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REGIONAL WORKSHOP FOR AFRICA ON WAYS AND MEANS TO PROMOTE THE SUSTAINABLE PRODUCTION AND USE OF BIOFUELS
Accra, 8-10 December 2009

REPORT OF THE MEETING

INTRODUCTION

1. At its ninth meeting, in May 2008, the Conference of the Parties to the Convention on Biological Diversity, in its decision IX/2 on agricultural biodiversity: biofuels and biodiversity, called upon Parties, other Governments, the research community, and invited other relevant organizations to continue to investigate and monitor the positive and negative impacts of the production and use of biofuels on biodiversity and related socio-economic aspects, including those related to indigenous and local communities, and requested the Executive Secretary to further compile this evidence and to make it available through the clearing-house mechanism of the Convention and other appropriate means.

2. The Conference of the Parties further encouraged Parties and other Governments, indigenous and local communities, and relevant stakeholders and organizations, to, *inter alia*, share their experiences on the development and application of tools relevant to the sustainable production and use of biofuels, in relation to promoting the positive and minimizing the negative impacts on biodiversity, taking into account their full life-cycle as compared to other fuel types, by, *inter alia*, submitting examples to the Executive Secretary; and requested the Executive Secretary to disseminate these experiences through the clearing-house mechanism, and to compile them for consideration by the Subsidiary Body on Scientific, Technical and Technological Advice. Accordingly, the Executive Secretary issued notification 2008-100 to this effect.

3. In paragraph 12 of decision IX/2 the Conference of the Parties requested the Executive Secretary to convene regional workshops on the sustainable production and use of biofuels aiming at considering ways and means to promote the positive and minimize the negative impacts of the production and use of biofuels on biodiversity, taking into account relevant guidance from the Convention. The reports of these workshops will also be considered by the Subsidiary Body on Scientific, Technical and Technological Advice at its fourteenth meeting when preparing recommendations for consideration by the Conference of the Parties at its tenth meeting in 2010.

4. With the financial support from Germany, the Executive Secretary convened this regional workshop for representatives from Africa. It is the third of a series of regional workshops which has been carried out throughout 2009.

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ITEM 1. OPENING OF THE MEETING

5. A representative of the Executive Secretary opened the meeting at 9 a.m. on Tuesday, 8 December 2009. He welcomed the participants and presented a statement on behalf of the Executive Secretary. He thanked the Government of Ghana for hosting the workshop and the Government of Germany for providing the necessary funds for the organization of the workshop. The outcomes would provide useful background for discussions on the next steps at the fourteenth meeting of the Convention's Subsidiary Body on Scientific, Technical and Technological Advice, to be held in Nairobi, in May 2010.

6. Mr. Jonathan Allotey, Executive Director of the Environmental Protection Agency of Ghana, welcomed participants and made some opening remarks on behalf of the host country. He highlighted the potential role of biofuels in Africa, while also presenting some of concerns surrounding the potential risks to biodiversity. He stressed the need to find ways and means to promote the sustainable production and use of biofuels, and the importance of sharing experiences in the field of biofuels in Africa.

ITEM 2. ORGANIZATIONAL MATTERS

2.1. Election of officers

7. In accordance with the established tradition that meetings be chaired by the host country, the Group elected Mr. Jonathan Allotey and Mr. Daniel Amlalo from the Environmental Protection Agency of Ghana, and Professor Alfred A. Oteng Yeboah, from the University of Ghana, as co-chairs.

2.2. Adoption of the agenda

8. The provisional agenda prepared by the Executive Secretary (UNEP/CBD/RW-SPU-BIO/3/1) was adopted without amendment.

2.3. Organization of work

9. The meeting agreed to organize its work as contained in annex II to document UNEP/CBD/RW-SPU-BIO/3/1/Add.1, while retaining flexibility. The languages of the meeting were English and French with simultaneous translation.

ITEM 3. EXPERIENCES ON THE PROMOTION OF THE SUSTAINABLE PRODUCTION AND USE OF BIOFUELS

10. A representative from the Secretariat of the Convention on Biological Diversity provided a brief overview of the experiences submitted by Parties and other Governments, indigenous and local communities, and relevant stakeholders and organizations in response to decision IX/2 through notification 2008-100. Participants were introduced to the note by the Executive Secretary on consideration of ways and means to promote the positive and minimize the negative impacts of the production and use of biofuels on biodiversity (UNEP/CBD/RW-SPU-BIO/3/2) providing this information. Of almost 50 submissions received, just under 20 were from Parties to the Convention. No Parties from the African region made official submissions.

11. A representative of Brazil was invited to present the outcomes of the Regional Meeting for Latin America and the Caribbean on Ways and Means to Promote the Sustainable Production and Use of Biofuels. Mr. Gustavo Pacheco, on behalf of the Government of Brazil, thanked the Government and the people of Ghana, as well as the Secretariat of the Convention on Biological Diversity, for hosting the meeting and for arranging a welcoming environment for countries to share their views and experiences on the sustainable production and use of biofuels. He then proceeded to introduce the report of the first regional meeting on the sustainable production and use of biofuels, held in São Paulo, on 28-30

September 2009 (document UNEP/CBD/RW-SPU-BIO/1/3). Mr. Pacheco highlighted that the basis for the discussions in São Paulo was the acknowledgement that the three pillars of sustainable development - social, economic and environmental - had to be taken into account when considering the sustainable production and use of biofuels. He also emphasized as an important conclusion of the São Paulo meeting the need to avoid generalizations and to move forward in the discussion of this issue by disaggregating good from bad practice, including by means of case-by-case assessments. He concluded by summarizing the convergence of views of the participants of the São Paulo meeting towards acknowledging the importance of legal frameworks and public policies for promoting the sustainable production and use of biofuels, as well as recognizing the potential of biofuels in terms of achieving social benefits, energy security and environmental sustainability. Finally, he highlighted the importance of recognizing and addressing institutional capacity constraints, as well as ensuring that public policies and legal frameworks are backed by capacity for effective implementation, a process for which international cooperation is crucial.

12. Mr. Pacheco also shared with participants some information on the Brazilian experience with regards to the sustainable production and use of biofuels, bearing in mind the existing cooperation in this area between Brazil and several African countries. He highlighted his country's strong investments in research and in the development and implementation of national policies for biofuels since the 1970s, which resulted in renewable sources providing 46 per cent of the domestic supply of energy, as well as more than 850 million tonnes of carbone dioxide emissions avoided, among many other benefits achieved. He then provided an overview of the current situation of biofuels in Brazil and concluded by saying that the Brazilian experience is a case that confirms that it is not only possible to produce and use biofuels in a sustainable way, but also that the sustainable production and use of biofuels are a way to provide diversification in energy supply, reduction of greenhouse gas emissions, and promotion of economic development without the competition with food production. Finally, he offered to share Brazil's experience and technical support through cooperation programmes with any country interested in evaluating their potential and achieving sustainable development in the social, economic and environmental pillars, and made reference to the agreements for that purpose that have been signed so far with Benin, Guinea-Bissau, Mozambique, Nigeria and Senegal, as well as with the Economic Community of West African States (ECOWAS).

13. Workshop participants were then invited to present their experiences in promoting the sustainable production and use of biofuels in their country. Summaries of the presentations are contained in annex I to the present report.

14. After the presentations, the Chair opened the meeting for general discussion. In the discussion the following points were made:

(a) The global demand for biofuels provides interesting market opportunities, yet African countries are hardly producing biofuels for export. Production is mostly for domestic, and often local, consumption;

(b) While some countries have decided that biofuels are not an option most countries have a range of production systems in place but generally lack policy frameworks, clear land use plans and strategies to attract investors in biofuel production;

(c) Some countries are establishing blending targets and have developed technical specifications/standards for biofuels;

(d) There is a general need for exchanging experiences, guidance and technical support to establish sustainable biofuel production systems in Africa.

ITEM 4. WAYS AND MEANS TO PROMOTE THE POSITIVE AND MINIMIZE THE NEGATIVE IMPACTS OF THE PRODUCTION AND USE OF BIOFUELS ON BIODIVERSITY

15. A representative from the Secretariat of the Convention on Biological Diversity provided a brief review of relevant guidance developed under the Convention based on more detailed information contained in document UNEP/CBD/RW-SPU-BIO/3/2. This included: The precautionary approach; the Addis Ababa Principles and Guidelines for the Sustainable Use of Biological Diversity and their further elaboration; the ecosystem approach; the voluntary guidelines on biodiversity-inclusive impact assessment; the Akwé: Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessments Regarding Development on Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities; all of the relevant CBD programmes of work; the Global Strategy for Plant Conservation; the guiding principles on alien invasive species; the application of sustainable forest management and best agricultural practices in relation to biological diversity; national biodiversity strategies and action plans; and relevant guidance developed under the Cartagena Protocol on Biosafety.

16. In order to organize into a framework the observations and findings of the workshop participants on ways and means to promote the positive and minimize the negative impacts of the production and use of biofuels on biodiversity, it was agreed to use the annex II to the Brazil workshop report (UNEP/CBD/RW-SPU-BIO/1/3) as a starting point and break into three working groups. For practical purposes, the French speaking countries were grouped together, and the rest of participants were split into two groups.

17. Each working group used as a basis of its deliberation annex II to the Brazil workshop (UNEP/CBD/RW-SPU-BIO/1/3) and elaborated it by providing additional perspectives from their group. The groups also considered the preamble of annex II to the Brazil workshop report. All groups decided to add one additional column to the table prepared by the Brazil workshop to include information on means, methodology, and needs for implementation. During discussions in plenary, it was agreed that there were no contradictions or discrepancies in views between the three groups. Therefore, it was decided to harmonize all the outcomes of the group deliberations and to put them together into a single table. The results of this process are provided in annex II to the present document.

