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Report on National Policies on Biofuels Sector Development in Sub-Saharan Africa

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List of Acronyms

AU	African Union
CO ₂	Carbon dioxide
COMESA	Common Market for Eastern and Southern Africa
ECOWAS	Economic Commission of West African States
EPA	Extension Planning Area
EU	European Union
FANRPAN	Food, Agriculture and Natural Resources Policy Analysis Network
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
GATT	General Agreement of Tariffs and Trade
GMO	Genetically modified organisms
N ₂ O	nitrogen dioxide
NGO	Non-governmental Organization
OECD	Organisation for Economic Co-operation and Development
PRSP	Poverty Reduction Strategy Paper
RECs	Regional Economic Communities
SADC	Southern Africa Development Community
SSA	Sub-Saharan Africa
UN	United Nations
UNDP	United Nations Development Program
US	United States of America
VAT	Value-added tax
WTO	World Trade Organization

Preface

This report has been prepared by a team led by the Centre for Agricultural and Rural Development (CARD), Bunda College, Malawi; Dr. Charles Jumbe is the team leader. CARD is a member of the FANRPAN network, providing research inputs on a number of policy areas of importance to the southern Africa region.

FANRPAN is a partner in the COMPETE project, responsible for leading the implementation of the Work Package on policy development. This is the first of two papers to be produced in the first year (2007) of implementation. The second report is on regional and international policy frameworks, also led by Dr. Jumbe.

Other contributors to this report include: CEEEZ (Zambia), AGAMA (South Africa), TaTEDO and FELISA (Tanzania), FMC (Mali), ENDA (Senegal), CIRPS (South Africa) and PREBE. We thank them for their inputs but we remain responsible for the contents of this report.

Summary

The primary objective of this paper is to examine the extent to which national policy frameworks for Sub-Saharan African (SSA) countries such as poverty reduction strategy papers (PRSPs) and energy policies incorporate strategies for mainstreaming or supporting the development of the biofuel sector. Many national energy policies reviewed in this study contain strategies for renewable energy in general, but no specific strategies for the biofuels sector. In addition, many policies only contain general statements without any action plan or explicit priorities as an indication of the National Energy priorities. The policies do not specify an institutional agency to be charged with the responsibility of coordinating biofuels research and development activities. The lack of priority and institutional framework for implementation has contributed to the meagre progress in the development of biofuels sector in Africa.

With the growing interest in biofuels worldwide, there is need for national governments in sub-Saharan Africa to develop mechanisms for harnessing the potential of the fast growing industry and benefit from the growing international trade in biofuels while at the same time protect the environment and rural communities from being disadvantaged by large-scale cultivation of energy crops for biofuel production. Specifically, this study urges the national governments in sub-Saharan Africa

- *to develop comprehensive national biofuels policies and plans in consultation with stakeholders including regional economic communities (RECs) such as SADC, ECOWAS, and COMESA, and with AU/NEPAD that also include the incentives for private sector participation in the biofuel industry;*

- *to raise the resources for infrastructural development for production, processing, storage, transporting and marketing of biofuel products;*
- *to commit resources for research and development (R&D), capacity-building and technical support, and*
- *to establish a regulatory and institutional framework to regulate and provide incentives for development and growth of the biofuel industry.*

1.0 Introduction

Bioenergy resources have traditionally been used by rural households for cooking and heating for centuries. Today, more than two billion of the world's poorest people depend on coal and biomass such as wood, charcoal, crop residues and dung to meet their daily energy needs (IEA, 2002). Estimates indicate that between 80 and 90 percent of the people in sub-Saharan African countries (SSA) depend on biomass fuels and fuelwood accounts for more than 75 percent of the household energy balance (WHO, 2002). For many developing countries, biomass energy will remain the primary and affordable source of energy for the unforeseeable future by the majority of rural people.

Since the last two decades, biofuels¹ especially liquid biofuels have risen to the top policy agenda in the United States of America, European Union, Canada and Asia. This renewed interest in biofuels mainly arises from the quest for increasing national energy sovereignty to turn the tide of increasing dependence on Middle East oil, environmental concerns from use of fossil fuels in the transportation sector and soaring world energy prices (FAO, 2007). In particular, the rapid economic growth in India and China is also putting enormous pressure on the price of oil due to the huge demand for oil required to run these economies. All these factors have stimulated great interest in exploring the role that energy crops should play in diversifying energy sources.

Today, substantial amounts of oilseed rape and soyabean oils are converted into biodiesel in the EU, the US and Canada (Takavarasha

¹ For practical purpose of this study, we confine our definition of biofuels to include biogas, gel fuel, biodiesel and bioethanol.

et al., 2005). Brazil was the first country to start a major ethanol production program followed by the US. Recently in 2003, the EU member states have set a target of incorporating 5.75 percent of biofuels in the total of fuels used for transportation by 2010 (Hodson, 2006). Brazil has set mandatory targets that all diesel used in the transportation sector contains 2 percent biodiesel by 2008 and 5 percent by 2013. America has an aggressive scheme to replace 15 percent of the petrol-powered cars with "green-fuel" vehicles with the aim of reducing petrol consumption by 20 percent by the year 2020. In 2006, 20 percent of the whole maize crop across the US went to ethanol production meeting two percent of its automobile fuel consumption.

In Africa, Malawi is among the few countries that started producing bioethanol from sugarcane molasses since the early 1980s. Presently, the government will pass a bill for mandatory blending of petrol with ethanol presently at 90:10. South Africa has developed advanced technologies for large-scale production of biofuels as the lead country in Africa.

Developments in the biofuel sector by industrialized countries offer both promises and challenges for developing countries in sub-Saharan Africa. While sceptics argue that biofuel production will threaten food supplies for the poor, others argue that if well managed, biofuels can be produced profitably and stimulate rural economic growth in developing countries. According to von Braun and Pachauri (2006), biofuel production can create demand for energy crops such as sugarcane, soybeans, rapeseed and oil palm that are grown by rural farmers. In addition, farmers can increase their incomes by growing energy crops such as *Jatropha curcas* on degraded or marginal land not suitable for food production. It is also argued that, as technology advances, a modern biofuels industry

could also provide developing country farmers with additional income from straw, grass, crop residues, stalks and leaves that can be converted into biogas, ethanol or electricity.

Worldwide, the use of biomass in the energy supply will invariably increase in the coming decades. The recent UNDP report predicts that the global production of biofuels doubled over the past five years and is predicted to double again in the next four years (UNDP 2007). According to FAO (2007), demand for biofuels will grow by 170 percent in the next three years and will contribute 25 percent of the world energy needs in the next 15 to 20 years. This will be accompanied by large-scale planting of energy crops requiring that new areas will be opened up for growing energy crops. This will offer opportunities for farmers, producers, processors and investors involved in this industry.

