

Are biofuels an efficient technology for generating sustainable development in oil-dependent African nations? A macroeconomic assessment of the opportunities and impacts in Burkina Faso

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ABSTRACT

This paper discusses the opportunity for substituting fossil fuels with biofuels in a Sahelian country, Burkina Faso. Bearing in mind the strong link between energy and development, and given the country's heavy reliance on imported fossil fuels, our study showed that the overall economy (private and public companies and basic social services) and the State Budget could be seriously affected if no viable and local alternative is integrated into the national energy strategy. In view of local potential, it is recommended that adequate energy resources be sought in order to ensure sustainable socio-economic development. Biofuel opportunities are discussed taking into account technical, agronomic and land potentials in this country. Diversification of energy resources with biofuels would substantially reduce fuel imports in the short term, improve overall public finances, provide a chance to develop agriculture and provide benefits for the locals. However, if they are to generate development, biofuel projects need to be mindful of food security and economic incentives, and should be part of national agricultural strategies.

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Contents

1. Introduction	2200
2. Energy and development in Burkina Faso	2200
2.1. Country overview: a poor country relying on extensive agriculture	2200
2.2. Energy supply	2201
2.3. Fossil fuel consumption and prospects for substitution	2201
3. Macroeconomic impacts of fossil fuel imports for Burkina Faso	2201
3.1. Oil price structure and impacts of imports on the Budget	2202
3.2. Impacts of fossil fuel imports on the national economy	2202
4. Biofuel potentials and risks for Burkina Faso	2203
4.1. Technical potentials	2203
4.2. Agronomic potentials	2205
4.3. Land potentials and competition	2205
4.4. National policy framework for the development of biofuels	2206
5. Positive impacts and limitations	2206
5.1. Socio-economic and environmental impacts	2206
5.2. Profitability of biofuels	2207
5.3. Impacts on macroeconomics	2207
6. Conclusion	2207
References	2208

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1. Introduction

The World Commission on Environment and Development suggests that development is sustainable where it “meets the needs of the present without compromising the ability of future generations to meet their own needs” [1]. In addition, energy has been defined by the United Nations Development Programme (UNDP) [2] as playing a key role in sustainable development and poverty alleviation efforts. As specified in the energy objectives [3] of the New Partnership for Africa’s Development (NEPAD), ensuring the provision of adequate, affordable, efficient and reliable high-quality energy services with minimum adverse effects on the environment for a sustained period is crucial for African countries. Although there are no specific Millennium Development Goals (MDGs) [4] relating to energy, it will be impossible to achieve MDGs without improving the quality and quantity of energy services in the developing world [5,6]. It affects all aspects of development including livelihoods, incomes (MDG 1), access to water, agricultural productivity, health (MDG 4 and 5), education (MDG 2 and 3), and gender related issues [7].

Many studies [5,8–10] have shown the net positive link between energy consumption and development. For example, the African Energy Policy Research Network has demonstrated (see Fig. 1) the correlation between Gross National Product (GNP) and per capita energy use in Africa [11].

While energy is not the sole factor for sustainable development, Africa needs to improve reliability and to search for more abundant, cheap energy in order to enable economic growth [12] and ensure the well being of its populations. It also needs to reverse environmental degradation and health impacts that are associated with the use of traditional fuels in rural areas [13,14].

Energy generates electricity for a variety of applications, including domestic purposes, off-grid rural electrification, small and medium enterprises and industrial needs. Roughly 1.6 billion people, mostly in developing countries, are reported as lacking access to basic electricity services. The lack of electricity deprives people of basic necessities such as refrigeration, lighting, and communications, and undermines national competitiveness [15]. Furthermore, most African countries are highly dependent on fuel imports [5]. World oil reserves are being depleted at an unprecedented rate, placing considerable pressure on the economies of oil-importing African countries in particular, and threatening their economies. Since the 1973 oil price shock, the prices of crude oil-based fuels have increased sharply, sometimes requiring as much as 20 percent of national income in Sahelian states [16]. Recently, fuel prices have become even more unstable and have increased very sharply (up to US\$ 70 in late 2006 and almost reaching US\$ 150 in mid-2008) [17]. According to the International Monetary Fund, Heavily Indebted Poor Countries (HIPC) are among the most seriously affected by higher oil prices [18]. These countries are already running large current account deficits and will encounter a sig-

