

Biofuels – transporting us to a fossil-free future?

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Summary

Biofuels are the alternative to fossil fuels

Recently there has been a huge push worldwide for biofuels as an alternative or even replacement for fossil fuels in response to a number of pressing issues: soaring oil prices, ongoing global conflicts over oil resources and the pressure to do more for the environment. The great advantage of both bioethanol and biodiesel is that they are compatible with current engines and can be mixed with available types of petrol and diesel. This allows the existing infrastructure to be used with only very minor modifications.

This Sarasin report shows that from a sustainability perspective there are not only opportunities, but also a number of risks associated with the development of biofuels.

Biofuels: opportunities and risks	
Opportunities	Risks
<ul style="list-style-type: none"> ◆ Reduced dependency on fossil fuels ◆ Reduction of greenhouse gas emissions ◆ Reduction of air pollution ◆ Improved fuel quality ◆ No new logistics and infrastructure required ◆ Supportive of local agriculture 	<ul style="list-style-type: none"> ◆ Environmental impact of vast tracts of monoculture ◆ Mounting pressure for rainforest clearance ◆ Crops in competition with the food and animal feed industry ◆ Critical working and social conditions in Third World and developing countries ◆ Use of genetically modified energy crops ◆ Lack of sales markets for by-products

Source: Sarasin, July 2006

Growth constraints – despite subsidy programmes

At present biofuels are receiving massive support from subsidy programmes and tax incentives in the US, Brazil and Europe especially. A large number of new production plants are planned for both types of fuel in the coming years. The sharp rises in the share prices of companies in the biofuels business clearly reflect investors' high expectations. We are less excited about the future of this industry, because its expansion quickly comes up against certain natural constraints. The land area that is freely available for energy crops – taking into account the needs of the food and animal feed industry for fallow land, biodiversity and soil quality – is in fact limited.

No more than 5% of fossil fuels can be replaced in a sustainable way by first-generation biofuels

When making an overall assessment of the sustainability of biofuels, we believe certain criteria and developments are essential in order to justify the continued use of the label "bio" fuels. These include new technologies to produce cellulose ethanol using enzyme-based methods. We therefore favour companies focusing on bioethanol or on the development of the second generation of technologies, such as biomass-to-liquid (BtL) fuels. As far as raw materials are concerned, we favour companies which buy their feedstock from local cultivation areas with short transport distances. If the materials are procured from developing or emerging economies, companies need to apply a catalogue of environmental and social criteria.

Our assessment of the sustainability performance of 16 companies from this sector identified 10 of them as being eligible for our investment universe of Sarasin sustainability funds. Here it should be noted that biofuels are only a niche business for some companies.

Overview

Search is being stepped up for alternatives to crude oil

There are a number of important factors forcing many governments to search for alternatives to dominant fossil fuels: a more reliable and independent energy supply, reduction of air pollution and avoidance of greenhouse gases.

Biofuels have this potential, and also have the great advantage of being compatible with current engines and mixable with available types of petrol and diesel. This allows the existing infrastructure to be used with only very minor modifications. In fact many filling stations already offer petrol mixes with 10% ethanol (E10). In many OECD countries biodiesel is added to mineral diesel. France, for example, has a 5% mix (D5) and the US a 20% mix (D20), while in Germany some companies even use pure biodiesel (D100) for their truck fleets.

What are biofuels?

Biofuels are all the liquid fuels (bioethanol or biodiesel) and gas fuels (biogas) that are used in the transport sector and have a biological origin, such as farming or forestry. The following categories of biological materials can be used to make biofuels:

- ♦ Cereals and plants containing sugar (bioethanol);
- ♦ Plants containing oil (rapeseed, soya, oil palms, sunflowers) can be converted into biodiesel;
- ♦ Plants containing cellulose, such as grasses, trees and agricultural residues from other crops, can also be converted into bioethanol using a more complex process;
- ♦ Organic waste of any sort can be used as a base material for making biogas.

In this report we focus mainly on biodiesel and bioethanol.