18. In reviewing the outcomes of the group work on ways and means to promote the sustainable production and use of biofuels the meeting recommended the development, in collaboration with competent partner organizations and relevant processes, of a toolkit to further assist in choosing and applying appropriate means to promote the sustainable production and use of biofuels.

ITEM 5. OTHER MATTERS

19. There were no other matters raised by participants.

ITEM 6. ADOPTION OF THE REPORT AND CLOSURE OF THE MEETING

20. The Chair explained that the final report would include the agreed outcomes of the last session of the meeting (the framework in annex II below) and that the report would be circulated amongst participants for their approval prior to its completion.

21. The Chair provided some closing remarks and thanked participants for their work during the workshop. The representative of the Executive Secretary acknowledged the engagement and openness of participants. He also thanked the three co-chairs, the interpretation company (Polyglot), Ange Hill Hotel, the Government of Germany for providing funds, and Ghana for hosting the workshop.

22. The meeting closed on Thursday, 10 December 2009, at 2:30 p.m.

Annex I

SUMMARIES OF COUNTRY PRESENTATIONS

Benin

Sorghum, sugarcane, cashew apple, corn and cassava could be used to produce bioethanol in Benin, while *Jatropha*, cotton, sunflower, oil palm, peanut, soy, castorbean and other oil crops could yield biodiesel.

Crop choices must account for the degree to which peasants master production techniques and should not include Benin's main food plants.

From an environmental perspective, it is important to define the boundaries of the natural reserve zones to be cultivated. It is also critical to determine the best crops for each zone, select plants that foster reforestation (cashew and others) and promote the use of agro-forest species (pulses) and crops that require little water (*Jatropha*). Legislative and regulatory provisions must also be implemented.

With regards to food security, priority should be granted to non-food plants (e.g., *Jatropha*, castorbean, sugarcane, cashew). Biofuel production should be focussed on meeting local demands and the use of domestic agricultural equipment. There should be no arable land competition to plant fuel crops at the expense of food crops, and farmers should not choose energy crops over subsistence plants. Particular attention must be paid to the potential rise in agricultural food commodity prices.

Legal and regulatory policies must develop and strengthen relations and bilateral cooperation between countries that have acquired biofuel expertise (Nigeria, Mali, South Africa, Brazil, China, India, Indonesia, Malaysia) with the support of regional and subregional institutions (UEMOA, ECOWAS). Implementing test fields and a communications policy to provide non-technical information on the biofuel sector, regulating rural land occupation and development, and elaborating a legal framework to provide access to rural land and oversee rural land use should also be considered.

All crops that could yield biofuel should be assessed. Those whose addition into bioethanol and biodiesel matrices is economically viable and whose social and environmental risks can be controlled should then be considered. New agricultural sectors will have to be set up, and national structures will have to be implemented to support sustainable biofuel development.

Botswana

Botswana is located in southern Africa neighbouring the Republic of South Africa, Namibia, Zimbabwe and Zambia; with an area of about 582 000km2. Climate is mainly semi-arid to arid with most of the country covered by the kgalagadi Sandvelt. The population is about 1.7 million concentrated in the eastern part of the country. Biodiversity; 17% of the 582 000km2 is put aside as protected ecosystems as game and forest reserves.

Biomass continues to be a major source of energy for rural and low income urban communities. The advent of trade in fuel wood has seen the indiscriminate cutting down of live trees. Fuel wood is now scarce in all areas of the country except in the North like previous efforts to augment fuel wood stocks through afforestation have not been very successful as there was no incentive for the communities to manage them.

Fuelwood or firewood is regarded as the major source of energy especially in rural areas. This energy source account for 92% of the rural households energy needs and it is used by 43% of the urban households. However biofuels and biogas hold enormous potential for the Botswana's energy. Generally, biomass activities have been fragmented in Government institutions private sector and NGOs. Efforts to introduce more efficient wood stoves have not been very successful partly due to the inability of the target groups to afford the stoves. Some success has been recorded in areas of severe wood shortages.

A Biomass Energy Strategy (BEST) has been formulated to find the most sustainable way of meeting the country's biomass energy requirements. The feasibility study to establish the potential for biofuels as a source of fuel for Botswana has been completed. The study has established that:

- Botswana has a potential to produce biofuels (biodiesel from *Jatropha* seeds, ethanol from sweet sorghum and bio-gel)
- Government assistance in the form of subsidies is required to make these initiatives attractive
- More research work is required on the feedstock.
- Currently undertaking a Study on the Socio-economic Impact of *Jatropha*
- *Jatropha* seeds are been purchased from Ghana for research and establishment of nursery for seedling production
- All energy projects need to undertake Environmental Impact Assessment (this includes biofuel plantations)

Current status of biodiesel production:

- Local private companies use used cooking oil to produce biodiesel mainly used for their respective machinery and cars
- Existing *Jatropha* plantations are initiatives of the private companies

Planned Activities:

- 50 000 litres of biodiesel production plant by 2016
- Govt. to acquire and lease out land for Jetropha plantations
- Strengthen research with research institutions
- Working on legislation and regulations
- Establish subsidies
- Use existing animal fat as feed stock

Burundi

Burundi is a Central African nation bordered by the Democratic Republic of Congo to the west and Tanzania to the east. It extends some 27,834 km^2 and is home to 8,000,000 people (280 inhabitants /km^2).

Over 95% of Burundians live off subsistence farming that barely meets the nutritional needs of the entire population.

The average income is US$70/Burundian/year, making Burundi one of the world's poorest countries.

Burundi's main export is coffee (35,000 tonnes in 1980-1993: 80% of exports; 10,000 tonnes since 2000), but trade is weakening due to low market prices.

Burundi is therefore seeking new sources of revenue. The biofuel sector could contribute to poverty reduction in the short, medium and long terms if it is developed in ways that prevent competition between fuel and food crops, which are currently insufficient.

Burundi imports some 65,000,000 tonnes of oil (current pump price: US$1.50) and would benefit from reducing its fuel imports by 50% through biofuel production.

No biofuel production or use policies have been implemented in Burundi. Burundians see fuel crops as direct competition for lacking food crops.

A small-scale cooperative project to plant Barbados nut tree (*Jatropha curcas*) was implemented in 2009.

Given current arable land areas and agricultural practices, biofuel production should be focussed on the development of species that do not compete with those used to meet the nutritional needs of human and animal populations and which are currently insufficient. In particular, producers must receive increased support to fully master the technologies and capitalize on biofuel dividends.

Burundi's options include:

- Producing biodiesel from *Jatropha* (biofuel, carbon sequestration and use of oil cake as fertilizer). *Jatropha curcas* generally grows near animal pens in the Imbo plain, which receives little rainfall;
- Producing biodiesel from *Moringa oleifera* (biofuel, carbon sequestration and use of oil cakes as cattle fodder);
- Relying on other plants such as *Pongamia pinnata*;
- Producing ethanol with cane molasses and coffee pulp;
- Burning rice and wheat husks, coffee hull, and cotton harvest waste.

Burundi should begin to explore the possible benefits of sustainable biofuel production and use as soon as possible in an effort to reduce poverty. Projects to transform harvest waste into biofuel could also be developed and tested.

The Regional Workshop for Africa should shed light on the ways to establish policies to promote biofuel production and use in Burundi and initiate participative discussions (public-private partnerships and local communities) leading to the prompt enactment and implementation of an operational strategy that takes biodiversity preservation into account. The experiences of other countries will serve as examples of the best models and species.

Cameroon

Cameroon like many developing countries has been confronted with the bitter reality of depending solely on fossil fuel as the only source of fuel energy and economic resource. This state of events is what has led the Government for the past five years to explore alternative sources of fuel energy which will act as a supplement and cheap to produce. The use of Biofuels is being seen as one of these options.

From the perspective of available land and labour resources, Cameroon has significant potentials to produce biofuels and become an international export supplier if high yield biofuel feed stock (such as sugar cane, oil palm, *Jatropha curcas* etc) are pursued. There will then be enough feed stock available for the production of first generation biofuels such as maize, sorghum, cassava and sugar cane and second generation biofuels (e.g. Biomass including cellulosic biofuels).

The availability of resources and government support especially from President Paul BIYA who encouraged the examination of the possibility of developing in Cameroon the production of bio-fuels from some residual agricultural products is currently attracting many investors in this sector.

Today there are two different schemes for biofuel production in Cameroon. First, biofuels are produced through large scale devoted projects (targeting more than 500ha) with mostly foreign companies as the main developers. Second, small-scale production schemes are possible involving plant oil, mainly from *Jatropha*, involving small-scale farmers' associations/cooperatives, NGOs and local companies focusing on rural development.

As an example of large scale investment, currently the Government of Cameroon is conducting through the Ministry of Water and Energy feasibility studies on the development of at least 30 biogas sites in Cameroon, this will be followed by feasibility studies for the development of biofuels from other feedstocks.

Furthermore, companies such as SOCAPALM, SAFACAM and the Ferme Suisse involved in palm oil production are expanding their productivity gains through the conversion of part of their oil into biofuels. The quantity of Biodiesel produced by these companies and others dealing with the production of biodiesel from palm oil is not known. However, sales of biodiesel from this feedstock are flourishing online1.

Other companies such as Venture Energie, created in 2006 have as objective to develop the production of *Jatropha* oil and hence biodiesel for domestic and international markets. The company presently has at her disposal 20,000 ha of land to carry out the production of biodiesel from *Jatropha* seeds. Currently, 34 ha are being used in an experimental plot of 10 acres. This Company plans to introduce intercropping of Jatropha with food crops as a contribution to sustainable development.

