

## Global biofuels dash too hasty?

Over the past several years, high fuel prices, energy security fears and concerns about climate change have focussed global attention, including that of investors, on alternative energies. Biofuels – fuels derived from renewable biomass<sup>1</sup> rather than finite fossil fuels (e.g. oil) – have not escaped notice. Many believe they have an important role to play in addressing these issues, as they are perceived to be ‘greener’ than fossil fuels (they are often referred to as ‘carbon neutral’) and could potentially reduce our dependence on oil, particularly foreign oil.

### Growing support for biofuels

The world’s leading biofuel is bioethanol. It is produced mainly from sugarcane and corn, and accounts for more than 90% of global biofuel production. It is used as an additive to gasoline (to improve engine performance) and as a substitute for gasoline. Brazil and the USA are its largest markets. The remaining 10% is biodiesel, which is derived primarily from plant oils such as rapeseed, soya, and palm. Biodiesel can be used as a substitute for petroleum-based diesel and is the most common biofuel in Europe.

Investor interest in biofuels has been spurred by government support for them. For example:

- The European Union’s 2003 Biofuels Directive recommends that 2% of the energy content of all petrol and diesel sold as transport fuels be from biofuels or other renewable fuels by 2005, rising to 5.75% by 2010 and 20% by 2020. Individual countries have followed up with their

own policies. In early 2007, the EU agreed on a draft energy plan that includes a binding biofuels target of 10% by 2020.

- The UK Government’s Renewable Transport Fuel Obligation, which begins in April 2008, sets biofuel usage goals in road transport fuel at 2.5% in the first year, 3.75% in the second and 5% by 2010-11.
- In the US, the Energy Policy Act of 2005 (the ‘Energy Bill’) includes a renewable fuels standard (RFS) that mandates the annual use of 4 billion gallons of renewable fuels in 2006, rising to 7.5 billion gallons in 2012. In his 2007 State of the Union Address, President Bush proposed a further target of 35 billion gallons of renewable and alternative fuels by 2017. Congress is currently considering several bills that would further increase this target.
- Other countries including Australia, Argentina, Brazil, Canada, India and Thailand have similar initiatives.

Notwithstanding the strong government support, in recent months, it has become increasingly clear that these ‘first generation’ biofuels are not the ‘silver bullet’ that will solve at a stroke the world’s energy security and environmental woes.

Several issues have arisen. Biofuels have ignited a fierce so-called ‘food versus fuel’ debate; some biofuels are responsible for significant environmental damage; and the CO<sub>2</sub> ‘footprints’ of some biofuels do not appear to be as small as once purported.

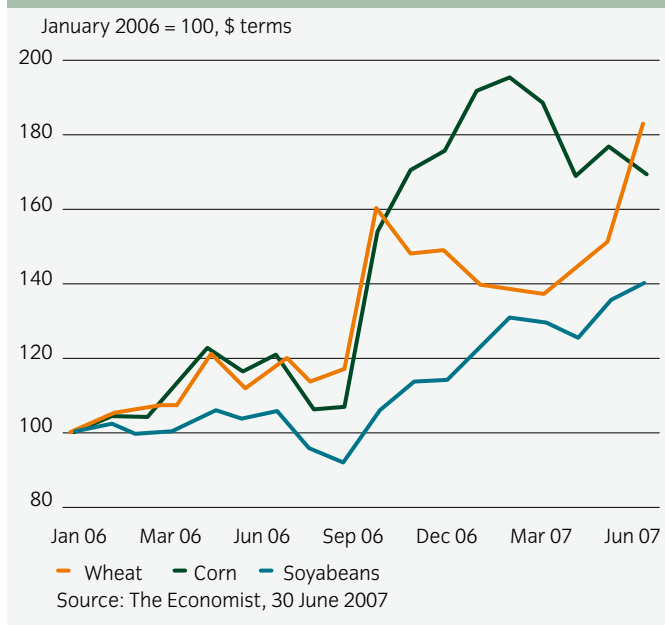
<sup>1</sup> Biomass is plant or animal material. Biomass feedstocks can (theoretically) be replenished at a rate equal to or greater than their rate of depletion; whereas finite feedstocks such as oil take hundreds of millions of years to form.

## 'Food versus fuel'

Concerns about the effect of biofuels on global food security are mounting; the immediate issue is rising crop prices, although fears about competition for arable land in the future are also being voiced.

Driven by significantly increased demand, the prices of most biofuel feedstocks including corn, sugar, wheat and soyabean, rapeseed and palm oils – many of which are also important human food crops – have soared on world markets in recent months (see Figure 1). This 'agflation' (as it has been dubbed) has had a measurable knock-on effect on food prices around the world. In its April 2007 World Economic Report, the International Monetary Fund said that global food prices rose by 10% in 2006 due to a surge in corn, wheat and soyabean oil prices.