Subsidy programs in Brazil, ...

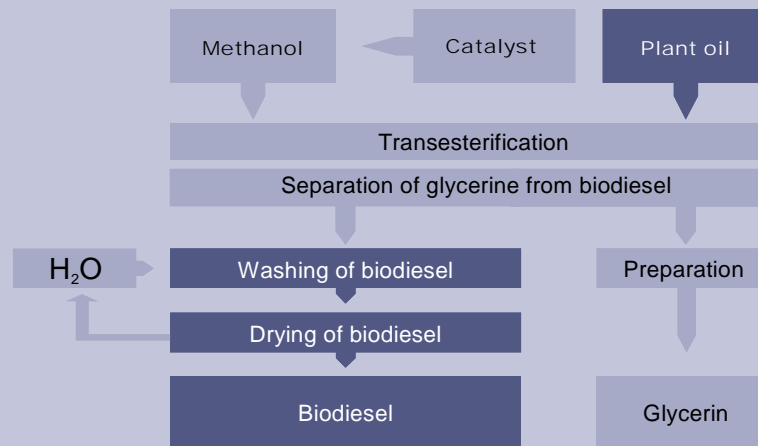
Brazil was the first country to develop a substantial market for bioethanol. The government launched a national ethanol fuel programme in 1975 following the first global oil crisis. This was designed to reduce Brazil's dependence on oil imports and at the same time take advantage of the massive sugar cane harvest. Now a third of all cars in Brazil are equipped to run on bioethanol or ethanol/petrol mixes.

... the US and the EU

Persistently high oil prices and the current discussion about the limits of mineral oil exploration are focusing more attention on alternative fuels. The US has passed a new law designed to double the use of biofuels from the current level of 13m tonnes to more than 28m tonnes in 2012. Europe is also promoting biofuels, with a new EU directive designed to increase the percentage of biofuels from 2% of total fuel consumption in 2005 (although only 1.4% has effectively been achieved) to 5.75% in 2010.

Production of biodiesel

Synonyms for biodiesel include FAME (Fatty Acid Methyl Ester) and RME (Rapeseed Methyl Ester). In principle any plant oil from rapeseed, sunflower, soya or oil palm can be used as a raw material for making biodiesel, as can animal fats. The main difference in the types of oil used lies in the fatty acid chain length and degree of saturation. These characteristics of the raw material can affect the properties of the biodiesel. Because of this, EN Standard 14214 has been developed to define and harmonise the quality of the end product.



Source: Association of German Biofuel Industry (Verband der Deutschen Biokraftstoffindustrie)

In 2004 the EU biodiesel production's basis was rapeseed oil for more than 75%. First the oil is extracted from the plant in a press. The residue (stems, etc.) can be used as high-protein animal feed. The plant oil is mixed with methanol to produce a chemical reaction (esterification). The result is a fuel with roughly the same viscosity as diesel fuel, which is an essential prerequisite for use in modern fuel-injection systems and diesel engines. This method creates 10% glycerine as a by-product, which is used as a raw material in the chemical industry. The average yield is 1,200 litres of biodiesel per hectare, depending on the growing region and the crop under cultivation.

