

Jatropha Biofuels in Ghana – Making Informed Policy Decisions

By

Francis Kemausuor
Lecturer and Researcher

**The Energy Center /
Department of Agricultural Engineering**
Kwame Nkrumah University
of Science and Technology,
Kumasi, Ghana

ICBE POLICY BRIEF



EXECUTIVE SUMMARY

Global debates underpinning biofuels have pushed many governments to design policies to make the maximum benefits of the biofuels industry whilst minimising the associated costs. Issues on alternative sustainable energy sources, rural development and perceived competition between biofuel and food production bring a sense of urgency among many governments to have policies that guide production of biofuels.

Ghana began the process of formulating a biofuels policy more than six (6) years ago as evident in the formulation of a draft biofuels policy in 2005 by the country's Energy Commission. The draft document was, however, not given much attention and was subsequently discarded. A fresh effort began in 2010 which has also produced a draft document for consideration by cabinet. Although the efforts show the country's desire to produce biofuels to compliment its energy needs, there is the need for evidence-based research to enable government to make well-informed policies, primarily to create a conducive atmosphere for the development of the burgeoning biofuel industry in the country.

This policy brief was prepared from a financial and technical feasibility study of Small- and Medium-Scale Enterprises (SMEs) for jatropha biofuels development in Ghana. The assessment summarises the financial and technical capacity for the production of jatropha feedstock, jatropha oil, as well as the jatropha biodiesel. The study also evaluates the stages at which the industry could be promising for Ghana and would need favourable policy intervention.

This study did not consider social implications of biofuels development and the recommendations therein are based purely on technical and economic grounds. The study recommends that government allow the cultivation of jatropha on arable lands, or with fertilizer and irrigation in fragile ecological zones. It also recommends that biofuel industries consider the production of jatropha oil for local use or export rather than the production of biodiesel, since the cost implications are rather high in the latter. In terms of technologies, there exists local capacity for the design and manufacture of equipment for jatropha oil production but less so for biodiesel production. Government should promote local technology for the production of jatropha oil as it considers upgrading capacity into the manufacture of equipment for biodiesel processing.

HEADQUARTERS

TrustAfrica
Lot 87, Sacré Coeur 3
Pyrotechnie x VDN
BP 45435
Dakar-Fann, Senegal

T +221 33 869 46 86
F +221 33 824 15 67
E info@trustafrica.org
W www.trustafrica.org

The ICBE Research Fund is a joint initiative of TrustAfrica and the International Development Research Centre.

CONTEXT AND IMPORTANCE OF THE PROBLEM

The recent challenges of climate change caused by the increased emission of greenhouse gases (GHG) from fossil fuels has resulted in an unprecedented interest in the commercial production of biofuels that are claimed renewable and pro-poor. The inadequacy of the agricultural sector which engages a chunk of labour to provide appreciable and regular income sources for the poor in developing countries makes investment in biofuels compelling enough.

Production of biofuels depends on the availability of the needed technology and expertise in the country. Other factors that are critical for the growth of the emerging biofuel industry are biomass availability, conducive climatic conditions, and political goodwill. The economic and the agronomic potentials of jatropha plant, even in marginal land areas, and the promising spin-off effects on rural livelihoods has provided impetus for land acquisition for large-scale jatropha investments in most developing countries over the past two decades. In Ghana, jatropha plantations are being undertaken in most parts of the county as a response to the global 'biofuels awakening.' Large tracts of land are thus outsourced to foreign investors for jatropha plantations.

Whereas local conditions and the social responsibility of investors are identified as important decisive factors influencing the impact of biofuels, the policy framework that lays down the rules and regulations of biofuels is equally important. Indeed, an important, but least considered issue which largely drives biofuels impacts is the existing policy structures regulating access to and control over land acquisition and the entire biofuels investments chain. This policy brief thus seeks to address the role policy could play in the emerging biofuels industry to the benefit of Ghana, based on the findings of a feasibility study conducted at The Energy Center at Kwame Nkrumah University of Science and Technology (KNUST), Kumasi.

CRITIQUE OF POLICY OPTIONS

Marginal versus arable lands

The jatropha crop has been hyped due to its perceived agronomic and economic viability in marginal land areas, which are generally areas that are not conducive for agricultural production. One of the policy options of the government has been to avoid the cultivation of jatropha in arable land areas and instead encourages growing jatropha in marginal land areas. This has been due to the ongoing food versus fuel debate.

In Ghana, jatropha plantations are being undertaken in most parts of the county as a response to the global 'biofuels awakening.' Large tracts of land are thus outsourced to foreign investors for jatropha plantations.

A feasibility study has indicated that even though small- and medium-scale jatropha plantations, between 50 and 500 hectares, are economically viable on marginal lands, the benefits do not match up to plantations on arable lands under the application of fertilizer and irrigation. Yields on fertilised and irrigated lands are high and the employment benefits are thus better compared to the case with reverse conditions.

Production of jatropha oil against jatropha biodiesel

At the national level, the export of the jatropha oil has the potential to generate foreign exchange for the country. Currently, per tonne price of jatropha oil ranges between US\$ 1100 and US\$ 1300. Due to favourable trade agreements such as the Cotonou agreement, coupled with a high demand for vegetable oil in Europe, jatropha oil production for export could constitute an important foreign exchange earner for the country to enhance the country's balance of payments. The financial feasibility analyses of jatropha biodiesel reveals a high per litre cost of approximately GHC 6 (US\$ 4) compared to a litre price of GHC 1.532 (US \$1) for fossil diesel when only the raw material costs are considered. The high cost of biodiesel production is due primarily to the high cost in importing the key chemicals (sulphuric acid, phosphoric acid

and methanol) that are used for the esterification and trans-esterification processes. Beside sodium hydroxide which could be easily produced locally, the remaining chemicals would have to be imported. Indeed, the three chemicals (sulphuric acid, phosphoric acid and methanol) constitute about 72% of the raw material cost whereas the jatropha oil forms only about 24%. In India, due to the relatively cheaper prices of the major raw materials for biodiesel production, a per litre price is as cheap as \$0.58 (GHC 0.87) which could compare favourably with the ex-pump price of fossil diesel in Ghana. Crude glycerine, which is an important by-product of the biodiesel production, has quite little economic value due to the global over production of biodiesel at the international market.

