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**The Consequences of Emerging Cash
Crops on Small-Scale Rural Farmers'
Livelihoods:
A Case Study of the Energy Crop, *Jatropha Curcas* L,
In Kenya**



A thesis presented in partial fulfilment of the requirements for the Degree of Master of Philosophy in Development Studies at Massey University, Palmerston North, New Zealand.

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Abstract

This thesis investigates claims that growing of drought resistant cash crops such as *Jatropha Curcas L (Jatropha)* by small-scale rural farmers living in arid and semi-arid regions is an effective way to improve their livelihoods through increased income and improved food security. One school of thought supports this claim – often made by proponents of the bio-fuel industry - and another is sceptical about the claim. This research used the Sustainable Livelihoods Framework to evaluate the impact of growing *Jatropha* on the livelihoods of small-scale rural farmers in the Meru North district in Kenya. The findings revealed that, some elements of *Jatropha* farming as an agricultural strategy could be capable of improving rural livelihoods.

Interviews carried out with farmers showed that *Jatropha* growing has had positive and negative impacts on the farmers' livelihoods. Farmers - especially those who were also traders in *Jatropha* - noted significant positive impacts in their financial, physical, human, and natural capital domains as demonstrated in the asset pentagon. However, the impacts were far less positive for those farmers who only produced *Jatropha*. Positive impacts of *Jatropha* were also noted amongst the wider rural communities. Local people interviewed indicated that *Jatropha* growing has increased their access to job opportunities as farmers were now employing local people on a casual basis to help out on the *Jatropha* farms. The local people including farmers have also used the *Jatropha* plant as a soil protector in places where land is susceptible to soil erosion and mud slides in the region.

There were some fundamentals of rural livelihoods that did not experience any immediate impact as a result of *Jatropha* farming. For instance, food production has not been impacted upon negatively as expected. Food supply in the region has remained constant due to the modes of *Jatropha* production adopted by farmers that do not interfere with the production of food crops. Similarly, no evidence was found that *Jatropha* growing had impacted positively or negatively on communal or state-owned physical capital assets.

Negative impacts were however noted in the social capital domains of farmers, as many farmers who produced *Jatropha* but did not trade it themselves have lost trust in their neighbours who acted as their middlemen or traders. More so, this study concludes that the expansion of the *Jatropha* trade has increased inequality among farmers. Farmers who are

presumed to be the poorest in the region are not taking up the growing of Jatropha, therefore the benefits of growing Jatropha are only being tapped by the richer farmers. In addition this thesis concludes that growing of Jatropha has increased labour demand for family members and particularly women are bearing much of the heavy labour impact in households in rural areas.

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Abbreviations and Glossaries

ADB	Asian Development Bank
ADC	Agriculture Development Corporation
AGR	Asian Green Revolution
ASALs	Arid and Semi-Arid Lands
CARE	Canada America Relief Everywhere
CDM	Clean Development Mechanism
DFID	Department for International Development
ERC	Energy Regulatory Commission
FELISA	Farming for Energy Better Livelihoods in Southern Africa
GAF	Green Africa Foundation
GDP	Gross Domestic Product
GFC	Global Forest Coalition
IDS	Institute of Development Studies
IMF	International Monetary Fund
IRD	Integrated Rural Development
KEFRI	Kenya Forestry Research Institute
MOA	Ministry of Agriculture
MOE	Ministry of Energy
NGO	Non-governmental Organisation
SAPs	Structural Adjustment Programmes
SLA	Sustainable Livelihoods Approach
SLF	Sustainable Livelihoods Framework
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNFAO	United Nations Food and Agriculture Organisation
USA	United States of America
WB	World Bank

Chapter 1

Introduction to the study

1.1 Introduction

This thesis investigates the consequences of emerging new cash crops on small-scale rural Kenyan farmers' livelihoods. The study focuses on a newly introduced cash crop for bio-fuel production - known as *Jatropha Curcas L* (*Jatropha*) - and how it has impacted on small-scale rural farmers' livelihoods, the wider rural communities, and the local *Jatropha* traders of the Meru North district in Kenya.

This study seeks to examine the assertion made by various authors and non-governmental organisations that a shift by small-scale rural farmers' in arid or semi-arid regions, from the production of subsistence food crop farming to the cash crop farming of bio-energy crops, such as *Jatropha*, offers a better opportunity for them to reduce their poverty and improve their food security situation.

Small-scale farming in Kenya plays an important role in the country's food production and it is the sustenance of rural populations' livelihoods. However, due to the diminishing production of agricultural food produce, as a result of deteriorating soil fertility and drier climatic conditions, which has also been coupled with low prices for primary agriculture products, many small-scale farmers have been confined to living in poverty.

Nonetheless, the emergence of the bio-fuel industry and the global demand for bio-energy crops has been seen as a potential solution to the problems that small-scale farmers encounter in arid and semi-arid regions, such as the Eastern province of Kenya. Therefore, the introduction of energy crops, such as *Jatropha*, which are deemed resilient to harsh climatic conditions, offer a possible solution for these farmers, as argued by proponents of the bio-fuel industry.

However, these assertions made by various parties who support the idea of small-scale farmers

turning to the production of bio-energy crops, have not yet been clearly evidenced in practice as alleged in the literature. Therefore, this thesis seeks to explore and ascertain the claims made by many authors and organisations that bio-energy crops do indeed offer a better opportunity for small-scale rural farmers than traditional food crop in the pursuance of an improved livelihood. This thesis will, therefore, employ the use of the 'Sustainable Livelihoods Framework', which will be used as an instrument for the analysis of rural farmer's livelihoods. This framework has been developed by development experts in order to incorporate all the aspects that are presumed to be important in rural livelihoods.

This chapter is, divided into various sections. The first section gives an overview of the background to the issue of the "recommended" shift by small-scale farmers, from subsistence food crop farming to cash crop farming. This is then followed by the problem statement and the aims and significance of the study. The final sections summarise the methodology and the content of the remaining chapters of the thesis.

1.2 Background to the issue

It is widely known that the majority of developing countries' populations live in rural areas and they are largely dependent on small-scale farming as a means of sustaining their livelihoods. It is also acknowledged that small-scale farming plays an important role in the production and supply of agricultural food products, which are consumed in urban regions. However, claims have been made that in most developing countries where small-scale farming takes place, the soils have been overused and they have become less fertile; this is hindering the maximum production of agricultural produce by many farmers. On the other hand, the climate cannot offer any solutions, since the effects of prolonged droughts are being experienced in many countries, reportedly due to climate change. This phenomenon has, therefore, led many smallholder farmers to struggle with the problem of food insecurity and widespread severe poverty.

Authors, such as Govereh and Jayne (2003), have argued that this situation which affects small-scale rural farmers, can be overcome if they change their agricultural strategy. A change from subsistence food crop farming to cash crop farming is necessary, considering the existing climatic

conditions. These authors suggest that cash crops, some of which can be grown in drier regions or are resistant to harsh climatic conditions, can be used as a means of generating income for farmers and thus, this will enable them to buy the food crops they require, instead of attempting to produce all the food crops they need on their depleted and/or degraded land.

Furthermore, Scoones (1998) has also suggested that small-scale farming can be beneficial to smallholder farmers if they could diversify or intensify their farming techniques, which could be done through irrigation schemes, intercropping or mixed farming. However, this is not practical to small-scale farmers in all rural areas due to lack of proper infrastructure, technology and capital. Therefore, this situation has led other authors to argue that, since most regions where smallholder farmers carry out their farming practices are either characterised as semi-arid or arid, a better option for these farmers would be to grow cash crops that are resistant to harsh climatic conditions (Omamo, 1998). One of the crops favoured by many agricultural experts is an energy crop, such as *Jatropha*.

This crop has received a great deal of support from national and international organisations, due to a renewed interest in the development of the bio-fuel industry (which is expanding worldwide) and also because of the supposed ability of the crop to survive in harsh climatic conditions. In addition, *Jatropha* has been viewed as a crop that has several other advantages for farmers and society in general, apart from the crop being a source of income. It has been reported that on and off-farm job opportunities could also be created, as a result of planting energy crops in developing countries.

1.3 Problem statement

'Blanket' statements have been made regarding the benefits of the bio-fuel industry. Small-scale farmers and wider rural communities in developing countries, who have been entrenched in poverty and who are in constant threat of food insecurity, have been seen as the main beneficiaries of the bio-fuel industry if they decide to engage in the production of bio-energy crops. Analysts and proponents of the industry such as Urgate (2005) suggests that bio-energy crops have the capability of improving the livelihoods of rural people, due to worldwide high demand for the crop, as a result of renewed interest in bio-fuels being used as a substitute to

fossil fuels, whose supply is becoming more uncertain. A prominent author has echoed this development on bio-fuels and he stated:

World agriculture is at a turning point: economic growth, energy security, and climate change redefine the equation of agricultural supply and demand and contribute to accelerated food prices. Bio-fuels have been particularly high on the global agenda largely due to rising concerns about national energy security, high energy prices and global climate change, as well as the income expectations of farmers and other investors

(VonBraun, 2009, p. 1)

However, we have witnessed the rise of two opposing schools of thought regarding the sustainability of the bio-fuel industry. One group which is in favour of the bio-fuel industry and another one that is sceptical about bio-fuels (GOK & GTZ, 2008). Small-scale farmers in the rural areas of developing countries have been influenced by proponents of the bio-fuels and have turned to the production of energy crops and in particular *Jatropha* in order to raise their income and improve their livelihoods.

Nonetheless, despite the bio-fuel industry seemingly appearing to be a possible solution to rural poverty, due to the associated benefits that are tagged onto it, the majority of claims have not been substantiated or proven. Some authors are not convinced that the growing of bio-energy crops will lead to energy security and eliminate poverty in rural areas. They are sceptical, and believe the growing of bio-energy crops may lead to increased poverty and food insecurity in rural areas. Two sources which are sceptical about the industry state:

Establishing of bio-fuels will be a "pandoras box" the production cannot be environmentally, socially and economically be sustainable or efficient.

(Pesket, Slater, Stevens, & Dufey, 2007, p. 2)

If bio-fuels are not implemented carefully they will eventually exacerbate degradation of land, water bodies, and ecosystem and reduce food security.

(Sagar & Kartha, 2007, p.131)

Therefore, this thesis is conceptualised within the realms of wanting to discover whether, indeed, small-scale farmers, the wider rural communities and the entrepreneurs involved in the bio-fuel

industry, have achieved improved livelihoods or not, as claimed by the two opposing schools of thought.

1.4 Aim and significance of the thesis

The aim of this study is to understand how the growing of *Jatropha* in rural areas by small-scale farmers, influences the five assets of sustainable livelihoods, with the underlying intention of determining the impact of emerging new cash crops on rural livelihoods. The aim of this research study will be explored through the following specific objective:

*To investigate the consequences of emerging new cash crops (in particular *Jatropha Curcas* L: - an energy crop) on small-scale rural farmers' livelihoods in the Meru North district, Kenya.*

1.4.1 Research questions

The aim of this study, as identified above, will be achieved by exploring the following research questions, as derived from the research objective.

- 1. What is the impact of *Jatropha* growing on the five assets of sustainable livelihoods and food production of small-scale rural farmers in Kenya?*
- 2. What are the consequences of *Jatropha* growing on the wider rural communities in Kenya?*
- 3. What is the impact of *Jatropha* growing on marketing parties such as commercial investors and/or entrepreneurs in the *Jatropha* value chain?*

1.5 Methodology overview

This research is a case study, which will be analysed within the context of a sustainable livelihoods framework. The purpose of employing the sustainable livelihoods framework in this research is to attempt to understand how the growing of *Jatropha* as an emerging new cash crop has influenced and/or impacted on the five assets of sustainable livelihoods: *financial capital; human capital; natural capital; physical capital; and social capital* of small-scale rural farmers', in the Meru North district of Kenya. This will also lead to an understanding of how *Jatropha* has impacted on the general and wider rural community, in addition to marketing parties, such as the local entrepreneurs/investors within the district.

In order to understand the complexities of the growing of *Jatropha* and the bio-fuel industry within the rural area of Meru North district, firstly an in-depth literature review will be conducted in the form of desk research, through sourcing and researching literature published by academics, the Government of Kenya, non-governmental organisations, civil society groups and individual interest groups. Secondly, this will be followed by a field survey in the selected case study villages where information will be gathered through household interviews with local small-scale farmers who grow *Jatropha* as a cash crop. Non-participant observation will be used to complement the structured household interviews, in order to verify information gathered from the farmers in regards to their livelihoods. Thirdly, semi-structured interviews will be conducted with government officials and non-governmental organisations and other interest groups within the bio-fuel industry. The full methodological approach of this study will be explained further in Chapter 4.

1.6 Overview of the thesis

Chapter 1 has introduced the thesis topic and explained its significance. Chapter 2 of this thesis highlights various aspects of agriculture and development in Kenya. The chapter is divided into two main sections; section one examines how rural agricultural has existed and evolved in Kenya since the colonial period and up to the present time. Emphasis is placed on how subsistence small-scale food crop farming has been transformed into cash crop farming. Issues regarding this rapid shift from traditional small-scale food crop farming, to subsistence non-food cash crop farming, are

discussed. The second section of this chapter examines the issues of bio-fuels. A bio-energy crop jatropha has been taken up by small-scale farmers as a potential cash crop to improve their livelihoods. The opportunities and challenges which bio-fuels present to small-scale farmers are examined and assessed.

Chapter 3 synthesises the literature surrounding the Sustainable Livelihoods Approach, which forms the theoretical framework of this thesis. It begins by providing a short recapitulation on how poverty has been defined and fought, since the 1950s. The economic development and the basic needs approaches of the 1950s and 1970s are discussed as approaches to poverty reduction during these periods. The minimal impacts of these approaches on world poverty are analysed. The chapter further discusses the economic difficulties experienced by developing countries after the establishment of the Structural Adjustment Programmes in the 1980s and the rethinking of new strategies for eliminating poverty in developing countries after the problematic effects of SAPs. The origin of the new approach to poverty alleviation, under the umbrella of the Sustainable Livelihoods Approach is examined. Debates and events leading to its foundation in the late 1980s are explored. The strengths and weaknesses levelled against this new approach to poverty alleviation are also examined.

Chapter 4 outlines the methodological approach used for gathering information from the field. Issues discussed include the ethics process (as required when dealing with human subjects); research sites and their characteristics and boundaries; research participants; data collection methods, such as household interviews; semi structured interviews; and non-participant observation.

Chapter 5 presents the findings of the field study (which was undertaken in the Meru North district) on the impact of Jatropha farming on small-scale farmers' livelihoods. This chapter is framed on the basis of the 'sustainable livelihoods framework pentagon' and issues regarding financial capital, physical capital; social capital; natural capital; and human capital are analysed and presented, as the results of the field study. This chapter also presents findings regarding the impact of Jatropha growing on small-scale farmers' food production in the district.

Chapter 6 is a further continuation of the fieldwork findings. This chapter presents findings regarding the impact of Jatropha growing on the wider rural communities, which surround the Jatropha growing region of the Meru North district. It further presents information gathered on the impact of Jatropha on commercial investors and entrepreneurs within the district.

Chapter 7 forms the discussion and conclusion of this thesis. In this chapter, insights gained from the fieldwork are discussed, through a reflection on the wider literature examined in the second and third chapters of this thesis. Key research questions, which formed the core of this study, are also reflected upon and answered. The chapter concludes by providing possible areas for further research.

Chapter 2

Agriculture and Development in Kenya

2.1 Introduction

The Kenyan economy is heavily depended on agriculture: this sector contributes up to 26% of the country's Gross Domestic Product (GDP) and it employs approximately 40% of the country's population in farm and off-farm jobs (Ngigi, 2005, p. 2). From the 80% of Kenya's population who live in rural areas, the majority derive their livelihoods from small-scale farming-related activities (Kimenyi, 2002, p. 6). Agriculture is seen as one of the central sectors that can contribute to economic growth in Kenya. This has clearly been spelt out in the country's development blueprint, 'Vision 2030', where the transformation of agricultural practices has been viewed as being significant to the country's development agenda. Closely related to agriculture, the Vision 2030 research team has also acknowledged the upcoming bio-fuel industry as a sector with the potential to significantly contribute to the country's economic development (GOK, 2007).

Kenya's agricultural sector is comprised of two main types of practices: declining large scale farming and rising small-scale farming. There are over five million households participating in small-scale farming in Kenya and they are engaged in various farming activities. Some are engaged in cash crop growing (which includes coffee, tea, pyrethrum and cotton) but the majority of small-scale farmers dedicate their land to traditional food crop farming, which include crops such as maize, beans, potatoes and cassava (Ngugi, 2009).

Nearly all the Kenyan landmass is categorised as arid and semi-arid lands (ASALs) and since up to 80% of the land is not arable, only 13% of the total landmass is categorised as being "high potential" areas for agriculture, with an average rainfall of more than 850mm a year. In addition 7% of the land is categorised as "potential" areas for agriculture, with rainfall averages of 735mm a year (Nyangito, Nzuma, Ommeh, & Mbithi, 2004, p. 13). Many small-scale farmers meanwhile grow food crops in marginal soils. Many farmers are now being encouraged (by NGOs and the government) to invest in cash crops which include cotton, sisal and oilseeds such as *Jatropha*, such crops that are

resistant to harsh climatic conditions are perceived as being capable of increasing their income returns, rather than encouraging them to concentrate on food crops that only produce meagre returns.

The recent rise of interest in the bio-fuel industry worldwide has therefore presented an alternative for smallholder farmers in the marginal areas of sub-Saharan Africa. These farmers are being encouraged to engage in the production of energy crops that are presumed to grow well in the harsh climatic conditions of the continent and to sell their crops to the bio-fuel industry. However, there have been questions raised as to whether the growing of energy crops, by small-scale farmers is indeed beneficial to these rural farmers as the promoters of the bio-energy crops assert.

Therefore, in this chapter, the existing literature on farming practices in Kenya, which includes large-scale and small-scale farming, is discussed. The principal focus in this topic however will be on small-scale farmers and the shift of these smallholder farmers from growing traditional food crops, to the cultivation of cash crops. An analysis of the bio-fuel industry will be evaluated and an example of an emerging energy cash crop (*Jatropha*) will be used, in order to assess the impact of this cash crop on rural small-scale farmers in Kenya using the available literature.

2.2 Agricultural practices in Kenya

Kenya's agricultural system is comprised of two main types: large-scale farming, which entails large tracts of land averaging generally between twenty to a thousand acres and small-scale farming, which is mainly carried out on land averaging between one and five acres. Whilst large-scale farming is carried out for commercial purposes only, small-scale farming is largely undertaken for both subsistence and commercial purposes, for the benefit of the rural population.

2.2.1 Large scale commercial farming in Kenya

Large-scale commercial farming in Kenya was first introduced by European settlers and it was mainly undertaken in the highly productive areas of the Kenyan Highlands (Morgan, 1963). These Highlands favoured European settlement and agriculture, due to the moderate temperatures that ranged between 15 to 24 degrees Celsius, low disease risks and rainfall patterns that were well distributed all year round (Bebe, Udo, & Thorpe, 2002). Commercial farming in the Kenyan Highlands included the keeping of dairy animals that flourished in the cool environment and the growing of tea, coffee, wheat and pyrethrum as cash crops, in the highly productive and fertile volcanic soils (Haugerud, 1989).

This form of agriculture was extensive and it involved large tracts of land owned or leased by the settler farmers. It was also highly mechanised with the use of modern technology and waged labour provided by Africans living within the Highlands. The crops produced were entirely intended for commercial purposes or export (Teoman & Kaymak, 2008). The European settlers cleared most of the tropical forests in the Highlands, in order to expand their animal and crop production. This, in turn, was accompanied by the alienation of large tracts of African people's land, especially in the Mount Kenya and Elgon regions. Many people were left landless and this led to overcrowding in certain areas and the eventual disruption of their agricultural practices. This was later followed by a prohibition on the production of export cash crops such as coffee, tea and pyrethrum by Africans (Angelique 1989).

Large-scale commercial farming is still being practiced in Kenya at the present time, long after the departure of many of the European settlers. Agricultural reforms in the 1950s and 1960s, permitted African farmers to grow cash crops, such as coffee, tea and pyrethrum (Conelly & Chaiken, 2000) and these crops have since been produced widely for export.

2.2.2 Small-scale subsistence farming in Kenya

Smallholder farming, in most developing countries, dominates the agricultural sector. This practice has been viewed as being very significant to the production of food and, employment and the

reduction of poverty in rural areas. In support of smallholder farming activities, the success of the Asian Green Revolution (AGR) has demonstrated the significance of small-scale farming, where growth in production has transformed rural economies and considerably helped many rural peasants farmers out of poverty (Hazell, 2003).

Small-scale farming in Kenya has been in existence since the pre-colonial period and a great deal of this farming is carried out on small plots with labour being provided by family members (Wiggins, 2000). Smallholder farmers are mainly found in the Kenyan Highlands region, these areas were initially occupied by European settlers. Kenya's independence in 1963 saw the majority of European settlers leave the country and the large tracts of land they had owned in the Highlands sub-divided and sold to small-scale farmers. These were majority households living within the Highlands region. This resulted in a quick expansion of smallholder farmers' groups, which now dominate the entire region (Bebe et al., 2002).

Most crop production on small-scale farms in Kenya is carried out manually and the land is sub-divided into various portions, which are used to grow different types of crops. An example of a typical smallholder farm is as follows: the farming household devotes 10-25% of their land to cash crops such as coffee, tea, pyrethrum or cotton (Conelly & Chaiken, 2000) and the remaining portion to food crops such as maize, beans, cassava and potatoes (Haugerud, 1989). Small farming households also integrate crop farming with dairy animal rearing in order to maximise their farm output from such a small piece of land (Bebe et al., 2002).

2.3 A shift from subsistence food crop farming to cash crop farming

It has been established that the majority of small-scale rural farming households, who dominate the agricultural sector in Kenya, devotes between 75- 90% of their land holdings to food crop production (Omamo, 1998). Despite this fact, it is evident that farming, as a means to improve rural livelihoods has not had any significant impact on the lives of these rural people and indeed, agriculture appears to have failed to improve the rural livelihoods of many small-scale farmers in Kenya and other developing countries (Wiggins, 2000). Problems, ranging from food insecurity to,

lack of income and unemployment, have all been attributed to small-scale farm holders dedicating most of their land to the production of indigenous food crops, such as cereals and root tubers, which are allegedly associated with low returns for the farmers (C. Gladwin, Thomson, Peterson, & Anderson, 2001).

Literature shows one dominant line of thinking from many authors that promotes cash crops, whilst others, are sceptical. Authors, such as Kherallah, Delgado, Gabre-Madhin, Minot, & Johnson (2002), have suggested that raising the livelihood levels of over 70% of the sub-Saharan African population, who live in rural areas, requires a strengthened agricultural system that can create economic opportunities within rural areas. In order to achieve this goal, rural subsistence farming diversification is required - from the pursuit of low yielding traditional food crops (mainly cereals) to high valued cash crops production (Jayne, 1994) . Cash crop farming has been commended as a means through which rural farmers can lift themselves out of poverty. This is because cash crops have been viewed as having the potential to generate income and thus enable farmers to overcome the constant lack of income needed to accumulate capital for investment in inputs, in order to increase output on their farms (Govere & Jayne, 2003).

As mentioned earlier, the problem derailing subsistence farming is the lack of investment or ventures into cash crops, which could enhance market opportunities that could then contribute to income stability and eventually national development (Wiggins, 2000). Overcoming the challenges of raising rural farmers' income in sub-Saharan Africa, as suggested by Govere and Jayne (2003), requires a major transformation from low productive traditional food crop farming, which is being practiced in most parts of sub-Saharan Africa, to the promotion of non-food cash crops that can result in higher returns to the farmers. Jayne (1994) has argued that, in order for sub-Saharan rural farmers to achieve food security, a strategy based on small-scale farmers changing their system from food crops to high valued cash crops is required. He suggests that many of the sub-Saharan African countries are semi-arid and arid and they are not suitable for food crops. Therefore, cash crops, such as cotton, sunflower and groundnuts can provide higher returns to these farmers - far more than the traditional food crops.

Omamo (1998) enunciated that the majority of subsistence farmers, living in semi-arid and arid

areas of sub-Saharan Africa, devoted most of their land to low yielding food crops. He believed this was ironic, considering that the same farmers could earn more by planting drought tolerant oilseeds, compared to the food crops they were growing such as maize and sorghum. Poor production of foods has caused most subsistence farmers in sub-Saharan Africa to become net purchasers of food grains, despite them devoting most of their land to food crops (Jayne, 1994).

It has been suggested that small-scale farming could make a substantial contribution to poverty reduction and hunger in many sub-Saharan countries (Govere & Jayne, 2003), but the current form of agriculture being practiced is not sufficient enough to make a positive impact on poverty and food insecurity vulnerability. Therefore the introduction of cash crop farming will help farmers focus more on income security and this constant income will lead to them achieving food security (Masanjala, 2006). To such an extent this is because the problem of food insecurity has been attributed to a lack of income and poverty - and not to a lack of sufficient production of food (C. Gladwin et al., 2001). Furthermore, initial programmes in sub-Saharan countries aimed at increasing production by subsistence farmers, in order to solve food insecurity issues in the continent, have often been ineffective.

A shift from growing traditional food crops by small-scale farmers, to the production of non-food cash crops has been viewed as a strategy which will assist rural areas to develop and thereby reduce existing cases of extreme poverty. There are a number of ways in which cash crop production can contribute to rural poverty alleviation according to comparative advantage economists (Masanjala, 2006). The literature by this economists argues that markets enable small-holder farmers to increase their income, through the production of cash crops, which have been deemed to produce the highest returns for the land (Govere & Jayne, 2003). This cash can then be used to buy household food items rather than the farmers striving to produce all the food items required for their household's consumption.

Due to this assumption stated by the comparative advantage economists, many countries throughout sub-Saharan Africa have since ventured into cash crop production, as a means of alleviating rural poverty and livelihoods sustenance (Masanjala, 2006). Kenya, in particular, began cash crop production by small-holder farmers in 1963 (after independence) and subsequent

reforms in the agricultural sector (as a result of the Swynnerton Plan in 1954) allowed Africans to grow cash crops, which had previously been prohibited by the European settlers (Conelly & Chaiken, 2000; Deininger & Binswanger, 1993; Haugerud, 1989).

Cash crop growing has been highly praised for its pro-poor rural growth potential to alleviate poverty and it has been linked to several contributions to rural communities. Govereh and Jayne, (2003) split these benefits into two broad categories that they called, “cash cropping and effects on household food crops” and “regional spill over effects”. These are considered in turn below.