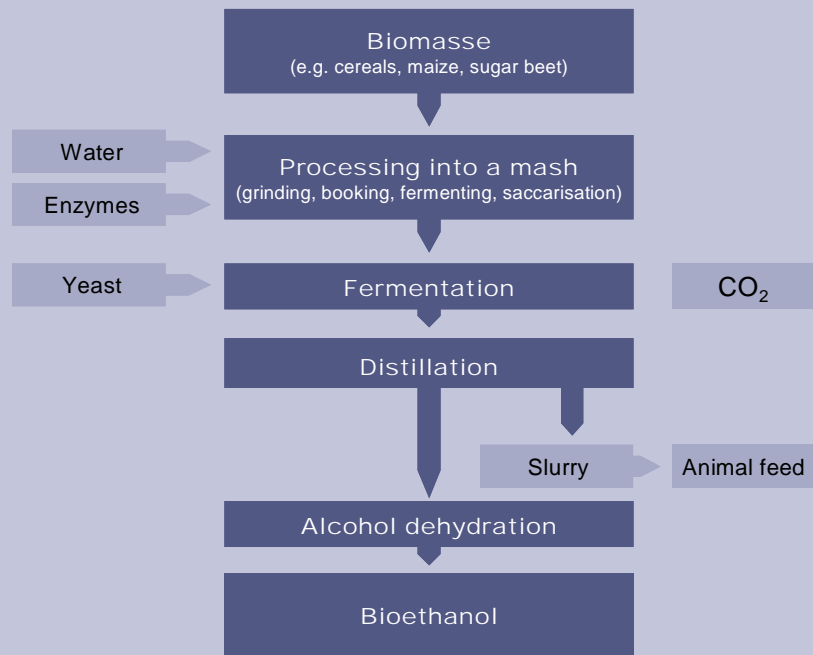
Production costs in the EU and the US are currently still much higher than for fossil fuels

The production costs for biodiesel are currently around 1.5 - 3 times higher than for mineral diesel, depending on the feedstock and production processes used. Bioethanol is also roughly 1.5 times more expensive to produce than petrol, but in large manufacturing plants it is cheaper to produce than biodiesel. At the moment there is no global biofuel market like there is for crude oil. This fact, combined with the broad variety of plants used, different land and salary expenses, sizes of production plant and state subsidies result in a wide range of production costs and prices. In Brazil, bioethanol can be produced from cane sugar for EUR 0.3/l. The costs for European bioethanol are around EUR 0.5 to 0.55/l, while the range in America is in the middle of that, at around EUR 0.35 - 0.4/l.

Production of bioethanol

Bioethanol can be produced from all types of plant that have a high enough sugar content (sugar beet and sugar cane) or which contain substances that can be converted into sugar (starch or cellulose for second generation biofuel).

Although cellulose requires more expensive technology, it produces a higher yield per hectare. Ethanol is normally produced by fermenting the sugar with the help of yeast cultures. The spent mass that is left over from the fermentation (slurry) can be used as animal feed. With bioethanol, the annual yield per hectare is between 6,500l (sugar cane in Brazil) and 2,500l (wheat in Europe). Bioethanol only contains roughly two-thirds as much energy as petrol (21 MJ/l vs. 35.7 MJ/l).



Source: Association of German Biofuel Industry (*Verband der Deutschen Biokraftstoffindustrie*)

Assessment of sustainability performance

Convincing arguments for biofuels

The growth of biofuels is currently being supported by state subsidy programmes, especially in Brazil, the US and the EU. These programmes usually entail tax incentives designed to compensate for the higher production costs of biofuels. The following positive aspects or opportunities are the main drivers for biofuels:

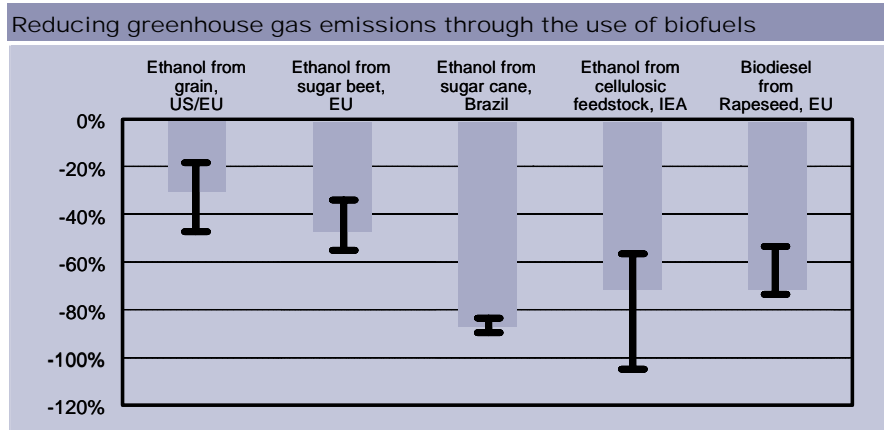
- ◆ **Reduced dependency on fossil fuels**

Biofuels can be used as a direct replacement for petrol and diesel, thereby helping to reduce a country's oil imports. In many cases the biofuels originate from locally cultivated crops. This also allows countries to improve their balance of trade. On the other hand some countries, such as Japan and Sweden, have already made agreements on imports of bioethanol from Brazil, although such arrangements simply tend to shift the current dependency on mineral oil onto other countries.

