



LAND RIGHTS RESEARCH & RESOURCES INSTITUTE



Biofuels in Tanzania: Small Scale Producers and Sustainable Environmental Management



**A Research Report
February 2013**

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**BIOFUELS IN TANZANIA: SMALL SCALE PRODUCERS AND
SUSTAINABLE ENVIRONMENTAL MANAGEMENT**

A RESEARCH REPORT

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TABLE OF CONTENT

ACKNOWLEDGEMENT	VI
LIST OF ABBREVIATIONS AND ACRONYMS	IX
RESEARCH METHODOLOGY	X
EXECUTIVE SUMMARY	XIV
STRUCTURE OF THE REPORT	XX
1.0 INTRODUCTION	1
1.1 Global energy overview.....	1
1.2 Tanzania current energy consumption pattern.....	4
1.3 Background to biofuel sector development in Tanzania.....	6
1.3.1 Genesis of biofuels investment in Tanzania	6
1.3.2 Contemporary concerns of biofuel investment in Tanzania..	8
1.3.3 Foreign direct investment an emerging concerns of biofuel sector/investment in Tanzania.....	11
1.4 Justification of the study	14
2.0 GLOBAL EVENTS AND EMERGING BIO-ENERGY BUSINESS IN TANZANIA	15
2.1 Status of Biofuel Companies in Tanzania.....	21
2.1.1 Felisa	24
2.1.2 30 Degree east (formely sunbiofuels Tanzania)	27
2.1.3 Bioshape Tanzania Ltd	31
2.1.4 African Green Oil Ltd (AGO).	34
2.1.5 Agro EcoEnergy Tanzania Ltd	37
2.1.6 Sekab ab of Sweden	41
2.1.7 Jatropha Seed and Energy Production (JASEP).....	41
2.1.8 Prokon Renewable Energy Ltd	42
2.1.9 AgriSol Energy LLC USA.....	44
3.0 EXTENT OF INVOLVEMENT, INCLUSION OR EXCLUSION OF SMALL SCALE PRODUCERS IN THE BIOENERGY PROJECTS...	59
4.0 LIQUID BIOFUEL POLICY DEVELOPMENT IN TANZANIA AND POLICY CHALLENGES.....	64
4.1 Liquid biofuel policy development in Tanzania.....	64
4.2 Liquid biofuel policy challenges.....	67
4.2.1 Tanzania energy poverty reduction.....	67
4.2.2 Unclear biofuel investment.....	68
4.2.3 Biofuels sustainability frameworks.....	68
4.2.4 Financial viability of biofuels projects.....	69

4.2.5	Market for liquid biofuels	69
4.2.6	Environmental impact assessment (EIA).....	69
4.2.7	Biofuel project size and exclusion of small-scale production	70
4.2.8	Legitimacy	70
5.0	OPERATIONAL LOCATIONS OF BIOFUEL PROJECTS IN TANZANIA	71
5.1.1	Geographical distribution of the biofuel projects by biofuel crops.....	73
5.1.2	Future operational locations of bio-energy projects in Tanzania	74
	1. Zonation/mapping of areas for biofuel projects.....	75
	2. Broad multi-sectoral consultations	76
	3. The change of policy and/or introduction of government initiative/programme	76
	4. Public interest and understanding on land use.....	77
5.2	Threats of biofuel projects.....	77
5.2.1	Food insecurity.....	78
5.2.2	Environment impacts.....	79
5.2.3	Water competition.....	80
5.2.4	Human settlement and population needs.....	81
5.2.5	Foreign possession of land and local displacement	83
5.2.6	Dispossession of land propertyError! Bookmark not defined..	83
6.0	SOCIO-ECONOMIC VIABILITY OF THE BIO-ENERGY BUSINESS IN TANZANIA.....	84
6.1	Land issues	87
6.2	Markets, value chains and income.....	90
6.3	Job Creation and additional income to villagers and small scale farmers	95
7.0	LAND RIGHTS OF SMALL SCALE PRODUCERS, COMPLIANCE TO ENVIRONMENTAL MANAGEMENT AND GOVERNANCE STANDARDS.....	97
8.0	RECOMMENDATIONS ON HOW SMALL SCALE PRODUCERS CAN BENEFIT	101
	REFERENCES.....	105
	ANNEX 1. KEY PERSONS INTERVIEWED	111

LIST OF FIGURES AND TABLES

FIGURE 1: FELISA PRODUCTION CONCEPT FLOW CHART.....	26
FIGURE 2: MAP OF TANZANIA SHOWING GEOGRAPHICAL DISTRIBUTION OF BIOFUEL PROJECTS BY BIOFUEL CROPS	74
TABLE 1: BIOFUEL PROJECTS VISITED DURING FIELD STUDY.....	XI
TABLE 2: BIO ENERGY COMPANIES, TYPE OF OWNERSHIP, LAND SIZE AND LAND LEASE IN TANZANIA	46
TABLE 3: OPERATIONAL LOCATIONS OF BIOFUEL CROPS IN TANZANIA	73
TABLE 4: POPULATION OF TANZANIA; CENSUS COUNTS.....	82
TABLE 5: SUSTAINABILITY INDICATORS FOR THE BIO-ENERGY SECTOR IN TANZANIA.....	86

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A Research Report February 2013

Errors, omissions, mistakes encompassing the unintentional are inevitable in any research accomplishment. The undersigned is the only institution which should take responsibility.

Land Rights Research and Resources Institute (HAKIARDHI)
Dar es Salaam
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LIST OF ABBREVIATIONS AND ACRONYMS

BRELA	Business Registration and Licensing Agency
CBOs	Community Based Organizations
CFC	Community Finance Cooperation
EIA	Environment Impact Assessment
EU	European Union
EVIROCARE	Environment, Human Rights Care and Gender Organization
EWURA	Energy Water Utility Regulatory Authority
FAO	Food Agriculture Organization
FDI	Foreign Direct Investment
FELISA	Farming For Energy, For Better Live hood in Southern Africa
GCA	Government Chemist Agency
GHG	Green House Gases
GMOs	Genetically Modified Organisms
GTZ	Germany Technical Cooperation
GoT	Government of Tanzania
KAKUTE	Kampuni ya Kusambaza Teknolojia
MGDs	Millennium Development Goals
MEM	Ministry of Energy and Minerals
MFPs	Multi Functional Energy Platforms
MKUKUTA	National Strategy for Growth and reduction of Poverty
NEMC	National Environment Management Council
NEPAD	The New Parternship for Africa's Development Agency
NBTF	National Biofuel Task Force
NGO	Non Government Organization
RUBADA	Rufiji River Basin Development Authority
SIDA	Swedish International Development Cooperation Agency
SVO	Straight Vegetable Oil
TABEF	Tanzania Bio-energy Forum
TaTEDO	Tanzania Traditional Energy Development and Environment Organization
TBS	Tanzania Bureau of Standards
TIB	Tanzania Investment Bank
TIC	Tanzania Investment centre
TPDC	Tanzania Petroleum Devolopment Company
URT	United Republic of Tanzania.
USA	United State of America

RESEARCH METHODOLOGY

This section briefly accounts the methodology of the study that involved both desk and field research. A combination of research methodologies such as discussions, key informants interviews, and physical observation were used to collect qualitative information.

Scope of the research

The purpose of this study was to assess the bio-energy sector in Tanzania and to critically inquire the threats, benefits and opportunities to small-scale producers and sustainable environment management. Based on the terms of references this study focused on areas where land is earmarked or already in use for production of biofuels in Tanzania for both large and small-scale firms. The development of policy of liquid biofuels and other policies in general were examined. The roles NGOs on small producers of biofuel and the roles of financial intermediaries to small producers were also studied. During the field research, the study covered both local and foreign companies engaged in production of biofuels with the intention to assess viability of biofuels projects and lay out the basis for liquid biofuel policy in Tanzania. Table 1, below presents the locations visited during the study.

Table 1: Biofuel projects visited during field study

Location	Companies/project name
Rufiji	Agro-eco-Energy formerly (SEKAB), African Green Oils
Kisarawe	30 Degrees East formerly Sun Biofuels Tanzania Ltd, Zaga.
Mpanda	Prokon, AgriSol
Bagamoyo	Agro eco Energy formerly (SEKAB), Shanta Estate Ltd, Kitomondo farm
Bahi	Donesta & Savannah Ltd
Kilwa	Bioshape Tanzania Ltd
Rural Lindi	Biomassive
Kigoma	FELISA, AgriSol, JASEP (Jatropha seed and energy production)
Rural Dodoma	East African biodiesel
Arusha	KAKUTE, Ecocarbon formerly (Diligent Tanzania Ltd), Smallholders
Kilimanjaro	Kikuletwa farm , Mitisubishi cooperation Ltd,
Dar es Salaam	Mafuta Sasa Biodiesel Ltd, TaTEDO, ARTIENERGY, African Biodiesel Emission Reduction Company Ltd, DOBECO Traders Limited
Kilombero-Morogoro	Inf energy Company Limited
Mbeya (Mbarali)	Kapunga rice project

Desk Research

During the desk study pertinent literature relating to bio-energy with emphasis on liquid biofuels in Tanzania and elsewhere were reviewed. The desk study aimed at understanding the linkages between global and national context of production of biofuels (trends, processes, policies, laws, guidelines, standards). The extent of involvement of small-scale biofuels producers, location and status of biofuels projects in Tanzania. The social-economic viability of bio-energy in Tanzania, liquid biofuel policy development (stage reached, stakeholders involvement and policy challenges) and the effects of biofuel on land rights of small-holders.

Field Research

The field research intended to collect information useful in meeting the objectives of the study, coupled with the physical observation of what was happening on the ground. It involved structured guided interviews with biofuels small-holders in the studied areas, management of biofuel companies/projects visited, Ministry officials, NGOs etc, governmental institutions and financial intermediary which included TIB. Furthermore, interviews with key informants were also carried out for the district directors in Local Government Authorities which included Mbarali, Kilombero, Bahi, Mpanda, Rural Dodoma Rufiji, Kisarawe, Bagamoyo, Rural Lindi, Kilwa, Moshi, Hai, and Arusha. During the field study both local and foreign biofuel projects/initiatives were visited. More over the study went further to map most of the companies engaged in, or interested in engaging in production of bio-energy in Tanzania.

Sampling and sample size

Sampling for primary data collection adopted a number of steps and procedures to ensure representative samples were obtained. Purposive sampling was used to select respondents in the identified local government authorities, financial intermediates like TIB, key government ministries and companies' involved/interested in production of bio-energy in Tanzania. The purposive sampling was adopted to obtain specialized information from targeted respondents. However, simple random sampling for small-scale producers was employed to interview them to solicit information. A total of 60 respondents were interviewed during data collection from which 6 were small- scale producers.

Data collection

Combinations of methodologies were used to collect qualitative data. Such methodologies included interviews, desks study and physical observation in the field. Key informants interviews were conducted for smallholders in some villages covered by the study, local government

officers at village level and district level. Also interviews were conducted for key ministries officials, government institutions, NGOs, financial intermediaries executive directors and biofuels companies. The purpose of covering a wide range of stakeholders was to create worth information of the research results among respondents who took part in the study.

Data analysis and presentation

The information gathered through the desk study, discussion with stakeholders, field observation were gathered, analyzed and presented in different formats. The study has employed the use of case study, tables, graphs, statistical map, numeral figures and percentages and photographs.

Limitation of the study

The Terms of Reference (ToRs) required assessing bio-energy sector in Tanzania with emphasis on the threats, benefits and opportunities to small-scale producers and sustainable environmental management. However, this study faced some constraints that deserve mentioning. The main limitation of this study was that the liquid biofuel industry is relatively new concept and business venture in Tanzania. Therefore data are scarce considering that very few companies are operating while the majority had ceased to operate due to several factors both internal and external. The expansion of large-scale land acquisitions was difficult to measure due to lack of transparency on land deals and some land deals are still under negotiation. It was also difficult to establish land acquired through village land and private owners from the districts land officers. It Besides it seemed also that there are many ways to acquire land informally therefore no clear information of the deal and land acquired. Despite this limitation, the study presents a fair overview of the updated bio-energy projects and threats, benefits and opportunities to small-scale producers and sustainable environmental management.

A Research Report February 2013

EXECUTIVE SUMMARY

Globally interest in biofuels is progressively increasing for a number of reasons; reduced reliance on fossil fuels, reduction in greenhouse gas emissions, national independent security of fuel supply and employment and economic benefits through the development of a new fuel production. Therefore, biofuels represent a key target for the future energy market that can play an important role in maintaining energy security. To that effect biofuels have been increasingly explored as a possible alternative source to fossil fuel with respect mainly to transport. Global liquid biofuel (bioethanol and biodiesel) production tripled from 4.8 billion gallons in 2002 to 16.0 billion in 2007, but still accounts for less than 3% of the global transportation fuel supply (Coyle, 2007).

There is a consensus of view that achieving the millennium development goals (MDGs) in Africa will require a significant expansion of access to modern and alternative renewable energy. Biofuel development in particular first generation biofuels involves the exploitation of four most strategic natural resources namely; labor, land, forests and water intensive enterprise. The exploitation of the 4 strategic resources for any nation of the world for first generation biofuels has gained renewed interest and concerns from researchers, entrepreneurs, governments of the world, NGO's, media United Nations entities, environmentalists and the general public. According to the FAO (2009), to develop the full potential of biofuels, growth has to be managed in a sustainable way to meet requirements related to the economic, social and environmental dimensions of sustainability. This being the case, introduction of biofuels in Tanzania in particular first generation biofuels with limited understanding of the complexity of financial, environmental, economic and social impacts and without biofuel policy, legal and institutional frameworks in place would seem unsustainable and dampening the infant biofuel sector in particular liquid biofuels.

The interest for biofuels development and use has been prompted by the increasing demand for biofuels worldwide as a component of climate change mitigation, energy security and a fossil fuel alternative. Ample

unused land has been critical for first generation biofuels production and an important factor to attract foreign direct investments in developing countries such as Tanzania (Habib-Mintz, 2010; Markensten and Mouk, 2012). It was established in this study and other previous reports that the so-called “ample/excess” or “unused “in the context of land investment” is a vague definition which should be taken precautionary since is not based on any authentic scientific research data findings in terms of land use and its associated resources. The definition seems to ignore two crucial issues; small-scale farming by landholders who cultivate the land for their various economic activities mainly under customary tenure and future generations land needs as a strategic and ultimate resource.

Tanzania started to receive mostly foreign investors on liquid biofuels towards the year 2006. Official government figures indicated that about 20 companies had requested land for commercial biofuel production by March 2009 (Markensten and Mouk, 2012). Kamanga (2008) indicated that about 37 companies had sought land in Tanzania for biofuel production by 2008. This study established over 40 companies and/or entities (see Table 2) dealing with first generation biofuels. However, the number could seem less or more since some have not been formalized, some on planning phase while some are contemplating quitting the biofuel investment while some had changed ownership. Still others were difficult to access their information and profiles considering they are scattered and it was not possible in this study to visit every part of Tanzania. The 43 companies/entities dealing with biofuel activities in Tanzania could be only indicative and is subject to change. Among the 43 companies some already acquired land, some processing land acquisition, some had started trials using plantation or contract and or community focused models. While some had changed their business plans, temporarily suspended their activities for various reasons and others had abandoned biofuel projects due to several local and external crosscutting factors.

Nevertheless, the influx of investors has had some negative impact since the land laws and their application in Tanzania are not very clear, which enabled several investors to acquire large tracts of land without the farmers using the land receiving sufficient compensation consequently fueling conflicts (Bergius, 2012; Markensten and Mouk, 2012). On the other hand, some investors had resorted on contracting small-scale farmers while others did not acquire the land although they applied for it. In recent years, over 4 million hectares (ha) of land have been reported requested by foreign investors for both agrofuel and food production in Tanzania (Oakland Institute, 2011). The 4 million ha figure of land requested which have been quoted in various reports is on the higher side and difficult to authenticate the data source. However, most land acquired or requested for biofuel production in Tanzania range between 400 and 400,000 hectares (Chachage and Baha, 2011). Though a small portion of these (70,000 ha) had actually been formally leased as of December 2010 (Oakland Institute, 2011), which confirmed Tanzania as a very attractive country for foreign investors seeking to grow food and agrofuels (Oakland Institute, 2011; Markensten and Mouk, 2012). The field study found that as of September 2012 about 114,798.806 ha of land has actually been formally leased by investors for biofuel production. If rice is replanted with *Jatropha* at Kapunga rice project of 5,500 ha then the total land would become 120,298.806 ha. On the other hand, if land acquired by Bioshape Tanzania Ltd is considered as 38,229.42 as per LARRRI (2010). Then total acquired land could be 99,982.418ha.

However, both figures exclude the land acquired through village land, private owners, different land deals in process at various stages which is difficult to establish the figure from the districts. Additionally as of September 2012 the total area requested for biofuel production by investors was about 687,421.734 ha. This figure excludes 5,818 ha of InfEnergy Co Ltd and RUBADA partnership, 5,500 ha of Kapunga rice project and 325, 117 ha of Agrosol Energy LLC. If Kapunga rice project and AgriSol Energy LLC land is included, then the total land requested would be 1,018,038.734 ha. Nevertheless, the secrecy and lack of transparency surrounding a number of land deals on village lands, general lands and reserve lands ongoing in Tanzania, the many flaws

identified in the investment processes, available data inconsistency as well as lack of coordinated data base system collection of land deals are clear prohibitive challenges for establishing land size formally leased by investors and actually land which has been requested by investors for biofuel production.

The interest in biofuels is increasing for a number of reasons, employment and economic benefits through the development of a new biofuel production. Yields of biofuels feedstock crop can surpass natural yield potentials due to irrigation, multiple cropping, inputs etc (FAO, 2008). World wide, with pressures to avoid the use of edible crops for fuels, investors have attempted to identify crops that are either underutilized food crops or are inedible. The non-edible biodiesel feedstock options are fairly limited resulting in *Jatropha* being promoted globally as a appropriate crop for biodiesel production (FAO, 2010). A large number of *Jatropha* based projects have however failed, downsized or closed. Since many of the actual investments and policy decisions on developing *Jatropha* as an oil crop have been made without the backing of sufficient science-based knowledge. Its seed yields, oil quality and oil content are all highly variable (FAO, 2010). Foreign investors, targeted to cultivate *Jatropha*, palm oil, sugarcane and *Croton megalocopus*, dominates most of the major biofuels companies in Tanzania. Few targeted sunflower, sweat sorghum and even avocado. It was established in this study that about 70 % of biofuel companies were for *Jatropha* growing with expectation of high yield hence large quantity production of biofuel in a cost-effective economic way.

Investment in *Jatropha* is still going on few companies, which employ-contracted farmers like Ecocarbon formerly Diligent Tanzania Ltd, community focused models like KAKUTE and TaTEDO. On the other hand, plantation models for *Jatropha* in Tanzania had turned out not to be the wonder crop as was thought to be and it has ceased for large companies like SunBiofuel Tanzania Ltd of Kisarawe and Bioshape of Kilwa. It was evident that reasons for failure of *Jatropha* as biofuel crop reported by FAO (2010) were also echoed in research findings of this study in Tanzania. Generally the failure of *Jatropha* has been implicated to failure of biofuels since many people tend to believe that *Jatropha* is

one and the same with biofuel. Besides global financial crisis in 2008, seriously undermined funding sources for the investors from credit agencies, which compelled many companies to leave or abandon cleared natural vegetation on acquired land without planting *Jatropha*. This also meant that promises made to farmers of income and social investments not fulfilled. This had culminated on negative public perception of biofuel investments in Tanzania (Markensten and Mouk, 2012).

The sustainability of the bio-energy sector in particular first generation biofuels depends much on how the land is located and used for investment. How much small-scale farmers understand their land rights and importance of investment in their localities and in what way are involved or excluded in value chain or as a player in biofuel sector. Monitoring of biofuel investment is essential to ensure environmental sustainability through policy and regulatory frameworks. Tanzania is preparing the liquid biofuel policy, which will guide the emerging biofuel industry. Justifications and rationale for liquid biofuel policy while marginalizing other biofuels the gaseous and solids remains contentious issue.

Since in Tanzania there is currently low access to modern energy, around 17.5% and about 90% of the population use traditional biomass solid biofuel, which is (the national energy of the majority) (Sawe, 2011; Markensten and Mouk, 2012). On the other hand, the contribution of liquid biofuels in Tanzania's energy mix is conservatively negligible. This implies obviously that preparation of the national liquid biofuel policy is not internally driven to increase the access to modern energy in order to improve standard of life as stipulated in the MDGs. During the field study it was found that biofuel industry in Tanzania is at best a non-performing investment due to different external and internal factors. The main internal factor among others is the absence of researched biofuel feedstock, the absence of functional policy. It is therefore pertinent that the liquid biofuel policy should take onboard and addresses the important issues on biofuel through consulting different wide-multi-stakeholders during its various cycles of its preparation.

A Research Report February 2013

Tanzania has the potential to benefit from biofuel industry via employment and economic benefits if will have in place a functional biofuel policy. This will entail inclusion of small-scale producers in the value chain and biofuel industry, which will limit allocation of large tract land to one investor. Monitoring of biofuel investment to see that the impact to the environment and biodiversity is reduced to minimum extend.

STRUCTURE OF THE REPORT

The focus of this report is the main concern around the current status of bio-energy investments in Tanzania. The main concerns include, the inclusion or exclusion of small producers and liquid biofuel policy development and its challenges in Tanzania. However, the study also looked into social-economic viability of biofuel investments, operational locations of bio-energy companies or projects at present and future, threats of biofuel investments and the linkage between the global trends, processes and initiatives of the local policy development, land rights of small producers, compliance to environmental management and governance standards and recommendations on how small scale producers can benefit from bio-energy sector in Tanzania.

Part one includes analysis of the linkages between the global trends, processes and initiatives, the local policy development initiative. Part two aims to address global events and emergence of bio-energy business in Tanzania and status of bio-energy companies in Tanzania. Part three discusses the extent of involvement, inclusion or exclusion of small-scale producers in the bio-energy projects in Tanzania. Part four covers the liquid biofuel policy development in Tanzania and policy challenges. Part five describes the operational locations of bio-energy companies or projects at present and future, threats of biofuel investments. Part six explains the socio-economic viability of the bio-energy business in Tanzania. Part seven describes the extent to which bio-energy has affected and/or is likely to affect the land rights of small-scale producers, compliance to environmental management and governance standards. Lastly part eight explores the recommendations on how small-scale producers can benefit from bio-energy sector in Tanzania.

A reservation stays on to be stated clearly at the commencement. This study was intended to establish on and therefore complement the research on current status of bio-energy investments in Tanzania, the inclusion or exclusion of small producers and liquid biofuel policy development and its challenges in Tanzania, which had not been conducted. Some issues that are covered well elsewhere are thus not

treated extensively herein, for example the employment and environmental impacts of agrofuels production which were analyzed in detail by Action Aid International Tanzania (Action Aid, 2009), social-economic impacts of biofuel (TaTEDO, 2011), its implications to environment, ecology, rural household and gender (Bergius, 2012), public perception of biofuels (TaTEDO, 2011) and challenges and opportunities of agrofuels in Tanzania (HAKIARDHI and JOLIT, 2008), land grabbing (Oakland, 2011), biofuels investment and community land tenure in Tanzania (Sulle and Nelson, 2012). However, it is emphasized in analysis and conclusions some of the key issues arising around the investment process itself, reviewing and taking stock of the current situation in Tanzania with a view to learning lessons for the future.

