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Biofuel policies for dynamic markets

Inventory of biofuel policy measures and their impact on the market

Report D2.1 of ELOBIO subtasks 2.1-2.2

Intelligent Energy Europe

Inventory of biofuel policy measures and their impact on the market

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Executive summary

Current transport is facing several challenges, including congestion, local air pollution, its contribution to greenhouse gas emissions, and last but not least its overwhelming dependence on fossil fuels, and in particular crude oil derived fuels. This dependence is even getting more critical as crude oil prices have started to rise exponentially in the past years.
Various alternatives exist, but their success largely depends on the policy support they receive, often in terms of fiscal incentives. The issue of biofuels for transport has become increasingly prevalent in the media and on political agendas, a fact reflected by the recent European Commission proposed binding target for at least 10% of vehicle fuel in the European Union to come from biofuels by 2020.

The current market introduction of biofuels and the anticipated increase in the future may have significant impacts on other commodity markets. Such policy-induced market disturbances can become a major barrier for industry and public support for biofuels. Therefore, the ELOBIO project develops low-disturbing policy options, enhancing biofuels but minimising the impacts on e.g. food and feed markets, and markets of biomass for power and heat. The project consists of a review of current experiences with biofuels and other renewable energy policies and their impacts on other markets, iterative stakeholder-supported development of low-disturbing biofuels policies, model-supported assessment of these policies' impacts on food & feed and ligno-cellulosic markets, and finally an assessment of the selected optimal policies on biofuels costs and potentials.

This report makes an inventory of biofuel policy measures applied or envisaged in the European member states, based on a review of public information and country reports on the progress towards the Biofuel Directive. Learnings from systems applied outside the European Union can also be important, so biofuel policy measures in specific relevant countries in South America (Brazil), North America (USA) and Asia (India) are also described.
The impact of biofuel policy measures at country level is analysed, with the focus on the national market (amount, type of biofuels, distinction between applications in blended or pure (high concentration) form, amount of biofuel fuel stations (pure or high concentration), development of domestic biofuel production capacity versus biofuel imports).

European approach

Biofuels are supported on an EU and Member State level with the instruments being closely interlinked. While support to the agricultural production is regulated on an EU-level (as the Common Agricultural Policy CAP is a common policy under sole EU responsibility), in most other areas, the EU provides the framework (e.g. allowing for tax exemptions of biofuels) and leaves the decision on concrete policy measures to the Member States.

Looking at the experiences in European Member States with high shares of biofuel consumption – Germany, Sweden, France and Austria – shows that a mix of policies is necessary in order to successfully stimulate the biofuel market:

- On the one hand, all of these countries managed to introduce a reliable "technical" framework at an early stage, which is the precondition for an increasing biofuel market. They reached agreements with car manufacturers that guaranteed the availability and warranty for cars adapted for the use of biofuels. At an early stage, they also adapted biofuel quality standards (biodiesel standard already in 1991 in Austria, followed by France, Germany, Czech Republic and Sweden in the years after; followed soon by

standards on ethanol and biogas in Sweden). These countries also succeeded in establishing a distribution network by supporting filling stations that offered biofuels.
- The establishment of a stable technical framework in all of these Member States is to some extent also the result of an early involvement in biofuels R&D.
- On the other hand, all these countries arranged for a favourable and stable financial framework to cover the additional costs of biofuels. Tax exemptions were in place since the early 1990s. Finally, all of those countries supported low blends as well as high blends or pure biofuels.
- However, with rapidly rising biofuel volumes resulting in high tax losses for the governments, there is a shift towards more efficient financial support mechanisms, with obligation systems coming in place (often still in combination with other support mechanisms).
- It also needs to be noted that in all those Member States interest groups actively supported the introduction of biofuels. In Germany and France, the agricultural sector pushed biofuels as a mean to establish an alternative market for agricultural products. Furthermore, oil companies and/or car manufacturers were open to biofuels. The political awareness of biofuels as one option to support agriculture or reduce environmental pressures of the transport sector formed another important factor in creating a market for biofuels.