- ◆ **Kyoto Protocol and climate protection targets**

Over the course of their entire life cycle – i.e. from planting the seed to producing the fuel – biofuels produce far less CO₂ and other greenhouse gases than mineral fuels. The amount of CO₂ produced from burning biofuels is deemed to be carbon-neutral, because the plant extracts the same amount of carbon dioxide from the air while it is growing. Various environmental audits

indicate a reduction of 20% - 50% in CO₂ emissions along the entire production chain, depending on the plant and process used. With sugar cane as raw material or using newer technologies such as cellulose-ethanol, it is even possible to cut CO₂ emissions by 80% to 100%. The next chart shows the potential savings in CO₂-equivalent emissions from the field to the car ('well-to-wheels') compared with a car running on conventional fuel.



Source: IEA 2004: Biofuels for Transport

The targets for reduced greenhouse gas emissions agreed by individual countries in the Kyoto Protocol provide a big incentive for the wider use of biofuels. There is mounting political pressure on the transport sector in the EU, because it is the only industrial sector that still has no target for cutting greenhouse gas emissions.

◆ **Reduction of air pollution**

Biofuels produce less air pollution, whether used in pure form or combined with conventional fuels. Emissions of carbon monoxide and particulates can be reduced by 30%-50%. Biofuels do not contain sulphur and therefore cut down on acidic sulphur dioxide emissions.

◆ **Fuel quality**

Refinery companies and car makers are very interested in the use of bio-ethanol as a fuel additive, since it has good antiknock properties and can therefore replace harmful additives such as methyl tertiary butyl ether (MTBE). In addition, because they are biodegradable, biofuels do not damage the soil or groundwater if there is a spill or an accident.

◆ **Immediate use**

Unlike other alternative fuels, such as natural gas or hydrogen, biofuels can be introduced to the market rapidly using the existing infrastructure of refineries and filling stations, and with the current engine technology. Only a bio-ethanol mix greater than 10% needs cars especially adapted to run on 'flexible fuel', i.e. capable of running on any blend of bioethanol and petrol. Such vehicles have been tried and tested in Brazil for some time now.

Risks associated with biofuels should not be overlooked

◆ **Supporting the development of local agriculture**

Biofuels make it possible to combine an energy policy with an agricultural policy. Despite cuts in farming subsidies, farmers can tap into a new source of income by planting energy crops.

Apart from the opportunities described, biofuels also present a number of risks or critical aspects that need to be taken into consideration from a sustainability perspective. These are associated mainly with the use of raw materials (palm oil, soya oil, sugar cane) from developing and emerging market countries.

◆ **Monocultures have a negative environmental impact**

Apart from the positive impact on greenhouse gases outlined above, biofuels also have a number of negative environmental impacts. The increased use of pesticides and fertilisers in monoculture crops causes pollution of the soil and groundwater. The nitrogen compounds created by agricultural production encourage eutrophication, acidification and ozone depletion.

◆ **Increased rainforest clearance**

A number of non-governmental organisations (NGOs) such as *Friends of the Earth* and the *WWF* are very worried about the rising production of biofuels in developing countries. This trend puts more pressure on the clearance of the rainforest. This results not only in the loss of important ecosystems with a high biodiversity, but the advantage of using carbon-neutral fuels is offset by the destruction of the rainforest which helps to capture CO₂ from the atmosphere. Furthermore, it would be economically cheaper for these countries to use this bioenergy locally rather than exporting it. Direct use of the energy at home avoids expensive imports of mineral oil and natural gas and helps to develop regional value chains.