A Research Report February 2013



1.0 INTRODUCTION

Energy development in its complexity interactions involves climate change, food and energy security and environmental sustainability. Biofuels are bio-energy carriers that store the energy derived from biomass (FAO, 2005). A wide range of biomass sources can be used to produce biofuels in a variety of forms. These forms are solid biofuels, gaseous biofuels and liquid biofuels (Omer, 2012). The liquid biofuels in particular bioethanol and biodiesel have been identified as an alternative biofuel of the future in the bio-economy era and as a survival strategy in post-fossil fuel era.

1.1 Global energy overview

Globally energy is an essential factor in development since it stimulates, and supports economic growth and development and social well being as the cost of energy is reflected in the cost of all consumer goods and services. Therefore, energy is highly obligatory to daily activities and is required in all sectors of the economy including industry, agriculture and transportation among others for sustainable economic growth and development. The energy requirement is on a high demand due to increased population, rapid industrialization and ever expanding transport industry.

It is well established socially and economically that energy plays a key role in the development of nations of the world and provides vital services and means that improve quality of life. Therefore reducing “Energy Poverty” leading to access to modern energy sources is a basic requirement to achieve decent and sustainable living standards. Energy is essential for lighting, heating and cooking, as well as for education, modern health treatment and productive activities, hence for food security and rural development. With the sub-Saharan Africa population of about 800 million bound to reach more than 1.2 billion by 2020, poverty cannot be effectively addressed without major improvements in the quality and magnitude of energy services. In contrast to the rest of the world, poverty in Africa is primarily a rural problem (Ambali et al., 2011).

Energy sources have changed throughout history due to intense exploration, technology and development. The current main sources of energy are the non-renewable sources, which include crude oil, nuclear power, coal, propane, natural gas etc (Duku et al., 2011). Hence the current energy pattern of our society is therefore based on substantial use of fossil fuels, limited oil reserves, increase of oil prices, and political instability, as well as on other indirect problems, such as the impacts on the climate and environment. However, renewable energy sources, unlike fossil fuels, are theoretically infinite (Ambali, 2011). Fossil fuels, especially oil and natural gas, are finite in extent and should be regarded as depleting resources. Therefore efforts are oriented to search for new sources of energy, which are renewable such as bio-energy (Omer, 2012).

Bio-energy is energy from the sun stored in materials of biological origin. This includes plant matter and animal waste, known as biomass. Plants store solar energy through photosynthesis in cellulose and lignin, whereas animals store energy as fats. When burned, these sugars break down and release energy exothermically, releasing carbon dioxide, heat and steam. The byproducts of this reaction can be captured and manipulated to create power, commonly called bio-energy (FAO, 2005). According to the FAO (2005) definition, bio-energy can be categorized in three main ways as bioresources, biofuel and bioresidue. Bio-energy development is identified by two competing paradigms, which coexist within energy supply sources. The first is the traditional biomass, including fuel wood, charcoal and animal dung, agricultural residues etc which has been used since time immemorial continues to provide important sources of energy in many parts of the world. More than 2.4 billion people, generally among the world's poorest/live on extreme poverty, rely directly on traditional biomass namely, wood, crop residues, dung, and other biomass fuels as dominant energy sources for their basic heating and cooking needs (UNDP, 2000). It is estimated that close to 80% of African countries rely on traditional biomass to meet their energy needs (NEPAD, 2005; Cotula et al., 2008).

The second is the innovative modern approach where production of biofuels is commercially done using more efficient and relatively environmentally friendly technologies. Biofuels are energy carriers that

store the energy derived from biomass. A wide range of biomass sources can be used to produce biofuels in a variety of forms. They may be solid biofuels (SBs), such as fuelwood, charcoal, wood pellets and briquettes etc. The gaseous biofuels (GBs), such as biogas, biohydrogen etc and liquid biofuels (LBs), such as ethanol, biodiesel and pyrolysis oils (Omer, 2012). The SBs are plant matter such as wood chips, baggase, and other solid or woody biomass, that can be directly burnt as fuel. SBs can be obtained via thermochemical processes (gasification, pyrolysis, liquefaction). The GBs biofuels mainly biogas is biofuel derived from anaerobic digestion of almost all organic materials. GBs are used for cooking, lighting, transport and power generation (Ambali et al., 2011; Amer, 2012).

The liquid biofuels (LSs) includes mainly biodiesel from plant seed oil, and bioethanol from fermenting grain, sugar, sap, grass, straw or wood etc and pure plant oil (straight vegetable oil). LSs are used for heating, cooking, lighting, transport and power generation. There are tentatively four liquid biofuels generation classified depending mainly on the type/origin of the feedstock and how the feedstock obtained/cultivated (OECD/IEA, 2010; Duku et al., 2011, Fink and Medved, 2011; Adam et al., 2011; Ambali et al 2011; Omer, 2012). First generation liquid biofuels are bioethanol produced from fermentation of sugar and starch (sugarcane, sweet sorghum, or molasses etc), and biodiesel from edible oil seeds oilseeds, palm oil and tallow (OECD/IEA, 2010; Duku et al., 2011, Fink and Medved, 2011; Adam et al., 2011; Ambali et al 2011; Omer, 2012). Second generation liquid biofuels are bioethanol and biobutanol from lignocellulosic biomass waste, biodiesel from non-edible oil seeds (OECD/IEA, 2010; Duku et al., 2011, Fink and Medved, 2011; Adam et al., 2011; Ambali et al 2011; Omer, 2012). Third generation liquid biofuels also referred to as advanced liquid biofuels are produced from macroalgae which are the large multi-cellular algae such as seaweeds and microalgae including cyanobacteria, green algae, diatoms, yellow-green algae, golden algae, red algae. Biofuel from algae is sometimes referred to as "oilgae". Its production is supposed to be low cost and high yielding giving up to nearly 30 times the energy per unit area as can be realized from current, conventional 'first-generation'

biofuel feedstocks. Biohydrogen and bioelectricity generation using photosynthetic methods may be regarded as fourth generation biofuels (OECD/IEA, 2010;Duku et al., 2011, Fink and Medved, 2011; Adam et al., 2011;Ambali et al 2011; Omer, 2012). The liquid biofuels in particular bioethanol and biodiesel as an alternative fuel of the future in the bio-economy era and as a survival strategy in post fossil era has gained renewed interest from researchers, entrepreneurs, governments of the world, NGO's, united nations entities, environmentalists and the general public. Since the first liquid biofuel generation involves land use, which is a strategic natural resource. The potential effects of LBs utilization on the relationship of agriculture and biodiversity/landscape conservation and environmental sustainability and management are antagonistic. It is against this background bio-energy in particular LBs development are high in research agenda's in many countries of the world due to serious concerns on the food security impacts, social feasibility and sustainability of bio-energy especially with for first liquid biofuel generation.

It has been recently established that bio-energy if well managed in socially and environmentally responsible manner coupled with focused efforts to improve agricultural practices in Africa may realize this high bio-energy potential in the next forty years which, could help address the need for energy expansion in the future Africa (Amigumi et al., 2008; Ambali et al., 2011). However, Africa still remains a large consumer of traditional sources of energy mainly fuel wood and with a greater proportion of its population facing energy insecurity. About half of the energy used in Africa originated from biomass or agricultural residues (Ambali et al., 2011).

1.2 Tanzania current energy consumption pattern

Currently, the estimated population of United Republic of Tanzania (URT) is about 43 million. The majority of Tanzanians (80%) still live in demarcated or agreed boundaries of Tanzania's approximately 12,000 villages /rural areas and rely on human energy and labor for agricultural and transport activities (Bergius, 2012). The documented formal energy

consumption pattern of Tanzanians until recently was that the national energy balance was still skewed towards the use of solid traditional (fire wood, charcoal, crop residues, animal dung) biomass fuel (90%). The rest was petroleum (8%), electricity (1.2 % with only 18% of the country that is connected to electricity up to 2013, projected up 30% by 2015, however, less than 3 % in the rural) and wind, coal, solar, LPG, natural gas and biogas combined (0.8%). This pattern of energy consumption indicates that Tanzania has not yet developed commercial sources of energy to meet the country's demand. Over 80% of the Tanzanian population estimated at 34 million lives without access to modern energy technologies and services. This is a bottleneck in achieving millennium development goals (MDGs) as estimates indicates that 80% of the Tanzanian population will remain without access to clean cooking fuels or improved cook stoves in 2015. Additionally, if electrification programmes follow the current trend and investments, the urban electrification gap will remain above 50% and the rural gap will remain above 90% in 2015. Coupled with ever increasing prices of electricity, petroleum products and poor infrastructure that limit improved access to alternative energy sources, the possibility to alter the energy balance in Tanzania remains a huge problem in social economic terms. In deed the results of tri-variate causality had indicated two-way fundamental association between electricity and economic growth and one-way from employment to GDP per capita for Tanzania (Shahbaz and Feridun, 2011). Supported by recent study on energy sector in Tanzania which revealed that low and unreliable energy supply have negative effect on the economic growth and development (Mwakaugi et al., 2010).

Although the energy policy in Tanzania state that one of the challenges facing the government is to reach rural households with around 80% of the population has very low purchasing power and depends mainly on wood-fuel for cooking and kerosene for lighting, which have negative consequences to the environment and the quality of life, especially to the rural poor. Tanzania had continued to experience an increasing scarcity of affordable, reliable and sustainable energy at household level, which affects over 94 per cent of the total population. Such scarcity of energy for domestic use has received little attention from policy makers a factor

could hinder successful implementation of the National Strategy for Growth and Reduction of Poverty (MKUKUTA) and achievement of the MDGs.

Furthermore, it has been recently reported that even though solid biofuel accounts for 90% of the energy mix, currently is the marginalized national energy carrier of the majority in Tanzania (Sawe, 2011). The National Energy Policy of 2003, in general is not clear and lacks proper guidance from the government in the form of policy goals and strategies defining the energy sector and development. Not even which type of energy is a priority? It is also silent on development for sustainable solid fuel production in Tanzania (Mwakaje, 2010). Therefore, concerted efforts to improve household energy efficiency could have enormous potential benefit for society and the environment especially reducing the burden to women, and the reversal of deforestation if alternative energy such liquid biofuel is promoted in cooking and lighting. Therefore, capitalizing on Tanzania's vast biomass potential with focus on improved agriculture and at the same time address social-economic and energy insecurity issues could merit a fresh look at the bio-energy potential of Tanzania with an emphasis on managing the sector.

1.3 Background to biofuel sector development in Tanzania

1.3.1 Genesis of biofuels investment in Tanzania

Bio-energy is fundamental to civilization and represents a significant proportion of global energy consumption and is demonstrating a great promise over time. The biofuels industry is a relatively new concept. However, the use of biofuel is not new, it has been technically known to be feasible a century ago. Dr. Rudolf Diesel's engine (1900) ran on 100% peanut oil nevertheless was abandoned in 1920 due to popularity and availability of petrol-diesel, but Dr. Rudolf predicted a return to biofuel, in particular use of vegetable oils as biodiesel (Agarwal, 2007).

Recently there has been renewed growing interest for biofuels triggered by increasing demand for biofuels world-wide as a component of climate

change mitigation, energy security, and a fossil fuel alternative. Ample unused land has been critical for first generation liquid biofuels production and an important feature to attract foreign direct investments in developing countries such as Tanzania that can contribute towards agricultural modernization and poverty reduction initiatives (Habib-Mintz, 2010). In Tanzania, a feasibility study carried out by German Association for Technical Cooperation in 2005 on Liquid biofuels for Transportation in Tanzania: Potential and Implications for Sustainable Agriculture and energy in the 21st Century laid the foundation for the development of biofuels in the country in particular first generation liquid biofuels (GTZ, 2005). The report concluded that Tanzania has a comparative advantage and potential to produce up to 22 times its annual energy consumption in bio-energy due to the fact that nearly half of the country's land area is suitable for biofuel production.

The report further noted that Tanzania has significant potential to produce biofuel from sugar cane, jatropha and palm oils. Furthermore it was revealed that that the country could become a cost-competitive supplier of biofuel to the world market due to the relatively high sugar cane yields and the large amount of underutilized land (GTZ, 2005). However, recent report observed that exogenous factors like global recessionary pressure depressed oil prices below the level at which biofuel production were profitable in 2007, making Tanzania's competitiveness and potential benefits questionable (Habib-Mintz, 2010). To promote liquid biofuels in Tanzania the GTZ report made nine recommendations to the government, including the establishment of a national task force to advise and guide the formulation of biofuel policies and regulations suitable for Tanzania. It stated that the government should start "immediately and without waiting for results and policy advice from the Task Force, to promote increased use of biofuel through the learning-by-doing process" (GTZ 2005: 122–123). Since 2006 a year after the GTZ, 2005 study report there was a rapid influx of foreign investors interested in investing in biofuel projects in Tanzania (Kamanga, 2008). Although Tanzania is part of the global community and with envisaged biofuel emerging opportunities, the Tanzanian government was not ready for biofuel industry investment and decided

to set up a National Biofuel Task Force (NBTF) in March 2006. One task for this group was to quickly formulate guidelines for investments in the biofuel industry. The Government of Tanzania supported the process of setting up the NBTF up to the stage of approval while Sweden provided the funding which enabled the NBTF to conduct initial meetings (Markensten and Mouk, 2012). The government of Tanzania is on the forefront encouraging the production of biofuels and the development of the biofuel industry is included in the Tanzanian Vision 2025 and in the present five-year plan. The President of the United Republic of Tanzania has also repeatedly emphasized the importance of developing this industry (Markensten and Mouk, 2012).

While other African countries like Mozambique have already developed sustainability principles for the biofuel sector, the Government of Tanzania had to begin with no policies, regulatory framework, strategies or regulations to guide biofuel investments in the country even though there have been biofuel investors targeting first generation liquid biofuels (Mwakaje, 2010). In deed without strong regulatory frameworks for land, investment management, and rural development, biofuel industrialization could further exacerbate poverty and food insecurity in Tanzania (Habib-Mintz, 2010). To that effect there has been widespread concerns raised from civil society organisations, local communities and other parties national and internationally on endogenous and exogenous factors crossing cutting issues surrounding emerging biofuel sector which could make Tanzania's competitiveness and potential benefits of biofuel sector uncertain (Habib-Mintz, 2010). This is not surprising as biofuel commercial/sector/industry is relatively new in country. Nevertheless, the impact of biofuel investment has started to emerge (Mwakaje, 2010).

1.3.2 Contemporary concerns of biofuel investment in Tanzania

Biofuels could provide an opportunity for mitigating climate change and improving energy security by replacing both liquid and solid fossil fuels (Davis et al., 2011). In Tanzania the majority of rural population in broad outlook welcomes agricultural investments as long as the investors fulfill their obligations (Bergius, 2012; Sulle and Nelson, 2012). Nevertheless

currently there is lack of local management capacity and misinformation. Serious flaw in the way community consultations are carried out, including political interference, lack of transparency, lack of local awareness of the process, and lack of constructive engagement between investors and local communities (Oakland Institute, 2011; Sulle and Nelson, 2012). Therefore major issue of concerns and main complaint have been but not limited: (i) to large-scale land acquisition and compensation, compensation procedure. Though the law provides for consultation of the concerned communities in acquiring land, in reality such procedures were often not strictly followed (Markensten and Mouk, 2012; Sulle and Nelson, 2012). (ii) Land targeted for biofuel production being labeled unoccupied but not unused. Areas of the country most likely to be targeted for biofuel cropping can barely be described as underutilized as was initially assumed by investors and wrongly perceived by most of the biofuels investors to be 'idle' due to lack of a comprehensive land-use plan (Markensten and Mouk, 2012). (iii) Villagers lack understanding of the process. The pattern of acquisition of land by investors cannot be described as transparent, coherent, or entirely consistent with applicable laws and policy directives (Markensten and Mouk, 2012; Sulle and Nelson, 2012). (iv) Promise and non-written contracts are easily broken. Many people interviewed commented that there are known cases where promises had been made regarding benefits for the communities, such as social services and employment, but none of this had been documented in written contracts with the investor (Markensten and Mouk, 2012; Sulle and Nelson, 2012). (v) Compensation procedures are not followed and not sufficient (Sulle and Nelson, 2012). In several cases where villages' land rights have been legally handed over to investors as a result of biofuel investments, the process for compensation has not followed the contractual stipulations (Sulle and Nelson, 2012). Nor is it clear if communities are being compensated at appropriate levels in relation to the value of their lands (Markensten and Mouk, 2012). (vi) Inadequate land valuation criteria rules, excluding any value attached to land itself, do not take any account of the opportunity costs villages face in divesting their rights over lands used for various economic activities (Markensten and Mouk, 2012; Sulle and Nelson, 2012). (vii) Lack of title deeds. An additional constraint

imposed by insecure land access and tenure is that smallholders may be limited in their ability to take advantage of higher commodity (Markensten and Mouk, 2012; Sulle and Nelson, 2012). (viii) The issues of sustainability (social, economic and environment) are also pertinent. There are also issues of clean energy and the poor, which have been a challenge since independence and it not clear how this booming biofuel sector will benefit the country economy and especially the rural poor (Mwakaje, 2010). (ix) Land use change. One of the most controversial issues in Tanzania and in most developing countries is the issue of land occupation. Where land ownership is associated with uncertainties as land is not officially secured and cadastral registries are often non-existent. Land is leased from the state, held communally not private based property. Therefore land rights are often dispute (Rutz et al., 2010; Davis et al., 2011). (x) Exclusion of small-scale biofuels holders. The large-scale land acquisition for first generation biofuels is criticized for depriving small-scale holder their properties, leading to displacement from arable land to no-arable land. Large-scale liquid biofuel productions are resource intensive (land, water) and inputs (seeds, herbicides and pesticides, fertilizers) to which small scale biofuel producers have limited hence excluded in value chain (Rutz et al., 2010). (xi) Wrong perception about land. In Tanzania land is wrongly perceived by most of the biofuels investors to be ‘idle/underutilized’ which actually is due to lack of a comprehensive land-use plan. The misconception that land has no market value and is owned by the government has also contributed to elements of ‘land grabbing’ by the investors and the subsequent adverse socio-economic and environmental impacts and therefore the negative public perception (Ringia, 2011; Oakland Institute, 2011). (xii) Food vs biofuel. This is so in particular as regards land scarcity and related conflicts arising from land alienation and displacement, as well as aggravating ‘food versus fuel’ conflicts as biomass and biofuel production uses land that can also be used for food production (Davis et al., 2011). (xiii) Vague land legislation. “Unoccupied” or “unused” land, which may be used for various economic activities or saved for future generations, is not under the jurisdiction of the village council, but instead the central government. Consequently, such vague land legislation and ambiguous definitions may help to facilitate grabbing of village land with the

backing of the law, and place land in the hands of investors (Oakland Institute, 2011; TNRF, 2012; Sulle and Nelson, 2012). (xiv) Pragmatic approach to agricultural development. The Tanzanian government is actively seeking investment at the same time attempting to establish procedures and safeguards to protect the land rights and food security of its citizens. But as is the case with many developing countries, this is not easily accomplished (Bergius, 2012). The extent to which the above concerns can be addressed responsibly will depend largely on the ways biofuels are being produced and the measures, criteria, and principles that are being put in place to guide their use. When defining suitable land-use practices for biofuels concerns about land availability, competition with food production and environmental impacts must all be addressed (Davis et al., 2011).

1.3.3 Foreign direct investment an emerging concerns of biofuel sector/investment in Tanzania

The bio-energy sector interacts with other ecosystem services; a holistic approach to assessment of land management is required. With increasing competition for land resources, there is a need for comprehensive tools that will identify the best ways to optimize many agricultural resources in an integrated way (Davis et al., 2011). Biofuels may also provide a new source of agricultural income in rural areas, and a source of improvements in local infrastructure and broader development. Biofuel production is not necessarily done only by large farms or foreign investors, but can be carried out by small-holder farmers as well (Markensten and Mouk, 2012).

Land is an invaluable economic asset from which most Tanzanians sustain their livelihoods. Kilimo Kwanza (Agriculture First), initiative launched in 2009, emphasizes modernization of both small-scale, medium and large-scale agriculture, through technological and political reforms, public-private partnerships, value chain approaches and foreign investments. However, the examination of projects such as the 325,000 ha AgriSol Energy LLC investment, raises serious questions over this perceived balanced approach to agricultural development (Oakland

Institute, 2011). It specifically aims to mobilize the private sector by creating incentives for investments and promote medium and large-scale farming, including making land available for biofuel investors (TNBC, 2009). The land targeted is to come from village lands, which is under the jurisdiction and use of Tanzania's 12,000 villages and small-scale farmers (German, et al., 2011; TNRF, 2012, Cotula, 2012). This strategy indicates yet another exclusion of Tanzanian small-farmers holders, on behalf of large scale investors (Bergius, 2012). Within this framework, international development actors and host countries has developed different sets of voluntary guidelines for investors to do land acquisitions responsibly, assuming that there is a way for large scale agro investors to "do right" (World Bank, 2010; URT, 2010; FAO, 2012). However, experiences from other parts of the world indicate that large scale land acquisition for investments did not fulfill the promises they provided and alienated households from access to lands, did not modernize agriculture and instead generated conflicts (Haralambous et al., 2009).

After decades of limited interest in agriculture in developing countries, foreign direct investment (FDI) in agriculture is on the rise (Oakland Institute, 2011). In recent years, over 4 million hectares (ha) of land have been requested by foreign investors for both agrofuel and food production in Tanzania. Though a small portion of these (70,000 ha) had actually been formally leased as of December 2010. These figures need to be treated with some cautions, as they are approximate. The expansion of large-scale land acquisitions is difficult to measure due to lack of transparency and authoritative research on the vast amount of deals taking place, and they do not differentiate between leased and bought land, and land deals still under negotiation (Bergius, 2012). Nevertheless, the available land acquired via DFI arrangement confirms Tanzania as a very attractive country for foreign investors seeking to grow food and agrofuels for export (Oakland Institute, 2011).

FDI is an emerging phenomenon of concern relating to land as strategic natural resource in agricultural investment from lessons learnt from developing countries especially in Africa:

- (i) The increasing interest by foreign agricultural investors, both public and private, in acquiring land in rural on a scale hitherto unspecified (Kaarhus et al., 2010).
- (ii) Government-to-government involvement (Kaarhus et al., 2010).
- (iii) Domestic policies promoting foreign agricultural investments, which may lead to agricultural investment related land deals, which affect huge areas of land routinely used by rural communities (Kachika, 2010).
- (iv) Opening the doors to FDI and offering fertile land to foreign investors, including other governments, at “giveaway prices” (Daniel and Mittal, 2010).
- (v) Suspected lax conditionality and opaque land tenure laws. Although most lands are leased rather than granted or sold to investors, leases are often long term and renewable. Their impacts on the livelihoods and land rights of local customary land users are thus in practice equivalent to the land being sold (Alden Wily, 2003).
- (vi) Negotiation between highest government levels and the investor. In Tanzania for example, the AgriSol Energy LLC investment project which will largely focused on the development of large-scale industrial farming, involving the use of genetically modified seeds and high levels of mechanization negotiation involved the highest level of the state and US investors (Oakland Institute, 2011).

