having a post-matriculation qualification. The reason for the high number of farmers with a tertiary education has nothing to do with age or gender but more to do with previous professions and intended professions that farmers were engaged in before they became MMI incubatees. Most of the older farmers with a tertiary qualification are retired from their professions such as teaching and are now willing to make a living from farming. The farmers in the younger age group with tertiary education acquired those qualifications before they became MMI incubatees. They hold diplomas in numerous disciplines including financial management, agriculture, and construction amongst others.

6.2.3 Farming Experience

There is strong correlation between the levels of farming experience and age in this study. A significant number of older farmers have extensive experience in farming. The majority of farmers over the age of 60 have more than 15 years of farming experience having been involved in farming since the 1980s and 1990s. These farmers have experience in subsistence farming. 64% of farmers have experience of more than 15 years while the younger farmers have also been involved in farming activities for a period not exceeding ten years. Only 9 % of farmers have experience of 5 years and below and a further 27% who have between 6 and 14 years of farming experience. Farmers started their farming experience by planting crops such as maize, sugar beet, potatoes, spinach, butternut and green pepper which they cultivated mainly for subsistence with minimal commercial production.

6.2.4 Sources of income

Most of the farmers (64%) have no other source of income other than farming. Only 27% of the farmers have an extra source of income in the form of state transfers (pension grant). Pension grants apply to elders above the age of 60; this correlates well with the figure of farmers above the age of 60. It is only 9% of farmers who get their extra income apart from farming from informal economic activities such as selling their cattle. In this case it is the majority of farmers who solely depend on farming income to sustain their livelihoods that if anything would compromise their farming activity they would not be able to make ends meet. Those farmers who make extra income from other activities mainly use it for household expenses with very little being spent to support the farming enterprise. This is because that extra income is not adequate to be able to purchase the necessary farming inputs needed to sustain the farming activities on the farm.

6.2.5 Land ownership

The table shows that 37% of the farmers are currently leasing the land. These are farmers who are passionate about farming who are unable to purchase their own farm and who have not benefitted from the state land reform programmes. The land is leased from someone who is not using the land for any agricultural activities. This might relate to Letete and Blonitz's (2012: 6) categorization of land in former homeland areas; one of them is the land owned by black emerging farmers whom since the 1990s have been awarded agricultural land by the state through various schemes but because of poor financial and technical skills most the land has been abandoned. This abandoned land might be the land leased to people who are using it productively such as MMI farmers. Another possibility is that land might be abandoned by people who have no interest in agriculture because of various reasons ranging from poor agricultural support to migration. However, more research is needed to understand under what type of land tenure system is land being leased in rural areas, to whom and why?

The findings also reveal that 18% of farmers purchased land either individually or in a group. Land purchased by a group of people is usually large depending on the number of people involved in the purchase. One of the farmers explained that their land adds up to 3000 ha in total and it was bought by 47 people. Of those farmers, he was the only one who has joined MMI to be incubated. The table also shows that 18% of farmers own the land communally. This is a well-known and common phenomenon of land ownership and access in rural areas. Communal areas are large pieces of land used by the communities for agricultural production and other livelihood enhancing activities such as grazing and natural resource extraction. A further 18% of farmers got access to land through the state's Land Redistribution for Agricultural Development (LRAD) land reform program. LRAD was launched in 2001 with the objective of establishing African commercial farmers and had since emerged as a way people can acquire land (Hall, 2004: 90). LRAD offers grants between R20 000 and R100 000 depending on the amount of cash or loans that the applicant can contribute (Hall, 2004:91). Below is a statement by Participant K on how they acquired land through this program:

> *"We made an application to the Department of Rural Development & Land Reform, and found out that my husband doesn't qualify because he is employed; I then applied for it myself, the government gave me a grant of R98 600. I went to Land Bank to get a loan and to make the first deposit, then the rest of the amount I pay it every month when I pay for the bond."*

The Table also shows that only 9% of farmers inherited the land from a family member.

6.2.6 Farm size

There is a strong correlation between the farms that are leased and the size of the farms. Almost half of the farms (45%) are below 20 ha in size. The farmers who did not own land did not have access to large farm sizes. The minimum land required by MMI for producing biofuel feedstock is 20 ha per farmer; farmers can limit their leases to that particular farm size. Before 2012 the minimum land required was 10 ha, perhaps the year of incubation also plays a role in the significant number of farms falling under this category of farm size. The Agronomist at MMI explains the reasons for placing such a requirement:

> *"…We encourage them to at least plant on at least a minimum of 20 ha of land. There is the issue of birds which love eating sunflower because it is very tasty; so if they eat sunflower on 2 ha of land then you will not remain with anything. But if you plant on a big area birds will only eat 2 ha you will remain with the rest. You cannot stop birds, and currently there is no bird control on sunflower farms."*

On the other side there are quite a significant number of farmers who have access to land more than 60 ha in size. Most of these farmers have access to that land which is communally owned. A partnership of 47 households can own up to 3000 ha of land which in turn is subdivided until each family have access to about 200 ha of land. However, in the case of such large tracts of lands, not all of it is used for biofuel feedstock production. For instance, one of the farmers who owns 150 ha of land only uses 65 ha to grow sunflower for biofuels (the rest of the land can be used for other food crops such as maize and other vegetables) and another one who has access to 200 ha of land only utilizes 20% of it (41 ha) for biofuel feedstock production. It is only 9% of farmers whose land is between 21 and 40 ha and the same percentage of farmers whose land is between 41 and 60 ha.

6.2.7 Crops cultivated

Farmers plant a variety of food and fuel crops on their farms. It is important to note at this point that MMI does not only support farmers who are solely engaged in farming crops for biofuel production only but also food crops. In fact some incubatees have abandoned fuel cropping and solely focused on producing food crops; MMI still supports them in any case. Farmers can also multi crop and cultivate for both fuel and food production. Fuel crop include sunflower and soybean and food crops include maize and others vegetable crops such as spinach, green pepper, potatoes. There is also cultivation of cotton (see table below).

Table 6.2.7 Number of farmers and number of hectares planted in the 2013/14 financial year

Production for 2013/2014 financial year						
	Sunflower	Maize	Beans	Cotton	Vegetables	Total
Number of farmers in production	19	33	11	1	4	68
Number of hectares planted	962	541	193	62	14	1772

(Source: MMI 2014)

The table above shows the type of crops farmers cultivate for their livelihoods. Sunflower is the most cultivated (fuel) crop adding up to 962 ha which accounts for 54.2% dedicated to land used to plant it. However, there is correlation between crops planted and the size of land. As it was previously articulated by the agronomist at MMI, that in order to cultivate sunflower successfully, a bigger piece of land is required. This justified MMI raising the minimum amount of land required for biofuel production from 10 to 20 ha of land, keeping in mind that sunflower is the most cultivated fuel crop. As a consequence, some farmers have stopped cultivating sunflower for reasons related to that. Here is Participant K's account on why she stopped sunflower cultivation on her farm.

