

**Africa Energy Unit (AFTEG)**  
**Africa Environment and Agriculture Unit (AFTS2)**  
**AFR - World Bank**

**DRAFT Terms of Reference**

**“ASSESSMENT OF THE FEASIBILITY TO LOCALLY PRODUCE AND MARKET  
MODERN BIOFUELS (ETHANOL AND BIODIESEL) IN MOZAMBIQUE**

**I. Background**

Annual consumption of petroleum fuels in Mozambique amounts to more than 1.5 million tonnes, equivalent to 15% of total final energy consumption. Diesel oil, kerosene and gasoline respectively represent 55 percent, 25%, and 20%. The transport sector accounts for more than 60% of the consumption of petroleum products, households 20% (kerosene and LPG) and industry 20%. In 1999/2000 petroleum imports were estimated to cost US\$1.5 billion and to represent 15% of total imports and 20% of export earnings. Estimates indicate that costs for 2004 should have surpassed US\$2.5 billion (constant prices) and represented more than 25% of total imports and 30% of export earnings. Given current and expected oil price trends and volatility, the gradual substitution of imported petroleum fuels and a diversification of energy supply source is rapidly gaining macroeconomic importance for Mozambique.

The household sector represents an estimated 40% of total national energy consumption. Woodfuel account for 30% of that total, of which fuelwood represents 20% and charcoal the remainder 10%. It is estimated that close to 80% of woodfuels are currently commercially transacted at prices ranging from \$0.10 to \$0.20 per kilogram of wood, and between \$0.10 and \$0.20 per kilogram of charcoal. Accounting for end-use energy efficiencies, cooking with woodfuels is less/more expensive than cooking with Kerosene and LPG. The theoretical reference market price for ethanol produced in Mozambique is of \$0.20 per liter (based on adjusted production costs from Zimbabwe, South Africa and Ethiopia). Given that theoretical reference market price, cooking with ethanol in Mozambique would be less/more expensive than cooking with fuelwood and/or charcoal if it were readily available in the local markets. Ethanol would constitute, however, a modern and clean cooking fuel, and has 19% less carbon emissions than LPG, 35% less than kerosene and between 100% and 250% less than woodfuels, depending on their methods of use.

Biomass resources such as wood, agricultural crops and residues can be converted into biofuels such as ethanol, methanol, biodiesel and bio-fuel oil. **Ethanol and bio-diesel** are of immediate potential in and relevance to Mozambique. Commercially available and transferable technologies exist for the production of ethanol (all scales) and bio-diesel (small/medium scale).

Mozambique has had some experience with the commercial production of ethanol at the Agro-Buzi complex, which included a sugar cane-based 3 million liter/year distillery.

That experience, however, was rather short-lived when the Agro-buzi complex was shut-down at the beginning of the "national liberation war" in the 80's. During the late 90's a couple of studies were undertaken by a South African Group (Tecnosult, co-owner of Agro-Buzi) to review the possibility to rehabilitate the Agro-Buzi complex and distillery, but nothing concrete was done on the distillery side. Over the last few years the Government of Mozambique (GoM) has been investing in the rehabilitation of the Agro-Buzi complex, but the ethanol facility remains out of operation.

In addition to the possibility to produce modern biofuels, agro-energy systems -- specially ethanol -- are nowadays combined with sugar production, baggasse co-generation and the production of other bi-products (fertilizers, yeast, CO<sub>2</sub>, etc.) for maximum economic efficiency and viability. While Mozambique has abundant hydroelectric resources and natural gas reserves, the possibility to produce incremental volumes of electricity from co-generation and use that either to boost decentralized rural electrification or to enable higher hydro power exports should be considered. In fact, the modular nature of biomass power generation systems could be highly advantageous in long-term energy planning. Unlike larger thermal power plants, capacity can be added in relatively small increments closely matching demand load trends, thereby minimizing risk and reducing capital investment requirements. Due to the dispersed location of the marginal generation capacity, grid reliability may also be strengthened. Decentralized ethanol and co-generation systems could further contribute towards increasing access to modern energy services to the rural poor.

The production of biofuels and "green power" in Mozambique should also be considered from the point of view of their potential **poverty alleviation** and environmental impacts, such as sustainable rural employment and income generation, ecosystem rehabilitation and climate change mitigation (carbon sinks and net Co<sub>2</sub> abatement).