Conversion technology options

Two technological options are available for Ghana: simple technology for jatropha oil production or a full-blown biodiesel processing technology. Technology for the production of jatropha oil is less sophisticated and readily available in the country. The simple equipment required is similar to that being used for palm oil or groundnut oil extraction.

Ghana could currently adopt existing palm oil processing technology for jatropha oil production. The local technology and expertise could be enhanced. Local machinery fabricators have shown strong capability to manufacture machinery for jatropha oil extraction but less so for the trans-esterification process. More so, Ghana has been used to palm oil processing for years where local machinery fabricators have contributed immensely and a similar technology could be used to manufacture machinery such as expellers, shellers, etc., needed for jatropha production.

At the moment, most of the available biodiesel reactors, condensers, evaporators, etc. are imported from outside Ghana. Therefore, not until the capacities of machinery fabricators are upgraded for the manufacture of more sophisticated machinery for the trans-esterification stage, Ghana would need to start the biofuel enterprises development with jatropha oil production or, at best, blend cleaned or well-filtered jatropha oil with fossil diesel. More so, the production of biodiesel requires significant access to chemical inputs such as methanol, sulphuric acid and sodium hydroxide which

Two technological options are available for Ghana: simple technology for jatropha oil production or a full-blown biodiesel processing technology.

contribute to higher production costs.

Summary of policy options

- Jatropha production using irrigation under the application of fertilizer could be more rewarding for investors and promising for employment creation among communities living in areas that host Jatropha growing projects. Cultivating jatropha on marginal lands may not make economic sense.
- Jatropha oil production could be very profitable especially if produced for export due to the high global demand for vegetable oil. Jatropha biodiesel production is more expensive compared to the ex-pump price of diesel due primarily to the high costs of production inputs, which would have to be imported.
- The production of jatropha oil will not only generate foreign exchange for Ghana but also make a full capacity utilisation of local technical expertise and technology. This is because, although local machine fabricators have expressed the capacity to produce reactors, condensers, evaporators, etc. for biodiesel production, they are more familiar with the manufacture of expellers, shellers and others for the extraction of jatropha oil.

POLICY RECOMMENDATIONS

Given the backdrop of the outlined policy options, the following recommendations are proposed for policy making:

- Jatropha should be classified as an agricultural crop. This way the government will encourage its cultivation on fertilized or fertile land areas in areas that receive good rainfall or under proper irrigation instead of subscribing to flimsy premises underpinning conventional pro-wasteland discourses. More so, it is unrealistic to cultivate large hectares of jatropha on marginal land areas. Irrigated and fertilized jatropha plantations are more economically viable than the non-irrigated and non-fertilized ones because a relatively large numbers of people are employed per hectare compared to investments on marginal land areas. It is thus recommended that jatropha investments must be encouraged in arable land areas under subsidised irrigation schemes to reap the maximum benefits.
- The key chemicals, including sulphuric acid, phosphoric acid and methanol, that are used for the production of biodiesel (esterification and trans-esterification stages) are not produced locally and can only be imported, making the cost of the product quite expensive. Ghana should therefore produce jatropha oil for local use or put in place mechanisms to reduce the cost of the chemicals by removing import tariffs (tax rebates) to enhance the production of jatropha biodiesel at very competitive prices. Nonetheless, the government should encourage local production of these key chemicals for biodiesel production or provide subsidies for the importation of such chemicals.
- Machinery fabricators have shown strong capability to supply machinery for jatropha oil extraction but less so for the trans-esterification process. Therefore, government should ensure an enabling environment (ideally in collaboration with Universities) for the capacities of machinery fabricators to be upgraded so that they can also easily manufacture the more sophisticated machinery for the trans-esterification stage.

BIBLIOGRAPHY

- Ariza-Montobbio, P., Lele, S., Kallis, G. and Martinez-Alier, J. (2010). *The Political Ecology of Jatropha plantations for biodiesel in Tamil Nadu, India*, Journal of Peasant Studies, 37: 4, 875 – 897 (2010).
- Tompsett, C. (2010). *Fuelling development? A critical look at government-centered jatropha cultivation for biodiesel as promoted by the biofuels policy in Rajasthan, India*. Master's Thesis, University of Bergen, UiB
- Brittain, R. and Litaladio, N. (2010). *Jatropha: A Smallholder Bioenergy Crop. The Potential for Pro-Poor Development*. Integrated Crop Management, Vol. 8. Report by IFAD for FAO.
- Dufey, A., Vermeulen, S., Vorley, B. (2007). *Biofuels: Strategic Choices for Commodity Dependent Developing Countries*. Prepared for Common Fund for Commodities, Institute for Environment and Development, London
- Dufey, A. (2006). *Biofuels Production, Trade and Sustainable Development: Emerging Issues*. International Institute for Environment and Development, London
- Caminiti, M., Cassal, M., O'Heigartaigh, M., Zeru, Y., (2007). *Feasibility study of biofuel production in Ghana: Assessing Competitiveness and Structure of the Industry's Value Chain*. A paper prepared for TECHNOSERVE