

## An IIED Briefing

# International trade in biofuels: Good for development? And good for environment?

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Biofuels are heating up debates and energising activities on many policy fronts. On the surface, they offer significant opportunities to pursue environment and development goals both globally and domestically. There are both synergies and trade-offs between these goals and levels. Trade will drive biofuels growth, yet current trade regimes are not fit for maximising benefits nor minimising risks from the sector. The novelty of biofuels, the vast array of issues involved and the lack of knowledge to tackle many of them, together with diverging political and business interests, mean that consensus is elusive. It is therefore increasingly urgent to map a path for the global biofuels industry that supports sustainable development. Based on a new analysis of the sector, this briefing lays out some of the options for achieving this.

### What are biofuels?

Biofuels are products that can be processed into liquid fuels for either transport or heating purposes. Bioethanol and biodiesel are two of the most common forms of biofuels. Others include biomethanol, biodimethylether and biogas. Bioethanol is produced from crops such as sugarcane, corn, beet, wheat and sorghum. A new generation of 'lignocellulosic' bioethanol also includes a range of forestry products such as short rotation coppices and energy grasses. Biodiesel is made from seeds such as rapeseed, sunflower, soy, palm, coconut or Jatropha. New biodiesel technologies – e.g. the Fischer-Tropsch process – synthesise diesel fuels from wood and straw to a gasification stage. The raw materials used to produce biofuels are referred to as feedstock.

### Biofuels: At the heart of many policy agendas

Although the first large-scale schemes for biofuel production began in the early 1970s (such as Brazil's launch in 1975 of the PROALCOOL programme for bioethanol production), it is only over the last five years or so that biofuels have been given notable worldwide consideration as an alternative to fossil fuels. Arguably their greatest appeal lies in their potential to reduce greenhouse gas emissions by partial replacement of oil as a transport fuel. This could help countries meet their commitments under the Kyoto Protocol and mitigate the effects of climate change. In economic terms, today's high oil prices make biofuels from the most efficient producer countries competitive. These are largely developing nations.

Further driving forces behind biofuel market development include the promotion of greater energy security; currency savings through a reduced oil bill; rural development; and poverty reduction. These factors combine to place biofuels at the top of today's most pressing policy agendas.

As the biofuels industry takes off, it will increasingly interact with agriculture, land and energy – three sectors whose existing

### KEY MESSAGES:

- The realisation of environmental and social benefits of biofuels is not straightforward. The trade-offs need to become clearer to all players.
- International trade will play a key role in determining the final outcomes. However, distortions in agricultural and energy trade regimes, the myriad of standards and the lack of a clear biofuel classification in the multilateral trade regime, suggest that biofuels might not deliver sustainable development gains for all trading partners.
- Industrialised countries need to analyse the global impacts of their domestic policies affecting biofuel production and trade, and pay particular attention to the sustainable development of developing countries.
- Developing countries need to seize the opportunities and appreciate the costs of the biofuels market, identifying those that are most suitable for the achievement of their sustainable development goals.
- The scale of biofuels production matters for achieving economies of scale. But large-scale models run the risk of squeezing out small-scale producers and the associated sustainable development benefits.
- Standards for the biofuels sector are proliferating. Mapping their implications for sustainable development and trade could help to evolve a more equitable regime.

policies are not fully equipped to deal with biofuels expansion. The inevitable trade-offs need to become clearer. This briefing paper clarifies some of these issues: Will fuel shortages be replaced by food shortages – or by water shortages? Will biodiverse landscapes be replaced by ecological and economic monocultures? Will this new form of trade exacerbate the environmental and social problems associated with the trade of many tropical food and cash crops, or will it provide a solution? Will industrialised countries' agricultural and energy programmes applying to biofuels continue to undermine developing countries' opportunities to benefit from trade? Will companies invest in environmental management to ensure biofuel production is sustainable, or will they merely be the latest 'raiders of nature' to make excessive profits?

## Global biofuel markets: Key trends

The new global interest in biofuels has already translated into rapidly expanding international biofuel markets. A growing number of industrialised and developing countries have introduced policies to increase the proportion of biofuels within their energy portfolio. With the Kyoto Protocol's recent entry into force and the worldwide implementation of national targets for biofuels, it is expected that in the next 20 years global biofuel production will quadruple, accounting for about 10 percent of world motor fuel (IEA, 2004).

Whereas at least 90 percent of biofuel production is consumed domestically, international trade in biofuels is expanding rapidly. Countries such as Japan, South Korea and the United States, and some in Europe, will not have the domestic capacity to meet national demand and are therefore looking to other countries to fill the gap and meet their ambitious targets. For instance, the EU's goal of 5.75 percent biofuels in the fuel transport blend by 2010<sup>1</sup> would require a fivefold increase in regional production.