> *"I only planted it (sunflower) for two years in 2008 & 2009 then I stopped planting it because I realised that it takes a while for you to start making money from it. It requires a bigger land so that you can harvest more and that you can mass produce and receive larger turnover as well. I decided to stop planting sunflower because I had to pay the farm bond, electricity and the workers; and by planting sunflower I'll have to wait for six months to only make R32 000; you can see that I'm not going anywhere. I then continued with spinach; MMI is presently mentoring me. They gave me someone to mentor me. MMI gave me exposure of how I must run my business, for example, record keeping so that I can see my losses and gains."*

The reason that sunflower was chosen as the one of the crops for biofuel feedstock production is because the ARC found that Limpopo farmers are familiar with it (ACB 2008:33). Ninety percent of farmers that were interviewed have been involved with the cultivation of sunflower in the past and recently. Some farmers have experience of cultivating it before they joined MMI and those that recently started planting during the incubation process admit that it is not difficult to cultivate and it also has a good price if the land is large enough, Participant D explains it further below:

> "*No, I have never planted sunflower before, it was the first time I plant it after I had joined MMI. But I used to work at a factory where all plants were stored; that is where I worked. And for me to plant sunflower was because it could be profitable if you plant it on large hectares of land. Its price on the market is good because if you sell it you can make a decent profit, you can improve and even be able to hire people. So every time from year to year when you improve you can increase the number of people who work for you so that other people can also make a living. This is why I love planting sunflower and according to me I won't stop planting it, its not difficult."*

The choice of which crop to cultivate depends on various factors including the availability of land and whether the choice of the crop will yield better income or not. In this case, farmers find sunflower rather easy to cultivate but at the same there is little that it yields for them because of the lack of large land to cultivate it, lack of production inputs and machinery as well as transport. Thus, farmers with small land are likely to migrate to cultivate a combination of food crops. Farmers with a smaller piece of land find it harder to cultivate sunflower because birds eat it, thus a larger piece of land is required. This study, focuses more on the impact of biofuel feedstock production by MMI's farmers on ther livelihoods, however, those who engage in the production of food cannot be ignored as MMI's impact on their livelihood can still be assessed too.

The impact of MMI on improving livelihoods for small-scale farmers in Limpopo

This section will deal with how MMI has an impact on farmers' livelihood outcomes. MMI's incubator model will be assessed on how it has an impact in improving farmers's access to livelihood assets and how that further improves their livelihood outcomes. The discussion will be guided by the Sustainable Livelihoods Framework and the Incubator model discussed in chapter four and five. For the incubator model, the focus will only be on the business support and mediation aspects that incubators adopt during the incubation process.

6.3 Business Support

From the findings, ninety percent of participants admitted that MMI has supported their farming enterprise in a number of ways. The form of support takes place in five different types: provision of farming inputs, provision of training, mentoring and education, provision of labour and market access. From the list of the support services provided by MMI the two most common according to the participants is provision of inputs (physical capital) as well as training and education (human capital). MMI embraces education and training as their main form of support for the farmers rather than the provision of farming inputs. MMI's agronomist explains below:

> "*MMI as it is does not have farming inputs. What is strict to MMI is technical advice, okay? Technical advice is about soil sampling, we train them to know how to cultivate sunflower and soya bean, when it is the right time to start planting, and how it is harvested so that they do not encounter problems. The issue of pests, financials, record keeping and things like that. If you are a farmer you must keep records so that you can balance to determine whether you are losing or gaining at the end of the day…things like that."*

However, the farmers see both (training and provision of inputs) as equally important because livelihood assets are interdependent. For livelihood activities to be successful both the human and physical capital as well as other capitals are required. Acquiring one and lacking the other can be a hindrance but it is better than having nothing at all. This is the problem that one of the farmers faces; the farmer acquired all the training and education provided by MMI but because of the lack of inputs her business is suffering. The nature of the training and what farmers are taught is vital in this regard because they are taught about how to plant biofuel crops such as sunflower and soya bean but neglected to train them on vegetable farming which a significant number of farmers are already interested in engaging in. Participant J explains how this lack of vegetable training and lack of provision of farming inputs is affecting the business.

> "*MMI gave us seeds when we were still training in the first year of incubation. MMI gave us more knowledge about farming, I know everything about farming even if they give me a task to plant on 20 ha land, I would. Look, they didn't teach anything about vegetables but with the knowledge I received I am now delivering goods for Spar and Pick n Pay. I came in second position in Limpopo, I received R49 000. But my heart is broken about vegetable business which I never went to training for. But I would plead to them to please give us seeds; we are suffering, I have three children who are in university now I am really struggling. My kids went to school because of the income from farming. One is in the University of Limpopo, one is at Tshwane University of Technology and another is at UNISA. I am so poor I am suffering."*

The lack of provision of farming inputs is not something MMI is unaware of or in denial for. They fully acknowledge that provision of seeds and fertilizers is crucial for any farming activity. They also acknowledge that provision of such inputs or lack thereof does affect production and livelihoods of farmers and therefore poses a huge challenge. The agronomist explains why there is shortages in the provision of farming inputs below:

> "*There are many challenges because MMI on its own cannot buy seeds because we are a non-profit organization (NGO). We don't make a profit, meaning we cannot buy inputs. Our farmers are still emerging therefore you will find that they cannot plant 20ha of land. We will have to make proposals to other institutions such as LDA, asking for inputs and donations and then divide them amongst the farmers to assist them. With regards to fertilizers we can ask from SASOL and others, they give us and we distribute to the farmers. From that we can see who can prove himself/herself.*

These people we were talking about they are now competing with commercial farmers, they started there; they are those lucky people that when they received inputs they were able to use their profits just as we advised them. Today, they are able to plant without our assistance, because if a farmer can be able to plant 250ha himself, that's an achievement! Others can't do it, some you give them those seeds and they just leave them in their garages, seeds get rotten if you don't know. Government would give us some funds, we would buy inputs keeping in mind the number of incubatees we have, and we will buy the inputs that will be enough for them so that we distribute them. Some people leave them in their garages, they get eaten by rats but they don't use them. But those who are clever and were able to use those inputs are up there."

Even though it is not all of the farmers who have access to farming inputs provided by MMI, 64% of them do get them and are able to keep production going. The amount of seeds and fertilizers provided for farmers is dependent upon two important factors: the size of the farm and whether the land is under irrigation or not. In terms of farm size, MMI is able to determine the amount of seeds/inputs that are needed using the data available. MMI's agronomist explains this further:

"If it's 20ha for instance then that means that four will be enough for a 20ha land because one bag is enough for four to six hectares depending on whether it is dryland or irrigation. When you are planting on dryland is not the same as when you irrigate, under dryland you can plant roughly12000 to 18000 plants per hectare and under irrigation you can plant as much as 30 000 - 40 000 plants per hectare. You can see that it is a huge difference."