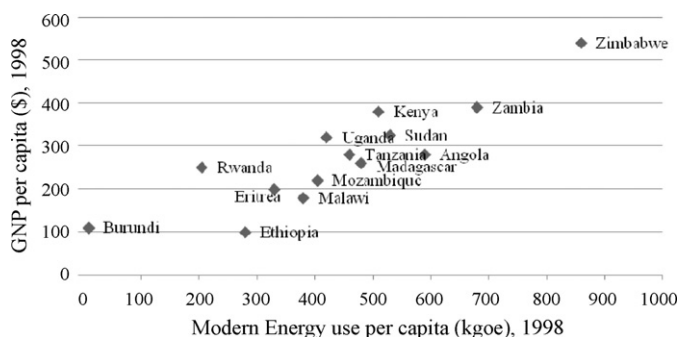


Fig. 1. Modern energy use per capita (kgoe) vs GNP per capita (\$) [9,11].

nificant deterioration in their foreign trade balance. Since oil is a finite resource, petroleum prices will inevitably escalate when this resource becomes limiting [17,19,20]. This situation weighs heavily on the assessment of public finances, at the expense of public services and oil-consuming businesses. Moreover, a lack of energy availability, or excessive energy prices, means a lack of basic social services, namely healthcare, education, drinking water supplies and nutrition, as well as difficulties in developing productive activities, particularly those related to the promotion and processing of agro-pastoral products [15,21].

In order to decrease reliance and pressure on fossil fuels, a number of countries, like Burkina Faso, have started to look closely at biofuels [22] for creating a more secure supply, in a less volatile market that can be accessed domestically [23]. Biofuels are increasingly seen as one of the best fuel resources that almost any country with surplus land and labour resources can exploit through relatively low capital inputs and medium levels of management.

Thus, this creates an attractive opportunity for biofuels to boost the development of national industry and to increase incomes in rural areas, by generating new energy sources and new channels in the agricultural sector. Given the challenges, developing crops for biofuel production seems worth exploring for these countries, while taking into account the country’s agricultural and land situation and understanding the socio-economic and environmental impacts (deforestation, competing land uses, use of chemicals and fertilizers, etc.) [24].

This paper presents a macroeconomic assessment of the opportunity of biofuels, in order to study whether it is an efficient technology for generating sustainable development in oil-dependent African nations. The case study will focus on the consequences of fuel energy prices on a national level in Burkina Faso, one of the poorest countries in the world, heavily dependent on fossil fuel imports. In this country, only 5% of households have access to electricity, compared to 20% in the West African region [5].

The paper presents an economic appraisal of the country’s vulnerability to oil fluctuation and takes a closer look at the potential biofuel strategy, considering the effects of large-scale programmes on land use, food security and socio-economic development. Finally, it sets the context for further discussions on biofuel feasibility in Burkina Faso.

2. Energy and development in Burkina Faso

2.1. Country overview: a poor country relying on extensive agriculture

Burkina Faso, landlocked in the middle of West Africa, is one of the poorest countries in the world with a Human Development Index (HDI) ranking it 177th out of 182 countries in 2007 [25]. People living below the poverty line (established at € 111/year) amounted to 46.4% in 2003 [26], and that percentage is increasing despite all the national measures and international help (1994: 44.5%, 1998: 45.3% [27]), with a greater incidence of poverty in rural and peri-urban areas.

The country covers 274,000 km² in the Sudano-Sahelian zone with an estimated population of more than 14 million people [28], largely farming and pastoral rural communities, while only 20% live in urban areas (10% in the capital city Ouagadougou). The country is one of the most populated in the West African region, with a strong increase in urban inhabitants, more than three times that of the rural increase [29]. Taking a population growth rate of 2.4%, the overall population will double in 29 years [29]. Agricultural activities account for more than one third of GDP, and provide jobs and income for about 80% of the population [27], with cotton being the main cash crop [29]. As Africa’s leading cotton producer Burk-

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