As for small-scale projects, some NGOs such as the GREENERY in the North West of Cameroon, have embarked on a pilot project to encourage the commercial production of oil from jatropha curcas. It seeks to provide technical assistance to assist farmers in the cultivation of *Jatropha* and production of its oil. Additionally, GREENERY hopes to set up long term agreements for the purchase of jatropha oil in order to boost the market value of *Jatropha* and to establish reliable demand for the product.

In order to manage the current "market boom" for biofuels in a way that maximizes its potentials for the economic development, while minimizing environmental and social impacts, the Government of Cameroon is still in the process of developing coordinated policies and strategies. At present, Cameroon lacks policies, strategies, guidelines and regulations that specifically target biofuels development. However, she can boast of the recent creation of a task force group known as the Renewable Energy Task Force that has as activity to critically analyze and advise the Government on biofuels projects amongst other tasks. The National Energy Action Plan for the Reduction of Poverty equally gives some orientation on the use of Biomass but does not mention biofuels or renewable energies as a major sector of concern.

The production of Biofuels is a necessity in Africa, especially when one looks at the current energy crises and the pressure exerted on wood by many homes. However, if sustainability in general and food security in particular is not taken into consideration in each biofuel project, the expected positive impacts such as improved energy security, livelihood and promotion of rural development will be forfeited.

Comoro Islands

The Comoro Archipelago is located at the northern mouth of the Mozambique Channel (between 11°20' and 13° 14' south latitude and 43° 11' and 45° 19' east latitude) between East Africa and Madagascar. The archipelago includes four islands: Grande Comore (Ngazidja), Anjouan (Ndzouani), Moili (Mwali) and Mayotte (Maoré).

The Comoros Islands were created when the fault trough that separated Madagascar and Africa was formed on a volcanic submarine plateau some 65 million years ago. The islands are, in fact, the result of magma eruptions that occurred 15 million years ago. Mayotte was the first island to emerge. Anjouan and Moili appeared millions of years later. Grande Comore surfaced two million years ago.

The Comoros Islands benefit from a tropical climate. The warm season, from November to April during the southern summer, is the rainy season. The cooler season is from May to October. Over 1,000 mm of rain fall annually on the islands. Rainfall varies from one island to another and can easily reach 6,000 mm on Grande Comores, 2,000 mm on Anjouan and 3,063 on Moili.

[1] http://www.alibaba.com/countrysearch/CM-suppliers/Biodiesel.html

The sovereignty of the Comorian republic is carried out on three islands (Ngazidja, Ndzuwani and Mwali), while Maoré remains under French administration. The 2001 constitution stipulates that the islands are to be known as the Union of the Comoros and constitute a republic in which each island is autonomous and possesses its own constitution.

The president, with the support of two vice-presidents from the islands that are not his/her home-island and a nominated government, holds executive authority within the Union. The president is elected for four years through first-ballot direct universal suffrage, and the presidency is taken in turns by each of the islands. The Union Assembly holds legislative authority.

Each island has its own president, who is elected for five years through direct universal suffrage (two-ballot uninominal system) and assisted by a nominated government. The Island Assembly holds legislative authority and members are elected (first-ballot direct universal suffrage).

The Union of the Comoros attributes the exclusive competencies of the Union and those of the autonomous islands.

The economy of the Comoros Islands is chiefly based on agriculture, which represents 40% of the GDP, 80% of jobs and 90% of national revenues. However, the Union cannot meet all of its food requirements and must import all or substantially all of the rice consumed by Comorians (the main staple of households) and all of the necessary sugar, wheat flour and salt. The national economy has been in steady decline. From 1989 to 1999, average GNP growth was -0.4% and GDP/inhabitant fell by 2.9% in the same period. In 1999, GDP decreased by 1.4% and GNP per capita plunged by 4.1%.

The agriculture and environment ministry, the Ministère de l'agriculture, de l'environnement, which oversees energy issues, aims to sustainably guarantee that food and energy needs are met, ensure sound natural resource management and contribute to the country's national economic development by supporting the craft sector and the implementation of industrial production units in an effort to reduce poverty.

There are two main sources of energy in the Comoros Islands:

- Plant and ligneous biomass, which meet approximately 78% of national demand, are used for household use (75%), ylang-ylang distillery use (19%) and for other activities (drying copra, lime carbonization, coral-derived lime production – 6%). Total national annual production is estimated to be 96,700 ton oil equivalent (TOE);
- Petroleum products, which are all imported. In 1992, 12,326 m^3 of diesel fuel, 7,666 m^3 of kerosene and 11,935 m^3 of gasoline were consumed (27,280 TOE). These products were used for transport (60%), electricity production (25%), and household use (15%), mainly in urban areas (where 29% of the population lives).

Electricity production is chiefly provided by MAMWE. The energy supply is mostly thermal, except in Ndzuani and Mwali, where two small hydroelectric stations and photovoltaic installations belonging to private and business operators have been implemented. Elsewhere, power stations rely on imported diesel fuel. Consumption habits vary according to energy rates. For example, lower kerosene oil rates make it cost-competitive with fuelwood for cooking. Unfortunately, this is not the case for distilleries, which contribute to deforestation and for which current diesel prices are still much higher than those of coconut fibre and plant biomass.

As part of its energy policy (electricity, fuel), the Government is seeking to reduce its dependency on imported petroleum products. With regards to the wood used by households or certain agro-industries such as the distillers, the partial or total replacement of petroleum products by other types of products is recommended in order to limit the pressures exerted on the forests. The partial or total remission of coal import taxes has been suggested.

It is also important to assess the possibility of implementing systems that rely on other energy sources including hydrothermal, geothermal, solar, wind, hydroelectric, biogasification, biofuel and agrobiofuel.

The most viable of these options for the Comoros Islands is solar (photovoltaic) energy since the Union receives eight hours of sunshine daily (2,880 hours/year) and, on average, 5,000 WP/m^2. Once used only as a backup source for the mail and telecommunications, civil aviation and police departments, in 1995, solar energy became available on a wider scale through World Bank funding for ENERCOM, a Comorian de jure corporation, which has implemented some 100 installations on the three islands yielding 10,000 WP for certain domestic and professional partners.

In 1985, two Kenyan Kijito wind turbines were installed in Ngazidja to drive groundwater pumps. One was installed on the eastern coast at Mtsangadju ya Dimani and the other on the northern coast at Wella (suction heads: 30 m and 40 m, respectively). However, neither has provided the amounts of water that were initially estimated. A wind generator requires average annual wind speeds of at least 3 m/second, and data has shown that island winds do not always reach this speed. Studies must therefore be carried out to determine the best areas in which to install such turbines.

Studies were conducted to develop wind energy in Ndzuani and Mwali, where potential resources are available. They have since been stopped due to a lack of funding. The three existing power stations in Ndzuani (Lingoni, Marahani, Trantrenga) were built and developed by the Bambao company and date back to the 1940's. Today, only the Marahani plant (125 kVA) remains operational and will continue to be used by village communities waiting to be served by MAMWE. In Mwali, the Miringoni power station built in 1980 through cooperation with West Germany yields little energy (15 kVA), powering only the village of Miringoni itself.

In 1986 in Fomboni (Mwali), MAMWE installed a 40-kW biomass gasifier with the support the EDF as part of a renewable energy development programme for South West Indian Ocean nations. The gasifier, which powered certain sectors during peak hours, ceased to function in 1988 due to a lack of technical support and means to ensure the daily fuel supply of a mix of coconut fibre (75%) and shell (25%).

Oilseed plants such as coconut, sesame, peanut and *Jatropha curcas* (Barbados nut tree) grow in the Comoros Islands. Coconut, sesame and peanut are grown for local consumption. Nut trees are planted to provide support for vanilla orchids and hedges. No in-depth studies have been conducted on these oilseeds, with the exception of the dried coconuts, which are transformed into oil for local consumption.

Studies could be conducted to reclaim this raw material, which is abundant. Mastering the extraction processes and physicochemical analysis techniques for these oilseeds could make it possible to transform the oil and its derivatives into finished and semi-finished goods and also obtain high-quality products. Converting oilseed plants may constitute a sustainable development option.

The use of *Jatropha* oil instead of diesel to power certain motors could partially resolve the energy supply issues pertaining to vanilla preparation and especially aromatic plant distillation. Studies could be carried out to assess whether it would be possible to use *Jatropha* oil rather than the traditional kerosene oil.

The Comoros Islands are too small to ensure biofuel production from crops such as corn, peanut or coconut and it would be best to support traditional nut tree growth as stakes for vanilla orchids and hedges and to protect the crops from animals, avoiding conflicts between crop farmers and stock farmers.

The Government is pursuing its policy to support renewable energy use and intends to facilitate the import and use of biofuel to curb greenhouse gas emissions.

Fostering the use of oilseed plants in the Comoros Islands is part of the initiatives to fight poverty and reach the MDG but also and especially constitutes the means to reach Stockholm Convention and Kyoto Protocol objectives.

The Comoros Islands have set a two-fold objective with regards to the workshop:

- Acquire sectoral knowledge to better assess the advantages and disadvantages of biofuel production and use;
- Discover the technologies used by other insular nations whose area and demographic pressures are similar to those of the Comoros Islands.