Given the widespread concerns envisaged through FDI on agricultural investment-related land deals with large-scale land investments. In Tanzania the FDI deals are still at an early stage, therefore there is an opportunity for the government, Tanzanians, NGO’s, Community Based Organizations (CBO’s) and all concerned actors to ensure transparency and open debate for the best way forward (Oakland Institute, 2011).

1.4 Justification of the study

Studies on biofuels in Tanzania by both local and foreign researchers are on an increase (Sulle and Nelson, 2012). These studies have been conducted on the social-economic impacts of biofuel, its implications to environment, ecology, rural household and gender, public perception of biofuels. The bigger study that establishes the current status of bio-energy investment and how the same has involved or excluded the small producers is yet to be investigated. There is biofuel policy development that has taken off, but how far the process involved wider consultation of stakeholders and the possible foreseeable policy challenges is an area for further exploration. This is indeed an impetus for Land Rights Research and Resources Institute (LARRRI)/HAKIARDHI to conduct major research that can explore and provide answers to these questions. Having established understanding of global energy over view, Tanzania current energy consumption pattern, genesis of biofuels investment, contemporary concerns of biofuel investment and foreign direct investment an emerging concerns of biofuel sector/investment in Tanzania. This research study intends to build the capacity of the LARRRI/HAKIARDHI in order to engage effectively with more research on land resources and advocacy work on relatively new and fast growing biofuel investment in a more informed position. Several researchers consider that the production of biofuel is still relevant for Tanzania in view of her economic and energy situation. However, the big the question is how to do it in a sustainable way considering financial, environmental and social-economic factors?

2.0 GLOBAL EVENTS AND EMERGING BIO-ENERGY BUSINESS IN TANZANIA

Bio-energy in the form of open wood fire was the first source of energy used by humankind as the dominant source of primary energy and is one of the oldest land-use forms of all (Agarwal, 2007). Even today, 25% of the world's population depends on this unprocessed biomass traditional form of bio-energy use, which covers about 10 percent of total world energy supply. However, wood as the dominant source of primary energy has been replaced during the last 150 years by fossil fuels initially coal, but then oil and natural gas (Lerner et al., 2010).

Commercial bio-energy is assuming greater importance and the emerging markets for modern biofuels is by contrast a relatively recent phenomenon, with dynamics that are driven by varying motives (Ambali et al., 2011). In industrialized countries like the European Union support biofuels with climate change mitigation targets while countries like the United States are driven by improvement of energy security. In developing countries like those in Africa biofuels refers to the potential developmental benefits (Lerner et al., 2010; Ambali et al., 2011). Liquid biofuels mainly ethanol and biodiesel for transport are generating the most attention and have seen a rapid expansion in production (Omer, 2012). However, quantitatively their role is only marginal 0.2-0.3 percent of total energy consumption worldwide (Coyle, 2007).

Promotion of biofuels and diversification of energy sources in developed countries the west in particular are driving the proposal for biofuel in developing countries which lacks a consideration of development agenda. Due to the fact that it undermines biofuels production for local energy consumption as investors target foreign markets, where rising global oil prices will determine high prices for agrofuels (Catula, 2012).

Biofuel can be beneficial if driven by the south taking the local contexts into considerations and if most biofuels companies obliged to construct refineries and supply to the domestic market (Habib-Mintz, 2010). Pushing for biofuel agenda in particular first generation liquid biofuel

for the developed countries is based on meeting their targets (European Commission, 2006). But there is also the reality not always disclosed about the energy dominance hegemony through what labeled as global biofuel (Widengård, 2011). That scenario should also be considered and explored fully responsibly, for it bears far reaching implications in regional and international integrations (Borras Jr, et al., 2010; White and Dasgupta, 2010).

As with other countries in Africa, a number of key global events influenced the emergence of biofuel investments in Tanzania. Among these include: rising oil prices, which reached its highest peak in the world history in 2008 at USD 140 per barrel (Markensten and Mouk, 2012). The predicted high demand for fossil fuel as the emerging economies such as China, India and Brazil grow very rapidly.

Another factor emancipated from the International Energy Agency (IEA) technology roadmap for biofuels envisions that by 2050, there is a potential that biofuels could supply about 25% of the world's demand for transportation fuels (IEA, 2011). Hence some countries have established ambitious targets for biofuel production and proportion of biofuels used in transport industry. The European Union (EU) aims at a mandatory 10% proportion of fuels used in transport by 2020 being biofuels (European Commission, 2006). Conservatively it has been estimated that 88 per cent will come from first generation biofuels a move, which would lead to a guaranteed market for biofuels.

The EUs environmental concern and the directive of having a target of 10% use of renewable fuel for transport led to many investors looking for land for investments in least developed countries (LDCs) such as Tanzania as EU had limited land to meet this targeted demand (Kachika, 2010; Markensten and Mouk, 2012). With an estimated 13-19 million hectares of land outside of Europe needed to meet the EU-wide targets, EU investors turned to Africa and Latin America for biofuel production to gain profit in the seeming profitable EU green energy market.

The demand of such huge tracts of land to invest in biofuel crops cultivation is most likely to lead to forced displacements of poor people from their land, human and land rights abuses are set to increase, to grow biofuel crops for the European market. Moreover, with little research done there was a belief that some biofuel crops such as *Jatropha* can grow in marginal areas with low water requirement and does not compete with food crops (Mshandete, 2011; Markensten and Mouk, 2012). Contrary to this not well researched perception the field visits conducted during this study in August 2012 noted that this is not the case as *Jatropha* as a crop need fertile land and plenty of water, hence with the presence of weak regulation they may compete with foods crops and jeopardize foods security. Nevertheless, the study found the biofuel sector is still in initial stages and some of the initial biofuel projects are either abandoned or stopped working and their owners have left the country with no information of whether they intend to come back or not.

The study also found that some investors who came with investment plans to establish biofuel projects have taken twist to starting with food crops as the country is food insecure and in future they will re-establish bio-energy business as a byproduct of their food crops. For example Agroeco-Energy formerly SEKAB amended business plan from producing biofuel to food items (sugar). Nevertheless, the new plans still accommodate production of bio-energy such as bioethanol from molasses and electricity from sugar cane baggasse which can be consumed within the firm and surplus sold to the country power supplier –TANESCO.

The fast growing interest in biofuels in the context of globalization of biofuels coupled to climate change mitigation strategies, ambitious set blending targets, potential green energy market/business and undisclosed reality for biofuel-energy power monopol/control (Widengård, 2011; Mshandete, 2011) seemed to be among plausible factors which led to a first comprehensive feasibility study on the prospects of biofuels as a transportation fuel in Tanzania (GTZ, 2005). It was summarized that Tanzania has good conditions for biofuel production in terms of land, water, labor costs and political environment (Markensten and Mouk, 2012). Among the factors which, has been identified that could favor

biofuel production in Tanzania (GTZ, 2005; Markensten and Mouk, 2012) included:

- (i) Abundance of land tamed as “unutilized land” - Tanzania has a total of 44 million hectares of arable land, of which only 23 per cent is currently in use. Of the 29 million hectares suitable for irrigation only one per cent is currently under irrigation. This means that a significant share of agricultural land could be developed and become productive.
- (ii) Availability of what labeled as “cheap labor” which can be used to produce biofuel at a comparatively low cost.
- (iii) Tanzania historical stable political environment, which is conducive for attracting foreign investments.
- (iv) Energy pattern consumption, which is low access to modern energy, around 17.5% and about 90% of the population use traditional biomass for energy.
- (v) Demand for fossil oil products estimated to grow at 30% per year with the country spending 25 - 40% of its import bill on oil imports.

All the above factors led to a rapid influx of foreign investors to Tanzania to invest in biofuel projects as the combined global events and country situations gave the country a comparative advantage for attracting bio-energy investments while investors perceived the favorable factors as opportunities for investments (Markensten and Mouk, 2012). On one hand, biofuels companies business models (e.g. large mechanized plantations and production of raw feed stocks for export and processing in Europe) appears to be contrary to Tanzania’s national sustainable energy self-sufficiency, job creation, promotion of value-added processing, import substitution and environmental conservation development strategies (Ringia, 2011). On the other hand, some investors would like to sell biofuel on the domestic market, which would greatly reduce their transport, handling, logistics costs, Tanzania is not yet set up to use

biofuel energy (for instance no vehicles in Tanzania run on biofuels). Thus at present there is no biofuel market in particular for transportation industry within Tanzania. Most important there is no any biofuel policy which could guide on blending ratios with petrol or diesel (Mwakaje, 2010).

The developed countries biofuels policies and its target as well as subsidies lured many multinational energy companies to invest in renewable energies in developing countries of Latin America and Africa such as Tanzania. The vast majority of which filled by first generation industrial biofuels. In Tanzania, it has been recently reported that official government figures indicate that about 20 companies had requested land for commercial biofuel production by March 2009 (Markensten and Mouk, 2012). Previously study indicated that about 37 companies had sought land in Tanzania for biofuel production and/or involved in biofuel activities by 2008 (Kamanga, 2008). It was established in this study that most of these companies are not in operation as they were affected by the global financial crisis, as they could not access financial resources. Another challenge, which become clear in Tanzania as in many other countries was the reality of whether crops such as *Jatropha* was real “desert crop” whose cultivation on non-arable land, withstand dry conditions, require low nutrient levels and endure adverse climatic conditions (Tomomatsu et al., 2007). Previous reports (Mshandete, 2011; Markensten and Mouk, 2012) and the field visits indicated the contrary. In the filed visits it was learnt from various stakeholders in the infant biofuel industry that *Jatropha* is not a dessert crop as claimed, it is essentially a crop that needs water and nutrients like any other crop. More importantly the viability for the large-scale businesses is still questionable since there is no local market for the bio-energy products and the difficulties to meet the standard requirement and compliances in the foreign markets in the EU and America. Moreover, it was observed during field study visits that some farmers who were convinced by the investors to be involved in the production chains to plant *Jatropha* were not getting a return on their investment as large *Jatropha* plantations shortly closed or suspended leading to lack of markets for *Jatropha* seeds promised. The situation was compounded by the fact that so far no

scientific studies has met the expectations of *Jatropha* projected yields, either in terms of fruit, or oil produced to sustain a full-scale biodiesel programme and blending (Mouk et al., 2010). A study on socio-economic and environmental impacts of a biofuel industry in Tanzania concluded that if biofuel industry introduced in a larger scale is not an economically, environmentally and socially sustainable option that improves sustainable livelihoods for rural communities in Tanzania (Ramadhani, 2007). Some products such as sugarcane could not be used to produce biofuel as the country is still running short of sugar. However, at the moment some investors use sugar by products (baggasse) for production of electricity used to run their plants while the surplus is sold to TANESCO (Tanzania Electric Supply Company Limited).

Markensten and Mouk (2012) recently summarized the above-mentioned challenges for biofuel industry in Tanzania being the global financial crisis in 2008, which seriously undermined funding sources for the investors. Investment in biofuel did not aroused high interest from investors and credit agencies. The bad publicity caused by biofuel debates led to negative perception by the locals and had dampened biofuel investment enthusiasm by investors. Yet another contemporary challenge is the current increasing interest of developed countries to move towards second generation of biofuels, which could render first generation biofuel producers uncompetitive (Habib-Mintz, 2010). These challenges had culminated into most investors abandoning the biofuel projects and returned to their countries while few other had changed their business objectives/plans and/or sold their companies. However, it has been observed that some of the projects, which were closed, had cleared large tracts of land, which were not restored to their original condition.

A case has been cited where an investor was allocated land for planting *Jatropha*. But the investor ended up only cutting the indigenous plants for timber in the name of clearing land for planting *Jatropha* (Markensten and Mouk, 2012;Sulle and Nelson, 2012). The timber was sold without benefiting surrounding local communities only leaving the soil bare. As a result of these experiences, there is widespread concern

about the adverse impacts of commercial biofuel production in rural Tanzania (Sulle and Nelson, 2012), which has been also echoed in other countries of the world (Fargione et al., 2008). The progress in the biofuel sector, however, is taking place in the absence of a guiding bio-energy policy and proper regulation frame works to guide the sector development in Tanzania (Mwakaje, 2010). Since the biofuel sector is still in progress most countries of the world the future challenges may mostly include, environmental concerns regarding bio-energy production related to natural resources such as land, water, soil, forests, biodiversity, represent complex challenges for land use and natural resource management (Scharlemann and Laurance, 2008;Fargione et al., 2008). Therefore, the future development of the biofuels sector must be based on a proper policy and regulatory frame works, on sound scientific research, public awareness creation and promotion of alternative biofuel feedstocks (Mwakaje, 2010; Habib-Mintz, 2010;Mshandete, 2011; Markensten and Mouk, 2012; Sulle and Nelson, 2012). More importantly to mainstream the bio-energy sector priorities to include all three biofuels forms namely, liquid, gaseous and solid biofuel unlike the current trend where the government of Tanzania seems to concentrate only liquid biofuels neglecting the solid and gaseous biofuels (URT, 2010). Including solid biofuels, which is the national energy carrier of the majority in Tanzania in the biofuel policy would help to attract investments in modern solid biofuel production and help to substitute the current unprocessed fuel wood and charcoal that is environmentally unfriendly (Sawe, 2011).

2.1 Status of Biofuel Companies in Tanzania

Biofuels remain a highly contentious issue in Tanzania (Sulle and Nelson, 2012). There has been a huge wave of foreign investors into the country since 2005. Many of these investors are proposed that they will be carrying out socially and environmentally responsible programs (Sulle and Nelson, 2012). In the recent past a number both local and foreign researchers have carried research on land, socio-economic impact, sustainability, policy, governance issues etc (Sulle and Nelson, 2012). The stalled development of the biofuels industry and the examples of

negative effects of investments lead to the conclusion that biofuel development must be based on a proper policy and regulatory framework and be based on sound scientific information, including promotion of alternative biofuel feedstock's, rather than supposed miracle crops such as *Jatropha* (Markensten and Mouk, 2012).

This report investigates and documents the status of biofuel development in Tanzania with a particular attention as to how small-scale farmers benefit/from the recent influx of investments in the bio-energy subsector. In terms of status for the bio-energy business the report provides the current number of companies or institutions that are still involved in the business, level of involvement, markets and their future plans, land allocated, utilization etc. For the past six years since 2006 over 4 million hectares (ha) of land have been reported requested by foreign investors for both agrofuel and food production in Tanzania (Oakland Institute, 2011). However, most land acquired or requested were for biofuel investments, particularly for *Jatropha*, sugar cane and oil palm.

In Tanzania land requested for biofuel investment estimated between 400 and 700,000 hectares (Kamanga, 2008; Sulle and Nelson, 2009; Sosovele, 2010; Chachage and Baha, 2011). Nevertheless, a small portion (70,000 ha) so far had actually been formally leased as of December 2010 (Oakland Institute, 2011). This study found that as of August/September 2012 about 114,798.806 ha of land has actually been formally leased by investors for biofuel production. If rice is replanted with *Jatropha* at Kapunga rice project of 5,500 ha then the total land would become 120,298.806 ha. On the other hand, if land acquired by Bioshape Tanzania Ltd is considered as 38,229.42 as per LARRI (2010) instead of 58,545.808 ha established from the field in this study. Then total acquired land could be 99,982.418 ha. Similarly, Sosovele (2010) reported that in Tanzania less than 100,000 ha are currently under biofuel crop production. However, 99,982.418 ha figure formally leased exclude the land acquired through village land, private owners, which is difficult to establish the figure from the districts. Also information on going land deals is still scant for many of biofuel investors including their unknown origins and intentions motives.

Additionally as of September 2012 the total area requested for biofuel production by investors was about 687,421.734 ha. This figure excludes 5,818 ha of InfEnergy Co Ltd and RUBADA partnership, 5,500 ha of Kapunga rice project and 325, 117 ha of AgriSol Energy LLC. If Kapunga rice project and Agrosol Energy LLC land included then the total land requested would be 1,018,038.734 ha as opposed to up 700,000 ha, which have been reported in other studies. Nevertheless, the secrecy and lack of transparency surrounding a number of land deals on village lands, general lands and reserve lands ongoing in Tanzania, the many flaws identified in the investment processes, available data inconsistency as well as lack of coordinated data base system collection of land deals are clear prohibitive challenges. A brief coverage on land in Tanzania is given below. Public land falls in the following categories: -

- General Land
- Village land
- Reserved land.

Under the Land Act, 1999, all land in Tanzania belongs to the state. However, land can be owned in three different ways 1) Government granted right of occupancy 2) TIC derivative rights 3) Sub-leases created out of granted right of occupancy by the private sector. Rights of occupancy and derivative rights are granted for a short term and long-term period.

- Long term rights of occupancy periods range from 5 - 99 years and are renewable, but for not more than 99 years.
- Long term derivatives rights and leases range between 5 - 98 years.

Local investors: Under the Land Act 1999, citizen may acquire land by a granted right of occupancy or a derivative right or by obtaining a sub-lease from private sector

Foreign investors: Occupation of land by non-citizens is restricted to lands for investment purposes under the Tanzania Investment Act, 1997.

Under the Land Act, 1999 a foreign investor may occupy land through.

- Derivative rights under section 20(2) of the Land Act, 1999
- Application to the Commissioner for Lands for grant of right of occupancy under section 25(1)(h) and (i) of the Land Act, 1999
- Sub-leases from private sector
- Licenses from the Government
- Purchase from other holders of granted right of occupancy.

But not all biofuels investors followed the procedures as explained (Habib-Mintz, 2010;Sulle and Nelson, 2012). There are procedures on how to acquire land for investment. There should be strictness in abiding to the procedures in order to avoid land conflicts in future. The details of the biofuels companies are provided below while Table 2 summarizes the status of bio-energy companies/projects in Tanzania.

It is worthy pointing out that in Tanzania three main biofuel production models are being used (Markensten and Mouk, 2012): Plantation model: The model is based on the investor acquiring land put under production company managed plantation. Community surrounding the plantation will benefit through employment mainly as unskilled labor. Out grower model: This is based on production by small farmers who sell to a processing company that presses the bio-product locally, either for the local market or for export. Community-focused model: This model is popular with NGOs/CBOs. This is based on cultivation of agrofuel crop by villagers for production of biofuel aiming at local self-sufficiency to power a number of agricultural machines-for grain milling, de-husking and seed pressing and for supply to a local electricity mini-grid.

2.1.1 FELISA

FELISA is located at Kigoma region, the company acquired a derivative right of 4,258 ha of land in 2009 for palm oil cultivation. FELISA had two options on the bio-energy sector; the first was to produce the biodiesel from the pure palm oil (labeled D in Figure 1) and to produce biogas for rural electrification (labeled I in Figure 1). FELISA production model of

2008 is not the same today. The demand for cooking oil to the local and international market has lead her to shift from biodiesel production to production of cooking oil. The process from D to E (In Figure 1) is expensive as compared to selling of well processed cooking oil at stage D. FELISA plans to use the waste generated from the production of pure palm oil to generate biogas through anaerobic digestion. The generated gas will be taped and used as electricity for rural electrification (H and I in Figure 1).

Land use/ plan.

FELISA expect to use approximately 1,000 ha of the 4,258 ha for cultivating the palm oil using the improved variety of palm oil, which assure high yield on a small cultivated land using plantation model. Other 1000 ha is set aside for food crops cultivation, the targeted crops being rice, maize and sunflower. The aim is to cultivate food crops is for seed multiplication, which will be sold to farmers. Since it is not environmental responsible and logically unsound to clear all 4,258 ha for agriculture, there will be uncleared forests within the area and in water sources natural plants will be left. To make uncleared land / forest productive, FELISA plan engage herself in honey bee keeping which in other way the bees will help in pollination. The other land 258 ha will cover the camping areas, roads and other infrastructure buildings and offices. FELISA has a plan to engage 50,000 to 100,000 small-scale farmers using out grower model of production. Since it is not supported by the land law to acquire 50,000-100,000 ha for investment but relatively possible to engage farmers as out growers to cultivate palm oils at least 1 ha of their land. According to FELISA, 150 palm oils can be grown in 1 ha, so a farmer will be advised to plant palm oil plants as land marks and at the edge of their farms while cultivating other food crops.

There will be market of the bunch of palm from the farmers, as FELISA will establish a factory to press palm oil and purify to international standards. Through out growers production model FELISA will provide farmers with improved variety of palm oil plant and provide extension

services on good agricultural practices. In out growers production model FELISA depends on farmers to get the palm oil bunch as raw material palm oil production plan. However, the cost of a small palm oil plant is around 5 USD, it is not easy for a farmer to buy 150 trees, which is equivalent to 750 USD at once for one hectare. So for the project to be successful and to create a win- win situation between FELISA and the farmers, the government has to be involved in helping FELISA in her out growers production model at this initial stage for the benefit of the farmers.

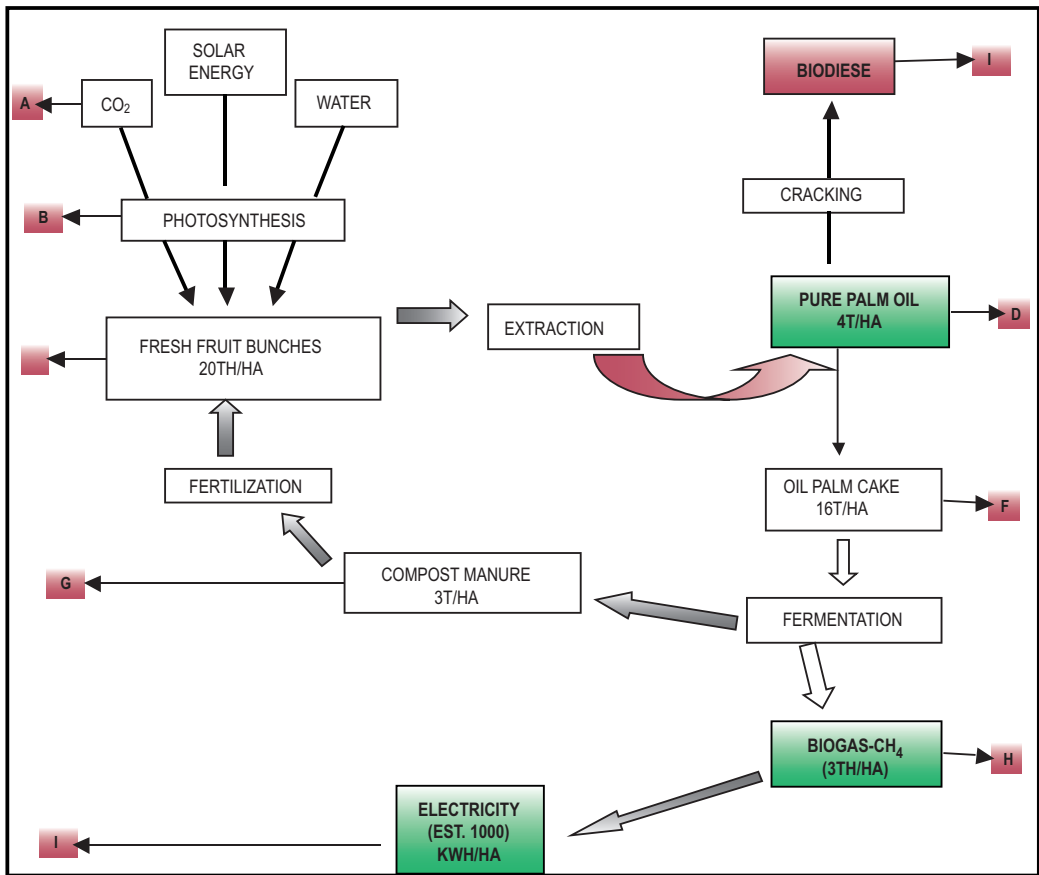


Figure 1: FELISA production concept flow chart

Land Conflict.

