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# EU-Africa Energy Partnership: Implications for Biofuel Use

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## Purpose

This brief intends to provide an overview of the rationale underlying the EU-Africa Energy Partnership, in addition to an analysis of the potential implications of this policy on the development of sub-Saharan African nations. It is posited that the partnership could have potentially negative repercussions if critical uncertainties are not sufficiently taken into account, and that it is in the EU's best interest to ensure that outcomes are genuinely equitable. The research also has implications for other developing nations around the world seeking to further their economies and raise living standards by means of engaging in the global biofuels industry.

## Europe, Energy Security and Biofuels

It is widely acknowledged that the energy security of the EU, as a whole, is deficient with respect to meeting future energy requirements. At the same time, the EU has resolved to decrease its carbon footprint and wean itself off from environmentally damaging fossil fuels. A further concern is that even if the developed world manages to arrest the proliferation of greenhouse gas (GHG) emissions the developing world will still continue to pollute.

To address these important issues, the EU has developed the EU-Africa Energy Partnership. The rationale, broadly speaking, is twofold:

- Secure the EU's energy supply and allow its member states to meet challenging emissions reduction targets.
- Provide sub-Saharan African economies with a further export market, in addition to allowing these nations to leapfrog to lower-emissions technologies.

Although the partnership deals with renewable energy in its broadest sense, there appears to be great emphasis on the cultivation of biomass used in the production of renewable fuels such as ethanol and biodiesel, for which there is increasing demand within the EU. Despite the ostensibly sound intentions of the policy, it remains to be seen whether the energy partnership will truly be mutually beneficial.

The aim of this brief is to examine the critical uncertainties that could potentially damage the workability and equitability of the energy partnership. A key consideration, here, is that the partnership has seemingly been formulated under *ceteris paribus* conditions. Thus, the partnership's success is predicated on the continuation of existing trends, such as growth in biofuel demand and the ability to cultivate biomass at market-friendly prices in the future. Yet, the increasing complexity of technological systems, the advent and potential adoption of new technologies, in addition to climate change, means that it cannot be assumed that all things will indeed remain equal.

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## EU Biofuel Policy

The EU has set targets for biofuel usage within the member states. Policy measures designed to stimulate biofuel use were introduced in 1992. The overall aim has been to reduce the cost of biofuels in comparison with conventional petroleum products, which otherwise would be higher given the production costs and economic risk associated with fluctuations in oil price and the value of biomass-derived by-products (Cadenas and Cabezudo, 1998).

The EU Commission set a political target of substituting 20 percent of conventional biofuels by 2020 (European Commission, 2001, p. 45). The even more ambitious COM(2006)845 proposed that biofuel targets *for transport fuel* should be 20 percent for the same year. The EU Biofuels Directive (2003/30/EEC) requires member states to ensure that a minimum proportion of fuels sold are biofuels (see Faaij, 2006). The aim is to ensure that 5.75% of conventional fuels are replaced by biofuels, although the Biomass Action Plan (BAP) has concluded that these targets will not be reached (Commission of the European Communities, 2006, p. 6).

There is thus a growing requirement for biofuel production within the EU and indeed a growing demand for biofuels (especially biodiesel). Since the EU member states do not have the capacity to increase biomass cultivation without causing an increase in food prices (a politically unpalatable outcome), it has been deemed necessary to look for alternative ways to satisfy this demand.

## Energy Partnership

In this context, the EU-Africa Energy Partnership emerges as an important component of the EU's aim to increase the use of biofuels for transport within the member states, thereby allowing the EU to meet challenging biofuel targets, contribute to global GHG mitigation strategies (such as Kyoto), and address concerns regarding energy security. The partnership is argued to be mutually beneficial, since it will also promote economic and social improvement in sub-Saharan African countries and allow such nations to switch to more environmentally friendly patterns of energy use.

The partnership is intended to promote greater interconnectivity between energy systems and ensure a diversity of energy options (Commission of the European Communities, 2006, p. 15). Although there is reference to alternative energy sources, such as hydropower (ibid.), there is clearly an emphasis on greater biomass cultivation and biofuel production, perhaps to the detriment of other energy solutions.

Energy security is obviously an important component of the partnership. Sub-Saharan Africa thus has the ability to supplement volatile supplies (and pricing) of OPEC oil with biomass cultivated in the region. Although the sub-Saharan region is also clearly not especially stable, it at least has the capacity to offset some of the risk associated with dealing with OPEC countries.

## Production Processes

Given the current high cost of second-generation biofuel production processes (which use the whole organic matter as a feedstock), it can be assumed that the bulk of the biofuel feedstocks grown in sub-Saharan Africa would be used in arguably inefficient first-generation production processes. Here, only the sugars and starches (rather than the whole plant) are used for ethanol production, while only the extracted vegetable oil is used in biodiesel production (Charles et al., 2007).