Tax incentives vs obligation

There are two main instruments which are actually the basis of biofuels supports schemes: subsidisation to compensate the extra costs of biofuels compared to fossil fuels, or prescription of a mandatory uptake in the market.
The first option is implemented by a tax exemption scheme, which has proven successful although it caused important revenue losses for governments. In the second option, fuel suppliers are obliged to achieve a certain biofuel share in their total sales. Here, fuel suppliers and ultimately the transport users will carry the additional costs. Both instruments can be complemented by a number of other incentives, such as support to dedicated vehicles.

Past experience shows that partial or total exemptions from fuel taxes for biofuels were vital in promoting biofuels in the EU. All Member States with a high penetration of biofuels have, or have had, a favourable tax regime in place, e.g. Germany (until the end of 2006), Sweden, Austria, France and Spain.
As the tax exemption must not exceed the level of the fuel tax, the instrument has proven most successful in countries with high enough fossil fuel tax levels to compensate the additional production costs of biofuels compared to the fossil alternatives. This relation becomes very clear for Germany, where the introduction of a continuously rising ecotax on fossil fuels from 1999 onwards, combined with a full tax exemption for biofuels, eventually led to biodiesel pump prices falling below those of fossil diesel.

A switch towards obligation schemes can recently be observed as a consequence of the high revenue losses resulting from tax exemption schemes. Since 2005, 12 EU Member States – accounting for almost 90% of the total EU biofuels consumption in 2006 – have switched from a tax exemption to an obligation scheme. In many Member States, some mixed schemes are in place, in which quota either limit the amount of biofuels that will benefit from a tax exemption (France, Belgium), or tax exemptions only apply to certain biofuels (often high blends) while the large volume biofuels fall under an obligation scheme (Germany). Various countries still combine of a tax reduction system with an obligation scheme (France, UK, Austria, …), with the tax reduction diminishing over time.

Low vs high blends

In most European Member States, there seems to be a tendency towards low-blend fuels as implementation costs and time-to-market are lower than for pure or high blend biofuels. Yet there are arguments to also include pure biofuels or high blends in the strategy:

- existing low-blend fuels alone will not be sufficient to meet the 10% target for 2020, because of fuel quality limitations (EN590 for diesel, EN228 for gasoline),
- preparedness for the use of high blends might also be a means to enhance responsiveness to an abrupt increase in oil prices or supply problems,
- adapting the engine to high biofuel blends can also help in reducing exhaust gas emissions; some biofuels (e.g. E95, bio-methane, DME) have inherent low emissions,
- the use of pure biofuels and dedicated technology is important for raising public awareness on biofuels and clean transport in general.

Compared to low blending, high-blend fuels still require more structural adjustments in vehicle technology and fuel distribution systems before they can make a concrete impact. Therefore the market for high blends needs a different approach than general blending. High blends are difficult to include in a mandatory system, a tax differential remains the most important policy tool for these fuels, combined with concrete user incentives (e.g. free parking or congestion charge exemption).

Differentiation between biofuels

Within a large biofuel market, it is possible – and desirable – to differentiate between different biofuels and production pathways, specifically looking into their effect on avoided greenhouse gas emissions, security of supply or agricultural income, while avoiding an excessive impact on other markets (like food).

Recently there is a serious debate going on about the sustainability of current biofuels. Traceability of biofuels will be key, including a ranking of different biofuel production pathways based on the efficient use of biomass, the carbon content and GHG savings potential, production costs and interference with food markets to identify those pathways that should primarily be supported to best fulfil the main objectives in supporting biofuels. So a government may thus decide to differentiate support to different biofuels in order to minimise potential negative impacts. Other measures like certification will therefore ideally complement the main instrument that creates the market demand (obligation or tax exemption).

Measures on the supply side have had a limited impact up to now in developing a market demand, but their significance may increase as a tool to steer a growing biofuel market into the desired direction.

- A crop-specific feedstock support subsidy may help to direct the crop mix into an environmental- and landscape-beneficial pathway. For example, the current revision of the energy crops scheme extended the support to perennials.
- Investment subsidies for production facilities were only partially successful in the past. However, they become more important in the future if more advanced biofuels are desired. Production facilities for advanced biofuels have much higher capital costs than those for conventional biofuels.
- Collaboration with car manufacturers is very important where pure or high concentration biofuels intend to be used, and this was successful for biodiesel in Germany and ethanol-FFVs in Sweden. Depending on whether there will be a policy push for high blends in

addition to low blend options, collaboration and dedicated subsidies for adapted cars can be of importance as Sweden demonstrated with the successful introduction of flexi-fuel vehicles. Moreover, it should be noted that pure biofuels also lead to increasing public awareness for biofuels.