◆ **Opposition from the food industry**

The *Confederation of the Food & Drink Industries of the EU (CIAA)* has expressed public concern about an increase in biofuel production, since it could push up prices for agricultural products. Price pressure is mounting in plant oils especially, because of the growing raw materials dilemma. The price of rapeseed oil, for example, has risen in recent months to the point where it is 45% higher than its five-year average. Three-quarters of the world's ethanol production is already used as motor fuel. In the case of rapeseed, over 50% of production now goes into biodiesel.

◆ **High CO₂ prevention costs**

Another criticism levelled by the food & beverage industry is that the costs of preventing CO₂ emissions when producing biodiesel or conventional bioethanol in Europe or the US are at least EUR 100 per tonne. This is much higher than other measures for reducing CO₂ emissions, such as trapping landfill gas or measures to improve the efficiency of engines or power stations.

◆ **Critical working and social conditions**

More negative social trends could occur here in Third World and developing countries especially. Industrialised farming of energy crops uses large amounts of agrochemicals. These are the main potential health risk to people working in agriculture. With sugar cane especially, the burning of fields can also be damaging to health because of the air pollution.

◆ **Genetically modified energy crops**

The use of crops for producing biofuels could soon require higher yields to be achieved with the help of genetically modified plant types. Here experts are even talking about selectively developing bespoke 'energy crops'. There is a risk that this could lead to cross-contamination of non-GMO foods or animal feeds. Opponents also fear that the use of genetically modified energy crops could encourage insidious acceptance of GMO crops by farmers and consumers.

The next table provides an overview of all the risks and opportunities described above.

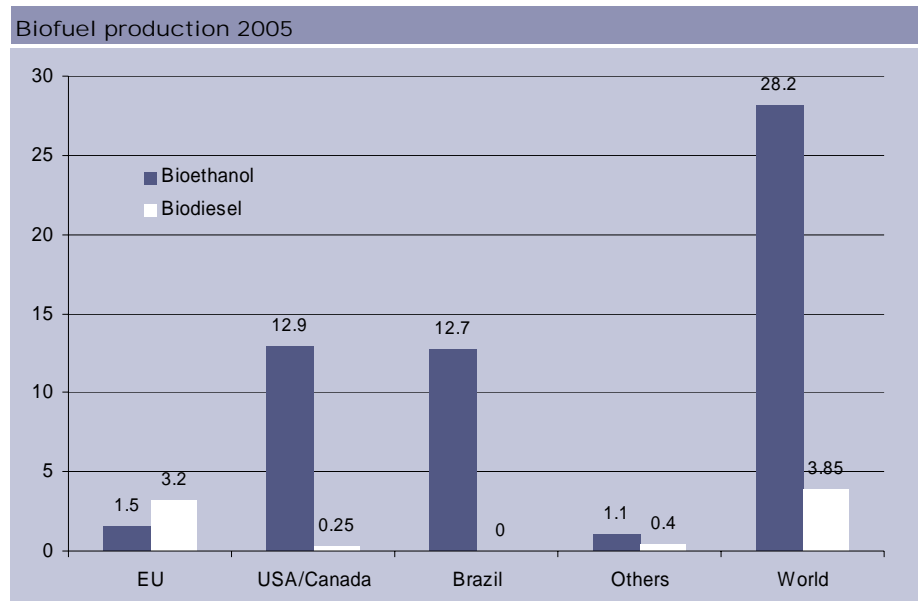
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Source: Bank Sarasin, July 2006

Market prospects and constraints

Bioethanol is the dominant biofuel worldwide

Bioethanol is easily the world's most heavily used biofuel (28.2m tonnes in 2005), especially because of the large production volumes in the US and Brazil. By contrast, biodiesel production is the highest in Europe (3.2m tonnes in 2005). The total quantity of biofuel used in 2005 was around 650,000 barrels/day, equivalent to less than 0.8% of global mineral oil consumption of 83m barrels/day. There are over 80 companies active in the European biofuel market, with the top three [Diester Industrie, Archer-Daniels-Midland (ADM) and Novaoil (Bunge)] commanding a combined market share of 60%.