FELISA had 70ha of land in Ilagala village as a pilot/demonstration farm. This farm was used when the process of legal acquisition of 4258 ha in Basanza was in progress. The 70 ha farm was in a village land and it was in two villages border of Karogo village and Ilagala village. These two villages had a conflict on the border of the farm, which caused FELISA to be a victim of the land disputes of the two villages. FELISA got a court injunction to stop any activity in the farm until stated otherwise by the court. Up to the August 2012 there was no any other order from the court and the farm was left unattended. The initial investment of FELISA in palm cultivation was directed in the 70 ha farm at Ilagala village, so it had to start afresh in another land. As a lesson learnt in Ilagala, FELISA had to make sure they get the title deed at the applied land in Basanza, which was a general land before starting any investment. They got the title deed with 99 years lease from TIC in June 2009. The land disputes and long process in obtaining the title deed of the 4258 ha made some of the financiers of the project to step aside.

Current Status

The actual operations in the acquired land will start in 2012 not certain when but according to the nature of the activities it means it will start during the rainy season.

2.1.2 30 DEGREE EAST (FORMELY SUNBIOFUELS TANZANIA LTD)

EU policy which targets to increase use of renewable energy in transport to 10 per cent by 2020, has pushed European companies like Sun Biofuels to look for land in Tanzania and other developing countries to cultivate biofuel crops. Sun Biofuels Tanzania Ltd was established in 2005, as a local affiliate of a UK-based company, Sun Biofuels Plc, which was widely investing in developing countries. Sun Biofuels Tanzania Ltd sold the company to a private firm 30 Degrees East based in Mauritius, which control 90% of the shares, while the remaining 10% is shared equally by two Tanzanians. The ownership change was registered with the Business

Registrations and Licensing Agency (BRELA) in Tanzania in October 2011.

The land acquired by Sun Biofuels Tanzania Ltd was mainly forested land, which supported livelihood of over 3,000 households under the jurisdiction of the surrounding 11 villages of Mtamba, Muhaga, Marumbo, Palaka, Kidugalo, Kurui, Mtakayo, Vilabwa, Mitengwe, Mzenga 'A' and Chakaye in Kisarawe district, Coast region (Bergius, 2012). The area was generally used by the villagers for a whole range of economic activities, such as charcoal production and the harvesting of timber, poles, firewood, wild food and medicines. After a long land acquisition process, which lasted for full 36 months, is one of few biofuel companies operating in Tanzania having finalized the process of obtaining the derivative title to the targeted land. According to a land officer of Kisarawe district Sunbiofuels Tanzania Ltd acquired 8,211 ha of land although it applied for 18,000 ha of land. The company slowly started production in 2009, having developed land 2,000 ha total land area acquired which out of it 750 ha has been grown *Jatropha* plants as a trial plot. The rest 6,211 ha have not been developed yet.

Status of the project

Sunbiofuels Tanzania Ltd shared as with other investors of biofuels in Africa a belief that *Jatropha* species was a new biofuel era wonder desert crop, which would be very suitable for the establishment of plantations. But without sound scientific findings that *Jatropha* can be planted on a large scale (Mshandete, 2011). Sunbiofuels Tanzania Ltd only after two years of planting *Jatropha* have found the plant less robust than first thought. The company had faced difficulties in growing *Jatropha* due to drought and presence of *Jatropha* plant diseases. As a measure to address the challenges encountered so far the company had stopped planting new *Jatropha* plant plots and it engages itself in *Jatropha* researches. It has established experimental plots to find out, which varieties of *Jatropha* are suitable to be grown in the area. The current situation had compelled the company to lay off 750 workers, leaving only 25 employee to take care of 2,000 ha planted with *Jatropha*. Since the company does not expect to cultivate *Jatropha* in near the future due to

presence of the mentioned challenges. This means that the company will continue with *Jatropha* cultivation after promising findings in the ongoing researches. Therefore the future of the project is still uncertain, and it is not known when or if the plantation will resume normal activity. The new owners the 30 Degree East are currently reviewing their strategy for the farm because current yields for *Jatropha* are not viable. For this reason they are also considering the production of other types of cash crops.



Plate 1: A section of unattended *Jatropha* farm of 30 Degree East at Kisarawe, Coast.

Area set aside for cultivation of food crops.

30 Degree East formerly Sunbiofuels Tanzania Ltd has set aside about 5 acres (about 2ha) which is 0.005% of the acquired land for food crop cassava in particular for her workers. However, it is contrary to 5% of the acquired land, which would translate into 410.55 ha as stipulated in the guidelines for sustainable liquid biofuels development in Tanzania as a tool to guide local and foreign investors (URT, 2010).

Land Conflicts

Land conflicts are not only linked to the unfulfilled promises, but also to the frustration of the company collapsing and the uncertain future of the Jatropha biofuel project which, seem abandoned. During the field visit there was a report that some pastoralists have entered the farm believing that the land is not in use and the owner had abandoned the land. The event provided evidence on impacts on land rights as result of land acquisition, communities have lost ownership and access to land for different multiple uses. Nevertheless, most of the land targeted for biofuel production is what the Land Act defines as unoccupied, but this case of Sun Biofuels Tanzania Ltd in Kisarawe show, it is certainly not unused.

Another conflict related to land worthy mentioning which have been reported in details elsewhere by other researchers on biofuels in Tanzania is failure of the investor to respect an agreement with villagers which promised improvement of infrastructure and allow villagers access to vital water sources including rivers and natural springs in the prime virgin land (Mdemu, 2011; Bergius, 2012; Markensten and Mouk, 2012). Also in adequate compensation paid perceived by household members as inadequate and failed to reflect the value of future use and income from the land. In the land deal Sun Biofuels Tanzania Ltd paid thousands of villagers from 11 villages in Kisarawe district Tanzania Shillings 280m/- in compensation for acquired land as per derivative right, which had drawn some complaints.

2.1.3 BIOSHAPE TANZANIA LTD

BioShape Tanzania Ltd is a wholly owned subsidiary of the BioShape Holding B.V. in The Netherlands located at Kilwa district in Lindi region. The company started for search of land in 2006 when officials visited TIC and Kilwa District and it approximately requested 81,000 ha but only legally acquired 34,000 ha in year 2008 (Sulle and Nelson, 2012). However, according to the land officer at Kilwa district the company acquired 58,545.808 ha of land in 2008 in 4 villages namely; Nainokwe (4,734.186 ha), Migeregere (13,486.120 ha), Mavuji (6,509.500 ha) and Liwiti (33,816ha) making a total of 58,545.808 ha. The later figure is contrary to the range of 32,000ha to 37,000 ha reported frequently in the literature (Chachage and Baha, 2010). Furthermore it is also contrary to the total area of land acquired of 38,229.42 ha from four villages Nainokwe (6,663.25 ha), Migeregere (13,759.61 ha), Mavuji (6,475.11 ha) and Liwiti (11,331.44ha) reported by LARRRI (2010). If the figure from the Kilwa District land officials is considered authentic the land acquired by BioShape Tanzania Ltd stood at 58,545.808 ha and if the figure from literature reports taken into account then area acquired by Bioshape could be 38,229.42. Attempts were made for the BioShape Tanzania Ltd officials to confirm the figure but in vain. This could be possibly because the BioShape business had collapsed and the company has been subjected to unfavorable media coverage both in Tanzania and Europe (Sulle and Nelson, 2012).

Box No. 1: Villagers leaders opinions on land available and employment prospects.

‘We have plenty of land for investors; even if another investor wants to come he will get the land’ (Team leader, Bioshape.)

‘We gave the land to the investor because we were promised to be employed’ (Village chairman

Operation status of the project.

BioShape Tanzania Ltd had cleared and developed as *Jatropha* plantation less than 500 ha out of 34,000 ha, nevertheless currently the investment in Kilwa is dormant (Sulle and Nelson, 2012). During field visit in August 2012 it was observed that a total of 3,000 ha at Mavuji

village was cleared for the purpose of establishing a Jatropha farm. However, only 1,000 ha of the total land were planted Jatropha for demonstration the rest 2,000 ha were left without planting Jatropha. Nevertheless, due to global recession in 2009 the company had stopped operation/abandoned the farm leaving the planted Jatropha unattended to date (See Plate, 2). Before BioShape Tanzania Ltd abandoned the farm in Kilwa had employed 100 workers and 700 casual labourers who have been suspended (Sulle and Nelson, 2012). This had shuttered their expectations for regular income and motivation for offering land to the investor, which sometime considers only short-lived gains as well as not considering future generations land requirement as strategic resource (See Box No. 1). The main reasons for abandoned Jatropha investment in Kilwa by Bioshape are both external and local (Sulle and Nelson, 2012). The external was loss of credit to high risk or speculative investment due to economic crisis that begun in 2008 which in ongoing today. The local reasons, which undermined the investment prospects included, suitability of the soil and climate for production of Jatropha with suitable yield and oil content (Sulle and Nelson, 2012).



Plate 2: A section of the BioShape Tanzania Ltd abandoned Jatropha demonstration farm at Mavuji village, Kilwa, Lindi.

Environmental concern and timber harvesting business model

BioShape Tanzania Ltd cleared a vast land as the way to establish Jatropha farm. Big trees were cut down to clear the farm, but over three years since tree were cut down without planting Jatropha the entire land cleared except for Jatropha demonstration farm. This an illustration of environmental concerns regarding biofuel production which are relevant to a number of natural resources, including land, water, soil, forests, and biodiversity, and represent complex challenges for land use and natural resource management (Markensten and Mouk, 2012). The conversion of forests into Jatropha cropland for biofuels at Mavuji village threatens biodiversity and can create a “carbon debt” by releasing significant greenhouse gas (GHG) emissions. Furthermore, Bioshape Tanzania Ltd harvested valuable hardwood timber in the initially cleared land worthy over 100 million USD. However, logging (timber harvesting) was not mentioned as one of the part of the company’s business model (Sulle and Nelson, 2012).

Land acquisition process and collapse of Bioshape Tanzania Ltd

Although the Bioshape investment has collapsed it seems however that the land acquisition in Kilwa did not adhere to the processes defined under the Land act and Village Land Act (Sulle and Nelson, 2012). The range of irregularities in land acquisition process that involved failure to follow proper legal procedures are detailed in the recent report by Sulle and Nelson (2012). The report concluded that it was not clear ultimately how the title deed was granted to Bioshape Tanzania Ltd amidst the legal procedures irregularities and if the land acquired was formally was transferred from village land to general land, an act that must be published in Government Gazete and can only be done by the President. There was no documentary evidence to verify that the transfer took place (Sulle and Nelson, 2012). Nevertheless finally the investor was granted the land. However, field visit established that the land given to the investor was not as fertile as the land used by villagers for their agricultural activities. The land offered to the investor has the tendency to crack during dry season exposing plant roots to sunlight and heat (Plate, 3) and being very muddy and sticky during rainy season

(characteristic of clay soil) hence according to villager's knowledge and understanding is not suitable for agriculture. Besides being frequently invaded by elephants. The soil and water conditions which are critical to potential productivity of any agricultural crop seems to be a constrain to Bioshape Tanzania Ltd in Jatropha investment Kilwa District and one of the reasons for rapid collapse and failure in biofuel investment.



Plate 3: A section cracked black cotton soil during dry season at Bioshape Tanzania Ltd acquired land at Mavuji village considered unproductive land by villagers

2.1.4 AFRICAN GREEN OIL LTD (AG0).

African Green oil Ltd is Norwegian based company operated in Rufiji district, Coast region. It applied for 35,000 ha of land in Rufiji district but acquired only 10% of the requested land i.e, 3,500 ha in four villages namely, Lungungu, Nyamatanga, Kilulwetambwe and Nyanjati. However, there were village borders issues, since land supposed to be offered to the investor in Lungungu village was said to be under Mangwi village.

How land was acquired.

The African Green Oil Ltd wrote a letter to Rufiji district showing interest to investing in the district. The request was then sent to the villages where palm oil trees are usually cultivated; the villages accepted the proposal through their village assemblies. But before land was granted to the investor the district ordered the preparation of land use plan, as land law requires. Land plan use was financed by the AGO Ltd in seven potential villages namely, Lungungu, Nyamatanga, Kilulwetambwe, Nyanjati, Lwaluke A and Lwaluke B and Nyamisati. After the land use plan was established each village showed the land allocated for investment, but under the land Act and Village Land Act, a village was not supposed to award more than 50 acres. The village leaders wrote back to the district to accept the project but they had no decision on the land over 50 acres. Since land greater than 250 ha area of village must be transferred to general land which require President approval and public announcement in Government Gazette (Sulle and Nelson, 2012). However, the AGO Ltd was allowed by the district to develop the land while other process of land acquisition was in progress. The lease and title deed was not possible to be granted at the time because the land was not surveyed. There was no compensation of land done to any locals because the land given to the investor was not in agricultural area called “Punguti” in local ethnic language loosely meaning unproductive land. Also at that time that land was not inhabited by people. Nevertheless, if the land could have been surveyed, as the process of acquiring the title deed requires, the compensation could have been done to the village for the land that the investor intended to use. It seems land compensation is an insufficient practice and procedures not followed (see Box No. 2). This reveals that biofuel being a new industry with most relevant issues around biofuel being unknown. The land rights and other rights of the farmers need for more knowledge to be imparted with broad-based creation of awareness to secure public support and participation in order for new major investments in biofuel to materialize (Markensten and Mouk, 2012).

Box No. 2: Land compensation -an insufficient practice and procedure not followed.

The Village Land Act states that no village land shall be transferred to general land until all the involved parties have agreed upon the issue of compensation. This section is thought to provide some safeguard against expropriation of village land (Alden Wily, 2003). However, identifying the multiple interests and uses of land is a difficult process, as rights to land are often held `through diverse blends of individual to collective rights` (Cotula, et al., 2009). The compensation is intended to cover all investments made on the land, and the loss of future

Status of the project.

The African Green Oil Ltd has a nursery plot in Lwaruke village of about 9ha, which has palm oil plants, but some plants has overgrown because they have been in the nursery for more than 3 years (see Plate 4). The project is no longer operational and the assumption is that the land requested was not acquired so it was not possible to meet the production cost and make profit out of the small land acquired. The company has ceased its operation company officials are not in the farm office but in Dar es Salaam.



Plate 4: A section of overgrown palm oil nursery of African Green Oil at Lwaruke Village, Rufiji district.

The company intends to change the type of the crop to be grown in the acquired land although the request is still pending in Rufiji district council. The intended crops are sunflower and sesame. Furthermore according to AGO field officer also has asked to be granted a land on Rufiji river basin for palm oils cultivation.

2.1.5 Agro EcoEnergy Tanzania Ltd

SEKAB Bioenergy Tanzania Ltd was a branch of SEKAB AB a Swedish biofuel company, which is the largest producer of green chemicals in Europe based on Ethanol. SEKAB Bioenergy Tanzania Ltd is another unsuccessful biofuel company operating in Tanzania. In 2009 it suffered severely from the global financial crisis and the collapse of the oil prices and the subsequent collapse of the ethanol market. In addition amid protest from environmentalists, activists and lack of proper policies to

guide biofuel Tanzania, opposition rose in Sweden and company was forced to shut down its projects in Tanzania in early 2009 (Sulle and Nelson, 2012). The same year SEKAB AB sold all its African projects to EcoDevelopment under the condition that EcoDevelopment reduced the remaining closure cost for SEKAB AB and that SEKAB AB retains a right to share future profits from the operations that EcoDevelopment AB could make in future. Therefore since October 2009 SEKAB AB has no ownership in any African operations.

Agro EcoEnergy Tanzania Ltd ownership

The company is 100% owned by the Project Developer Agro EcoEnergy Tanzania, which in turn is a Tanzanian registered company, owned 93.5% by EcoEnergy Africa AB, which is registered in Sweden, 5% by Tanzanian Petroleum Development Company (TPDC) and 1.5% by Community Finance Corporation Ltd (CFC). TPDC is 100% owned by Government of Tanzania. TPDC will have key role in the future development of a national ethanol infrastructure. CFC is owned by three Tanzanians. EcoDevelopment in Europe AB, a minority owner in SEKAB, owns EcoEnergy Africa AB.

Land ownership of Agro EcoEnergy Tanzania Ltd

Agro EcoEnergy Tanzania Ltd project will mainly use land in the district of Bagamoyo that belongs to the Government of Tanzania (GoT). The area consists of an abandoned state owned cattle ranch that has not been in use since 1994. Since the demise of the cattle ranch there has been no formal development in the area. In April 2008 the western part of the former Ranchi ya Zanzibar (Razaba) cattle ranch was officially offered to Agro EcoEnergy Tanzania Ltd by the GoT providing 24,000 ha for the intended project. In this joint venture partnership Agro EcoEnergy Tanzania Ltd will obtain a 99 year lease and free access to the land from the GoT in exchange for a 25% long term shareholder of the company together with local communities and a membership of the board of directors. This model, of equity in exchange for land, is applied for the first time in Tanzania and is now intended to serve as a model for a new national policy relating to large-scale land investments in Tanzania in agriculture or forestry.

Agro EcoEnergy Tanzania Ltd production model

The production model comprises initially 11,000 ha of sugar cane, where 7,800 ha will be on the site of the project (plantation model) and approximately 3,000 ha of out grower land (out growers model). Approximately 30% of all sugarcane supply will be sourced through an out growers' programme by 2018. The company intends to eventually expand to 200,000ha and has applied for a credit guarantee from the Swedish International Development Agency (Sulle and Nelson, 2012). The acquired land for the project, (map) has been formally identified and demarcated. The National Environment Management Council (NEMC) has approved environmental and social surveys for the project. Furthermore, water rights have been granted by the Wami/Ruvu River Basin Authority and a local demonstration farm of 200 ha with drip irrigation has been operational since 2007 with excellent yields.

Sugar, ethanol and electricity production

The project will produce approximately 125,000 tonnes of sugar per year for sale to the domestic market when the factory will run on full capacity by 2015. The project also will produce 8-15 million litres of ethanol, which would be blended with gasoline primarily for the domestic market. Besides ethanol, the 30 MWh of electricity which will be produced by the project from sugarcane baggasse waste will be used to facilitate production processing in the factory and the other 15 MWh will sold to the national grid. It is anticipated that there will be direct employment of approximately 2,000 persons. Through the out growers scheme (3,000 ha) an estimated 1,500 persons will be employed. With indirect effects included, an estimated total of 11,000-15,000 new jobs will be created.

Box No. 3: Concerns about Agro EcoEnergy Tanzania Ltd sugar cane project

-Current land use: More than 1300 people will be impacted who are living or working within the project area. Those physically impacted include households in surrounding villages. Economically impacted, charcoal producers living in temporary camps by reason of their loss of forestry resources are also impacted. Pastoralist families with over 3000 cattle and a range of other livestock.

-Resettlement procedures, site selection and host communities:

Monitoring and evaluation of physical resettlement based on cultural ties, social and political cohesion and livelihood opportunities are complex.

-Compensation procedures complexity:

Will the framework involves cash compensation or in-kind compensation to the vulnerable groups, physically impacted, economically impacted etc?

- Life cycle analysis:

Life cycle analysis (LFA) for the production of sugars, ethanol and electricity from sugars cane and sugar cane processing wastes.

-Land use change:

The impacts of land use change on biodiversity both of flora and fauna and other strategic resources such as water, human, wild life, forests, air etc

-Land transformation:

On social, ecological systems, climate change and environmental sustainability would be complex and difficult to predict.

Meeting sustainability criteria:

The carbon debt that would arise from transforming land to sugar cane plantations must be considered. The soil may be highly rich in carbon and function as important carbon storages.

-Competition for scarce resources may to lead to conflict

What protocols will be in place for processes related to conflict resolution, reconciling competing interests and good governance of land and natural resources?

Concerns

Despite anticipated socio-economic contribution of the project. There are some concerns which are worthy mentioning and need to be treated responsibly by all parties involved both the Agro EcoEnergy Tanzania Ltd and partners (see Box No. 3).

2.1.6 SEKAB AB OF SWEDEN

Decision by European Union countries of increased renewable sources in the energy mix attracted a lot of attention from the multinationals. Europe's largest ethanol company, SEKAB AB of Sweden planned to invest in sugarcane plantations targeting to produce ethanol for consumption in Europe. To that effect the Swedish company requested for vast area of land 400,000ha for that purpose in Rufiji district in 2008/2009 (Sulle and Nelson, 2009).

Land Acquisition Process.

SEKAB AB of Sweden land deals in several potential villages namely; Tawi, Nyamage, Utunge, Kilimani west and East, Ngorongo East and west, Ndundunyikanya, Kipo, Kipugilo, Nyaminywili, Mtanza, Mwasena, Mloka in Rufiji district were very controversial interms of observing the land law and the procedures for land acquisition. According to the Rufiji land officer, SEKAB AB of Sweden officials have not visited Rufiji district since 2008 after world economic recession. This implied the company had abandoned her plan to invest ethanol production from sugar cane in Rufiji district in Tanzania. Actually the SEKAB AB of Sweden had collapsed and since 2009 had sold all its African projects to former CEO. Who had revived the project in Tanzania and setting up a sugar company (see 2.1.5 on Agro EcoEnergy Tanzania Ltd) with about 8,000 ha sugarcane plantation and a refinery in Bagamoyo, Tanzania.

2.1.7 JATROPHA SEED AND ENERGY PRODUCTION (JASEP)

The company was registered by BRELA in 2007, based at Kigoma district and is owned by Tanzanian by 100% with four shareholders. The company aims to promote the cultivation of Jatropha for small scale farmers by providing them with seeds and extension services on good agricultural practices. In return the company will buy the Jatropha seeds from farmers.

Target market of the Jatropha seeds

JASEP planned to buy the Jatropha seeds from the farmers and sell it to the international and local markets. The company planned to sell Jatropha seeds or pressed oil to Prokon renewable energy Ltd based in Mpanda, Katavi region

Land acquisition process

The company had applied for 1000 acres (400 ha) in Kigoma district and process is ongoing. Besides the application the company is finalizing legal ownership for 300 acres land, which already being demarcated after surveyed. The land to be acquired will not only be used to cultivate Jatropha alone but also other agricultural food crops such as cassava, maize and sunflower. The land use plan for 300 acres (120ha) and allocation of each crop is underway.

Status of the project.

The company does not promote the cultivation of Jatropha anymore since most of the companies, which were to buy Jatropha seeds are no longer operational and the market of Jatropha is uncertain.

2.1.8 PROKON RENEWABLE ENERGY LTD.

PROKON Renewable Energy Ltd was founded in 2006 to implement the cultivation of Jatropha, the processing of Jatropha seeds and the selling of Jatropha oil and is based in Mpanda district in Katavi region. It is a member of the PROKON Group, whose headquarter is in Itzehoe, Germany. The company has been operating the business of bioenergy by contracting smaller farmers to cultivate Jatropha. Through contract farming the company provides the seeds, extension services and pesticides.

