

June 2007

Biofuels in Europe

EuropaBio position and specific recommendations

This position represents the current consensus view of EuropaBio's Biofuels Task Force and does not necessarily represent the opinion of individual member companies. We reserve the right to review this position as the issues and policy in this area further evolves.

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About EuropaBio

EuropaBio, the European Association for Bioindustries, has 85 direct members operating Worldwide, 12 associate members and 6 bioregions as well as 25 national biotechnology associations representing some 1800 small and medium sized enterprises involved in research and development, testing, manufacturing and distribution of biotechnology products. More information can be found on <http://www.europabio.org>

For more information

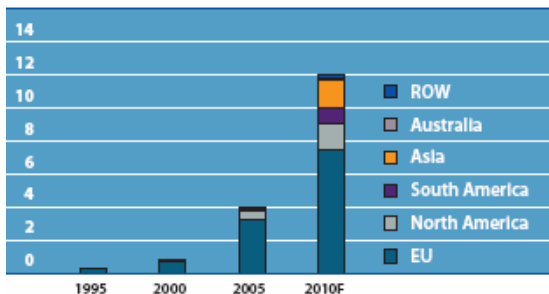
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1. Biofuels worldwide

Today, the global biofuels market consists of approximately 85% bioethanol and 15% biodiesel. Bioethanol is produced and consumed mainly in Brazil and North America. On the other hand, Europe is the world leader in biodiesel production and this fuel represents about 3/4 of the European biofuels market.

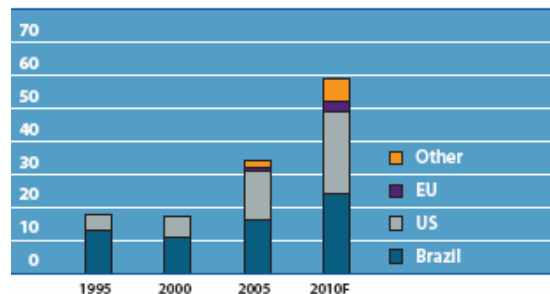
The following figures¹ illustrate the medium-term worldwide projections for global biodiesel and ethanol production respectively. By 2010, it is estimated that global biodiesel production will be three times that of 2005, while the global biofuel ethanol production in 2010 is expected to be close to double the output in 2005. Probably the vast majority, if not all, of this increased production will employ first generation technology, and agricultural crops will continue to account for the bulk of raw material used by the sector, while second generation technologies (e.g. cellulosic ethanol and biomass-to-liquid biodiesel) will enter mainstream commercial production after 2010.

Figure 5: Global biodiesel production, 1995 - 2010
in million tonnes



Source: Rabobank (2006)

Figure 6: Global fuel ethanol production, 1995 - 2010
in billion litres



Source: Rabobank (2006)

2. European biofuels policy

Europe is supporting the production and use of biofuels via several strategies and action plans:

- In 2003, the EU adopted **Directive 2003/30/EC**² on the promotion of the use of biofuels for transport. This "biofuels directive" urged member states to set indicative targets for a minimum proportion of biofuels to be placed on the market. These targets were set at 2% in 2005 and 5.75% in 2010.
- **Directive 2003/96/EC**³ restructuring the Community framework for the taxation of energy products and electricity. As biofuels are currently more expensive than traditional fuels, this Directive allows Member States, to apply a total or partial exemption of taxation for biofuels.
- In view of higher oil prices and the urgency of a new debate on security of energy supply, the Commission presented a **Biomass Action Plan**⁴ in December 2005, setting out measures to increase the development of biomass energy from wood, wastes and agricultural crops.
- In February 2006, the Commission published a new Communication entitled **An EU Strategy for Biofuels**⁵ preparing the ground for a review of the Biofuels Directive by the end of 2006, which might include mandatory targets instead of the indicative ones set in 2003. The aim of the strategy was to further promote biofuels in the EU, to prepare for the large scale use of biofuels, and to explore opportunities for developing countries to build plants with which to produce biofuels.