1.1 Rationale of the study

This paper explores the extent to which the national policy frameworks for sub-Saharan African (SSA) countries such as poverty reduction strategies (PRSPs) and national energy policies incorporate strategies for mainstreaming or supporting the development of the biofuel sector. Specifically, the study aims at addressing the following questions:

- (a) What do the national policies state with regard to bioenergy or biomass energy development?
- (b) What are the notable gaps in the policies across countries with regard to bioenergy and energy crops development?
- (c) What is government's commitment in implementing the policies?
- (d) Have governments allocated resources for implementation?

Addressing these questions is vital for a number of reasons. First, this analysis helps to assess the extent to which the national policies provide a supportive legislative framework for the development of the biofuel sector while safeguarding the livelihood systems of the vulnerable people. This will ensure that the poor are not further impoverished by converting arable land for biofuels production at the expense of food production, or squeezing the profits from smallholder farmers involved in biofuel production to the advantage of the private sector.

Second, biofuels offer a great opportunity for diversifying energy sources and livelihood systems of rural communities through employment creation in the bioenergy industry, production and marketing of biofuel products. This analysis helps to assess whether there are clear government regulations and incentives for the development of sustainable biofuels industry. Third, this analysis tries to assess whether there are appropriate policies and technologies for the production of non-food feedstock for biofuel production as a way to safeguard the potential dangers of biofuel production on the environment. Lastly, the study identifies some challenges in the implementation of the policies and design measures to mitigate the adverse effects of implementing faulty policies.

1.2. Main challenges of the analysis

The major limitation of this study is the difficulty in obtaining national policies from different African countries. As such, the analysis covers only 19 of the 53 African countries. Another limitation is that, since the biofuels sector is not well developed in most countries, data are scarce considering that few countries have developed specific biofuels policies and strategies. Despite these limitations, the study

presents a fair overview of the opportunities and challenges in the development of the biofuels sector in sub-Saharan Africa.

1.3 Organization of the report

The rest of the report is organized as follows. The following section presents a review of biofuel initiatives in Sub-Saharan Africa. Section 3 reviews national regulatory and institutional frameworks for the national bioenergy development, while section 4 presents an overview of trade policy incentives for the development of the biofuels industry. The opportunities and challenges for biofuels development in Africa as discussed in section 5. The report concludes with a summary of main findings and the way forward in section 6.

2.0 Biofuel Initiatives in Some African Countries

This section discusses the progress some countries in sub-Saharan Africa have made in the biofuels sector focusing on promising initiatives across the countries, the key stakeholders involved, their roles and whether the livelihood of the vulnerable groups has improved or not. We also review supporting policies and institutions, comparative advantages in the biofuels production for some countries and lessons learnt from such initiatives.

2.1 Specific program for promoting biofuels in some African countries

Many countries in sub-Saharan Africa have started a number of initiatives aimed at reducing the volume of imported crude oil since the majority of the countries are land locked and do not have oil

reserves. For example, Malawi started producing ethanol in 1982², which is blended with petrol in order to reduce the fuel import bill where between 80 and 90 million litres of petrol is imported every year. Other countries such as Kenya, Zimbabwe and Sudan started programs to blend ethanol with petrol in the 1980s to reduce the fuel import bill. Sudan and Kenya stopped producing ethanol, but Kenya has since revived its ethanol production. Zimbabwe continued producing ethanol, but not the blending of ethanol with petrol. Much of the ethanol produced by these countries is exported to other countries as alcohol. A number of countries in Africa such as Mauritius, Ghana and recently Egypt, Zambia, Nigeria, South Africa, Mozambique, Mali, Tanzania and Ethiopia have started ethanol production from sugarcane molasses after Malawi had gone into full production in the 1970s.

In Uganda and Mali, the public sector is directly involved in producing biofuels; its primary role is to create an environment conducive for the development of the sector such as policies and regulations, incentives, extension advice, information and market infrastructure. In many African countries such as South Africa, Malawi, Tanzania and Zambia, biofuels production has been the domain of the private sector mainly focussing on ethanol and biogas production.

For ethanol, private firms operating sugar mills play a major role in the development of the biofuel sector. For example in Malawi, two private companies namely, Ethanol Company of Malawi and Press Cane in the Central and Southern Regions of Malawi are involved in ethanol production. The Ethanol Company of Malawi received

² Recently in October 2007, Malawi has imported an ethanol-propelled car from Brazil and has launched a pilot program of modifying the engines of some vehicles to run on ethanol or a mixture of ethanol and petrol.

government support for developing an ethanol plant in 1980s. In both companies, large sugar plantations owned by the Illovo Group provide the raw materials (molasses) which is further processed into ethanol. However, some of the molasses is provided by smallholder farmers who grow sugarcane under out-grower schemes. In many countries, farmers are involved in the sector as the main providers of raw materials through out-grower schemes. For example, most of the sugarcane in Kenya is grown under out-grower schemes. This arrangement helps the local communities to not only be involved in gainful employment, but also participate in economic activities of their countries.

In Mali, *Jatropha* is grown by local communities supported by the Mali-Folke Centre, which has been working with local communities in promoting *Jatropha* as a raw material for biodiesel production (UN-Energy, 2007). Communities living within a 20km radius from the Centre benefit from biodiesel production activities. In addition, these communities are also employed to run the power plants for electricity generation thereby creating employment. In the village of Tiecourabongoe, an energy service centre has been established focusing on *Jatropha*. Due to the success of the project, the Mali-Folke Centre has embarked on a large-scale 15 years rural electrification project in Southern Mali produced from *Jatropha* oil. Under the project, 1,000 hectares of *Jatropha* plantation will be established to provide fuel for a 300kw power plant. This is expected to benefit more than 10,000 residents, which is expected to transform the lives of rural communities in Southern Mali.

In Tanzania, there are a few small scale on going bioenergy projects such as the *Solid Bioenergy, a SADC Program for Biomass Energy Conservation (PROBEC)*. These programs aim at improving the supply and use of solid bioenergy for improved rural livelihood. On

biofuels, there exist several initiatives from the national to the local levels with the objective of developing policies, regulations and programmes aiming at ensuring sustainable development of liquid bioenergy in Tanzania. The government through a biofuels Task Force is working on the preparations of policies, regulations for creating enabling environment for stakeholders to participate in the development of biofuels.

In spite of the delays in the formulation of regulations, several actors, multinationals companies, NGOs and smallholder farmers are implementing a number of projects aimed at increasing the supply of liquid biofuels in the country. More than ten companies are already at different stages of establishing farms for biofuels farming. Such companies include among others: Prokon of Germany, Wilma of USA, SEKAB of UK, and Diligent of Netherlands; some are in joint ventures such as FELISA with investors from Tanzania and Belgium.

