

Review

Industrial biotechnology for developing countries: The case for genetically modified biofuels in Kenya

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Attempts to diversify the energy portfolios of developed countries with green technologies have brought competition between food and fuel for crop production resources to the forefront of public policy debates. Biofuel policies in the European Union (EU) and the United States (US) mandate the long-term use of renewable energy in transportation, independent of production capacity and technical feasibility. Both the US and EU policies explicitly allow for biofuel imports and, hence, have the potential to provide developing countries with export opportunities. For example, the EU is seen as a market that could be supplied with biofuels produced in Kenya. As a result, contentious land acquisitions have been made in Kenya to make way for sugar cane and *Jatropha* cultivation for biofuel production. One potential means of improving the efficiency of Kenya's agricultural sector is the application of transgenic technologies. The objective of this article is to assess whether a biofuel industry could be developed in Kenya, based on the use of genetically modified (GM) feedstocks to supply the EU demand for biofuel. This article concludes that GM agriculture will improve the economic returns for those Kenyan farmers willing to engage in the production of GM biofuel crops.

Key words: Barriers to trade, energy policy, genetically modified (GM) crops, international trade, land-use policy.

INTRODUCTION

Interest in producing biofuels has risen significantly in recent years in response to increased instability in international oil supplies, the environmental degradation associated with greenhouse gas (GHG) emissions and government policies which support the development of energy alternatives to fossil fuels. The desire to find alternative sources of energy, particularly for transportation purposes, has resulted in large scale government investments in, and support for, the biofuel industry. The United States (US), the European Union (EU) and a number of other countries, including developing countries, have encouraged the development of renewable energy in an attempt to enhance energy security and to mitigate the ne-

gative effects arising from GHG emissions (Viju and Kerr, 2013). The EU and US policies mandate significant domestic use of biofuels, in spite of capacity constraints in the EU and technical limitations in the US.

These industry support measures, which artificially boosts demand for biofuels, create potential beneficial opportunities for developing countries endowed with large amounts of land suitable for growing biomass. The potential for genetically modified (GM) crops to support biofuel production in developing countries exists as observed, for example, in Brazil and Argentina. However, diversifying the energy mix with biofuel production may result in a loss of natural capital, (defined as the stock of natural resources, environmental and ecosystem resources used as inputs in the production of goods and services in addition to being enjoyed for its own sake) (Olewiler, 2004) including biodiversity. The EU's Renewable Energy Directive (RED) (2009) imposes regulatory constraints on

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