

Biofuels — A Revolution in the Making?

The challenge is to avoid supporting biofuels through distortionary incentives

With oil prices near an all-time high and few alternative fuels for transport, Brazil, the European Union, the United States, and several other countries are actively supporting the production of liquid biofuels — ethanol and biodiesel. The economic, environmental, and social impacts of biofuels are widely debated. As a renewable energy source, biofuels could help mitigate climate change and reduce dependence on oil in the transportation sector. They may also offer large new markets for agricultural producers that could stimulate rural growth and farm incomes. On the downside are environmental risks and upward pressure on food prices.

About 90% of the global ethanol fuel production in 2006 was produced in Brazil and the United States, and 75% of biodiesel was produced in the EU — mainly in France and Germany. Brazil is the most competitive producer and has the longest history of ethanol production (dating back to the 1930s), using about half its sugarcane to produce ethanol and mandating its consumption. However, new players are emerging, such as Indonesia, Malaysia, Mozambique, and India.

Economic Viability and the Impact on Food Prices

Governments provide substantial support to biofuels so that they can compete with gasoline and conventional diesel. These supports include consumption incentives (fuel tax reductions), production incentives (tax incentives, loan guarantees, direct subsidy payments), and mandatory consumption requirements. Are biofuels economically viable without subsidies and protection?

The most important determining factors are the cost of oil and the cost of the feedstock, which constitutes more than half of today's production costs. Biofuel production has pushed up feedstock prices. The clearest example is maize, whose price rose by 23% in 2006 and by some 60% over the past two years, large-

ly because of the U.S. ethanol program. Spurred by subsidies and the Renewable Fuel Standard issued in 2005, the United States has been diverting more maize to ethanol. Because it is the world's largest maize exporter, biofuel expansion in the United States has contributed to a decline in grain stocks to a low level and has put upward pressure on world cereal prices. Similar price increases have occurred for vegetable oils (palm, soybean, and rapeseed).

Cereal supply is likely to remain constrained in the short term and prices will be subject to upward pressure from further supply shocks. Provided there is not another major surge in energy prices, however, it is likely that feedstock prices will rise less in the long term as farmers respond to higher prices, and biofuels production will be moderated by lower profits because of higher feedstock prices.

Rising cereal prices will have an adverse impact on many food-importing countries. At the same time, many poor producers could benefit from higher prices.

Potential Benefits

- *Energy Security.* Current-technology biofuels can only marginally enhance energy security in individual countries because domestic harvests of feedstock crops meet a small part of the demand for transport fuels, with few exceptions (for example, ethanol in Brazil). In 2006/07, around one-fifth of the U.S. maize harvest was used for ethanol but displaced only about 3% of gasoline consumption. Second-generation technologies could potentially make a higher contribution to energy security.

- *Environmental impacts.* Global environmental benefits from using renewable fuels — reducing greenhouse gas emissions (GHGs) — are frequently cited as reasons for policy support to biofuels. Although possibly significant, those benefits cannot be assumed. The emissions from growing feedstocks (including

emissions from fertilizer production), manufacturing biofuels, and transporting biofuels to consumption centers, as well as those from changes in land use, also have to be evaluated. According to the 2006 EU Biofuel Strategy, a change in land use, such as cutting forests or draining peat land to produce feedstocks such as oil palm, can cancel the GHG emission savings "for decades." Reducing potential environmental risks from large-scale biofuels production could be possible through certification schemes to measure and communicate the environmental performance of biofuels.

- *Benefits to smallholders.* Biofuel can benefit smallholder farmers through employment generation and higher rural incomes, but the scope of these impacts is likely to remain limited. Ethanol production with current technologies requires fairly large economies of scale and vertical integration and may do little to help small-scale farmers.

Defining Public Policies

Can developing countries, apart from Brazil, benefit from the production of biofuels? In some cases, such as landlocked countries that are importers of oil and potentially efficient producers of sugarcane, the high costs of transport could make biofuel production economically viable even with current technologies. The much higher potential benefits of second-generation technologies, including for small-scale biodiesel production, justify substantial privately and publicly financed investments in research.

The challenge for developing country governments is to avoid supporting biofuels through distortionary incentives that might displace alternative activities with higher returns and to implement regulations and devise certification systems to reduce environmental risks.

Source: World Development Report 2008, www.worldbank.org/wdr2008 BT