¹ http://www.rabobankgroep.nl/download/Rabobank_bio-energy_totaal_DEF.pdf

² http://ec.europa.eu/energy/res/legislation/doc/biofuels/en_final.pdf

³ http://ec.europa.eu/energy/res/legislation/doc/biofuels/taxation_energy_products_and_electricity.pdf

⁴ http://ec.europa.eu/energy/res/biomass_action_plan/green_electricity_en.htm

⁵ http://ec.europa.eu/energy/res/biomass_action_plan/doc/2006_02_08_comm_eu_strategy_en.pdf

- In January 2007, the Commission proposed its strategic **Energy Policy for Europe**⁶. Central to the proposals is a binding target to slash the EU's greenhouse gas (GHG) emissions by 20% in 2020 compared with 1999 levels, a binding target for 20% of the EU's energy mix to come from renewables by 2020, and an obligation for each Member State to have **10% biofuels** in their transport fuel mix by 2020. This proposal was endorsed by the Heads of Governments during the European Summit in March 2007.

3. The 5.75% biofuel target in 2010

The Biofuels Directive (Dir 2003/30/EC) urged member states to set indicative targets for the quantity of biofuels to be placed on the market: 2% in 2005 and 5.75% in 2010.

Although the biofuels progress report⁷ shows that biofuels have doubled their market share in two years, from 0.5% in 2003 to 1% in 2005, this growth rate is not fast enough. The quantity achieved in 2005 fell short of the 2% reference value laid down in the Biofuels Directive.

This situation is expected to change, because most Member States have now introduced tax exemptions for biofuels. Eight have even introduced biofuel obligations, and many others are considering them. Nevertheless, the report estimates that on present policies and measures, biofuels' share in 2010 will not rise much above 4%, and the biofuels Directive's 5.75% target for 2010 is not likely to be achieved.

A study performed by DG Agriculture of the European Commission, shows the implications on European land use in 2010 if we want to reach the 5.75% biofuel production target. To reach this target by 2010, Europe needs to produce 24 million tonnes of biofuels, replacing 18.6 million tons of fossil fuels currently used. If all crops would be produced in the EU, 16 to 18 million ha of agricultural land would be needed. As the total arable area in the EU is around 103.6 million ha, this means almost 20% of all currently available arable land should be cultivated for biofuels. Although on a first view this does not look very realistic, there is lot of flexibility: there is almost 4 million ha obligatory set-aside land in the EU-15, and almost 3 million ha of suitable land currently not cultivated, which can be cultivated for energy (biofuels) crops. Today, the EU also produces a surplus of food that it stores in intervention stocks. And of course productivity and yields have scope to increase by adopting the best agricultural practices (e.g. in Eastern Europe yields can increase by adopting existing good agricultural practices from Western Europe) and due to innovation.

4. The 10% biofuel target in 2020

In early 2007, the EU Commission proposed an "integrated energy and climate change" package. This Communication on an Energy Strategy received the support of the European Parliament and from the Energy and Environment Councils, and was finally adopted by EU Heads of State during the European Council on 8-9 March 2007. The overall strategic objective is to limit the increase in global average temperature

- by using 20% renewable energy in 2020
- by reducing greenhouse gas (GHG) emissions in 2020 by 20% compared to 1999
- by 20% energy savings compared to projections for 2020
- and with a 10% **binding** minimum target for biofuels in 2020.

It is also worth to mention that this 10% biofuels target also includes a 120,000 net increase in employment and the EU GDP rising by 0,17%, assuming all biofuels are produced domestically from European feedstock.

In this proposal, the Commission intends to promote the development of so-called second generation biofuels which are produced from ligno-cellulosic or 'woody' raw materials such as straw, timber, woodchips or manure. It has argued that these are more favourable than the current "first generation" biofuels mainly produced from crops such as sugar beet and rapeseed, due to their expected lower costs, their more

⁶ http://eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0001en01.pdf

⁷ http://ec.europa.eu/energy/energy_policy/doc/07_biofuels_progress_report_en.pdf

favourable GHG balance, their energy output and better fuel quality. In addition, their ability to use a wider range of raw materials means that they compete less with food production. However, such second generation technology is still only at the development stage and requires concerted investment and political support.

Therefore, at the March 2007 European Council, EU Heads of State asked the Commission to draft proposals in 2007 towards a comprehensive new Directive on the use of all renewable energy resources that would include Member States national targets and action plans on how to achieve these targets. They also called for implementation of the Biomass Action Plan, notably demonstration projects for second generation biofuels, and the Fuel Quality Directive being amended accordingly to allow for adequate levels of blending.