Local institutions such as Kakute currently support small farmers to grow *Jatropha* and sell its oil for soap production. TaTEDO is implementing a number of activities which include awareness creation at all levels, supporting small farmers to grow and process *Jatropha* and sunflower to provide oil for powering multifunctional platforms and sell extra to private companies buyers. TaTEDO will be undertaking such activities in more than 120 villages in the next five years starting January 2008. There are also other biofuels initiatives in Zambia, Zimbabwe, Senegal, Mozambique and South Africa aimed at promoting biofuels and developing appropriate technologies for the rural communities.

2.2 Major energy crops across sub-Saharan African countries

If one looks at all the biofuels currently available on the market, ethanol is the most promising product that can be produced from different raw materials by African countries as shown below:

Table 1 : Biofuels Potential in Selected African Countries

Country	Raw material	Biodiesel (litres)	Ethanol (litres)
Benin	Cassava		20,000,000
Burkina Faso	Sugarcane		20,000,000
Ivory Coast	Molasses		20,000,000
Ghana	Jatropha	50,000,000	
Guinea Bissau	Cashew		10,000,000
Mali	Molasses		20,000,000
Malawi	Molasses		146,000,000
Kenya	Molasses		413,000,000
Ethiopia	Molasses		80,000,000
Niger	Jatropha	10,000,000	
Nigeria	sugarcane		70,000,000
Sudan	Molasses		408,000,000
Swaziland	Molasses		480,000,000
Senegal	Molasses		15,000,000
Tanzania	Molasses		254,000,000
Togo	Jatropha	10,000,000	
Uganda	Molasses		119,000,000

Source: Hagan (2007); Kerekezi (2007).

It can be noted from Table 1 that many countries use molasses from sugarcane for producing ethanol and only Burkina Faso uses sugarcane. Another interesting fact is that in those countries with the potential to produce biodiesel, Jatropha and oilseed are the dominant raw materials. Jatropha has been traditionally be used as a hedge and making soap and candles by rural communities. However, with

the advance in technologies, Jatropha is being used as a feedstock for biodiesel production that can be used to power stationary generators such as hammer mills, for electricity production and as a diesel substitute for transportation. Although many countries grow Jatropha, Togo, Ghana and Niger have large Jatropha farms.

Many African countries are located within the tropics where rainfall is adequate, with vast arable land with fertile soils and warm weather, which are conducive for growing tropical crops. Table 2 below shows the yields realized for biodiesel using different feedstock in different countries.

Table 2: Yields of different energy crops across Africa

Crop	Litres of oil per hectare	Countries Grown
Palm oil	5,950	Angola, DRC Nigeria, Ghana and Tanzania.
Soya bean	446	DRC Malawi, Republic of South Africa, Tanzania and Ghana
Coconut	2689	Nigeria, Ghana, Senegal Mozambique and Tanzania
Jatropha	1892	All countries
Sunflower	952	Angola, Malawi Nigeria, Ghana, Bots, DRC, Mozambique, Republic of South Africa, Namibia, Zimbabwe, Zambia and Tanzania
Cotton Seed	325	Angola, Malawi, Nigeria, Ghana, Mozambique, Tanzania, Zimbabwe, Zambia and Republic of South Africa,
Avocado	2638	DRC, Republic of South Africa, Tanzania, Nigeria, Ghana and Senegal
Groundnuts	1059	Malawi, Angola, Ghana, Nigeria, DRC, Gambia, Senegal, Mozambique, Tanzania, Zimbabwe and Zambia
Cashew nut	176	Angola, Mozambique, Tanzania, Ghana and Nigeria, Senegal
Castor beans	1413	Angola, DRC, Tanzania, Republic of South

Source: Raemaekers (2001), Crop Production in Tropical Africa

As shown above, there are huge differences in the productivity of different energy crops across countries where some energy crops produce higher yields of oil per hectare than others. This may be due to differences in the varieties of energy crops, soil conditions, climate and technology for oil extraction. Overall, we see that palm has the highest yields per hectare compared to any other energy crop. Palm oil is commonly grown in Angola, DRC, Nigeria, Ghana and Tanzania. In Malawi, palm trees grow along the lakeshore areas and have not been exploited for biofuel production.

3.0 Regulatory and Institutional Frameworks for Biofuels Development in sub-Saharan Africa

The sustainable development of a viable biofuels industry requires a strong, supportive policy, and a firm legal, regulatory and institutional framework to ensure that measures are put in place to harness the contribution of the sector to rural livelihood. This section analyses the policy frameworks relevant for the development of the bio-fuels sector in the Sub Saharan countries. We present an overview of the country policy statements to identify specific policy thrusts for the development of the biofuel sector.

3.1 National development policy frameworks and bioenergy sector

The study examined the major available policy frameworks especially the Poverty Reduction Strategy Papers (PRSP) for 17 Sub-Saharan Africa (SSA) countries (see Appendix 1). Our aim was to determine the extent to which bioenergy and biofuel issues are addressed. For the PRSPs reviewed, the main thrust is to reduce poverty through

different interventions including increasing access to affordable energy sources for domestic and industrial uses. The biofuels sector generally fits within the national policy frameworks.

Many PRSPs highlight the connections between energy and reduction in income poverty, while a few (e.g., South Africa) mention the linkage between energy and food security. Takada and Charles (2007) observe that most PRSPs have stressed the expansion of electricity supply as a principal strategy for meeting energy needs, while only eleven PRSPs have explored the potential for decentralized and renewable energy options for meeting energy needs. These PRSPs are for countries such as: Burkina Faso, Cameroon, Ghana, Madagascar, Malawi, Mali, Mozambique, Nigeria, Sierra Leone, Senegal and Zambia (see Appendix 1).

From the analysis, a number of issues emerge. Despite the fact that the biofuel sector is becoming an increasingly important sector in national and international economic development, the biofuel issues are not elaborately discussed in most national policy frameworks. As shown in Appendix 1, out of the 17 PRSPs reviewed, only the PRSP for Ghana contains specific strategies for biogas development³. This is consistent with the findings of Takada and Charles (2007) who also found that virtually all African PRSPs recognize the role of energy in macroeconomic growth and its importance as a factor of production, but do not have specific strategies for the biofuels sector.