Up to this point human and physical capital have been discussed as how MMI provides business support or access to livelihood assets to its incubatees. MMI also provides another important type of physical capital in the form of mechanization. The importance of mechanization in agriculture is elementary especially for clearing and preparing land for cultivation and to help plant easily and efficiently. During previous years (2006-2010) MMI farmers struggled to get mechanization services but through the help of LDA and funding from SEDA MMI was able to purchase a combine harvester, slasher, planter, hydraulic disc harrow, boom sprayer and a disc plough (MMI, 2010:1). Some farmers like Participant D joined MMI particularly for that reason.

"I joined MMI because they called us here at the beginning, they showed us all the mechanization they had, they told us they would assist those of us who were struggling so that we could have our own mechanization permanently so that you can be able to start working on time and finish on time as well. That's why we joined MMI, we joined it because of the mechanization that we saw they had so that we could be helped."

During the first years of incubation (2006-2010) MMI struggled to provide their farmers with mechanization and this situation has not improved to date. As outlined in the previous paragraph, MMI currently owns a tractor, a row planter, disc harrow, slasher etc which are used on a rotational basis. It is obvious with such limited resources MMI is unable to service the needs of all their farmers. The agronomist explained that machinery was lent to farmers for free but now charge a fee for usage because farmers previously misused their services.

> *"We plough for them for a fee right now, but when we started the project we did not charge them. But due to the challenges that some people are misusing our services, we came to agree that let's charge them because they are misusing our resources. Like in terms of mechanization, say for instance I came to plough for you and then maybe you are from Polokwane, if the tractor comes from Polokwane to here at MMI sometimes…it's far, and we are also trying to save costs."*

Access to mechanization according to this quote above is geographically dependent. Perhaps, the further away a farmer is from MMI the less likey they were to access mechanization and in a quest to be cost-effective MMI thus introduced the pay-as-you-use mechanism operating on a first-come-first-serve-basis. What happens on this process is that farmers will be put on a list and the list will be used as a guide to see which farmer made the request first. This looks like a time-consuming process as one type of equipment is rotated amongst a number of farmers who need it and this might affect the planting and harvesting schedules of farmers.

One other livelihood asset provided by MMI's business support is natural capital in the form of land management and erosion. However, this livelihood asset is acquired indirectly because land management practises and erosion control are part of the training and education that farmers receive during incubation. Finally, MMI supports farmers' livelihood assets through the provision of labour on their farms. MMI recruited farm workers to work on incubatees farms and in some instances paid for their wages. 27% of farmers reported that MMI had assisted them in this way.

This section has highlighted how MMI's business support provided access to livelihood assets which farmers need to be successful sustainable farmers (see figure 6). MMI's business support model enhances three of the five livelihood assets which are human capital (through provision of free training, education, coaching, mentoring and the provision of labour). These elements have improved the skills and capacity for farmers to adapt to the increasingly modernised agricultural sector. The second element of livelihood assets influenced by MMIs business support is the provision of physical capital in the form of farming inputs (seeds and fertilizers) as well as mechanization; these are vital for any operation of a farm and

production cannot take place if they are unavailable. Natural capital is also fulfilled through practicing good farming methods. The training provided helps farmers to know when to start preparing the land for the planting season, how to prepare the land and when to harvest. These skills will prevent negative environmental impacts as good land management processes and erosion will be controlled.

6.4 Mediation

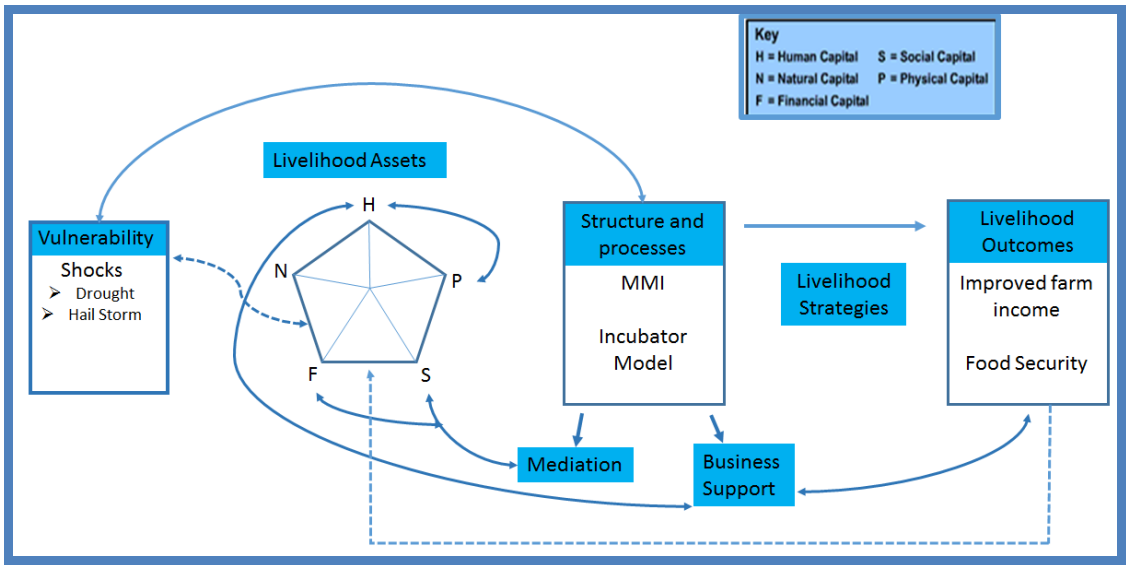
Mediation as discussed in chapter four refers to when an incubator is the mediator or middleman between incubatees and other external actors for various reasons including access to markets and funding (Peters *et al,* 2004). The experience of farmers to such actors also contributes to the influence and access to livelihood assets such as financial capital and social capital.

MMI mediates for farmers through hosting information days annually to discuss various issues pertaining to farming with various stakeholders in this sector. MMI's goal is to see that all their incubatees are knowledgeable, skilled and have connections with different stakeholders in the farming community (Maluleke, 2008:3). During the information day in 2008, there were representatives of Monsanto, Structa, Mabeleng Grain, LDA crop division and the MMI"92s production task team were the speakers; the event was attended by farmers, Tompi Seleka employees, local school learners (Maluleke, 2008:3). This was done to improve farmers' network of growing sunflower and soya bean where knowledge and ideas are shared on how to best produce these two biofuel crops.