2.3.1 Cash cropping and effects on household food crops

The growing of cash crops by small-scale farmers was deemed vital by Govereh & Jayne T, (2003) and they suggested that, under circumstances where smallholder farmers had no access to farm inputs, engaging in cash crop growing schemes might provide the necessary farm inputs which could then be used in food crop production. They give examples of Mozambique and Kenya, where they state that farmers in Mozambique, who participated in cotton growing, were able to access farm inputs from the cotton growers’ schemes, which they used not only for cotton production but also for other food crop production. In the central Highlands of Kenya, small-scale farmers, who took up coffee production, were able to obtain farm inputs through their co-operatives to use for other food crops. The coffee co-operative gives maximum support to all its members, not only for the production of coffee but also for other non-cash crops, such as maize, beans and, sorghum.

Cash crop growing has also been viewed as a means of enabling farmers to overcome the problem of insufficient cash income (Masanjala, 2006). Through the growing of cash crops, farmers are able to raise capital to buy assets and inputs, which can improve the production of food crops, in addition to cash crops. These cash crops can also benefit the wider society by providing job opportunities for the members of the community, due to its nature of intensive labour requirements. Furthermore, cash crop growing can attract improved technology on small farms that will maximise production of both food crops and cash crops (Singh, 2002).

2.3.2 Regional spill-over effects

Govere and Jayne (2003) also wrote about the regional spill over effects in the production of cash crops. They suggest that engaging in cash crop schemes attracts investment in rural regions, which in turn provides vast and positive spill-over effects to the communities in that region. They use the example of Mali, where the introduction of cotton raised the demand for fertiliser and this led to manufacturing companies and distributors of fertilisers setting up businesses in the region. This made the availability of fertiliser and other agricultural inputs accessible to all farmers, whether they were participating in cotton production or food crop production. Infrastructural development has also been associated with cash crop farming and, transport networks have been developed in regions that were initially inaccessible.

2.3.3 Cash crop critiques

However, the promotion of cash crops as a means to achieve rural development and poverty alleviation in Africa has often been impeded by perceptions that these crops will compete with food production and therefore exacerbate food insecurity in rural areas. Authors, such as Omamo, (1998), are sceptical about this whole idea of small-scale farmers turning to cash crop production. He suggests that cash crop production may not be more economically viable, despite the higher returns to farmers, than food crops. He argues that in rural areas where there is high food marketing costs, cash crop growing cannot solve the problem of food insecurity.

Two examples from South Sudan and Kenya prove this point. In the Blue Nile province of South Sudan, during the 1970s, many farmers turned their farms into cotton production and this had a profoundly negative impact on food crop production, especially sorghum where the price rose more than 500%. Also, in Kenya the shift from growing food crops to cash crops in the Pekerra irrigation scheme area in the Molo district, resulted in the price of the two staple grains (maize and finger millet) rising by 300% to 380%, respectively, between 1972 and 1981 (Singh, 2002).

Therefore, for the proponents of cash crops to make sweeping claims that cash crop farming is the answer to rural poverty, without considering the other myriad of problems which affect the sector,

is misleading. Smallholder farmers face other constraints that have not yet been mentioned. Firstly agriculture in most developing countries depends entirely on the climate of the region and (since most farmers cannot afford to irrigate their land), the crops are rain fed. Any changes in the rainy season may have adverse effects on the crops. The physical infrastructure in many developing countries, for example Kenya, is in a deplorable condition and this hampers the transportation of agricultural produce by farmers to markets. Due to difficulties in accessing markets from rural areas, many farmers tend to avoid participating in the wider economy and they end up 'losing' their produce - very cheaply - to middlemen. The problem of the exclusion of rural farmers in the participation of agricultural policy formulation further marginalises these rural farmers. For example, Kenya's rural agricultural activities are to a large extent carried out by women, since they undertake the bulk of the work on the farms but, despite their involvement in the sector, their views are hardly taken into consideration (Kimenyi, 2002).

The inequality that exists within developing countries also affects small-scale farming, for example, access to important resources for agriculture such as land. Access to land is still not possible for the very poor, as the rural population increases steadily and substantially, this places more pressure on land.

Furthermore, it has been suggested that the Kenyan policy framework is not effective enough in addressing such inequalities:

There is evidence that Kenya's national and social policies are biased and this is directly contributing to rural poverty by excluding the rural poor from the benefits of development. In essence, the taxation policies are not pro-poor. Taxation and policy biases against agriculture include: concentration of public investments in areas of infrastructure and provision of safety nets in towns; direct taxation of agricultural exports and local authority tax; subsidies and tax waivers for capital intensive technologies such as computers and mobile phones instead of reducing costs of agricultural inputs; development of infrastructure (roads, water, power) in urban areas rather than in rural areas where the infrastructure is needed most; skewed development of social infrastructure in favour of urban areas; weak institution to

support agriculture; and market access and transport costs that are biased against rural development.

(Kimenyi, 2002, p. 17).

2.3.4 Summary

Agriculture (and in particular small-scale farming) plays an important potential role in rural poverty alleviation and thus many developing countries have, for many years relied on agriculture as an important sector which could contribute to their economic growth. However, despite the importance of this sector small-scale farmers in many countries, who are the primary drivers of the agricultural sector, still lag behind and live in extreme poverty. This situation has been attributed to the majority of the farmers dedicating too much of their land to low yielding traditional food crops, which have been perceived as offering a low rate of return to the farmers. Therefore, small-scale farmers are now being advised to change their practices, from the production of food crops to the production of cash crops, which are deemed to offer high returns to farmers, as asserted by the proponents of cash crops. Cash crop production may appear to be a possible solution for small-scale farmers to increase their income.

However, the production of traditional food crops may not be the only problem that is entrenching smallholder farmers in poverty. Without consideration of all the problems surrounding small-scale farming in the agricultural sector in developing countries, the shift from growing traditional food crops to the growing of cash crops is not going to be a panacea for rural poverty alleviation. Smallholder farmers will require support from many sectors, for example, the government, non-governmental organisations and the private sector, in order to realise their goal of improving their livelihoods through small-scale farming.

2.4 The New Energy Paradigm (Bio-fuels)

Bio-fuels are liquid organic fuels extracted from renewable biomass, which can be used to generate energy through combustion (Pesket et al., 2007; UN, 2007). The two forms of bio-fuels commonly used are bio-ethanol and bio-diesel. Bio-ethanol is extracted from crops such as sugarcane, corn, wheat, sorghum and beet, whilst bio-diesel is extracted from crops, such as rapeseed, soy, sunflower, palm, *Jatropha* and coconut (Muchiri, 2008). The bio-fuel industry worldwide is gaining a vast amount of support from both the developed and developing countries. This has been caused by recent increases in oil (fossil fuels) prices around the world (Naylor et al., 2007; Tomatsu & Swallow, 2007). This situation has resulted in a rapid demand for oil, depletion of oil supplies and political turmoil and instability in the major oil producing countries of the Middle East (Hazell & Pachauri, 2006). This phenomenon has led to many developing and developed countries, who are net importers of fossil fuel, investing more in alternative forms of fuel (bio-fuels). Whilst there are many advocates of bio-fuels, literature shows that there are also sceptics, who contest the huge advantages put forward by the proponents of the bio-fuel industry.

Bio-fuels were given special attention after world representatives at the United Nations climate change conference 2007 in Bali acknowledged the need to reduce carbon dioxide emissions into the atmosphere before the Kyoto protocol ends in 2012 (Ruth, 2008). Having pledged to reduce green house gas emissions and perceiving a need to combat high oil prices, many countries (developed and developing) have resorted to developing alternative and renewable sources of energy, which have been regarded as having the potential to solve the supposed twin problems of climate change and energy insecurity (Pesket et al., 2007). The debate on bio-fuels is currently being driven by the need to achieve energy security and to mitigate the environmental destruction that is being witnessed today, through the combustion of fossil fuels.

Bio-fuels have, therefore, in this period of natural resource depletion, presented a new insight for both developing and developed countries, in relation to energy security, environmental protection and poverty alleviation (Mulugetta, 2009). Furthermore, the use of bio-fuels has been regarded as resulting in decrease in the dependence of oil importing countries on fossil fuels, which are constantly rising in prices. Rising oil prices has lead to many countries spending more money on the

importation of fuels, to the detriment of the provision of public services to their populations. Bio-fuels produced from indigenous energy resources can therefore relieve pressure on the governments of oil importing nations, or they can help them to resist the high prices that usually have an adverse impact on the poorest people in their populations.

Sub-Saharan African countries are generally the ones that bear much of the brunt of high oil prices. According to a recent report by the African Development Bank (ADB), in 2006, it was confirmed that sub-Saharan countries rely heavily on imported oil: up to 39% of the total energy consumed in these countries is imported. This report has confirmed the over-reliance of these countries on imported fuels (Mulugetta, 2009). Therefore, investing in alternative fuels, which can offer relief to these countries from high imports of fossil fuels, is a great leap forward for them to save vast amounts of foreign exchange. Kenya, for example, in the period between 2003 and 2005, saw the country pay an extra 1320 million US dollars, as a result of sharp increase in oil prices (GOK & GTZ, 2008).

The bio-fuel venture began as a small-scale operation, but the need to minimise over-reliance on fossil fuel, which is unpredictable due to depletion and price oscillations, has made this once small venture develop into a large scheme. It is clear now that the topic of bio-fuels has taken centre stage in many countries' policy frameworks, which are aimed towards achieving the agenda of the 1992 United Nations conference on Environment and Development: - the need for sustainable development, which takes into consideration the three spheres of economic, social and environmental dimensions (Muchiri, 2008). This has led to the bio-fuel venture shaping policy domains within countries and multi-lateral organisations, for example, the Clean Development Mechanism (CDM), which emerged from the Kyoto conference and which is promoting investments in renewable energy. Countries in the developing world, which are interested in bio-energy, can obtain assistance from the CDM, in order to develop this technology (Tomatsu & Swallow, 2007). Bio-energy has been seen as one way of mitigating the green house gas effect and promoting rural development in rural areas of Third World countries (Sagar & Kartha, 2007; Ugarte, 2005, p. 1).

Bio-energy, derived from sustainable agricultural practices, can be seen as an opportunity for Third World countries to use their resources, in order to achieve sustainable development. The bio-fuel

industry appears to be offering a possible solution to overcoming the energy and poverty problems which affect developing countries. However, these promises are linked with challenges (Jumbe, Msiska, & Mhango, 2007). Sceptics of the industry argue that bio-fuels will undermine food production and supply for the poor, but promoters of the industry believe that if the industry is managed well it can be profitable and it can be used to stimulate rural development in poor countries (Sagar & Kartha, 2007).

These promoters believe that the bio-fuels industry can create demand for energy crops (which are produced by rural farmers) and thereby this will lead to increased incomes for the farmers (Ugarte, 2005). Furthermore, provision of energy to the poor is a means through which the poor can be incorporated into the capitalist economy, which can assist them in fighting poverty and, hunger, whilst at the same time assisting them to achieving sustainable development (UN, 2007).

However, the industry sceptics argues that, since the currently used bio-fuels are first generation fuels, they are based on food crops such as corn, sugarcane, potatoes, soybeans, with minimal use of non-food crops such as rapeseed and *Jatropha* (Ruth, 2008). The reliance of bio-fuels on food crops will raise food insecurity concerns. Despite the industry looking promising, issues relating to food supply, environmental protection and the improvement of rural livelihoods have been questioned. Sceptics of bio-fuels have argued that the expansion of the bio-fuel industry will eventually lead to food shortages, as a result of increased prices and low production by farmers, due to conversion of food crop land to energy crops (Naylor et al., 2007; Pesket et al., 2007).

Recent statistics have shown that the world's population is increasing at a rate of 75 million people per year and this growth is occurring mainly in developing countries. Thus rural areas diverting food crops and agricultural land to bio-fuels would cause acute food shortages, without achieving energy security (Gomiero, Paoletti, & Pimentel, 2009). Jacques Diouf of the 'United Nations Food and Agriculture Organisation (UNFAO)' recently stated that crops, which have traditionally been used for food and which are now being turned into bio-fuel, have already caused food shortages for the poorest people in the world (Pimentel et al., 2009)

This was evident when food shortages and sharp price increases were felt in Mexico in 2007, as corn prices from the United States of America (USA) rose to unprecedented heights, leading to protests and unrest in Mexico. This led to the United Nations Food and Agricultural Organization (UNFAO) expressing concerns about the rising food prices, as a result of the expansion and use of food crops for bio-fuels. This has been viewed as a potential trigger for social unrest in developing countries because they are generally the most affected group during any food crisis (FAO, 2007). Furthermore, authors, such as Hill, Nelson, Tilman, Polasky, & Tiffany (2006), have argued that it is not possible for bio-fuel production to meaningfully replace the entire current world consumption of fossil fuels, without it impacting negatively on food supplies.

On the contrary, promoters of bio-fuels have argued that the major cause of price increases in food products is not low production (as asserted by many) or the diversion of food crops to bio-fuel. They have associated food insecurity problems with increases in oil prices, which they claim can only be overcome if countries invest in bio-fuels, in order to obtain a sustainable supply of fuel (Ruth, 2008). Other promoters of the industry also believe that the bio-fuel industry could benefit from surplus food supplies in the world and it would provide solutions to the problems of poverty. One such proponent is the former Brazilian president, Lula da Silva, who believes that bio-fuel could enable poor countries in Africa, Latin America and Asia to become wealthier by producing feedstock and exporting it. He states that this could lead to energy security and increased income for the already struggling farmers of the Third World (Boddiger, 2007)

Sub-Saharan African countries have not been left behind in the recent rush for bio-fuels. With over 39 countries being net importers of oil, an increase in oil prices would mean that these countries (which are home to many of the poorest people in the world) will be negatively affected (Mulugetta, 2009, p. 2). In the case of Kenya, being one of the countries in sub-Sahara with no proven petroleum resources, bio-fuel technology could not have come at a more propitious time, when the country is struggling with high oil prices and a deteriorating economy (Tomatsu & Swallow, 2007).

Oil prices between 2003 and 2006, in Kenya's domestic market, rose by 32% and the effects were felt most strongly by households that earn low income and, who apportion a great deal of their

small income to fuel. This increased the burden of the already struggling poor people and, therefore the emergence of bio-fuel technology, to combat high fuel prices and improve rural people's livelihoods, was genuinely welcomed by most Kenyan farmers. To an extent, this is so because "fuel is central to rural livelihoods, sustainable development and poverty reduction" (UN, 2007, p. 1) and however small an increase in price, it usually has a profound impact on the social and financial implications for rural people.

2.5 Jatropha farming in Kenya for biofuels

Jatropha, as a commercial cash crop, was introduced in Kenya in 2005, by private entrepreneurs, non-governmental organisations and development agencies. It is a small tree growing to up to five metres tall (Tomatsu & Swallow, 2007). It is widely grown in semi-arid and arid regions in Kenya, mainly in the central, western, eastern provinces and coastal parts. Prior to the bio-fuel boom taking centre stage, Jatropha in Kenya was planted by local people as a hedge for a 'live' fence and boundary demarcations, but since the crop has been viewed as a potential candidate for bio-fuel, it is now being produced mainly for commercial purposes by small-scale farmers in the regions named above.

Small-scale farmers in Kenya and (particularly in the Eastern province) produce Jatropha through mixed cropping, and intercropping with other crops, such as beans, peas, etc. Since 2005, Jatropha has been produced mainly for sale as a bio-fuel. Kenya's climate is deemed appropriate for Jatropha production because it is mainly semi-arid and arid and Jatropha is known to grow well under such harsh climatic conditions (Grass, 2009; Sagar & Kartha, 2007). Authors, such as Hazell and Pachauri (2006), have argued that countries that have tropical climate hold a comparative advantage in the production of energy crops, - and Kenya's tropical climate conditions, Jatropha growing offers a promising opportunity for small scale farmers to increase their income.

2.6 The Jatropha value chain

The production of Jatropha in rural areas has been seen as a potential spark for rural development. However, the processing of Jatropha into bio-diesel (which adds value to it) is entirely being carried

out by international companies. A number of European companies are operating in East Africa, processing *Jatropha* into bio-diesel. Farmers only produce the raw material which is the *Jatropha* seeds, whilst the remainder of the process is carried out by commercial investors (Tomatsu & Swallow, 2007). Messemaker (2008) clearly illustrates this situation in his value chain structure that he conducted in Tanzania. This type of scenario offers limited opportunities for small scale-farmers producing *Jatropha*, since without small scale processing operations being carried out locally most of the benefits will be lost to commercial investors.

FELISA (Farming for Energy for better Livelihoods in Southern Africa) a Tanzanian/Belgium Company, for example, targets over 50% of its feedstock to come from out-grower farmers, who in exchange receive financial and technical assistance from the company. 'Diligent Tanzania' - (a Dutch bio-diesel company), on the other hand, depends completely on small-scale farmers who produce and supply them with *Jatropha* seeds on contract basis (Vermeulen, Sulle, & Fauveaud, 2009).

Similar to any other cash crop, *Jatropha* has been associated with numerous prospects to contribute to the improved livelihoods of small-scale farmers, rural communities and to conserve the environment (Muchiri, 2008). *Jatropha* has been seen as a crop that can offer an alternative for small-scale farmers, who set aside a great deal of their unproductive land for traditional food crops. This is because *Jatropha* can be grown on marginal soils, it is drought/pest resistant and it provides high yields in harsh climatic conditions (Grass, 2009). This, in turn will offer new streams of income for farmers, from the sale of these energy crops.

In addition, *Jatropha* production in rural areas has also been seen as having the potential to provide job opportunities in rural areas (GOK & GTZ, 2008). This would be quite beneficial to Kenyan rural communities, who account for over 80% of the total population in Kenya. Job opportunities in rural areas would play a major role in poverty alleviation, considering that these areas are semi-arid and arid, with high poverty levels and low agricultural productivity (Tomatsu & Swallow, 2007). It is estimated that the growing of *Jatropha* would create new farm jobs in Kenya considering that *Jatropha* growing is labour intensive, if the processing is undertaken manually within the rural areas.

However, despite the opportunities that *Jatropha* production may bring to a rural area, sceptics of the industry have argued that these are just lofty claims that cannot be attained. Looking back through history to the introduction of cash crops to small-scale farmers, it can be seen that there has not been any positive impact on rural livelihoods and, in many ways *Jatropha* is no exception to the other cash crops, such as coffee, tea, pyrethrum and cotton (Pesket et al., 2007). Cash crops have been known to compete with food crops for land and, because of the sweeping claims made by the promoters of *Jatropha*, the majority of farmers are converting their land into the production of this crop. This may be detrimental to small-scale farmers, who are already the most food insecure group in Kenya, as a result of existing poverty and low production on their farms (Mills, Undated). Recent price increases in Kenya for staple foods such as maize have been linked to the increased interest in bio-fuels and the conversion of food crop land to energy crop producing farms (Muchiri, 2008).

An increase in the demand for bio-fuels has already been projected, as the world's thirst for bio-fuels increases and demand has already surpassed supply for major producers of bio-fuels, such as Brazil and Malaysia, therefore there is a call for an expansion in production (GFC, 2006). This circumstance could eventually cause food shortages in rural areas and the continual expansion of land (for the growing of *Jatropha*) could lead to the clearance of forests, which may cause soil erosion and further marginalisation of land (Pesket et al., 2007). Other potential problems include the possible alienation of small-scale peasant farmers' land and the eviction of indigenous communities. Women, who are dependent on the natural forest for their daily livelihoods in rural areas, could then lack places to collect biomass for fuel, traditional herbs, water and food (Muchiri, 2008).

Furthermore, the impact of *Jatropha* expansion may affect the environment in various ways. Claims made by GFC (2006) have clearly stated that production of *Jatropha* will eventually lead to the destruction of watersheds and it will, cause pollution of rivers, lakes, and streams. Extensive use of fertiliser which is used to increase yields, may also lead to unprecedented risks in the future.

2.7 Summary

The introduction of drought resistant cash crops, such as *Jatropha*, has been seen as a possible solution for farmers who live in marginal areas but who still devote much of their less productive land to food crops. *Jatropha* as a cash crop has been regarded as one that can produce high yields under the prevailing harsh conditions of the Kenyan climate thus giving value to the poor agricultural soils. *Jatropha* has been linked to various advantages not only for the farmers but also for the environment, as mentioned earlier. Farmers stand to gain from the sale of the energy fruits which are in high demand, due to increased interest in the bio-fuel industry and, employment opportunities, due to the crops' intensive labour requirement (Ugarte, 2005), whilst the environment will gain from reduced carbon emissions in the atmosphere. This crop is also praised for its abilities in reclaiming marginal or waste lands. Production of *Jatropha* has also been seen as having high prospects of sparking rural development and improved livelihoods because of investments, which are likely to increase, due to the increased demand and interests in the crop by various parties. It is thought that entrepreneurs, development agencies and the government will see the need to invest in rural areas in order to tap into the benefits associated with the crop.

On the other hand, however promising the introduction of *Jatropha* to small-scale farmers appears, several concerns have been put forward. Considering the current system of growing *Jatropha*, many critics of *Jatropha* have predicted further deterioration of livelihoods in rural areas. They believe that, if small-scale farmers who are the main contributors of food production in Kenya convert their land to the growing of *Jatropha*, food shortages are bound to occur. Land degradation is also projected to occur, as the demand for bio-energy crops increases worldwide, and demand for more land to produce energy crops could lead to the clearance of forests and further use of the land in an unsustainable way. The use of fertilisers would also have adverse future effects on the land.

This situation therefore, leaves many unanswered questions about the practicability of growing *Jatropha* as a strategy for improving rural livelihoods. The field survey carried out for this thesis provides some answers to these questions particularly with regard to Meru North district in Kenya. The following chapter discusses the Sustainable Livelihoods Approach that encompasses a

framework that will be used in analysing small-scale rural farmers' livelihoods of the Meru North district.

Chapter 3

The Sustainable Livelihoods Approach

3.1 Introduction

The eradication of poverty in developing countries has proven to be elusive over the past several decades. The period after the Second World War saw frantic efforts by many development organisations to fight poverty through economic growth and an Integrated Rural Development (IRD)/ Basic Needs Approach (Frank Ellis & Biggs, 2001). Nevertheless, these approaches had limited impacts on poverty in developing countries. Furthermore, the beginning of the 1980s saw a greater deterioration in the fight against poverty in developing countries, following the adoption of structural adjustment programmes. This led to development organisations urgently rethinking their strategies for delivering development initiatives, and consequently, they sought ways that could have a lasting impact on the poor rural people of developing countries.

Based on the failures and limitations of the previous conventional development strategies, in the late 1980s the Sustainable Livelihoods Approach (SLA) was developed by several organisations including, the Institute of Development Studies (IDS) at Sussex University and the Department for International Development (DFID), UK. Since its invention, the Sustainable Livelihoods Approach has gained favour in many development orientated organisations including Oxfam, CARE, FAO, UNDP and the World Bank (Hussein, 2002). This is because this type of approach emphasises that people's lives are the most important in the process of development, unlike the previous blue-print development that placed emphasis on material things rather than people (Chambers, 1987). The Sustainable Livelihoods Approach goes beyond the traditional understandings of poverty, such as living "on a purchasing power of \$ [US] 1.00 a day... and/or to consume less than 2,000 calories per person a day" (Adato & Meinzen-Dick, 2002, p. 6). It looks at poverty from a multi-dimensional point of view and it describes poverty as encompassing not only a lack of income and basic needs - but also personal wellbeing.

The Sustainable Livelihoods Approach has been seen as having the potential to solve rural poverty

problems, which previous development strategies had failed to resolve. This approach addresses the wider livelihoods constraints of rural people and it attempts to identify lasting solutions to the problems which affect them. Therefore this chapter analyses some development strategies which have been used to reduce poverty (from the 1950s to 1970s) and traces the origin of the Sustainable Livelihoods Approach from the late 1980s. The chapter also examines the principles underpinning this approach, and the use of its framework as a tool for analysing sustainable livelihoods. The strengths and limitations of this approach are also included as part of the analysis.

3.2 The 'old' approach to poverty reduction

The period after the Second World War saw an increased interest in the fight against poverty within countries that had been labelled as 'underdeveloped'. Poverty has been conventionally defined or equated with people being *economically deprived* and this deprivation is measured through a threshold of *living below a dollar a day*. This poverty indicator has been in use for several decades. Therefore, measures put forward during this time were aimed at increasing the economic capabilities of these supposedly *deprived people*.

The period between 1950 and 1960 marked an era of economic growth when development policies were structured to assist countries that had been labelled as underdeveloped, after the Second World War (Rist, 2002). According to Harry Truman, the president of the United States of America at the time, the solution to problems that were affecting over two billion people in the underdeveloped (or Third World countries) were solvable through economic growth, which was to be driven by industrial development. Therefore, policies formulated and adopted during this period in the fight against poverty, totally emphasised a strengthening of the economy. It was assumed that economic growth within these poor countries would eventually translate into an overall development of these countries, resulting in improved living conditions for their people (Mazumdar, 1996). The assumption here was that a stronger economy would subsequently benefit the masses. During this ten year period, many economies of countries in Africa, Latin America and Asia grew substantially and steadily (Goldstein, 1985).

Nevertheless, despite the success of economic growth in the 1950s, the negative effects of these

fast growing economies were noted in the late 1960s by the World Bank (Tinker, 2000). It was evident that many poor countries' Gross Domestic Products (GDP) had massively increased, but the levels of poverty amongst their people were still rising. The World Bank (WB) estimated that approximately half of the world's population, during that time, was still living below the poverty line, despite the successful economic growth of the decade (Coady, 2003).

Dissatisfaction with such a narrow understanding of poverty led to the realisation that poverty was not only about satisfying monetary needs. The trickle-down effect had failed and a rise in GDP did not necessarily mean an improvement in the social wellbeing of the poor, as had been earlier assumed (Saith, 2001). In response to the failure of economic growth as a strategy to reduce poverty, bi-lateral and multi-lateral organisations' assistance policies were refocused in the 1970s. A great deal of prominence was now being placed on poverty alleviation by focusing on poor people's attainment of basic needs, rather than emphasising macro-economic growth through industrial and infrastructural development (Tinker, 2000).

The beginning of the 1970s saw the adoption of the Basic Needs Approach (related to integrated rural development) to combat poverty. This approach viewed poverty as a deprivation of biological needs which include food, shelter and healthcare and not only income (Green, 2006). This approach has further developed into the present comprehensive description of poverty as multidimensional by acknowledging and incorporating Sen Amartya's description of poverty as a lack of attaining full human potential and freedoms. Amartya (1999) describes full human potential as the ability to have entitlements, not only for exchange but also to access good health services, education and personal freedom. During this period, therefore, the majority of developing countries emphasised the social wellbeing of their people and development programmes were geared towards achieving basic human needs (Mazumdar, 1996). This approach acknowledged that poverty is not only economic deprivation, but rather it is the deprivation of being unable to lead a fulfilling life, which could only be achieved through the provision of basic needs.