Concerning the revision of the directive regarding the specification for biofuel, the Commission proposed that from 2011, fuel suppliers will have to reduce GHG emissions attributed to the use of their fuels over their life cycle (refining, transportation, use) per unit of energy by 1% a year from 2010 level. This should result in a 10% cut by 2020. And to enable a higher volume of biofuels to be used in petrol, a separate petrol blend will be established with a higher permitted content of oxygen-containing additives (so-called oxygenates), including up to 10% ethanol.

5. Biotechnology: an essential technology to produce biofuel

In order to achieve the ambitious goals of biofuel use set by the European Union (5.75% in 2010 and 10% in 2020) in a sustainable and competitive way, the available biomass in Europe will need to increase. Cultivating energy crops on set-aside and non-cultivated land will contribute, but this won't be sufficient to fulfill all the demand.

It will also be critical to increase land productivity (meaning more biomass output/ha), as well as crop quality (meaning more fermentable carbohydrates or higher oil content). This can be done via plant science (modern plant breeding techniques and biotechnology) in combination with state-of-the-art application of crop protection.

Another important step to increase the biofuel production will be the competitive production of biofuels from (hemi) cellulose and organic agricultural waste instead of from starch, sugar and oils. These are the so-called second generation biofuels. Again innovation in plant science and industrial biotechnology – especially (hemi)cellulose degrading enzymes with improved efficiency - will be crucial to obtain this.

Biotechnology is today one of the most effective and innovative tools we have to attain European targets for biofuel use, while reducing adverse environmental impacts of transport, and limiting the impact of the increased cultivated land.

Biotechnological techniques can help to:

- Increase biomass yield/ha while reducing the needs for production inputs;
- Improve crop quality (higher biofuel yields);
- Contribute to also grow energy crops in areas with marginal conditions;
- Develop efficient micro-organisms and enzymes to convert the (hemi)cellulose to sugars, which can then be fermented into biofuel; and
- Convert agricultural waste into biofuels.

6. EuropaBio's position on biofuels

The European biotech industry strongly supports EU initiatives to boost the use of biofuels. EuropaBio also shares the concern of European leaders that the high use of energy stemming from fossil resources is untenable in the long term. The challenges of increasing CO₂ emissions, climate change, increasing import dependence and higher energy prices all send clear signals that Europe needs to act now to deliver sustainable, secure and competitive energy.

EuropaBio believes that biotechnology can offer a solution - ensuring an energy supply, in particular in the transportation sector – that is heavily independent of oil and that leads to significant reductions in CO₂ emissions.

Currently and for the foreseeable future, the transport sector can only operate with energy in liquid form (fuel) and it is the opinion of EuropaBio that the only realistic alternatives to fossil based energy for the transport sector are biofuels - such as bioethanol, biobutanol or biodiesel - produced from renewable raw materials from agricultural production and (often) with the involvement of advanced enzyme or microbial systems in the conversion processes. The advantage of biofuels is indeed that they can be blended with existing transport fuels, and that they are compatible with existing vehicles.

Well-to-wheel assessments indicate that the use of biofuels in vehicles yield definite benefits in terms of GHG emissions compared to petroleum-based automotive fuels, although the precise amount of saved CO₂ emission depends on the specific type of raw material used, the production process for the agricultural raw materials, the conversion process and several other elements. EuropaBio strongly believes that biofuels, and in particular second generation biofuels (such as bioethanol or biodiesel from ligno-cellulosic biomass or biodiesel from biomass gasification) has the potential to become an attractive replacement for fossil transportation fuels for both environmental and economic (depending on the oil price) reasons, and due to its potential of creating jobs in rural areas.

To reach the 10% biofuels target, the EU urgently needs to draw up a comprehensive and coherent framework comprising all relevant policy areas. This will require a realistic roadmap to implement the different policies.

We also need to encourage investments in second generation technologies, and a Europe-wide coherent research project with funding from the European Commission as well as from the different Member States.

EuropaBio also underlines that in order to facilitate the transition towards second generation biofuels, a market for first generation biofuels is needed, with an appropriate infrastructure and distribution.