Include a paragraph defining the possible types of biofuels and a paragraph on the common potential uses

### **Moving Forward**

While modern biomass energy offers a large suite of energy, economic and developmental "opportunities", it can also result in significant negative impacts if the establishment and/or expansion of bioenergy systems is not well thought through. In the specific case of biofuels in Mozambique, an essential step in the development of a viable and robust industry is the elaboration of a sound Sectoral Strategy and of a comprehensive Policy and Regulatory Framework which together: *(i)* orient the technical and operational evolution of the industry; *(ii)* lay-out the roles for the public and private sectors; *(iii)* create an enabling environment for capital mobilization; and *(iv)* set the appropriate social and environmental guidelines and safeguards for the operation of the sector. Given the considerable public and private interest that appears to exist in Mozambique for the establishment of a modern biofuels industry, it is imperative that such does not happen in the absence of a coherent strategy and policy framework. The Government wishes to establish such a framework before an industry develops in an *ad hoc* manner.

## **II. Objectives of the Assignment**

The proposed consultant assignment will be divided in two main consecutive phases. These phases and their respective objectives are:

- **Phase I:** evaluate the technical, economic, social and environmental feasibility to produce and market biofuels (ethanol, ETBE and biodiesel) in Mozambique as alternative renewable fuels for the transport, industry, power generation and/or household sectors and for exports; and
- **Phase II:** design a Draft “National Ethanol Program and Development/Implementation Strategy”, elaborate a “Policy and Regulatory Framework” for the development of a sound biofuels sector in Mozambique, and design a National Biofuels Implementation Program. It should also include the definition of a Program for Capacity Building and Technological Transference, in terms of agricultural and industrial production and logistics.

The output from these two phases will serve as: (i) the basis for comprehensive multi-stakeholder national policy discussions on biofuels; (ii) the basis for elaborating and enacting a national biofuels policy framework; and (iii) a core input for further energy, agriculture, macroeconomics, commerce, trade, social, rural development and environmental policy development.

### **III. Tasks to be performed by the Consultant Under Phase I**

The Consultant will provide information on the overall context for the use of biomass-derived ethanol, ETBE and Biodiesel as a fuel for transportation in Mozambique. This overview will embrace a supply-chain approach, including the institutional environment analysis. After a brief introduction about social and economic aspects of Mozambique, the main tasks of the Consultant will be the following: an overview of the agricultural sector followed by an assessment of potential feedstocks for the production of biofuels (Task # 1). Task #2 will present an analysis of the biofuels' industry sector. Task # 3 will focus on the potential uses and markets for biofuels. Under this task, the Consultant is expected to establish several biofuels production/end-use scenarios, including the utilization of biofuels in transports, power generation, households, agriculture and other relevant economic activities/sectors. Task # 4 will present the institutional and legal environment, describing current policies for agriculture, industry and energy sectors. Finally, Task 5 will present some recommendations and an assessment of Economic, Social and Environmental Sustainability aspects.

After completion of Tasks # 1-5 the Consultant will prepare and submit to the World Bank a written report with the main findings and outcomes of Phase I of the assignment.

#### **Introduction:**

- On this introduction, the Consultant will describe the area, geography and administrative organization of Mozambique. Facts and analyses will be presented

regarding the main economic indicators, such as GDP and GDP per capita, income distribution, overall and sectorial rates of growth, etc.

### **Task # 1: The agricultural Sector (Biofuel feedstocks)**

**With regards to the Agricultural sector and issues the Consultant will:**

- Present an overview on the agricultural sector, including survey land tenure and utilization patterns and distribution over the national territory and administrative divisions. Amount and distribution of rainfall will be noted. The distribution between cultivated areas (with an indication of extent of irrigated land and perennial crop cultivated area), forest cover, permanent pastures, marginal and non-arable land will be shown. The size distribution of farms will be established and the population employed in farming estimated. Agriculture's share of GDP and future trends will be presented. Major crops for subsistence and cash markets, including exports will be identified and mapped Major agribusiness activity will be described and mapped.
- Population demographics in the rural areas and the features of the labor force will be characterized, including employment and job creation.
- The role of trade and the situation of the balance of payments in Mozambique's agricultural sector will be described, including the Mozambique's membership in regional or international trade agreements, identifying either opportunities or barriers for the agricultural products.