Congo

Located in Central Africa, Congo is home to the Congo Basin, which constitutes the world's second largest forest reserve after the Amazon in Brazil. With regards to environmental preservation, the Congo Basin provides a crucial supply of oxygen for the planet. In Congo, the forest is the second most important natural resource after oil. The forest massifs are regularly subject to intense human pressures brought about by unsustainable logging (timber, fuelwood, lumber) and slash and burn agriculture, which alter the pedologic structure and ecosystem balance, disrupting populations and creating new habits.

Congo has yet to establish a national biofuel program. However, certain sectoral activities have been carried out, including the use of wood by-products (e.g. wood chips) as an alternative to fuelwood and to manure in market farming and the use of gluten feed as agricultural manure and as fishfood on fish farms.

The biofuel projects implemented by oil company ENI and a joint Congo-Brazil project integrate Congo's development plans.

Côte d'Ivoire

The only type of bioenergy used in Côte d'Ivoire is biomass (fuelwood and charcoal), which is the nation's most prevalent source, meeting some 60% of energy needs (mostly household and craft related).

The two other bioenergy sources, biogas and biofuel, are still in the development stages. In fact, Côte d'Ivoire possesses many of the resources necessary to renewable energy production.

The organic and plant materials required for biogas production, including household refuse, industrial and urban wastewater treatment plant sludge, industrial organic waste and agricultural and farm waste (droppings, manure, etc.), are readily available.

Given the widespread implementation of agriculture in Côte d'Ivoire, the development of biofuels (bioethanol and biodiesel) could stem from a variety of sources.

Bioethanol production could rely on the following crops: cashew (cashew apple broth), pineapple (portion that is not exported or sold on the national market), cacao (mucilaginous pulp broth at production sites), sugarcane (vast plantations adequately supply the country's two sugar plants), corn and cassava (require a specific programme given their primordial role in meeting national food needs), mango (50% of the production that is not exported, local species that are not exported or locally consumed).

Biodiesel could rely on the following crops: peanut and soy (require a specific programme because production barely meets national needs), coconut (sector to be relaunched for biodiesel production), cotton seed (requires a project to relaunch the sector), and the oil palm (requires a specific programme given its national strategic importance).

Also, agroclimatic conditions, land availability, national readiness, existing research and development structures, the clear interest of several private operators and obtainable funding are assets to the sustainable production and use of biofuels in Côte d'Ivoire.

There are, however, certain obstacles: the lack of significant biofuel production process activities, the lack of institutional and regulatory frameworks pertaining to biofuel production and use, the possible competition with food crops, the lack of formal national biofuel strategies, inadequately

coordinated activities, the inadequate promotion of biofuel in the private sector, especially at the SME and SMI levels, the lack of information and awareness-building (general public, decision-makers and potential operators), the absence of an appropriate and official renewable energy and biofuel funding system and inadequate personnel training in the private sector.

Côte d'Ivoire recognizes that though biofuels yield opportunities to foster sustainable agriculture and meet the nation's many energy needs, they are not without significant risk. Therefore, the country will only make a decision regarding the matter after fully assessing the advantages and drawbacks.

Egypt

In Egypt renewable energy resources represented 11% of total energy supply in 2003. Hydroenergy and biomass made up 0.1% of total energy supply. The total renewable energy power generated reached 2,929 MW, 94% of which being large from hydrodams. The rest was composed of 145 MW from wind, 36 MW from biomass, and 3 MW from photovoltaics. The renewable energy generated represents 17.5% of the total installed electricity capacity and the renewable energy power generation was 13.2 TWh (terawatt hours), representing about 15% of the total electricity generation. Egypt's strategy it is to provide 14% of national energy consumption from renewable sources by 2020 with the long term goal to increase the share to 40% by 2050.

Egypt's policies on biofuels are focused on the production of biofuels from agricultural residues. This aims to protect the environment and to promote crop rotation in agricultural land. In addition biofuels are produced from cultivated trees such as *Jojoba* and *Jatropha* which are grown in desert areas, thereby combining bio-energy production with the combating of desertification. Moreover, since the 1980's dozens of units for the production of biogas were established in rural areas. Recently the Ministry of the Environment began to establish many factories for the production of biofuels from agricultural residues and from *Jatropha* plantations.

In Egypt the amount of agricultural residues are estimated at around 25 million tons per year. If proper technology is applied to convert biomass into biofuel, about 12 million tons could be utilized for energy purposes, while approximately 3 million tons of bagasse and rice straw are used as fuel for industrial purposes. The remainder is disposed of by burning in low-efficiency open-fire stoves and ovens. A small percentage of the residue is used as organic fertilizer, animal fodder, and industrial raw materials.

In an effort to safely dispose of wastewater the Ministry of the Environment plans to plant 440 thousand feddan (185,000 ha) with biofuel trees and other trees near sewage stations in major cities and the capitals of all governates. This area could be irrigated with 2.4 billion cubic metres of sewage. Until the end of 2007, 15 thousand feddan of forest have been planted in 34 forest in 17 governorates (about 10% of the project area), mostly in Upper Egypt, New Valley and Sinai. Additional forests are being planted covering an area of 17 feddans in 8 governorates.

Egypt has a logistical advantage in biodiesel production: the country has a competitive labour force, a stable and hot climate facilitating plant growth, and an abundance of affordable land for plant production. The Government plan indicates that biomass will generate an expected share of 1,500 MW worth of electricity by 2020.

The Government Egypt expects that wind projects and biomass plants will offer an estimated 40 jobs per project. In addition, the cultivation of plants for biodiesel production provides 3,000-5,000 job, thus creating opportunities to help boost the country's economy and the public image of the renewable energy sector.

Egypt's experience with the production of biofuels as a source of clean and safe energy started in Sukhna area in the Suez governorate with the establishment of the first project at a cost of 17 million Euros and a capacity of up to 40 million tons biofuel, and 4 million medical glycerin. The project aims to save energy, eliminate pollution and increase soil fertility by planting 6,000 feddan (2,500 ha) in Suez, of which 400 feddan have already been establishing using wastewater for irrigation.

A biodiesel plant and *Jatropha* plantation were also established in Luxor on an area of 100 feddan using sewage water and without use of fertilizers. With cooperation between the Ministries of Agriculture and the Environment, another 10,000 feddan will be planted in Aswan.

In October 2008 the Government opened the first factory for the production of biofuels in Elsharkia governorate. This project is the first to use agricultural residues, especially rice straw, rather than agricultural crops. The factory consumes about 40 thousand tons of rice straw and is provides about 200 jobs to local people in addition to the production of fuel.

Ghana

Ghana depends mainly on imported crude oil and petroleum products for its energy use. In 2008 the country spent US$2.3 billion on crude oil and petroleum importation. About 80% of Ghana's prime energy is from woodfuel (firewood and charcoal). Energy for lighting purposes is obtained from two sources, kerosene (52%) and electricity (48%) and 82 % of rural population depend on kerosene for lighting.

Biofuel Policy Objective:

1. Energy security
2. To reduce the high dependency on the imported crude oil and petroleum products and make foreign exchange savings
3. To reduce poverty and create wealth for the well-being of the people.

Target: 5% of fossil fuel substituted by biofuels by the end of December 2012

Feedstock under consideration:

- Biodiesel - *Jatropha*, soya bean, palm oil, sunflower, etc
- Bio-ethanol – Sugarcane, cassava, corn, etc

Status:

- Draft Biofuel Policy is about to be finalised and it would be subjected to Strategic Environmental Assessment (SEA)
- Renewable Energy Law on Bio-Energy is being developed – by the end of 2010
- Standards for Biodiesel and Bio-ethanol have been developed
- A Licensing/Permitting Manual for RE industry has been developed
- Bio-energy resources throughout the country to be assessed by the end of Dec. 2010
- A compiled list of some biofuel producers and growers

Production

- Some individuals produce bio-diesel for their private vehicles
- Association of Farmers grow and produce *Jatropha* bio-diesel for export and local use
- Some few companies produce biofuel by on small scale
- Some rural communities grow and produce bio-diesel to run their generators for village power supply

Challenges

1. The challenge of food versus fuel. Palm oil, cassava are main staple food
2. Absence of land use policy or management plan. Chiefs/traditional authorities are mostly the custodian of land
3. Legal framework for biofuel industry
4. No comprehensive database on production of biofuel.

Madagascar

With a total area of 586,760 km² and boasting unique biodiversity and ecosystems, Madagascar is the fourth largest island in the world. It is home to some 12,000 plant species, 283 bird species, 370 reptile species, 244 amphibian species, 154 fish species and 99 lemur species. This great biodiversity and equally great vulnerability led Conservation International to designate Madagascar as one of the world's four hot spots.

Madagascar is, in fact, facing several significant issues including the annual clearing of 0.55% of primary habitats (slash-and-burn agriculture, charcoal, bush fires) and the overexploitation of natural resources. With regards to charcoal, 80% of Malagasy households use woodfuel for cooking.

Pollution and natural disasters (cyclones, floods) largely contribute to the depletion of certain habitats. It is currently estimated that the annual cost of this environmental depletion amounts to $10 million.

More recently, the impacts of climate change on the marine and coastal ecosystem were found to be particularly devastating.

In light of these environmental issues, through the actions of the environment and forestry ministry, the Ministère de l'Environnement et des Forêts, Madagascar has invested efforts to implement a national sustainable biodiversity management strategy and a national plan of environmental actions. Initiatives include:

- Increasing the hectarage of protected areas from 1.7 million to 6 million. With regard to the 2012 objective, 79.20% of the territory is now protected, and 4,751,895 ha of protected zones have been created (8% of the island's total area);
- Reforesting 34,925 ha compared to the planned 25,000 ha, including 357 ha of primary forest in 2008;
- Reducing the number of brush fires in 2008 by 75% as compared to reference year 2002.