Streeten (1977, as cited in Mazumdar 1996) asserted that basic needs could be achieved through the provision of public services, such as education and good health services. Streeten suggested that if poor nations provided reliable social services to their populations, particularly education and

health, they could make a key contribution to an increase in productivity within the country. He therefore proposed a trickle-up effect, which he termed as being more effective than the trickle-down effect proposed by the proponents of economic growth. This basic needs approach focused on meeting people's basic needs and the redistribution of resources to the poor (Madon, 2000).

3.3 The sidelining of poverty: Structural adjustment programmes

In the 1980s, the key theme of poverty alleviation appeared to have been forgotten, as developing countries adopted structural adjustment programmes (SAPs), which had been made mandatory by international donor organisations. Structural adjustment programmes emerged from the ideology of neo-liberalism, which rose to prominence in the 1980s. This occurred after the evidence of economic hardships that most developing countries were going through. There was a possibility that these countries might not be able to service the loans received from international donor governments and multi-lateral organisations. The neo-liberal economists thus believed that the underdevelopment and poor economic performance in developing countries were being caused by the strong unnecessary involvement of the state in their economic activities. The neo-liberalists also suggested that the state was inefficient and, bureaucratic and it was run by self-seeking politicians, who were corrupt and adopt policies that were not relevant to economic development (Simmons, 2008). The prime movers in promoting structural reforms were the World Bank (WB) and the International Monetary Fund (IMF).

The main aim of the SAPs was to correct the supposed inefficiencies of the old dysfunctional policies, which were seen in most developing countries' governments. The SAPs, therefore, adopted policies which were seen to be geared towards economic growth and development. Since many countries were in need of aid during this debt crisis period, the majority of the developing countries had to take up the structural reforms proposed by the World Bank and IMF in exchange for debt relief. These reforms entailed a reduction of their government's budget deficit, which meant that their governments had to reduce their spending to minimal levels. This was to be realised through, for example, a reduction of subsidies on agriculture and manufacturing industries;

the introduction of user charges in health and education; a reduction in the number of employees in the civil service; privatisation of state owned enterprises; and the introduction of free trade (Ezeonu, 2008).

The policies adopted during this time led to increased poverty throughout the developing countries. This was partly because a decrease in government subsidies led to increased prices for basic commodities, such as food and fuel. With many people out of work and the introduction of user charges accessing health and education was impossible for many. In addition, a reduction of subsidies on agricultural inputs, such as fertiliser and seeds, affected the majority of small-scale farmers and favoured multi-national agribusiness export-orientated farming (Hague, 1999).

Countries were left with a void in their quest to fight poverty and the adoption of these structural reforms led to “poor economic performance and a sharp rise in poverty amongst developing countries” (Laderchi, Saith, & Stewart, 2003, p. 269). This forced donor organisations (especially nongovernmental organisations), which had taken charge of development in developing countries, to rethink the most effective way to deliver development initiatives to developing countries.

3.4 A new approach to poverty: Sustainable Livelihoods Approach

The strategies undertaken between the 1950s and 1980s to fight poverty were mainly based on the idea of increasing economic growth; however, these strategies had failed to tackle poverty effectively. Therefore, redefining poverty was seen as an important aspect to ensure that correct interventions were employed. Initially, poverty had been seen through the perspective of the rich, but there was a need to look at poverty from the poor people’s perspective. In 1950s through to the 1970s poverty had been defined as a deprivation of income and a lack of basic essentials then in the 1980s, SAPs sidelined poverty. In reality, poverty is multi-faceted and/or multi-dimensional and it can only be identified through the consideration of various indicators, which have been identified by poor people themselves (Laderchi et al., 2003).

It is quite clear and widely accepted that the narrow perception of poverty, in terms of deprived

income and lack of basic needs is too simplistic. Chambers (1995, p. 8) asserted that any analysis of poverty should start by recognising that poverty is something greater than just income deprivation and low consumption: poverty is complex. It was not until 1986, when the idea of the Sustainable Livelihoods Approach (SLA) was first mooted during discussion at the 'Food 2000, Brundtland Commission in Geneva', that a workable approach was found. It was during this discussion that the words *sustainable, rural and livelihoods* were used together to refer to a strategy that would later be widely accepted as the most effective way of combating poverty. The outcome of this discussion was a report that outlined a people-centred development strategy that took the realities of the poor people as its starting point: and this was referred to as the Sustainable Livelihoods Approach. Later, in 1987, this approach became the main reference point in a development agenda, during a conference organised by the International Institute for Environment and Development (Scoones, 2009, p. 175).

From this point onwards, donor organisations, such as the Department for International Development (DFID), the United Nations Development Program (UNDP), and non-governmental organizations like Canada America Relief Everywhere International (CARE) and Oxfam, adopted the approach for fighting poverty in developing countries. This approach was regarded as effective compared to other development approaches that emphasised provision of services and infrastructural development, because it placed *people* at the centre of development and its success would be determined by the improved livelihoods of poor people (Ashley & Carney, 1999, p. 5).

The concept of the Sustainable Livelihoods Approach was then later popularised following a 1992 publication by Robert Chambers and Gordon Conway that gave sustainable livelihoods a definition, which has for many years been used to refer to this approach. They defined sustainable livelihoods as follows:

Livelihoods comprise the capabilities assets including both material and social resources and activities for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks; maintaining and enhancing its capabilities and assets while not undermining the natural resource base.

(Chambers & Conway, 1992, p. 7).

3.4.1 Characteristics, key features and principles of SLA

The Sustainable Livelihoods Approach is governed or underpinned by several core principles that determine how development interventions should be designed. Toner (2003) organises these principles into two categories; a category with normative principles and a category with operational principles. In the normative category, the author lists the four principles discussed below.

People centred

The Sustainable Livelihoods Approach is believed to be a people centred approach, because it recognises that the poor are the most important people to consider in any development initiative. It focuses on what matters to poor people and not what outsiders think is most important (Ashley & Carney, 1999). This approach:

Analyses people's livelihoods, the changes they go through and supports them in achieving their own livelihood goals, it also focuses on the impact of different policies and institutional arrangements on poor peoples' livelihoods, with the intention of seeking to influence these arrangements so that they can promote the agenda of the poor.

(Farrington, Carney, Ashley, & Turton, 1999, p. 4).

Participatory

Secondly, Toner (2003) identified the participatory nature of the SLA. It is believed that past development interventions were ineffective partly because they excluded the poor in the process of development. Therefore, the SLA identifies this major weakness and attempts to correct it, by including the poor in the process of developing development initiatives. The poor become the major participants in the identification of indicators of poverty and their preferred intervention in

the solving of their problems. The SLA privileges the knowledge of the poor and requires (or prefers) outsiders to respond to the poor according to their wishes (Carney, 2002).

Sustainable

Thirdly, the SLA considers the four dimensions of sustainability. Economic sustainability, which allows continual growth of the economy and development, does not compromise the environment and it is achieved through the use of renewable natural resources over a long period of time, without altering or depleting the resource base (Overton, 1999). In addition, social sustainability as seen in the SLA, upholds forms of social equality and justice which are enjoyed within society. It advocates for the removal of injustices and major inequalities that exist within societies, for example, the division of society by race, class, gender, human rights violation and extreme inequality in the division of wealth.

However, environmental sustainability advocates for the use and protection of the environment, by the local people. For example, local people should use their natural resources to meet their basic needs requirements in life, but this should be undertaken in sustainable ways that do not deplete or pollute the environment (T. N. Gladwin, Kennelly, & Krause, 1995). Institutional sustainability, on the other hand, is also advocated by the SL approach, through well defined laws, the involvement of local people in policy making, and the involvement of an effective public and private sector, which allows for the continual improvement of poor people within society. This approach, therefore, upholds the importance of not only using the natural resources sustainably but it also advocates for the sustainability of institutions that govern them, for example, government or traditional rules and regulations (Farrington et al., 1999).

Empowering

The fourth principle (under the category of normative principles) is the notion of empowerment. In the past, development programmes initiated in rural areas appeared to not give the poor a voice with which to stand up for themselves, following a development intervention. Therefore, the SLA

seeks to overcome this constraint by attempting to give the poor a voice and, increased opportunities and wellbeing, after the process of development has taken place (Carney, 2002, p. 13). This enables the poor not to constantly depend on outside assistance but rather be able to solve any problem that may befall them: this approach enables poor people to not always depend on external help.

The second category identified by Toner comprises operational principles. These are principles that make people seriously consider particular issues and what form/steps need to be taken, in regards to issues (Carney, 2002, p. 14). These principles are outlined and briefly discussed below.

Conducted in partnership

The SLA emphasises the importance of the partnership between various participants in development and it acknowledges the importance of bringing together the actors in development. It emphasises the creation of a partnership between the poor, the public sector and the private sector (Hussein, 2002, p. 15). This type of partnership which the SLA advocates, is one based on equality, transparency and common goals between the participating parties (Carney, 2002, p. 15).

Multi-level and Holistic

The SL approach acknowledges that fighting poverty is a vast responsibility and that it can only be successful if approached from all levels: micro and macro-levels. SLA ensures that activities undertaken at the micro-level are reflected in policies at the macro-level and these policies support development initiatives carried out by people at the micro-level (Ashley & Carney, 1999, p. 7). In addition the SLA is also holistic, since it is:

Non-sectoral and applicable across social groups, recognizes multiple influences on people and seeks to understand the relationship between these influences. Furthermore it recognizes multiple actors from private to national ministries,

community based organizations to newly emerging decentralized government. More so it acknowledges the multiple livelihoods strategies that people adopt to secure their livelihoods and seeks to achieve multiple livelihoods outcomes to be determined and negotiated by people themselves.

(Farrington et al., 1999, p. 4).

Disaggregated

The SLA recognizes the different livelihoods that exist within various groups of people (Toner, 2003). It acknowledges the importance of understanding how livelihoods strategies vary between disadvantaged groups of people, as well as between men and women. This approach, therefore, notes that stakeholder analysis and gender analysis are important tools that should be considered during the development process (Carney, 2002, p. 15).

Long term and flexible

Lastly, this approach also acknowledges that poverty reduction is a complex endeavour that requires a long term involvement or commitment and that it should be dynamic, in order to respond to the diverse and ever-changing livelihoods of poor people (Hussein, 2002).

3.4.2 The Sustainable Livelihoods Framework

The Sustainable Livelihood Framework (SLF) is a conceptual framework that was originally developed by the Institute of Development Studies at the University of Sussex, as a tool to use in the application of the Sustainable Livelihoods Approach (Scoones, 1998). A similar version of the framework was developed by the UK Department for International Development (DFID), in 1999 (Hussein, 2002). This framework particularly analyses the probable causes of poverty within rural areas, including poor people's access to resources and their diverse forms of livelihood activities. This framework is intended to broaden people's perspective and understanding of the poor and to be used to assess and give priority to development interventions that would have an impact on the

poor (Adato & Meinzen-Dick, 2002). Various organisations have developed their own framework. However, they all draw from the original framework developed by the Institute of Development Studies (IDS at Sussex University). An example shown below is the commonly used framework developed by the DFID.

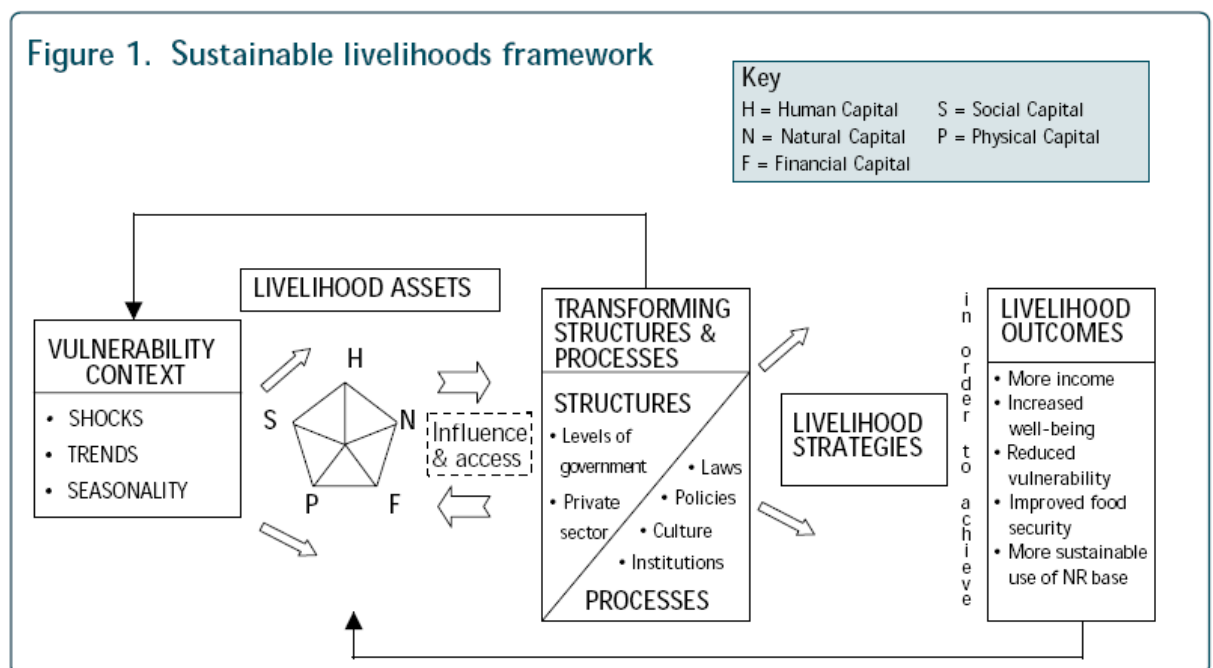


Figure 1 Sustainable Livelihoods Framework

Source: DFID 1999.

This framework has several key features: vulnerability context; livelihoods assets; structures and processes; livelihoods strategies and livelihoods outcome (Adato & Meinzen-Dick, 2002, p. 6). In order to understand this framework it is important to evaluate these key features individually.

3.4.2.1 Vulnerability context

The vulnerability context refers to factors that occur naturally and which are beyond the control of poor people. These events are categorised as trends in population growth and natural resources

and technology (Adato & Meinzen-Dick, 2002, p. 8). Shocks are also classified as vulnerabilities and they include impacts that are unexpected and usually distressing to people, for example, diseases, earthquakes, drought, floods, fires and conflicts (Chambers & Conway, 1992, p. 10). Seasonality in employment opportunities, resource availability, productivity of farming activities and prices in market are also aspects of the vulnerability context, which can have adverse impacts on rural livelihoods (Cahn, 2002).

3.4.2.2 Livelihoods assets

Assets and capital are central to the Sustainable Livelihoods Framework in the assets pentagon (see Figure 1 and 3). These assets represent the resources that poor people have and on which they build their livelihoods. They include both tangible and intangible assets, which are vital to the Sustainable Livelihoods Approach (Chambers & Conway, 1992, p. 7). They are divided into five categories which are discussed in turn below.

Human capital (skills, education and, labour)

Human capital represents an important component of the Sustainable Livelihoods Framework. This has been described by Duncombe (2007) as the available skills and knowledge possessed by rural people in order to pursue their livelihood strategies in life, together with their ability to perform or carry out an income generating activity. This ability to do work is referred to by Ellis (2000) as the labour that can be made available within a rural community or a household to be used in pursuing a livelihood. Therefore, the three aspects of skills, knowledge/education and labour, which form human capital, are essentially important in the livelihoods of poor people. In addition, the exploration of human capital in rural communities also requires information regarding health too, because the health status of household members is vital to the provision of human capital. Only healthy people can contribute to the pursuance of a livelihood, so therefore being healthy is important for people, in order that they can provide labour, education and skills. These are essential requirements for performing different tasks geared towards achieving a particular livelihood strategy.

Human capital can be categorised into qualitative and quantitative dimensions (Rakodi & Lloyd-Jones, 2002). The quantitative dimension refers to the number of family members in a household or in a community and the available time they have to participate in an income generating activity. The qualitative dimension, on the other hand, encompasses the level of education, skills and health status of the household, or the community being analysed.

Natural capital (land, water and, forests),

Natural capital is defined as resources that occur naturally in the environment. They include resources such as land, water, marine and air and soil quality (Adato & Meizen-Dick, 2002). These resources have been deemed as essential inputs for the poor, because it is from these naturally occurring resources that the rural poor people can derive their livelihoods (Duncombe, 2007). The majority of rural people depend entirely on the status of their natural resource capital for their survival, for example, access to land, water and suitable climatic conditions. Therefore, these aspects play a significant role in the determination and/ or sustainability of rural livelihoods.

Financial capital (savings, credit and/or, remittances)

According to the Sustainable Livelihoods Framework, financial capital is defined or described as:

The monetary income that can be accessed by the people living in rural areas to construct their livelihoods within a range of different livelihoods options available to them. The financial capital commonly available to rural people is comprised of personal savings, micro-credit, remittances, gifts and any other transfers that may have monetary value, which are carried out within rural families' social circles.

(Duncombe, 2007, p. 85).

Physical capital (roads, buildings and, energy)

Physical capital is the basic technology, infrastructure, tools and equipment, housing, and household goods (including stocks such as jewellery), which a rural household owns. These are

resources that a household can use to supply itself with shelter, transport, energy, water and communication. Physical capital is productive household assets either owned individually by a household, for example, houses, equipment, tools and machinery, household goods and stocks such as jewellery, or they could be productive state-owned assets, for example, infrastructure such as roads, hospitals and schools, which can be used directly or indirectly by households in generating income (Rakodi & Lloyd-Jones, 2002).

Social capital (networks, informal safety nets and, membership of organisations)

Within the Sustainable Livelihoods Approach, social capital has been defined as:

The rules, norms, obligations, reciprocity and trust, which are set within a society's social relationships and structures. This may also include the society's institutional planning, which is responsible for enabling its members to realise either their individual or communal objectives.

(Duncombe, 2007, p. 86)

Lyon (2000) added that social capital also involves features of social organisation, which serve to coordinate accomplishments within a society and these features include norms, trust and wider networks that are all geared towards activities which may generate income for its members. Social capital, furthermore, includes information that is passed onto society members through their social networks (Granovetter, 1993).

Shankland (2000) stated that social capital is one of the key resources, as described by the Sustainable Livelihoods Approach, which poor people can utilise and upon which they can build their livelihoods. Grootaert (1998) went on to identify three levels of social capital relationships within societies. Firstly, he identifies the horizontal link, which he describes as the relationship that exists between households groups within a community and this mainly dwells on the virtue of reciprocity. Secondly, he identifies the vertical link, which he describes as entailing a relationship between a more powerful individual in a community and less powerful individuals, and thirdly he

identifies the diffuse link which exists between people and groups within a society.

Although the majority of frameworks refer to these five categories of assets, some authors such as Baumann and Subir (2001), have argued that a sixth asset category, political assets should be added to the framework. Political assets are deemed important because they give the poor the right to membership in political parties and the right to citizenship within their country.

Within the Sustainable Livelihoods Framework assets are central to rural people livelihoods. It is through these five key assets that an improvement in peoples' lives can be measured. From the above discussion on each of these assets a positive improvement is essential in all the five assets categories in order to record any form of improved livelihood. For example, a positive improvement in financial assets is important as it gives people the ability to be financially capable, while human capital improves the rural peoples' knowledge, education, skills and ability to work in terms of labour provision. Natural capital offers the rural people a resource base where they could derive their livelihoods for example, land for farming and clean water for drinking. In addition physical capital also provides opportunities or infrastructure that rural people can use to generate income to sustain their livelihoods, while the social capital enables the rural people to live in a united society that looks after the welfare of every member in the community.

3.4.2.3 Structures and processes

Policies, institutions and processes within the framework refer to both formal and informal institutions that are responsible for shaping rural livelihoods (Adato & Meinzen-Dick, 2002). These institutions play an important role in determining people's access, control and use of assets, in order to sustain their livelihoods (Toner & Franks, 2006). Such structures could include the various levels of the government and the private sector, while the processes may include culture, laws and policies as spelled out in the Sustainable Livelihoods Framework.

3.4.2.4 Livelihoods strategies

Livelihood' strategies are the multiple activities that poor people can choose, in order to improve their livelihoods, and these activities can enable or assist poor people to survive (F Ellis, 2000). For example, Scoones (1998) identified three strategies that poor people in a rural setting can pursue: agricultural intensification, diversification and migration.

3.4.2.5 Livelihood outcomes

Livelihood outcomes are possible results of achievement, or indicators of progress that signify wellbeing. The outcomes of Sustainable Livelihoods are centred around improved wellbeing and reduced poverty (DFID, 1999). This can be observed through indicators, such as improved food security; sustainable use of natural resources; strengthened assets base; reduced vulnerability, and "improvement in other aspects such as health, self esteem, sense of control and even maintenance of cultural assets" (Adato & Meinzen-Dick, 2002, p. 10).

This section has unpacked the Sustainable Livelihoods Framework by examining the components that make up the framework and how important each component relates to rural livelihoods. Issues examined included the vulnerability context which encompasses aspects of shocks, trends and seasonality in rural livelihoods, livelihoods assets such as human, natural, financial, physical and social have also been examined and how they impact on rural livelihoods. In addition structures and processes that govern rural livelihoods and livelihoods strategies undertaken by rural people to improve their livelihoods have also been discussed in detail. Lastly the livelihoods outcomes which represent or indicate the improvement of a livelihood have also been discussed.

3.4.3 Strengths of Sustainable Livelihoods Approach

In the past, development interventions have been criticised because of their inability to focus on the most important issues in poverty reduction. The main focus had been on material items, rather than people's wellbeing. The Sustainable Livelihoods Approach attempts to overcome this by

placing *people* at the centre of the development process (Cahn, 2002). This approach presents a new way of looking at development processes, through recognising the complexity of poor people's lives (Toner, 2003). By focusing on people rather than material things, a true representative picture of poverty within rural regions is realised. This enables development partners to fully involve the people who are affected with poverty and in turn give priority to the decisions they make regarding the development programmes initiated. This approach, therefore, embraces the views of the poor people themselves and the choices they make, when pursuing certain livelihood strategies.

The Sustainable Livelihoods Approach also emphasises the participation of rural people in the development process. Rural people are regarded as active participants and equal partners, who are empowered to be active players in development interventions. This approach seeks to identify potential barriers to participation and therefore to minimise them, unlike previous development interventions, which were mainly top-down and technocratic and, where rural people were regarded as passive recipients of development initiatives (Adato & Meinzen-Dick, 2002). The Sustainable Livelihoods Approach recognises that the poor themselves should be the key players in identifying and prioritising development strategies.

The Sustainable Livelihoods Approach is holistic and it,

...identifies the most pressing constraints faced by rural people and promising - opportunities open to them regardless of where they occur (i.e. in which sector, geographical space or level from the national to international). The approach builds upon people's own definition of these constraints and opportunities and where feasible it then supports the poor to address or realise them. The livelihoods approach helps to organise the various factors which constrain or provide opportunities and show how these relate to each other. It is not intended to be an exact model of the way the world is, nor does it mean to suggest that stakeholders themselves necessarily adopt a systematic approach to problem solving. Rather, it aspires to provide a way of

thinking about livelihoods that is manageable and that helps to improve development effectiveness.

(DFID, 1999, p. 5).

This approach also emphasises the importance of linking micro and macro-levels in policy formulation and, it stresses that policies being formulated at macro-level must be informed by activities being carried out at local level. This enables local people to have an influence on policies that can have a major impact on their livelihoods (Scoones, 1998). Furthermore, this approach upholds the importance of sustainability and it identifies four key areas that are important in achieving sustainable livelihoods for rural people: environmental, social, economic and institutional sustainability. Sustainability is a vital indicator that shows if progress in poverty reduction is being achieved. This can be observed through people's livelihoods. If they are resilient and/or can recover from unpredicted natural disasters such as droughts, floods, earthquakes without any external assistance, then sustainability would have been achieved and progress in achieving a lasting poverty reduction would have been realised (Chambers, 1987).

3.4.4 Critique and concerns relating to the Sustainable Livelihoods Approach

Despite the Sustainable Livelihoods Approach gaining support from major organisations in the development sector, for the pursuit of poverty reduction, several concerns have been raised regarding this popular approach. One such concern is that the approach is just the same as the failed Integrated Rural Development (IRD) approach of the 1970s, which failed to reduce poverty in rural areas (Scoones, 2009). Sceptics have argued that SLA is a replica of the IRD approach and that (due to the complexity of the Sustainable Livelihoods Approach) it is bound to experience the same problems such as the focussing or giving preference only on the rural as the ultimate solution in the quest to eliminate poverty, while neglecting other regions infiltrated with poverty which the Integrated Rural Development experienced that eventually led to its failure as its focus was also mainly directed to rural areas alone (Frank Ellis & Biggs, 2001).

Secondly, poverty is defined by Sustainable Livelihoods Approach as being multi-dimensional with

many causes. One such cause is lack of power and rights (Carney, 2002). Whilst this approach appears to lay emphasis on giving a voice to the poor, in order that they can claim and realise their rights, some authors such as Baumann and Subir (2001), as mentioned previously, have argued that the approach downplays the issue of power, rights and politics, because the assets pentagon does not explicitly recognise these issues. They argue that, for issues relating to power and politics to be taken seriously in the approach, political capital (as a sixth asset) should be included in the assets pentagon.

Thirdly, this approach has also been criticised for not being able to deal adequately with the issue of climate change, which has been raised since the early 1990s. Scoones (2009) asserted that the Sustainable Livelihoods Approach is not ready for this challenge, which is being regarded as the most challenging issue of the 21st century. Scoones also suggests that, despite the word 'sustainable' being an important component of the approach, nothing has been done regarding climate change impacts that are having adverse effects on countries where poverty reduction and livelihood-orientated development is taking place. This situation, the author argues, is a clear indication of the inability of the SLA to deal with environmental issues.

Lastly, the fourth critique that has been levelled against the SL approach is that, although it claims to be people centred and exercises bottom-up strategies of development, it often fails to do this in practice. Authors such as Arce (2003) believe that the approach is technocratic and it exhibits a traditional top-down development process, both in theory and practice, which hinders community initiated development. As mentioned previously this is not what is claimed in the principles of the approach. In addition, Toner and Franks (2006) have argued that the approach adopted by development agencies is not necessarily a rural based development approach, but more importantly it is a strategy between development actors attempting to identify the most effective way of delivering development initiatives to rural people.