**With regards to the specific production of biofuels feedstocks the Consultant will:**

- Survey and analyze raw materials for ethanol, ETBE and biodiesel production, considering both commercially established and experimental crops. Given the expectation that traditional food crops such as maize, sugarcane and rice might be too demanding on good lands, inputs and water so as to render them non-competitive feed-stocks for producing biofuels, special attention will be dedicated to less demanding crops known or crops new to Mozambique, such as sweet sorghum, grain sorghum, cassava, tropical sugar beets, jatropha, etc. For each candidate feed-stock and where applicable, the following items will be assessed:
  - crop location in the country, area (hectares), access to irrigation and level of rain fall and crop cycle;
  - prices obtained for the crop and/or its products;
  - crop financing, integration, intermediation, benefit sharing ratios between growers and processors, marketing and distribution channels;
  - agricultural extension services and crop research;
  - crop production economics and opportunities to reduce costs;
  - domestic and external markets;
- In the case of new/experimental crops (i.e., sweet sorghum, tropical sugar beets, jatropha, etc.), assess both Mozambican and international information on crop experimentation and future prospects. Agricultural production costs will be estimated for these new feedstocks.

- Identify and discuss any possible significant impact on food security in Mozambique as a result of the scaling-up of existing biofuels feedstock crops (i.e., sugar cane, cassava, etc.) and/or the introduction of new biofuels feedstock crops in Mozambique.
- Estimate the employment generation effects of the scaling-up of existing biofuels feedstock crops (i.e., sugar cane, etc.) and/or the introduction of new biofuels feedstock crops in Mozambique, and will estimate its economic and social impacts.
- Identify and discuss any significant negative or positive impact in terms of land tenure, competition for land, disruption of food and non-food agricultural markets, etc., which could/would potentially result from the scaling-up of existing biofuels feedstock crops (i.e., sugar cane, etc.) and/or the introduction of new biofuels feedstock crops in Mozambique. Identify and discuss, for each negative impact case, possible mitigation strategies including policy, regulatory, legal, institutional, or other required measures.
- Identify and evaluate any significant social and environmental impacts/issues expected to result from the scaling-up of existing biofuels feedstock crops (i.e., sugar cane, etc.) and/or the introduction of new biofuels feedstock crops in Mozambique. Identifying and discussing, for each negative impact case, possible mitigation strategies including policy, regulatory, legal, institutional, or other required measures.

## **Task # 2: Assessment of the Potential Production of Biofuels (Industry and Supply Assessment)**

The Consultant will assess the potential to establish a supply of biofuels in Mozambique paying particular attention to the following issues:

- Assessment of existing installed capacity -- if any -- for ethanol, ETBE and biodiesel making in Mozambique. The installed capacity of distilleries and or biodiesel refineries will be described by unit and location, specifying raw materials, the volumes and types of ethanol made, the estimated costs of production, the markets served and selling prices.
- Ethanol imports and exports volumes and prices by ethanol types and applicable tariffs and other applicable taxes should be surveyed.
- Biofuels-related research capabilities and ongoing research activities in companies, universities and government laboratories will be identified and described.
- Given the potential demand for biofuels from the various economic sectors/activities, several scenarios of small and large ethanol distilleries and biodiesel refineries to meet those demands will be developed. For each scale, small and large distillery, a select number of feedstocks will be considered such as sugarcane (as juice), molasses (and high test molasses), sweet sorghum, cassava and tropical beets.
- Currently used technologies such as in Brazil and India (ethanol) and Germany and Brazil (biodiesel) and other relevant countries will be the basis for an economic evaluation of the feasibility of producing biofuels from the various feedstocks. In situations where there is no practical biofuels production experience in Mozambique, such as in the case of cassava, sweet sorghum, tropical beets and

jatropha, estimates will be developed on the basis of existing information from elsewhere. The fuel source for these ethanol distilleries and biodiesel refineries under analysis would vary to include bagasse, natural gas, fuel oil or wood residues. For small distilleries/refineries, the electricity may be purchased from the grid.