Indonesia and Malaysia are already expanding oil-palm plantations to meet this growing demand. Together they are expected to supply up to 20 percent of the EU market. In the Netherlands, it is expected that 80 percent of the necessary feedstock will be imported due to the small arable crop area available and the ambitious biofuels goal set by the government (Gains Report 2006). Brazil is also expected to be an important beneficiary of EU demand for soy for biofuel. Other palm oil producers such as Ecuador and Colombia and traditional soy and coconut oil exporters such as Argentina and the Philippines are also seizing biodiesel trade opportunities. Several African and Asian countries are exploring the benefits of large-scale production and trade of fast growing, drought resistant feedstock (e.g. *Jatropha* tree seeds).

Bioethanol is, by far, the most widely used biofuel for transport, it accounts for more than 94 percent of global biofuel production. About 60 percent of bioethanol comes from sugarcane and 40 percent from other crops (Trindade 2005). Brazil is the largest bioethanol exporter, supplying about half of the global market. Other traditional sugar exporters including Guatemala, El Salvador, Pakistan, South Africa and Swaziland are also looking at opportunities derived from bioethanol production and trade.

## Links between biofuels and sustainable development

At the Millennium Summit in September 2000 the largest gathering of world leaders in history adopted the United Nations Millennium Declaration. They committed to a new global partnership to reduce extreme poverty by 2015 in line with a series of targets that have become known as the Millennium Development Goals (MDGs). The MDGs are crafted around eight themes to address extreme poverty in its different dimensions including hunger, disease, lack of adequate shelter, and the promotion of gender equality and education. Of particular relevance here is the seventh MDG, which calls for environmental sustainability. One of its targets is to

integrate the principles of sustainable development into country policies and programmes and to reverse the loss of environmental resources.

Biofuels provide opportunities to contribute to the achievement of MDG7 but they also pose some threats. Links between biofuels and sustainable development are complex, depending on a number of variables: the energy crop, method of cultivation, conversion technology and the conditions and alternatives facing the specific country.

**Environmental goals:** The available evidence shows considerable variation in greenhouse gas savings from biofuel use depending on the type of feedstock, cultivation methods, conversion technologies, and energy efficiency assumptions. The greatest greenhouse gas reductions can be derived from sugarcane-based bioethanol and the forthcoming 'second generation' of biofuels such as lignocellulosic bioethanol and Fischer-Tropsch biodiesel. One issue is the 'energy balance' of biofuels i.e. the amount of energy required to produce one unit of biofuel compared to the energy contained in the same unit of biofuel. In some cases, notably where fossil fuels are used in the production process, biofuels may not fare better than conventional fuels.

But a greenhouse-gas equation is not the only environmental balance to be considered: biofuels also have the potential to reduce emissions of key toxic substances – such as carbon monoxide, particulate materials and sulphates – usually associated with the use of standard fuels. Biodiesel, however, tends to produce higher emissions of nitrogen oxide. Burning sugarcane fields just prior to harvest has been linked to air pollution, greenhouse gas emissions and health risks.

The cultivation of energy crops may also trigger – or exacerbate – several of the environmental problems associated with agricultural commodity production such as deforestation, monocropping, water usage, land degradation and water pollution. Of these, the expansion of the agricultural frontier is a key concern, and especially the impacts this may have on tropical forests, savannahs and biodiversity. Forests have been cleared for palm oil production in countries such as Indonesia and Malaysia. If the increased demand for biofuel were met by expansion of soy production, this would imply further environmental pressure in the sensitive drier savannah areas of north-central Brazil (*the cerrado*) and in the Amazon forests. On the other hand, because certain energy crops such as trees and grasses require fewer inputs, they can sometimes be grown on very degraded land, promoting land restoration. Indeed, crops such as *Jatropha*, due to their fast growth, drought-resistant nature and soil-improving properties, have the potential to extend the land base available for agricultural activities and to create new markets for farmers in marginal areas – as well as providing local biofuels through simple processing plants.

The rapid global development of biofuels has largely been driven by the promise of reduced greenhouse gas emissions – yet environmental benefits could be lost if the expansion of energy crops leads to further deforestation and input-intensive cultivation.

**Social goals:** A potential benefit associated with biofuels is their positive impact on agricultural employment and livelihoods. Sugarcane-based bioethanol in Brazil, for instance, already employs around one million workers (Moreira, 2005) and this number is expected to grow by 20 percent in the next five years. Most of these jobs are filled by the lower-skilled, poorest workers in rural areas (Macedo, 2005). The Colombian government anticipates that every farming family engaged in bioethanol production will earn two to three times the minimum salary (US\$4000/year) once the national Bioethanol Programme is implemented (Etcheverri-Campuzano, 2002). However, the cultivation of other energy crops such as soybeans tends to be associated with large-scale production methods, with very little positive impact on rural labour. In

<sup>1</sup>A 10 percent target for 2015 is currently under review.

addition, widespread biofuel production may result in, or enhance, poor labour practices. In some developing countries certain types of feedstock (notably sugarcane and palm oil), have been produced under poor working conditions with health and safety risks, and in some cases, child labour and/or forced labour. Last but not least, the likely expansion of agricultural land for biofuel production may also exacerbate landlessness in a number of developing countries by dislocating rural people who had depended upon access to forest resources and ecosystem services.