3.5 Other new approaches to poverty

It is evident that development interventions that were formulated from the 1950s until 1980s were all based on the Western European and American ideas of what should constitute of development

programmes (Offenheiser & Holcombe, 2003). This largely led to many programmes being directed to the strengthening of countries economies in terms of improved GDP. Nonetheless the improvement of the GDP in countries did not present insights regarding the distribution of resources and wealth within these countries and particularly among the minorities (Praz, 2010). It is because of these forms of limitations that new approaches have been specifically structured to overcome problems associated with old approaches in fighting poverty. Apart from the Sustainable Livelihoods Approach other new approaches in the quest to eliminate poverty are:

Rights Based Approach

The Rights Based Approach has entered the development field recently as a new approach in fighting poverty. This approach is based on the idea of emphasising on the recognition of individual rights, especially the rights of the poor and marginalised communities. These rights have been described by the approach as a series of benefits ranging from education, healthcare, and security that should be provided to every individual by their state or donor organisations (Moser, Norton, Conway, Ferguson, & Vizard, 2001). The approach calls for governments and donor organisations to take up the responsibility of protecting the poor people rights without any form of discrimination. This approach associates individual rights with equitable distribution of resources and development (DFID, 2000).

This approach emphasises on the people who are the rights-holders because previous development programmes were undermining the poor peoples' rights. The state which is viewed as the duty-bearer to provide these rights in the previous development initiatives trampled upon these rights while favouring commercial investor's interests. This approach therefore, advocates for a state that provides development initiatives that do not undermine human rights, rules in favour of the marginalised poor and enforces rights that are essential for the poor to live in a dignified way (Johnson, 2002).

Community Based Approach

Community Based Approach has also been given special attention in recent development

programmes; this approach entails the participation of the rural communities in development interventions. The approach attempts to overcome the problem of exclusion of rural communities during the process of development. It calls upon governments and donor organisations to incorporate the communities and their institutions in tackling problems associated or contributing to poverty in rural communities (Aguirre-Molina & Gorman, 1996). This approach has been regarded as essential in fighting poverty as it focuses on social and physical structural inequalities and actively involve the community members fully, who in turn contribute towards a development programme. The approach also supports both the private and public sectors in searching for viable solutions of eliminating poverty in rural communities.

Development as Freedom

In addition to the Rights Based and the Community Based Approaches, Sen Amartya has developed a new line of thinking in development; he suggests that development should be seen as freedom of all individuals to attain whatever they desire. He argues for an approach based on human freedom and states that underdevelopment is caused by the deprivation of human beings from political, economic, and social opportunities which cause suffering and eventually a slowed-down progress (Amartya, 1999). He further states that rights of freedom are influential in formulating policy and development programmes that are mainly directed towards favouring the poor and the vulnerable communities in society

3.6 Summary

This chapter has overviewed some older approaches to poverty alleviation before introducing a newer approach the SLA. It has analysed the Sustainable Livelihoods Approach in relation to its origin, principles, framework and strengths, and it has also noted critiques of the approach. It is evident that this approach has gained popularity and it is widely accepted by major development organisations, as a strategy that, when used in development initiatives, could have a lasting and positive impact on poverty in rural areas. The approach has been credited for its ability to focus on the most poor in society by; giving them an opportunity to participate in development interventions, and determine their own development initiatives through various ways discussed

above. The approach also focuses and stresses on the importance of the five key livelihoods assets of; financial physical, social, natural and human assets that are deemed vital in rural livelihoods. However the Sustainable Livelihoods Approach should not be seen as a panacea or a ‘magic bullet’ that can cure rural poverty in developing countries. Several concerns regarding this approach have been brought to the forefront by sceptics of the approach. It is clear that in the twenty years since the SLA was introduced, poverty and environmental issues still remain a vast problem in rural areas, in developing countries. Even more so, we are yet to declare with confidence that poverty has been effectively alleviated, since rural people still face the same poverty challenges that existed half a century ago.

While the SLA should not be seen as a perfect “model” for development it is chosen above other new approaches to poverty for this study such as Sen’s ideas on development as freedom, because it is a pragmatic approach with a framework which can readily be applied to rural livelihoods contexts. Thus, keeping in mind some limitations of the SLA it will be employed in my research into the use of *Jatropha* as a new cash crop in rural Kenya. The following chapter discusses the methodology used in this study.

Chapter 4

Research Methodology

4.1 Introduction

This research study will be framed on the basis that rural livelihoods are always impacted upon by new development initiatives introduced by development agents. However, rural people are sometimes coerced into changing their livelihood strategies without considering the consequences that may arise from the initiated project. The majority of rural people are faced with constant problems associated with poverty and they are in dire need of improving their livelihoods. Thus many 'fall for' new development initiatives which are introduced. Therefore, this study attempts to explore the means of finding answers to the aim of this research, which is to understand how the growing of *Jatropha* (as an emerging cash crop) in rural areas influences the five assets of sustainable livelihoods, with the intention of determining the impact of emerging new cash crops on rural livelihoods.

In order to understand the impact and/or consequences of the bio-fuel industry on rural livelihoods, the study will use the Sustainable Livelihoods Framework as a guiding tool in the investigation of livelihoods within rural areas. This will mainly be undertaken at household level, since the majority of livelihood strategies are decided upon within family households. Therefore, in this chapter, I explain the methods that were used in the process of data gathering, which were carefully chosen with the central aim of the study in mind. This is important because these methods should have the potential of answering the research questions derived from the study's aim. The chapter highlights issues which include: ethical issues; research boundaries; research sites' characteristics; research participants; data collection (qualitative, quantitative); research methods (non-participant observation, structured household interviews and semi-structured interviews); and finally, data analysis.

4.2 Research design (ethical issues)

Before commencing this research, an in-house ethics process was conducted as required by the Department of Development Studies at Massey University. Several issues of concern regarding this research were discussed. They included issues such as how I was going to recruit my research assistant, what criteria to use for example, level of education, familiarity of the person in the region, ability of the person to speak the local language (Kimeru) and skills possessed by the person for example, riding a motorbike or driving which would be helpful during the field trips in the villages. Issues regarding the sharing of information with my participants and how I was going to store the information collected from the field were also discussed in detail during this meeting.

A further approval was then sought from Massey University Ethics Committee after the in-house process, as required by the Code of Ethical Conduct when dealing with human subjects as participants. The research project was evaluated by peer review and judged to be of low risk (see Appendix 7). This ensured that in the process of gathering information from these participants their psychological and emotional wellbeing was not compromised.

The central principles considered, in order to ensure the wellbeing of the participants according to the Ethics Code, were as follows. The participants were respected at all times and they were provided with an informative sheet and a voluntary consent form requesting their participation in the research and assuring them of their anonymity, confidentiality and privacy throughout the research (Blaxter, Hughes, & Tight, 2001). I conducted this exercise as my previous work as a research and advocacy officer at IEI-Kenya had equipped me with the necessary skills when dealing with research participants. The research assistant and I were truthful and honest during the time of the research and ensured that no harm was done to the participants in the process of sourcing any information. The participants were not coerced or forced into giving particular information of interest. The study also took into consideration the social and cultural issues that governed the participants within their community, in order to avoid any possible present or future conflict within the community (Stewart-Withers, 2007). This was important and was made possible by my research assistant, who being a “Mumeru” understood their traditional culture and always guided

me during the homestead visits, for example not insisting on talking to the women when the men of the house were at home.

4.3 Research boundaries

This research was limited to areas of the Eastern province of Kenya that have taken up the production of energy crops as cash crops. This province is the fourth largest of the eight provinces in Kenya and is characterised by an arid and semi-arid climate and it experiences droughts for most of the year. With this adverse harsh climate, production of food crops has been greatly affected and the majority of the population depend entirely on relief food from government and development organisations. My choice of Eastern province and specifically Meru North district was because of my first contact person, who was a field officer from the Green African Foundation. She proposed to me that I do further research here from the farmers as she had earlier on carried out some research studies on *Jatropha* growing in the region. I therefore, thought it would be beneficial for both of us to compare our findings after the study, thus I decided to make Meru North my research region.

4.3.1 Fieldwork in the Meru North District

Small-scale farmers who participate in *Jatropha* production are scattered all over the Meru North district and therefore, locating villages that had a considerable number of farmers who grew *Jatropha* was a challenging task. Liaising with organisations working in the area (or those involved in *Jatropha* projects in this region), was very important in order to locate these villages. One such organisation that provided the researcher with essential information is the Green Africa Foundation. This organisation works with small-scale rural farmers in the production of *Jatropha* as a means of improving rural livelihoods in the arid and semi-arid regions of Kenya (Kalua, 2008). It has established several demonstration plots with local farmers in the Meru North and Makueni districts. Therefore, this organisation was an important source of information for the study regarding *Jatropha*, and a number of its employees were also involved in the study as research participants.

The Ministry of Energy also played an important role in the initial research stages, since a number of its employees were contacts within the study and the ministry was also a source of data regarding policies relating to the bio-fuel industry. Other important contacts and participants included in this research study (but could not be reached during the time of the study due to time constraint) were commercial investors, such as Biwako Bio-laboratory Ltd Japan, that processes *Jatropha* into bio-fuels, and philanthropic organisations, such as the Prince Albert 11 of Monaco Foundation, which is in partnership with the Green African Foundation.

4.4 Research Sites

The research sites in this study were two villages selected from the Meru North district which was formerly known as the Nyambene district. It is one of thirteen districts in the Eastern province of Kenya. The district has fifteen administrative divisions, which are further subdivided into fifty six locations and one hundred and thirty nine sub-locations. The district covers a vast area of 3,942 square kilometres. The Kenyan map below shows the Meru district before it was split into Meru North, Meru South and Meru Central district in Eastern province of Kenya.



Figure 2 A map of Kenya showing the Meru North district

Source: Google maps

The two villages, Nchiiri and Kagaene, where the research information was collected, are situated in the Uringu division, which has a total population of approximately 39,000 people. There are a total of 7,760 households located in this division.

This district experiences high poverty levels in its rural areas and people generally affected include landless people, who are located in high density areas and settlement schemes of the district. Most have settled in market places whilst others are living as squatters. Child labour is common, due to the high poverty levels that plague the district. School-aged children have resorted to working in

Khat (another cash crop grown in the district) producing areas within the district, instead of attending school (Personal communication with the district's agricultural extension officer).

The soil fertility of the district is determined by the volcanic Nyambene ranges. The north east of the district has more gentle land forms with highly productive rich volcanic soils, as a result of the volcanic ash from Mount Kenya. The uplands of this district, on the highest parts of the Nyambene hills, are moderately fertile but very susceptible to soil erosion, whilst the erosion plains in the north are considerably fertile during rainy seasons, but are mostly dry and rocky since the area experiences constant dry weather in most months of the year (Personal communication with the district's agricultural extension officer).

4.5 Research participants

The total number of participants in this research study was 39 and they were selected from the government's Ministry of Energy and, Ministry of Agriculture, non-governmental organisations, research institutes, traders and small-scale rural farmers. The participants were purposively selected by their degree of involvement in the bio-energy industry. This was because they exhibited the appropriate characteristics that were able to assist in the answering of the research questions (Patton, 1990), regarding the growing of *Jatropha* in rural areas. The research participants were chosen carefully and more often women participants were given considerable attention which is in line with the Sustainable Livelihoods Approach principles of ensuring the participation and empowerment of the marginalised especially women in male dominated communities. The table below shows the number of participants chosen from the government ministries, the rural community of Meru North, nongovernmental and community based organisations, and research institutions.

Participants	No. Of Participants Interviewed	Women	Men
Participating small-scale farmers			
Farmers growing Jatropha/not trading	11	5	6
Farmers growing Jatropha /trading	4	0	4
Farmers not growing Jatropha	15	9	6
Total number of Participating farmers	30	14	16
Participating officials (Government, NGOs and Research institutions)			
Ministry of Agriculture	2	2	0
Ministry of Energy	1	1	0
Energy Regulatory Commission	1	0	1
Green Africa Foundation	1	1	0
Vanilla Jatropha Foundation	1	0	1
Community based Organisation	1	0	1
Nchiiri women group	1	1	0
KEFRI Research Institution	1	0	1
Total Number Of Participants	39	19	20

Table 1: Number of participants interviewed in the research study

Source: Author

4.6 Data collection

This research was a case study that utilised both qualitative and quantitative research methods. Quantitative methods are described as empirical or statistical, where reliable measures are required and generalisations are made from the samples (Newman & Benz, 1998). The quantitative research in this study involved the collection of information from a number of purposively sampled participants (Patton, 2002). Furthermore, quantifying of qualitative data was considered where appropriate for example information gathered through observation on household assets was later turned into numbers and percentages, same with responses gathered with regards to the impact of *Jatropha* on household's incomes and food production issues.

However, this research generally used qualitative methods during the information gathering period. Qualitative methods focus on studying people in their natural settings and there is an attempt to draw interpretations from the events or activities studied, together with the importance of these events within the participants lives (Newman & Benz, 1998). Qualitative methods in this study were utilised in order to understand the complex social life of rural people from the perspective of the participants, which quantitative methods can-not measure (Curry, Nembland, & Bradley, 2009). Furthermore, these methods assisted in bringing to light beliefs and values of people living in the rural areas. These methods were intended to be exploratory and they sought to elucidate new insights by initially starting with a general observation which then developed into a hypothesis.

As mentioned previously, the study utilised both qualitative and quantitative methods. Due to the complexity of the study on rural livelihoods, it was easier for the study to overcome the limitations of a single method, by capitalising on the strengths of each method. Flick (2002) asserted that, by combining the two methods, it would be helpful in validating data and ensuring that the information gathered is also reliable.

4.7 Research methods

In order to gain a comprehensive understanding of these rural livelihoods, qualitative methods, such as non-participant observation, structured household interviews and semi-structured interviews were employed. A brief evaluation of these methods is provided below.

4.7.1 Non-participant observation

This method involved systematic and detailed data gathering through observation of the household and, events and activities which happened to the research participants and within the research sites. The intention was to learn about what they owned and how they carried on with their livelihoods within their natural environment. This method was considered because, it has been suggested that it is designed to help the researcher understand participants' situations that are not normally exposed to the public, or when the participants have a different viewpoint from other people outside their community (Curry et al., 2009). This method was important in the study because it provided a means of testing what the government, non-governmental organisations and commercial investors say about the impact of *Jatropha* growing on small-scale farmers and rural livelihoods in general, by observing the livelihood situation of these rural communities.

This method entailed staying in the chosen villages for an extended period of six weeks, during which the researcher interacted with the participants at all levels. The researcher chose to be a non-participant observer and therefore he was known to the subjects as 'the researcher'. The data gathered contained field notes that were taken during the interaction with the participants and during the stay in the villages (Curry et al., 2009, p. 1146).

Observation, as a method, has been linked to a number of advantages, for example, one important aspect of observation is that the researcher is able to learn more about the behaviour of the participants and can, examine events or situations that may be hidden from outside people. However, one major limitation identified is that the participants may choose to alter their manner of behaviour, if they know they are being observed. Although this could have been minimised, by being a participant observer and hiding the researcher's identity, this would have raised serious

ethical issues regarding the consent of the participants and the researcher being truthful and honest (Curry et al., 2009, p. 1145).

4.7.2 Structured household interviews

Interviews are purposeful conversations carried out between a researcher and a participant. The researcher controls or stipulates the limits of the research, by generally focusing the conversation on a particular topic of interest, whilst at the same time allowing the participant to respond freely to the questions being asked (Davies, 2007). It can also be described as an interaction between a researcher and a participant, in order to investigate in detail some particular experiences of the participant. The household interviews that were carried out in this study were based on closed and open-ended questions (Curry et al., 2009), centred around the impact of growing *Jatropha* on small-scale rural farmers. Data collected from the participants, who were mainly comprised of small-scale rural farmers living in the Meru North district, assisted in the answering of the first research question of this study: *What are the impacts of Jatropha growing on the five assets of rural livelihoods and food production?*

Interviews were considered in this study because they are viewed as being an excellent source for gathering qualitative data, since they explore the experiences and views of the participants in broad detail (Curry et al., 2009, p. 1445) and, they are easy to administer to the participant (Langdrige, 2004). However, there is always a substantial risk of misunderstanding what the participant is actually saying (Davies, 2007, p. 162). This situation calls for the interviewer to always ask the participants to clarify any words, if they appear to be contradicting, in order to ensure that both parties understand each other correctly. On many occasions, the people interviewed may use the same words, whilst their meaning may be different when applied to different situations/ events. Furthermore, information gathered through interviews may be distorted through inadequate recording by the researcher and thus the richness of the data collected could be reduced (Langdrige, 2004, p. 51).

Apart from the limitations outlined above by various authors, this method carries the risk of gender bias. This study, in particular, may have experienced this limitation at some point during the

data gathering. Information regarding changes in labour of household members may have not been inclusive of all views, since in some cases where men were interviewed they spoke on behalf of every member of their family (male, female and children). This type of scenario could result in the provision of information that may be gender biased. Nonetheless, the researcher had to accept this limitation (and the information given during the interviews) without being able to resort to other ways of verifying the information about other family members, since it is ethically not accepted within the Meru community, for the women of the house to be interviewed, when the man of the house is either at home or not at home.

4.7.3 Semi-structured interviews

In this study semi-structured interviews were utilised amongst key participants from the government's Ministry of Energy and Ministry of Agriculture, in addition to research institutes, non-governmental organisations and traders. Unlike the structured household interviews, these interviews were comprised of a number of pre-set open-ended questions. This method was preferred for use with this category of participants, because of its advantageous nature of eliciting more discussions with the participants and exploring issues that were not necessarily linked to the study, for example, policy issues within the bio-energy industry that have impacts on rural farmers. Furthermore, this method was valuable because the respondents were not limited to giving specific or fixed answers and the interviews covered a wide range of issues, thus minimising the possibility of 'missing out' on an important subject during the discussions (Langdrige, 2004, p. 50).

However, a few limitations were observed, whilst implementing the semi-structured interviews. Firstly, there was a possibility of the respondent 'wandering off' the topic and thus offering irrelevant information, if not well guided by the interviewer. In addition, the information generated might also be distorted, through inadequate recording, and also the respondent might choose to be subjective and biased towards certain issues, of which they did not approve. This may have reduced the validity of the information collected, thus rendering the information unreliable (Langdrige, 2004).

4.8 Data analysis

A process of data analysis is required in order to build up a set of precise conclusions and recommendations from the many interview scripts and notes, the data gathered during the field study was manually analysed. O'Leary (2004) suggested that, in order to gain a meaningful understanding of the raw data, it has to be processed through exploration which will then generate relevant themes. This situation was reached through an inductive analysis of the raw data and an assessment of the insights gained during the process of data gathering.

In regards to the qualitative data obtained, the analysis involved an analytical approach, where the raw data was assessed by critically 'going through' the interview scripts and field notes made during the observations (Curry et al., 2009). The concepts that emerged as having similar characteristics and/or themes, were then coded and assigned tags for identification purposes (Blaxter et al., 2001).

There was a need and/or opportunity to quantify some of the qualitative data obtained from the structured interviews. Table presentations were utilised in order to illustrate the quantitative results obtained. These are provided in Chapter 5.

4.9 Fieldwork Experiences: A reflection on the successes and failures of my fieldwork

I consider my fieldwork to have been a great success, although I did encounter a few frustrating moments. The success of my fieldwork began even before I set out to go to the field. Organising my research design adequately and having prepared my interview questions early was vital in undertaking this research. In addition, as I got to the field my previous work experience as a research and advocacy officer that often dealt with rural people in sourcing for information was an added advantage to me, while researching this community. By hiring a local research assistant who was known as a good man in the village my interaction with the local people was easy despite being a foreigner in the district. His ability to talk the local language and the mastery of the local people's culture was vital in interacting with the participants who are deeply rooted in their culture

with regards to talking to foreigners.

Furthermore my research assistant and I developed a bond of friendship and more often saw each other as equals and not as employer and employee. He was willing to carry out his duties as I advised him in the beginning on methods and ethics considerations, without altering questions or responses from participants who spoke in the local language that I could not understand.

However, as I mentioned previously, interviewing women in the presence of men was not possible, this gave me a challenge during my fieldwork but also enabled me to learn that sometimes it is good to have a female research assistant in such cases. Therefore for any further research undertakings I will carry out, I will endeavour to recruit female research assistants. Apart from this, other minor problems like being looked down upon by ministry employees and sometimes being made to wait for long hours without being attended to were also experienced. Despite this however, I consider this fieldwork experience to have been exciting and successful.

4.10 Summary

This chapter has examined the methodology involved in this research study. It particularly explored the methods used in the gathering of information from research participants, in regards to *Jatropha* and its impact on rural livelihoods. The Sustainable Livelihoods Framework was used as a tool to guide this study. The use of this theoretical framework was chosen because of its ability to capture the entirety of livelihood aspects that are experienced in rural areas. The methods described in this chapter were largely qualitative, although some data was later quantified, for the purposes of clarifying specific aspects of livelihoods which can be quantified, for example, financial assets and physical assets. Other aspects considered and examined in this chapter included: ethical issues; research boundaries; research participants; research sites; data collection; and data analysis.

The following chapter presents the results from the field information gathered in the Meru North district on the impact of *Jatropha* growing on small-scale farmer's livelihoods and food production.

Chapter 5

The impact of *Jatropha* farming on small-scale rural farmers' livelihoods in Meru North district

5.1 Introduction

This chapter presents the findings revealed from the research data gathered in Nchiiri and Kagaene villages. These two villages are situated in the Meru North district and they form the main research site for this study. The chapter comprehensively explores the first research question: *what is the impact of *Jatropha* growing on the five assets of sustainable livelihoods and food production of small-scale rural farmers' livelihoods*. The Sustainable Livelihoods Framework forms the basis of the analysis of the farmers' livelihoods.

The results presented in this chapter are, therefore, based on the household interviews, and semi-structured interviews and observations made during the field study within the district. The primary analysis of the farmers' livelihoods is based on the Assets Pentagon of the Sustainable Livelihoods Framework and the aspects focussed upon include financial capital, human capital, social capital, natural capital and physical capital, as shown in the Asset Pentagon in Figure 3 below.

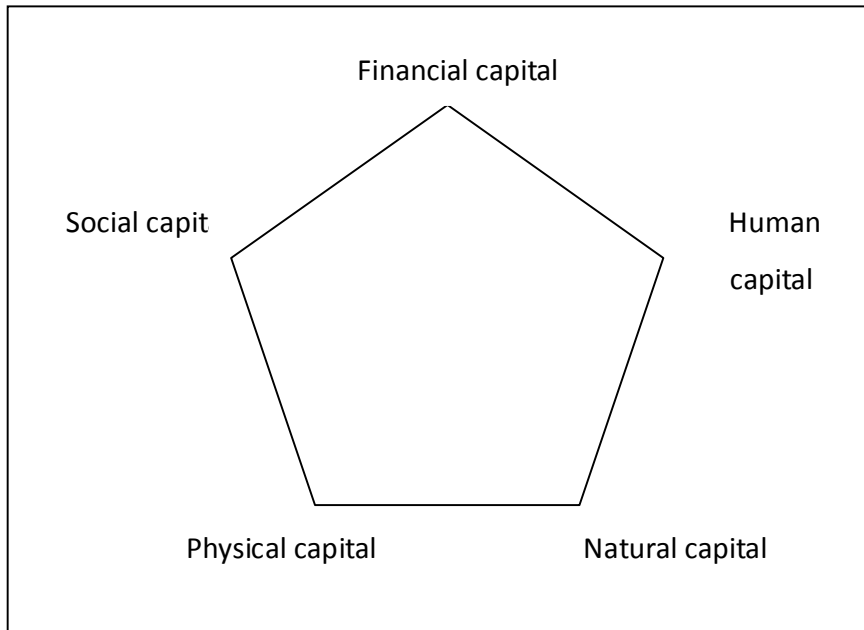


Figure 3 The Livelihoods Assets Pentagon

Source: Adapted from (Rakodi and Lloyd-jones 2002)

While the physical capital aspect forms one of the key components in the capital/assets pentagon, this study has divided physical capital into two distinct parts: firstly, individually owned physical capital, which is discussed within this chapter as part of the assets of small-scale rural farmers' livelihoods; and secondly, physical capital being the assets owned by the state and/or the wider community, which are discussed in the following chapter as part of the wider rural community's assets. The decision to split this component into two parts was taken because authors such as Rakodi & Lloyd-Jones (2002), have stated that physical capital which includes public or state owned infrastructure, such as roads, hospitals and schools, are public investments that are meant to benefit the community and therefore they are collective resources rather than individual ones.

In this chapter also, the study presents the findings of the impact of Jatropha on food production in the Meru North district. Food production is an important aspect of small-scale rural farmers' livelihoods and it is significantly impacted upon by the growing of non-food cash crops such as Jatropha. Therefore, the issue of food is also discussed within this chapter.

The first asset analysed is the financial capital of the farmers. Financial resources are deemed essential, since rural livelihoods are constructed based on them and accessibility to these resources may subsequently result in improved livelihoods. Therefore, in order to identify how Jatropha has impacted on these farmers finances, the study has assessed the farmers' income changes and what they have acquired (in terms of assets) from the Jatropha trade.

The second asset analysed was the impact of Jatropha on individually owned physical capital. Under this section, the study analyses type of assets are held by farmers who grow Jatropha, in comparison with those assets owned by farmers who do not grow Jatropha.

Thirdly, the study examines the human capital aspect and here the main interest is to determine how Jatropha has impacted on these rural farmers and members of their household, in relation to acquiring skills, education and better health. In addition, labour, which is also an important aspect of human capital, is also analysed. The study examines how the growing of Jatropha has impacted on the available labour within these households.

Fourthly, the study explores aspects of social capital amongst the small-scale farmers who grow Jatropha and also the general community. The fifth aspect to be analysed is the natural capital on how Jatropha has enabled these farmers to acquire natural assets (for example land). However, other aspects under natural capital, such as the quality of air and water are not dealt with in this study. Lastly, as mentioned previously it is of great importance to discuss issues related to food in this chapter, since this is a very important aspect of rural livelihoods.

5.2 Financial Capital

Financial capital is described as monetary resources that can be accessed by a household in order to construct their livelihoods and this includes savings, income and credit (Brocklesby &

Fisher, 2003). Small-scale farmers in the Meru North district do not have access to elaborate modern savings and credit facilities and, most of their financial savings and credit activities are undertaken informally within their social circles. This situation was observed in the villages of Nchiiri and Kagaene. While there was lack of a visible formal financial institution informal networks for savings and credit were used. It was noted that the majority of the farmers prefer to save their money through the buying of livestock, such as goats, cows or chickens and then sell them at a later date, or whenever they needed urgent cash.

Duncombe (2007) concluded that the analysis of financial capital in rural livelihoods requires a deep and elaborate exploration of a wider range of issues within rural communities. He identifies aspects such as; sources of finance, means of access to money, savings and credit and the role of remittances, to mention a few. All these aspects need to be analysed in order to obtain a reliable representation of rural people's financial capabilities. However, due to time constraints during the period of this research study, only two aspects were considered: the source of income and the acquired assets.