- Process flow sheets will be developed for the various combinations of capacity, feedstock and process fuel. The processing of stillage -- in the case of ethanol -- and of all other significant process wastes will be shown in these flow sheets.
- The financial feasibility analysis will be carried out on the basis of reference cases for large and small-scale distilleries, feedstocks and process fuel options. Sensitivity analysis with respect to fixed investment, feedstock cost and ethanol yields will be performed to test the feasibility against these parameters. Furthermore, the Consultant will analyze for each feedstock and biofuels producing process, the types and amounts of by-products and "wastes" generated, their costs and potential markets and prices.
- The economics of large and small scale ethanol and biodiesel production in Mozambique will then be assessed based on discounted cash flow analysis and expressed in terms of internal rates of return – IRR. These will be tabulated to show results for large and small capacity:
  - feedstock
  - fixed investment
  - operating campaign duration
  - feed-stock price
  - biofuel production yields
  - process fuel options
  - by-products and "wastes"
  - IRR

### **Task # 3: Assessment of the Potential Markets and End-uses for Biofuels (Demand Assessment)**

The Consultant will identify and quantify, for each of the major consumption sectors (transports, household, industry, agriculture, etc.) the possible inter-fuel substitution opportunities for ethanol, ETBE and/or biodiesel, paying particular attention to:

#### **Transport Sector**

- Fuel ethanol markets for use in the transport sector will be essentially estimated on the basis of projections of gasoline demand over the next 10 years and assumptions about blend level, say 5%, 10% and 20%.
- A specific analysis of current practice for displacement of lead in the gasoline will be undertaken and a discussion of the economic, social and environmental costs and benefits of the current practice vis-à-vis gasoline oxygenation with ethanol will be undertaken. Additionally, the volume of ethanol required to convert ethanol into ETBE for blending with gasoline in lieu of MTBE over the next 10 years will be estimated on the basis of MTBE substitution levels.

- The consultant should also consider the prospect of exporting ethanol, ETBE and/or biodiesel to regional (SADC) and international markets (i.e., EU, South and North America, Asia, etc.).
- biodiesel markets for use in the transport sector will be essentially estimated on the basis of projections of diesel demand over the next 10 years and assumptions about blend level, say 5%, 10% and 20%. Transport costs and infrastructure requirements, if any, will also be considered.

### Household Sector

- A comparative analysis of the cost of cooking, lighting and space heating in the household sector with conventional fuels (woodfuels, LPG and kerosene) and biofuels and their corresponding climate change and “in-door” pollution impacts will be undertaken. On the basis of that assessment, potential demand for biofuels in the household sector (urban and rural) will be estimated. Additional costs associated with logistics of distribution will be considered.
- Identification and discussion of the end-use equipment required to introduce/support the use of ethanol for household cooking, lighting and space heating applications, with emphasis on how that would be financed and the practical mechanism for its implementation and quality control.

### Other Sectors

- The Consultant will identify and evaluate the potential market demand for biofuels in other economic activities/sector, identifying the specific applications for which the biofuels could be used, the corresponding end-use technologies that would be required, and all major opportunities and/or barriers for implementation.
- In particular, the potential demand for ethanol and/or biodiesel (and Direct Vegetable Oil) for rural alternative transport/mobility solutions and other energy service delivery applications (water pumping, irrigation, crop grinding, etc.) should be specifically assessed and quantified. This potential demand would be serviced through small scale community-based appropriate technology production means and strategies.

### End-Use Technologies Issues

- The Consultant will identify and evaluate the changes and/or modifications needed in end-use technologies (transportation vehicles, power generation equipment, household appliances, etc.) in the main economic sectors considered as a result of the introduction of biofuels in Mozambique. This analysis will include technological aspects, costs and any other relevant factors.

## **Task # 4: Energy Sector Overview**

- The Consultant will review and analyze the structure and function of the Mozambican energy sector. The country's National Energy Balance<sup>1</sup> (for the latest year for which data is available) will be included in the analysis. Major past, present and future trends in energy production, imports and exports and consumption will be identified and discussed.
- The Consultant will identify and discuss the main energy policies, legislation and regulations affecting the energy markets in Mozambique, with special reference to liquid fuels.
- The Consultant will analyze pricing of gasoline, diesel, kerosene and LPG in Mozambique. Both economic and financial prices will be considered. The consultant will assess the likely pricing of ethanol and/or biodiesel as a substitute for these fuels and indicate whether subsidies would be required to maintain current market prices.
- The Consultant will analyze the supply trends for petroleum-based fuels and their demand trends in the main economic sectors (transports, industry, power generation, households, agriculture, etc.). The gasoline, diesel, LPG and kerosene markets and trends will be analyzed in detail to identify opportunities and barriers to the introduction of biofuels (ethanol, ETBE and biodiesel).
- The Consultant will in particular analyze the household energy sector, will identify the current range of typical energy services/uses and the corresponding end-use technologies being used, and will assess the opportunities and barriers for interfuel substitution of woodfuels, kerosene and LPG with modern biofuels in cooking, lighting and heating applications.
- The consultant will identify and evaluate the need for modifications in current practices and standards applied for liquid fuel distribution and storage in Mozambique with the introduction of gasolines or diesel containing ethanol and/or ETBE.
- The Consultant will estimate a measure of energy self-sufficiency for Mozambique. That measure will be defined as the ratio of the total value of energy production divided by the total value of consumption of energy, both measured in constant currency.
- The consultant will identify and analyze the set legal, regulatory and institutional issues which would/could affect the market penetration of fuel ethanol, ETBE and biodiesel in Mozambique.
- The consultant will end the analysis of the energy sector with an assessment of the major "energy challenges" facing Mozambique and highlight possible courses of action to overcome them.