Figure 1: Global corn, wheat and soyabean prices



For example, corn prices have doubled since the beginning of 2006 and reached a 10-year high earlier this year. Corn is used as an ingredient in breads, as cooking oil, as corn syrup in beverages and processed foods, as well as for animal feed. While corn farmers in the US (where most corn-derived ethanol is produced) are happy with the high prices they are getting for their crops, the development is worrisome to ethanol producers and livestock farmers, whose feedstock and feed costs, respectively, have doubled in just 12 months. The global wheat price has also reached a 10-year high and soya beans have reached a 2-year high this year. Global corn and wheat stockpiles are at their lowest for some time now.

The livestock industry is particularly vulnerable. As feed prices rise, the cost of raising cattle, poultry and hogs rise.

Ranchers, in turn, lower the size of their herds to keep costs down. This results in less meat being produced and higher prices. In February, the US Department of Agriculture said that the supply of meat (beef, pork and chicken) will fall this year because of the high cost of feed, leading to a rise (up to 3.5%) in prices. The industry is beginning to warn of negative consequences.

For example, in early March, the incoming CEO of Cargill (the world's largest agricultural company by revenues), Greg Page, questioned the system of tax breaks and subsidies used to increase biofuel production in the US amid concerns about the inflationary impact on global food and animal feed prices. And Tyson (the world's largest beef and chicken producer) has also recently warned that consumers face higher meat prices during the summer months. For some time now, the company has led calls within the industry for policymakers to address the competing claims on domestic corn and other feedstocks from the food and biofuels sectors.

Other industries are also exposed. The chief executive of Heineken, the Dutch brewer, recently warned that the expansion of the biofuels sector was beginning to cause a structural shift in European and US agricultural markets. He said that one result could be a long-term shift upwards in the price of beer as barley and hops account for about 7 to 8 % of brewing costs.

In May, the United Nations reported that the global rush to energy crops threatens to bring food shortages and increase poverty. Mexico has experienced a particularly negative repercussion of the US bioethanol boom. Higher yellow (US) corn prices have pushed up the price of Mexico's domestic white corn, sharply driving up the price of tortillas – the staple food for a large portion of the country's population. This has sparked protests, and the government has had to negotiate a price cap with the largest tortilla producers.

## Negative environmental effects

A number of environmental concerns are associated with the growing of some of the feedstocks for biofuels. Changes in land use – deforestation in particular – is, without a doubt, the most significant of these. For example, tropical forests rich in biodiversity are being destroyed for palm oil plantations in Malaysia and Indonesia. This is resulting in not only the devastation of habitats for numerous plant and animal species (the plight of orang-utans has been highlighted by several environmental NGOs in recent months), but also the release of significant amounts of CO<sub>2</sub> at the time the forests are converted as well as the destruction of their important long-term role as natural 'carbon sinks.'<sup>2</sup>

<sup>2</sup> 'Carbon sinks' are essentially reservoirs for CO<sub>2</sub>. Forests sequester (remove) CO<sub>2</sub> from the atmosphere through the process of photosynthesis and store it in their biomass as starches, sugars and cellulose.

In addition, many of the feedstocks for biofuels are grown as monocultures and plantations. Although this is not unlike other commercial agricultural products, they nevertheless require generous amounts of fertilisers and pesticides, which, in turn, can lead to soil degradation and pollution of water sources.

## CO<sub>2</sub> footprints

It is often claimed that biofuels are 'carbon neutral' because when they are burned they only release the CO<sub>2</sub> that was absorbed from the atmosphere by the feedstock plant as it grew. However, this assertion fails to account for the considerable energy requirements, and associated CO<sub>2</sub> emissions, of the growing, refining and distilling processes needed to produce biofuels, as well as from their transport.

In addition, with respect to their CO<sub>2</sub> footprints, biofuels are not created equal. Biofuels made from corn grown in the US, palm oil in Malaysia and sugarcane in Brazil have radically different energy balances<sup>3</sup> and associated greenhouse gas impacts. This is an area of considerable research and debate; however, it is becoming apparent that some biofuels have CO<sub>2</sub> footprints that are not much smaller than that of some fossil fuels.

## Responses

A growing number of environmentalists, scientists and economists are warning that the headlong rush into biofuels is creating more problems than it is solving. Sir Nicholas Stern, author of the Stern Report and an adviser to the UK Government, has recently said that turning grains and sugar cane into fuel is not the answer to cutting greenhouse gas emissions from transport. Some are calling for a biofuels 'time out.' While this is highly unlikely, there appears to be increasing recognition that something needs to be done.

In June, in an unprecedented move, the Chinese government placed a moratorium on the production of ethanol from corn and other food crops, citing concerns about food security and soaring corn prices. Other governments have started to move in a similar direction, albeit not as radically as China. For example:

- The European Commission, recognising the potential negative environmental effects of biofuels, recently launched a public consultation on the issue. It is aiming to develop a sustainability scheme to complement its proposed binding target for 10% biofuels in transport by 2020.