5.2.1 Income

Based on the data collected in the two villages, a small sample of 15 farmers (who grow *Jatropha*) were chosen to respond to this question of, determining the impact of *Jatropha* as a cash crop on small-scale farmer's income. It is important to acknowledge that this sample of participant farmers is relatively small and it may, therefore, not offer a representative picture of the entire district. Despite this limitation, 80% of the 15 farmers interviewed responded that the sale of *Jatropha* had increased their income, at some point in time. This can be seen at different levels of increments per farmer, as represented in Table 1. Some farmers stated that the increment was 'a lot' whilst others said the increment was 'minimal', the reason for the difference being that the selling of *Jatropha* did not go on for a long period of time, due to lack of a reliable market and dishonest traders.

From a total of 15 farmers who grow *Jatropha*, 20% of the farmers in Nchiiri and Kagaene stated that the sale of *Jatropha* had not increased their income, at any level. They assumed

that the only farmers who benefited from the sale of Jatropha were those who acted as middlemen or brokers. This is because these middlemen bought the seeds at a low price from the farmers (who did not have a direct contact with the market) and then, they reaped large profits from the sale of these cheaply acquired seeds to the market. One disgruntled farmer stated:

Most of the farmers including me sold our seeds at the beginning for only 20ksh per kilogram, this is what the buyers who some were our fellow farmers told us, but later we came to realise that the Jatropha seeds actual price was more than 20ksh per kilogram. The middlemen had deceived most of us who did not know where to take the Jatropha seed to sell. They had made away with our seeds at cheaper prices while they sold the same seeds at 70ksh a kilogram (Farmer Participant No.12)

Confirmation of this occurrence came from a farmer/trader who appeared to have benefited from this trade:

Because the farmers did not know the actual price that one kilogram of Jatropha seeds could fetch I bought the seeds from them at a paltry 20ksh (Kenyan shillings) instead of 70ksh. This gave me a profit margin of 50ksh on each kilogram I bought from the other farmers who did not know where to take their seeds (Farmer Participant No. 6)

Income change	Number of farmers	Women	Men	Percentage
Income increased a lot	7	2	5	47%
Income increased a little	5	2	3	33%
No change in income	3	1	2	20%

Table 2 Number of farmers in Nchiiri and Kagaene villages responses on income.

Source: Authors field data interviews

Interestingly, another group of 15 farmers, who do not grow Jatropha and who formed my second set of participants, offered the same sentiments as the 80% who do grow Jatropha. They believe that Jatropha growing, as a cash crop, does increase a household's income. In order to verify this assumption, I asked them what they thought about Jatropha as a cash crop, in relation to a farmer's income and why they had not grown it. This group acknowledged that Jatropha did indeed increase a farmer's income, because they had seen their neighbours employing casual labourers to tend to their Jatropha trees. The reason they gave, as to why they are not already engaged in planting Jatropha, is because of the unreliable markets that exist and therefore they are not ready to take the risk.

5.2.2 Acquired assets

From the 80% farmers interviewed in the two villages who said they had "a little" or "a lot" more income, due to the growing of Jatropha, all confirmed that they had acquired some form of assets from the sale of the Jatropha seeds: either tangible assets or intangible assets. Six farmers had bought livestock with the income they received from selling the seeds and generally they had bought goats, cows and chickens. Four others claimed to have bought farm inputs such as fertilisers and seeds for growing food crops, along with household furniture and electronic equipment. Three of the 15 farmers claimed to have either paid school fees for their children or bought them school uniforms.

Two of the farmers who also doubled as traders interviewed revealed to me that the business of Jatropha was very profitable. One had paid off a piece of land he had acquired with the income he generated from the Jatropha trade, whilst the other had bought up to sixteen acres of land with his income from the Jatropha business.

5.3 Physical capital

Physical capital refers to assets that are individually owned by a household or publicly owned by the state and which can be used by a community to achieve a particular livelihood. These assets include buildings, water, energy, roads, schools, hospitals, tools and machinery (F Ellis,

2000). The analysis of rural livelihoods indicates that physical capital is central to sustaining livelihoods in rural areas. This is because physical capital enhances rural household's capabilities of transforming either human or natural capital into their desired livelihood (Albu & Scott, 2001). Therefore, under this category I examine individual (household owned) physical assets, whilst state (publicly owned) physical assets will be analysed in the following chapter.

5.3.1 Individual (household owned) physical assets

Information gathered through the observation scheme used during this field study revealed that several physical assets were owned by the farmers, who were selected as participants. The results presented here shows that the households visited (who grow *Jatropha*) had more physical assets that signified wealth, than those households that do not grow *Jatropha*. However, it is important to note that it is not necessarily due to *Jatropha* growing that these households have become wealthier. Rather the households that tended to be already wealthier were those ready to engage in the production of the newly introduced cash crops, rather than the less wealthy farmer household.

This was evident, since 60% of the homesteads visited (who grow *Jatropha*) had houses built with bricks or blocks, whilst the remainder were built with timber and roofed with corrugated iron sheets, as shown in Figure 4 below. These houses represent the homes of those farmers who were growing *Jatropha* as a cash crop.



Figure 4 Jatropha growing farmers and their houses

Source: Author's field data observations

In addition, only 20% of the represented households had access to electricity, whilst seven of the fifteen homesteads visited were using solar energy, since they had solar panels on their roof-tops. The remaining five homesteads which grow Jatropha, had neither electricity nor solar panels and thus, presumably, they were using kerosene for lighting. Despite the villages being located in a Jatropha producing area, no household confirmed the use of Jatropha oil for their daily lighting. Although Jatropha oil is not being used in the two villages, information from the Ministry of Agriculture (MOA) and the Green African Foundation (GAF) indicated that small-scale processing and domestic use of Jatropha oil is being implemented at Msambweni and Mpeketoni Villages located in the coastal province.

Furthermore, all fifteen households of farmers growing Jatropha had modern furniture, such as sofa sets and coffee tables, with 67% of the represented households having electronic equipment, such as television and radio. In addition, four of the women farmers interviewed wore jewellery, thus confirming that they may have a stock of jewellery within their household. The most noticeable or commonly used tools observed included a hoe for weeding and a machete for slashing. This was evident from the casual labourers found working on several Jatropha farms. The presence of oxen with animal ploughs in seven homesteads indicates that the farmers were using animals for ploughing. Table 3 below shows the assets of households growing Jatropha and those not growing Jatropha.

HOUSEHOLDS GROWING JATROPHA			HOUSEHOLDS NOT GROWING JATROPHA	
ITEMS	NO. OF HOMES	PERCENTAGE	NO. OF HOMES	PERCENTAGE
Block/brick houses	9	60%	2	13%
Timber houses	6	40%	3	20%
Corrugated roofs	15	100%	15	100%
Mud houses	0	0%	10	67%
Sofas and coffee tables	15	100%	5	33%
Televisions and radios	10	67%	5	33%
Electricity	3	20%	1	7%
Solar energy	7	47%	0	0%
Kerosene	5	33%	14	93%
Oxen and animal plough	7	47%	5	33%
Hoes and machetes	15	100%	15	100%
Jewellery stocks	4	27%	0	0%

Table 3 Households physical assets owned by farmers – in Nchiiri and Kagaene villages, who grow Jatropha, compared to those not growing Jatropha.

Source: Author's field data observations

In addition to the data gathered from farmers growing Jatropha, there was also the opportunity to observe what type of physical assets were owned by farmers not growing Jatropha. A similar observation scheme was used to mark the assets of the non-Jatropha growers. Top of the list were their houses. Figure 5 below show typical houses owned by farmer's not growing Jatropha.



Figure 5 Houses of farmers who do not grow Jatropha.

Source: Author's field data observations.

The homesteads visited, where the farmers were not growing Jatropha, all confirmed that they have heard about Jatropha. They said they have heard about the crop from agricultural extension officers who have been collaborating with non-governmental organisations that had been visiting farmers in the region. As seen in Table 3 above, the majority of the households visited which are non-Jatropha growers, appear to have fewer assets than those who do grow Jatropha. Whereas 60% of the households that grow Jatropha have houses built with block and bricks, only 13% of the households visited which do not grow Jatropha have homes built with blocks or bricks. On the other hand, 67% of the houses of non-Jatropha growers are semi-permanent (mud houses), whilst none of the households visited, which grow Jatropha have semi-permanent buildings.

Furthermore, household's furniture that signifies wealth or a secured livelihood, such as sofa sets, coffee tables, radios and televisions were only available in five homes. It is likely that these farmers were not yet ready to engage in risky agriculture, when they were not sure of the financial returns. As will be discussed later in the discussion chapter, the majority of the farmers who have ventured into the growing of Jatropha, already have their livelihoods secured. Most of them have alternative sources of income and thus they can afford to take the risk of growing a crop that has not been officially popularised by the government, but rather by non-governmental organisations.

5.4 Human capital

Human capital has been described by Duncombe as skills and knowledge that rural people have and use, in order to pursue their livelihood strategies. In addition, human capital encompasses the factors of labour and health, which can be vital in the pursuance of a livelihood. Therefore, under human capital this study focuses on presenting information gathered in the two villages, in regards to labour, education, skills and health.

5.4.1 Labour

Information on labour gathered from the sample farmers who grow *Jatropha*, indicate that the production of *Jatropha* involves all family members in a household at varying points in time (see Table 5). Information regarding what particular time members of their household were more involved was obtained from the interviewed farmers and this was converted into the seasonal calendar shown below in Table 4. However, it is important to acknowledge that this information may be biased, since neither gender nor ages were considered during the interviews. For example, in cases where men were interviewed, they spoke on behalf of every member (women and children) of the household.

Farm activities	Involved members of the household [Male (m); Female (f); Children (c)]
Ploughing	m
Planting	m
Weeding	f/c
Pruning	m
Harvesting	c/f
Shelling and drying	f/c

Table 4 Seasonal calendar for the production of *Jatropha*

Source: Author's field interviews

The study employs a five point scale measuring tool, in order to estimate labour availability in all households visited. This exercise reveals that Jatropha production has increased labouring hours for all family members in these households. This occurs at different periods during the production. For example, men are usually busy during the time of planting and pruning, whilst women and children are normally involved during weeding, harvesting, shelling (removing of husks) and drying. Table 6 below shows results obtained from the interviewed farmers who grow Jatropha regarding the labour changes on members of their households. It is evident that Jatropha growing has increased labouring hours for all family members. However, women seem to be the most affected as 11 interviewed farmers indicated that women workload has increased a lot. This may have a negative impact considering the women have to work more hours in the farm and still do their household chores as required. Children as well may be affected despite not missing school spending much of their time on farming activities may negatively impact on their education.

Labour change in households	Men	Women	Children
Increased a lot	7	11	10
Increased a little	1	3	2
No change	7	1	3
Decreased a little	0	0	0
Decreased a lot	0	0	0
Total number of farmers interviewed	15	15	15

Table 5 showing labour changes in Jatropha growing households

Source: Author field data interviews

All farmers interviewed affirmed that, indeed, there is ‘a lot’ of work required during the periods of planting, weeding and harvesting. Four farmers, who have planted Jatropha since 2004 and who have plantations of over two acres of land under Jatropha, indicated that during

the busy periods they are sometimes forced to hire labour from their neighbours on a casual basis, to assist them in either weeding or harvesting the seeds. Figure 6 below shows casual labourers I encountered on a *Jatropha* farm in Kagaene village.



Figure 6 Casual labourers working on a *Jatropha* farm.

Source: Authors field data observations.

Considering that labouring hours for farmers and members of their households have increased as a result of *Jatropha* production, it was important to establish how the farmers manage this increased demand for labour. Apart from hiring labour, the other option open to farmers is by a reduction of their labouring hours in other farming activities, or they have less leisure time. In addition, their children could reduce their time for play or studying, in order to make up for the increased labouring hours. However, during the field research, these conclusions were only reached on the basis of mere speculations, since the study did not investigate exactly how farmers make up the increased labouring hours needed.

5.4.2 Education

This study did not contact formal institutions in order to verify levels of education in the two villages, but rather it relied on informal information provided by the farmer participants. This was considered to be a more reliable source of information regarding children's education in the villages, unlike formal institutions such as schools and government offices, which might

hold records of children attending school, when in fact they were not attending schools.

All the farmers interviewed (Jatropha growers and non-Jatropha growers) indicate that they have managed to send their children to school. This was not necessarily as a result of the income they received from the sale of Jatropha, but in some ways the Jatropha income had contributed towards their children's education either through paying of tuition fees, buying of school uniforms or other materials that supported their children in school.

I used some of the money I got from selling the seeds to buy my children school uniforms and books, my harvest was not much, but some other farmers who had larger harvests got more money and used it to pay school fees for their children. (Farmer Participant No. 1).

Five interviewed farmers stated that, since the start of free primary education in Kenya in 2002, most people do not want to take their children to public schools because of deteriorating academic standards. They have, therefore, opted for private schools, in order to give their children a better education. The selling of Jatropha in some ways had assisted them to either buy school uniforms or pay tuition fees charged at these private schools. One Jatropha farmer has also started a private school in her home, in order to cater for the demand of many parents opting for private schools for their children in the region.

I started this school because many farmers are opting to take their children to private schools. My friends who grow Jatropha have their children in my school too because they have an extra income from the sale of Jatropha. Since people started buying these seeds the parents are usually very punctual in paying school fees and I never have to send their children home because of delayed payment (Farmer Participant No. 2).

My observations relating to the absence of children in both Jatropha growing households and non-Jatropha growing households during the day, and my occasional encounter with children dressed in school uniforms coming home for lunch to the homesteads I visited, confirmed that the children did indeed attend school.

From the interviews conducted with the farmers regarding education, it would be possible to conclude that the sale of *Jatropha* seeds had definitely contributed to the educational needs of the children in the two villages. The farmer's acknowledgement that they certainly use the money they obtain from selling *Jatropha* seeds to pay school fees and, buy items that support their children in school, and/ or send their children to private schools, is an indication of the positive impact of the *Jatropha* trade on expanding a household's access to education.

However, there were concerns that compelled an inquiry regarding school children being involved in the harvesting and drying of *Jatropha* seeds. Akin (2009) for example, stated that, children from poor families may often feel obligated to look for work due to the economic hardships they encounter at home. This may mean that school children leave school to start working in *Jatropha* farms. This has already happened elsewhere in the region, where many children have left school to work on farms that produce khat, which is another cash crop produced in the region. Nonetheless, the interviewed farmers refuted this claim and one participant, who was asked about this situation, commented:

I don't think Jatropha can make our children run away from school. The seeds do not require picking on weekly basis like the picking of khat twigs; therefore there is no any foreseen possible threat of the crop causing education disruption in the region for school going children (Farmer Participant No.7).

5.4.3 Skills acquired

Farming skills are an important aspect of any agricultural endeavour. In the area of this study, these skills are normally achieved through a prolonged period of engaging in the production of particular crops, or through a series of seminars conducted by agricultural extension officers, non-governmental organisations and other interest groups connected with agriculture. The sample of 15 interviewed farmers who all grow *Jatropha*, acknowledged that they have been in constant contact with extension officers and non-governmental officers regarding the growing of *Jatropha*.

The extension officers also confirmed that they conduct seminars and demonstrations for all interested farmers about Jatropha growing, and the processing of oil from the seeds using local technologies. The farmers who do not grow Jatropha also confirmed that they have attended seminars on Jatropha conducted by extension officers and non-governmental organisations, and that they have been educated about the importance of Jatropha and its potential to increase their incomes.

The farmers who grow Jatropha stated that the officers educated them on ways of improving the production of Jatropha, and ways of intercropping it with other crops. They have shown them the proper propagation of Jatropha (for example - spacing) and informed them about the crops that would do well when intercropped with Jatropha and also the correct maintenance of the crop until its maturity. My main contact during this study was an extension officer in the area and he stated:

Farmers in these areas always thought that Jatropha was a wild crop since they have had it for many years. They considered it as a crop that could just grow wildly without proper propagation. It is through seminars that many have come to learn that Jatropha is now a domesticated crop that requires proper tending just like any other crop in order to get a good yield. (Official, Participant No. 5).

The photographs below in Figure 7 show some Jatropha oil and a lamp that the agricultural extension officers use to educate farmers during seminars and demonstrations.



Figure 7 Samples of Jatropha bio-diesel and an oil lamp used for demonstration in seminars run by extension officers

Source: Author's field data interviews.

5.4.4 Health

This study would have benefitted from an in-depth survey of health issues regarding the local people, since this area has been impacted on by *Jatropha*. However, as indicated previously, due to a limit on research time, I just had to rely on general interviews with farmers to elicit some information on how *Jatropha* has been used as a medicinal herb to improve or maintain their household members' health.

The interviewed farmers stated that they do not only rely on dispensaries and clinics for their health needs but they also use traditional herbs for treatments. One important herb used for healing cuts and wounds is *Jatropha* sap, which has been used for a long time. One farmer stated that he has used *Jatropha* sap as a herb to heal wounds since 1982 from his 28 year old tree. Another farmer stated:

I have had these plants for a very long time and what I know about it is that I use the plant as a fence and the sap to treat cuts and wound. I have never known any other use for it. (Farmer Participant No. 18).

The *Jatropha* sap has only been used domestically by local people. It does not require any processing, since it can be manually squeezed from the leaves and the stem with little effort. Therefore, *Jatropha* in the region has existed long before the hype of bio-fuel began in Kenya and now it can be seen that it not only being grown for sale as a bio-fuel – it also has other uses for the local people.

5.5 Social capital

Social capital is described as the existing relationship between family members and the wider community surrounding them. This can be developed through either horizontal or vertical networks, membership of formal groups or through relationships of trust and reciprocity (DFID, 1999). This research dwells mostly on the horizontal links/relationships within the villages visited, because Turton, (2000) has indicated that horizontal links (which represents the social networks, and solidarity relationships within a community) are commonly used when analysing

the sustainable livelihoods of rural people, since they are the basis for providing informal safety nets within a community. Therefore, it is important that this study lays more emphasis on the family and their immediate community, since they are the representatives of units that may provide assistance in times of distress.

5.5.1 Social relations between small scale farmers in Meru district

Prior to any analysis of the social capital in a community, it is important to understand that measuring any community's social capital, as an outsider or non-local researcher is a daunting task. Usually to understand social capital in a community requires analysing a community over a lengthy period of time (DFID, 1999). Nevertheless, this study was keen to investigate the social relationships that existed between small-scale farmers who grow *Jatropha*, the farmers who do not grow *Jatropha* and the general community, within the two villages visited during the study period.

As mentioned previously, a great deal of emphasis has been put on the horizontal networks of social relationships. In this study, the degree of reciprocity that existed between the farmers was tested. From the interviewed fifteen farmers who grow *Jatropha*, all indicated that there had been a positive change in their relationships with their fellow farmers who grow *Jatropha*. Generally, the relationships had improved and this was indicated by the willingness of the interviewed farmers to share farm inputs, such as seeds, fertiliser and ideas, on how to improve the production of *Jatropha* and market opportunities for selling the seeds.

On the other hand, in regards to the relationships that existed with farmers who did not grow *Jatropha* most interviewed farmers stated, that there was no discrimination when it came to assisting one another in the village, whether the farmer grows *Jatropha* or not. They all helped each another during times of need, especially in regard to farming matters or in times of grief. One *Jatropha* farmer commented:

When it comes to helping one another in the village I normally don't discriminate, those who grow this crop with those who do not grow the crop, if someone needs my help I just help him as a neighbour not because he grows Jatropha or not. We have always had good relationships in the village even before people started selling this seeds and that is not about to change because some of us have decided to grow Jatropha and others not. (Farmer Participant No.10)

According to the information obtained from the above respondent, it appears that Jatropha growing has had no particular or noticeable impact on the way farmers interact with others in the community. This is because their social relationships have always been of mutual assistance, even before Jatropha came along. However, despite some of the farmers claiming that Jatropha had initiated some positive impacts on their social relationships within the community, others did not express the same sentiments. One disgruntled farmer believes that the buyers (who were mainly their fellow farmers) have exploited them:

I am disappointed because the extension officers from the agricultural office knew that the buyers were buying the seeds at a lower price but they did not do anything about it. I am angry because I put a lot of effort in preparing my seeds and eventually losing them cheaply to other people, I never even got paid for some of the seeds and I blame the agricultural officers for this (Farmer Participant No. 12).

All 10 farmers who were not Jatropha traders expressed similar sentiments. These farmer were indeed annoyed, not only with the agricultural officers but also with their neighbour who doubled as buyers. This indicated some loss of trust between neighbours and this situation could negatively impact on the social relationships that exist in the community. Although none of the farmers openly stated that the new Jatropha trade had deteriorated their social relationships, it could be argued that for some farmers, the expanding and marketing of Jatropha had negatively affected social relationships in the region. In hindsight, therefore, it would be true to conclude that the growing of Jatropha or rather the local trading in Jatropha has increased levels of mistrust between farmers.

5.6 Natural capital

Natural capital is defined as natural resources stock that occurs naturally in the environment. It consists of a wide variety of resources, ranging from intangible goods, such as soil and air quality to tangible assets such as trees, land and water (DFID, 1999). In this section of the study, an assessment of the impact of growing *Jatropha* on the area's natural capital is examined, the intention being to determine how the growing of *Jatropha* has influenced the acquisition of natural resource capital (especially land) and soil quality by small-scale rural farmers in Nchiiri and Kagaene villages.

5.6.1 Land holdings and acquisition

From the 15 interviewed farmers in this study who grow *Jatropha*, in regards to land ownership and acquisition, the majority of the farmers owned land that averaged one acre to three acres. Land in these villages is individually owned and people can acquire it through buying or, leasing or paternal transfer. 13 of the interviewed farmers stated that they were being cautious about expanding their plantation of *Jatropha* and one commented:

I am very careful when planting these Jatropha trees. I don't want to put all my land under Jatropha at the expense of other crops that I can easily sell at the market. Jatropha can bring more money compared to maize in this region but the problem is that we don't have regular buyers of the seeds. They show up at times but sometimes they don't. Even some farmers still have unsold seeds in their houses right now because no one is interested in buying the seeds anymore. (Farmer Participant No. 9).

Due to the unreliability of the markets, the majority of the interviewed farmers acknowledged that they were not yet ready to increase the area of land they used for the *Jatropha* crop. This was a result of them realising that most of their seeds were bought at a lower prices than the real price. Many were disappointed with this occurrence and therefore, they were not willing to increase the area of land they used for *Jatropha*.

However, those farmers who doubled as traders had a different story to tell. This is because these farmers made extra profit from the sale of Jatropha. As mentioned previously, many farmers had been deceived into selling their seeds at 20kshs while the buyers sold them on for 70kshs per kilogram. It is noted that no clear information from reliable buyers was sent out to farmers regarding Jatropha prices.

The trade was indeed carried out in secrecy by the few middlemen, who were interested in making more profits from the farmers, who were not well informed on the price of Jatropha seeds. It is clear that these middlemen gained more from the trade at the expense of many farmers, who at the time of doing this study were very disgruntled. One farmer/trader, who was interviewed, confirmed that the Jatropha business was very profitable for him:

There was a period when I didn't have any money and I had made a down payment on a piece of land and I was unable to pay for the remaining amount of money. I almost lost the piece of land but when the people who were buying Jatropha approached me to buy for them the seeds from the farmers I knew I would get enough money to pay for my piece of land, because the farmers did not know the prices that the buyers were offering. Therefore I decided to lower the prices from 70ksh to 20ksh per kilogram. This gave me a very big return that I managed to pay off my piece of land and even roofed my house with new iron sheets. (Farmer Participant No. 6)

Another farmer had managed to buy sixteen acres of land with profit from the Jatropha trade. His employee who manages his farm confirmed that this farmer had actually acquired the land with the money he got from Jatropha.

My boss has bought up sixteen acres of land from the selling of this seeds. He started planting Jatropha in 2004 and up to now the whole of his farm has only Jatropha trees. I manage the farm for him and also buy Jatropha seeds from other farmers for him that he sells in bulk. (Farmer Participant No. 3)

However, the farm employee could not tell me where his employer takes the seeds and efforts to reach the farm owner were unsuccessful because he does not live in the village.

One farmer, who is very optimistic about Jatropha, planted one acre and she has now leased three more acres to plant more Jatropha (see Figure 8). She intends to use part of the plantation as a demonstration plot for educating other farmers who might be interested in growing of Jatropha. Although she has a relatively young crop, she thinks the bio-fuel industry has a bright future in the region and she believes that policies being put together will enable farmers to have better economic terms than the ones that currently exist.



Figure 8 One farmer who has decided to expand her Jatropha crop

Source: Authors field data interviews

5.7 Soil Quality: Minimising soil erosion

Meru North district lies at the bottom of Mount Kenya and the terrain of the land is hilly and very susceptible to landslides and massive soil erosion. The participant farmers stated that they have often lost productive top soil during rainy seasons. Water from the hills easily washes away soils to lower lands and often the soils usually end up in rivers. This has been a major problem for farmers. However, some of them have discovered that Jatropha can act as an efficient barrier to flood water and therefore protect the soil. A number of interviewed farmers, who are living on steep slopes and who are facing the risk of soil erosions have now taken up the growing of Jatropha so that it can act as a barrier to protect loose soil from being washed away. A farmer who grows Jatropha for this reason stated:

These trees have assisted me in protecting my land against flood waters from up the hills, and since I started using Jatropha trees as barriers my land has remained fertile and I am able to harvest a good crop. Initially water just ran through my farm carrying away the soil and crops but now it has not happened for quite a long time. Almost everybody in the village is now using Jatropha to protect their land from being eroded and we can sell the seeds from the trees too. (Farmer Participant No.4)

This confirmed why the majority of the farmers were growing their Jatropha trees across their land and not parallel with the slopes and this situation was also observed in a couple of farms situated on the nearby Nyambene hills.

5.8 The impact of Jatropha growing on small-scale farmers' food production in Meru North district

This section of the study analyses the impact of Jatropha on food production within the two villages presented. It is important to note that small-scale farmers in developing countries play a significant role in food production. Part of the food supplied to urban areas is usually produced by the many small scale-farmers living in the country-side and more importantly, it provides for the subsistence needs of rural dwellers. There is, therefore, a possibility that a major imbalance in food production may occur in these areas, considering that most of the farmers are now being encouraged to turn to non-food energy crops or to divert their food crops and land to bio-fuel crops.

Land is a valuable asset to small-scale farmers but it is limited. In the two studied villages the majority of small-scale farmers own between one acre and three acres of land that they use to produce food crops. In order to determine the impact of Jatropha growing on food production in these two villages, a five point scale was used to determine how food production has increased or decreased, for those farmers who are now growing Jatropha as a cash crop. The findings clearly suggest that a large majority of the farmers felt that growing Jatropha had no impact at all on their growing of food crops. Table 6 below illustrates responses from farmers in the two villages regarding the impacts of Jatropha on their food production. From the table it is

clear that Jatropha has not had an impact on food production in the region as many would expect with regards to previous experiences with non-food cash crops.