## **Task # 5: Recommendations and Assessment of Economic, Social and Environmental Sustainability**

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<sup>1</sup> The National Energy Balance is defined as the conventional matrix of energy sources (fossil; geothermal; hydro; biomass and residues) and end-use sectors (exports, transportation; industrial, agricultural and mining; residential, commercial, public and others; non-energy uses and losses).



The consultant will identify the main economic, social and environmental sustainability issues and opportunities connected with the potential biofuel systems, comprising the production chains and transportation, storage and end-use. Within this Task the Consultant will pay special attention to the following issues:

- An analysis of the scenarios against different sustainability criteria will be developed. i.e:
  - **economic** (foreign exchange; economic indifference prices of sugar, molasses and other feedstocks and by-products; ethanol versus naphtha; biodiesel vs diesel; longer term scenarios; distortions of agricultural markets);
  - **energy** (energy priorities; energy independence; regional energy integration);
  - **institutional** (institutional capacity, science and technology)
  - **legal** (policies and legal institutional framework)
  - **social** (employment, regional development);
  - **environmental** (crop and distillery wastes, air, water, soil quality).
  - **food security** (competition/synergies between specific food and energy crops; restrictions for energy crops/area)
- For each of the identified issues, the Consultant will assess the potential impact and mitigation opportunities, beginning with feed-stock cultivation, and all other activities along the production chain from harvest to moving feed-stock to processing units, with special reference to stillage processing and disposal, to storing and to shipping to markets.
- Since stillage is a major issue in ethanol making, the consultant will survey technologies and costs resulting from the present international "best practices" regarding stillage processing and disposal. Given the prospect of expanding ethanol output in Mozambique, and based on the stillage characteristics such as content of solids, organic matter and chemical composition, as well as chemical and biological oxygen demands and pH, the consultant will highlight alternative technologies and costs associated with valuing stillage as a resource for fertilizers, energy, feed and food and chemical feedstock. Of special interest will be ferti-irrigation; concentration; burning stillage concentrate; aerobic and anaerobic fermentation, yielding single cell protein and methane respectively.
- End-use impacts of ethanol, ETBE and biodiesel on air quality, water and soil will be presented by the Consultant. Ethanol and ETBE permeation through plastic conduits and the possible spillage onto the environment resulting in water and soil contamination will be surveyed based on existing information such as available in Mozambique, Brazil, Europe, the US with special reference to that developed by the California Air Resources Board. A comment will be made on the possible gap between the estimated effects from biofuels and the Mozambican air and water quality legislation and regulatory requirements.
- Air quality impacts of emissions originating from ethanol, ETBE containing blends and biodiesel will be surveyed on a similar basis as the permeation/spillage analysis. Ethanol, ETBE and biodiesel could have a positive impact on emissions of certain controlled substances such as carbon monoxide and unburned hydrocarbons. The consultant will comment on the relative importance of increased acetaldehyde emissions and the expected levels of nitrogen oxide emissions that may result from the increased use of ethanol and ETBE and contrast them with Mozambican legislation and regulatory requirements.

- From a global environmental perspective, the consultant will assess the impact of ethanol, ETBE and biodiesel combustion on greenhouse gas emissions considering different feed-stocks and process energy sources and using a life cycle analysis approach covering the totality of the respective “energy vectors”.