- The UK Government has proposed that 50% of the feedstocks used to make biofuels qualifying for its Renewable Transport Fuel Obligation (which begins in April 2008) meet sustainability standards by 2009-10, rising to 80% in 2010-11. Among other things, biofuels used will need to have an annual greenhouse gas saving of 40% over fossil fuels in 2008-09, 50% in 2009-10 and 60% in 2010-11.
- In late April, a government committee in the Netherlands (the biggest buyer of palm oil in Europe) unveiled stringent biofuels criteria: production cannot contribute to deforestation, deplete greenhouse gas reservoirs or sinks, compete with food crops, degrade soil or water supplies, upset biodiversity or displace local populations. The committee suggested developing a system whereby biofuels would be fully traceable to their feedstock sources by 2020.

The biofuels industry, itself, is collaborating with other stakeholders to address the challenges that biofuels present. The two most significant initiatives are:

- The Roundtable on Sustainable Palm Oil, a global association of businesses and NGOs seeking to promote sustainable palm oil, has been working for several years on developing sustainability criteria and a verification schemes for the oil. (See <http://www.rspo.org>.)
- The Roundtable on Sustainable Biofuels (RSB), an initiative of the Swiss École Polytechnique Fédérale de Lausanne (EPFL) Energy Center, is a multi-stakeholder initiative to develop standards for the sustainability of biofuels. RSB aims to publish a draft sustainability standard, including criteria and indicators, by May 2008. Its draft set of sustainability principles are currently out for consultation. (See <http://cgse.epfl.ch/page65660.html>.)

These guideline initiatives are, indeed, welcome – although it is not clear to what extent and how quickly they will address the sustainability issues at hand.

## Conclusion

The future prospects for biofuels remain uncertain. While there are currently strong policy drivers for the development of the first generation of these fuels, the sustainability challenges – economic, social and environmental – discussed above threaten to erode this support, particularly in Europe.

For the sector to successfully address these issues, it is critical that governments around the world further incentivise alternative biofuels including:

<sup>3</sup> A fuel's 'energy balance' is the ratio of its energy output to its energy input.

## Some early 'casualties'

In recent months, numerous biofuels projects have been cancelled or postponed, and several companies have made it clear that the current operating climate is challenging. Among those that have been widely reported in the press are:

- In February, Neste Oil (Finland) and Total (France) cancelled a pilot biodiesel project after a feasibility study indicated that the plant would have been too expensive. Neste is going forward with three other biodiesel projects.
- Also in February, Spain's Abengoa suspended bioethanol production at its biggest plant located in Salamanca for three months. The plant was built in partnership with food group Abro Puleva last year and switched from wheat to barley as its raw material in December. The plant was intended to produce bioethanol for domestic use, however, the company's two other plants are currently meeting domestic demand. Bioethanol from the Salamanca plant is being exported, which is more costly, particularly when considering the cost of importing the feedstock. The company believes that the Spanish government needs to impose mandatory blending to increase domestic demand.
- In January, RWE npower (Germany) announced the cancellation of its project to convert its Littlebrook power station in the UK to run on palm oil. Apparently, the company could not secure enough palm oil from reliable sustainable plantations.
- The CEO of the UK's D1 Oils recently stated that high vegetable oil feedstock prices are squeezing margins for UK biofuels producers, forcing his company to rein in output and to seek out alternative, lower-cost feedstocks. He has noted that production of biodiesel is currently unprofitable, even with 20 pence-a-litre duty relief. And this is at a time when the industry needs to be ramping up production to meet the government's Renewable Transport Fuel Obligation.
- The UK's Biofuels Corp. has seen its margins halve in recent months due to the combination of higher vegetable oil and lower crude oil prices. The company recently secured between £16 million and £25 million in financing (in addition to its £95 million of debt) to keep it afloat through the end of the year.
- In March, Germany's Verbio announced that it expected 2007 to be a difficult year. The company's bioethanol business is burdened by high feedstock prices and imports of cheap ethanol from Brazil, and its biodiesel business is under pressure because of the weak price of crude oil and the high price of rapeseed.

While these examples do not necessarily undermine the case for investing in biofuels, they must nevertheless be seen as something of a negative indicator for the sector.

- Those produced from non-food feedstocks that do not compete for agricultural land, such as jatropha and waste products (i.e. used cooking oil, tallow, etc.); and
- 'Second generation' biofuels, which are made from ligno-cellulosic biomass (all plant materials rather than solely plant starches or sugars). These biofuels are higher yielding and have smaller carbon footprints. Switchgrass and forestry and agricultural wastes are examples of potential feedstocks.

These types of biofuels are more likely to make a positive contribution to the world's energy security and climate change predicaments without creating significant economic, social and/or environmental problems of their own.

In the meantime, investors should be particularly careful to take into account all of these uncertainties and challenges when considering buying into biofuels companies.

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