Change in food production	Number of farmers	Percentage
Decreased a lot	1	7%
Decreased a little	0	0%
No change	14	93%
Increased a little	0	0
Increased a lot	0	0

Table 6 Response of farmers in regards to Jatropha growing and food production

Source: Author's Field data interviews

There were several non-governmental organisations collaborating with agricultural extension officers in the two villages where this study was conducted and they have encouraged farmers to grow Jatropha as a cash crop. However, the farmers are quite cautious about the idea of growing the crop, as a dependable cash crop to earn income:

I cannot turn my whole land into growing Jatropha because I have a family that depends on this land for food; therefore I am usually very careful when it comes to expanding the Jatropha crop on my land. The market too has not been good therefore I would rather not have a big plantation at the expense of maize or beans, having it as a hedge or mixed with other food crops is much safer for me. (Farmer Participant No. 5)

The above comments expressed by one of the farmers that who grows Jatropha explains why 93% of all farmers, who participated in this study stated that there has not been any changes in food production since they started growing Jatropha. In the two villages, Jatropha has existed for over thirty years and it was mainly planted as a live hedge to fence off the farmers' pieces of land. Farmers have, therefore, decided to continue planting the crop as a hedge, apart from

six farmers who have decided to have it as a plantation. The farmers grow *Jatropha* around their farms and partition portions of land for different crops using *Jatropha*. This system has enabled them to have a *Jatropha* crop from which they can harvest a substantial amount, without it interfering with their acreage under food crops. This mode of growing *Jatropha* has been praised by different interest groups, since it does not compromise the acreage of food crops, whilst it still enables farmers to earn money from it and at the same time assists in barricading the farmers' land against livestock, as shown in the photographs below in figure 9.



Figure 9 *Jatropha* used as hedging

Source: Authors field data observations

In addition, the farmers who have decided to plant *Jatropha* as a cash crop on their land are doing so cautiously. They are intercropping *Jatropha* with other varieties of food crops such as, maize, cassava, black peas, beans, potatoes and a range of diverse vegetables such as kale, cow peas, cabbages, spinach and traditional vegetables (see Figure 10). This form of agriculture has enabled them to continue harvesting their food crop as usual and thus, they are not compromising their food supplies. This has been made possible through proper planting, in order to allow for other crops to be grown on the same piece of land.



Figure 10 Jatropha being intercropped with other food crops and vegetables

Source: Authors field data observations

One important factor that has made farmers cautious is the fact that Jatropha does not yet have a reliable market in the region. There are uncertainties amongst farmers about future markets for their crop. Thus, most farmers are being extra careful when it comes to planting as a means of generating income. However, those who have decided to have the crop as a plantation (and not just as hedging) are optimistic that the marketing of the crop will be developed in the near future,

I believe that this crop will soon be in very high demand. Many people especially the poor will have to turn to Jatropha oil as the prices of fossil fuels keep on going up. Their only hope for cheaper oil will be to use bio-fuels. (Farmer Participant No. 2).

Reviewing this sub-topic on the bio-fuel - food production nexus, it is factual to state that food production is an important factor for small-scale farmers and converting food crop land into entirely bio-fuel crop land may pose serious impacts to the livelihoods of small-scale farmers in future. It could become worse if the bio-fuel industry continues without any reliable market chains, in addition to unpredictable prices and policy frameworks that cannot protect small-scale farmers. Despite the research not finding any evidence for this, in future food shortage may occur as a result of majority of farmers converting to energy crops.

5.9 Summary

This chapter has analysed small-scale rural farmers' livelihoods in the Meru North district through the use of the Sustainable Livelihoods Framework. The main aim was to assess how Jatropha growing, as a cash crop, has impacted on the livelihoods of farmers in this district. The information gathered and presented here demonstrates that the growing of Jatropha has had impacts on the livelihoods of the farmers at different levels. The positive impacts of Jatropha have been realised in the following livelihoods aspects.

The financial capital of the farmers has improved relatively, since 80% of the interviewed farmers confirmed an increase in their income at various levels. Assets have also been acquired as a result of the improved income status of these farmers. From the 80% of farmers who confirmed this increase in income, a number have bought domestic animals, such as goats and cows, whilst others have obtained farm inputs. The aspect of human capital investigated also shows a positive improvement, especially regarding access to education and educational materials for their children. The interviewed farmers confirmed that they were able to purchase school materials, such as books, pens and uniforms and even pay their children's school fees from the income they received from selling Jatropha seeds. Natural capital features also show a positive impact, since farmers who doubled as traders confirmed the acquisition of assets from the sale of the Jatropha seeds such as the purchase of land. In addition Jatropha has enabled farmers to minimise soil erosion on their land and thus improving the soil quality of their farms.

Nevertheless, some negative impacts on these farmer's livelihoods were also noted during the time of the study. Issues regarding social capital have been negatively impacted upon by the expansion and marketing of Jatropha. Farmers had begun to lose trust in their neighbours, who were acting as middlemen during the time of the Jatropha trading. This was related to the secrecy of information regarding the price of the Jatropha seeds that then led to many farmers feeling cheated or defrauded of their crop.

On the other hand, the food aspect did not experience any type of impact. As expected, food shortages had been anticipated during this research, as established by the literature. However, farmers in this district are very cautious when it comes to interfering with their food production. They have adopted a mode of production that does not interfere with their food crop land. This has, therefore, ensured that the farmers are not threatened by food insecurity, whilst they pursue the production of Jatropha as a cash crop. The following chapter explores and presents the second and third research questions findings on the impact of Jatropha on the wider rural community and the Jatropha entrepreneurs within the region.

Chapter 6

The impact of *Jatropha* growing on the wider rural community and local entrepreneurs of Meru North district

6.1 Introduction

This chapter focuses on the second and third research questions: *The impact of Jatropha farming on the wider rural community and the impact of Jatropha on entrepreneurs involved in the Jatropha trade*. Information regarding these participants was collected through interviews conducted with NGOs, government ministries and local *Jatropha* farmers, who also double as traders. The information gathered, in regards to *Jatropha*, demonstrates that there have been impacts on the rural communities surrounding the *Jatropha* producing areas and also on local traders. Some of the aspects considered were job availability, and opportunities which have been created as a result of growing *Jatropha*, in addition to the use of the plant as a barrier to soil erosion in the region which has already been discussed, (refer to Chapter 5).

The aspect of state-owned or public physical capital is also analysed in this section. This is because assets regarded as public or state-owned are supposedly meant to benefit the whole community and not only the individual farmers who grow *Jatropha*. Therefore, the potential impact of *Jatropha*, as a cash crop, on physical assets such as schools, hospitals, and roads is assessed. Furthermore, the chapter discusses the impact of *Jatropha* on local *Jatropha* traders in the region. A simple *Jatropha* value chain has been constructed in order to identify the entrepreneurs.

However, as will be discussed, the *Jatropha* value chain in the region is not elaborate and/or it has not been fully developed, some key participants in the value chain could not be reached, despite the obvious ongoing trade. Therefore, the study focuses on the available traders identified and they include seedling sellers and middlemen, who were basically some of the

farmers that had contact with the buyers who were not able to be reached during the time of the field research.

In order to establish the impact of Jatropha on the wider rural community and entrepreneurs, I interviewed one key participant from the Ministry of Energy, who is in charge of renewable energy and one person from the Ministry of Agriculture, who is in charge of emerging crops. Representatives of two local non-governmental organisations and one community based organisation formed the second set of participants. The study also involved two agricultural extension officers at Nchiiri, five farmers who also doubled as traders and one participant from the Kenya Forestry Research Institute (KEFRI).

6.2 The impact of Jatropha on the rural community of Meru North

Jatropha has been grown in the Meru North district for over three decades - this was even before the publicity of it being a potential feedstock for the production of bio-fuel. Since the late 1990s or early 2000s, however, community based organisations and non-governmental organisations who are collaborating with agricultural extension officers in rural areas have been at the forefront of popularising and encouraging farmers to cultivate Jatropha as a cash crop for bio-fuel. This is because of the presumed benefits that bio-energy crops could bring to small-scale rural farmers and general wider communities. The Kenyan government, on the other hand has been sceptical about the possibilities of bio-energy crops bringing supposed benefits to small-scale farmers, as indicated by many NGOs. This is evident as participants from the Ministry of Agriculture and Energy distanced themselves from the idea of popularising Jatropha in rural areas when asked about it.

6.2.1 Employment opportunities

The literature that has been published by various non-governmental organisations in Kenya indicates that growing Jatropha as a cash crop, has the potential to provide employment opportunities for rural people. Therefore, this aspect is at the forefront of this study.

Information gathered from 15 farmers who grow *Jatropha* in the two villages, indicated that there is often a great deal of work in the production of *Jatropha* and sometimes hired labour is required.

For those of us who have the crop on our land as a plantation, a lot of labour is required during the time of planting, pruning, weeding and harvesting, while those farmers who have it as a hedge during the time of pruning and harvesting is the main period when they require labour assistance. (Farmer Participant No. 2)

Four farmers confirmed that indeed they are compelled to hire labour from the local community to assist them during the busy periods when a great deal of labour is required. Children have also been used as pickers of the seeds but they are generally family members and friends who are willing to help.

Harvesting of these seeds is very demanding and requires a lot of people to do it. The good thing is that it is easy to pick the seeds from the trees and even children can do it. I therefore sometimes ask my children to come with their friends and help me pick the seeds. (Farmer Participant No. 12)

Furthermore, the 15 farmers who do not grow *Jatropha* offered the same opinion when asked what type of benefits they thought *Jatropha* would bring and, all 15 farmers indicated that *Jatropha*, as a cash crop, has the potential to provide employment for local people. These responses from different farmers were confirmed, since several workers were found working on *Jatropha* farms within the two villages. One casual worker found on one of the *Jatropha* farms stated:

*I normally come here for work, my neighbour grows these trees and sometimes I assist him in weeding, pruning, picking the seeds and spraying. I have worked here for the last five years since he started growing these trees in 2004. (Casual labourer found on a *Jatropha* farm).*

A field officer from Green Africa Foundation also stated that,

Jatropha has provided employment opportunities in rural areas especially in Meru North where I have done my surveys, farmers confirmed to me that indeed they require more labour at certain periods. For example during harvesting time they get assistance from hired labour from the local people, and this has enabled many youths who are jobless to get some form of income in the area. (Official Participant No. 4)

This was also confirmed by several farms visited, where a number of casual workers were found tending to Jatropha farms in the two villages. Figure 11 below shows photograph of a woman found working as a casual labourer on a Jatropha farm, during the time of the study.



Figure 11 A casual labourer on a Jatropha farm

Source: Author's field data observations

However, despite several NGOs such as the Green Africa Foundation and the Vanilla Jatropha Foundation arguing that Jatropha provides employment opportunities for the rural population, key ministries in the government still state that Jatropha, at the present time, has not developed well enough to have an impact on job opportunities in rural areas. Information gathered from a key participant in the Ministry of Energy's Department of Renewable Energy, indicated that job opportunities are minimal:

I agree that Jatropha is capable of providing job opportunities in rural areas, but this can only happen if these regions have well developed processing plants for the seeds, but since the government has not yet set up any plant at the moment I would say the only jobs that may be available are farm jobs which are normally casual and seasonal. (Official Participant Ministry of Energy, Department of Renewable Energy Resources No.2)

These same sentiments were echoed by the Ministry of Agriculture participant:

Farm job opportunities are there but still very minimal, the main reason being the crop at the moment is facing a lot of resistance from the farmers due to the unreliability of the markets and lack of sufficient information sent out to the farmers regarding Jatropha. (Official Participant Ministry of Agriculture, Department of Emerging Crops No.1)

The Ministry of Agriculture participant attributed this to the rapid action of most NGOs, who she believed had popularised the crop without involving a main government ministry. She stated that NGOs were quick to encourage and convince farmers to grow Jatropha by providing incentives such as seeds but they never informed the farmers as where they could sell their Jatropha seeds after they had harvested them. Figure 12 below summarises the benefits of Jatropha some of which were researched in this study and some that were not dealt with in the study.

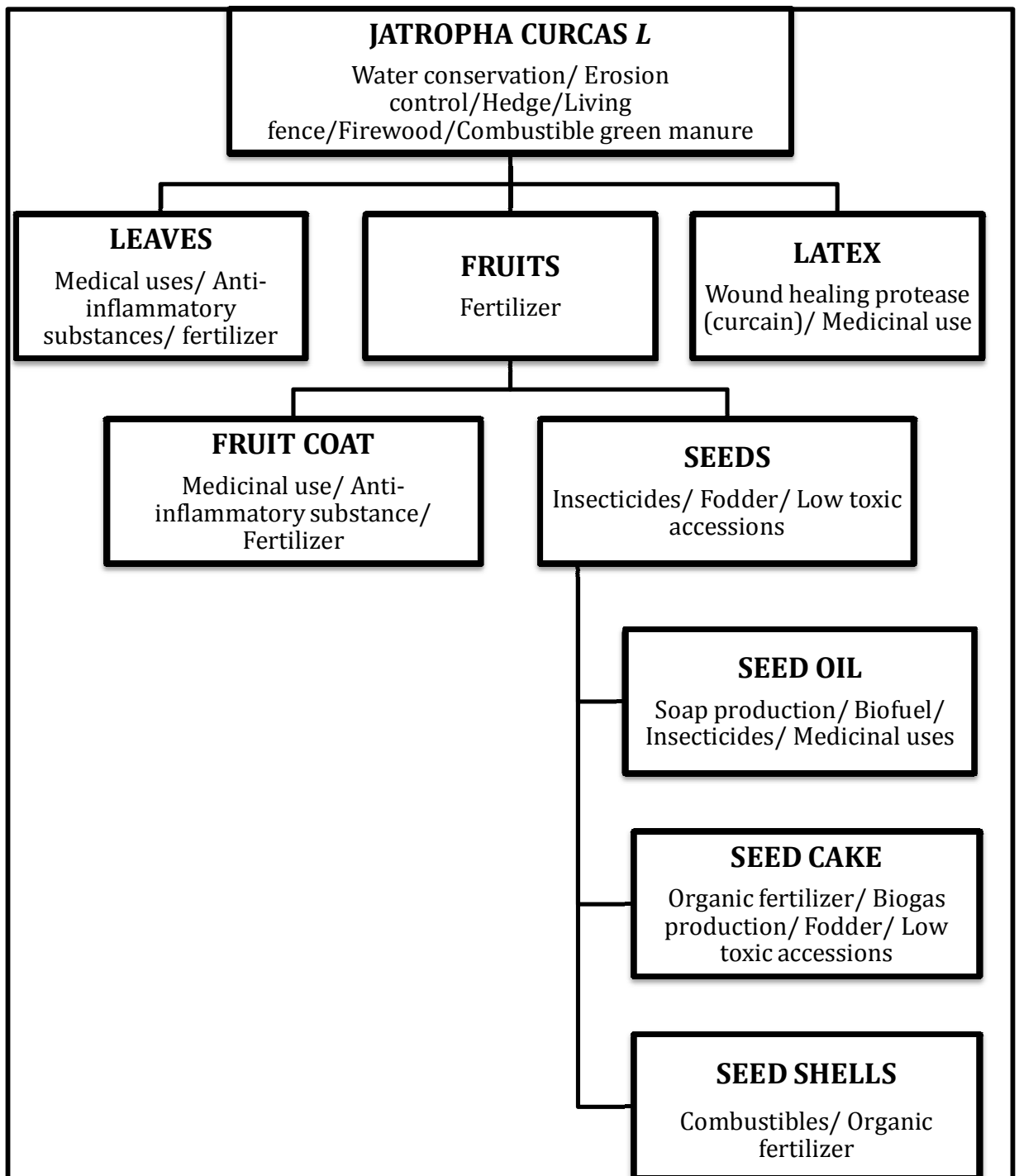


Figure 12 A summary of *Jatropha* benefits .

Source: Adopted from Gubits *et al* 1999.

6.2.2 Infrastructure development and maintenance

The physical capital considered in this is research comprised of infrastructural assets, such as schools, clinics, energy, water points, and the roads in the two villages, which are state/ publicly owned. The villages visited had well developed schools, clinics, electricity and piped water. However, it was difficult to ascertain whether the region's well developed public infrastructure was related to the *Jatropha* trade. Based on interviews conducted with the Ministry of Energy and Agriculture informants, it was clearly stated that the impact of the *Jatropha* trade in the region and the whole of Kenya, in general, were very minimal. A participant from the Ministry of Agriculture stated:

Jatropha has not had an impact on the public assets that you see in these areas that are growing Jatropha as a bio-fuel. It takes a long time for a cash crop to have an impact on these facilities and Jatropha has only been grown as a commercial cash crop since 2005. Therefore we do not expect any impacts on these facilities until after ten to fifteen years. In fact I doubt it because Jatropha is facing a lot of resistance from farmers, as many are not willing to take up the crop as a cash crop. (Official Participant No. 1)

Indeed, the interviewed farmers stated that no recognisable impact had been seen on these facilities but some farmers were optimistic that, in future, there is going to be an impact. One farmer/ trader said,

I believe that the growing of this crop is going to have an impact on schools, as many parents enrol children in schools because of the income they are getting that can support their children's education and a demand for more schools will arise, and therefore the government and private sectors will eventually develop new schools to accommodate these children. (Farmer Participant No. 2)

Overall, the research did not find any evidence or suggestion that there was a direct link or proof that the *Jatropha* trade had actually contributed to the infrastructural development of these facilities in the area.

On the other hand, despite the region having the aforementioned well developed infrastructure, the road network in the two villages is still dilapidated. The majority of the roads, apart from the highway, are all earth roads (rough roads). At the time of this research, the roads were being graded (see Figure 13 below) but still no one could link the road's construction to the trade of Jatropha in the region. This is because rural roads are often repaired at intervals of between three to four years and the repairs encountered, during this study, may have been a mere coincidence with the normal road repairs undertaken by the council. However, some of the farmers speculated that this maintenance might have been due to the area's potential in producing cash crops, not only Jatropha but also khat:

I believe the county council of Meru North is going to start repairing these roads more often if the region continues to produce cash crops. The khat business is attracting a lot of traders and they come with big vehicles that need good roads. If Jatropha too becomes popular and many traders start coming in, road construction will be the first priority of the council in order to keep the trade going on. (Farmer Participant No. 15).



Figure 13 State of the road between Nchiiri to Kagaene while they were being graded

Sources: Field data observations

Despite the optimism of some farmers that the production of Jatropha, as a cash crop, will

eventually lead to infrastructural development in the area, this may only succeed if Jatropha becomes a well sought after crop. This may be achieved through the involvement of the government, if it installs processing plants that would create a constant demand for the Jatropha seeds.

6.3 The impact of Jatropha trade on local entrepreneurs

In order to assess the impacts of Jatropha on local entrepreneurs, it is important that the study first identifies these entrepreneurs. Any trade or form of organised business requires a complete value chain that distinctively identifies key participants within the trade. Therefore, a well developed Jatropha value chain would be comprised of the following entrepreneur's producers (seedling sellers, farmers), processors (bio-fuel extractors) marketers (distributors, retailers) and consumers as shown in Figure 14 below.

THE JATROPHA VALUE CHAIN

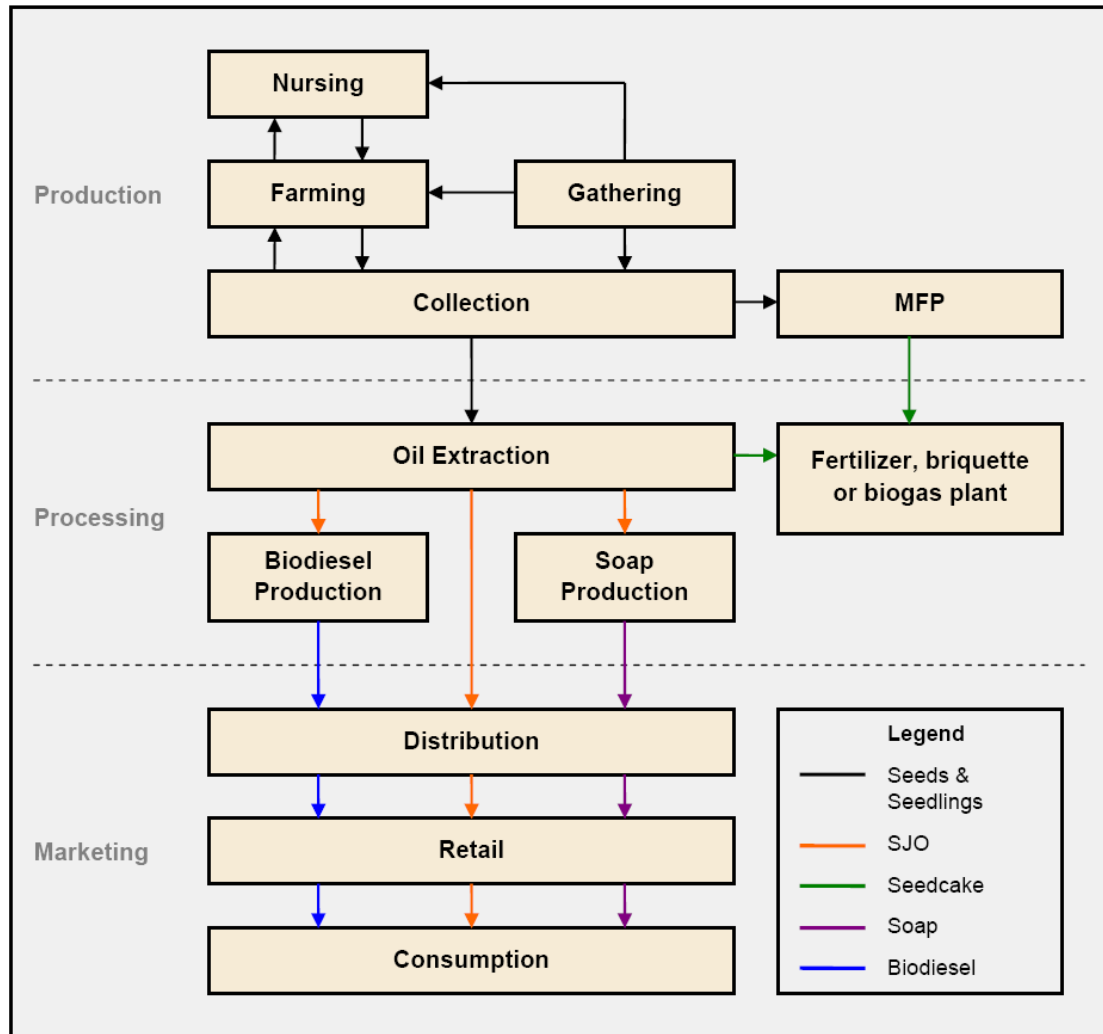


Figure 14 Jatropha value chain

Source: Adopted from Messemaker 2008.

However, the Jatropha trade in Kenya does not exhibit such an elaborate value chain, as required of any trade. Throughout the research study, it was difficult to identify distinct groups of people that would make up a complete value chain. The parties identified by the researcher

and categorised as entrepreneurs were the seed sellers, and a few buyers who were generally doubling as farmers and traders. Apparently, there were no selling or buying points located in the two villages, as would be expected in any form of organised trade.

An observation carried out within the villages failed to reveal any demarcated places for buying *Jatropha* seeds. Information from local farmers confirmed that no such locations existed. Farmers, who had their seeds for sale, would carry them to the homesteads of the buyers within the village. In other cases, farmers who also acted as traders would send out their farm employees on bicycles, to buy the seeds from the village. This action confirmed the lack of visible transport networks for the villagers' products.

On the other hand, however, the khat trade in the region is quite well organised, since all the participants can easily be identified, including transport networks and selling points within the two villages. One reason why the khat trade is more organised could be that khat has existed as a cash crop for a very long time, and there is high demand for the product, which has a large market in the neighbouring countries of Somalia and Ethiopia.

Since there was a lack of distinct or visible *Jatropha* traders it was important to determine how the trade was being carried out within the two villages. The first entrepreneurs that the researcher was keen to interview were the seedling sellers. This group is mainly comprised of non-governmental organisations. In this particular region Green Africa Foundation (GAF), in collaboration with the area's agricultural extension officers had established nursery seedling plots for *Jatropha*, which they sold at subsidised prices to farmers or made available free of charge to farmers who were interested in growing the crop. Apart from these GAF plots, there was one women's group (known as the Nchiiri Women's Group) that had established nurseries to raise seedlings for sale, but they abandoned the project after a few months. The chairwoman of the group interviewed stated:

*At the beginning every farmer in the region was enthusiastic about growing *Jatropha* because of the benefits the NGOs and agricultural officers were telling people about. The people who had these trees with seeds had sold them and made a lot of money out*

of it. Therefore many farmers were interested in growing the crop not just as a fence but as a cash crop. I therefore initiated the project with my women's group with the help of agricultural extension officer. After the first year no farmers were again interested in planting the trees therefore we abandoned the project. We never got to sell any of the seedlings we just left them in the garden and whoever wanted could take them for free (Official Participant Chairwoman of the Nchiiri Women's Group, No. 7).

Nowadays, the distribution of seedlings in the region is particularly being undertaken by NGOs. Farmers who want to plant *Jatropha* are obtaining seedlings of the local variety free of charge. Exotic varieties from India and Tanzania, which are presumed to produce more oil, are being sold at 10 shillings a tree. Figure 15 below shows photographs of seedbeds established by GAF, at the division's agricultural offices in Nchiiri.



Figure 15 Seedbeds of *Jatropha curcas* at Nchiiri agricultural offices in Meru North district

Source: Authors field data observations

The other group of entrepreneurs that the study managed to identify were the middlemen or brokers, who acted as buyers of the seeds. This group of people were mostly farmers who had their own *Jatropha* crop, but they also had contacts with other people who had an interest in obtaining the *Jatropha* seeds from farmers. Information gathered from NGOs and extension officers reveal that these buyers gained a great deal of cash through their involvement in the *Jatropha* trade.

Several farmers that were trading in this crop that I know made profits out of the business as some have confirmed to me that they have acquired property such as land from the money they made from the trade (Official Participant No. 5)

Two NGOs responding to this question indicated that traders made money out of this business. Similar sentiments were expressed by the agricultural extension officers interviewed. In order to verify these claims, two farmers/traders were interviewed and they confirmed that they did indeed benefit a great deal from the *Jatropha* trade. An employee of a farmer/trade interviewed on one of the *Jatropha* farms stated:

My boss has made a lot of money from this seeds, he has this two acre plantation of Jatropha but during the time of harvest he sends me out to buy more seeds from other farmers and he takes them to a place I don't know. He has even bought several pieces of land and I am sure it is through the money he gets from the seeds that has enabled him to buy these pieces of land (Farmer Participant No.3).

Another farmer/trader confirmed that he made 'a lot of' money from the trade, since the farmers did not know the exact price of the seeds.

That house you see there was built from the money I got from the sale of the Jatropha seed and I have a piece of land too bought from that money (Farmer Participant No.6).