Source: EBB (European Biodiesel Board) and Bank Sarasin estimates

Global bioethanol production has risen by 60% since 2000. Biodiesel production jumped 250% over the same period.

Numerous projects for expanding capacity are planned for both types of fuel in the years ahead.

Expansion plans and official targets for biofuels			
Market	Production 2005	Expansion plans	Official targets (by law)
US (bioethanol)	12.9m tonnes bioethanol (~2% of total petrol consumption). (+17% increase in output vs. 2004)	In 2006 33 plants are being built and 8 production facilities expanded to provide an additional 5.7m tonnes (+44%)	The new Energy Act (EPACT) aims to achieve 28.4m tonnes of biofuel by 2012 (mainly bioethanol)
EU (biodiesel)	3.18m tonnes in 75 plants with a capacity of 4.2m tonnes (+65% vs. 2004)	10-25 new plants to come on stream by the end of 2006, which will increase capacity to 6m tonnes (+43%)	EU directive plans to increase the quota of biofuels from 2% to 5.75% by the end of 2010. (equivalent to approx. 14m tonnes)
Germany (biodiesel)	1.7m tonnes (+60% vs. 2004)	In 2006 production is set to rise to 2.2m tonnes (+30%)	5.75% biodiesel in 2010 equivalent to around 2.2m tonnes for DE. Can be achieved in 2006

Source: American Renewable Fuel Association, RFA; EBB

Market forecasts for biofuels up to 2010 show growth rates of >20% p.a.

Market growth is expected to accelerate in the coming years (see table below) thanks to subsidy programmes and tax incentives.

Growth forecasts for the biofuel market			
Source and market	Current	Forecast	Growth rate p.a.
IEA* (April 2004)	(2000)	(2010)	(2000-2010)
Biodiesel (US market)	0.1m tonnes	10.8m tonnes	60%
Bioethanol (US market)	6.2m tonnes	38.6m tonnes	20%
Biodiesel (EU market)	0.7m tonnes	10.2m tonnes	30%
Bioethanol (EU market)	0.3m tonnes	11.4m tonnes	44%
Frost&Sullivan (Sept 2005)	(2004)	(2011)	(2004-2011)
Biodiesel (EU market)	1.9m tonnes	9.8m tonnes	26.4%
Bioethanol (EU market)	0.6m tonnes	3.55m tonnes	28.5%

* IEA = International Energy Agency; Source: see table

Biofuel growth will hit a barrier
– Investors should tread cautiously

It is clear from the sharp rise in the share prices of biofuel companies that stock markets expect high growth rates to continue in future. We advise a more cautious approach, as growth could quickly come up against natural barriers in the short term at least. This is mainly due to the limited availability of raw materials (arable land, competition for use by the food & beverage industry), but also due to the limited saleability of by-products. In all the regions mentioned above, it is actually unclear how much land is available for growing energy crops without having a negative impact on the needs of the food industry, animal feed industry, fallow land, soil quality and biodiversity.

No sales markets for by-products

13% of the US maize harvest went towards alcohol production in 2005. If the target set in EPACT of 28.4m tonnes is achieved in full, this would generate approximately 12 - 14m tonnes of animal feed. Industry experts estimate that new markets and applications would have to be found for such huge quantities of by-product, such as foods, fertilisers or cat litter. The same applies to glycerine, the by-product of biodiesel manufacture.

Higher biofuel quotas will require huge areas of arable land

Both in the EU and the US the amount of arable land required for a substantial increase in the quota of biofuels (>5%) would be enormous. In its scenario up to 2010 for the replacement of 5% of conventional fuel with biofuel, the IEA estimates that around 15% - 20% of the land currently under cultivation will be required, depending on fuel usage, the development of yields per hectare, and the type of energy crop grown.