7. EuropaBio's recommendations

7.1. General recommendations

EuropaBio supports the various EU initiatives to boost the use of biofuels and advocates a step-by-step approach from the current first generation to more advanced biofuels. Specifically, the industry:

- calls upon the Member States to implement, as soon as possible, the principle of binding targets for blending biofuels with petrol and diesel;
- supports a change in fuel standards to permit a higher biofuel content in blends of petrol and diesel; and
- advocates performance based regulation that encourages efficient delivery of biofuels which are most effective in reducing green house gas emissions.

In order to harvest the full potential of biofuels, EuropaBio encourages European legislators to follow a similar approach to the USA and China and initiate policy measures which will allow second generation biofuels to become a viable, commercial business within the next 4-6 years.

This should include support to further research in second generation technologies as well as support for demonstration projects. EuropaBio recommends that the Biofuels Technology Platform is used as the key platform on innovation in this area. It would also include explicit commitments from European legislators on long term strategies and plans that could encourage the investing society to invest in the area.

In EuropaBio's opinion, the integrated diversified biorefinery - an integrated cluster of industries, using a variety of different technologies to produce chemicals, materials, biofuels and power from biomass raw materials - will be a key element in the future. And although the current renewable feedstocks are typically wood, starch and sugar, in future more complex by-products such as straw and even agricultural residues and households waste could be converted into a wide range of end products, including biofuels. Cross sectoral approaches might bring real win-win situations for the EU economy.

Finally, EuropaBio encourages European legislators to establish a certification system for sustainable production and use of biofuels in order to ensure that biomass production always complies with good agricultural and labour practices and ensures a good and responsible balance between food and non-food crop production, complying with existing international standards and agreements. Robust, realistic and coherent sustainability schemes - to be respected all over Europe, and preferentially worldwide – could help to achieve this.

EuropaBio bases its optimistic view on the potential of biofuels on many reports and statistics elaborated by independent and well respected institutes and/or organisations (see Annex).

However, EuropaBio can not support any unsustainable use of plant material for biofuel production and we insist that the use of biomass for fuel purposes should not jeopardise European and third countries' ability to secure its people's food supply, nor should it prevent achieving environmental priorities such as protecting forests, preventing soil degradation and keeping a good ecological status of waters.

7.2. Eco-efficiency of biofuels

The eco-efficiency of biofuels has been analysed by several researchers during the past decade often with very different outcomes, partly due to a lack of a common analytical protocol and partly due to the fact that the assessed production conditions represent a broad diversity.

Several studies have been published on the eco-efficiency of biofuels⁸. They all found that CO₂ savings with the present biofuel technologies are between 20 and 80% (depending on the feedstock and conversion process) compared with using conventional petrol. And this can increase to 90% and higher for second generation biofuel such as cellulosic ethanol. High energy feedstock, less fuel intensive cultivation of crops and low carbon conversion processes could further help us to achieve this.

It is important to realise that the technologies for large scale ethanol production in Europe is still in its infancy and that performance can be improved considerably as the technology matures.

7.3. Biofuel and land use – Food vs. non-food

A recent study from the European Environment Agency (2006) entitled "How much bio-energy can Europe produce without harming the environment"⁹ foresees that large areas of agricultural land will be superfluous in the coming decades, partly due to yield improvements and partly due to agricultural reforms. This study presents data showing that even with strict environmental constraints Europe has and will continue to have access to sufficient unutilized biomass allowing up to one quarter of all transportation fuel to come from

⁸ <http://ies.jrc.ec.europa.eu/wtw.html>

⁹ http://reports.eea.europa.eu/eea_report_2006_7/en

biofuels in 2030. Other recent studies (Copernicus Institute, IPCC, etc.) indicate that Europe could have sufficient biofuel raw materials to replace more than 30% of the transport fuel (this includes second generation biofuels from agricultural residues and specific energy crops). On the other hand, it is not the aim that all biomass will be produced in Europe itself. What we need is a balanced approach respecting realistic sustainability criteria.

Experience from the USA shows that since 1948, maize yields have increased four-fold, from 40 bushels per acre to 160 bushels/acre in 2004 due to the use of fertilizers, better agricultural practices, innovation, and improved new varieties. Yields and crop quality can be further increased via plant science (modern plant breeding, genomics and biotechnology). The conclusion is therefore that an increasing demand to a large extent has been met by improved productivity, whereas growth in inputs used, such as land, has been quite modest.