In relation to *economic* goals, biofuels are already generating a new demand for some agricultural crops, reducing market volatility and surpluses, leading to increases in commodity prices and providing opportunities for value-added agricultural outputs. Where distributional/social policies are supportive, all of these trends could reduce poverty, especially in developing countries. However, the stronger demands exerted on commodity markets by the biofuels industry could lead to land being drawn away from other uses including food production, and to potential changes in food price and availability for the poor. For example, in Malaysia, demand for palm-based biofuel is growing so fast that the country decided to stop licensing new producers while the palm oil industry works out how to divide up its raw material between the food and energy sectors (Reuters, 2006). The country, together with Indonesia, recently announced a commitment to set aside nearly 40 percent of its crude palm oil output for biodiesel production (The Star, 2006). These countries account for 90 percent of global palm oil production.

### **Risk of protectionism undermining the achievement of environment and development goals**

The many sustainable development potentials associated with biofuels are contingent upon international trading, since the most efficient producing countries are or will be developing countries, while the main consumers are industrialised countries. The bad news is that, under current trading conditions, there are several policy problems preventing developing countries from reaping the benefits of the biofuels trade, not to mention the negative environmental and social impacts that these policies may have.

Several trade barriers distort biofuel trade and jeopardise developing countries' potential to benefit from greater global demand for biofuels. Tariff barriers commonly insulate domestic producers from external competition. The United States, for example, applies an extra US\$0.54 to each gallon of imported bioethanol on top of the 2.5 percent tariff, bringing the cost of Brazilian bioethanol in line with that produced domestically (Severinghaus, 2005). Moreover, the tariff escalation systems that prevail in many industrialised countries encourage developing countries to export feedstock, such as unprocessed molasses and crude oils while the final biofuel conversion – and associated value addition – takes place in the importing country. The tariffs vary – the EU and United States, for instance, have trade agreements granting preferential market access conditions for certain countries and products.

Subsidies are another key concern. In industrialised countries, government support for the domestic production of energy crops and the processing of biofuels seem to be the rule.

The impacts of these policies on developing countries' efforts for sustainable development need to be understood. Not only do they undermine developing-country competitiveness, but they may also damage their potential for poverty reduction and environmental management. Although the positive environmental and social externalities of biofuels may in some cases justify policy incentives in industrialised countries, the impacts of these policies on developing countries need to be explored, as government support in these countries (if there is any) is likely to be limited. Policies

in industrialised countries might be promoting the development of a biofuels industry based on the least efficient energy crops: feedstock cultivated in tropical countries yields about five times more energy than that grown in temperate zones. The closer the locations of cultivation and biofuel conversion are, the greater the contributions to rural job creation and cutting greenhouse gas emissions are likely to be.

The current lack of a clear classification of biofuels within the multilateral trading system constrains effective trade. At present there is no agreement on whether biofuels are industrial or agricultural goods. On the one hand, biofuels are traded as 'other fuels', or as alcohol (in the case of ethanol) and are subject to general international trade rules under the World Trade Organisation (WTO). The WTO Agriculture Agreement, on the other hand, addresses energy crops, and categorises domestic support into three 'boxes': an 'Amber Box' containing actionable or trade distorting subsidies; a 'Blue Box' containing Amber Box subsidies that satisfy certain conditions designed to reduce the trade distortion; and a 'Green Box' containing non-actionable subsidies, or subsidies unlinked to production subsidies, which would permit certain kinds of subsidy aimed at environmental objectives. Biofuels may also be included in a list of environmental goods stated for accelerated trade liberalisation under the Doha Round. All of this means that at the multilateral level there is currently no specific forum for discussions on how to deal with biofuel trade.

Last but not least, the proliferation of different technical, environmental and social standards and regulations for biofuels – without a system for mutual recognition – is also likely to cause additional difficulties. Although some form of environmental and social assurance is needed, there are some concerns that if these schemes are developed by industrialised nations, with little participation by producer country stakeholders, there will be no reflection of these countries' environmental and social priorities. An additional problem will arise if the costs of implementing these standards are to be borne by small producers in developing countries. To avoid some of these problems, and to initiate discussion towards mutual recognition or more unified schemes, existing standard schemes should be mapped out against sustainable development criteria.