Out growers model/contracted farmers.

The company targeted to contract as many farmers as possible to meet the set target of 200 tons of Jatropha seeds per year. Although they contracted more than 4000 farmers were not able to reach the set target. The farmers had signed a contract of selling all the Jatropha seed for ten

years from the first year of harvest. The company also was to buy *Jatropha* seeds for ten years.

Status of the project.

The company evaluated the project in 2010 and revealed that the project was underperforming. For year 2009/2010 30 tons of *Jatropha* seeds were bought from farmers and for 2011 was 4 tons and the expectations for in 2012 is less than 4 tons. This partly is due to fact that in February 2011 the company declared it will not be in operation after the next ten years from 2011. The announcement disappointed contracted farmers to the extent some cut down their *Jatropha* plants in order to cultivate other crops. However, currently the company still buys the seed from the farmers who have the seeds and will continue to buy the seeds up to 2019 as part of the contract.

Soil for the *jatropha* cultivation.

Through contracting farming, a farmer is left to decide which land can be used to cultivate the crop. In the initial years farmers can have intercropping farming, and as the crops grow they extend their leaves and the intercropping start to be impossible. Then the calculation of the benefit of the crop rises, does the crop have low cost of production than food crops? The *Jatropha* intercropping with other crops practices leaves a number of unanswered questions.

- (i) Was the soil studies conducted?
- (ii) Was there any study on pests done?
- (iii) Water resource availability for crops to be intercropped with *Jatropha* assessed?
- (iv) Was there any joint extension service between government extension officers and those of Prokon on intercropping *Jatropha* with other crops?
- (v) Were farmers aware of the biofuel vs food competition?

Land Request.

The company applied for the land about 10,000 ha from 3 villages of Sibwesa, Majalila and Katumba so that they can be able to produce as much *Jatropha* as needed to meet the target. Although villagers accepted

the project, the request was turned down at district level due to the fact that biofuel policy was not in place to guide the biofuel sector, the land requested was potential for food crops cultivation and some of the villages had no land use plan.

2.1.9 AgriSol Energy LLC USA.

Is the Iowa-based Investment Company in USA that specializes in agribusiness. It has partnered with Summit Group, Global Agriculture Fund of the Pharos Financial Group and the College of Agriculture and Life Sciences at Iowa State University, to develop a large agriculture enterprise in Tanzania. The Tanzanian arm of AgriSol Energy, AgriSol Energy Tanzania, and Serengeti Advisers Limited, a Tanzanian Investment and consulting firm, provide the domestic front for this operation (Oakland Institute, 2011).

Motivation for AgriSol Energy to invest in Tanzania

It stems towards realization of the “Kilimo Kwanza” (Agriculture First), Tanzanian government’s initiative launched in 2009. The initiative emphasizes modernization of both small-scale and large-scale agriculture, through technological and political reforms, public-private partnerships, value chain approaches and foreign investments. However, modernization of agriculture in Tanzania through cultivation of genetically modified crops is not technically feasible since at the moment there are no policies that support GM (genetically modified) crop cultivation. Even research on genetically modified organisms (GMOs) is not permitted in biosafety laboratories/confined field trials.

AgriSol Energy LLC project focus in Tanzania

The AgriSol project is largely focused on the development of large-scale industrial farming, involving the use of genetically modified seeds and high levels of mechanization. The food and biofuel crops investment will include corn, sorghum, soybeans, sugarcane, poultry, cattle and ethanol production (Oakland Institute, 2011).

AgriSol Energy LLC project target land in Tanzania. The land targeted is 325,117 ha from three “abandoned refugee camps” of Lugufu in Kigoma region (25,000 ha), Katumba (80,317 ha), and Mishamo (219,800 ha), both in newly formed Katavi region formerly part of Rukwa region (Oakland Institute, 2011).

AgriSol Energy LLC land deal in Tanzania

The AgriSol Energy LLC land deal is a part of Kilimo Kwanza, or Agriculture First, the Tanzanian government’s scheme to promote agricultural development through public-private partnerships. Acquisition is in process and the details of the land deal at different levels between the investor and the GoT are being worked out at various levels. However, acquisition of huge chunks of land for investment to foreigners such that of 325, 117 ha by AgriSol Energy LLC has raised serious concerns recently, which calls for assessment and survey be carried out to establish the amount of land that had so far been leased to foreigners for investment. Competition for land and natural resources has been reported as concerns if locals are evicted from their land without compensation or the compensation is worth much less than the actual value of the land.

Table 2: Bio energy companies, type of ownership, land size and land lease in Tanzania

Sn	Investor and Nationality	Location	Biofuel crop	Size of land (ha)			Details
				Applied	Acquired	Developed	
1	FELISA (Tanzania and Belgium partnership)	Kigoma	Palm oil	10,000	4,258	None	*Plan to start the operation on 4,258ha *Stopped the operation on 700 ha which caused conflict between two villages
2	BioShape Tanzania Ltd (The Netherlands)	Kilwa	Jatropha	81,000	58,545.806	1,000	*Stopped the operation in 2008/2009 and to-date still not operational *Still holds the lease for the land
3	30 Degree East (Mauritus (90%) and Tanzanian (10%) partnership formerly Sunbiofuels Tanzania Ltd (UK)	Kisarawe	Jatropha	18,000	8,211	750	*Stopped the operations temporarily due to drought, *Conducting research on Jatropha varieties with high yield and disease resistant, *Reviews the business plan to grow other crops

A Research Report February 2013

4	Agro Eco energy Tanzania Ltd (Private public partership) with GoT	Bagamoyo	Sugarcane	Not known	24,000	200	*Officially offered Razaba ranch in 2008 by GoT with 99 years lease *Equity in exchange for land model *Planned 7800 ha sugar plantation and 3000 ha out growers *Doing the research on drip irrigation on 200 ha sugar cane in Bagamoyo Magereza land
5	SEKAB AB	Rufiji	Sugarcane	400,000	None	None	*Failed to (Sweden) acquire the land in Rufiji because of financial crisis and the company
6	Prokon renewable energy solution & system Ltd. (Germany)	Mpanda	Jatropha	10,000	None	None	*Failed to get land on Sibwesa, Majalila and Katuma villages

A Research Report February 2013

							<p>*Stopped contracting farmers in 2011</p> <p>*It will continue to buy seeds from contracted farmers up to 2019 and sell the seeds to Diligent Tanzania Ltd</p>
7.	Eco Carbon (France) formerly Diligent Tanzania Ltd (Netherlands)	Arusha, Babati Singida, Monduli, Handeni,	Jatropha	None	None	None	<p>*Operating by means out growers model with 5,000 farmers</p> <p>*Produce between 600-800 liters/day</p>
8	Donesta Ltd & savannah biofuels Ltd	Dodoma	Jatropha	Not known	None	None	<p>*Located in rural Dodoma but during field study no information was found.</p>
9	Trinity consultant/ bioenergy	Bagamoyo	Jatropha	19,719.91	None	None	<p>*Negotiated with village of Kidogozero</p> <p>*It is waiting for district approval when processing the title deed.</p>

A Research Report February 2013

10	Shanta Estates Ltd	Bagamoyo	Jatropha	7,933.824	None	None	*Forwarded the application to the Ministry of land and settlement to issue the title deed
11	Tanzania biodiesel plant Ltd	Bagamoyo	Palm oil	25,000	None	None	*In the process to receive derivative title for only 16,000 ha
12	Clean power TZ Ltd	Bagamoyo	Palm oil	Not known	None	None	*Located in Bagamoyo district but during field study no record was found
13	CMC agriculture bio energy	Bagamoyo	White sorghum	Not known	None	None	Located in Bagamoyo but during field study no record was found
14	Zaga	Kisarawe	Jatropha	Not known	None	None	*Abandoned the Jatropha plan and granted the land to the district for the construction of Medical College
15	African green oils Ltd	Rufiji	Palm oil	35,000	3,500		*Has 9 ha (Norwegian) palm oil nursery *Stopped the activities the past three years

A Research Report February 2013

							* Business plan change to grow other crops other than palm oil *Applied more land in Rufiji basin to grow palm oil
16	Inf energy Co Ltd (Britain/UK)	Mvomero	Initially Jatropha/ Palm oil now rice	Not known	5,818	None	*Land acquisition in process *Joint partnership between Inf energy Co Ltd and RUBADA
17	African biofuel and emission reduction Ltd	Biharamulo	Croton megalocopus	Not known	None	None	*Closed the plan temporary in Tanzania because the land acquisition of land was delayed * Current operating in Kenya while processing land in Tanzania
18	Mitsubishi corporation (Japan)	Kilimanjaro	Jatropha	Not known	None	None	*Abandoned the project no record found in Kilimanjaro

A Research Report February 2013

19	Kapunga rice project (Partnership between South African Dutch & Indians)	Mbarali	Initially Jatropha now rice	5500	5500	None	*Planned to replant Jatropha with rice *Ordered to stop Jatropha cultivation * Ordered to the land for rice only otherwise the derivative right will be revoked
20	D1 oils Tanzania ltd	Kilimanjaro	Jatropha	Not known	None	None	* Possibly abandoned the Jatropha project since no record found in Kilimanjaro
21	Kikuletwa Farm (Southern African) Now Kilimanjaro Irrigation Ltd)	Moshi TPC	Jatropha	Not known	200	Not known	*Abandoned Jatropha growing due to poor yield and need for agric inputs *Current cultivating Aloe vera and horticulture products.
22	Wilma (USA)	Biharamulo	C. megalocopus	Not known	None	None	*Abandoned the plan of investing due to the long processes on land acquisition.

A Research Report February 2013

23	National Service /JKT (Tanzanian)	Oljoro, Ruvu, Maramba, Mlale, Mgambo	Jatropha	Not known	Not known	90	*Operating
24	Kitomondo	Bagamoyo	Jatropha.	Not known	None	None	*Abandoned the Jatropha project * No information found in Bagamoyo land office
25	Export trading co Ltd (Indian)	Mtwara	Jatropha	Not known	None	none	*Closed/ abandoned the plan
26	Biomassive (British)	Lindi rural	Jatropha	50,000	None	None	*Abandoned demonstration farm *No any sign to come back *Faced financial crisis due financial recession in Europe *Villages refused to grant requested land.
27	East African bio diesel (Kenyan of Indian descent)	Bahi Dodoma	Jatropha	Not known	None	None	*Not operational and still in process of acquiring land in Bahi *Planned to contract the out growers

A Research Report February 2013

							* Has Jatropha nursery of 5 ha at Kisima village ,6ha at Chikopelo, 5ha at Dodepu , *The company is hoping to be granted the land.
28	Tatedo (Tanzanian)	Kisarawe and Engaruka	Jatropha, other biomass	Not known	20	None	*Conduct research on the Jatropha seeds in Kisarawe, *Provide trainings to small producers in Engaruka (Arusha), *Plan to acquire more land at due time
29	Mafuta Sasa Bio diesel Ltd (Partnership Tanzanian/ USA)	Temeke (Keko)	Biodiesel from waste cooking oil	Not known	None	None	*Operating with production of 2000 litres per week. The full capacity is 10,000litres per week. *Land acquisition in Singida to grow Jatropha in progress

A Research Report February 2013

30	AgriSol Energy Ltd LLC (USA)	Katavi (Mpanda) and Kigoma	Corn, Soy beans, sugar cane, poultry, cattle, sorghum, and ethanol	325,117	None	None	*Processing the land acquisition at Katumba and Mishamo (Mpanda) Lugufu (Kigoma) *Details of land deals are being worked
31	Jatropha products Tanzania Ltd	Kilimanjaro	Jatropha	Not known	None	None	*Closed
32	Kiumma	Tunduru	Jatropha	Not known	None	None	*Not operational
33	DOSI (EWC)	Simanjiro (Arusha)	Jatropha	Not known	None	None	*Operational
34	AMOSI MUBESI	Bukoba	Jatropha	Not known	None	None	*Operational
35	Vincentian sisters in Mbinga (Tanzanian)	Mbinga	Jatropha	Not known	None	None	*Closed
36	Kilimanjaro biofuels corporation	Kilimanjaro	Jatropha	Not known	None	None	*Never operated
37	BEST RAY	Mount Meru (Arusha)	Jatropha	Not known	None	None	*No any Jatropha activities in place
38	Sekisui (Chinese)	Tanga and Kisarawe	Jatropha	48	48	None	*Planning to conduct research on Jatropha *Signed/entered contract for

A Research Report February 2013

							acquiring 48 ha of land from a villager in Kisarawe
39	Matumaini Mapya	Bukoba	Jatropha	Not known	None	None	*Jatopha activities ceased
40	Kakute (Tanzanian)	Arusha	Jatropha	None	None	None	*Operate community based model * Train small producers how to grow the Jatropha, extract the oil and manufacture the related products.
41	Bioenergy	Bagamoyo	Jatropha	30,000	16,000	None	The investor got Tanzania Ltd only 16,000ha out of 30,000 ha applied
42	Jatropha seed and energy production (Tanzanian)	Kigoma	Jatropha	520ha	None	None	*Finalizing legal possession of 120 ha *Promote Jatropha to farmers *Buy Jatropha seeds and sell to Prokon *Changing business plan to include other crops other than Jatropha

Sources: Field study data (August/September, 2012); Oakland Institute, (2011); Kaarhus et al. 2010; ActionAid, 2009;Sulle and Nelson, 2009,2012; LARRI (2010);RUBADA (Rufiji River Basin Authority); TIC, Ministry of Agriculture Food Security and Cooperatives.

During the field visits that conducted were in August/September 2012, it noted that commercial biofuel production is still in infant stage such that most of the bio-energy investments either suspended or completely stopped their production for a number of reasons. Discussion with some project investors, project representatives and stakeholders who are in the sector indicated that the reasons for the immediate closure of most the projects among others included:

- (i) Lack of financial resources for seed capital for project establishment especially at the time when the global financial crisis was starting.
- (ii) Difficulties of establishing the project due to delay for acquiring land titles that can be used as collaterals for bank loans, projects.
- (iii) In-viability as some of the crops were never researched before establishment and someone has to wait for 3 years to get the product (e.g *Jatropha* crop with very low yields).
- (iv) Inaccessibility of land for establishing the farms and
- (v) Investors change business plan in view of opportunities available in the country.

In Tanzania regardless of the origin of the investor, type of biofuel crop/feedstock and whether biofuel projects are on going and/or abandoned, it was evident as presented in Table 2 that about 72% of the investors engaged *Jatropha* as a biofuel crop using plantation, out growers and community models. This implies that *Jatropha* as a biofuel crop dominated biofuel activities in Tanzania. The observation is in line with the fact that the interest in biofuel in Africa coincided with the introduction of *Jatropha* for biofuel, with *Jatropha* becoming species of choice for the emerging biofuel era. Perception of the majority is that *Jatropha* is synonymous with biofuel. Failure of *Jatropha* mean then biofuel has failed and anything wrong about *Jatropha* suggests more generally failure of biofuels (Markensten and Mouk, 2012).

In fact it has been established by FAO that large number of *Jatropha* based (crop for biodiesel production) projects have however failed to live up to the initial hype and several have downsized or closed (FAO, 2008). According to FAO assessment, many of the actual investments and policy decisions on developing *Jatropha* as an oil crop have been made without the backing of sufficient science-based knowledge. Its seed yields, oil quality and oil content are all highly variable. In terms of its viability as a cash crop, experience with *Jatropha* production in sub-Saharan Africa and South Asia has found that yields are marginal, at best. Reported yields have been between 1 and 1.6 tones per ha (FAO 2010). It was learnt from the field in this study that so far no investor is looking for land to invest on *Jatropha*. *Jatropha* is no longer considered option as a biofuel crop given concerns about its productivity and economic viability. There is actually a global collapse of *Jatropha* as biofuel feedstock as per report from India, China, Kenya and Tanzania (Kant and Wu, 2011). The concerns about *Jatropha* as a biofuel feedstock is illustrated in (Plate 5) below which, show the abandoned Kikuletwa farm formally grown *Jatropha* or biodiesel production. However, currently a new investor Kilimanjaro Irrigation Ltd is growing food crops such as maize, beans, onions, tomatoes and cash crops such as *Aloe vera* and horticultural crops.



Plate 5: Jatropha trees remains from the former the Kikuletwa farm abandoned in Kilimanjaro region.

The visit to various investment areas in Lindi, Kilwa, Bagamoyo, Rufiji, Kisarawe, Kilimanjaro, Kigoma, Katavi (Mpanda), Dodoma (Bahi), Morogoro (Kilombero), Mbeya (Mbarali) and Arusha indicated that the bio-energy sector in particular liquid biofuels in Tanzania is almost non-performing as most of the bio-energy companies had stopped, suspended or changed their business plans/models or sold majority of their shares while others had ceased to operate and changed location. In the areas visited it was observed in some places where investors suspended their activities on the acquired land locals surrounding the abandoned land practically cannot access or use it until the end right of occupancy period or if happens that the of right occupancy (lease) is revoked. It can be generally concluded that the recent surge for land based major investment in Tanzania seem setting a platform for unending conflicts as local people are dispossessed of their customary lands in order to make a way for large scale commercial investors in this case biofuel production in particular first generation biofuels. There is need therefore for the government and stakeholders the investors, NGO's, CBO's etc to come up with deliberate collective action plan to address land related conflicts. Bearing in mind that Tanzania experience up to five land conflicts daily with many of those investors, economical and political powerful actors.

3.0 EXTENT OF INVOLVEMENT, INCLUSION OR EXCLUSION OF SMALL SCALE PRODUCERS IN THE BIOENERGY PROJECTS

The extent of involvement inclusion or exclusion of small-scale producers in the bio-energy projects entails adoption of transparent processes for good governance and decision-making process. An important consideration for inclusive development and sustainability for small-scale producers is the need to link them to income generating activities as it enables more end-users to afford new bio-energy services (FAO and UNEP, 2010). This was in line with what was established at KAKUTE during field study (see Box.4). Adoption of a pro-small scale producer approach is potential also to increase opportunities for small-scale, community-based bio-energy projects to improve local benefits by strengthening community consultation in bio-energy production and ensuring local traditions, practices, experiences and expertise are consolidated as well as becoming self-subsistence bio-energy producers (Lerner et al., 2010). For illustration see KAKUTE pro-small scale producer and processors approach (see Box.4).

Box No. 4: KAKUTE Pro-small-scale producers approach based on Jatropha and Jatropha products

KAKUTE (Kampuni ya Kusambaza Tekinolojia) is an NGO based in Arusha.

- *Promote micro enterprise at the village level using Jatropha and Jatropha products
- *Training women groups to establish commercial Jatropha nursery and bulk seeds collection.
- *Women groups supply tree seedlings, planting cuttings, collect pressing seeds, processing oil and making soap for sale.
- *Training on Jatropha soap making and market development.
- *Training youth on Jatropha oil processing and training sales outlet on marketing of the products. Seed cake are used for biogas plants. Oil residue is used to cure animal skin problems
- *Tree nurseries business generate income for rural women groups. Oil processing business generates income to rural people.
- *The soap making business generate income (To women groups in rural area).
- *Cottage soap making and marketing.
- *Jatropha oil used as fuel for engine, lamps and cooking and soap making and for off-grid electricity generation.
- * Promote Jatropha oil for cooking application using Protos stoves (BOSCH plant oil stoves)

The type and bio-energy feedstock production scheme/model and the way that bio-energy production is implemented might have significant implications on the extent of involvement inclusion or exclusion of small-scale producers in the bio-energy projects. The schemes/models, which are particular to bio-energy feedstock production (FAO and UNEP, 2010), Include:

- A: Large corporate farms for large-scale biofuel production
- B: Private commercial farms in support of large-scale biofuel production
- C: Small-scale out growers providing feedstock to large-scale biofuel production
- D: Large corporate farms for small-scale biofuel production
- E: Private farms for small-scale biofuel production
- F: Small scale private farms providing feedstock to local small-scale bio-energy providers

Smallholder farmers have been lured in to long term contractual agreements without support in the negotiation part of in setting the terms, thus resulting in a dependency relation between the farmer and the trader that does not benefit the farmer. This is a problem for the whole agricultural sector and nothing specific to biofuels (Lerner et al., 2010). During field study it was established that most of investors and companies who had acquired big chunk of land for *Jatropha* cultivation started to cultivate without including small scale produces in their plantation production model. Governments should however pay careful attention to smallholder farmers and their opportunities. Contract farming can in conclusion have positive and negative impacts to both the seller and buyer so national regulations are required to regulate the relationships and ensure adequate protection of both parties.

The contractors do not own farm/land but establishes a networks and creates markets. For example Prokon renewable energy Ltd contracted more than 4,000 farmers and was expecting to get 200 tones of *Jatropha* seeds per year. But the target was not met and it was decided to stop contracting more farmers, to continue to buy up to ten years from now and finally close the operation after failing to get the land for its

plantation. However, some contracted farmers with the *Jatropha* in their farms started to cut them down because of misinformation they got that Prokon renewable energy Ltd will not buy the *Jatropha* seeds anymore. Another example is based on exclusion of small-scale bio-energy producers on value added products, which emancipated from *Jatropha* seeds they sold. Diligent Tanzania Ltd contracted 5,000 *Jatropha* farmers and buys the seeds from them. The company is still operational although it does not own any plantation.

Small-scale producers are included in the bio-energy sector through this mode of production. But they are excluded in the value chain of the post-harvested seed. Therefore, outgrowers model may work or not work depending on prevailing local settings and the type of crop involved. The best model, which could possibly work best in Tanzania is joint venture model aimed at empowering the indigenous/locals. The joint model incorporates indigenous/the locals who continue to own land and organize themselves in cooperatives, become part and parcel of one village product aimed at wealth creation. The investor will access land owned by locals in joint venture arrangement according to agreed terms and conditions.

Land for equity is GoT new concept/initiative, which could ensure inclusion of locals in the value chain. In this arrangement there will be no transfer of village land to general land but the title deed will be issued to the particular village concerned. Instead the village land will be part of the investment. In this land for equity model the practice will be 25% share where 5% will belong to the village and 20% to the council. Another recent proposal is 2% village, 3% council and 20% central government. The rest of the shares 75% will belong the investor. The land for equity formalization is still at early stage and will be debated by wide ranges of stakeholders in order to solicit their inputs. However, without biofuel policy, regulatory frameworks in place to guide biofuel investments such initiatives and efforts will be doomed.

Small-scale schemes are bio-energy processing schemes in which bio-energy is produced locally for local use. An example of this model might be a community or co-operative that utilizes its own land for growing feedstock and will use the biofuel derived to operate small bio-energy

equipment to generate energy for local use (FAO and UNEP, 2010). In Tanzania during field study it was established that The Tanzania Traditional Energy and Environment Development Organization, (TaTEDO) Multi-Functional Energy Platforms (MFPs) fits well such local context modern renewable energy provision. Since 2006 TaTEDO has piloted MFPs, fueled by *Jatropha* oil for production of electricity. At the moment supply electricity to more than 100 households using locally, produced *Jatropha* oil to run generators. MFPs are used to power a number of agricultural machines – for grain milling, de-husking and seed pressing and for supply to a local electricity mini-grid. TaTEDO trains villagers to operate and maintain the machines, manage the business and cultivate *Jatropha*, aiming at local self-sufficiency. TaTEDO is already using *Jatropha* straight vegetable oil (SVO) to run vehicles (with minor engine modifications) (Sawe, 2011).