Too many projects will lead to an overheating of the biofuel market

Many additional plants are already being constructed or planned (US 2006: 44% expansion of bioethanol capacity; EU 2006: 43% expansion of biodiesel production capacity). Given the backdrop of limited availability of raw materials, the potential for future projects is therefore limited and there could be a danger of the biofuel market overheating in the mid-term.

Criteria for sustainable biofuels

Criteria for a sustainable investment in the biofuels industry

Because of the risks described, biofuels cannot automatically be classed as sustainable, despite their “**bio**” label. We therefore think there are certain criteria and developments that are essential if biofuels are still to be classed as renewable energies in future, and ones that stand up to thorough sustainability analysis. Sarasin seeks to invest in companies that actively support the following trends:

Fuel type

- ◆ Bioethanol is preferable to biodiesel, because it can be made from a broader range of raw materials; it offers a higher yield per hectare and a better CO₂ balance.
- ◆ New – second generation – technologies for making bioethanol, which can also use ligno-cellulose, i.e. the inedible part of the plant (straw and stems) as feedstock, provide better eco-efficiency. An enzymatic process allows cellulose to be used for ethanol production, while lignin can be used to generate electricity for the production plant. This allows greenhouse gas emissions to be reduced by around 90%, compared with 30% - 50% for traditional technologies.

- ◆ Other interesting technologies from a sustainability perspective involve the liquefaction of biomass (Biomass-to-Liquid, BtL) or fermentation to produce biogas. Both options allow a much wider choice of biomass. BtL fuels are extremely clean synthetic fuels which are produced, through gasification and subsequent synthesis, from solid biomass such as wood or straw. The development of this next generation of biofuels is still in its infancy, but in the long term they promise much greater potential than conventional plant oils and bioethanol.

Raw materials used

- ◆ From a sustainability viewpoint, preference is given to companies which procure their raw materials from local cultivation areas with short transport distances. From an economic perspective as well, longer-term contracts that safeguard the supply of raw materials are also preferable to purchasing materials on the spot market.
- ◆ With procurement of raw materials or biofuels from developing countries, we expect companies to have a catalogue of environmental and social criteria that they apply to the cultivation of the energy crop. One UK biodiesel company, for example, is involved in drawing up criteria for the sustainable cultivation of palm oil. This working group was set up two years ago by the food industry and representatives of the palm oil supply chain in collaboration with the *WWF*.
- ◆ As far as sustainability is concerned, the most suitable raw materials for producing biofuels are “optimised” energy crops that have additional environmental benefits. Examples include *sweet sorghum* for making bioethanol and *jatropha* for producing biodiesel. The *jatropha* plant can also be grown on arid soil threatened by erosion and – like *sorghum* – can get by with very little water.
- ◆ It is important to consider the entire life cycle for biofuel production. To prevent the use of biofuel with a “poor environmental quality”, the European standards committee, CEN, intends to publish a quality standard for biofuels. In Switzerland, Alcosuisse wants to create a quality label in collaboration with those players involved. This label is designed to guarantee the quality of the technology and environment (life cycle, especially CO₂ and eco-efficiency) and must be satisfied by the bioethanol produced in Switzerland and imported into Switzerland.

Conclusion

Sustainability analysis puts the limit for biofuels quota at 5%

Until new technological advances enable biomass to be exploited more efficiently so that not just the “edible” part of the plants are burnt in our car engines, we place the present limit for the environmentally and socially responsible use of biofuels at roughly 5% of current petrol and diesel consumption in the EU and US. A second generation of biofuels, such as cellulose-ethanol, BtL fuels and biogas, are making technological progress. We think the sustainability of these products is generally more convincing, because the yield per hectare is higher on the one hand, while on the other many different types of plant can be used as feedstock.

It should also be noted that all initiatives to replace conventional fuels only make sense when combined with further measures to improve efficiency in the manufacture of engines and vehicles.

