

STATE OF THE ART OF THE DEVELOPMENT OF A NATIONAL BIOFUEL PROMOTION STRATEGY IN THE DEMOCRATIC REPUBLIC OF BENIN

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ABSTRACT: In 2007-2008 a technical-economic feasibility study for the production of bioethanol and biodiesel was carried out and developed by ETA Renewable Energies on behalf of the Ministry of Mines, Energy and Water of the Democratic Republic of Benin, with the purpose of elaborating a strategy for the production and use of modern biofuels.

The study was divided into two distinct phases: the feasibility study on the production of biofuels, and the elaboration of a proposition for a National Biofuels Strategy. The first phase addressed the technical, financial, economic, institutional and environmental issues.

Based on the results of the first phase, a proposition for a National Biofuels Strategy was elaborated and validated by local stakeholders, whose purpose will be to develop a supply and production chain for biofuels and an action plan to coordinate public and private activities in this sector.

Keywords: bioenergy, biofuels, energy crops, bioethanol, biodiesel.

1 INTRODUCTION

The elaboration of a National Biofuel Program in Benin occurs in a context of a heavy energy crisis for the country, characterized by continuous power shortages and constant increases of fossil fuel prices.

In 2007 a feasibility study was co-financed by DGE (Direction Générale Energie) of the Ministry of Mines, Energy and Water of Bénin and IDA, the International Development Agency of the World Bank, with the aim of assessing the opportunities, constraints and the market potential for the production of bioethanol and biodiesel in the country, whilst elaborating a proposition for a National Biofuel Strategy.

The project was carried out by ETA Renewable Energies with the technical support of local and international experts which was divided in two phases.

The first phase was the implementation of a **preliminary feasibility study** which investigated five main issues:

- The ongoing experiences and current biofuel market trends in the world;
- The assessment of market potential for biofuel (ethanol and biodiesel) in the two scenarios of national usage and export, as well as the techno-economic analysis of biofuel production from different feedstock the estimation of possible production costs and financial issues;
- The identification and evaluation of possible equipment for the use of biofuels in households in order to reduce the use of traditional biomass and fossil fuels;
- The analysis of environmental issues related to the production of biofuels;
- The assessment of socio-economic issues and the identification of potential financing schemes.

The results of the feasibility study have provided a basis for the development of a proposition for a National Biofuel Promotion Strategy. This policy document will define the priorities and set a road map for the development of biofuel projects in Benin and will offer detailed principles for the set up of a national policy as well as an institutional and regulatory framework for the promotion and development of biofuel production and use.

The present paper will outline the structure of the current draft strategy document and will present some major advancements on the elaboration of the country's regulatory framework for the development of the biofuel sector in Benin.

2 BACKGROUND

The feasibility study prepared during the first phase of the projects highlighted the country's potentials as well as the challenges and barriers that must be overcome to develop a biofuel industry in Benin.

The following questions were addressed:

- Is there enough land available to support biofuel production in a sustainable manner?
- Which are the most suitable energy crops for the production of ethanol and biodiesel in Benin?
- What is the theoretical domestic market potential for biofuels and what is the country's potential for export?
- Is there a favourable institutional framework for the development of biofuels and how to mobilize public and private investments in this sector?

Like many other African countries, Benin still has a large unexploited agricultural potential estimated at 8.300.000 ha of arable land, representing around 70% of

the total national territory, whereas the currently used land for agriculture is estimated at only 2.500.000 ha

Benin still has many available water resources, which are well distributed around the territory, the land that can be potentially irrigated amounts to over 320.000 ha; nevertheless the lack of infrastructures for irrigation is limiting the actual extension of irrigated lands to only 12.000 ha, found mainly in the central areas.

However, the average rainfall varying between 750 and 1200 mm/year and the relatively good distribution of rainfall (2 rainy seasons in the south and centre) can support the cultivation of many energy crops even under rainfed conditions.

The choice of the most suitable energy crops to be promoted was based not only on the compatibility with the climatic and soil conditions, but considered also the level of knowledge and experience of the farmers with the crop, the yields, the potential risks of competition with food consumption etc.

Based on these assumptions the study indicated cassava, sweet sorghum and sugarcane as the most suitable energy crops for ethanol production and jatropha and castor for biodiesel.

Corn (for ethanol) was discarded due to the extremely low yields and its importance for food security in the country (besides the relatively poor energy balance); soybean, groundnut and cotton seeds (for biodiesel) were also discarded for the same reasons and, in the case of cotton oil, for its high price on the food market that makes it fairly uncompetitive for biodiesel production.

Concerning bioethanol, cassava has been indicated as one of the primary resources to start the production, since it is well known by farmers, it has good yields (thanks to the success of some recent R&D projects), and presents minimal risks of food competition.

At the same time a program to introduce and test adapted varieties and hybrids of sweet sorghum should be launched throughout the country (traditional sorghum is already widely used and well known by farmers especially in the centre north).