Financial assets are improved as a result of MMIs information days. Best performing farmers in the province are awarded with cash prizes which they could use to improve production on their farms. During the information day, the best performing farmer for soya bean and sunflower were presented with cash prizes. One of the MMI farmers (Participant F) was one of the winners in one of these annual information days, in 2013 the farmer received R40 000 for being the best female farmer in the province and she also received R120 000 for taking the best young farmer award. As a result of these cash prizes she never had to take out a loan to support her business venture. During the 2009 information day, a representative of Khula Enterprise Finance LTD spoke to farmers about financial opportunities that may emerge (Maluleke, 2009:4). Financial opportunities may come in the form of loans which farmers take out to boost their farming enterprise. Surprisingly, it is only 27% of farmers who have taken out a loan, others do not qualify for it because of being pensioners, other cannot afford to repay it and other simply do not need it. But MMI through its mediation is involved in

fundraising activities. As a section 21 company fundraising is important for the sustainability of the incubator. In the 2013/14 financial year MMI managed to raise an amount of R 1 111 278.35 which was mostly utilized for implementing SMME support programmes (MMI, 2014:22). Because of the training in financial management, farmers are taught how to handle their finances to weigh in profits and losses to gauge their own progress and profitability of their own farming enterprises.

This section dealt with how the incubation element of mediation influences and provides access to two of the five livelihood assets which are social and financial capital. MMI provides a network on planting sunflower and soya to their farmers. It also exposes them to a wide range of stakeholders in the farming community who share ideas and knowledge for the farmers to become better at what they do. MMI provides financial capital through training on financial management as well as fundraising to support farmer programmes as well as purchasing farming inputs to distribute to them. The nature and effect of the incubator and its incubator model to livelihood assets are depicted in the diagram below. It shows the two elements of the incubator model and which livelihood assets it influences access to; looks at the links between the MMI's incubator model in relation to vulnerability context and shows how access to livelihood assets may lead to farmers achieving livelihood outcomes.



Modified from (DFID, 1999)

Figure 6.4: Sustainable Livelihoods Framework in MMIs context

The diagram above has been adapted and modified from DFID (2000). It depicts the sustainable livelihoods framework in the context of MMI and demonstrates the role that MMI plays in helping or assisting farmers to obtain livelihoods assets. It has already been established (in Chapter 5) that people chase different types of livelihood outcomes by attaining a wide range of assets to pursue a variety of activities (in this case, farming). Furthermore, their options are determined by structures and processes. In this diagram, MMI as a structure with its own processes (policies, incubator model) has an effect on farmers attaining livelihood assets. The diagram shows two aspects of MMI's incubator model (mediation and business support) and which livelihoods assets it helps famers to obtain. The mediation aspect of MMI's incubator model (which includes creating connections and networks between incubatees and other farming stakeholders for financial advice and farming in general) provides financial and social capital livelihood assets. On the other hand, business support as another aspect of MMI's incubator model provides natural, human and physical capital to farmers in the form of training, mentoring, coaching, providing inputs, and mechanization. The attainment of livelihood assets can be restricted by shocks such as droughts and floods and this can affect farmer achieving livelihood outcomes. However, the obtaining of livelihood assets with minimal restrictions from shocks can ultimately lead to farmers achieving livelihood outcomes which in this case includes an improved farming income and food security.

6.5 Livelihood outcomes

As a result of the improved influence that the incubator model had on farmers' access to livelihood assets, some livelihood outcomes have been achieved. The skills and training received during incubation, the provision of seeds and fertilizers, access to mechanization and a market, the networks created for farmers have proven to have a positive impact on farmers' livelihoods. This section will discuss the outcomes of MMI's incubation process on improving livelihoods for farmers. Improved livelihoods took shape in the form of increased income and security of food.

6.5.1 Income

An overwhelming number of farmers (73%) explained that their income has increased ever since they joined MMI. Most of these farmers are growing sunflower as a biofuel feedstock crop; because of the profitability of the crop and the guaranteed market access, farmers are generating more income. Participant F explained that 1 ton of sunflower can generate up to

R4500 in income, therefore if a farmer has more land and is able to harvest more tons an even larger income can be generated. One such farmer is Participant B who made R500 000 in the previous season only; he cultivates sunflower for MMI on 65 ha of land and had harvested 49 tons of it. However, because Participant B is not only involved in sunflower cultivation but in cotton (which can generate R6000 per ton) and maize, this cumulated to an impressive turnover. Participant E who is leasing the minimum required amount of land (20ha) made a turnover of R63 000 from both sunflower and soya bean and participant G whom also leases 10ha land harvested 4 tons and made R16 000.

This income is used to sustain livelihoods in various ways. It is reinvested in livelihood assets through the purchasing of farming inputs and machinery to sustain the farming business. It is also used for household needs such as groceries, renovating the house, school fees and it can also be used to pay labour. Here are accounts of how farmers have utilized their income made from planting biofuel crops:

> **Participant C**: *"I use it to buy livestock and the remaining amount is used to support chidren. The children go to school, I pay the full amount for the whole year; they go to multi-racial schools; so I just pay for the whole year knowing that I won't pay for any more education expense. When I have money I use it in that manner so that I see how the money is spent."*
>
> **Participant E**: *"I was able to help in the household; I buy groceries and also renovated the house. From there I used R20 000 to buy seeds and fertilizers, I had previously borrowed money to pay the farmworkers so I was able to pay that money back. Then the remaining amount is for this year when I start ploughing for the new season in October. I support a household of seven people."*
>
> **Participant G**: *"The income has improved, I have more than ten tractors and I already had three before I joined MMI. I live with my wife and four children so it's a total of six in the household and I really support them."*

The reinvesting of farm-generated income into farmers' livelihood assets such as education for their kids (human capital) and purchasing of inputs and mechanization (physical capital) will contribute to the sustainability of their livelihoods in future and it will put them in the correct path to becoming self-sustaining farmers independent from MMI. However, this cannot be said about all the farmers involved in MMI's incubation processes. Twenty seven percent of the farmers have not been able to generate income that will help to sustain their livelihoods. This group of farmers is comprised of farmers who never received farming inputs and those who only plant vegetable crops.