Input, production and conversion technologies influence the extent of involvement, inclusion or exclusion of bio-energy small-scale producers. There should be adequate inputs (including adequate plant breeds, improved seeds, viability, yield and data performance), technologies and extension systems/services (including effective information diffusion) for the production and conversion of biomass and the processing of the resulting by-products into valuable products such as (e.g. fertilizers, cattle cakes, briquettes etc.). During field study it was found *Jatropha* was the choice crop for biodiesel production since does not compete with edible oil. *Jatropha* was found being used in both small- and large-scale production models but at present, mostly as pilot projects plantation. Uncertainties around the viability of *Jatropha* planted on marginal land with few inputs previously claimed as a reason choosing it as the main feedstock for diesel as well as lack of positive yield and performance data are however resulting in a re-think by some investors. In fact in the field it was established that some of the investors had abandoned cultivation of *Jatropha*, which illustrate the importance of research and development on plant breeding and agronomic studies.

Economic and credit exclusion could be major constraint for techno-economic advancement for small-scale bio-energy producers. The

stringent condition for collateral such house, land etc make impossible access credit from micro and macro-financing/institutions and credit schemes for bio-energy production (FAO and UNEP, 2010;Lerner et al., 2010). See Box No.5 on financial exclusion for small-scale biodiesel production using waste cooking oil. Briquette producers, which women are the majority of them share a similar financial exclusion. Likewise small-scale bio-energy producers insecure land access and tenure due to lack of registered title or title deeds diminish their access to credit/loan, which limit them to benefit from the opportunities presented by increased biofuel production.

Box No. 5: Financial exclusion for small-scale bio-energy producers, the case of Mafuta Sasa Biodiesel Ltd Tanzania.

*Mafuta Sasa Biodiesel Ltd is biodiesel producing company locate at Keko in Dar es Salaam, which produce biodiesel using waste cooking oil.

* It has the capacity to produce 10,000 liters of biodiesel per week but currently it produces 2,000 liters of biodiesel from the used cooking oils collected from 46 hotels in Dar es Salaam.

*According to director of the company, there is a demand of the biodiesel in a local market but the production is still low.

*The price of 1 liter of biodiesel is 20% less than petroleum diesel at the market price. One petroleum company showed an interest to blend with the petroleum diesel but it wasn't possible because there is no blending ratio set for Tanzania.

*When it comes to financial assistance or loan from the Tanzanian banks the director said, *"it is not easy to secure a loan from the banks for this kind of investment, most banks needs a collateral, no matter how good is the business and apart from that strict condition bio-energy industry is at infant stage in Tanzania so they consider it as a risky business."*

The field survey showed that the extent in which the small producer has been included in the existing bio-energy production is very minimal, and it is discouraging because most of the bio-energy companies are no longer operational. The extent of involvement, inclusion of small scale producers is not an effort of small-scale producers alone in the bio-energy projects but requires conceit efforts of multi-stake holders pooling efforts and resources in terms of supportive policy, better access to credit, land, markets, adequate inputs (adequate plant breeds) and technical assistance (in production of bio-energy and conversion of biomass into valued added energy carries (briquettes, biogas, biofertilizer, feed).

4.0 LIQUID BIOFUEL POLICY DEVELOPMENT IN TANZANIA AND POLICY CHALLENGES

4.1 Liquid biofuel policy development in Tanzania

The production and use of biofuels has the potential to assist Tanzania leverage opportunities for climate change and environmental policy development, strengthen security of energy supply and bring about rural and economic development. Therefore, promotion of energy diversification through renewable energy sources, biofuels have attracted growing attention of policy makers, NGOs, CBO's, industry and researchers (Mshandete, 2011). How biofuels can best be integrated into national developmental activities needs sound solid guidance on how to move forward since there are both benefits and risks in the development of biofuels programmes. Therefore biofuel development needed to be carefully planned and implemented. In fact the biofuel interest expressed by local and international investors must be supported by clear guidelines on how to establish a sustainable biofuel project (Lerner et al., 2010). With the predicted demand of fuel and the current market opportunities on bio-energy in both the local and international market, it is the time to develop strategies in order to benefit from the bio-economy. The underlying problem on biofuels around the world is not with the type of biofuel crop or type of biofuel or good or bad biofuel but with the policy framework around biofuels production and use (Christian Aid, 2009). In practice, sound biofuel policies involve a convergence between policies to protect ecosystems and reduce greenhouse gases and policies to support food security and agricultural income (Ogg, 2009).

A policy is defined as a statement of principles or intent established by an organization or government in order for it to achieve its goals and objectives with regard to specific subject areas. In particular policy should answer frequently asked questions and resolve crisis/chaos if any. Therefore a biofuel policy should articulate legal framework, standards, criteria for investments, and targets (for blending) to be achieved and used in biofuel development.

Most biofuels projects started in 2006, a year after the study on liquid biofuels for transportation in Tanzania had been done, a study funded by the GTZ (GTZ, 2005). Findings from this study and previous similar ones (Kamanga, 2008; Mwakaje, 2010; Mshandete, 2011) revealed that commercial biofuel industry in Tanzania is still at early infancy stage. During this study it was also noted that biofuel projects and initiatives in Tanzania had developed faster than policy development (see Table 2). This is not surprising since promotion of liquid biofuel has been implemented through learning by doing process as it was recommended by the GTZ study on the prospects of biofuels for transport sector (GTZ, 2005). The Government of Tanzania had to begin with no policies, strategies or regulations to guide biofuel investments in the country (Mwakaje, 2010).

In the absence of a biofuels policy, the government borrowed some clauses from various national policies to make decisions on biofuels investments. These policies do not specify any institution or agency to be charged with the responsibility to coordinate biofuels development activities. Lack of specific policy, priorities, and institutional and regulatory framework for implementation has contributed to the ad hoc investment processes in the biofuels sector, in the country (Mwakaje, 2010). Biofuel activities in Tanzania will impact a wide number of legislative areas ranging from energy, agriculture and environment to water, transport, health and public works.

The establishment of a multi-stakeholder taskforce to accompany the development of biofuel strategies is therefore an important first step. Hence, in March 2006, the government, through the Ministry of Energy and Minerals (MEM), established a National Biofuels Task Force (NBTF) with the responsibility of promoting the development of an interim policy on biofuels. The NBTF comprised eleven government agencies, ministries and executive offices, as well as two private sector representatives. The NBTF composition on the guideline preparation process was criticized for its lack of transparency and for the drafters' failure to include NGOs and other stakeholders, which is a common problem in Africa (Ribeiro et al., 2009).

Sweden provided the funding which enabled the National Biofuel Task Force (NBTF) to conduct initial meetings, while GTZ commissioned the first comprehensive study on the prospects of biofuels (for the transport sector) in Tanzania (GTZ, 2005). NBTF produced an initial draft of guidelines on biofuel production in August 2008. Various stakeholders, including NGOs, discussed this draft. Some NGOs criticized sections of the guidelines and made alternative suggestions, e.g. WWF-Tanzania (2008). In order to come up with the policy that takes into account different issues then involvement of stakeholders of each aspect has to be taken into account. To that effect the government subsequently included some of suggestions in a revised draft of guidelines on liquid biofuels and co-generation production, which was released in November, 2008 but was not published and disseminated in order to still solicit more inputs from various stakeholders (Mwakaje, 2010). Finally the government through MEM had released, published and disseminated guidelines for sustainable liquid biofuels development in Tanzania a tool to guide local and foreign investors (URT, 2010). These guidelines covers issues such as the sustainability of biofuel developments, land acquisition, food vs biofuel conflicts, the promotion of community engagement, and the use of part of the investor's land for food production (URT, 2010). Nevertheless, the guidelines have a number of issues, which are contradictory. Notably land tenure periods stipulated in the Land Act (33,66,99 years' lease). The land tenure for biofuels production is 25 years with the initial period of land tenure for biofuels production of 5 years for an investors/developer to demonstrate investment seriousness (URT, 2010). But the guidelines are silent about what will happen to the investor after five years. It was noted during field study that biofuel sector is non-performing with most of the biofuel investors in Tanzania with or closer to 5 years of operation and they have not shown any serious investment on the acquired land yet. However, the main challenge these guidelines will be difficult to enforce in the absence of the policy, legal regulatory and institutional framework regarding biofuel development industry in Tanzania. Nevertheless recently in September 2012 first draft "National liquid biofuel policy" has been released and made public for various stakeholders to review, discuss and come up with deliberations, comments and suggestions aimed at improving the

subsequent drafts. There are many proposals for what should be included in the new policy, a good overview is given in a table with the headlines (shortened): Policy definition, Blending targets, Land use, Feedstock's, Policy framework, Biodiversity, Purchase price, Financial incentives, Research (Mshandete, 2011;Markensten and Mouk, 2012).

4.2 Liquid biofuel policy challenges

Policy challenges are those aspects that together or in isolation influence the outcome of the desired policy goals and objectives. Policy challenges critical to biofuels development has been recently reported in details (Sosovele, 2010). These policy challenges that could significantly slow down biofuel development in Tanzania include lack of integrated policy framework that takes into account agriculture, land use, the availability of water, transport and energy needs in order to guide the biofuel sector. There is also lack of a holistic and comprehensive energy policy that addresses the broad spectrum of energy options and issues, and weak or absent institutional and legal frameworks. In fact, lack of national policy on biofuels development remains a major obstacle towards the realization of the biofuel sector's huge potential in the country (Mshandete, 2011).

The national liquid biofuel policy among the three types of biofuels cover first generation biofuel linked to biofuel crops cultivated on land. The liquid biofuel policy will likely to encounter a number of challenges since it cuts across several strategic main areas, namely energy, land, food, agriculture, environment and trade, governance etc. Some of the challenges are listed here under:

4.2.1 Tanzania energy poverty reduction

Reducing energy poverty is increasingly acknowledged as a missing development goal due to the fact that access to modern energy sources is a basic requirement to achieve decent and sustainable living standards (Markensten and Mouk, 2012). In Tanzania there is low access to modern energy, around 17.5%. About 90% of the population use traditional biomass for energy (GTZ, 2005). This means that 90% of

primary energy is derived from solid biofuels (wood, charcoal etc). Low access to modern energy and dominance of traditional biofuels in the energy mix are indicators of energy poverty which, needs deliberate inclusive policy to alleviate if Tanzania is to achieve the millennium development goals. Nevertheless, solid biofuels are marginalized energy of the majority (Sawe, 2011). From the field observations currently contribution of liquid biofuels in the energy mix of Tanzania is negligible. The national liquid biofuel is challenged as being not for Tanzanians majority but minority. Hence if the policy aims at combating energy poverty then it must be inclusive and mainstream of all the three main biofuels, solid, gaseous and liquid. The inclusive biofuel policy should adopt pro-poor energy approach with possibility to produce and use bio-energy and biofuels in rural areas, which is also closely linked to poverty reduction. An improved access to modern energy services is essential for lighting, heating and cooking, as well as for education, productive activities, for reduction of indoor pollution caused by firewood use, together with a reduction of deforestation.

4.2.2 Unclear biofuel investment

Guidelines and supportive regulatory frameworks also restrict investment. How will the biofuel policy overcome/address barriers issues around financial challenges due to low and fluctuating petroleum prices, investment problems like credit and equity finance and the uncertainty about taxation treatment, currency fluctuation, land identification, the level of government support needed, environmental and sustainability constraints, crop selection, yields and others.

4.2.3 Biofuels sustainability frameworks

According to the FAO (2009), to develop the full potential of biofuels, growth has to be managed in a sustainable way to meet requirements related to the economic, social and environmental dimensions of sustainability. Where Tanzania may intend to export biofuels when there is surplus, the policy must ensure only environmentally and socially compliant biofuel projects are developed and to ensure the exported fuel is compatible with emerging global sustainability standards.

Sustainability frameworks should intend to protect biodiversity, vulnerable population and ensure that only sustainable biofuel investments are developed.

4.2.4 Financial viability of biofuels projects

The establishment of anchor markets is crucially important for financial viability of biofuel projects. Amongst various policy instruments, blending mandates are a common measure to ensure a certain amount of biofuel is consumed regardless of the current market situation, thereby offering more market certainty to the producer side. Market regulation would involve compulsory blending of diesel/petrol. Provide in the biofuel policy on liquid biofuel section the blending ratio/proportions.

4.2.5 Market for liquid biofuels

Policy is amongst supportive government interventions, which can make biofuels produced commodities that can be traded in local or international market. In Tanzania the biofuel policy on biofuel liquid section should introduce mandated blending of biofuels with existing fossil fuel supplies. Mandating blending provides the drive for investment and guarantees a market. The introduction of blending gives time for producers to invest in developing their crops and infrastructure, which in turn yields greater quantities of biofuel for blending purposes (Lerner et al., 2010).

4.2.6 Environmental impact assessment (EIA)

The rapid policy-driven growth in demand for biofuels is likely to exacerbate the conversion of non-agricultural lands to feedstock production in particular of first generation biofuels (Markensten and Mouk, 2012). This likely to happen either directly for biofuel feedstock production or indirectly for other crops displaced from existing cropland (Lerner et al., 2010). An EIA can be defined as the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being

taken and commitments made (IAIA, 1999). The international EIA best practices guides produced for road, power, hydro, irrigation projects etc cannot be used one to one for biofuel EIAs. This is because biofuel production can pose unique environmental risks, which varies substantially depending on what kind of feedstock is being produced and the environmental context (climate, water, soil type, etc.) (Lerner et al., 2010). In Tanzania therefore institutions and relevant stakeholders responsible should come up with specific environmental guidelines for biofuel EIAs which will identify the key issues that need investigating and provide background information relating to potential impacts of biofuel production, processing and use. Furthermore, the guides provide indicative information to help inform a more comprehensive but focused assessment of the potential impacts.

4.2.7 Biofuel project size and exclusion of small-scale production

A trend in biofuels production towards large-scale biofuel projects (minimum 1,000 ha) in combination with concentrated ownership and operations was observed amongst biofuel investors in Tanzania (Table 2). This is linked to efficiency, economies of scale, assets security, and quality assurance and reliability of supplies. In the field it was observed that this form of production fuel the exclusion of local small-scale holders. There is therefore the need for land tenure policy that seeks to protect the rights and livelihoods of local people. This will be the driver towards involvement and inclusion in biofuel projects.

4.2.8 Legitimacy

Since 2006 there has been influx of foreigners seeking to acquire land for biofuels investment in Tanzania. However, guidelines for sustainable liquid biofuels development in Tanzania come in 2010 (URT, 2010) while the first liquid biofuel policy draft was released in 2012 for stakeholders to review and give their comments aimed at improving the subsequent versions. The liquid biofuel policy will lack legitimate due to the fact that for the past six years there has been allocation of huge chunks of land for investment to foreigners major factor fuelling land conflicts in various

areas of the country. Besides peanut compensation to the villagers and failure of some investors to invest leaving the acquired land undeveloped (Sulle and Nelson, 2012).

In conclusion there is a need therefore to overcome some of the key challenges and take advantage of some of the key opportunities. When writing policy is it crucial that the development of sound policies and regulatory frameworks is done in a multi-disciplinary approach.

5.0 OPERATIONAL LOCATIONS OF BIOFUEL PROJECTS IN TANZANIA

The acquisition of land and location of activities to different parts of Tanzania by investors predominantly foreigners with marginal locals was driven by the first ever-comprehensive study on the prospects of biofuels (for the transport sector) in Tanzania commissioned by GTZ (GTZ, 2005). The study identified factors that favor biofuel production in Tanzania, which have been recently summarized by (Markensten and Mouk, 2012). Amongst is the factor that Tanzania has a total of 44 million hectares of arable land, which 77 per cent is currently not in use. This means that a significant share of agricultural land could be developed and become productive for producing biofuels in particular first generation biofuels.

Although there has not been any regulatory framework to guide investment in the liquid biofuels industry, Tanzania started to experience a fleet of investors in biofuels since 2006 (Markensten and Mouk, 2012). Investors began the process of acquiring land for cultivation of liquid biofuel feedstocks mainly *Jatropha*, palm oil, sugarcane and *Croton megalocarpus*. Based on the literatures (Kamanga, 2008; Mshandete, 2011) and field observations, the biofuel projects were allocated in various places of Tanzania depending on the discretion of the investor, guidance and facilitation by TIC. Since 2006 and before the year 2008, foreign and local companies demonstrated the seriousness in land acquisition and cultivation of biofuel crops but after 2008 few companies were found in those areas requesting for land. The declining

number of projects to different localities was imputed by the financial market crisis in 2008, which diminished access to credit/loans from financial institutions. Therefore the recession, which led to financial crisis, constrained the biofuel investments in Tanzania. This was confirmed during the field observation conducted to assess the current status of biofuel sector in Tanzania.

It was noted that over 40 biofuels projects listed in (Table 2) some were on planning stage, some never existed, some abandoned and changed business plan. On the other hand, biofuel projects with plantation model based on the investor acquiring land put under production company managed plantation most of the had ceased/collapsed while other had closed temporarily. Those very few operational are those with out grower model based on production by small farmers who sell to a processing company that presses the bio-product locally, either for the local market or for export for example Diligent Tanzania Ltd and Prokon renewable energy solution and system Ltd. Also operational were those in particular NGO's, which implement community-focused model such as TaTEDO and KAKUTE.

Furthermore, failure to acquire the land and the delays on the land acquisition was another reason for the declining in number and changing location of biofuel projects in Tanzania. For instance the absence of WILMA and the African Biodiesel emission reduction Ltd in Kagera region due to delayed land acquisition, which affected credit access from USA and World Bank. Also the absence of Biomassive in Rural Lindi and the SEKAB AB in Rufiji was contributed by the same reason. During field study it was observed that the occurrence of land conflicts and denial to acquire land due to various reasons in some localities compelled some companies to abandon biofuel projects in those area for instance SEKAB AB and the African Green Oils Ltd in Rufiji. Therefore the operational locations of biofuel crops per literatures (Kamanga, 2008;Mshandete 2011) and the field observations conducted from June to August 2012, are provided in Table 3 below.

Table 3: Operational locations of biofuel crops in Tanzania

Biofuel crops	Areas
Jatropha	Kisarawe, Bagamoyo, Mpanda, Dodoma, Arusha, Kilimanjaro, Rural Lindi, Tanga, Tabora, Manyara, Ruvuma, Shinyanga, Kagera and Kilwa
Palm oils	Kigoma, Bagamoyo, Rufiji, Mvomero
Sugarcane	Bagamoyo, Kilombero, Rufiji.
<i>Croton megalocarpus</i>	Kagera and Arusha.

Sources: Kamanga (2008); Mshandete (2011) and field observation June to August, 2012

5.1.1 Geographical distribution of the biofuel projects by biofuel crops.

Of recent, there has been renewed interest in biofuel crop production particularly liquid biofuels, in Africa, Latin America and the rest of the world. Over the last six years or so, this has mainly been in response to significant rise and volatility of oil prices as well as the campaign for increased production and use of renewable energy to meet the concerns on climate change. In Tanzania, there has a big rush for biofuel crop production. Various investors had applied for land for investment in biofuel crop production and processing. In Tanzania the major biofuel projects are concentrated into four crops namely *Croton megalocarpus*, palm oils, Jatropha for biodiesel and sugarcane for bioethanol and co-generation (Figure 2). Most of foreign and local biofuel companies preferred the four crops as biofuel feedstocks for various reasons such as technical, economical yield, soil fertility, water availability, low input need, climate, past experience, access to transport, robustness, etc.



Figure 2: Map of Tanzania showing geographical distribution of biofuel projects by biofuel crops

5.1.2 Future operational locations of bio-energy projects in Tanzania.

The determinant factors for operational location of the current biofuel projects in Tanzania may be not one and the same. Through interactions with various stakeholders in the field, it was learnt that future location of bio-energy projects would depend on number of interdependent factors due to increased awareness, knowledge, information, shared experiences locally, regional and international on biofuels. The assortment interdependent factors had come into existence as measure address the previous location of biofuels challenges such as land conflicts, alienation,

peanut compensation, exclusion of small-scale holders, failure of *Jatropha* as a desert/wonder/miracle crop. The aforementioned challenges had resulted into negatives attitudes and perceptions on the liquid biofuels. The main reasons for the encountered challenges shared by various stakeholders were the results of policy vacuum, absence of researches on feedstocks and soil, partial involvements of NGOs, lack of extensive cooperative model like out growers scheme and community based projects. It was concluded that the GoT through the MEM, the public, other sectors as well as broad multi-stakeholders would influence the future location of biofuel projects. Through the following:

1. Zonation/mapping of areas for biofuel projects

The identification of land for biofuel crops must be selected according to acceptable criteria on land evaluation. Agro-ecological land zoning is a critical component for informed decision-making in biofuel projects (Lerner et al., 2010). Since it includes among others:

- (i) Development of strategies for the integrated management of land, water and natural resources that promotes conservation and sustainable use in an equitable way.
- (ii) Determination of water and soil qualities,
- (iii) Considerations for livelihoods and rural development.
- (iv) Restriction of cropland expansion, whether for food or non-food production, in high value natural ecosystems

During field visits and discussions with MEM officials in Tanzania it was revealed there is a plan for zonation/mapping with the purpose of identifying the potential areas for biofuel crops. Zonation will be accomplished through studying the nature of soil with respect to biofuel feedstocks. After the mapping and critical study on feed stocks the MEM will then guide location of investors in the mapped areas. However, it was not apparently clear how zonation will accommodate the existing investors in case the zonation will not be compatible with prior biofuel location. There is a danger that the ongoing biofuel projects may influence zonation process some how in a way. The MEM anticipates that zonation will take the biofuel industry into sustainable development path

because the issues of food security, environment impact, community involvement and infrastructures and research and development and feedstocks will be addressed.

2. Broad multi-sectoral consultations

Literature review coupled to the field observation made in this study revealed that biofuel sector is not an independent sector but rather an integrated sector with other sector including land, agriculture, water, natural resources, forest, wildlife, environment, tourism, media, research and development institution, judicial, NGO's, CBO's. The location of biofuel project will require the supportive institution framework of all sectors involved. The absence of such multi-sectoral interaction in ongoing biofuel investments caused many problems on land issues, environment and agriculture.

3. The change of policy and/or introduction of government initiative/programme

Any change of policy, which form the institutional framework may lead change in the biofuel subsector including the changes in the location of projects or halting the projects. The government's "Kilimo Kwanza" initiative to declare some regions including Morogoro and Mbeya as food national reserves, it means these regions given narrow or no chance at all in biofuel crops rather exclusive food crops. In Morogoro region there are sugar industries in Mtibwa and Kilombero, which produce the electricity from byproducts baggasse. However their main role is to produce the sugar to meet national demand, which at the moment is only met by 60% and the rest imported. Such obligation will restrict the direct extraction of juice from the sugarcane to generate the ethanol unless otherwise there are proven surplus of sugar.