One possible explanation why biofuels are not adequately featured in the PRSPs could be that the momentum on biofuels has just peaked during the last two or so years. The growing impetus for biofuels is

³ Malawi's PRSP developed in 2002 covering the period 2002-2005 has specific strategies for establishing 105 biogas plants by 2005. However, in the current national policy framework (the Malawi Growth and Development Strategy), there is no strategy for the biofuels sector.

likely to instigate changes to the existing national policy frameworks to support the development of a vibrant biofuels sector. In fact, some countries have developed specific biofuels strategies or incorporating biofuels in their national energy policies as discussed below.

3.2 National energy policies /strategies and the biofuels sector development

This study reviewed seven national energy policies and two specific biofuels strategies from sub-Saharan countries⁴. Most of the policies were developed during the last five years and many countries are still in the process of developing their policies. Almost all energy policies have policy statements on general biofuels development without concrete strategies and institutional framework for implementation (see Appendix 1).

For many energy policies, biofuels are discussed within a group of renewable energy sources. For example, although ethanol has been produced and blended with petrol in Malawi since 1982, its national energy policy approved in 2003 discusses ethanol among liquid fuels. In the policy, ethanol blending is mandatory. The new energy law yet to be passed by parliament will make petrol-ethanol blending mandatory. The recent launch of ethanol-powered vehicles in October 2007 shows that the Government of Malawi is committed to finding alternative and cheap sources of fuel to replace imported fossil fuels.

In the case of Mozambique, although the Government has not finalized the national energy policy document, it has already adopted

⁴ The energy policies are for Botswana, Malawi, Mozambique, Nigeria, Tanzania, Uganda and Zambia, while biofuels strategies are for South Africa and Ghana.

preliminary regulations to foster large-scale production of bio-fuels for domestic consumption and exports, including the gradual introduction of blending of petrol (gasoline) with ethanol and bio-diesel with fossil diesel, initially, at 5 – 10 percent.

Some countries such as South Africa and Ghana have developed specific biofuels strategies with even more specific targets. For example, the Government of Ghana has set a target of substituting 20 percent of national gas and oil consumption with biodiesel by 2015, and 30 percent of national kerosene consumption is to be replaced with *Jatropha* oil by 2015. The policy also aims at improving the efficiency of production technologies and techniques of biodiesel in order to reduce costs. The proposed biofuels strategy for South Africa aims to achieve a market penetration of 4.5 percent, of liquid road transport fuels (petrol and diesel) in South Africa by 2013⁵.

In general, with the growing interest in biofuels worldwide, this study envisages a major reorientation of energy policies to include specific strategies in order to harness the economic opportunities of biofuels development while at the same time protect the environment and rural communities from exploitation by large companies.

3.3 Synergies and trade offs between bioenergy and agricultural production systems

A number of controversial issues have been discussed in different fora questioning whether the growing interest in biofuels will provide opportunities for improving rural livelihoods or will exacerbate poverty. From the literature, both positive and negative relationships among the biofuels industry, agriculture and food security have been

⁵ A recent government announcement saying that maize will be excluded as a biofuel feed stock has raised doubts about the effectiveness of the biofuels policy; government has expressed concern about the impact of using maize to make ethanol on the price of food.

documented. According to Woods (2006), large scale and mechanized farms will not be appropriate for growing energy crops in many developing countries. As the biofuels sector develops, smallholder farmers in the SSA are likely to play a critical role in the production of the bioenergy crops. Thus, small-scale production and processing of energy crops to produce biofuels would help to add value to locally produced crops by rural communities, thereby enhancing their incomes.

With improved technologies, scientists and investors are developing more energy efficient crops as well as efficient methods of extracting oil from the energy crops. For example, Monsanto, a private company, has developed a variety of corn that yields more ethanol per hectare (Lanely, 2006). A number of technologies are being developed to extract ethanol and biogas from non-food feedstock such as crop residues, straw, grass and leaves. The breakthrough in research and technology that will make it possible to use non-food feedstock in biofuels production will help to diffuse the fears of food insecurity associated with large scale production of energy crops for biofuels production. It must be pointed out though that it will take a long time for such advanced technologies to mature and diffuse to Africa considering their high capital cost.

One of the benefits of the biofuel sector is its potential to produce biodiesel to power generators for electricity generation that can also be used to run hammer mills. As Woods (2006) observes, many developing countries may be able to leapfrog first generation bioenergy technologies, particularly in the production of bioelectricity and liquid fuels for transportation. In fact, Mali and Tanzania have championed the production of electricity using *Jatropha* involving

rural communities. Such initiatives must be encouraged and supported to stimulate rural economic development.

Although the biofuel sector may have several advantages for rural communities in sub-Saharan Africa, there are a number of challenges. The major concern regards the potential competition between biomass systems for biofuels production and the use of biomass resources for animal feed, bedding, fertilizer and construction materials (UN-Energy, 2007). In addition, the production of energy crops might be so attractive in terms of price ratios and income that may induce the diversion of resources away from food crop production for biofuels thereby threatening food security (SADC, 2005).

Further, there are controversies surrounding the impact of biofuels production on food security, environment, land and water use. For example, other studies have shown that the SADC region has the potential to produce sufficient raw materials needed for biofuels without adversely affecting the ecosystem, food security and traditional farming system (SADC, 2005). In terms of water use, studies in other parts of the world have shown that production of energy crops for biofuel production can have substantial impact on water demand especially if irrigation is used for their production (e.g., Fraiture, Giordano and Yongsong, undated).

In terms of incomes and food security, biofuels development may have positive benefits on ensuring household food security through increased incomes and markets for energy crops. In fact, many countries have expressed growing interest in *Jatropha* as feedstock for biodiesel production. Since *Jatropha* can grow relatively well in marginal areas compared to other traditional crops, it may help to reclaim degraded land and protecting the soil from erosion. In

addition, Jatropha production may be inter-planted with other annual crops without changing the traditional agricultural production system. However, since Jatropha typically grows in the wild and has traditionally been used for making soaps and candles, there is need for research into its agronomy as a cash crop.

With its high starch content, cassava also holds promise as a feedstock for ethanol production. From an economic development standpoint, cassava could be a desirable feedstock because it is already grown in developing countries and can be cultivated with comparatively low input and labour requirements compared to those required for growing maize. Depending on feedstocks and technologies used, biofuels production may create food supply shortage. It is for this reason that national governments need to undertake proper and systematic, country-specific research to ascertain the viability and economic feasibility of biofuels in their setting.

4.0 Trade and Investment Policy Incentives for Biofuels Sector Development in Africa

As stated earlier, the development of national policies on biofuels has largely been driven by three major policy goals. These are the motivation to reduce trade imbalances through reduction in oil import bills and increase export earnings, increase national energy security, and support rural development through increased bio-energy crop production and processing. However, a fourth driver is the need to mitigate environment problems related to the use of fossil fuels. There are a lot of trade benefits in promoting the use of biofuels. Consequently, interventions in the form of public policy incentives became inevitable. Such interventions would make biofuels

production competitive during the early stages of its market development.