Concerning oil crops, as in many other countries jatropha is well known and used by farmers for the production of fences and for local use, but is not currently cultivated at commercial scale, whereas castor was a major cash crop in the past and cultivated at industrial scale but is currently abandoned.

For these reasons the introduction of these crops should be based initially on small scale rural electrification projects (on the model of the Garalo project in Mali), to develop the production capacity and to improve the level of knowledge and experience of farmers.

3 PROPOSITION FOR A NATIONAL BIOFUEL PROMOTION STRATEGY

Based on the results of the feasibility study, a proposition for a Biofuel Promotion Strategy was elaborated and submitted to a large group of local stakeholders (ministries and institutions, research centers, farmers' associations, chambers of commerce and agriculture, NGO's). Their various recommendations, concerns and suggestions were collected and integrated in the draft strategy to develop a document whose position is shared by the largest possible number of stakeholders.

Being the base of a future framework policy document which will be adopted by the State, the proposal focused on a general *vision* that is "*To develop biofuel production and supply chains, as a driver for economic growth and poverty reduction, with positive effects on food crops and environment*" and on an *objective*, that is to "*contribute to the growth of the agricultural GDP, the improvement of trade balance, the increase of farmer's incomes, and to the reduction of the human pressure on forestry resources*".

The scenario under which the strategy will take place is the development of a national biofuel market; indeed the strategy proposed to establish a mandatory biofuel blend from B5 and E5 up to E10 and B10 by 2020. At the same time an effort should be done to establish reliable partnerships with foreign countries and investors to develop Benin's export capacity. The estimated land needed to achieve these goals is 280.000 Ha for ethanol production and 210.000 Ha for biodiesel by 2020.

The proposed strategy will be based on 4 main axes, each one introducing specific measures addressed to the different stakeholders and different segments of the supply chain in order to support and stimulate the development of the biofuel industry (Tab. 1):

- Axis 1: Development of a favourable institutional environment actions;
- Axis 2: Promoting the country's capacity of use, storage and distribution of biofuels;
- Axis 3: Promoting the production of agricultural feedstock;
- Axis 4: Promoting the establishment of a network of processing plants.

The effects and expected positive impacts from the implementation of the strategy are:

1. Reduction of energy dependency from the import of oil products;
2. Increase in the contribution of agriculture, improving the trade balance through the reduction of fossil fuel imports and the promotion of biofuel exports;
3. Income improvement for small farmers;
4. Job creation;
5. Diversification of agricultural production;
6. Reduction of GHG emission.

In June 2008 a major step forward towards the development of the National regulatory framework for biofuels was achieved, through the adoption of two important decrees:

1. *Decree 360/2008: Nomination of a National Commission for the Promotion of Biofuels;*
2. *Decree 361/2008: General conditions for the installation of biofuel companies in Benin.*

Decrees n. 361 defines the general conditions for biofuel production in Benin and introduces the following important statements:

1. The export of raw agricultural feedstock to foreign countries for biofuel production is forbidden;
2. The State decides which food crops can be used as energy crops for biofuel production;
3. Priority should be given to small rural families for the production of energy crops preferably in a contract farming model;
4. Research, production, processing and trade of seeds, feedstock and biofuels in Benin is subject to authorization by the State;
5. The authorization is given by the Government upon proposal of the National Commission for the Promotion of Biofuels.

This commission is introduced by Decree n. 360 and is composed by members of different ministries and institutions. This group of experts is subdivided into 3 committees (agricultural production, biofuel production and trade, support measures) and supervised by a coordination group.

This commission is charged with the implementation of the future national biofuel plan and with the technical evaluation of all files submitted by private companies for the production of energy crops and biofuels in Benin.

This proposition will be the basis upon which the actual National Biofuel Plan of RD Benin will be based. The adoption of a detailed “action plan” that will originate from this strategy will be an important step forward to support a coordinated approach for the development of the biofuel market and industry in Benin and will hopefully constitute to being a helpful example and reference for the development of similar initiatives in other countries.

Table I: Proposed support measures for the promotion of biofuels in Benin

Axis	Measures
Development of a favourable institutional environment actions	Creation of a favourable regulatory and legislative framework Establishment of fiscal incentives and support measures, Establishment of a coordination and regulation mechanism for the management of supply chains Promotion of research and standardization structures
Promoting the country's capacity of use, storage and distribution of biofuels	Promotion of biofuel for transports and for households; Development of infrastructure for storage and distribution Promotion of the use of biofuels in industry
Promoting the production of energy crops	Securing access to land and land tenure Securing access to fertilizers, equipments and education services, Establishing fair relationships between farmers and industry, promoting agricultural research
Promoting the establishment of a network of processing industries	Promoting private investments through the creation of a national biofuels market (mandatory blends) and introduction of guarantee funds for investors