4. Public interest and understanding on land use

During field visits it was noted that public interest, understanding on land use and awareness could exert profound influence on location of biofuel project. For example the acquisitions of village land require the consensus of all villagers through village assemble. This public concern is important because some projects require the displacement and compensation agreements and/or resettlement. The presence of Sun biofuels Tanzania Ltd in Kisarawe is the result of the collective agreements in eleven villagers. Bioshape only obtained 34,000ha of the 50,000ha it requested in Lindi rural because the villagers were a bit knowledgeable on land issues. The Kapunga rice project that has made trials to engage in Jatropha in 2007, had stopped because Kapunga villagers understood the land use. They had an understanding that land was designated for rice not for Jatropha as the investor wanted to change the land use which could affected their livelihood which depends on rice cultivation. The public interest on the production models has been key factor for the future location and the survival of the investors in their localities. The field experience showed the out growers scheme model is very successful in Arusha and Mpanda. In these regions the interest of the public on out grower scheme is the determining factor of future location of Prokon renewable energy solutions and systems and Diligent Tanzania limited. The growing understanding and awareness of public on the land rights championed by the NGOs, is tuning the investors to start thinking and adopting the non-exploitative models, which has significant impact on the future location of biofuel projects.

5.2. Threats of biofuel projects.

Threats of biofuel projects would likely emanate if the policy and legal framework will not justify clearly some contentious issues or address them responsibly. In Tanzania the threats might be obvious because the nature of biofuel investment geared mostly to first generation biofuel that requires a large piece of land. Land is a resource, which is fixed by its nature and accommodates different activities. Offering large tract of land to one agri-business activity has a negative implication on the other

activities, related uses and resources such as water, forest. Looking at the different types of biofuel feedstocks and the different uses of land the following would likely to be the threats of biofuel projects.

5.2.1 Food insecurity

Many of the world's poor spend more than half of their incomes on food. Therefore the decisions about biofuels should take into consideration the food security situation, but also the availability of land and water (FAO, 2008). Despite the limited importance of liquid biofuels in terms of global energy supply (FAO, 2008). The demand for agricultural feedstock (sugar, maize, oilseeds etc) for liquid biofuels will continue to grow over the next decade and perhaps beyond, putting upward pressure on food prices (FAO, 2008).

In Tanzania the use of some food crops as feedstocks like oil palm, sunflower, sesame and sugarcane to generate the biofuel products will likely affects the availability edible oil from palm oil, sunflower, sesame and the sugar from sugar cane. Discussion with stakeholders revealed 60% of the edible oil is being imported from the neighboring countries like Kenya and Asian like Malaysia. This implies that Tanzania has huge effective demand in edible oil. Taking the quick decision to use some of the crops as feedstocks to produce biodiesel and bioethanol for blending and substituting the importation of fossil fuel will have the negative implications. The supply of edible oil which, include the food inflation, depletion of foreign exchange to import the edible oil and the sugar. Also the experience shows the first generation biofuel (liquid biofuel mainly bioethanol and biodiesel) require chunk of land in order to achieve massive production. For stance the scientific studies has proved that 4 to 4.5 kg of *Jatropha* generate one liter of oil. This implies that to satisfy country demand of biodiesel it require large number tons of *Jatropha* seeds which in turn is linked to land size.

Tanzania is the country with small open economy, which means it cannot influence the world market price of biodiesel or bioethanol rather being a price taker. The records portray Tanzania is among the few countries

which is well endowed with valuable and scarce natural resources like Tanzanite but it has failed to influence its price. This justifies to what extent Tanzania is forming the small portion of economy in the total global economy. Taking into account market force will regulate the needs of biofuel products and the food crops obvious will be wrong assumption without building the legal regulatory framework through policy. This is because, experience shows that business entities care super normal profit. For instance in case there is high demand of bioethanol or biodiesel from foreign companies, biofuel projects will focus on foreign market of biofuel but not to the local demand of food.

Brazil and Sweden have made progress in the biofuel industry, the true fact these are countries with large open economies, which means their domestic market forces are capable of accommodating world market forces in one hand and the other hand they had made progress on production of liquid biofuel. Mauritius is a country with small open economy, which is well mechanized in sugarcane plantation agriculture which is the backbone of the nation because from it the country manage to produce sugar from sugarcane juice and generates the total electrical energy from sugarcane baggase waste. Therefore if chunk of land will be cleared for cultivation of biofuel feedstock and the direct use of some food crops as feedstocks instead of its byproducts (wastes) will have negative impact on the food security. The country has to wait for the market forces to determine the use of feedstocks but through policy and legal framework should restrict on the use biofuel feedstock, which is food.

5.2.2 Environment impacts

High concentration of investments of first generation biofuel is posing the negative implications on environment due to fact it requires the conversion of woodlands and wetlands into cropland of biofuel. The observation shows that companies acquired large land for instance Sun biofuel Tanzania Ltd in Kisarawe and Bioshape Tanzania Ltd in Kilwa has cleared truck of land and valuable trees for establishing the plantations and such loss will go forever for number of years because the land are being leased 99 years. The disappearance of vegetation has

impact on the distribution of temperature and rainfall and the effects goes further to destruction of ecosystem, loss of biodiversity, change of wildlife migratory routes along their habitat being destroyed. Tanzania has about 33.5 million hectares are forests and woodlands, two third of woodland are public land which enormous pressure from expansion of activities including livestock, fires, agriculture, other human activities (Tanzania water policy, 2002). The biofuel industry has many potentials and alternative to fossil fuel in post-fossil fuels era. Nevertheless, the over whelming of investments to only first generation biofuel (liquid biofuels) is posing side effects on the land because investments are not placed on bare land but on the woodland and forests which moderate climate to influence the activities like tourism and agriculture.

5.2.3 Water competition

Despite potential of biofuels to help reduce dependence on fossil energy, biofuels, with current technology, are likely to place a disproportionate amount of pressure on biodiversity and the environment (WWAP, 2009). New biofuel production venture should focus on less water demanding crops such as sweet sorghum, that are less likely to compete with food crops (IWMI, 2009). One of the major problems with biofuels is the need for large quantities of water and fertilizers to grow the crops. Between 1 000 and 4 000 liters of water are needed to produce a single liter of biofuel (WWAP, 2009). Research findings have shown that to obtain the high yield of oil from the biofuel crops it requires effective irrigation of water otherwise poor yield will be realized. For instance initially *Jatropha* was proposed to be cultivated on the marginal land where there is low supply of water (Mshandete, 2011). Nevertheless, scientific researches already made the comparison of yield between the *Jatropha* grown with high supply of water and the other one which is rarely supplied with water and the result had shown the *Jatropha* in water has high yield. In the field it was established that *Jatropha* projects were using irrigation schemes. This was specifically for Kikuletwa farm before abandoned *Jatropha* cultivation and Kapunga rice project when was engaged in the *Jatropha* 2007 before was forced to stop in favor of rice production. More over some biofuel projects have located the activities near the water

catchments/wetlands. This was observed with Sun biofuel Tanzania Ltd and the African Green Oil Ltd. The experience from the field observation has shown that most of the companies that went directly to operate in the marginal land have closed the *Jatropha* activities because they realized low yield.

Irrigated sugarcane for biofuel is putting pressure on existing water resources, where water flow requirements for other uses can result in it not being available because more and more water is being withdrawn (IWMI, 2009). In Tanzania water resources are used for agriculture, livestock keeping, mining and industry development, commercial crops plantation and for domestic purpose. The different uses of water need to take into account the integration of all sectors, so if the water is devoted much on one sector then the other sectors will be lagging behind in development. About 80% of Tanzanians estimated at 34 millions live in rural areas and only 50% have access to water (Tanzania water policy, 2002). This situation proves that the location biofuel projects near the water resources is likely to compete with other uses of water and sometimes seen jeopardize the efforts of supplying the water to all Tanzanians. It has been reported that growing more and more biofuel crops could add to conflicts between environmental and livelihood goals in the water sector (IWMI, 2009). During the field nomadic pastoralists were observed to enter into the area owned by Sunbiofuel Tanzania Ltd, searching for water and grass for their animals. The situation articulate some doubts whether land use planning was conducted effectively to locate the grazing land with water for livestock keepers in those villages where Sunbiofuel Tanzania Ltd acquired the land otherwise conflicts with investors will be inevitable.

5.2.4 Human settlement and population needs

This is another area where the liquid biofuel is likely to affect the future needs related to land resources and human settlements because these are not considered effectively during the development of biofuel subsector. Despite initiatives to control the population growth in

Tanzania population growth is at 2.96% (United nation Population Division, 2010) and the crude death rate is 10.47 (World Bank, 2012). Series censuses conducted showed that by the year 1967 Tanzania had population of 12.3 million, for the year 1978 it was 17.5 million, for the year 1988 was 23.1 million and by 2002 it was 34.4 million (URT, 2003). These statistics suggests the population of Tanzania is increasing progressively. The census of 2002 revealed that 34.4 million of people living in Tanzania and occupied a total land of $883,749\text{km}^2$ where 97.1% was population from mainland and 2.9% was population from Tanzania Zanzibar which occupied 2460km^2 of land. Looking at these statistics and continuing investments of the first biofuel generation, which demand chunks of land. These investments definitely are constraint to the increasing population for the settlements and other future needs, which are to be supported by the use land resources. Table 4 below provides the population size and population density in regard in censuses.

Table 4: Population of Tanzania; census counts.

Year the census conducted	Population size (in millions)	Population density. (population per square kilometer)
1967	12.3	14
1978	17.5	20
1988	23.1	26
2002	34.4	38.95

Sources; (Madulu, 1994;URT, 1994, 2003)

The field observation has identified that most of the villages where the biofuel projects were allocated, the land survey and land use planning were not conducted. In some cases biofuel projects started first and then survey followed later. Therefore leaves doubt whether the land use planning conducted effectively considered the population growth and the future needs of the coming generations. The population density is increasing as per (Table 4) above to imply that on average the number of people living per square kilometers is increasing while the chunk of land is demanded for first generation biofuel. Perhaps the population density

is not problematic because it is a calculation of assumption. However, the chunk of land is leased for 99 years with no guarantee whether shall be reverted to the population in future after the lease of 99.

5.2.5 Foreign possession of land and local displacement

The first generation biofuel is observed as the only sector that has open up for the foreigners to possess land in Tanzania as well as in the other African countries (Oakland Institute, 2011). The influx of foreign companies was driven by the fact that Tanzania is having arable unused land (GTZ, 2005). However, that assumption is wrong since before land was acquired was in possession with villages, land bank of TIC or prison land or private individuals this is why compensation is necessary. Since 2006 over 20-40 biofuel companies had requested for land in Tanzania some had managed acquire land while were discouraged after realizing the expenses in compensation and others were rejected by the villages. It is now six years some since some investors had acquired land without showing any seriousness. Which indicates these are genuine investors because they holding a chunk of land and they had in some places displaced people.

5.2.6 Dispossession of land property

The field observation has identified the investment in first generation biofuel been leading sector for dispossession of the land (LRRRI,2010). The huge piece of land is being taken and entered into the market forever. The study observed in Kisarawe that 11 villages dispossessed 8,211ha of land to Sunbiofuel Tanzania Ltd in 2009, in Rufiji seven villages released 3,500ha to African green oils Ltd and in Kilwa four released 58,545.50ha to Bioshape. However, various stakeholders recommended that biofuel crops could be cultivated in joint venture or out grower scheme without the dispossession of land from the villagers. This is because once the village land has been transferred to general land there is no process that state how that land would be reverted to previous owners. Furthermore, discussions with the stakeholders revealed that once the investors have received the derivative right, the land remain in

possession TIC, but leased up to 99 years. This is the threat to rural development because the investors possess large piece of land while this was the only simple capital or collateral securities to poor people and their next generations.

From the preceding biofuel threats in Tanzania biofuels should fit into an overall energy, climate, land-use, water and agricultural strategy if their deployment is to benefit society, the economy and the environment as a whole (UNEP, 2009).

6.0 SOCIO-ECONOMIC VIABILITY OF THE BIO-ENERGY BUSINESS IN TANZANIA

The ambitions for biofuels are high, both on large-scale usage for climate mitigation, and also on social-economic development. In addition social goals are defined; criteria for sustainable biofuels include criteria on GHG balance, food security, biodiversity, welfare, wellbeing, and environmental impacts (Balken and Romijn, 2011). In the context of world economic crisis and increasing global demand for renewable energy sources, the successful development of a thriving bio-energy industry can be catalyst for economic growth (Coyle, 2007; Romijn and Caniëls, 2011). NEPAD (The New partnership for Africa's Development Agency) the implementing body of the African Union, advocates efficient and effective utilization of the vast resources of bio-energy in Africa in a sustainable manner to achieve both energy and food security for the African population. However, that sustainability will not happen without support for innovation and appropriate public and private funding mechanisms (NEPAD, 2012).

The world wide challenge for bio-energy business is that if bio-energy products are not sustainably produced, distributed and utilized they can put more pressure on scarce land resources such as water, forestry and biodiversity, thus negatively affecting environment and food security (Scharlemann and Laurance, 2008; Fargione et al., 2008). These effects may severely affect the performance of the developing economies such as Tanzania (Ramadhani, 2007).

At the same time if the country has no efficient land use plans and enforcement for available land laws, they can result into among others: increased deforestation, loss of land to small scale marginalized farmers who cannot defend for their only asset (land) and land degradation can occur leading to an negative impact on climate change (Rutz et al., 2011; Oakland Institute, 2011, 2012).

Already the literature and the field visit in areas where such biofuel investment have been established showed similar concerns. However, for Tanzania, biofuels may offer opportunities to diversify sources of energy and offer potentials of developing new rural employment and additional income that could help in the poverty alleviation in the agrarian sector. Where property rights and land tenure is not well defined as the case of Tanzania, communities can be displaced and lose access to land and other natural resources leading to unfinished land conflicts and disputes, again this is one of the key challenges in this sector as it starts to grow (Rutz et al., 2011;Oakland Institute, 2011;Markensten and Mouk, 2012;Bergius, 2012). Although the field visits conducted indicated that the sector is almost non-performing as most of the bio-energy companies had stopped the business, such weaknesses were observed in the visited areas such as Kilwa, Rufiji and Kisarawe as land was taken from small scare farmers, left unutilized by investors who legally own it and in absence of the current owners farmers whose population is increasing practically cannot claim it back. In some place the villagers still complain that their land taken and given to investors without proper compensation given to them.

In the above context this section attempts to review and update various aspects related the sustainability and viability issues as they relate to the socio, economic effects of the establishment of the biofuel subsector in the country. Various sustainability indicators will be reviewed to come to the conclusion of whether the sector is viable or not, among others they include: effects in accessibility or distribution of natural resources such as land and water to investors and small scale famers, and vulnerable groups, markets for the biofuel crops (local or foreign markets), access to

land and distribution for land between investors and small scale farmers, jobs created by the sector, markets, efficiency in the use of land resources and water. According to the FAO (2009), to develop the full potential of biofuels, growth has to be managed in a sustainable way to meet requirements related to the economic, social and environmental dimensions of sustainability. Table 5 below gives a summary of sustainability indicators using the socio, economic and environmental pillars that will be assessed in this report so that to come to a conclusion of whether sector is viable or not.

Table 5: Sustainability indicators for the bio-energy sector in Tanzania.

SN	Sustainability pillars	Indicators
1	Social pillars	Access to land, capacity building to the small scale farmers, markets, equity
2	Economic pillars	Income, contribution to local energy, jobs created, type of production relations
3	Environmental	Availability of environmental impact assessment (EIA) report, regulations, soil quality, harvest of wood resources, efficiency in resources use, water distribution,

It is generally acknowledged that bio-energy can make a significant contribution to meeting energy security and economic development goals in the country, as well as helping to reduce GHG emissions (Yasmeen, 2011). There is also worldwide recognition that if bio-energy is to have a viable long-term benefits, must be produced and used in a sustainable way, taking into consideration the economic, environmental and social pillars of sustainability (Ramadhani, 2007). For sustainability large-scale agricultural investments need to be thoroughly scrutinized (cost benefit analysis) from a number of viewpoints: land issues, environment, water availability and effects on food security, effects to farmers who may lose land, taxes to both local and central governments, overall economic effects for the country, foreign exchange effects and social effects (Ramadhani, 2007; Bergius, 2012).

6.1 Land issues

The reason why there is more external interest in biofuel production in the country and other low developing countries (LDCs) is largely driven by what is perceived as low cost of land as most land is regarded as idle and low labor cost in rural Africa (GTZ, 2005). Investors are believed to target areas of land, which are perceived as being ‘unused’ or ‘marginal’ in terms of their productivity and agricultural potential. This view was also shared and confirmed during the field visit discussions with one bio-energy company-officials who gave the reasons for selecting Tanzania as a destination for his bio-energy investments. The section looks at the sustainability of the sector by assessing the land issues as they impact the livelihood of landholders who in most cases are small-scale farmers.

Issues such as the size of land acquired, processes, and soil type in terms of fertility of the allocated land whether fertile, marginal, arable should be looked in view of existing practice or prevailing situation or what is on the ground. Interview with various stakeholders who are in the sub sector and the visited farm areas indicated that, in practice biofuel projects are allocated in fertile land hence the possibility of reducing the amount of suitable land for food and cash crops production. The discussion some biofuel companies officials such as of Kilimanjaro irrigation Ltd (formerly known as Kikuletwa farm) indicated that the production for biofuel crops such as *Jatropha* was not well researched and initially believed that *Jatropha* is a desert crops that do not need arable land and water. Field observation revealed that *Jatropha* crop like any other plant needed fertile land and water for proper growth. Moreover, even the suitable species that grow well in the country is yet to be known. On the top of these challenges the market for biofuel crops was low or nonexistent. Therefore there is a need to develop biofuel market. Furthermore, more research is needed before the biofuel crops could be are promoted in the country.

From the field study observation at Kilimanjaro irrigation Ltd (formerly known as Kikuletwa farm) It was learnt that the new investor has embarked in production of food crops using the same land intended for

biofuel crops (*Jatropha*). This is clear indication that land allocated was not marginal land but rather fertile land suitable for food crop production. However, it should be noted that this is just one of examples of improper land allocation leading to conflicting land needs between food production and biofuel crops (See plate 6 below)



Plate 6: Kilimanjaro irrigation Ltd demonstration farm (Formerly Kikuletwa farm)

This farm is strategically located near the river that cross the sugarcane farm owned by TPC, it gets water from the river and situated in fertile land suitable for priority crops such as foods. The discussion with the villagers who border the farm indicated that the land was taken from the villagers by force and allocated to the investor. Hence the experience above indicates that land for allocated for growing biofuel crops may not be the planed marginal but arable land hence conflicting the policy objectives. More over the guideline for biofuel business in Tanzania requires that a maximum of only 25,000 hectares be allocated to investors for an initial period of 5 years while the maximum period is 25 years (URT, 2010). The field experience showed that this requirement is

also not followed. The discussion with the few active investors in the visited farms indicated that some farms were larger than what is stated in the guideline and the land titles had more time than what is stated in the guideline for bio-energy business. The investor decision to embark in the production of food crops in the new farm may represent the best practices by foreign investors in sustainable land use management and the government needs to recognize and appreciate such efforts (see Box.No 6).

The same view of how land can be used sustainably was shared to the research team during the discussion with official of Diligent Tanzania Ltd whose firm deals with the processing of biodiesel from *Jatropha* seeds in Arusha. In view point of stakeholders interviewed in the field it was affirmed that biodiesel feedstock production in arable land needed to be discouraged, as it will be competing with food and other cash crops that may bring more value than biodiesel. It was also observed that if the government wants to promote bio-energy business and crop production the motive should be driven by local and not foreign market demands as the country is still spending scarce foreign exchange to import fuel while promoting biofuel crops for foreign markets.

Box No. 6: Kikuletwa farm embarking in food crop production

Kikulewa farm was formerly dedicated for growing *Jatropha* to satisfy bio-energy needs in foreign markets. The decision by the new investor Kilimanjaro irrigation Ltd to embark in food crops production that are in great need may represent the best land use practices as the country is still food insecure. This decisions need to be appreciated and supported by the government of Tanzania. The investment and land given to the investor seems to be more viable as the policy insists on land resources satisfy local needs first and foreign market later. Such best practices need to be followed by other investors such that the country needs need to be satisfied first. The other credit given to this investment is the establishment of demonstrations of new cheap technology for mechanical irrigation to the farmers. Irrigation farming need to be supported in the country as most farmers still depend on rain fed farming that is not sustainable especially in this era of climatic variations that affect rain fall patterns thus reduce agriculture productivity and income of most famers sinking them in the cycle of poverty.

Institutional framework and sustainability of the sector

Despite the above challenges the sector seems to lack coordination and monitoring from TIC (Tanzania Investment Centre), NEMC (National Environmental Management Council), EWURA (Energy and Water Utilities Regulation Authority) and MEM (Ministry of Energy and Minerals) entities. Moreover, there is confusion on which institution regarded one stop centre entrusted with the task of regulating the bio-energy subsector. While the guidelines for sustainable liquid biofuels development in Tanzania (URT, 2010) indicate that TIC is a one stop centre and therefore deals with the regulation, the Energy policy (2003) recognize the MEM as the regulator of the bio-energy subsector. Although such weaknesses stems from the absence of the guiding policy on biofuel in the country, such confusion creates a lacuna that need to be urgently solved for sustainable development of the sector. The biofuel policy would also state what the country plans on key issue such as blending ratios and mainstreaming all biofuels the country will concentrate (liquid, solid and gaseous). The move may determine the growth and sustainability of the sector as it will create the local demand for the biofuel product and avoid the existing disputes such the current one between EWURA and TBS (Tanzania Bureau of Standards) and GCA (Government Chemist Agency) on quality of imported fuel. This is because Tanzania has no blending ratio for her imported fuel supported by biofuel policy. Nevertheless, it has been recently officially proven through EWURA that allowable quantum of ethanol on fuel destined for the local market in Tanzania should not exceed 9.5 per cent and such fuel had to be blended at processing plant (at a refinery) and not elsewhere.

6.2 Markets, value chains and income

Biofuels are commodities that can be traded and have, with supportive government interventions, a ready national or even international market. In order to develop a national market, incentives are required to spur development and investment. This could entail introduction of mandated blending of biofuels with existing fossil fuel supplies.

Mandating blending provides the impetus for investment and guarantees a market. The phased introduction of blending gives time for producers to invest in developing their crops and infrastructure, which in turn yields greater quantities of biofuel for blending purposes (Lerner et al., 2010).

The financial viability of biofuel projects is inherently linked to the price of oil. The lower the oil the price the more difficult it is for biofuel producers to stay in business without assistance. The oil price highs in 2008 (\$149 a barrel) stimulated wide interest in biofuels and many projects were conceptualized (Lerner et al., 2010). However, the economic recession that started in 2009 brought the oil price down to \$60 and many projects were shelved. For Tanzania the volatility of the oil price remains a major concern. The International Energy Association (IEA) predict that as the global economy picks up in 2010 to 2011, the oil price will begin to move past the \$80 mark which will increase the viability of biofuel projects (Lerner et al., 2010).

For viability and sustainability one key area that the projects supposed to touch is the areas related to creating markets and incomes of local producers along the value chains for the biofuel crops. The earlier concern for the subsector was that as the consumption for the biofuel crops such as biodiesel and bioethanol is almost non-existent and only the foreign market can absorb the product, the product may be regarded as not viable. At the same time these crops practically use arable land that is suitable for production for food crops or cash crops. The absence of the local market means that such scarce resources will be diverted for tackling foreign market needs and the country spends scarce foreign resources to buy food items such as sugar that would have been grown in the same land. However, as noted above the current investors are taking a new twist into an inside market model where the local market is given more impetus. Some have changed their initial plans where they wanted to invest for the production for biodiesel and ethanol from products such as sugarcane and currently they have decided to produce food crops due to food shortages noted in the country. As indicated in the box (Box. No. 7), the investor being concern with the local market for

sustainability of the products he decided to satisfy the local market for sugar first, such twist may constitute the best practices for local market consideration first.