4.1 An overview of trade and investment policy frameworks for biofuel development in Africa

Since the biofuels sector is relatively new, most trade policies and discussions focus on general renewable energy and may not be specific to biofuels. However, the fact that biofuels may not have been the centre stage in the current trade negotiations does not imply that biofuel trade does not offer potential benefits for the economies of SSA. There are six areas in which trade opportunities for the biofuels sector exist. These are:

- (a) cross border movement of planting seed for energy crops;
- (b) trade in feedstock to guarantee year round processing in countries with bigger capacity;
- (c) movement of biofuels to countries with bigger processing capacity;
- (d) trade in finished product biodiesel and ethanol with high consumption countries;
- (e) trade in finished and semi-finished bio-diesel products, and
- (f) Trade in machinery and processing equipment.

According to Dufey (2006), the use of policy tools such as national targets for blending of biofuels with standard fuels, tax benefits, subsidies and loan guarantees to encourage greater production and consumption have been advocated in western countries. This has led to a breakthrough in biofuel research and technology development in those countries. In this respect, Dufey reports that as a response to the rising oil prices in the 1970s, Brazil started a programme to promote biofuels in 1975 aimed at producing ethanol for locomotives

to replace petrol. A number of policy measures were introduced. These include (a) production quotas, (b) fixed purchase price for bioethanol, (c) control of domestic bioethanol sales and distribution by a monopolistic public agent, (d) subsidies to bioethanol blend petrol producers, (e) tax incentives to car owners using bioethanol blend with petrol, and (f) soft loans to implement the necessary technical changes for vehicles.

A review of the National Trade Policy documents and analyses from a few African countries shows that African countries have trade and investment policy frameworks to promote or facilitate domestic and foreign investments in various sectors of their countries. Analysis of trade and export promotion policy frameworks of some countries such as Ghana, Tanzania, Malawi and Uganda show that the common policy instruments used to promote trade and investment include: (a) tariff structures such as taxes and duty draw back schemes, (b) non tariff measures such as quotas and import licensing, (c) trade defence mechanisms such as subsidies and anti-dumping, (d) trade promotion instruments such as export processing zones, and (e) international trade instruments namely bilateral trade agreements.

Of interest here is the question of the extent to which the national trade and investment policies in the SSA region match those of the Brazilian government as reported by Dufey (2006). A simple comparative analysis of the SSA and Brazilian policy frameworks shows one marked difference, that is, the former does not focus on the biofuel sector but other sectors of the national economy whereas the latter is directly focused on development of the biofuels sector. This, therefore, implies that all that is needed is for the SSA countries to extend their current national trade and investment incentives to the biofuels sector. For instance, the Malawi National Export Strategy

(2005) outlines the five areas of national focus for the export sector promotion. These include: the development of an integrated domestic cotton-textiles garments value chain, tourism, agro-processing, services and handcrafts. Apparently, the biofuel sector value chain development is left out despite having an economic and social turn around potential for Malawi. The situation is not different in other SSA countries.

4.2 Common features of trade and investment policies in Africa and their implications for biofuels sector development

The common challenges across the SSA countries with regard to trade and investment promotion include inadequate national capacities to apply the available instruments. In some cases, the prevailing policy and regulatory instruments are still not quite conducive to both domestic and international investments in a number of sectors including the biofuels sector. In this regard, Bajracharya and Flatters (1999) reports that in Ghana, there are serious operational challenges regarding the duty drawback system since some producers report that drawback payments are extremely slow to be processed and in many cases, almost impossible to obtain. The minimum time required to process a claim was reported to be three to four months; but the norm is much longer, and many claims are never realized. Not only are procedures slow and cumbersome; they also require that claimants relinquish their sole copies of official import documents, creating serious difficulties for subsequent company recordkeeping.

The challenge of red tape, bureaucratic procedures and weak institutions for investment is not restricted to Ghana alone. The Tanzanian National Trade Policy (2003) and the Malawi National Export Strategy (2005) both openly acknowledge the existing

challenges that discourage foreign direct investment (FDI) and domestic investment. These include tax and incentive structures, the slow process for processing of incentives, and inefficiencies of statutory institutions amongst others. In the same vein, Morrissey, Rudaherenwa, and Moller (2003) observe that while a number of incentives have been put in place in Uganda under which import duties on certain raw materials may be refunded under VAT and a duty drawback scheme, the refund mechanism in these schemes have attracted criticisms on grounds of inefficiency. This snapshot of SSA region trade and investment challenges has serious implications for the biofuels industry, which is at the infancy stage in many countries. The SSA region should not expect the biofuels industry to effectively develop in the presence of the multiple investment hurdles that threaten to strangle to death the biofuel industry even before its full potential is realized for the African continent.

The trade policies of SSA countries acknowledge the role of the international markets through bilateral and multilateral trade agreements. The partnership arrangements between sub-Saharan Africa and the EU countries and African Growth Opportunity Act of the US Government are some of the examples of international frameworks that offer greater market opportunity for the SSA countries' biofuels. In fact, some entrepreneurs from outside Africa have already started investing in Africa for the production of energy crops to satisfy the growing demand for biofuels in the EU countries, America and Asia. This is so because the SSA region has vast land and favourable agro-climate for growing energy crops. What is now needed is for the African countries to put in place appropriate policy and regulatory frameworks. Such frameworks would not only promote biofuel production and processing by foreign and domestic investors, but protect African poor households from being displaced

from their land, creating hunger through large-scale appropriation of arable land meant for food crop production for growing energy crops.

Trade in biofuels may affect the various stakeholders or sectors through the linkages between the fossil fuel and biofuel prices. At a sectoral level, small-scale rural sector which uses very much less energy than the high-input and mechanized or urban sectors, it is not likely to be exposed as much to the effects of higher fossil fuel prices. However, at a national level, though the low-income developing countries are likely to be adversely affected by the rising prices of fossil fuels. This is likely to be offset by the increased investment in biofuels production that would supplement imported fuels thereby drastically reducing the import bill.

It has also been noted that much as the global economy offers great export market opportunities for the SSA biofuels, a number of challenges also exists outside national policies that need careful consideration. These include low levels of biofuel production, lack of commonly agreed upon international standards and trade barriers such as grades, standards, tariffs and subsidies. In fact, to protect its domestic industry the USA levies a 54 percent tariff on ethanol imported from Brazil, which is the only exporter of bioethanol (Lanely, 2006). Possibly, the SSA countries could be exempted from the US market tariffs through the AGOA initiative by the US government. Unfortunately, the international standards for biofuels (especially for biodiesel) are difficult to achieve given the technologies used in most African countries to produce biofuels.