# Critical Uncertainties

It is necessary to look at the critical uncertainties that could impact on the success of the EU-Africa Energy Partnership.

## Climate Change

The energy partnership, in as much as it relates to promoting sub-Saharan Africa as a source of biofuel feedstock, assumes that current climatic conditions will prevail. Yet climate change could mean that climatic conditions in areas currently suitable for agricultural endeavour might militate against profitable biomass cultivation.

There are a number of critical factors associated with climate change that need to be taken into account:

- *Increased uncertainty with regard to rainfall patterns*: This will problematize when to plant and place pressure on water use, with potential social repercussions.
- *Increased and more severe meteorological phenomena*: Floods could wipe out entire fields; storms could damage or destroy harvests, while uncontrolled fires (resulting from co-factors of drought, thunderstorm activity or human action) could do likewise.
- *Increased incidence and severity of pestilence*: Changed climatic conditions could make crops more susceptible to pests, thereby increasing the need to employ pesticides (with cost penalties and potential impact on the local environment and human health).

These factors, when taken together, suggest that it will be more difficult to plan for weather-related phenomena into the future. Thus, claims of increased energy security within the EU resulting from the partnership need to be tempered with the realization that traditional agricultural techniques do not guarantee constant and predictable harvests, while climate change may exacerbate uncertainty.

## Environmental Impacts

Agriculture has brought about widespread environmental degradation around the world. Thus, it is important to bear in mind the potentially negative impacts that intensified farming practices will have on ecosystems in sub-Saharan nations, in addition to the region as a whole.

The possible factors that could lead to negative environmental impacts are as follows:

- *Increased use of fertilizers*: Run-off from fertilizers increases the incidence of algal bloom in aquatic environments; fertilizers lead to an increased level of atmospheric $N_2O$ harmful to the ozone layer; and fertilizer production and distribution is energy inefficient and contributes to greenhouse gas proliferation.
- *Increased use of pesticides*: Pesticide run-off pollutes local watercourses, results in a loss of biodiversity when food supplies for higher organisms are reduced, can flow throughout food-chains, thereby leading to chemical build-up in higher organisms, especially avian fauna; production processes and distribution incur GHG penalties, can be harmful to human life and can contaminate water supplies (of particular importance in developing nations).
- *Increased threat of deforestation*: Expanding biofuel markets may prompt changes in land-use, potentially leading to deforestation, entailing significant biodiversity and $CO_2$ penalties.

These factors could be aggravated if a greater demand for biofuels in the EU member states is occasioned and if changing weather patterns result in a need to 'make hay while the sun shines'. Such a demand could effectively see the EU exporting local environmental degradation from its member states to sub-Saharan Africa. Environmental degradation could also lead to opportunity costs resulting from a loss of potential ecotourism income.

## Technological Change

Biofuels, at best, will be an important component in a future energy mix. There are no indications that biofuels will ever replace petroleum-derived products on a one-for-one basis (Di Lucia and Nilsson, 2007). Biofuels enjoy a clear advantage over other potential energy solutions, especially since they take advantage of existing infrastructural systems (Foresight Vehicle, 2004). This ensures that switching costs are reduced.

On the other hand, there is the threat that biofuels will be rendered redundant by other technologies. There is much evidence throughout history to suggest that over-reliance on a single natural resource for a nation's prosperity is not sustainable over the long-term. For example, Chile, which prospered on the basis of its export of sodium nitrate (saltpetre), lost this advantage when scientists developed a synthetic alternative.

Some threats to the increasing importance of biofuels are as follows:

- Increase in use of *nuclear energy* (and thus 'clean' electricity).
- Switch to cleaner *second- (and third-) generation biofuel production* processes.
- Development of a *hydrogen economy* (predicated on the availability of clean, renewable energy, such as from the sources listed below).
- Other energy paradigms, for instance, *geothermal*, *hydroelectric*, *photovoltaic*, *wind* etc.

Thus, over-capitalization in biomass cultivation for first-generation production processes (in particular) may lead to unsustainable increases in foreign debt, in addition to severe job losses and resultant social upheaval. In a worst case scenario, more efficient technologies, if they become widely adopted around the globe, could lead to the biofuel industry's collapse.

## Opportunity Costs

Even if the biofuel industry remains important, over-emphasis on biomass cultivation could result in a failure to develop industries that have the potential to contribute greater value added to sub-Saharan African economies. This would especially be the case if insufficient attention were paid to processing the feedstock in sub-Saharan Africa, as could occur in nations traditionally focussed on exporting natural resources.