For the past five years, Madagascar has also struggled with a major energy crisis due to high fuel prices and insufficient energy supply because of a crisis within the national electricity company (electrical distribution rate of 25% in 2005). However, the island possesses important energy sources for agrofuel development, including vast available space and a favourable climate.

Madagascar has not yet established regulations regarding the use and promotion of biofuels. Through its energy department, Madagascar is currently working to:

- Implement a regulatory framework for the promotion and development of biofuels;
- Create a sustainable agrofuel platform to bring together sector stakeholders (institutions, current investors, decentralized territorial communities and the public) to foster projects and discussions.

Malawi

Malawi is a landlocked country with a total area of 119,140 square kilometres. The country shares borders with United Republic of Tanzania to the north, Mozambique to the east and south and Zambia to the west. The country has a population of 14 million people (2008 census) of whom 85 per cent live in rural areas.

In terms of economy, the country is highly dependent on agriculture which accounts to about 36% of the gross domestic product (GDP). This agriculture is characterised by dual system consisting of smallholder farmers and estate farming.

Smallholder farming is mainly done on customary land which covers about 4.8 million ha and contributes to about 80 per cent of food crop production in the country, whereas estate farming is mainly dominated by cash crops production such as tobacco, tea and sugar.

In 2006, these two categories of farmers were introduced to growing of *Jatropha* for biofuel production and the figures show that about 1,800 ha has already been planted.

In an effort to stimulate development, the country came up with a medium term development paper called *Malawi Growth and Development Strategy Paper* (MDGS) in order to transform the country's economy. The country would want to see materialisation of turning from largely importing and consuming country to producing and exporting country.

In order to realize this is the medium term, nine priority areas were identified as shown below:

- Agriculture and food security;
- The Greenbelt Irrigation and Water Initiative
- Education, science and technology;
- Transport infrastructure and Nsanje World Inland Port;
- Climate change, natural resources and environmental management;
- Integrated rural development;
- Public health, sanitation and HIV/AIDS management;
- Youth development;
- Energy, mining, and industrial development.

Being a landlocked country, Malawi imports petroleum from oil-producing countries, and the supply is subjected to international market forces which adversely affect the economy. In an effort to achieve pillar number nine, the Government allowed establishment of companies in biofuel production among other fields . As such the country would like to encourage import substitution of petroleum by developing local agro-based alcohol fuels and gases (National Energy Policy 2003). This has led to issuance of business licences to four companies namely Energem,Farmersworld,Environmental Africa and Bio Energy Limited in 2006-2007.

Company	**Plantation**	**Year of Establishment**	**Focus**
Ethanol Company Limited (Sugarcane Mollases)		1985	Uses molasses from sugarcane
Energem	18000	2007	smallholder farmers
Farmersworld	15000	2007	Estate Growing and Smallholder farmers
Bio Energy Limited	75000	2006	Estate Growing and Smallholder farmers
Environment Africa	6500	2007	smallholder farmers

In case of ethanol production, the current level of production is at 90,000 tonnes of ethanol which is mainly used for blending purposes with gasoline at the ratio of 20:80. However, this ratio is not met with the increase in demand for petrol by motorists. As of 2003, the ratio was at 7:93. This has forced the

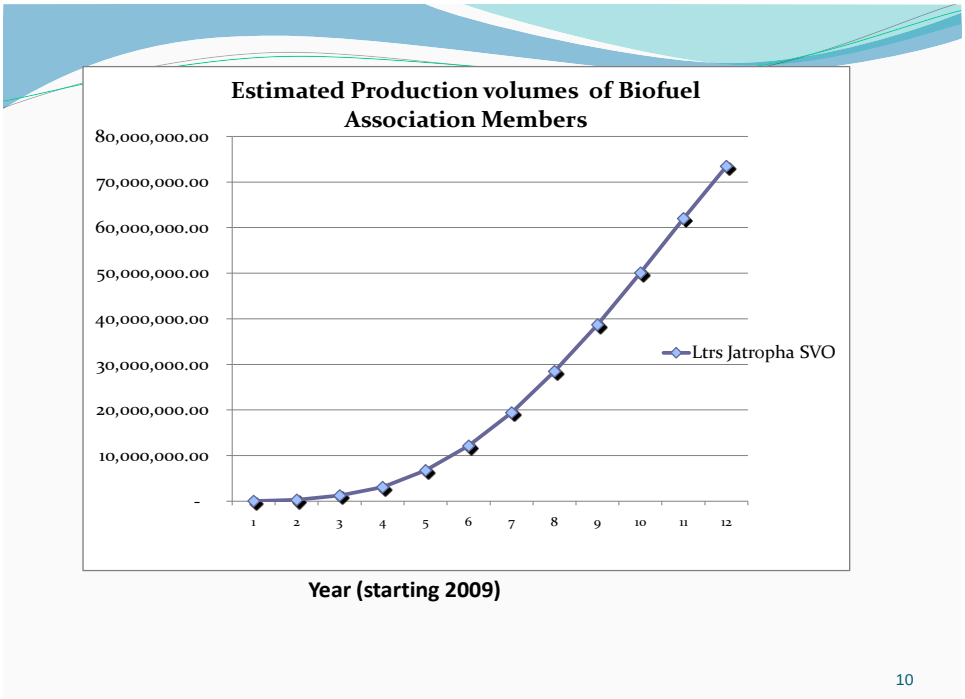
country to increase sugarcane production by smallholder farmers which it is estimated that production will increase to 100,000 metric tonnes. About 5% of the total ethanol is used as alcohol in industries.

The four companies are at the establishment stage where they are involved in awareness creation to local farmers so that they can grow *Jatropha* and establishment of *Jatropha* nurseries. *Jatropha* is mainly planted in marginal lands and abandoned tobacco estates.

They have also formed an association as a body that will be working with the Government for negotiations of prices, tax exemption on imported machinery and tax holiday during the course of production.

It is envisaged that biofuel production using *Jatropha* feedstock will create jobs, reduce importation of petroleum products and contribute to improvement on the GDP.

The figure below shows estimates of biofuel production if the current pace of *Jatropha* planting is maintained:



Before the introduction of *Jatropha*, the Government put much emphasis on the production and use of ethanol and biomass because these were by then applicable to the then situation. There are legal instruments which govern sustainable production and use of biomass energy resources. The demand for biomass fuel for domestic use increased due to increasing population which doubled from 5million in 1966 to 12million in 1998 of which 99% depends on fuelwood and charcoal. This led clearing of forests mainly on the customary land. The decline in forest cover was also partly contributed by opening of tobacco estates.

With the introduction of *Jatropha*, the Government has set a body called biofuel Advisory Council (comprised of Government representatives and stakeholders) for policy development and guidance

The body will help the Government in coming up with policy on biofuel and standards in order to increase the benefits of biofuel production without compromising the negative impacts on the environment, food security and use of child labour.

The Government has further tasked government institutions such as Malawi Bureau of standards, Department of Agricultural Research Services, Environmental Affairs Department to enforce quality of

biofuel produced; seed provenance, crop research and seedcake trials and assessing the impact of *Jatropha* plantation and biofuel production processes on the ecosystem respectively.

Much as biofuel production in Malawi is seen as a viable venture to the socio-economic development of the country, there are a number of shortfalls which need to be locked at critically such:

- Lack of comprehensive literature in The National Energy policy which has not touched much on biofuel production *per se (it only has an objective which reads: Encouraging import substitution by developing local agro-based alcohol fuels and gases)*
- The National Biodiversity Strategy and Action Plan does not mention any impact of production and use of biofuels on biodiversity
- Threat to food security if biofuel production would give more economic returns than food crops.

There is need for countries to a replicate at best practices from countries that have been involved in biofuel production for decades much as these are also subjected to geography and local environment of the country.

Mauritania

Mauritania is located in the western desert between the 15th and 17th parallel north and the 5 and 7° west meridian. It is bordered to the west by the Atlantic Ocean, to the south by Senegal, to the east by Mali, to the north by Algeria and to the northwest by Western Sahara.

Mauritania is the largest, most arid country of the Sahel. In fact, 75% of the country is desert. It covers 1,030,700 km^2, and is home to some three million people, most of whom live in the capital city of Nouakchott, whose size accounts for less than 1% of the nation's total area.

Biofuel production and use are new to Mauritania. However, two projects involving the use of the oil from the *Jatropha curcas*, a Brazilian spurge family shrub species, are currently in the experimental stages. The shrubs' seeds contain between 27 and 40% curcas oil and are used in traditional medicine, as fodder for livestock and to manufacture household soap.

One of the projects is being carried out by a private NGO, whose president planted 15 ha of *Jatropha* and then developed a system to extract the seed oil. He then invented a food warmer that burns *Jatropha* oil rather than butane gas for locals. However, the development and marketing of the burner is limited due to a lack funds.

The second project is in earlier stages than the first. It is actually an experiment conducted by an oil company to develop an energy source for local populations: *Jatropha* trees are currently being planted and irrigated through a drip system.

Biofuel production and use is currently limited by:

- Insufficient water resources;
- Inadequate regulatory framework;
- Insufficient funding;
- Insufficient information.





Senegal

Senegal's marked interest in biofuel production arose out of a global situation with significant energy sector impacts that threaten oil-importing nations:

- Higher petroleum product prices;
- Supply disruptions that upset supply stability;
- Decreased energy security;
- Significant industrial development constraints and difficulties meeting household energy demands;
- Environmental degradation and increased greenhouse gas emissions.