As mentioned previously it was impossible to identify all participants in the *Jatropha* value chain in this region. This study intended to interview transport people, pesticide sellers, and money lenders but unfortunately the majority of these people were not able to be traced within the region.

6.4 Summary

This chapter has evaluated and presented data gathered in the field regarding the impact of *Jatropha* on the wider rural community in the Meru North district, and this has included information from local entrepreneurs engaged in the *Jatropha* business. It is certain that the

local community has been impacted upon by the production of Jatropha. This has included job opportunities in the region. Several casual workers encountered on Jatropha farms confirmed that Jatropha had provided some form of employment for local people.

The use of the Jatropha crop as a soil erosion barrier has also had an impact on the local community, to some extent. Farmers and the local people living on the slopes have confirmed that Jatropha acts as a suitable barrier for protecting loose soils from being washed away easily by flood waters as explained in Chapter 5, and (as a result) they have been able to restore their farm's soil fertility. On the other hand, the physical infrastructure development analysed in the region indicates that the area has well developed infrastructures, such as schools and hospitals but none of these developments could be linked to Jatropha farming or trade.

The road network was not as well developed as other public facilities, since the majority of roads are still made from earth, apart from the main road. During the time of this study there were some road repairs and maintenance going on but this could not be linked to the Jatropha trade. Nonetheless, there was some speculation from a few farmers that, if Jatropha became popular in the region, it would bring about infrastructural development and especially road networks, which are essential for the transportation of products.

Furthermore, the chapter has assessed the impact of Jatropha on local entrepreneurs. The study identified seedling sellers and local middlemen as the target group below the entrepreneurial level. NGOs, such as GAF and Vanilla Jatropha foundation have been at the forefront of the distribution of seedlings to farmers. Whilst local people have not taken up the idea of selling seedlings, one women's group had been interested in venturing into the business but they discarded the project after most farmers lost interest in growing Jatropha, due to the uncertainty of the markets.

On the other hand, farmers who double as middlemen have indicated that they have benefitted from the trade and the few that were interviewed confirmed that they have acquired valuable assets from the profits they have received from the Jatropha trade. Some farmers have managed to buy pieces of land, whilst others have built and renovated their

houses, with money from the Jatropha trade.

The following chapter presents the discussions and conclusions of this study. It is based on information gathered in the field and it also reflects on the research questions of this study and the literature reviewed in Chapters 2 and 3.

Chapter 7

Discussions and conclusions

7.1 Introduction

This thesis examined the impact of cash crop farming by small-scale rural farmers, as a means or tool for rural livelihood improvement and rural development in Kenya. The main aim of the study was as follows:

*To understand how the growing of *Jatropha curcas* L in rural areas, by small-scale rural farmers influences the five assets of sustainable livelihoods.*

This chapter seeks to answer the three research questions posed at the beginning of the study. These three questions formed the basis of this study and they were formulated with the intention of fulfilling the study aim of this research:

1. What is the impact of *Jatropha* growing on the five assets of sustainable livelihoods and food production, of small-scale rural farmers in Kenya?
2. What are the consequences of *Jatropha* growing on the wider rural communities in Kenya?
3. What is the impact of *Jatropha* growing on marketing parties, such as commercial investors and /or entrepreneurs in the *Jatropha* value chain?

This chapter thus focuses mainly on attempting to place the key findings highlighted in Chapter 5 and 6 within the wider literature, whilst reflecting on the key issues mentioned in the literature reviewed in Chapter 2 and 3. This focus will further answer the research questions outlined in Chapter 1, which guided this research study.

7.2 Overview of the research findings highlighted in Chapters 5 and 6

The small-scale farmers, who were interviewed about their livelihoods and how they had been impacted on by the growing of *Jatropha*, indicate that, *Jatropha* had both negatively and

positively impacted upon them. The positive impacts were noted in the farmer's financial capital, since the majority (80%) of the farmers who grow Jatropha for sale, indicate an increase in their income at various levels since they began engaging in Jatropha production as a cash crop. A minority (20%) of the farmers interviewed on the impact of Jatropha on their income stated that they had not had any changes in their income since taking up Jatropha growing as a cash crop. However, those who indicated that they have had an increase in their incomes, note that they have acquired some type of physical assets from the sale of Jatropha, thus confirming a positive financial impact from the growing of Jatropha.

In an analysis of the physical capital available to farmers, the study notes that both farmers who are growers and non-growers owned physical assets. However, the farmers who were engaged in Jatropha production as a cash crop tended to have more physical assets than the non-Jatropha growers. Through a critical evaluation of this phenomenon, the study concludes that the farmers who had more physical assets for example, better quality houses are more likely to engage in the production of new cash crops such as Jatropha, whilst the farmers with less physical assets are cautious when it comes to involvement in new cash crop production. This is due to the uncertainties and risk within crop markets that may be faced by farmers, meaning those who are most vulnerable because of having fewer assets won't risk trying a new cash crop.

An impact on human capital is also noted. There has been an increase in family member labour for the farmers who produce Jatropha. All the farmers interviewed confirm an increase in the labouring hours required during pruning, weeding and harvesting, and this situation sometimes requires hired labour. It is evident that the increased labour burden falls heavily on women as they have to work more hours on farms and still carry out their household duties. It is also noted from the interviewed farmers that Jatropha growing has led to an increased access for education to their families. These farmers indicate that they are now able to pay school fees and buy materials that support their children in school, such as books, pens and uniforms, from the extra money received from the Jatropha trade. In addition, the farmers'

knowledge and skills in regards to agriculture have been improved as a result of the frequent seminars, related to crop production, conducted by agricultural extension officers and non-governmental organisations.

Some of the negative impacts noted since the beginning of Jatropha growing amongst the rural farmers in the Meru North district, were related to the social capital aspect. Although it was not explicitly stated by the interviewed farmers that their social capital had deteriorated, some farmers who also traded in Jatropha lost trust in their neighbours. Several farmers hold the view that neighbours who doubled as farmers and traders had bought seeds from them at very low prices. They believed that farmers doubling as traders took advantage of farmers who only produced Jatropha and who were less informed or aware of the actual market prices for Jatropha seeds. This has angered many farmers and whilst being interviewed they expressed some form of animosity and mistrust towards their neighbours, regarding the Jatropha trade in the region.

However, more positive impacts have been felt by the farmers within the natural capital domain. Farmers who have fared well in the Jatropha trade reveal that they had managed to acquire natural assets, such as land, from the money they obtained from the Jatropha trade. Following this situation, several of the farmers interviewed showed more interest in increasing their land acreage under Jatropha, through the leasing of more land. The farmers and the wider rural community had also managed to restore their soil fertility by using Jatropha as a barrier to soil erosion in the region. This clearly indicates that, indeed, Jatropha growing in rural areas has increased natural capital/ assets but also an inequality amongst farmers, since those who have managed to succeed in the trade were then able to acquire more assets.

Food supply in the Meru North district has not been impacted upon by the production of Jatropha as a cash crop. As expected, bio-fuel crops have been seen as a possible competitor with food production, thus causing food insecurity. However, the farmers interviewed in this study (regarding this particular issue) note that there have been no major shortages in the region's food production, the main reason being that farmers have adopted sustainable ways of

producing this cash crop which do not undermine food production even though the workload of women has increased. These methods include mixed cropping and planting the crop along boundaries, as a hedge. This has ensured their acreage of land under food production is not compromised and therefore their food supply is maintained.

Regarding the impact of Jatropha on the wider rural communities surrounding the Jatropha producing regions, evidence shows that Jatropha growing has increased job opportunities within these regions. Jatropha farmers confirm that they hire labour from local people to assist them during periods when a great deal of labour is required: during pruning, weeding and harvesting. The crop has also become popular with local communities that are under threat of soil erosions and landslides in the region, since it is a satisfactory soil protector. The Jatropha crop has been quite effective in this way and farmers in this region have been able to restore their soil fertility somewhat within the hilly regions of Meru North.

Regarding the issue concerning the impact of Jatropha on local entrepreneurs, the study notes that the Jatropha value chain in Kenya, at the moment, is not sufficiently detailed to distinguish participants clearly. Nevertheless, the study has identified middlemen who act as farmers and traders. This group confirms that Jatropha has had a positive impact on their financial assets, since all those farmers who also acted as traders interviewed indicated that they had managed to acquire various properties with the profits obtained from the Jatropha trade.

7.3 Discussion of Research Question 1

What is the impact of Jatropha growing on the five assets of sustainable livelihoods and food production of small-scale rural farmers in Kenya?

The literature examined in Chapter 2 of this thesis, as indicated by various authors such as Jayne (1994) suggests that small-scale farmers can improve their livelihoods by shifting from the traditional growing of food crops, to the growing of cash crops. However, this notion has been contested by Omamo (1998), who claimed that the shift to cash crops from food crops alone, is not sufficient enough to improve small-scale farmers' livelihoods. This is because where the majority of these farmers are living in arid and/or semi arid areas, the climate do not

support rain-fed agriculture. Therefore, authors, such as Grass (2009) and Muchiri (2008) have argued that the shift to cash crops is important but farmers should also consider turning to the production of energy crops, which are presumed to be resistant to harsh climatic conditions and more productive, compared to food crops.

Authors such as Jumbe, Msiska and Mhango (2007), have further stated that farmers in developing countries should take up the advantages of the bio-fuel industry, which has now gained popularity with the increasing demand for bio-energy crops. The proponents of the industry believe that countries in the sub-Saharan region, such as Kenya, have a comparative advantage when it comes to producing energy crops, since they have sufficient resources such as suitable land and a favourable climate which they can use for the production of energy crops (GOK & GTZ, 2008; Hazell & Pachauri, 2006).

This has, therefore, led to a number of non-governmental organisations and other interest groups encouraging farmers to grow energy crops, such as *Jatropha* (Tomatsu & Swallow, 2007). This crop has been well supported, since it is deemed to have potential benefits that could improve small-scale rural farmers' livelihoods. Authors, such as Muchiri (2008) and Tomatsu and Swallow (2007), have stated that *Jatropha* is capable of increasing farmers' incomes; creating employment in rural areas; enabling farmers who are food insecure and dependent on relief food to achieve food security; and lastly it can bring energy security to rural areas, which for many years has proven to be elusive.

The findings in the field research presented in Chapter 5 regarding the research question were guided by the sustainable livelihoods framework discussed in Chapter 3. A focus has been placed on the five pillars of the sustainable livelihoods framework, as presented by the asset pentagon in Figure 3 (page. 64) and food production. The five rural livelihoods aspect in the asset pentagon are comprised of financial, human, social, natural and physical assets. The results revealed that assertions of some such as the UN (2007), that bio-energy crops may offer new streams of income to rural farmers have been supported by evidence obtained from the field. This literature asserts that farmers' incomes are bound to increase if they take up the

growing of energy crops. Indeed these sentiments have been proven, since up to 80% of the farmers who grow *Jatropha* confirm an increase in their total income, which has contributed to their financial status.

The improvement in the financial status of the farmers interviewed has enabled them to acquire various physical assets. This ranged from tangible assets, such as domestic animals and farm inputs, such as fertilisers and seeds, to materials that support their children in school. These support claims stated in Govereh and Jayne's (2003) work, which asserts that, by the taking up of non-food cash crop growing, small-scale farmers may be able to have access to other farm inputs, which can then assist them in the production of food crops, such as maize and beans.

Some farmers who acknowledge that they have had an increase in their income, also confirm that the extra income from the sale of *Jatropha* has enabled them to send their children to schools (especially private schools), since they can now afford to pay the school fees charged by these schools. Others farmers, who have also earned extra income from the trade, indicate that they now have a source of income that assists them to buy materials to support their children in school, such as school uniforms, pens and books. The farmers who appear to have fared well in the *Jatropha* trade, especially those who also act as traders, confirm that the trade has enabled them to acquire natural capital assets. A number of farmers/traders indicate that they have managed to buy and/or lease extra land from the income they have received from the *Jatropha* trade.

While the majority (80%) of farmers who grow *Jatropha* indicating that they have had a positive financial increase in their income, 20% of them indicate that the growing of *Jatropha* has not had any positive financial implications for them. All these farmers were mainly producing *Jatropha* and they did not act as traders, so therefore, this may have been the cause of them not benefiting in the same way as their counterparts, who also acted as traders. This could confirm the works of, Bodigger (2007) who claims that, if the establishment of the bio-fuel industry is not implemented correctly, all the benefits may be diverted to the already

richer parties, rather than to the small-scale rural farmers.

In addition, not all the livelihoods aspects mentioned in Chapter 5 saw positive impact. Negative impacts were noted on the social capital aspect of the farmers living in the region, which has been assessed as being a result of the expansion of the *Jatropha* trade. During the time of the field survey, a number of farmers indicated a deterioration in the level of trust with their neighbours, since the majority of them acted as middlemen in the *Jatropha* trade. Several farmers felt that they had been cheated into selling their seeds at lower prices, due to their lack of information relating to the standard price of *Jatropha* seeds. They believe that the traders did this intentionally, since official information, regarding the price being obtained for the crop, had not been communicated to them in advance. Local traders, who were also farmers in the region, thus took advantage of this situation and obtained seeds from their colleagues at much cheaper prices.

The farmers in the field research also indicated that their labour requirements had increased as a result of producing *Jatropha* for sale. This supports arguments put forward by Hazell & Pachauri, (2006) that bio-energy crops are indeed labour intensive and they may stimulate a demand for hired labour in rural areas. Farmers with *Jatropha* plantations indicate that they are forced to hire labour during the labour-intensive periods, as shown on the seasonal calendar in Chapter 5. On the other hand, labour demands for household members have also increased, as shown in Table 4 (page. 73). Households producing *Jatropha* now have their family members working more hours than when they produced only food crops. Since the crop is labour intensive, those households, which cannot afford hired labour, make use of their family members during these labour intensive periods of which the study concludes that this increased labour demands has fallen heavily particularly on the women.

The nexus between bio-fuel and food

Sweeping claims made by sceptics of the bio-fuel industry, regarding the negative impact of bio-energy crops, suggested these crops will have adverse effects on the production of food, especially in rural areas. Evidence from the field contradicts statements made by many authors

and other critics of the bio-fuel industry, such as Pesket et al. (2007), who have strongly claimed that a shift by rural farmers, from food crops to bio-fuels crops, may lead to food shortages in rural areas. The results obtained in the Meru North region show that over 97% of the farmers interviewed (regarding the issue of bio-fuels competing with food production) indicate that their food crops have not decreased since the farmers began engaging in the production of *Jatropha* as a cash crop. This has been made possible through farmers adopting more sustainable agricultural systems of producing these energy crops, as suggested by GOK and GTZ, (2008) and having women work more .

There was no impact on families growing food crops because most of the farmers have opted to intercrop *Jatropha* with food crops, or they have grown *Jatropha* as a hedge on their farm boundaries, as outlined in the works of Tomatsu and Swallow (2007). This has, therefore, made it possible for the farmers not to interfere with their acreage of land under food production. This clearly demonstrates that if bio-fuels are produced on a small scale with approved means, they will not compromise food crop land, nor will food shortages be experienced. This is contrary to claims by a number of bio-fuel critics such as Hill et al. (2006), who claims that, there is no way the current production of bio-fuels could make an impact on the global consumption of fuels, without also having a negative impact on food production.

7.4 Discussion of Research Question 2

What are the consequences of *Jatropha* growing on the wider rural communities in Kenya?

Rural poverty, in many developing countries of the sub-Saharan Africa, has been partly caused by the dependence of the rural population on subsistence farming in a situation aggravated by a constant rise in rural population density and a diminishing of agricultural land (C. Gladwin et al., 2001). This has led to many rural people being entrenched in poverty because there are not many options available to them to improve their living conditions. Job opportunities are scarce in rural areas, and many rural people have tried to overcome this situation by migrating to urban areas where they hope industrial jobs can be secured. However, due to mass migration

to cities, many cities are now unable to accommodate more migrants and/or provide employment for them. The creation of job opportunities and/or income generating activities in rural areas has therefore, become an important endeavour for many governments in developing countries.

The proponents of the bio-fuel industry have suggested that the growing of bio-energy crops by rural people could have the potential of creating highly needed job opportunities and/or activities that could generate income for rural households. This is because bio-energy crops are labour intensive and require a great deal of labour during production (Ugarte, 2005). This could compel farmers to hire labour from the local communities within their areas, thus creating job opportunities either within the farms or in processing plants but also pushing women into working more hours. The bio-fuel industry has also been viewed as one that could open up investment opportunities for rural people to engage in income generating activities within rural areas.

Results obtained from the Meru North district, indeed, indicate that the production of *Jatropha* as a cash crop requires a great deal of labour. This supports arguments made by Hazell & Pachauri, (2006), regarding the labour intensity of these bio-energy crops. The farmers interviewed, stated that during planting, pruning, and harvesting periods there is a need to hire labour from the local community, in order to manage the work. This, in turn, has created employment in the area, since several labourers found on *Jatropha* farms confirm that they do earn a living from their neighbours who grow *Jatropha*. In verification of these statements, an investigation into labour changes certainly confirmed that *Jatropha* has increased labouring hours for all the family members and especially women in a household. This has, however, not negatively affected the household's food growing/ security and their children's education.

Apart from job opportunities, *Jatropha* also offers other opportunities to the communities authors such as Gubitz, Mittelbach, and Trabi (1999), have outlined other potential uses of *Jatropha*. They state that *Jatropha*, which is easily propagated from either seedlings or stem cuttings, has commonly been used as a hedge to protect farmers' fields, since it is not browsed

by domestic animals, such as cows, sheep and goats. This was confirmed by several of the farmers interviewed, when they acknowledged that, indeed, they use the crop for fencing their farms. This was also visible during observations around the villages. Almost all the farms around the two villages visited in the Meru North district had *Jatropha* cultivated around their homes.

In addition, Heller (1996) has stated that *Jatropha curcas* in rural areas is often used for controlling soil erosion in areas that are hilly and prone to landslides and soil erosion. These sentiments expressed by Heller are supported by the information gathered in the field, since all the farmers, the local people and the agriculture extension officers interviewed in the region regarding this issue acknowledged this fact. The growing of *Jatropha* in the Meru North district as a soil erosion barrier is essential to the local community since the district terrain is quite susceptible to erosions and landslides.

In addition, Duke (1985) and Heller (1996) further stated that *Jatropha* had also been used traditionally as a medicinal plant. These arguments were confirmed by the information collected from the field, since the local people in the district stated that they use the plant's sap to treat wounds and cuts. Apparently, *Jatropha* has other uses, which were not investigated during the time of the study, but these have been researched by several authors, as shown in Figure 12 (page. 96) as indicated by Gubitz et al.(1999).

In addition to potential benefits, such as improved incomes and the acquisition of natural capital (such as land) by rural households/farmers and soil protection, for which the field research found some evidence, the proponents of *Jatropha* crop as a bio-fuel also suggest that the wider community could benefit from *Jatropha* growing, as a result of the crop's ability to expand job opportunities and income generating activities and also to improve infrastructure. However, the field research did not find evidence to support arguments made by Ugarte (2005), regarding the development of infrastructure on public or state owned facilities. This author argued that investment in bio-energy crops by rural farmers would lead to infrastructural development in a rural region. Despite the region having well established facilities, such as schools and dispensaries, it was difficult to ascertain that *Jatropha* growing had contributed to

the development of these facilities. This was again confirmed by officials from the Ministries of Energy and Agriculture, who acknowledged that Jatropha, at the present time, has not had any impacts on the state-owned infrastructural facilities in these areas. They suggest that the impact of any cash crop is usually felt on these facilities after the crop has been grown for an extended period of time: at least ten years. They believe that Jatropha has the potential to contribute to facility development in future. The local community also offers the same views that, in future, Jatropha production would eventually have an impact on these facilities but only after the crop gains popularity and is adopted by more farmers similar to other cash crops in the region, for example, khat or coffee.

7.5 Discussion of Research Question 3

What is the impact of Jatropha growing on marketing parties such as commercial investors and /or entrepreneurs in the Jatropha value chain?

A major contributing factor to the deterioration of rural livelihoods in developing countries is the inability of the rural population to engage in income generating activities. Proponents of the bio-fuel industry have suggested that Jatropha growing has the potential to enable rural population to venture into entrepreneurial activities, which could assist them in generating income (UN, 2007). This would occur through the buying and selling of Jatropha seeds within the community and/or selling the seeds to larger business entities that process Jatropha into biodiesel.

In the Meru North district (and Kenya in general) the bio-energy enterprise has not developed as other agriculture industries, such as coffee and tea. The Jatropha value chain in this region is still not sufficiently developed, since important key participants are missing from the chain. Using the simple value chain analysis provided in Chapter 6 in Figure 14 (Page 100), the producers and local traders who acted as middlemen in the chain are clearly identified. However, the chain appears to be missing processors or end users of the Jatropha products in the Meru North district as at the time of the study I was not able to reach them.

Research studies carried out by Kalua, (2008), of the Green Africa Foundation (GAF), indicated

that several international organisations are working with local farmers in the production of bio-energy crops and the processing of the seeds. However, information received from the farmers in Meru North indicates that the processing plants have not yet been established in the district, unlike in other district such as Msabweni. This were also contradictory to views expressed by the UN, (2007) suggesting that the processing of bio-fuels is being undertaken in rural areas (as is the case of Meru North district) and thus creating more entrepreneurial opportunities in rural areas. Therefore, this situation confined the study to only analysing the few traders, who were generally farmers who doubled as middlemen.

The results obtained from the field suggest that, indeed, the few identified *Jatropha* traders in the region had made significant positive economic gains from the *Jatropha* trade. Several traders interviewed confirm that they have managed to acquire properties and assets from the money generated by their *Jatropha* business. Several middlemen indicate that they have bought land, whilst others have repaired their homes with the money obtained from the trade. This supports literature by the UN, (2007) which argued that bio-energy crops have the capability to improve the financial status of rural traders. Despite these positive impacts noted about the entrepreneurs, the lack of processing plants in rural areas, which could increase opportunities for the local traders and the community in general, has limited the supposed stimulation of the rural economy, as anticipated by authors such as Boddiger (2007).

7.6 Issues surrounding the bio-fuel industry in Kenya

The bio-fuel industry in Kenya has had varied results since the introduction of bio-energy crops. It was expected that farmers would take up the growing of such energy crops as cash crops because of their presumed potential to enhance the financial capabilities of rural farmers and rural communities, which would transform into improved livelihoods. However, since the introduction of *Jatropha* in 2005 the crop has not gained as much popularity as expected. The farmers did not readily accept the growing of *Jatropha*, as they did with other cash crops such as coffee or tea. During the time of this research study, key government officials in charge of energy and agriculture revealed that *Jatropha*, is at the present facing a great deal of resistance

from the farmers.

Field interviews revealed some of farmers' concerns. These issues included that the farmers were not ready to dedicate most of their land and time into the mass production of *Jatropha* because there was the problem of market unreliability for the crop's product. Many farmers complain about lack of a stable reliable market with controlled prices, such as that for other agricultural products such as maize and beans. These farmers state that the buyers only show up at particular times and sometimes not at all. As a result, this leaves farmers with stock piles of their products that they have worked hard to produce for such a long time. This was evident, since some farmers still had the *Jatropha* seed, which they had harvested several months previously. This situation is worrying to many farmers because they cannot rely on it for their livelihood survival. Hence, many have resorted to not having the crop as a dependable cash crop on a plantation, but rather they use it as a hedge, in the manner in which it has been traditionally grown.

The lack of reliable markets for *Jatropha* in Kenya has led to many farmers selling their seeds to middlemen for low prices. This has been exacerbated by a lack of involvement from the government side to intervene and set standard prices for the seeds. During the time of the study farmers raised concerns as to why the government was reluctant to intervene on this issue.

A visit to the Ministries of Energy and Agriculture revealed that there was a tussle between the two ministries regarding *Jatropha*. The Ministry of Agriculture state firmly that *Jatropha* farmers are facing problems of market unreliability and price fluctuations because of lack of action by the Ministry of Energy. It was claimed that the Ministry of Energy had not made any effort to develop or support private sector initiative that could develop processing plants, which could offer the farmers reliable market for their products. However, the Ministry of Energy officials explained it would be premature to establish processing plants or support the establishment of plants by the private sector because not enough farmers in the country are growing *Jatropha*. The Ministry of Energy fears that a possibility of shortage in raw materials could arise and thus they believe it is the duty of the Ministry of Agriculture to popularise the

crop and to ensure the production is high enough to convince the Ministry of Energy to build processing plants, or to attract private investors to assist in the development of processing plants.

The tussle between these two ministries and a lack of any private sector to venture into the bio-fuel industry in Kenya has left farmers who already grow the crop, in a dilemma. A question arose as to why the farmers were encouraged to grow *Jatropha* before there were proper plans in place for the processing of *Jatropha*. The Ministry of Agriculture lays the blame for the current *Jatropha* situation on both local and international non-governmental organisations. The Ministry of Agriculture claims that NGOs took up the mandate of popularising and advocating for bio-energy crops to rural farmers, without involving or consulting government ministries that are in charge of agriculture and energy. This was done hurriedly, without any proper consultation, since many NGOs are being driven by the international agenda for energy security, climate change and sustainable development (Tomatsu & Swallow, 2007). It is suggested that the NGOs, therefore, took to the popularising and advocating for bio-energy crops in rural areas because of the financial gains to these NGOs, through donor funding organisations, which came with these projects. Farmers, on the other hand, were quick to respond because of the incentives they were receiving from these organisations, in the form of free or subsidised seedlings and fertilisers. However, they did not inquire about the eventual market for the crop, since many believed that the NGOs would provide the markets for their products.

Despite an uncertain future for the bio-fuel industry in Kenya, at the time of this study, encouraging information on the development of the industry was obtained from the Ministry of Energy and the Energy Regulatory Commission of Kenya (ERC). A key informant in the Ministry of Energy's department of renewable energy resources stated that the government had allocated funding in the 2010-2011 financial year budget for the Ministry to establish two processing bio-fuel plants: one in Makueni district in Eastern province and another one in Mpeketoni, at the Coast province. The Energy Regulatory Commission and the Ministry of Energy had both (at the time of the study) set up a Bio-fuel Board that was working on formulating policies, which will govern the industry in future, relating to the production and

processing of bio-fuel in Kenya (a set of policies is attached in Appendix 6).

7.7 Conclusions

This research has showed that some elements of cash crop farming of energy crops could be capable of improving rural livelihoods. Despite several challenges experienced by small-scale farmers in Meru North district of Kenya, whilst pursuing cash crop farming of Jatropha the livelihoods of some farmers (especially those who were also traders) has improved. The wider rural community has also seen some form of positive impact, especially in the employment domain. Aspects of financial, human and natural assets (as demonstrated in the assets pentagon of the Sustainable Livelihoods Framework) show positive impacts from the growing of Jatropha for some grower/traders, but far less for those who only engage in the growing of Jatropha. Some notable potential negative impacts on the expansion of the Jatropha trade were observed in relation to the social capital of the farmers, this being a reduced trust amongst farmers in the region.