This analysis, therefore, underscores the need for the countries in the sub-Saharan Africa region to come up with policies, legislation and strong institutional frameworks that will stimulate production and

processing of biofuels in a sustainable manner as Brazil and a few African countries⁶ have done (as reported by Howse et al. 2007). In addition, African countries need to build the capacity and skills in production systems through training of experts in biofuels technology. This must be complemented by increased investment in infrastructure such as biofuel production plants, storage depots, service stations and transportation system. Many African countries may take time to develop the local infrastructure for biofuels. However, unless these measures are taken, it will be difficult for most countries sub-Saharan Africa to establish themselves and take advantage of the growing international biofuels markets.

5.0 Challenges and Opportunities for Biofuels Development in sub-Saharan Africa

The global expansion of biofuels production will have serious ramifications for Africa, which has large land mass and favourable climate for growing energy crops. However, there is need for proper mechanisms to regulate the sector to ensure that biofuels are not given too much priority at the expense of other important values for nature, environment and society⁷. Of particular concern is the competition for land, water, and the displacement of land used for the cultivation of food and other crops. With the exception of South Africa, most policies are formulated without analysis of the implications of embarking on the biofuels program. Most policies reviewed have not spelt out strategies to stimulate the demand for biofuels, develop biofuels infrastructure, expand feedstock supplies,

⁶ In Africa, efforts to expand biofuels production and use are being initiated or are under way in Benin, Ethiopia, Ghana, Guinea Bissau, Kenya, Malawi, Mozambique, Nigeria, Senegal, South Africa, and Zimbabwe (see <http://www.worldwatch.org/node/4081>).

⁷ As part of regulation, Malawi's Liquid Fuels and Gas (Production and Supply) Bill of 2004 bars any person from producing ethanol and biodiesel without a licence.

develop local and regional markets for biofuels, and increased investment in research and technology development. In countries such as Nigeria and Uganda, although the energy policy defines the role of Government as that of facilitating development, providing stimulus for private investment and initiatives, and monitoring and co-ordination of the sector activities, the government and public universities are still the key players in the energy sector. This contrasts with South Africa, Tanzania, Zambia and Malawi where the private sector plays a pivotal role for the development of the biofuels sector. However, there is still need to establish an authority charged with the responsibility of coordinating biofuels research and development activities.

Because SSA countries have clear comparative advantages in the production of biofuels, they should not only consider incorporating the sector in their national trade and investment policy frameworks but also include it in the current and on-going international trade negotiations. The trade reform efforts will have powerful effects on biofuels expansion. There are concerns that the rapid growth of the first generation liquid biofuels production will raise agricultural commodity prices, and this will have negative economic and social effects particularly on the poor who spend a large share of their income on food. In addition, the current structure of agricultural markets means that most profits go to the wealthier households or foreign investors at the expense of the poor (UN-Energy, 2007).

It has also been argued that despite the attempts to link the biofuels sector to the regional and international markets, not all countries will take advantage of these market opportunities. In some countries, the production of biofuels is concentrated in remote rural areas. As such, when fossil fuel prices increase due to high transportation costs or changes in world oil prices, bioenergy systems may help such

countries to become self-reliant in energy by depending on locally produced biofuels. Nevertheless, efforts should be devoted to improving access to international biofuels markets in order to enhance the incomes and welfare of both producers and consumers in Africa.

Howse et al. (2007) argue that even though some developing countries may have a comparative advantage in the production of biofuels or biofuel feedstock, potential trade may be stifled by an overly exclusive focus on domestic production. Under these circumstances, biofuels will continue to be produced from low-yielding feedstock. For example, it is known that the production of ethanol from sugarcane is significantly more energy efficient and environmentally sustainable than using maize (corn) as feedstock for ethanol production. Rapeseed, which is one of the best yielding temperate crops for oil production is inferior to either palm oil or *Jatropha* grown in the tropical regions in terms of yield of oil per hectare. However, these concerns may not be justified considering that investment in biofuel crops won't be done without clear investment analyses. The investors with the support of national investment promotion agencies in SSA are likely to undertake thorough analyses of costs and benefits of investing in any of the energy efficient biofuel crops.

6.0 Summary and the Way Forward

Consistent with the findings of Hagan (2007), we found that biofuels do not feature prominently in most national development policy frameworks and national energy policies for some sub-Saharan Africa countries. None of the 17 PRSPs reviewed have included any policy statement on biofuels suggesting that biofuels was not a

national priority when these PRSPs were formulated. Similarly, many National Energy Policies have either mentioned biofuels in passing or discussed biofuel products under renewable and non-renewable energy sources such as petroleum, biomass, electricity, coal, ethanol, among others. For example, the National Energy Policy for Ghana contains specific strategies for biogas, while ethanol is discussed as part of liquid fuels in the case of Malawi. The energy policies in general do not have explicit strategies, regulatory frameworks and institutional arrangements for the promotion of the biofuels sector with the exception of South Africa's draft biofuels strategy, which contains elaborate strategies for biofuels development in South Africa.

With the growing interest in biofuels worldwide, there is need for national governments in sub-Saharan Africa to develop a clear biofuels policy and strategy to take advantage of potential economic opportunities of biofuels development, while at the same time, protect the environment and rural communities from large-scale expansion production of energy crops for biofuels production at the expense of local needs.

As we now live in a global village, any significant shift in the agriculture landscape in the industrialized world will heavily affect Africa countries. Similarly, the effect of rising prices of fossil fuels will heavily impact on oil importing countries in Africa -- biofuels offers some relief on the fuel import bill. Throughout history, agriculture has always adapted to the changing needs of humanity. African agriculture has to change and adapt to meet the demand for both food and fuel.

In the industrialized world, scientists are already developing and testing technologies to increase productivity of agriculture per unit of

land or labour in order to meet growing global demand for both food and biofuels. In addition, the biofuels industry is rapidly developing next generation cellulosic technology that will pave the way for scientific breakthrough where non-food feedstocks such as wood chips, algae and switch grass and any other type of biomass will be used as feedstock for producing biofuels. In other words, the biofuels era is here to stay! Countries and everyone must face reality, and adjust accordingly in order to survive in the fast changing world.

“It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.” Charles Darwin. from “On the Origin of Species” (1859).