Faced with these challenges, countries like Senegal have already begun implementing biofuel promotion programmes to partially meet electricity needs, support transport and reduce greenhouse gas emissions. Biofuel production initiatives are excellent platforms that contribute to the attainment of the Millennium Development Goals (MDG) and provide opportunities to cultivate new land, diversify crops and create jobs and steady incomes in rural areas which will, in turn, impact health and education. In addition, the partial substitution of imported petroleum products will lead to national investment and funding mobilization prospects through initiatives such as the MDG, carbon funds and bilateral and multilateral cooperation.

The objectives are to:

- Promote the production of renewable energies able to provide modern, clean, safe and cost-effective energy services;
- Reduce the dependency on traditional energy sources (charcoal and wood) and petroleum products;
- Increase the incomes of populations and strengthen the roles of women and economically-disadvantaged groups in the fight against poverty;
- Sustainably enhance soil productivity and support rural, peri-urban and urban agricultural activities.

Expected results include:

- *Jatropha curcas* seed production: 3,210,000 tonnes/year beginning in 2012;
- Sown areas of at least 321,000 ha in 2012 (1,000 ha per CR on average);
- Increased and diversified household incomes (women and economically-disadvantaged groups);
- Job creation and helping people to remain in their communities;
- Better materials and yields (seeds and oil) – more productive varieties and the determination and dissemination of better implementation methods;
- Populations that are familiar with better crop and plantation production, management and extraction techniques (oil and other derivatives).

Conclusion and perspectives

Biofuel production and use may constitute sustainable alternatives to oil. However, it is important to note that this alternative depends on farmers. Supportive agricultural research will play a significant role in ensuring the profitability and sustainability of the production phase and the preservation of biodiversity.

However, it is important to note that:

- In Africa, countries like Senegal made the brave decision to implement the *Jatropha* programme;
- The potential of bioenergy projects to reduce greenhouse gas emissions is proven;
- Biofuels could reduce oil bills;

- Direct and indirect employment will be created throughout the production line, including positions in the technical services and transport sectors;
- The success of the initiative will largely depend on farmers' reactions;
- Complimentary research will therefore be necessary to support farmers in order to ensure that they carry out their responsibilities.

Sudan

The Sudan is the largest country in Africa with a total area of 2.5 million square kilometres. It is bounded on the east by the Red Sea and is surrounded on the other sides by nine African nations. Its terrain is characteristically flat apart from the Imatong – Didinga mountain series in the south and the Red Sea Hills to the east that form an extension of the Ethiopian Highlands. Rainfall varies from zero mm/annum in the northern deserts to over 1500mm per annum towards the southern border of the country. The ecosystem classification and the vegetation distribution closely follow the isohyets that run across the country from west to east.

This diversity of ecological zones in Sudan permits further planting of multi-purpose tree species (e.g. *Jatropha*, *Moringa*, oil palms etc). Biomass energy is the main source of energy in Sudan. This dependency on biomass has exerted great pressure on forestry resources in particular and biodiversity in general. Sudan is recently experimenting biofuel production (ethanol production) from the agricultural residues (molasses from Kenana Sugar Factory). Biofuel is one of the option for relieving this pressure from forestry resources

The most important conclusions and recommendations:

Sudan has a potential for biofuel production, this will support rural development and alleviate poverty. Its sustainable production should be restrained to the degraded and waste lands which will not distress food security.

In the absence of land use map and legislation enforcement, implementation of conservational action and management plans, biodiversity in Sudan will continue to face various kinds of threats., Lack of clear policy for the conservation of the local genetic resources of plants and animals, capacities to conserve biodiversity are very limited, and lack of a national framework with legislative and institutional instruments on biodiversity issues characterize the work on biodiversity in Sudan.

More concern should be devoted to capacity building of the resources and creation of networks and linkages.

Research on biofuel in Sudan should be supported and more awareness should be directed to the public and policy makers on the importance of clean energy

Swaziland

Swaziland gets her energy supplies from biomass, electricity, coal and petroleum. However, Swaziland has no refining capacity hence imports all its fuel from South Africa. The current high crude oil prices the weak Lilingeni/Dollar exchange rate make it important for us as country to encourage biofuels industry to strengthen energy security, create employment, improve land utilization, support rural farmers and contribute towards the reduction of greenhouse gases.

Swaziland currently has no strategy relating to specifically biofuel production with regard to protection of biodiversity or environmental sustainability. However, there is a National Energy Policy (NEP), which calls upon the Government of Swaziland to investigate and promote the use of environmentally friendly fuels, energy and technologies.

As part of implementation of the NEP, the Government of Swaziland established a stakeholder group to facilitate the development of a biofuel sector which includes establishing an overall national strategy for biofuel production and use. By the end of 2008, a draft National Biofuel Development Strategy and Action Plan (NBDSAP) was produced. Gaps were identified and further consultancy was

engaged to carry out further consultation of stakeholders especially farmers. The draft NBDSAP highlights the need for a Biofuels Authority that will coordinate and regulate biofuel development in Swaziland.

The purpose of the strategy is to provide guidance to the Government of Swaziland and other stakeholders to develop and nurture a biofuel industry, exploiting the countries opportunities and overcoming key challenges.

The Government made it a policy to investigate the possibility of blending petrol with ethanol. Currently there is an ongoing petrol blending project and a flex- fuel car has been bought to study the effects of biofuels (blended petrol) and on greenhouse gas emission reduction. With regard to household energy, the promotion and development of fuel efficient stoves is underway.

Tanzania

In Tanzania, solid biofuel (wood fuels, agro/forestry residues) still account for 90% of total energy consumed, while modern commercial energy i.e. Petroleum, electricity, and others contribute 7%, 1.4% and 1.6% respectively. Also solid biofuels provide heat for most of rural industries such as pottery, crop processing, brick and lime burning, fish smoking and local beer brewing.

Tanzania has no specific policy on biofuels. However, some sectoral policies have statements on biofuels. These policies are:-

- *Forest policy (1998)* - Ensure sustainable supply and use of forest products including biofuel, firewood and charcoal through participation of key stakeholders in joint forest management.
- *Environmental policy (1997)*-Investment in biomass development vital for environmental protection and poverty alleviation.
- *Agriculture policy (1997)* - Promote sustainable food security, income generation, employment, and export enhancement through use of environmentally friendly practices and technologies.
- *Land policy (1997)* - Land belongs to the Government, users can lease for use for an agreed period of years.
- *Energy policy (2003)* - Promote efficient conversion and use of biofuel to reduce land degradation and deforestation and mitigate climate change.

Biofuel industry is still at the infancy stage, only about 650,000 hectares of land is allocated for biofuel production from potential 88 million hectares of arable land in Tanzania. Key actors include several government ministries and institutions, civil society organizations, village governments, private investors and development partners

Specific actors and developers on the ground are at various stages of developing and/or promoting biofuel, mostly foreign investors.

Following the increased interests and enquiries from local and international actors and investors on biofuel development, the Government established a national biofuel task force in 2006. Its function is to prepare an enabling environment for sustainable production and utilisation of biofuels in Tanzania.

As a way forward, key stakeholders will have to work together to come up with realistic and effective policies, regulations and strategies necessary for sustainable biofuel development in Tanzania. They also need to fully participate in the preparation and implementation of the national integrated biofuel development program.

Sustainable biofuel systems could contribute significantly to Tanzania future energy mix, enhance Tanzania's participation in the global energy business, bring about new investment and industries, ensure

increased employment and income generation and hence poverty reduction. Win-win situation is possible if biofuels initiatives are carefully designed to address and cater for core sustainability.

Togo

Electricity supply issues, the load shedding that they entail and skyrocketing oil prices have led most African countries to seek alternatives.

Despite funding from the Togolese Government, communities are highly impacted by the marked increases in oil prices. Solutions must be determined quickly, and, in light of high oil prices, the Togolese Government is assessing the biofuel alternative.

But biofuel production can also negatively impact biodiversity, lead to food shortages and even threaten sustainable development

Located on the western coast of Africa, with Ghana to the west, Benin to the east and Burkina Faso to the north, Togo covers a total area of 56,600 km². According to a 2006 study[2], there are 5,337,000 Togolese, and 60% of the population lives in rural communities.

Togo has little forest coverage (7%) and posts an average deforestation rate of 4%[3] (2000-2005).

Political framework

- National environment policy adopted in June 1997;
- National action plan for the environment adopted in 1991;
- National desertification control programme adopted in December 2001;
- National biological diversity preservation and sustainable use strategy developed in 2003;
- National biosafety framework developed in 2004;
- National strategy to implement the United Nations Framework Convention on Climate Change (UNFCCC).

Legal framework

- National ratification of the Convention on Biological Diversity in October 1995;
- Ratification of the UNFCCC in March 1995;
- Enactment of the Togolese environment framework act in May 2008;
- Implementation of the Togolese forest act in June 2008;
- Enactment of the Togolese biosafety act in December 2008.

Institutional framework

- Environment and forest resources department (*Ministère de l'Environnement et des Ressources Forestières*);
- Agriculture, livestock and fisheries department (*Ministère de l'Agriculture, de l'Elevage et de la Pêche*);
- Energy and mines department (*Ministère de l'Energie et des Mines*);
- Industry, crafts and technological innovations department (*Ministère de l'industrie, de l'artisanat et des innovations technologiques*);
- Department to promote commerce and the private sector (*Ministère du Commerce et de la Promotion du Secteur Privé*);
- Higher education and research department (*Ministère de l'Enseignement Supérieure et de la Recherche*).