Part of the field findings, from the study carried out in the district, supports claims made by Govereh and Jayne (2003) that cash crop farming may provide solutions to rural poverty. This is due to the spill-over effects, which they believe could benefit both the farmers and the communities in general. Some farmers confirm these assertions, as they indeed indicate that they have used financial gains received from the sale of Jatropha to buy farm inputs, which have assisted them in the production of other crops.

Positive impacts are further noted in the natural and human asset domains of these farmers and both farmers and local traders confirm that they have been able to purchase or lease more land from the money obtained from the Jatropha trade. Furthermore, their children have been sent to school with the extra income received from the Jatropha trade. Farmers have acknowledged using money obtained from the Jatropha trade to pay school fees or to buy materials that support their children in school. Local people, on the other hand, have been able to secure jobs on Jatropha farms, as casual labourers.

Apart from the positive impacts on financial, human and natural capital which have been experienced since the emergence of *Jatropha* as a cash crop, other non-monetary impacts have also been felt by the Meru North community. Locals in the district have used *Jatropha* to prevent soil erosion on their land and they also use it as a medicinal herb to treat wounds and cuts. Moreover the crop has been traditionally used as a live hedge to fence their farms, since *Jatropha* is not browsed by domestic animals.

However, the positive impacts noted within the rural farmers' livelihoods and the wider rural community of Meru North district were not felt by all farmers. It is evident that the majority of the farmers, who were engaged in *Jatropha* growing, were not the poorest in the community. This is revealed through the assessment of the physical assets owned by households that grow *Jatropha* as a cash crop, compared to those households that do not grow it as a cash crop. Farmers who grow *Jatropha* tend to own more physical assets, such televisions, radios, sofa sets and coffee tables, which may signify wealth within rural areas. On the other hand, observations on farmers who did not grow *Jatropha* as a cash crop reveal that most of them had less physical assets signifying wealth.

This lack of assets, such as televisions, radios, sofa sets and coffee tables in a rural household, is usually an indication that the household is poor. Therefore, if the cash crop farming of new cash crops, such as *Jatropha*, is to be used as poverty alleviating strategy, in this study it has failed to achieve this aim. This is because the poorest small-scale farmers in the district were unable or unwilling to engage in the production of *Jatropha* as a cash crop, in order to improve their livelihoods, because of the uncertainties and/or problems related to the crops marketability. This confirms claims made by Boddiger (2007) who states that without balancing and making equitable the complex agricultural structures that continue to favour a rich small group by diverting all benefits to them, the bio-fuel industry will not benefit the majority of poor farmers. This has indeed been confirmed in the study conducted in the field, since the relatively richer farmers are the ones who are venturing more into the bio-fuel industry, rather than the less wealthy farmers. This will eventually lead to the bio-fuel industry most likely bringing prosperity to a few richer farmers, whilst the small-scale rural farmers continue to

struggle with their problems of poverty and food insecurity.

This research has, considered and highlighted instances of improved livelihoods, which verify that the growing of Jatropha as a cash crop for bio-fuel is capable of improving rural livelihoods. Several cases of improved livelihoods have been noted from statements made by the farmers interviewed during the course of this research study, particularly if farmers combined the growing of Jatropha with trading. However, several issues have to be addressed, in order to ensure that the industry becomes more profitable for the poorest people within rural populations. The involvement of the poorest farmers in rural areas is important, if any impact is to be made on rural poverty. This could be made possible through the government's involvement in creating markets and establishing processing plants for Jatropha products. The government should also set policies to govern the industry, since it would be an important way to encourage national and international firms to venture into the industry.

7.8 Future research undertakings

During the time of this research study, several issues of concern and of great importance came to light. However, due to the limited time of the study these issues could not be fully explored. Therefore, some suggestions for further research in these areas are worth mentioning.

One of the areas which raised concerns during the time of this study was the idea of establishing large scale Jatropha producing farms in Kenya and the impact it would have on the rural population. The Ministry of Agriculture revealed that several NGOs have leased land in Kenya in order to grow Jatropha on a large scale. Jatropha Energy Kenya has established approximately 92,000 Jatropha seedlings and it plans to cultivate over fifty thousand acres of Jatropha in the Mangarini district. Vital Bio-energy, on the other hand, has also leased up to seventy thousand acres of land (to grow Jatropha) from Agriculture Development Corporation (ADC) land, at a low coastal area near Galana.

This form of large scale cultivation of Jatropha will impact on the environment, the local people and small-scale farmers. Therefore, an investigation into the economic, environmental and

social consequences of such large scale Jatropha farming would be worthwhile. It would be important to establishing whether this type of farming could lead to more economic opportunities for rural people, or if it will merely lead to more economic opportunities for the already rich investors, thus by-passing the rural population and small-scale farmers.

Research into the Jatropha value chain would also be worthwhile. This study noted that Jatropha trade is taking place in the Meru North district, but none of the traders or farmers could trace where their products finally end up. In addition, neither could end products be traced. This was attributed to many national and international investors not being willing to publicly declare their involvement in the bio-fuel industry in Kenya, since (at the time of this study) the country did not have policies governing the industry and its investors. Now that policies are being drafted, it would be worthwhile to investigate whether any changes have taken place in regards to the value chain and also whether investors have indeed openly declared their investment in the industry. During the study, it was evident that Jatropha growing was heavily impacting on women in terms of labour provision. An investigation into how this phenomenon has affected the rural women is worth exploring.

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Appendices

Appendix 1: Household interviews questionnaire

Research Question: **What is the impact of Jatropha growing on the five pillars of sustainable livelihoods of rural farmers (Financial, physical, human, social and natural) and food production?**

Interview questions

1. Financial capita aspects

(a) What has been the impact if any of growing Jatropha on your income

Decreased a lot	Decreased a little	No change	Increased a little	Increased a lot

(b) Since you started growing Jatropha have you acquired any property

Yes	No

(c) List what you have acquired

2. Physical capital aspects

Has the growing of Jatropha had any impact on the local schools, clinics, and roads

Yes	No

If yes what are the impacts on:

(a) Schools

(b) Clinics

(c) Roads

3. Human capital aspects

(a) Do you receive any educational seminars from people who promote the growing of Jatropha

Yes	No

(b) List the things that you liked about the seminars and what you did not like or missed from the seminars

(c) How would you describe the impact of Jatropha on the total amount of labour provided by the following members of your household:

(1a) Men

Decreased a lot	Decreased a little	a	No change	Increased a little	Increased a lot

(1b) Give an explanation

(11a) Women

Decreased a lot	Decreased a little	a	No change	Increased a little	Increased a lot

(11b) Explain

(111a) Children

Decreased a lot	Decreased a little	a	No change	Increased a little	Increased a lot

(111b) Explain

4. Social capital aspects

(a) Has there been any change in your relationship with neighbours who grow Jatropha

Yes	No

(b) What has been the change if any

(c) What about your relationship with those people who do not grow Jatropha, has there been any change in your relationship with them

Yes	No

(d) What has been the change

5. Natural capital aspects

(a) Since you started growing Jatropha have you increased the land portion under Jatropha

Yes	No

(b) If yes how or through which ways

Leasing additional land	
Buying additional land	
Clearing forests	
Reducing the area under food crops	
Reducing the area under other cash crops	
others	

6. Food aspects

(a) Since you started growing Jatropha what has happened to your food production

Decreased a lot	Decreased a little	a	No change	Increased a little	Increased a lot

(b) If your own food production has decreased how do you deal with the shortage

(c) If you buy additional food how would you describe the prices

Decreased a lot	Decreased a little	a	No change	Increased a little	Increased a lot

Appendix 2: Semi-structured interviews questionnaire

Research question 2: Respondents will include: NGOs officials, Government employees in Ministry of Energy and agriculture, Research institutions and local entrepreneurs)

What are the consequences of Jatropha growing on the wider rural communities in Kenya?

Interview questions

1. Has the growing of Jatropha had any impacts on jobs in the region

Yes	No

- (a) What are some of the impacts on jobs in the district, can you explain

- (1) Positive

- (11) Negative

2. Has the growing of Jatropha in the region had an impact on the following public facilities

- (a) **Primary schools**

Yes	No

- (1) Positive

- (11) Negative

- (b) **Health clinics**

Yes	NO

(1) Positive,

(11) Negative

(c) Roads

Yes	No

(1) Positive,

(11) Negative

3. Has the growing of the crop had any other impact on the community apart from what we have mentioned?

Yes	No

(a) Can you explain some on these impacts

(1) Positive

(11) Negative

Research question 3:

What are the impacts of *Jatropha* growing on marketing parties i.e. local entrepreneurs?

1. List any positive or negative impacts experienced by the local entrepreneurs listed

Entrepreneurs	Positive impacts	Negative impacts
Buyers		
Sellers		
Lorry drivers		
Money lenders		
Pesticide sellers		
Seedling sellers		

Appendix 3: The observation scheme

Aspects to be considered during the observation process on households that grow Jatropha and those that do not.

1. Do the family members have the following items

ITEMS	YES	NO	WHO HAS
Wrist watches			
Reading glasses			
Jewelry			
Shoes			
Sandals			
Bare feet			

2. What kind of houses do the family live in

Characteristics	Yes	No
Block		
Brick		
Mud		
Corrugated iron sheets		
Grass thatch		

3. Types of windows

Characteristics	Yes	No
Glass windows		
Wooden windows		
Tin windows		
Painted frames		

4. Type of furniture in the house

Furniture	Yes	No
Wooden stools		
Sofas		
Tables		
Mirrors		
Wall clocks		

5. Electronic equipment

Equipment	Yes	No
Television Set		
Radios		

Appendix 4: Information sheet



Massey University

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

Institute of Development Studies
School of People Environment and Planning
Private Bag 11 222
Palmerston North, New Zealand
T 64 6 3569099 extn 2509

My name is Joshua Kizito Wamalwa and I am here in Meru North district to do my field research for my master's thesis. I am a student in the department of development studies at Massey University in New Zealand. My research topic is assessing consequences of emerging cash crops on small-scale rural farmers using the energy cash crop *Jatropha curcas* L, as an example. The purpose of this study is to understand how local livelihoods are affected by new development initiatives introduced in rural areas.

My intention is to interview small scale farmers who grow *Jatropha* in the district, nongovernmental organizations, government employees, *Jatropha* entrepreneurs and local community people in Meru North. The main aim for me is to get information from the different groups that will enable me to make some reliable conclusions about the impacts of *Jatropha* on rural livelihoods.

Participation in this research is voluntary, the participants will be recruited from the above mentioned groups and those who are willing are invited to share their information with me. In accepting to take part in this study you can decline answering any question you don't feel comfortable with, ask any questions you may wish and have access to the information you will provide, moreover you will remain anonymous unless you want your name to be used. You can withdraw from the participation in the research at any given time.

The information that you will provide will only be used for the purpose of writing my thesis and associated academic purposes and will only be accessed by my supervisor and me during the period of storage.

We do not foresee any form of harm to any person taking part in the study but, if you feel the

project may cause any form of harm you, are free to raise any issues and I will be more than willing to discuss with you before the start of the interview.

This research project has been evaluated by an academic panel and judged to be of low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher named above is responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you may wish to raise with someone other than the researcher please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail humanethics@massey.ac.nz

Appendix 5: Participants informed consent sheet



Massey University

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES

Institute of Development Studies

School of People Environment and Planning

Private Bag 11 222

Palmerston North, New Zealand

T 64 6 3569099 extn 2509

I agree to participate and give relevant information regarding this research to be used solely for academics purposes. I have read and understood the information provided in the information sheet and received all the clarification about the research that I have doubts on, I therefore voluntarily accept to participate in this research without expecting any form of payment afterwards.

I also know my rights as a participant in this research and may decline giving information on particular issues as stated in the information sheet.

Date

Full Names

Signature

Appendix 6: Bio-fuel policies

PROPOSED NATIONAL BIOFUEL POLICY

DECEMBER 2009



MINISTRY OF ENERGY

1.0 Vision and mission of the policy

1.1 Vision of the Policy

Kenya will increase access to energy through sustainable biofuel production, and reduce the importation of fossil fuels by 25% in volume by the year 2030.

1.2 Mission of the policy

The mission of the policy is to explore agro-energetic resources to stimulate the energy matrix diversification, contributing to social and economic development, especially in rural areas. It aims to align with policy and law in several sectors in accordance with the vision of biofuel policy. It will contribute to the Republic of Kenya's Medium, Term plan (2008-2012) and Vision 2030 of developing in an environmentally and economically sustainable manner.

1.3 The Principle Objectives of the Biofuel Policy are

1.3.1 Broad Objective

Introduce a National Biofuels framework that would promote development of a self sustaining biofuel sector in Kenya while optimising the social benefits and addressing environmental realities.

1.3.2 Specific Objectives

- i. Improve energy security at domestic, national and regional levels;
- ii. Increase the %age of different renewable energies in the national energy mix without jeopardizing food production, forests, water, biodiversity viability and sustainable land use;
- iii. Facilitate access to clean and safe energy for all Kenyans;
- iv. Promote understanding and sustainable use of local energy resources;
- v. Establish equitable access to Kenya's natural energy resources and the economic opportunities they provide;
- vi. Create income generation, especially in rural areas;

-
- vii. Support a regulated development of sustainable biofuel value chain that is market driven;
 - viii. Promote public and private sector research and development in biofuels;
 - ix. Meet the Millennium Development Goals in line with Vision 2030

1.4 Policy Guiding Principles

1.4.1 Transparency

To ensure that the pricing mechanism is handled in a transparent manner to create and management of the National Biofuels Framework allows for the participation of all stakeholders;

1.4.2 Inclusiveness

To establish business opportunities for private investors and rural communities including both small and large-scale producers;

1.4.3 Equitable benefits sharing and gender equity

To facilitate full participation of both men and women in production and consumption of biofuels; and promote equal access to biofuel energy services and benefit sharing by and among all stakeholders in the value chain.

1.4.4 Environmental and social protection

To provide a mechanism that enhances environmental and social benefits from biofuels production and use, and avoid new and/or mitigate existing negative impacts.

CHAPTER TWO

2.0 POLICY RATIONALE

2.1 Why biofuel?

The expected benefits to the country include:

2.1.1. Energy security

i. Self sufficiency

Kenya's dependence on imported fuel resources and parties guided by their own self-interests leaves the country's fuel supplies in a vulnerable position and exposed to significant risk. Biofuels can usefully contribute to greater energy security and reduce the dependence on fossil fuel imports. Greater and more devolved energy self-sufficiency can lead to smoother, more equitable and less expensive industrial growth.

ii. Diversification of energy sources

At national level, biomass (mostly fuelwood) accounts for about 68 % of the total primary energy consumption, followed by petroleum at 22 %, electricity at 9 % and others at the remaining 1 %. Over reliance on a limited number of sources of energy has got a high risk if one of the sources fails. Currently, Kenya's electricity generation is heavily dependent on hydro-power generation. Frequent drought in the country often results in low water levels in dam reservoirs resulting in frequent power deficits and rationing, and a stunting of potential industrial growth.

iii. Rural access to adequate and renewable energy

In rural areas, the reliance on biomass is over 80 %. Approximately, 6 % of Kenyans have access to grid electricity. Access to affordable modern energy services is constrained by a combination of low consumer incomes, high costs and ineffective supply systems. In the

rural areas, where about 4 % of the population has access to electricity, the scattered nature of human settlements further escalates distribution costs and reduces accessibility. Development of biofuels provides a strong opportunity to move away from the unsustainable use of biomass.

2.1.2. Economic development

i. Improve trade balance by reducing fossil fuel import bill

According to the *Economic Survey 2009*, the total import bill of petroleum products increased tremendously by 62.3 % from Ksh.121, 776 million in 2007 to Kshs. 197,676.2 million in 2008. Premium and regular motor spirits which bioethanol is expected to substitute accounted for 381.3 thousand tonnes (11.6%) of the total domestic demand for petroleum fuels amounting to 3,283 thousand tonnes in 2008. Illuminating kerosene on the other hand accounted for 244.7 thousand tonnes (7.5%) of the total domestic demand in 2008. Introducing a 10% bioethanol blend with petrol for motor vehicles and total displacement of kerosene with bioethanol would therefore save the country close to 16% of the petroleum import bill which works out to about Kshs. 31.6 Billion based on the 2008 import bill.

ii. Cost savings (time, labour and money)

Institutions can have considerable investment savings by investing in renewable biofuels. For example, Biogas plants can cut the volumes of waste lagoons in halve by providing a short digestion time. Investment cost savings can reach about 30-40% from biogas plant price. Providing renewable biofuels, such as straight vegetable oil and briquettes on site and/or close to rural homesteads will significantly reduce the time women and men spend in harvesting and collecting fuelwood. Biogas plants reduce the costs of environmental cleaning such as when municipal and other wastes are used as feedstocks in biogas digesters.

iii. Developing rural incomes

Rural-based biofuel production will spur development of adjunct industries in producing

equipment including micro-distilleries; presses; bio-refineries and biogas plants; stoves; cookers; lighting equipment and generators; , and the use and micro trade of inputs and by products including fertilisers; cosmetics; seeds; nurseries; organic and other agrochemicals. The different value chains have the potential to tap the unemployed youth in the rural areas and put their abundant energy to productive use, thus creating income sources and improving rural livelihoods.

2.1.3. Environmental Protection

i. Greenhouse gas emission reduction

Sustainably produced biofuels are seen as carbon neutral and promoted under the IPCC and in European mandatory blending as 'green fuels'. They are seen as responding to the climate change influenced by increasing carbon emissions and to the air pollution and attendant environmental and health problems created by burning of fossil fuels.

ii. Replacing unsustainable use of wood biomass

With over 80% of the rural households in Kenya using biomass as the primary source of fuel, approximately 200-300 trees are needed per household per year¹. In addition, use of inefficient stoves, especially the traditional three stone stoves, is still prevalent in the rural areas. Despite annual forest growth, this volume of wood biomass harvested is unsustainable leading to many negative environmental and economic impacts. Replacing traditional cooking stoves with more efficient and cleaner stoves and alternative biofuel sources can contribute to both economic and environmental sustainability as well as social well-being.

iii. Reforestation of degraded lands and forests

Carefully integrating energy crops into farmer led systems, with minimal investment risk

¹ http://regionalenergy-net.com/index.php?option=com_content&task=view&id=100&Itemid=114

as well as avoiding conflicts with food supply, can increase rural energy security, promote sustainable biomass use, regenerate forests and optimize land use.

iv. Environmental cleaning through use of municipal and other solid waste

Both solid and liquid waste streams are produced from farms, municipalities and industries. These wastes are frequently rich in organic matter content. These wastes, including corn stover, husks and sawdust; paper, wood and yard wastes; plastics and industrial process effluents, can be converted by various methods into liquid and gaseous fuels as clean energy. The use of wastes-to-energy cleans up the environment; increases productive use of byproducts and can raise income to the producers.

2.1.4. Social Benefits

i. Clean, healthy and safe environment

In rural areas, direct combustion of biomass, especially wood, and charcoal, to provide energy for domestic, industrial and commercial uses is often done using inefficient technologies. Incomplete combustion coupled with poorly ventilated environments result in the emission of smoke that contains particulate matter as well as other invisible hazardous emissions including, carbon monoxide; nitrogen dioxide; sulphur oxides; formaldehydes; and polycyclic organic matter. Globally indoor air pollution is responsible for the death of 1.6 million people, of which 56% are children under fiveⁱ. Cleaner (and longer) burning biofuels can have a dramatic impact on lessening biomass dependence as well as dramatically improving rural household health and so reducing the associated mortalities and health bills of resource - poor families and communities.

ii. Employment creation

The production value chain of biofuels can create jobs for the youth and all gender groups. Their participation in biofuel projects and activities can lead to reduced unemployment rates and improved income levels, which in turn improves the quality of life.

iii. Development of rural areas

Biofuels have the potential to cause significant socio-economic benefits in rural areas. Small-scale farmer-led biofuel production in Kenya is likely to benefit more people, where ecosystem services and livelihoods from agricultural lands are of fundamental importance. The ability to grow some feedstocks on agriculturally marginal land and the labour-intensive production chain could prove important drivers for rural development, especially in Pastoral and Agropastoral areas where poverty has increased up to 27% in the last decades². Well informed and consistent biofuel production can contribute to the rural energy security as well as creation of employment and entrepreneurial opportunities. This in turn would help to alleviate poverty, stem rural urban migration, and reverse environmental degradation³

iv. Gender, equity and human rights

Gender equity means fairness of treatment of women and men, according to their respective needs. Many women do not have access to clean affordable energy. The burden of fuelwood harvesting and subsequent associated health problems disproportionately predisposes women and children to the drudgery and health hazards of harvesting fuelwood, carrying heavy burdens and subsequent indoor air pollution, (IAP). Biofuels can provide access to clean energy thus eliminating and/ or mitigating these challenges for women and children.

2.2 Why a biofuel policy?

In general, the need for biofuel policy can be summarized as follows:

² 'Kristjanson P, Mango N et al (2009) Understanding poverty dynamics in Kenya' Journal of International Development published on line in Wiley Interscience.

³ Muok, B.O. (2009) View points. Boiling Points Issue No. 56

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- i. Increasing importance of biofuels world wide;
 - ii. Projected deficits in petroleum supplies;
 - iii. Climate change issues;
 - iv. Need to address national energy security and high energy costs;
 - v. Uncoordinated activities on biodiesel;
 - vi. Need to fast track development of biofuel energy resource;
 - vii. Creating an enabling environment where energy poor Kenyans can choose alternative energy sources and supply;
 - viii. Protecting the diverse natural environment from any further degradation;
 - ix. Developing a framework for sustainable exploitation of biofuel energy sources.

Different biofuel types however have specific policy needs, which this policy has recognized as in the details below.

2.2.1 Biomass Policy

Biomass is the main source of primary energy. In rural areas, people are using wood, agricultural residues and other biofuels for up to 90% of their energy consumption. However, the importance of biomass energy is not adequately reflected in national energy policies. The Energy Act (2004) has strong bias towards electric and petroleum energy sectors, with only a token mention of renewable energy. This is in spite of the fact that the situation is deteriorating. Biomass energy is becoming so scarce that fewer and fewer people are able to find enough fuelwood to cook and sometimes resort to burning plastic and trash⁴. Fuelwood substitutes such as LPG and modern biofuels are commonly unaffordable or not available.

Improved cook stoves can reduce pollution levels in the kitchen and promote cleaner kitchens. They also reduce work burden on women, which gives them a sense of modernity and wellbeing. However, for a woman to buy an improved cook stove or attend a course to build her own stove, she needs to have access to and control over her own income or have a supportive husband. Improved cook stoves have been promoted in the country since the 80s but to date the penetration rate remains low. This policy intends to provide a framework to improve penetration of the improved and cleaner cook stoves in rural and urban communities.

2.2.2 Liquid Biofuel

⁴ <http://www.bioenergylists.org/stovesdoc/GenderEcDev/EWSLkenya.pdf>

Power alcohol was introduced in the country in 1983 but its use was discontinued in 1993 due to production problems that led to unsustainable pricing and inadequate policy framework. Re-introduction of the programme needs to be based on a concrete policy framework taking into account all accumulated experience and new and emerging technologies in liquid biofuel for household and industrial energy use and not only for transport as was the case before.

2.2.3 Biogas

Biogas use in Kenya dates back to the 1960's when Koru Research Sub-Centre in Western Kenya had a biogas plant that supplied energy for lighting and cooking (*in litt*: KARI Technical Note No. 9, 2003). Since the 1980s, nearly 1000 household size biogas digesters, mainly fed with cattle dung, were constructed to provide gas for cooking and lighting to rural families. It is estimated that about 30-50% of them are meanwhile out of order (MoE, 2008). The main problems were poor masonry, site selection, operational workload, limited water supply, insufficient feedstocks, high maintenance cost, limited technical support as well as unreliable models, such as floating channels from steel getting exposed to erosion, all of which were introduced to the country by different NGOs and GoK agencies. Presently, the technology has evolved and local experience has developed to arouse the interest of local SMEs, some of which are working in close linkages with foreign experts and NGOs. Recent developments have brought in assorted designs of both small and large biogas systems targeting a diverse range of feedstocks and clientele. This policy aims to lay a framework to avoid the past failure.

2.3 Policy linkage to other strategies and policies

Plant based biofuels are an agricultural product and fit well within the current focus on increasing agricultural productivity, innovation and intensification. The aim is that marginal croplands will be farmed more intensively and previously unfarmed areas can be brought into production without damaging key watersheds, ecosystems or areas of high conservation value.

Agricultural and forestry policies then need to support these emerging feedstocks and focus on supplying the emerging biofuels industry with enough biomass to meet the Kenyan biofuel energy target of replacing certain percentage of Kenyan petroleum consumption with biofuels by the year 2030. Sustainably, meeting this target can support the transport; forestry, agriculture and livestock production and overall industrialization sectors. Properly and carefully managed, it can support, rather than degrade, the environment, forests, wildlife, and water ecosystems.

Whole value chain efficiencies also means focusing on intensive and efficient systems that use extended industrialized processes to extract energy from or find productive uses for the whole plant and all 'waste' products. As biofuel production touches on many aspect of the Kenyan agro-socio-economic landscape, this policy should be considered within the broad framework and encompass policies of other ministries such as transport, agriculture, land, forestry, environment, livestock, tourism, wildlife and finance and industrialization inter *alia*.

Taken together, principles relating to unitary governmental systems and even alignment with existing laws influenced for example by the Ministry of Energy (MoE) and the *subsidiary legislation* to the *energy Act No. 12 of 2006*, and consistency with the National Environment and Management Authority (NEMA)'s *Environment Management and Co-ordination Act 1999 (EMCA)* conservation of ecosystem services, and scale alignment – can create a sustainable biofuels infrastructure that will serve Kenyan citizens, the economy, and the environment.

Appendix 7: Massey University Ethics Committee Approval



MASSEY UNIVERSITY

10 June 2010

Joshua Wamalwa
263 Park Road
PALMERSTON NORTH

Dear Joshua

Re: An Investigation into the Consequences of Emerging New Cash Crops on Rural Small Scale Kenyan Farmers' Livelihoods Using the Energy Crop, *Jatropha curcas*, as an Example

Thank you for your Low Risk Notification which was received on 8 June 2010.

Your project has been recorded on the Low Risk Database which is reported in the Annual Report of the Massey University Human Ethics Committees.

The low risk notification for this project is valid for a maximum of three years.

Please notify me if situations subsequently occur which cause you to reconsider your initial ethical analysis that it is safe to proceed without approval by one of the University's Human Ethics Committees.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:

"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research."

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail humanethics@massey.ac.nz."

Please note that if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to provide a full application to one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely

John G O'Neill (Professor)
Chair, Human Ethics Chairs' Committee and
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