Those who lack farming inputs end up resorting to other alternatives such as providing all the basic necessities for farming (inputs) for themselves. Participant I is one of those farmers

who never received farming inputs from MMI ever since she joined in 2006 and graduated. She explained that MMI said they would not give her seeds because she does not have a tractor and she would misuse them. The seeds she received were from a white farmer and they were not that productive because of lack of rainfall and on top of that she does not have electricity. As a result, she had to find other alternatives. She planted *Moringa,* a multi-nutritional tree whose leaves can be used for giving nutrients and boosting the immune system. She sold the tree leaves and made only R300 because she does not have a market. She explains further below:

> *"I used that R300 as part of the money I used to purchase a (second-hand)generator, which costs R3000. I also bought groceries for the household. We are six in total with two grandchildren; one of them goes to school but the others are done. One was doing a learnership at Tompi Seleka, she sent her CV for another learnership for three months. Two of them went to look for jobs, so that they can help me with my electricity problem."*

Participant D below further reiterates the poor service received from MMI. The participant argues that the support has been inadequate and he had to stand up and do things himself because the assistance from MMI was minimal. He further explains below:

> *"The support is too poor. From my observation, the management is trying too hard even if you ask how others got assisted you will find that others were assisted in this manner and others were not even assisted at all. That's why I told you that from 2010 and 2011 they came and planted 15 ha and then they left and never came back. It is only this year that they came and planted that 1.5 ha which I had to fight for because they had previously gave me seeds that had expired. I was even forced to go and buy seeds for myself; their seed wasn't growing me anything because I had tried it that's when they came and planted that 1.5 ha. From there, there was no scout who came, I struggled with many things, when I asked about the market there was no market nearby but there was soya feedstock; their explanation on how long it would take for them to pay me what I sold for them was not clear, we didn't get all those things. I never receive anything totally!"*

MMI played a vital role in improving farmers' livelihood outcomes in the form of increased income. There are factors which have contributed to certain farmers having improved income as compared to others as demonstrated from the participants above. Farmers who have an improved income such as Participant B is because of factors such as having access to large piece of land, machinery and access to inputs such as the case of Participant E. Participant I and D demonstrate how the lack of those necessities (land, seeds and fertilizers) has affected their farms and their ability for them to make a decent income.

6.5.2 Food security

One of MMI's objective is for its farmers to become food producers. The food vs fuel debate is prominent within the biofuel literature with arguments that farming for fuel crops could result in farmers abondoning farming for food crops which can ultimately lead to increasing food prices and malnutrition (see Chapter 2).

To avoid the food and fuel conflict, MMI seeks to establish an entrepreneurial class of emerging farmers and further transform them into self-sustaining commercial farmers who can produce both food and fuel crops for the market. Farmers were growing food crops before they joined and when they joined MMI some of them did not abandon growing food crops even though biofuels are the ones generating them more income (Musyoki, 2012:8). Some of them are not even growing biofuel crops but they still receive more or less the same business support as the others. Participant K is one such farmer, she started growing sunflower but she was not satisfied with her returns because of lack of adequate land and other expenses she had to pay. As a result she migrated to food production and produced spinach, butternut and green pepper which she sells to Tswane Market. Therefore in this case, her food crops generate her more income better than when she was cultivating crops for fuel production. Her food production does not benefit herself and family but the community at large. Participant K explains how the food she produces benefits the community:

> *"What I also do is to supply schools with vegetables when they have functions, there is a creche which I provide for every week, I give them spinach and beetroot and whatever vegetables are available. I will not say my money bag is not full yet, whatever I have I should always try to give back to the community. MMI have done a great job, you see, education does not come to an end for a person. They still call us, even SEDA, there are always events happening; unfortunately now they fund Co-operations (five owners) so my business does not qualify to be a co-operation its a private company because it is just me and my husband."*

This section has demonstrated how farmers benefitted from MMIs support and how access to various livelihood assets have yielded more income and food security for farmers to sustain their livelihoods. The incubator model has had positive impact on farmers' livelihoods but there are still some few discrepancies and challenges that MMI faces on which there is still room to improve.

6.6 Challenges and Constraints

Although the majority farmers (73%) are pleased with services that MMI provides for them a few (27%) who are yet to taste benefits of those services remain disgruntled. There are challenges that farmers still face, even with those whom are pleased with MMI still face a

few challenges. Challenges pertain to limited access of livelihood assets which affect livelihood outcomes and the minimal role MMI plays in reducing vulnerability. The challenges are for both the farmers and MMI; this section discuss them both but with more focus on farmers' challenges.

6.6.1 Access to land

Access to land is another challenge expressed by farmers. With most of them leasing the land and having small sizes of land on which they are currently farming on, ownership of a considerable piece of land is highly desired. A study conducted by Lipton (2009) has shown that farm size is crucial for attaining certain benefits. In Organization for Economic Co-operation and Development (OECD) countries farm subsidies usually favour large farms for political economy reasons; big farms are better placed to have tax laws interpreted in their advantage (Eastwood *et al*, 2010:3373-76). Farmers have expressed how having a small piece of land is restricting them on their desire to have a larger production output. Production output is not the only factor that disadvantages farmers to be sustainable. Eastwood *et al* (2010) outlines several factors that hinder small farms from being competitive in global markets. Firstly, globalization has expanded FDI and in the process has raised the profile of supermarkets (foreign-owned) in developing countries (Eastwood *et al*, 2010:3377). In South Africa, supermarkets have a share of 55% in food retail shares; they are spread nationwide; they developed procurement methods which favour delivery of goods in large quantities, cutting out small farmers in the process (Eastwood *et al*, 2010:3378). Secondly, the state and state-like agencies have imposed grades and standards for goods overseeing health, labour and environment; grades and standards have shifted to cut transaction costs and this has excluded small firms and farms (Eastwood *et al*, 2010:3379). Therefore small farms are affected by market forces and actors.

MMI incubatees are aware that in order to compete in regional, national or international markets they will have to expand and the first step towards that achievement is through obtaining a larger farm size.

> **Participant B**: *"If I say I am a self sustaining farmer,I would have my own land; if I can also be able to take out loans from the Land Bank for my own land. I would consider myself a self sustaining farmer."*
>
> **Participant E**: *"When I'm self sustaining is when I would be called a commercial farmer. If I have my farm, remember that I'm currently leasing and on top of that lease I can't do anything; I can't go to the government for help. To be self sustaining would be to have my own land; and at last have my own tractor in that farm that is when I would call myself a self sustaining farmer."*

MMI incubatees view a self-sustaining farmer as a farmer who owns their own land and who can do everything for him/herself without depending on the assistance of government or any other institution. This is certainly what most farmers are striving to become and the ownership of land will be the beginning.

6.6.2 Lack of production support

MMI has admitted that it does not have adequate farming inputs to distribute amongst all its farmers because its main priority is education and training in various skills. As it was already discussed, MMI receives seeds by applying to other institutions such as LDA and SASOL for donations. As a consequence, some farmers will not have access to those inputs if the donations and supply of inputs are not adequate. The following quote by Participant H illustrates this:

> "*We often go to them to ask for fertilizers, they would also tell us that they are looking for donors and they are not receiving any donations…We run out of implements such as fertilizers and seeds. Sometimes we have to borrow fertilizers and seeds because we are running short*".