[2] 2006 QUIBB survey
[3] FAO 2006

Togo has chosen to produce this alternative form of energy. The principle has been accepted but it is important to note that all of the actions undertaken to date remain at the identification, assessment and study phases. Initiatives include:

- July 2006: Ratification of a memorandum of understanding between the Togolese Government and the Togolese renewable energy corporation (*Société d'Energie Renouvelable Togolaise*) for the implementation of a bioenergy project (bioenergy from bagasse to produce bioelectricity and ethanol for export to northern nations;
- January 2008: Other projects (*Jatropha*, sorghum) determined by NGOs[4] in collaboration with partners to produce biofuel for bioelectricity in their communities:
  - Research into a community *Jatropha* system project;[5]
  - Test planting of *Jatropha* using Indian seeds.

However, the development of the biofuel sector could:

- Lead to forest clearing;
- Impact biodiversity;
- Accelerate deforestation;
- Increase the pressures on arable land;
- Impact food safety, which is already precarious;
- Impact climate change.

Tunisia

In light of global warming and the impacts of high oil prices and fossil fuel scarcity on global economic cycles, experts and scientists are turning towards biofuel production as an energy alternative.

From a strategic perspective, Tunisia, which has developed a voluntary energy and treated sewage reuse policy for different sectors, is also seeking to take part in this shift.

However, given the nation's limited area of arable land and lack of water resources, biofuel development requires preliminary studies to assess its economic, social and environmental impacts and determine the optimal conditions under which biofuel production could be implemented in Tunisia.

In 2008, the country therefore began a series of technical and economic feasibility studies.

Results indicated the possibility of extracting ethanol from sugar beets. *Jatropha* and castorbean oil extraction on degraded lands could be carried out as part of regional or local projects, as long as these initiatives do not have any direct or indirect impacts on food production.

Studies on the *Jatropha* plant also revealed that of the 4,200,000 ha of arable land in the nine governorates that were assessed, 1,850,000 ha are ranges – 686,000 ha of which could be used to grow *Jatropha*. However, current treated sewage irrigation infrastructure would only meet the needs of 12,966 ha.

In Tunisia, the development of the biofuel sector should be undertaken as part of public-private partnerships. Cost sharing between sector stakeholders should be based on expected win-win benefits sharing. For optimal cost-effectiveness, the sector should be limited to the reclamation of *Jatropha* oil. Also, 50% of the oil extracted from *Jatropha* and its derivatives should be sold on the local market, taking the CDM contribution into account.

It is important to note that the gains would only be significant and cost effective for Tunisia if oil prices are at $130/barrel.

[4] Association Maison Rurale d'Education et d'Action de Développement (ASMERADE TOGO)

[5] Community in a forest area

Specific research programmes to fully understand how *Jatropha* behaves in Tunisian soil must be implemented to enhance growing conditions. Whenever possible, these programmes should be part of regional and/or international cooperation projects in partnership with the private sector.

Zambia

Zambia is located in Sub-Saharan Africa between latitudes 8 and 18 degrees south of the Equator and longitudes 22 and 34 degrees east of the Greenwich Meridian. With a mean altitude of 1200 meters above sea level, the country has a total area of 752,614 square kilometres. It is landlocked and surrounded by eight neighbouring countries; namely Botswana, Namibia and Zimbabwe in the south, Mozambique to the southeast, Malawi in the east, Democratic Republic of Congo (former Zaire) and Tanzania in the north as well as Angola in the west.

The country enjoys a sub-tropical climate characterized by three distinct seasons; a cool dry season lasting from May to August, a hot dry season between September and November and a warm wet season between December and April. The average annual temperatures are between 18 and 20 degrees Celsius with the highest annual mean temperature of 32 degrees and the lowest temperature averaging 4 degrees Celsius. The annual rainfall decreases from an average of 1000 mm or more in the northern parts (including Copperbelt) to an average of 600 mm in the southern parts.

Zambia is richly endowed with a wide range of indigenous energy sources, particularly woodlands and forests, hydropower, coal and renewable sources of energy.

- **Woodfuel -** estimated to cover about 50 million hectares or 66 percent of Zambia's total land area. In 2004, woodfuel accounted for over 70% of total national energy consumption;
- **Bio fuels -** The utilisation of biofuels has now been recognised in Zambia as an effective way of fulfilling the country's energy requirements considering the disruptions in petroleum supply which are being experienced on the international market;
- **Gel fuel** - is an energy source that is made from sugar molasses. The Government desire is to promote the gel fuel as an alternative to woodfuel use which has negative impact in the environment.
- **Electricity** - is the second most important energy source after woodfuel contributing 10% to the national energy supply;
- **Petroleum -** Zambia imports all its petroleum requirements which contribute 9% to the national energy demand. Petroleum is a key input in the Mining and Transport sectors on which trade and commerce depend;
- **Coal -** Proven coal deposits are estimated to be over 30 million tonnes; and
- Other sources of energy include **Solar, Briquettes and biogas,**

The Draft National Energy Policy of 2007 sets out the Government's intentions in the energy sector that are aimed at ensuring that the sector's latent potential to drive economic growth and reduce poverty is fully harnessed. It also recognises the potential of utilising biofuels as an effective way of fulfilling the country's energy requirements considering the disruptions in petroleum supply which are being experienced on the international market.

The National Policy on Environment (NPE) of 2007 promotes the development of renewable energy sources and the possibility of using biofuels to reduce dependency on non-renewable resources

The Fifth National Development Plan for 2006-2010 advocates for development and provision of alternative energy sources to wood fuel for household energy requirements.

It is estimated that the net result of these efforts is an achievement of an annual saving in wood of about 10 percent of total wood consumption, which is equivalent to 400,000 tons per annum.

The National Energy Policy of 2007 provides for the following;

Environmental impact assessment

- EIA should be a requirement for all major biofuels projects
- In addition, existing biofuels ventures should undergo EIA
- No further land should be allocated or expanded until impacts of biofuels (*Jatropha*) and other alien species on the environment are established beyond doubt.
- Production and Use of Biofuels should be done under the correct environmental management.

Research on biofuels

- Support research and development into all new/alien species of energy crops and their cultivation cycles/process before being widely promoted to establish any negative impacts on the environment;
- Promote research to determine which type/species of energy crops would give the best quality and yield of biofuels;
- Provide funds and support research and development of breeding, testing and agronomy of plants suitable for biofuels; and,
- Stimulating research and development into the innovation and appropriate local technology for the extraction and processing of Biofuels

Standards for biofuels production

- Provision of standards for energy crops, biofuels quality and blending ratios;
- Biofuels Standards should be developed in line with the provisions of the Energy Regulation Board Act; and
- Plant material for Biofuels, should be registered under the Ministry of Agricultural and Cooperatives.

Incentives for biofuels production

- The energy policy also provides for provision of Biofuels incentives in line with Acts such as the Zambia Development Agency (ZDA) Act and any other relevant Legal instruments; and ;
- Tailor made incentives for Biofuels should be introduced if ZDA Act is not adequate,

In conclusion, Zambia's economy depends on energy sector that drives all development processes of the country. The energy sector in Zambia will continue to play an important part in the development process. It is therefore important that the policy framework in this sector is always responsive to the ever increasing challenges not only in this sector but the economy as a whole.

Annex II

DRAFT CONCEPTUAL FRAMEWORKS FOR WAYS AND MEANS TO MINIMIZE THE NEGATIVE AND MAXIMIZE THE POSITIVE IMPACT OF BIOFUEL PRODUCTION AND USE ON BIODIVERSITY

Recognizing the role of the Convention on Biological Diversity with regard to the biodiversity-related aspects of the production and use of biofuels; also recognizing that some of the tools outlined in the table below[6] are the responsibility of national Governments with the assistance of international cooperation, while other tools are already being developed by other relevant international organizations and initiatives; the participants:

(a) Emphasized the importance of framing the discussion on biofuels within the context of sustainable development and its three pillars;

(b) Recognized the potential contribution of biofuels for the achievement of sustainable development, for energy security, carbon sequestration, to halt deforestation and desertification, rural development and the achievement of the Millennium Development Goals;

(c) Also recognized the potential conflicting role of biofuel production and food security and in this context noted the concerns by national Governments that biofuel production should not further exacerbate the problem of food security;

(d) Highlighted the need to convey a developing country perspective to the discussion;

(e) Noted the need to avoid generalizations when assessing the potential impacts of biofuel production and use by case-by-case assessments that take into account regional, national, or sub-national circumstances;

(f) Noted the potential for regional cooperation among African countries and other regional groupings and international cooperation towards the sustainable production and use of biofuels;

(g) Noted the different stages of development within the region with regards to biofuels production and use;

(h) Recognized the need to include biofuels concerns in national biodiversity strategies and action plans (NBSAPs) and national development plans;

(i) Emphasized the need for human and institutional capacity-building at national level for sustainable production and use of biofuels;

(j) Recognized the need to integrate the Roundtable on Sustainable Biofuels (RSB) principles version one in all biofuels regulatory frameworks (http://cgse.epfl.ch/page84341.html);

(k) Noted the need to elaborate an appropriate legal and regulatory framework for the sustainable production and use of biofuels; and

(l) Emphasized the importance of applied research on biofuel production and sustainability.

[6] The meeting divided into three working groups to consider the draft framework, including its preamble, produced from the regional workshop for Latin America-Caribbean (Annex II of document RW-SPU-BIO-01-03). The outcomes from each working group were approved in plenary and were put together into one table.