In order to harness the potential of the fast growing industry and benefit from the growing international trade in biofuels, the study urges national governments in sub-Saharan Africa

- to develop comprehensive national biofuels policies and plans in consultation with stakeholders including regional economic communities (RECs) such as SADC, ECOWAS, and COMESA, and with AU/NEPAD;
- to raise the resources for infrastructural development for production, processing, storage, transporting and marketing of biofuels products,
- to commit resources for research and development (R&D), capacity-building and technical support, and
- to establish regulatory and institutional frameworks that provide the incentives for private sector participation in the development of the biofuel industry.

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Appendix 1

A matrix of National Policy Frameworks for Sub Saharan African (SSA) countries with regard to Bio-fuels Policy						
SSA Country	Policy Document	Policy Time frame	National /Sectoral	Policy Objectives	General Bio-energy Sector Development Objective	Specific bio-fuel sub-sector policy outline
Benin	Poverty Reduction Strategy Paper	2003-2005	National Policy document	Medium-term macroeconomic stability sustained by an acceleration and judicious application of growth, in particular in favour of the rural population.	Development of alternative energy sources and extension.	None
Botswana	National Energy Policy	2006	Sectoral Policy document	Within the framework of the Botswana National Development Plan 9, the energy policy seeks to facilitate economic efficiency and conservation for each sector; improve access and affordability of energy services to all sectors of the economy; ensure environmental sustainability; ensure surety security of supply and diversified supply sources; facilitate gender equality and improve governance within the energy sector.	To promote sustainable use and harvesting of biomass energy and to promote the switch from fuelwood to alternative energy sources by public institutions, amongst others.	None
Burkina Faso	Poverty Reduction Strategy Paper	2004-2006	National Policy document	To help remove barriers to economic and social progress.	Promoting renewable energy sources in areas that are	None

					sparsely populated or far from conventional power grids, while at the same time ensuring quality of service and consumer protection.	
Cameroon	Poverty Reduction Strategy Paper	2003	National Policy Document	A framework for blending a new generation of economic and social policies into a coherent set for accelerating growth and fighting poverty in a sustainable fashion.	Facilitating maximum development of the existing potential, through appropriate incentives giving priority to basic hydroelectricity, additional natural gas, and renewable Energy for remote areas not yet connected to the interconnected grid.	None
Ethiopia	Sustainable Development and Poverty Reduction Programme	2002	National Policy Document	The overarching objective of the government's poverty reduction strategy is to reduce poverty through at the same time maintaining macroeconomic stability	None, but just a recognition of the fact that biomass accounts for about 76 percent of the national energy demand by the country's population.	None
Ghana	Ghana Poverty	2003 -	National Policy	To ensure sustainable equitable	Introducing and developing	Support the development

	Reduction Strategy	2005	Document	growth, accelerated poverty reduction and the protection of the vulnerable and excluded within a decentralized, democratic environment.	renewable energy technologies such as solar PVs and biogas for purposes of improving energy provision for production in rural areas.	of renewable energy technologies such as solar PVs and biogas
	National Biofuels Policy	2005	Sectoral policy document	The strategic objectives of Government's biodiesel development program focus are energy security; managing the oil import bill; and reducing poverty and creating wealth for the well-being of the people.	Same as the policy objective	The policy objectives of Government of Ghana biodiesel development include:(i) to substitute for national gas oil and kerosene consumption as follows: 20 percent of national gas oil consumption replaced with biodiesel by 2015; and 30 percent of national kerosene consumption replaced with Jatropha oil by 2015. To improve the efficiency of production technologies and techniques of biodiesel with the aim of reducing costs.
Kenya	Poverty Reduction Paper	2000-2003	National Policy Document	To achieve a broad-based, sustainable improvement in the standards of welfare of all	Though not specifically mentioning bio-energy or renewable energy, the	None

				Kenyans.	national policy states that the Kenyan government seeks to intensify exploration of indigenous energy resources to minimize the costs of energy and promote use of environmentally clean technologies.	
Madagascar	Poverty Reduction Paper	2003 - 2006	National Policy document	Promotion of rapid and sustainable development in order to reduce poverty by half in 10 years.	To encourage the development of alternative energies (solar, wind, hydraulic, biogas and biomass) and manage wood fuel resources rationally.	None
Malawi	Malawi Growth and Development Strategy (MGDS)	2006 - 2011	National Policy Document	To reduce poverty through sustained economic growth and infrastructure development.	To create awareness of the use of renewable energy (solar, wind, biomass, and micro hydro) To increase access to reliable and sustainable energy supply.	None
	The National Energy Policy.	2003	Sector Policy Document	To improve efficiency and effectiveness of the commercial energy supply industries To improve the security and reliability of energy supply	To work with the private sector to encourage the expansion of fuel-ethanol production capacity to maintain a 20:80 petrol-ethanol blend and support other fuel-ethanol applications such as ethanol-diesel blends, gel	To enforce the mandatory blending of petrol with ethanol to the ratio 80:20. The Malawi Government will support Research and Development (R&D) into

				<p>systems</p> <p>To increase access to affordable and modern energy services</p> <p>To stimulate economic development and rural transformation for poverty reduction</p> <p>To improve energy sector governance</p> <p>To mitigate environmental safety and health impacts of energy production and utilization</p>	<p>fuel, etc;</p> <p>To reduce Malawi's dependence on imports by supporting import substitution energy industries and by establishing institutional arrangements that provides an adequate balance between public and private participation in the supply of liquid fuels and gas in the country.</p>	<p>new fuel-ethanol applications and into other materials, to complement sugar by-products, for its production.</p>
	Liquid Fuels and Gas (Production and Supply) Bill	2004		<p>To assure that the liquid fuels and gas supply of Malawi is Adequate, reliable, efficient and economical for the country and consumers.</p> <p>Create favorable conditions for new participation and investors in order to improve and expand the infrastructure of the chain of</p>	<p>None specifically besides what is on the specific biofuels policy outline.</p>	<p>It is a proposed regulatory framework for regulating the production and distribution of fossil oils and bio energy fuels such as ethanol and bio-diesel.</p>

				supply.		
	The Agriculture Development Programme (ADP) draft	2007-2011	Sectoral Policy document	Increase agricultural productivity and incomes through prioritized, coordinated and harmonized investments in selected crops such as maize, rice, cotton, beans ,etc and livestock such as cattle, goats and chicken.	None	None
	The Malawi National Strategy for Sustainable Development	2004	Sectoral Policy document	To provide the basis for Malawi's sustainable development framework to implement the WSSD recommendations and specifically to, amongst others, provide Malawi's priority areas for environment management and socio-economic development for the next 10 to 15 years.	To promote efficient energy utilization.	To promote efficient energy utilization systems developed through increase in the Petrol: Ethanol blending ratio from the present 82:12 to 80:20.
	The National Environmental	2004	Sectoral policy document	To promote sustainable social and economic development through	To promote energy saving and renewable energy	Exploring ways of increasing the percentage of ethanol in