#### IV. Tasks to be performed by the Consultant Under Phase II

##### **Task # 6. National Bio-Fuels Strategy, Policy and Regulatory Framework and National Implementation Program)**

Based on the findings and outcomes of Tasks # 1- 5, described above, the Consultant will:

- Elaborate of a National Bio-fuels (ethanol and biodiesel) Strategy proposal for Mozambique including all the different program components and covering all relevant technical, economic, environmental, social, financial, institutional, organizational and technological issues;
- Elaborate, a policy and regulatory framework for the National Biofuels Strategy, paying special attention to the design of a comprehensive social and environmental safeguards framework.
- Design and assist the Government of Mozambique to implement a participatory and stakeholder consultation process to validate the National Bio-fuels Strategy proposal and policy and regulatory framework.
- Elaborate a multi-stakeholder Implementation Program proposal for the National Bio-fuels National Strategy for Mozambique, including detailed public, private and partnership implementation arrangements, financing plans and time schedule.
- Elaborate a Program for Capacity Building and Technological Transference, in terms of agricultural and industrial production and logistics.

#### V. **Assignment Duration and Schedule**

The total duration of the consulting assignment will be of **170 billable days for Phase I** and **90 billable days for Phase II**, for a total maximum of 260 billable days (at different rates) and the overall output would be completed within a maximum calendar period of **9 months**.

Assignment Schedule (Pending)

	Months
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Tasks	1	2	3	4	5	6	7	8	9	10
<b>PHASE I</b>										
1. Agriculture Sector Overview and issue										
2. Assessment of the Potential Production of Biofuels (Supply Assessment)										
3. Assessment of the potential markets and End-Uses for Biofuels (Demand Assessment)										
4. Energy Sector Overview										
5. Assessment of Economic, Social and Environmental Sustainability										
Reporting Requirements										
<b>PHASE II</b>										
National Biofuels Strategy										
Policy and Regulatory Framework										
Stakeholder Consultation Process										
National Biofuels Implementation Program										
Reporting Requirements										

## VI. Assignment Deliverables

The assignment deliverables include:

- (a) an **interim report** for Phase I to be submitted to the World Bank within 100 billable days of initiation of the assignment;
- (b) **A presentation of this draft report on a workshop to be held in Maputo, Mozambique with the major stakeholders;**
- (c) **Phase I Completion Report** to be delivered to the World Bank at the completion of the first phase of the assignment;
- (d) a comprehensive Powerpoint presentation on the findings and outcomes of Phase I of the assignment;
- (e) a **Phase II Completion Report**, including Phases I and II of the assignment to be submitted to the World Bank at the completion of the assignment; and,
- (f) a comprehensive Powerpoint presentation on the findings and outcomes of Phase II of the assignment.

All written reports and Powerpoint presentation have to be submitted by the Consultant in **English**. The three written reports are to be submitted first in DRAFT format to the World Bank. The World Bank will review and, in parallel to that, forward copies to the Government of Mozambique (need to specify which agency/contact person ..... ) for its review and comments. The World Bank will provide comments on the reports to the Consultant within 15 working days. The Consultant will have 20 working days to incorporate the feedback received from the World Bank and submit the respective final reports.

All final written reports have to be submitted in desktop published form, on hardcopy and electronic copies (word processor software, preferably Word). Inter alia, all reports should include a detailed annexes documenting: (a) the meetings and other

activities undertaken by the Consultant in the performance of the assignment; and (b) a list of names, titles, and complete contact information for individuals with whom the Consultant(s) discussed relevant issues in the course of the assignment.

The Powerpoint presentation have to be submitted in active Powerpoint format (\*.PPT).

A final oral presentation and debriefing to summarize the consultant(s) findings and discuss issues related to the resulting recommendations will take place at the Headquarters of the World Bank in Washington, DC, shortly after the completion of the Phase II of the assignment.

## VII. Supervision

The Consultant will work under the overall technical supervision of **Boris E. Utria** (AFTEG / Task Manager) at the Headquarters of the World Bank, and will coordinate all the in-country work closely with **Wendy Hughes** (AFTEG) and **Eduardo Luis Leao de Sousa** (AFTS2) at the Resident Mission of the World Bank in Maputo.

## VIII. Profile of the Consultant

Because of the multi-sectorial and multi-disciplinary nature of the work to be undertaken within this assignment, the required Consultant should be a firm or consortium of firms (international and/or local), with the core firm having at least 10 years of experience in the elaboration of biofuel assessments and production systems. The Consultant should mobilize a multi-disciplinary team with the following core competencies:

- a Senior Team Leader, specialised in energy planning and policy making with a minimum of 10 years direct experience on biofuel assessments;
- a Senior Agricultural Economist.
- an Energy Expert (technology);
- an Economist Analyst;
- an Environmentalist Specialist; and,
- a Sociologist.

## VIII. Contractual Arrangements

Pending