Sustainability rating of individual companies

10 of the 16 companies analysed qualify for Sarasin's sustainable investment universe

The overview on the next page provides a selection of major listed companies with activities in the biofuel sector and their sustainability rating based on the criteria described. Of the 16 companies from this sector, 10 of them are eligible for inclusion in our investment universe of Sarasin sustainability funds. Here it should be noted that biofuels are only a niche business for some companies. The sustainability rating of these companies is the result of a general assessment of the company. Here biofuels only represent one element of their business (and an insignificant one in some cases). These companies could therefore be eligible/ineligible on the basis of this comprehensive sustainability analysis.



Sustainability rating of companies active in the biofuels sector (1: "pure player", 2: "niche business")							
Company	Cat.	Country	Fuel type		Raw material used		Eligible for Sarasin universe
Abengoa	2	SP	Bioethanol, recently Biodiesel as well	+	All energy crops; R&D with cellulose; regional procurement	+	Yes
Biofuels Corp	1	GB	Biodiesel	-	Plant oils; with sust. criteria; global procurement via long-term contracts	+	Yes
D1 Oils	1	GB	Biodiesel	-	Jatropha plant; incl. sust. criteria, regional procurement worldwide	+	Yes
EOP Biodiesel	1	GE	Biodiesel	-	Rapeseed; no sust. criteria; regional procurement and Eastern Europe	+	Yes
Pacific Ethanol	1	US	Bioethanol	+	Maize, among others; no sust. criteria; regional procurement	=	Yes
Renova Energy	1	UK	Bioethanol	+	Maize, among others; no sust. criteria; regional procurement	=	Yes
Xethanol	1	US	Bioethanol	+	Biomass, organic waste; regional procurement	=	Yes
Neste Oil	2	FI	Biodiesel	-	Plant oils and animal fats; regional procurement	=	Yes
Novozymes	2	DK	Allows production of cellulose-ethanol	+	Enzyme provider	+	Yes
Sunopta	2	CA	Allows production of cellulose-ethanol	+	Process provider for ligno-cellulose	+	Yes
Biopetrol Industries	1	SZ	Biodiesel	-	Plant oils; no sust. criteria; global procurement	-	No
Cosan	1	BZ	Bioethanol	+	Sugar cane; no sust. criteria; regional procurement in Brazil	-	No
Archer Daniels Midland	2	US	Biodiesel and Bioethanol	=	All energy crops; no sust. criteria; regional procurement and spot market	-	No
Agrana	2	AS	Bioethanol	+	Wheat, sugar beet; no sust. criteria; regional procurement	-	No
Bunge	2	US	Biodiesel	-	Plant oils; no sust. criteria; regional procurement and spot market	-	No
Südzucker	2	GE	Bioethanol	+	Wheat, sugar beet; no sust. criteria; regional procurement	-	No

Source: Bank Sarasin, July 2006

Further information sources and links

International Energy Agency, IEA: Biofuels for Transport – An International Perspective, April 2004
 Frost & Sullivan: European Biofuels - Market and Opportunity – Analysis, Sept. 2005
 American Renewable Biofuel Association, RFA: Ethanol Industry Outlook 2006, Feb. 2006; www.ethanolRFA.org
 Union zur Förderung von Oel- und Proteinpflanzen, UFOP; www.ufop.de
 Verband der Deutschen Biokraftstoffindustrie; www.biokraftstoffverband.de
 European Biomass Industry Association; www.eubia.org
 European Biodiesel Board; www.ebb-eu.org
 Biofuel Markets, Brussels 17 February 2006; www.greenpowerconferences.com
 Roundtable on Sustainable Palm Oil; www.sustainable-palmoil.org
www.ethanol-statt-benzin.de
www.regenwald.org

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Publications

Biofuels	Biofuels – transporting us into a fossil-free future? Matthias Fawer, July 2006
Trading	Buying into sustainability. Environmental and social challenges in Trading, Distribution and Retailing. Michaela Collins, June 2006
Textiles & Luxury Goods	“Just do it” – but responsibly. An analysis of the environmental and social aspects of the apparel, textile and luxury goods industry. Makiko Ashida, March 2006
Solar Energy 2005	Solar Energy 2005 – Silicon supply bottleneck at odds with booming demand. Matthias Fawer, November 2005
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