	Policy			the sound management of the environment and natural resources.	technologies.	petrol and the possibility of blending ethanol and paraffin to reduce dependency on non-renewable resources.
Mali	Poverty Reduction Strategy Paper	2002-2006	National Policy Document	Government's desire to engage in development activity that is more intense, more organized, more consensus-based, and more effective, and capable of bringing about lasting poverty reduction.	Development and provision of cost effective energy sources (hydroelectricity and new and renewable energy sources) through, amongst others, tax and duty exemptions for new and renewable energy equipment.	None
Mozambique	Action Plan for the Reduction of Absolute Poverty	2001-2005	National Policy document	A substantial reduction in the levels of absolute poverty in Mozambique through the adoption of measures to improve the capacities of, and the opportunities available to all Mozambicans, especially the poor.	to promote the use of new and renewable energy sources in the electrification of remote areas;	none
	Mozambique Position and Experience on Biofuels	2007	A Sectoral Paper	To explain the approaches, policies and strategies for the development of the biofuel industry in Mozambique.	Same as the paper policy objective	(i) Mozambique to make use of the 41.2 million hectares of marginal land to produce crops like <i>Jatropha Curcas</i> , providing the rural population with an opportunity to generate

						<p>income out of a land that did not produce anything at all, without threatening food production and food security;</p> <p>(ii) Mozambique has adopted a preliminary regulation to foster large-scale production of bio-fuels for domestic consumption and exports, including the gradual introduction of blending of gasoline with ethanol and bio-diesel with fossil diesel, initially, at 5 - 10 percent.</p>
Nigeria	The National Economic Empowerment and Development Strategy (NEEDS)	2004	National Policy Document	To mobilize the resources of Nigeria to make a fundamental break with the failures of the past and bequeath a united and prosperous nation to generations to come.	Increase in the share of renewable energy in total energy mix.	None
	National Energy Policy	2003	Sectoral Policy document	It is a blueprint for the sustainable development, supply and utilization of energy resources within the economy, and for the	The nation shall effectively harness non-fuelwood biomass energy resources and integrate them with other	Since Nigeria is endowed with many energy resource types, including oil, gas, coal, tar sands, solar, hydro,

				use of such resources in international trade and co-operation.	energy resources..... <i>and</i> Shall maintain an interest in other emerging sources of renewable energy.	biofuels and other renewable energy resources, its national policy seeks to promote the harnessing of all the viable energy resources to have an optimal energy mix, while ensuring sustainable and environmentally friendly energy practices.
Rwanda	Poverty Reduction Strategy Paper	2002	National Policy document	A strategy for poverty reduction and economic growth.	Not a clear policy position but a recognition of the fact that renewable energy sector has a potentially high poverty impact through employment generation.	None
Senegal	Poverty Reduction Paper	2002-05	National policy document	To double per capita income by 2015 in a context of strong, balanced and better distributed growth and generalize access to the essential social services by accelerating the establishment of basic infrastructure facilities in order to strengthen the country's human capital before 2010; and as	Diversify energy sources through integration of renewable energy sources into rural development	none

				well as eradicating all forms of exclusion in the nation and ensure equality of the sexes, especially in primary and secondary education, by 2015.		
Sierra Leone	Poverty Reduction Strategy Paper	2005-2007	National Policy document	To pursue accountable, transparent and corruption-free policies for stability as well as to ensure a carefully sequenced opening up of investment and trade to deliver economic growth.	the strategy is to encourage both public and private investment in the energy sector and promote energy mix through the promotion of renewable energy resources	None
South Africa	Biofuels Industrial Strategy of Republic of South Africa	2006	Sectoral Policy Document	The Strategy has multiple objectives of contributing to the country's development goals, renewable energy target, generating employment and reducing the negative impact of energy consumption on the environment.	to facilitate a biofuels industry that best meets the broader national interests and national development priorities in the short and long term	The biofuels strategy aims to achieve a biofuels average market penetration of 4.5 percent, of liquid road transport fuels (petrol and diesel) in South Africa by 2013, which is achievable without excessive support by utilizing surplus agricultural capacity.
Tanzania	National Strategy for Growth and Poverty Reduction	2005-2010	National Policy Document	It's a national organizing framework for putting the focus on poverty reduction high on the country's development agenda, informed by the aspirations of	Promote fuel switch from petroleum to other alternative environmentally friendly fuels. To implement rural energy master plan with focus on	None

				Tanzania's Development Vision (Vision 2025) for high and shared growth, high quality livelihood, peace, stability and unity, good governance, high quality education and international competitiveness.	extension of rural electrification schemes, development of renewable and alternative sources of energy.	
	National Energy Policy	2000	Sectoral Policy document	To provide an input in the development process by establishing an efficient energy Production, procurement, transportation, distribution, and end-user systems in an environmentally sound manner and with due regard to gender issues.	To promote efficient conversion and end-use energy technologies and practices in order to minimize health hazards primarily affecting women and children, and environmental degradation.	To encourage exploration of possibilities of fuel switch such as ... ethanol and compressed natural gas
Uganda	Uganda Poverty Eradication Action Plan	2005-2008	National Policy document	Provide an overarching framework to guide public action to eradicate poverty, defined as low incomes: limited human development: and powerlessness.	Not specifically, but a recognition of the fact that only 3 percent of rural households and 8 percent of urban households have access to grid electricity and the rest rely on biomass energy sources, hence the Energy for Rural Transformation (ERT) program	None

					has been developed to widen the access of rural areas to energy supplies to 10 percent by 2012, through grid extension, independent power producers and solar or renewable energy .	
	The Energy Policy of Uganda	2002	Sectoral policy	To meet the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner".	To develop the use of renewable energy resources for both small and large-scale applications.	Research into opportunities for using alternative fuels, e.g. ethanol, methanol and biodiesel
Zambia	The Poverty Reduction Strategy Paper	2002-2004	National Policy Document	achieve poverty reduction through a combination of growth-promoting activities in key economic sectors (with a particular emphasis on rural-based activities) and supporting infrastructure, improved access and quality in the provision of social services, improved governance, and the integration of policies on HIV/AIDS, gender and the environment across the main sectors.	Promote development and dissemination of viable new and renewable sources of energy technologies.	None
	Renewable Energy Policy (review process)	2004	Sectoral policy Analysis	To promote investment in the renewable energy sources.	The proposed measures in the Energy Policy review process include ensuring equitable land distributions between biofuels	Government to promote ethanol-petrol blending and biodiesel by reducing tax on ethanol and offering

					and food security, putting in place a biofuels legislation, and promoting research and development, amongst others.	incentives to the private sector.
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