Overall, given that not all of the interactions between biofuels and sustainable development are positive, the challenge is to set up structures within an international trading system that can support the positive contributions of biofuels to sustainable development, and minimise the negative aspects.

### **Power structures in biofuels markets may lead to the unfair distribution of benefits along the value chain**

The sustainable development impacts of biofuels will also depend upon how the value chain is governed. Studies of several agricultural commodity markets assert that benefits from export production in the developing world have increasingly accrued to actors in upper parts of the chain, while the primary producers have received comparatively little. Many biofuels supply chains are, or would be, targeting export markets with (as noted above) the risk that the value added process takes place in importing countries. This, coupled with concentrated international market power structures (currently two companies – Cargill and Archer Daniels Midland (ADM) – control about 65 percent of the global grain trade; Vorley, 2003) raises concerns about how costs and benefits will be distributed along the value chain. Many of the social benefits of biofuels – particularly those related to poverty reduction – accrue from the pro-poor/small farmer nature of the production system. However, if producers are dependent on a very few international traders bringing their products into the international market, there is a risk that primary producers will receive very few benefits.

Considerable work has been done on value chain analysis in the food sector. This needs to be replicated across the fuel sector, with comparisons drawn between cost-benefit distributions for food and fuel industry supply chains.

## Towards a framework for win-win-win outcomes from biofuel trade

The global biofuels market offers important opportunities to bring together the economic, environmental and social agendas both in developing countries and globally. However, a lack of coherence and coordination between the stakeholders and policy agendas involved at the interface between biofuels, trade and sustainable development could lead to biofuels providing a solution to one specific problem while simultaneously creating several others. It is therefore increasingly urgent to map a path for the global biofuels industry that supports sustainable development. Analysis is needed to integrate the above issues and to deliver concrete and timely recommendations to policy makers that will drive the sustainable development results of this new market.

Biofuels can help tackle climate change problems and improve rural employment and livelihoods. They may also help diversify energy portfolios, ameliorate trade balances and improve air quality. However they are not a panacea and present several limitations and problems. Of these, the expansion of the agricultural frontier is a key concern. On the social side, there are important concerns about the impacts of biofuel production on food security, labour practices and on the fair distribution of costs and benefits along the trade chain.

All of this suggests a long list of issues to be urgently addressed by national governments and the international community to realise opportunities and minimise risks. Some of the necessary actions include:

**At the national level:** Developing-country governments need to seize trade opportunities. They need to identify the types of biofuels and feedstock that are most suitable for the achievement of their sustainable development goals. This involves not only an analysis of the country's potential to produce different types of feedstock, but also a consideration of whether there is enough agricultural land available and what the environmental impacts will be. The social consequences of that move must also be considered, as must the trade-offs with food security that may arise. The international community could help by providing evidence on the sustainable development impacts of different types of biofuels and energy crops through analyses of the entire chain from production to consumption.

Before designing and implementing policies to promote biofuels, national governments need to have a clear understanding of the potential sustainable development benefits. From an economic point of view, it is necessary to identify the right policies for the industry to take off. Evidence so far suggests that the countries currently at the forefront of biofuel development owe their progress to a set of economic incentives and domestic policies that allowed this to happen. From an environmental point of view, policies should promote investment in environmentally suitable farming practices and technologies. From a social point of view, policies should enable the fair participation of small farmers in the supply chain. The 'Social Fuel' label, introduced by the PROBIODIESEL programme in Brazil, aims to promote social inclusion along the value chain and points the industry in the right direction. The international community could help by devoting resources to provide capacity building in several of these areas.

**At the international level:** Governments also need to take a proactive approach to set the right conditions for the creation of

a sustainable international biofuels market. Governments need to identify key barriers affecting trade, and the best ways and arenas in which to address them. Industrialised countries need to analyse the impacts of their domestic policies on biofuel trade and in particular on the sustainable development of developing countries. The international community could also contribute analysis to clarify these issues.

All this points to the need for environmental and social certification systems for biofuel. The experience of certification schemes in the agriculture and forestry sectors constitutes a valuable starting point. Experience there needs to be built on with evidence from other areas – notably greenhouse gas emissions. More analysis is also required on how these schemes can be beneficial to small producers. At present, there are an increasing number of initiatives for the development of biofuel certification schemes, mainly dominated by industrialised governments and institutions. These need to be mapped and better coordinated. The proliferation of certification systems in the North, with insufficient consideration of conditions in producer countries, could be detrimental to sustainable trade and place a significant burden on small producers.

These factors highlight the need for a coherent international trading system that is well equipped to facilitate the industry's contribution to sustainable development, and for mechanisms that can deal with the negative aspects. Biofuels will not serve as a single solution to global warming nor to problems of poverty. But they can form an important component of an integrated approach to tackling two of the most significant challenges facing us today.

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