Box No.7: Case of Agro-eco-Energy Tanzania Ltd change in plans to satisfy the local market

The discussion with the managing director of Agro Ecoenergy Tanzania Ltd who also bought the initially known as SEKAB AB business, indicated that the company also switched from their initial plan of growing sugarcane for production of biofuel products to sugarcane for satisfying local food demand unlike the formal model that wanted to satisfy foreign demand for biofuels. According to him after studying the country situation they discovered that the country has a acute shortage for sugar hence they amended their business plan from producing biofuel to food items (sugar), however, the new plans still accommodate production of bioenergy products such as bioethanol as they will now be produced from sugar by-products along with other products such as molasses and electricity from sugar can baggase, which can be consumed within the firm and surplus sold to the country power supplier - TANESCO as the case of Kilombero and Mtibwa Sugar. Such decisions and the above case study need to be encouraged and appreciated by the government for sustainability of the sector.

The above turn around makes the sector sustainable and viable as the scarce land resources are being utilized for satisfying local demand first, the foreign market may come in future when the country is food sufficient.

The same view was shared by Diligent Tanzania Ltd that applies the out growers model where the company buys *Jatropha* form small scale famers scattered all over the country to produce biodiesel that is sold in rural areas to run the machines formally run by imported fuels such diesels or petrol. At the same time this green source of energy come with by- products such briquettes and pellets sold in rural environment to substitute fuel wood and charcoal hence preserving the environment. The company model is recommendable, as it tends to include the small-scale famers in the product value chain, both before and after the final product.

Before the production process, farmers are involved in growing the crop or seeds collection where they get an additional income from selling the seeds to the company agents. While after the final product rural communities benefit by getting green energy from *Jatropha* by-products (briquettes and pellets) hence substituting the traditional sources that are not environmentally friendly such as fuel wood. The (Box No. 8) below indicate the case study for Diligent Tanzania Ltd market model that applied the farmers out growers model that is sustainable in the Tanzanian environment as it creates employment and inclusiveness to farmers in the value chains. The discussion with the Diligent Tanzania Ltd general manager indicated that at the moment biodiesel from *Jatropha* can fetch a market price of Tshs 1,600 per liter. At the same time the firm uses four and a half kilograms bought at Tshs 300 per kilogram. If you include other costs such as transport, labor and other utilities the cost exceeds the market prices. According to him it is the sales of *Jatropha* by-products such as the briquettes and pellets that can help the firm to break even.

On the other hand, the managing director of KAKUTE observed that biofuels product may not be profitable and viable business in the country at the moment as the market is still small hence a need to promote it. Lack of public knowledge on the product and its benefits to the environment, presence of few machines and lack of clear statement on blending ratios in the country, standards, and other specifications for biodiesel and ethanol that can substitute or mix with diesel and petrol to reduce the fuel cost are among the factors behind the market in-viability of the bio-fuel business in Tanzania. However, the low scale for biofuel production makes it difficult to come with a strong conclusion on the future sustainability of the sector as it is hard to predict the direction of the biofuel business in the country given the current global dynamics. Hence having a sustainable local market is very crucial for growth and sustainable business in the country.

Box No. 8: Diligent Tanzania Ltd model increases labor employment, assist in environmental conservation and avoid land conflicts

The business model used by Diligent Tanzania Ltd includes several actors (small-scale farmers, field officers, extension officers, seed collectors, etc.). Smallholder scale farmers are self-employed in growing *Jatropha* and seed collectors are employed under contractual basis and extension staff and the company formally employs field coordinators. The model is interesting as the company does not own any piece of land but only encourages a labor-intensive value chain consisting of two main activities. One is to encourage local producers of *Jatropha* as farm demarcation or fences while other do collect seeds. The company buys all existing *Jatropha* seeds through collection centers and the other activity is to train contracted farmers to plant *Jatropha* following the out-grower model. In some villages where it operates, Diligent has established collaboration with local small farmers SACCOS and NGOs working on the area to assist farmers' or mediators to reach all farmers interested in starting *Jatropha* business. Then farmer's sign the contract with Diligent Tanzania Ltd and are given free seeds. Field officers are selected and contracted among persons suggested by local actors in the community in order to establish trust relationship among farmers and field officers to enforce the contract and assure that farmers are willing to sell seeds to Diligent Tanzania Ltd. Diligent Tanzania Ltd field officers provide training and education to farmers and teach farmers on how to cultivate *Jatropha*. Field officers visit farmers during the growing season or collection season and after community members manage harvesting time and report the production situation to Diligent Tanzania Ltd. Collection centers, usually shop owners with a central location in the village. Collection centers are established in areas with many *Jatropha* trees. These collection centers consist of main collectors who are often well known in the village. This model is the best practice as it creates jobs and additional income to many villagers along the value chain and also the company sells briquettes to small-scale farmers for using as the source of fuel and substitutes fuel wood that is environmentally not friendly. More over as the company does not own land it avoids the most prevalent problems associated with land conflicts and more importantly as the company encouraged small-scale farmer to grow *Jatropha* in a form of fences or farm demarcation and avoids the expected conflict between food and biofuel crops.

However, as indicated in the (Box No. 8) above for sustainability Diligent Tanzania Ltd also provided extension services that is part of capacity building to small scale famers and by doing so they include farmers in the value chain. For sustainability of the biofuel subsector the government to other investors should encourage such innovative models. The situation was different in Kilwa, Rufiji and Kisarawe where fertile land from villagers who in most cases are small scale famers was left unutilized as some investors had left the country and nothing is taking place and small scale farmers cannot utilize such land for growing food or other valued crops as it doesn't belong to them. The plate (7) below indicates an abandoned farm at Kilwa by Bioshape Tanzania Ltd.



Plate 7: Abandoned demonstration farm at Mavuji Village in Kilwa District by Bioshape Tanzania Ltd

6.3 Job Creation and additional income to villagers and small scale farmers

As indicated in the above literature the sector is still in an infant stage and most of the projects have either temporarily ceased, stopped,

completely abandoned or have changed their business plans to establish new projects in the production of food crops that are in high demand in the country. At the same time some of the investments companies have changed their model of operation where they only buy bio-energy crops hence very few direct or indirect jobs created. The visit in field areas indicated that very few jobs were created directly for instance at Sunbiofuel Tanzania Ltd in Kisarawe there were 32 people employed, while African green oil Ltd employed about 10 people, and Diligent Tanzania Ltd plant around 25 workers. However there were indirect jobs created; as small scale farmers are involved in *Jatropha* cultivation where they earn a little income from selling seeds to the company agents at the price of Tsh 300 per kg. There are other services providers who also make their income indirectly from this sector. These include food and cloth vendors, animal products, transport and the recent highly growing sector –communication particularly for mobile phones.

As far as the environmental sustainability for countries like Tanzania, biofuels crops may offer opportunities to diversify sources of energy and a potential to develop new rural employment and additional income that could help in the poverty alleviation in the agrarian sector. In rural settings biofuel crops can play a big role in rural electrification and substitute fuel wood and reduce green house gases (GHG). A good example related a number project established by various NGOs such as TATEDO, KAKUTE and Diligent Tanzania Ltd. The National Environment Commission (NEMC) takes care on the environmental issues of the investments. The field assessment and interview indicated when it comes to the legal framework, the roles of these institutions is very weak and does not guarantee proper environmental regulation of the sector and accountability of any of these on the institution on sectors performance. Periodic monitoring for assessing for the sectors sustainability is not done nor and no coordination of all stakeholders is no one's role. Moreover, the environmental impact assessment (EIA) is rarely done, in most of the projects if EIA is conducted, it is the investor who does it and NEMC entrusted by the Government of Tanzania does the review of the EIA reports and advice the minister responsible for issue no objection certificate.

The current sector performance and regulation approaches in the country are not aligned with the sustainability policy objectives as the crops are not grown in marginal land as stated in the policy but fertile land suitable for food crops. Of critical worry is that most of the government organs visited during the study in the regions with bio-energy investments had no reliable information of the sector. These institutions are responsible to advice the government on the sector, but lack of information that is key for informed decision making and proper regulation of the sector, this situation threatens the viability and sustainability of the sector.

In conclusion Tanzania biofuel development faces several challenges that are amenable and resolved. Barriers that need to be overcome include issues around financial challenges due to low and fluctuating petroleum price. Investment problems like credit and equity finance and the uncertainty about taxation treatment and currency fluctuation. Land identification, absence of mandatory blending and the level of government support needed. Others include, environmental sustainability constraints, crop selection, yields and many more others. Finally, restriction to biofuel investment could be due to institutional capacity constraints and unclear biofuel investment guidelines and supportive regulatory frame works.

7.0 LAND RIGHTS OF SMALL SCALE PRODUCERS, COMPLIANCE TO ENVIRONMENTAL MANAGEMENT AND GOVERNANCE STANDARDS

The biofuel development is complex and multidimensional since it entails exploitation of four principal resources namely; land, forests, water resources and labor. Strategic important resources, different countries of the world are developing their national strategies on biofuel development to include environmental and social criteria/aspects, which are intricately interrelated.

Biofuels can be regarded as integral part of emerging bio-economy with great development expected to come especially for those countries which agriculture is the main activity. Although production of liquid biofuels; bioethanol and biodiesel in Tanzania is new and still in its infancy stage, the biofuel industry has attracted a wide range of investors and a handful of foreign firms and few local firms dominate the biofuel development initiative and investment(s).

The investment in first generation biofuels needs a considerable land, which is directly used in agriculture and habitats or indirectly used by the villagers of the investment area. There has been displacement of the villagers in places where the biofuel projects has to be implemented. The compensation has been done but has been very minimal compared to what the investor will gain out of it, and the time, which the land will be on the investor ownership. In some of the investment localities the companies started to operate without having the title deed and when they have failed to operate villagers did not / do not know how they can have their land back. This was the experienced at Nyamatanga village in Rufiji district where Africa Green Oil Ltd has stopped the operation and now village leaders do not know the procedure to follow in order to get their land back. The field study has observed that villages are not aware of the land right and the whole aspect of investment in land. In Mavuji village, located in Kilwa district where Bioshape Tanzania Ltd has land and previously operated, village leaders said they agreed with the company to give the land for thirty years but they are not aware of the lease status that the company has been granted to Bioshape Tanzania Ltd. Land tenure is not known by most of villagers including their leaders in many areas where there is presence of biofuel investors see (Box No. 9).

In Rufiji where the African Green Oil Ltd had the palm oil nursery and started its plantation although they have left for three years now the village leader was honest on the fact that they need education on the investment and the issues of land in general, and not the present practice in which the education on investment is done in one or two days when there is investors. See (Box. 10) the urgent need for education related to

land issues and investment observed in the field and what has been reported in the pertinent literature.

Box No. 9: Limited understanding of land tenure in the area with biofuel investments, case of Mavuji village, Kilwa District.

We don't know much on land issues, we agreed to give the land to the investor for 30 years, but because the land was more than 20 ha the district had to decide. We have heard that the land has been leased to the investor for 99 years. (Mavuji village leader)

Box No.10: The need on land right awareness.

"Land right awareness training should be offered frequently to the villagers and their leaders even when there is no investors. The training should not be done on one day when there is an investor" (Nyamatanga-Village chairman, Rufiji District)

"We need our land back but we don't know what to do", we wrote 2 letters to the Rufiji district but there have been no any reply so far" (Nyamatanga-village chairman, Rufiji District)

"We need to be taught land rights, especially on land compensation. Sometimes compensation on land is done a year after evaluation and real price of land is unknown to us until the day of compensation" (Mavuji- Village executive officer, Kilwa District)

"The land laws and their application in Tanzania are not very clear; this enabled several investors to acquire large tracts of land without sufficient compensation to the farmers using the land" (Markensten and Mouk, 2012)

"The major problem identified, is that the farmers coming into contact with large biofuel investments are not prepared and do not know their rights" (Markensten and Mouk, 2012).

When it comes to environmental management, it is obvious that any investment need from time to time monitoring. The bio-energy sector, acquire large tracts of land they should also be monitored as the investments proceed. The National environmental management council (NEMC), review the companies Environmental Impact Assessment (EIA) before they start to operate but there should be time to time management even if there is no complaints.

In case of sustainable environmental management of the biofuels investment; Fargione et al. (2008) introduced a concept “carbon debt” to calculate the amount of CO₂ released during land conversion. Understanding that soil and plant biomass are the two major biologically active stores of terrestrial carbon, converting native habitats to cropland, releases CO₂ as a result of land burning or decomposition of leaves and roots. Over time, biofuels from converted land can repay this carbon debt if their production and combustion have net GHG emissions that are less than the life-cycle emissions of the fossil fuel they displace. Until the carbon debt is repaid, biofuels from converted lands impact less upon GHG emission reduction than fossil fuel they displace. Studies suggest that, biofuels help to mitigate global climate change only if they are produced in degraded and abandoned agricultural lands or from waste biomass (Fargione et al.2008). Biofuels from waste products can avoid land-use change and its emissions. For example, municipal waste and crop wastes would add benefit to biofuels; as such resources minimize habitat destruction, competition with food production and carbon debt.

8.0 RECOMMENDATIONS ON HOW SMALL SCALE PRODUCERS CAN BENEFIT FROM BIO-ENERGY SECTOR IN TANZANIA.

In Tanzania several combinations of business models exist, ranging from models that limit the production of biofuels to smaller holder farmers in groups to that which relies on the out growers/contract farming and models that involves company owned farms/plantations/estates.

Field studies showed the companies using out grower and other contracted smallholder arrangements have little direct negative impacts on land access and represent the most positive model for local livelihoods and the environment if local agricultural officers and natural resources officers are involved. Given local context of bio-energy path in Tanzania inclusion of small scale producers will for foreseeable be catalyst for successful bio-energy sector (see Box No. 11)

Box No. 11: Small scale involvement/inclusion is vital for bio-energy sector success in Tanzania

*The field study on bio-energy companies has discovered that investments, which included small producers have the more potential to prosper than the one which only investor is the only player. Compare Diligent Tanzania Ltd to Sun biofuel Tanzania Ltd and Bioshape Tanzania Ltd

*Companies or institutions which have been promoting or producing biofuels for local use are still in operations compared to those which the target market were not clear. Example of biofuel companies which targeted the local markets and are still in operations are TaTEDO, KAKUTE, Diligent Tanzania Ltd and Mafuta sasa biodiesel Ltd.

*Small scale producers involvement/inclusion in bio-energy sector coupled with local market availability and local use are pillars for successful bio-energy sector in given Tanzania local context without the need of offering large tracts of land to one investor.

Although contract farming and out grower scheme systems are currently considered more inherently 'sustainable' from a social and environmental perspective, these scheme are good if the intercropping of energy and food crops is practiced at considerable distance. In Kakese village, Mpanda district a small farmer contracted by Prokon Renewable energy solution and system Ltd has 1.5 ha of Jatropha farm in which he was able to intercrop Jatropha with groundnuts and maize in three previous years. But it won't be possible in the coming agricultural season 2013 because the leaves of the Jatropha will not allow enough sunlight to reach the seedlings on the ground (see plate 8). If these schemes are not monitored then there is possibility of using the land suitable for food crops to be used for energy crops. This is the appropriate option for the inclusion of small-scale producer in the biofuel industry. Local government authorities must make sure that the intercropping is done sustainably.



Plate 8: A section of Jatropha farm which was intercropped with food crops at Kakese village, Mpanda district, Katavi region.

If the biofuel promise to rural development is to be realized, then supportive measure in the agriculture sector to increase yields need to be led by the government and/or in cooperation with potential investors. The government through agricultural research institutes should ensure that research on biofuel crops is done effectively. The correct varieties of the bio-energy crops are to be introduced to farmers instead of leaving them to be research fields. Small-scale producer skills need to be nurtured and technical assistances are to be provided to help maximize the yields. Skills such as greater accessibility to on-farm technology through use of better varieties, access to training, irrigation, could be the means to improve productivity of feedstock and reduce biofuel production costs.

Research on simple machine that will use the *Jatropha* oil should go hand in hand with the promotion of its cultivation, such that the products are also used to provide the solutions for rural energy challenges. The investment in the bio-energy sector in particular first generation biofuels need very large tract of land. The research has observed compensation on the land is very low compared to the lease, which will be given to the investor. The best practice for the small scales producers is to form cooperative and or viable companies and enter into contract with the investors as joint venture. The distribution of the profit will then be done accordingly as per established agreements. By so doing they will benefit from the investment in all the lease period of the land. It is not possible to include small-scale producer as a shareholder in the existing projects because they have already been compensated, but it is easy to include them in the value chain of the processed seeds.

In conclusion given Tanzanian context and infancy of biofuel industry in particular first biofuel generation, which is anchored on land as strategic resource. Amendments to the land legislation be undertaken to put power over land in the hands of the smallholders, and not in the hands of large-scale investors. Lessons learnt in bio-energy sector in particular first generation biofuels are summarized in (Box No. 12).

Box No. 12: Lesson learnt from the field in the emerging biofuel sector Tanzania.

1. Education on the land rights and investment is not enough. Only few people understand the land right and the impact of investment in their localities while the majorities do not.
2. There should be strategies to make sure that land laws and rights are understood by village leaders and villages at large by so doing, they will be certain on decision they make when it comes to investment. The country should set the land for investment before acting under pressure of the investors. This can easily be done if all villages will have the land use plan. Several villages did not have land use plan when the investors applied for a land.
3. Investors should document the promises they make as part of corporate social responsibility in their localities and time frame when they will be fulfilled. This will reduce the complaint of people who believe that promises are to be fulfilled at the beginning of the investment.
4. In places where contact farming is practiced, the government authorities should be a link between the two parties (investors and farmers) and monitor the process.
5. Contacting farming should be accepted in a crop which is well researched and with a stable price than food crop grown in the selected area otherwise the government official should approve the cultivation of energy crop when there is no threat of using a land intended for food crops.
6. Although investment in agriculture takes time to break even, there is a need to provide the lease of 33 years and in all agricultural investments. So that it becomes easy to revoke the derivative right for non performing investments
7. Local people consider a soil to be unfertile if it does not suite to grow a crop of their choice, but the same soil can be suitable to grow other crops, so even what was said to be unproductive or not fertile can be found to be fertile and productive if researched.
8. Instead of giving away the so called or labeled “unused” land to large scale investors, it should be distributed among rural households in order to enhance local access to land
9. If the goal is to pursue a sustainable development path in bio-energy sector in Tanzania, smallholders need to be included and not excluded in the process, through secure land rights and entitlements.

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ANNEX 1. KEY PERSONS INTERVIEWED

S/N	Name	Position	Institution
1	Ms Ruth H.J. Lugwisha	Official in Directorate of Environmental Compliance and Enforcement	NEMC
2	John Joel Kyaruzi	Director of research and information	TIC
3	Justina P.L.Uisso Russali	Projects appraisal and Supervision	REA
4	Jensen C. Chuma	Senior Manager (Resources mobilization)	TaTEDO
5	Michael Mwakilasa	Managing Director	MAFUTA SASA BIODIESEL LTD
6	Abdallah R. Mkindi	Program Director	ENVIROCARE
7	Esther Mfugale	MEM official (During Sabasaba Trade Exhibition)	MEM
8	Mr. Mwaipopo	District natural & environment officer	Rural Lindi District
9	Eng.Bright Naiman	Business Development Manager	Renewable Energy African Biodiesel Reduction Emission Ltd)
10	Ramadhani Nyoni	Chairman	Kapunga Village, Mbarali District
11	Emmanuel Kasekwa	Villager	Kapunga Village, Mbarali District
12	Sangali Mashishanga)	Village Executive Officer	Kapunga Village, Mbarali District
13	Otwin Mafui	Village Executive Officer	Melela Village

A Research Report February 2013

S/N	Name	Position	Institution
14	Ms. Justina	Former Village Executive Officer	Melela Village
15	Eng. James Ngeleja	Official in Directorate of Environmental Compliance and Enforcement	NEMC
16	Clemence Mkusa	Rural & Urban development officer	Bagamoyo District
17	Mr. Wally	Manager	Kapunga rice project. Mbarali District
18	Mr. Rajendrack	Worker	Kapunga rice project. Mbarali District
19	Mr. Paul Kiwele	Biofuel coordinator	MEM
20	Ms. Gugu	Land officer	Bagamoyo
21	Mr. Kijiji	Land officer	Kisarawe
22	Clement William	Zonal coordinator (TIC)	TIC, Northern Zone
23	Mr Aman	Kibo irrigation Manager	
24	Mtui	Land officer	Arusha Municipal
25	Majumba	Assistant Land officer	Hai District
26	Mr. Livinus Manyanga	Local Project Coordinator	KAKUTE
27	Jane Gervaert	General Manager	Diligent Company Ltd
28	Manase Eliamani	Head Factory	Diligent Company Ltd
29	Mr. Ngulangwa	Land officer	Rufiji District
30	Mr. Kibona	Agricultural Extension Officer	Mpanda District

A Research Report February 2013

S/N	Name	Position	Institution
31	Mr. Hamis	Representative	FELISA
32	Mr. Aziz Selemani	Team leader	Bioshape Tanzania Ltd at Mavuji Village. Kilwa District
33	Mr. Jeremiah Makala	Land Officer	Bahi District
34	Mr Shamte	Project Manager	East African Biodiesel Ltd, Bahi District
35	Mrs. Nyokanyoka		Villager Mbarali District
36	Mrs. Chenya	Smallholder of Jatropha (contracted by Prokon)	Mpanda District
37	Charles Nkuba	Director	JASEP-Kigoma
38	Eng. Gashaza	Chief Petroleum Inspector	EWURA

A Research Report February 2013



Biofuel has become one of the common issue in both scholarly and policy discourse in Tanzania and globally. It is simply defined as fuel that is generated out of biomass. In its liquid form, it is either bio-diesel or bio-ethanol extracted out of living plants. This publication is an attempt to bring to the public attention the trends and processes in the development of biofuel industry in Tanzania with a view to bridge the knowledge gap that has been haunting the sector and feed into the ongoing policy development process. The book is a research report that succinctly analyses the current status, dynamics and trends in land acquisition processes by both the local and foreign companies and manages to develop an up to date and reliable database of functional and dysfunctional projects, their impacts to local communities and the future of rural folk that is traditionally dependent on the contested land. Specific cases of chunks of acquired and abandoned land have been dealt with at length while the implications of allotting such huge tracks of land to investors without due regard to the local communities needs have been finely discussed and narrated. The study reports cautions land administrators to ensure that land is fairly and justly governed if the citizens are to use it to sustain their living without necessarily engaging into resource based conflicts.

The study that produced this publication was commissioned Professor Anthony Manoni Mshandete, a renowned scholar and researcher in the field of biofuels. Professor Mshandete has written and published over 16 articles relating to bioenergy in international journals and is currently the head of Department of Molecular Biology and Biotechnology, College of Natural and Applied Sciences (CoNAS), University of Dar es Salaam.

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