EuropaBio considers that the unsustainable use of land for the production of biofuels can be avoided if efforts are concentrated on raising the yields of existing agricultural land instead of widespread deforestation. Besides relying on good agricultural practice, including proper application of crop protection products and fertilizers, one way of increasing the yield per hectare is to use new breeding and modern biotechnology techniques.

In addition, second generation biofuels will also focus on using non-food parts of current crops as well as other crops that are not used for food purposes (such as switch grass, cereals that bear little grain and more fiber, wood chips, etc.).

7.4. Biofuels and Developing Countries

The development of biofuels also has a large potential for Developing Countries. In Developing Countries the majority of the population often lives in rural areas and subsists on agriculture. Such peoples are more vulnerable to natural disasters such as storms, floods and droughts and all efforts to counteract climate changes will therefore be beneficial. Global warming itself is today, a bigger danger to the biodiversity in these areas.

The development of biofuels will also bring direct opportunities to Developing Countries because their production will create many local jobs in the value chain from growing raw materials to their actual manufacture.

Industrialised countries must be prepared to set up the right regulatory frameworks with their local counterparts which can support a sustainable development for these countries and prevent unsustainable cutting of rain forests and similar (such as biofuels and sustainable production certification schemes). A realistic quota system where a certain percentage of the biomass has to be produced in the EU could create opportunities for European farmers as well as for Developing Countries.

7.5. Biofuels and GMO plants

The early phase of second generation biofuels will rely on current biomass (mainly crops and wood) and their agricultural residues as well as on improved enzymes and other technologies to make the process more effective. In the longer term horizon, the necessary increase in yield may probably only be achievable with modern plant breeding techniques - including plant biotechnology - and state of the art plant production methods, including the use of modern fertilization and plant protection systems. As already seen in other parts of the world, modern plant varieties produced by biotechnology lead to far higher and more consistent yields. Also in Europe plant biotechnology can thus optimise land use and increase competitiveness and sustainability of European agriculture. Likewise, modern plant biotechnology may contribute to also grow energy plants in areas with marginal agricultural conditions, such as drought and saline zones or areas with very heterogeneous production conditions (frost, heat, flooding etc.). This would open unique opportunities for marginal rural areas to play an economic role again in future and contribute to raising their countries Gross Domestic Products (GDP).

Annex

Additional background documents

- Financing and the emerging bio-energy markets
Rabobank (2006)
http://www.rabobank.com/content/images/Financing_and_the_emerging_bio-energy_markets_tcm43-34502.pdf
- Biofuels for transportation - Global potential and implications for sustainable agriculture and energy In the 21st century
WorldWatch Institute (2006)
<http://www.worldwatch.org/node/4079>
- Biofuels in the European Union - A vision for 2030 and beyond.
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<http://www.worldwatch.org/node/4079>
- Status and Comparative Study: Cellulosic Bioethanol production in the US, EU and China
Jesmini Ambikapathy (2006)
- How much bioenergy can Europe produce without harming the environment?
European Environment Agency (2006)
http://reports.eea.europa.eu/eea_report_2006_7/en/eea_report_7_2006.pdf
- Well-to-Wheels analysis of future automotive fuels and powertrains in the European context.
European Commission – JRC (2006)
<http://ies.jrc.ec.europa.eu/WTW>
- An overview of biofuel technologies, markets and policies in Europe
Energy research Centre of the Netherlands - ECN (2003)
<http://www.ecn.nl/docs/library/report/2003/c03008.pdf>
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European Commission (2004)
http://ec.europa.eu/energy/res/publications/doc/2004_brochure_biofuels_en.pdf
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http://www.ifp.fr/IFP/en/events/panorama/IFP-Panorama07_06-Biocarburants_Europe_VA.pdf
- Biofuels Worldwide
IFP (2007)
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- Biofuels and their Environmental Performance
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<http://www.fas.usda.gov/gainfiles/200605/146187771.pdf>
- A bottom-up assessment and review of global bio-energy potentials to 2050
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Progress in Energy and Combustion Science (2006), doi:10.1016/j.pecs.2006.08.001