The challenge of the lack of provision of physical capital to some farmers stems from a paradox that exists within MMI's processes of providing such services. First of all, MMI is aware that most of the farmers in rural areas lack access to mechanization and farming inputs to sustain the farming activity and in this regard, MMI vowed to offer assistance. MMI assists through the provision of seeds and fertilizers as well as mechanization. The problem here is not what MMI provides for assisting farmers but how it actually does it. MMI would provide seeds and fertilizers to farmers and some would not utilize them:

> *"Others can't do it, some of those you gave seeds just leave them in their garages, seeds get rotten if you don't know. Government would give us some funds, we would buy inputs keeping in mind the number of incubatees we have, and we will buy the inputs that will be enough for them so that we distribute them. Some people leave them in their garages, they get eaten by rats but they don't use them. But those who are clever and were able to use those inputs are up there."*

What looks problematic in this case is the provision of seeds without the farmers having access to mechanization. MMI itself owns a single tractor which is supposed to be rotated amongst many farmers. This restricts farmers who do not have access to tractor the provision

of farming inputs because it is argued that they will not be able to utilize them. Participant I explains that MMI told her she would not receive inputs if she does not have access to a tractor. This is precisely the paradox, MMI limiting the provision of inputs to farmers who have access to a tractor when there is only one tractor in rotation and limited access to mechanization to a number of farmers. Some farmers lamented the poor management of that tractor and how not every farmer can have access to it. Only those in a geographically advantaged area can access it, **Participant B** explains that:

> *"MMI does want to support us but they lack management to support farmers. They have machinery like combine harvester, you find that when it is time to harvest the machine is only used in a single area while other areas are still waiting, maybe because of lack of transportation They also have tractors I don't know if its only one or two they are also not properly managed because they are only used at a single area."*

Even though farmers are still charged a fee to prevent the misuse of the tractor, farmers who reside further away from the incubator may not have access to the tractor due to the distance factor and for MMI to save costs. Transport is also a factor in this regard and many farmers have bemoaned how its lack is affecting their livelihoods.

6.6.3 Lack of transportation

Farmers are dispersed within the district municipalities where MMI's biofuel project is currently operating. As a consequence, reaching to them whether for post-incubation coaching and mentoring or delivering inputs can be a difficult, challenging and costly process for MMI. Participant A complained that MMI does not come to them and it does not monitor them on their progress. *"They used to come to us and those who did were mainly women. It is not easy for women to take a car and navigate their way through farms to check how farmers are doing*". But the problem of lack of transportation also affects farmers too, farmers who lack transportation especially those who are far from Tompi Seleka (Waterberg and Capricorn districts) can find it hard to access MMI services if MMI is unable to come to them, whether for purposes of transporting feedstock, or fetching farming inputs and for coaching, advice or to attend MMI's information days.

The importance of transport for agriculture has been demonstrated in the study conducted by Yaro *et al* (2014). The study assessed the impact of rural transportation on agricultural production in the Boki district, south of Nigeria and it found that, in inaccesible areas, people use porterage as a means of transport to deliver goods to the market (Yaro *et al*, 2014:125). Accesibility to the market through transport has positive yields because of higher income,

employment and easy access to markets (Yaro *et al*, 2014:125). The lack of transport therefore can affect farmers'access to markets which in turn can be problematic for the growth of the farming venture as well as restrictive factor to achieve livelihood outcomes.

6.6.4 Access to markets

Access to markets is one of the main challenges facing small-scale rural farmers. Farmers can be able to produce feedstock but not be able to sell their goods. MMI set a goal to become the market for which farmers can sell their biofuel feedstock. But to the farmers who are practising mixed farming and those who produce only food crops are finding it hard to sell their goods as MMI is not providing a guaranteed market for their produce. They have to resort to other ways and find markets in other places like Tshwane market or informal trading. There are also challenges for accessing these markets; selling at the side of the road would require transport to carry goods to places where they could be sold. In terms of delivering goods to Tshwane Market, there is risk of not getting a return as farmers suspect that their goods are being dumped, **Participant K** explains:

> *"One time I took my spinach there they told me they dumped it, that was so painful… it was R0.00. After you had paid R1500 and people buying then they tell you that we dumped it and there was no proof. Inside the shop there is a board which reads 'you deliver your goods at your own risk' and that they are not responsible. I saw that this board is just to oppress me as a black person. That's the problem we have with Tshwane Market."*

MMI has since cautioned farmers to be aware of such scams by doing follow-ups so that they do not get cheated off the money they have made from the produce. Access to markets has always been a challenge to farmers but it looks like access to better and transparent markets is a new challenge for farmers.

6.6.5 Access to loans

73% of the farmers interviewed are currently not repaying any loans. This can be due to various reasons, firstly, they do not qualify because they are pensioners and secondly, they do not take out a loan they do not qualify financially and would not be able to pay it back and lastly, they are financially secure and do not need one. That leaves only 27% of them who were able and needed to take out a loan, and from this, it is only 9% struggling to repay back the loan. Participant G explains that she still owes a huge amount of money and her repayments are disturbed by a shortage in finances to pay them back. *"I always apologise to them for not meeting payment targets. These apologies will not clear my debt, I just have to pull up my socks and pay them"* she says. On the contrary 18% of the farmer take out many loans and are able to pay them back without any complications.

> **Participant G**: *"I take out many loans! I take them and pay them back so on and so forth, even now I just took out another one for R150 000"*
>
> **Participant B**:*"For me I sometimes run short of finances, I'll ask for a personal loan which does not go through the bank or anything like that...I go to Loskop to ask for it and they would give me, perhaps, R30 000 and a tank of diesel and immediately after I harvest I pay them back*".

Loans can help the farmer obtain short-term finance for long-term benefits. But loans are risks for either financial stability or for financial woes. But MMI has trained farmers to manage the finances, perhaps this could be reason why there is such a low percentage of farmers in debt. Debt repayment cannot be attributed to the lack of financial management but other factors as well such as shocks (e.g. natural disasters) which affect farmers' production output.

6.6.6 Shocks

Shocks such as natural disasters can be a setback for farmers to sustain their livelihoods and can threaten and endanger them. This relates to the vulnerability context of the Sustainable Livelihoods Framework (see Figure 6) which has factors that affect people's access to livelihood assets and their quest to achieve livelihood outcomes (DFID, 2000:15).

> *"In December there was a crisis because of hail, I expected to make atleast R180 000 but that wasn't the case because of the hail I only managed to make R50 000; I worked at a loss. And in December I planted my spinach hoping that it would make an adequate income for me for the rest of the year but in February there was a lot of rain I also worked at a loss in this case. In March there was still a lot of water from the rain, I had to wait for May to start preparing soil to plant spinach again."*

Too much rainfall and hailstorm are not the only natural disasters that affect production but drought can also be problematic as well. The lack of rainfall affects growth of crops, kills livestock and leads to huge losses that limit farmers from achieving livelihood outcomes. In January 2015, heavy rainfall destroyed crops and killed livestock; reports suggest that 25 000 ha of crops have been destroyed in Malawi, 65 000 in Mozambique and 9900 ha in Madagascar (FEWS NET, 2015). Although, natural disasters are beyond people's control, based on their frequency they can be predicted and measures can be taken to minimise their impact. MMI can only be assessed on how it helps farmers minimise their vulnerability from such shocks. In the case of a drought, MMI can invest in infrastructure to be built on farms like greenhouses and irrigation to restrict the effects of drought and hailstorm during those events.