Biomass cultivation, in the event of an ever-increasing demand for biofuels, would not merely translate into sub-Saharan African countries gaining an OPEC-like significance on the world stage. This is especially the case given a) the potentially wide dispersal of biomass cultivation and b) the high likelihood that biofuels would remain one of several alternative energy solutions. African biomass would also have to compete with that cultivated in North and South America, and also in South-East Asia and the Indian subcontinent. Given that these regions are already more highly industrialized than most sub-Saharan African nations, it is plausible that greater value added would occur in these regions.

There is also a danger that biomass cultivation in sub-Saharan Africa could engender an increased dependency on multinational corporations involved in agribusiness. There are already substantial links to agriculture in developing nations and the research-intensive products, including seeds, support systems and expertise, being offered by multinational agribusiness entities.

## Export Commodity Dependency

Sub-Saharan Africa has a long history of supplying European nations with raw materials to be used in value-adding production processes. There is thus the potential for this situation to continue if Europe resolves to view the region merely as

source of inexpensive feedstock for biofuel production, rather than as a knowledge-intensive producer in its own right.

Many of the economic and social problems faced today in sub-Saharan Africa are deeply rooted in history. When the European colonial powers partitioned Africa, they viewed the colonies as suppliers of raw materials for their factories. Farmland traditionally used for food cultivation, even after the independence of the former colonies, was turned over to cash crops such as cocoa, cotton, coffee and rubber. The result was that Africa exported what it did not need, and imported what it did, thereby leading to substantial trade deficits and continued indebtedness (Carmody, 1998). This is because the low price obtained for cash crops rarely if ever matches the relatively high price paid for imported food, in addition to luxury goods and hardware desired by affluent members of society.

It is important to be awake to the potential for ongoing commodity dependence to occur, especially if the EU pays insufficient attention to developing sub-Saharan Africa as an energy producer rather than merely an agricultural supplier.

## Investing in Sub-Saharan Future

It is possible to formulate a number of potential policy implications that would add rigour to the energy partnership.

- *Moving away from first-generation biofuels*: A continued emphasis on first-generation biofuel production processes reinforces sub-Saharan Africa as a supplier of cash crops. There are inherent problems with first-generation biofuel production processes. A failure to address these and move demand towards more efficient second-generation processes could lead to a global undermining of confidence in biofuels as a source of renewable energy.
- *Ensuring environmental sustainability*: This is tied closely to the previous consideration, but also with the necessity of preventing local and regional environmental degradation as a result of poor farming practices or indeed widespread change in land-use. There is a need to develop mechanisms to ensure that increasing demand for biofuels within the EU does not lead to catastrophic environmental impacts in sub-Saharan Africa.
- *Investing in sub-Saharan Africa's future*: The energy partnership should be used as a component in an overall strategy to enhance economic development in the region. A failure to do so will result in greater amounts of environmental degradation (including greenhouse gas emissions) over the long-term.

In short, the nations of the region need to acquire their own energy security and processing infrastructure. The EU-Africa Energy Partnership must serve as a vehicle to promote these ends. To achieve this end, sufficient political will over the long-term to propagate cleaner biofuel production processes is required. If not, the biofuels market could be irreparably compromised and the partnership with it, with grave implications for not only the EU and sub-Saharan Africa, but also the planet as a whole.

## Sources and References


- Cadenas, A., and Cabezudo, S., 1998. Biofuels as sustainable technologies: perspectives for less developed countries. *Technological Forecasting and Social Change* 58(1–2), 83–103.
- Carmody, P., 1998. Constructing alternatives to structural adjustment in Africa. *Review of African Political Economy* 25(75), 25–46.
- Charles, M.B., Ryan, R., Ryan, N., and Oloruntoba, R., 2007. Public policy and biofuels: the way forward? *Energy Policy* 35(11), 5737–5746.
- Di Lucia, L., and Nilsson, L.J., 2007. Transport biofuels in the European Union: the state of play. *Transport Policy* 14(6), 533–543.
- European Commision, 2001. Green Paper: Towards a European Strategy for Security of Supply. Directorate-General for Transport and Energy. http://ec.europa.eu/energy/green-paper-energy-supply/doc/green_paper_energy_supply_en.pdf
- European Commission, 2006. Communication from the Commission: An EU strategy for Biofuels—Impact Assessment. Commission Staff Working Document COOM (2006) 34 final. http://ec.europa.eu/agriculture/biomass/biofuel/sec2006_142_en.pdf
- Faaij, A.P.C., 2006. Bio-energy in Europe: changing technology choices. *Energy Policy* 34(3), 322–342.
- Foresight Vehicle, 2004. Foresight Vehicle Technology Roadmap: Technology and Research Directions for Future Road Vehicles, Version 2.0. http://www.foresightvehicle.org.uk/public/info_/FV/TRMV2.pdf