Sustainability Pillar	Approach	Tools	Means/Methodology/Needs for implementation
Environmental pillar	Environmentally sensitive planning and assessment	Environmental Impact Assessment Strategic Environmental Assessment Area definitions/zoning (mapping), agricultural maps Land policy National environmental and agricultural policy Feasibility studies Plants for carbon sequestration National strategies for biofuel production (e.g. Mozambique's experience) Biodiversity-inclusive SEA guidelines (VIII/28) (Sudan, Egypt and Zambia presentations) Brazil and Colombia presentations (Annex I to document UNEP/CBD/RW-SPU-BIO/1/3), report from the United Kingdom	Utilize the national EIA procedures available at country level Application of Guidelines of the International Association for Impact Assessment (IAIA) and the CBD (decision VIII/28) Utilization of national geological and land use maps for zoning Utilization of AfriCover 2003 land cover map and classification Promotion of public participation Examination of land use suitability Utilization of treated sewage water for irrigation Utilization of household and agricultural waste as feedstock Development of a land settlement plan Capacity building of main stakeholders Provision of international or bilateral financial assistance
	Technical environmental standards (national) for biofuels 1. technical specification for biofuel (e.g Ghana's experience) 2. certification of biofuel production (e.g Ghana's experience)	National legislation regarding permitted uses in ecosystems Public policies and legislation Voluntary certification schemes for international standards that respect food security Obligatory certification schemes for national standards	Establishment of national technical specification standards for the production of biofuels Updating and incorporation of biofuels in public policies and legislation Issuance of permits for biofuel production based on legislation on permitted uses in ecosystems Awareness raising and dissemination of existing regulations
Economic Pillar	Development of national, regional and international market for sustainable biofuels	Value addition guidelines to promote market access in the national, regional and international arena Feasibility studies for biofuel production Policies to promote	Signing of Memorandum of Understanding (MOUs) Establishment of frameworks for consultations Promotion and facilitation of local transformation of biofuels into finished production before exportation

Sustainability Pillar	Approach	Tools	Means/Methodology/Needs for implementation
		international market access for developing countries Crops adapted to producing countries Case-by-case consideration concerning natural ecosystems in producer countries Capacity development and technology transfer to developing countries including SIDS, to participate in the international market for biofuels South-South and triangular cooperation for sharing experiences Trade agreements [7]	Application of cost-benefit analysis Conduct of capacity needs assessment Incorporation of biofuel issues into international trade related policies Enforcement of policies and laws to prohibit the use of fertile lands, water resources, forest areas for biofuel production Development of adequate human and institutional capacity on technicalities and negotiation skills Signing and strengthening of bilateral and multilateral agreements between Africa and South America
	Energy security	Update NBSAPs to include biofuels considerations National evaluation of energy resources Renewable energy sources Energy-producing plant byproducts Other sources of biofuels such as biogas and biomass (e.g. Cameroon's experience) Low cost hybrid technologies to encourage the use of biodiesel at local level (e.g. Ghana's experience)	Review and update of NBSAPs to include biofuels Capacity building on sustainable biofuels Provision of financial assistance to develop capacities for the production of sustainable biofuels Access to Clean Development Mechanism (CDM) funds
	Positive incentives	CBD decision and guidance (minimize effects on livelihoods in third countries) Tax free transfer of technologies	Review (and adaptation) of CBD decisions and guidelines with regard to the provision of incentives for sustainable local biofuel production Introduction of special pricing regime for biofuel

[7] For example, Caribbean Basin Initiative (CBI), Commission de l'Océan Indien (COI), Economic Community of West African States (ECOWAS), l'Union du Maghreb Arabe (UMA), Southern African Development Community (SADC), Union Economique et Monétaire Ouest Africaine (UEMOA), Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC), Communauté des États sahélo-sahariens (CEN-SAD), African Union, Common Market for Eastern and Southern Africa (COMESA), Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS).

Sustainability Pillar	Approach	Tools	Means/Methodology/Needs for implementation
		Involvement of vulnerable groups	Creation/promotion of income-generating activities Provision of microcredit Provision of training
Social Pillar	Food security	Agricultural policies to harmonize production of biofuels and foodstuff, including the utilization of other foodstuff Plants that are non-competitive to food plants	Elaboration of inventories of local species and research on plants that are non-competitive to food plants Intercropping to produce foodstuff for local consumption Enactment and enforcement of laws and (or guidelines) for the production of feedstock for biofuels by producers and foodstuff for local consumption Enactment of law/regulation on limits on land size for biofuel production Establishment of foodstuff observatory Support to producers of improved seeds Promotion of applied research on indigenous and traditional knowledge Provision of subsidies to networks in charge of food production Implementation of basic infrastructure for agricultural production (storage shop, packaging, isolation, irrigation system)
	Equity Benefits to small-scale farmers and poor/vulnerable populations Job creation Dignification of work (`decent jobs`)	Strengthen technology transfer to promote sustainability (species choice, etc.) increase productivity (ensure food production), including access to small machinery for small producers Public policies creating decent jobs, training and income for local communities and promoting social justice (both private sector and legislation) Voluntary mechanisms in production sector to promote strategic partnerships (e.g. between small and large producers) Site production facilities nearer to rural areas Programmes to respond to	Updating and review of existing legislation and policies (e.g. presentation of Malawi; prevent child labour) Review and updating of existing agricultural policies to include biofuel (e.g. encourage the use of agricultural by-products) Organization of farmers into cooperative societies Building of human and institutional capacity Integration and harmonization of ideas from the different stakeholders Sponsorship of programmes for social responsibility Creation of economic incentives (e.g. credit schemes) Capacity building, organization of workshops and training sessions at national, sub-regional and regional level

Sustainability Pillar	Approach	Tools	Means/Methodology/Needs for implementation
		displacement of labour and local population through mechanization according to national and regional circumstances Sponsorship of programmes for social responsibility	Scanning for technology and identification of country relevant technologies for adaptation for biofuel production Establishment of guideline for equitable distribution of revenue Promotion of gender equity Conduct of social and economic impact assessment Professionalization of agricultural professions Exoneration of the equipment of any tax Involvement of NGOs and agricultural groups Implementation of a coordination and regulatory framework Promotion/provision of income-generating activities Provision of training Provision of agricultural credit/farm credit Promotion of/support to NGOs, women associations, local management structures and public bids
	Land security	Strengthening land management Land register Tenant farming contracts Rural land plans	Review and updating of land tenure policies to include biofuel Adaptation and application of regulatory texts regarding land Strengthening of structures in charge of rural land
Crosscutting issues	International and regional cooperation	Bilateral and trilateral cooperation, relevant international organizations and initiatives, including FAO, GBEP, CBD, etc[8].	Signing of relevant MOUs, treaties, agreements, conventions Organization of exchange programmes Development of human and institutional capacity

[8] e.g. Caribbean Basin Initiative (CBI), Commission de l'Océan Indien (COI), Economic Community Of West African States (ECOWAS), l'Union du Maghreb Arabe (UMA), Southern African Development Community (SADC), Union Economique et Monétaire Ouest Africaine (UEMOA), Communauté Economique et Monétaire de l'Afrique Centrale (CEMAC), Communauté des États sahélo-sahariens (CEN-SAD), Union Africaine (UA), Common Market for Eastern and Southern Africa (COMESA), Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS)

Sustainability Pillar	Approach	Tools	Means/Methodology/Needs for implementation
	Access to information and information dissemination	Regional networks for the exchange of information, taking into account existing initiatives Documentation and dissemination of national experiences, including through the CHM and other means	Organization of international workshops, seminars to share experiences Creation of a regional or sub-regional database, accessible to all Utilization of the existing Clearing House Mechanism (e.g. CBD) to store information related to biofuels Establishment and strengthening of centres of excellence Publication of scientific research documents Utilization of media to create awareness and training of journalists for information dissemination Establishment of consultation framework Promotion of public awareness Establishment of website
	Legal framework and public policies	Exchange of experiences on national legal frameworks and public policies Communication strategies to promote public participation and awareness-raising	Regional harmonization of regulatory texts Evaluation and adaptation of existing texts based on current context Elaboration of a communication document
	Best practices, including best practices for other agricultural commodities	Research on best practices. Application of best practices through increase of productivity and sustainability for biofuel production systems for biodiversity conservation	Establishment of a fund for research, institutional collaboration and networking Documentation and dissemination of best practices Exploration of case studies and researches on best practices Promotion of applied research Promotion of best cultural techniques Reinforcement of management structures Prioritization of agroforestry practices
	Institutional capacity building	Identification of capacity needs Integrated and interdisciplinary approach	Review of National Capacity Self Assessment (NCSA) to incorporate biofuel issues Organization of national stakeholders' consultations Organization of awareness raising workshops Provision of training and equipment Provision of financial assistance

Sustainability Pillar	Approach	Tools	Means/Methodology/Needs for implementation
			Establishment of National Committees for Sustainable Development Access to trust funds (GEF, UNEP UNDP, ADB)
	Sustainability assessments	Recommendations generated through initiatives seeking to create indicators for sustainable biofuels Life cycle analysis, taking into account regional/local circumstances, and use of feedstock	Application of existing sustainable indicators suitable for sustainable biofuel production Adaptation of already existing indigenous capacity to undertake life cycle analysis National capacity building Establishment of monitoring systems Strengthening of national and regional research laboratories Promotion of applied research
	Technology transfer and identification of common research needs	Traditional plant breeding and genetic improvement to achieve higher productivity and sustainability of production systems Adoption of cleaner technologies Exchange of information and research cooperation to strengthen the national development of research for the production of second-generation biofuels	Documentation and dissemination of traditional practices on plant breeding and genetic improvement Provision of certification for cleaner technology Access to funding and incentives from Clean Development Mechanism Establishment of research network for research information Promotion of research into the second generation biofuel production National capacity building Promotion of applied research Provision of training Provision of financial assistance Development of exchanges of experiences at the regional level Creation of consultation framework

Annex III

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