6.7 Opportunities

Despite the challenges that emerged from the incubation process to improve livelihoods there are opportunities that have emerged. Opportunities can be broken down into four categories namely: education and training; media exposure, mechanization business opportunities and no opportunities at all. Farmers have expressed gratitude to MMI for giving them an opportunity to educate and train them about farming. Since farming has changed and modernised from the way it was before, farmers have found it difficult to adapt. MMI certainly has given them a chance to teach themselves about how to survive in this new modernised sector of agriculture. Education was not limited to those who had some form of education but to all who are passionate and enthusiastic about farming this includes those who have little or no schooling.

Secondly, 37% of MMI farmers interviewed have attracted media exposure and have appeared on the television programme Living Land on SABC 2 which mainly focuses on issues such as agriculture and farming. **Participant E** explains below:

> *"I was able to see myself on TV, this is something I did not even dream about that one one day I would also appear on TV. When they came with the SABC people they took video footage of us working on the farm and told us when the footage will be aired; I was able to see myself on TV. This was the biggest opportunity that arose for me".*

Participant K had an opportunity to attend biofuel workshops in Mozambique and Johannesburg representing MMI "without paying a cent" she said. Participant J also had an opportunity to represent MMI on Thobela FM (a local radio station) to talk about farming and also encourage women to be involved in farming activities. The exposure of MMI farmers is also an exposure to MMI to market itself and inform people about what it does and this can lead to more farmers wanting to be part of their project.

The lack of mechanization in MMI became an opportunity for other farmers to fill a gap and further enhance their livelihood strategies. Participant G who has more than ten tractors has used some of the tractors to plough for other MMI incubatees who are in need for a fee. This is also an opportunity for other farmers to have access to mechanization and releases the pressure from MMI to rotate a single tractor to a number of farmers who need it. Finally, 18% of the farmers say they did not have any opprotunities arising for them but they are grateful for the chance MMI has given them to learn more about farming.

6.8 Conclusion

This chapter has demonstrated that biofuel production for MMI has had positive impacts on small-scale farmers' livelihoods. It is an overwhelming seventy three percent of farmers who admit that joining MMI to produce fuel crop has increased their income from what it was before they joined. Most of the farmers are engaged in sunflower feedstock production which has been said to yield approximately R4500 per ton. The study shows that there are three types of farmers that are involved with MMI: fuel crop growers, mixed crop farmers and food crop producers. All the farmers were cultivating vegetables crops prior to incubation with MMI but became better food and fuel growers after the assistance of MMI. MMI supports farmers growing both food and fuel crops. MMI still supports farmers irrespective of whether they produce food or cultivate biofuel crops or both.

The chapter also showed how MMI incubator model in the form of business support and mediation has improved farmers' access to certain types of livelihood assets. Farmers gained the necessary skills and education that will equip them to be better farmers; it improved their access to basic farming implements such as seeds, fertilizers and mechanization and business support has indirectly benefitted their natural capital through controlled erosion and good farming methods that they learned from the training they received from MMI. Mediation from MMI opened doors for farmers to create networks and connections to the farming community for various benefits including access to information about financing their farming enterprise and to learn more about biofuel feedstock production. The improved livelihood access has also yielded more income and an improved food security not only for the farmers but the community at large.

Challenges exist and these make access to livelihood assets difficult. Challenges such as access to markets, lack of provision of farming inputs, lack of transportation and natural disasters affect the production output of farmers and make them work at a loss.

Opportunities have arisen from the relations that exist between MMI and farmers: networks were established, funds were raised and self-sustaining farmers were created. Biofuel production, even though it is still an infant industry in South Africa, has the potential of improving farmers' livelihoods, and uplift communities if proper models are applied. MMI's incubator has yielded a positive impact to its farmers, although there might still be challenges such as wider provision of inputs and mechanization, transport to access markets and reducing the impact of shocks. Therefore, MMI should improve its own capacity to provide better and much more improved service to the farmers. This should entail attracting more

donations to increase provision of farming inputs for more farmers, purchasing more mechanization, and also improving transport services for farmers to access markets. Improved capacity to provide such services will reach a wider farmer population and will have a positive impact to farmers' livelihoods.

Chapter 7

Conclusion and Recommendations

The drive for energy security globally and locally in South Africa has opened up opportunities to explore various energy sources including biofuel production. Whereas energy security is an overarching goal for developed countries, socio-economic development is the primary focus for developing countries such as South Africa. Developed countries focused on energy security and developing countries focused on socio-economic development. However, the development of biofuel industries would not get the go-ahead without attracting debates on a number of issues such as the environment, land and most importantly food security. Different arguments from the opposing schools-of-thoughts were presented in Chapter 2 highlighting the impacts that biofuels might have on these countries' environmental and socio-economic status of citizens.

The primary objective of the study was to examine the livelihood impact of biofuel production on small-scale rural farmers participating in the MMI project in the local districts in Limpopo province. Such an initiative should occur without compromising food production, environmental issues and local peoples' access to land as it was often perpetuated in other sections of the literature. In South Africa where a history of land dispossession and deterioration of black farming was facilitated by the previous regime it was interesting to look at how the new democratic government was planning to reverse those effects and expose African farmers to modern agriculture through biofuel production in previously disadvantaged areas. The new government introduced a series of legislation that aimed to induce energy security and diversification. Most notably, is the Biofuel Industrial Strategy of 2007 which became South Africa's blueprint for the development of a biofuel industry. Albeit that piece of legislation creating directions for the country's biofuel production, it was however, sparked with contradictions and confusion and as a result most of the proposed projects are yet to take off. This questions the viability and capability of a sustainable biofuel industry in the future. MMI was established before the legislation was passed and therefore remains unaffected by its shortcomings.

This study found that MMI plays a vital role in assisting farmers to obtain livelihood assets which yield improved livelihood outcomes. The overwhelming majority of farmers (73%) have articulated that MMI has been pivotal in assisting them and their farming enterprise to

receive an improved income and become food secure. The findings of this study reflect the findings of a biofuel project in Ghana (Boamah, 2011); Cotula *et al* (2008) and Mwakasonda and Farioli (2012) that biofuel projects that improve the sustainability of livelihoods are those based on business models that do not involve large-scale land acquisitions but involve collaborative agreements between companies, governments and communities. Companies which adopt business models such as contract farming and operate projects on a smaller scale are more viable and effective in alleviating poverty and improving rural livelihoods. MMI has adopted contract farming as part of its incubation model and it has proved to be beneficial in terms of improving livelihood outcomes (better income and food security), increasing access to livelihood assets (human, social, physical, financial, natural capital) for farmers.

Farmers have explained how their livelihood outcomes were improved. They have pointed out that the improved income they had received since joining MMI was beneficial to both their households and for their farming business enterprises. They are able to pay for children's education in full, purchase their own farming inputs (seeds and fertilizers) and able to purchase more mechanization (see also Kalas, 2009). MMI certainly provided business support to its farmers through those attributes and provided access to three of the five livelihood assets which included human, physical and natural capital. Mediation on the other hand, was concerned with linking farmers to various stakeholders in the farming community for a range of reasons including networking, fundraising and warding. The mediation side of MMI's incubation model influenced access to social and financial capital livelihood assets. Overall, access to livelihood assets had positive impact to livelihood outcomes as more income and food security were achieved.

The project still faces a number of challenges. MMI aims to incubate farmers to see them being successful self-sustaining commercial farmers. However, with 37 % of the participants leasing land and 45% of them farming on land less than 20 ha, a larger farm size is highly desired. A study conducted by Eastwood *et al* (2010) has demonstrated the importance of large farm sizes and their advantages as compared to small farms.

Farmers also pointed out the lack of production inputs. They explained how MMI is inconsistent in providing seeds and fertilizers. The lack of transport from both the farmers and MMI is another challenge which also affects farmers' access to markets. Farmers have also explained how natural disasters such as floods and drought affect their production output and how that in turn affects their income.

The challenges that are faced by MMI and its incubatees can be addressed through MMI improving its capacity to have a much more positive impact for farmers in rural and specifically in former homeland areas. MMI as a biofuel producing entity has demonstrated that its support services are an adequate mechanism for socio-economic transformation in these areas by improving the status of agriculture. MMI should therefore deal with the problems it already has of improving its provision of farming inputs and access to mechanization to its farmers. It should create markets for those who are producing food crops and who lack transportation and markets to sell their goods. MMI should train their farmers to produce vegetable crops and not only focus on fuel crops if they want to improve food production. MMI should also reduce the impact of shocks such as natural disaster which have a negative impact on production and livelihoods and invest in infrastructure that minimise their impact such as installing irrigation pipes to minimise the impact of drought. All these challenges are possible to address and MMI should make an effort to tackle such issues before expanding the project into other provinces.

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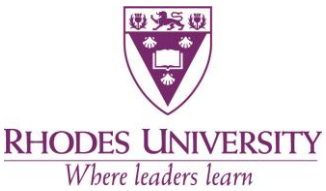
Appendices

Appendix 1: Letter of negotiating access to the field



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01 September 2014

TO WHOM IT MAY CONCERN

This letter serves to confirm that Mr Frans Mothupi, student number: 609M3201 is a student in our Department. As part of his Master's degree, Frans is required to conduct interviews for his research. The research process is a vital component of our teaching programme and we would appreciate any assistance that you could give to enable him to meet his commitments in this regard. Please note that the data collected will be used for research purposes only.

Many thanks.

Yours sincerely

Ms Babalwa Sishuta
Supervisor

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Appendix 2: Interview Schedule to MMI

Incubation

- How many incubatees does MMI have in the project so far?
- How many is MMI hoping to create in the future?
- The project currently runs in numerous district municipalities such as Makhuduthamaga and Tubatse, are there targets for further operations in other districts?
- How do you recruit farmers?

About MMI

- Who is MMI?
- What are some of MMI's aims?
- Have MMI's objectives changed ever since the inception of the project?
- What is the relationship between Tompi Seleka Agricultural Training School and MMI?
- Does the re-opening of Tompi Seleka correlate with the establishment of MMI project in 2006?
- What does Tompi Seleka train its farmers for?
- Are the farmers contracted to MMI during the incubation period?
- Why do you want to turn small scale farmers into commercial farmers?
- Do you set a specific production target for farmers?
- Why is 10ha the minimum requirement of land for an incubatee?

Biofuel Production

- What biofuels does MMI produce?
- Are there further prospects for production of other biofuels other than biodiesel, perhaps Bioethanol?
- From which crops are the biofuels processed from?
- Why sunflower and Soya bean? Are farmers familiar with those crops?
- Are sunflower plantations to other non-dryland areas restricted because those areas have irrigation?
- Do you meeting the 1 million litres biodiesel production targets as stipulated in your annual reports?

- How many litres of biodiesel are you producing annually?

Support

- How does MMI support the farmers? I have read in some of your newsletters that you provide them with farming inputs?
- Do the seeds they receive depend on the amount of land that they have?
- How do you support them with mechanization?
- What happens if one wants to borrow any of that machinery?
- How often does MMI visit incubatee's farms?
- How often do extension officers visit farmers on their farms?

Challenges

- What are some of the challenges MMI faces in terms of business support to the incubatees?
- Which challenge concerns MMI the most?
- How are you planning to overcome those challenges?

Outcomes

- How many incubatees are now self-sustaining commercial farmers without the continued support from MMI?
- How long have they been self-sustaining?

Appendix 3: Interview Schedule to farmers

Biographical Information

sex	
Age	
Beneficiary of land reform	
Level of education	
District	

Joining MMI

- How did you know abou MMI?
- When did you join MMI?
- Why did you decide to become an MMI incubatee?

Agricultural Production

- How long have you been involved in agriculture
- What crops did you cultivate then?
- What crops are you currently cultivating?
- What crops do you produce for MMI?
- Are you familiar with planting sunflower?Is it difficult to plant it?
- What is the size of your farm?
- What is the total amount of land used for biofuel crops?
- Does MMI set production targets for you?
- What was your turnover this past season?
- Was your turnover like this before you joined MMI?
- How many farmworkers are currently employed on your farm?

MMI Support services

- How did MMI support your farming enterprise?
- What happens if you have a problem with MMI? Do you come individually or as a group?

- How often do you come here? Do they call you or you as farmers organise the meeting?
- How often do they call you in a year?
- Are you satisfied with how MMI tried to solve those problems?
- How often do extention officers visit your farm?

Livelihoods

- Besides farming, are there other livelihood activities you engage in?
- How do you benefit from those livelihoods?
- Are there any other sources of income?
- Is the income you receive adequate to sustain your farming business?
- How beneficial is the income for household expenses and consumption?
- How many are you in the household?
- How do other members of the household contribute towards improving livelihoods?
- How has the income from farming benefitted the business further?
- Have anyone taken a loan to support your farming enterprise?
- Did you face any problems paying them back?

Challenges

- What are some of the challenges you have encountered as an MMI incubatee?
- How did those challenges affect your farming enterprise?
- Are you satisfied with how MMI is tackling those challenges?
- What do you think MMI should do to better address those challenges?

Perceptions

- How would you define a self sustaining farmer?
- Where do you see yourselves and your farming enterprise in five years time?
- How long do you think it will take you to achieve your goal?
- Are there any opportunities that arose from you joining MMI?