- Certification of biofuels becomes more important with the market reaching a certain share. Only with additional measures such as certification (either of fuels or of the fuel suppliers) it can be ensured that the GHG balance is good and that other environmental impacts are limited.

Long term stability

Creating a long-term stable framework for farmers, biofuel producers, oil companies and car manufacturers is an important factor for a successful biofuel policy. This can best be met by setting long-term targets and a predictable policy. From an industry point of view, this would argue in favour of a unique EU biofuel policy.
If targets are set, these should ideally be binding targets, in order to create investment stability for industry. When setting the targets, the designated biofuel policy needs to be set into context with other existing legislation (in particular energy and agricultural policies) and other policies aiming at similar objectives in order to achieve a consistent, cost-efficient overall approach. If, for example, GHG emission reductions were the only objective for promoting biofuels, other policies are likely to achieve the same results at lower costs. In this respect, the proposed Renewable Energy Directive asks Member States to provide National Action Plans on their optimal mix of renewables.

Standards for biofuels are best taken on an EU-level. This will be beneficial for transport users and car manufactures as well as the biofuel industry. Also a certification scheme to ensure sustainability of domestic and imported biomass is most efficient on an EU and even worldwide scale. Furthermore, current European legislation (i.e. fuel quality directive) will need to be adapted so as to allow for higher shares of biofuels, the process of which has already started.

RTD is necessary in a coordinated way between the national and EU-levels. In particular, advanced biofuels are a promising technology that requires further R&D. Additionally, there should be an emphasis on R&D for dedicated energy feedstock. Today's production techniques use traditional food/fodder crops. These crops can be further optimized for energy/biofuel production. Also new crops can become interesting for advanced biofuels.

Experiences outside Europe

We looked into the main regions outside Europe where biofuels are promoted at large scale.

Brazil is of course the most prominent example, reaching a 50% share of ethanol in their gasoline market, partly through a general blending of 20-25% to all gasoline, partly through the use of pure ethanol in dedicated ethanol vehicles and recently also flex-fuel vehicles. Already 30 years ago, the Brazilian government started a programme ‘ProAlcool’ to build up some competitive advantages to sugarcane ethanol use as an automobile fuel by investing in technology research, creating an alcohol industrial policy and offering incentives for the private sector. The main driver was to create an alternative for fossil fuel and reduce Brazil’s dependence on imported crude oil (the decision was triggered by the oil crisis in mid 1970s). In the course Brazil has created a real advantage compared to the rest of the world in the market of ethanol production and technology in the long term. This case shows the

importance of public policies in allowing the creation of a market for renewable energy. Mechanisms for implementing economic and technology policies can lead the private sector, and society in general, towards the accomplishments of planned national or environmentally sustainable goals. On the other hand, the decline in economic competitiveness due to the fall in oil prices in the 1990s illustrates the difficulties of long-range planning, which is one of the key points for planning sustainable development strategies. The recent market change with the availability of flexible fuel vehicles and the renewed environmental interests, creates a serious rise in demand, building on the 30 year ethanol experience in Brazil. With a 90% share in car sales, flexible fuel vehicles really create a long term option for Brazil to break away from fossil fuel addiction in transport, while there are enormous possibilities for ethanol export to the rest of the world.

The **USA** has a long ethanol history, which is mainly focussed on blends up to 10% (gasohol). Biodiesel is expanding rapidly in recent years, however its production level is still 10 times lower than ethanol.
The reasons behind the introduction of bio-ethanol in the USA varied between security of energy supply in the beginning (energy crisis in the 1970s), reduction of vehicle pollution in the 1990s and again security of energy supply after 2000. The fact that the fuel is domestically produced is an important factor, and biofuels can reduce to some extent the major oil imports into the US.
Since 1978, there have been continuously maintained national tax incentives to encourage ethanol fuel production and use. This has been supplemented with fuel regulations (oxygenates and RFG), fleet requirements, import tariffs, CAFE credits and research funding. On top of Federal initiatives, also State initiatives play an important role. State incentives, which come on top of federal incentives at the end can make the difference. These State incentives often depend on the role of lobby groups and local stakeholders. Recently the Renewable Fuels Standards of 2005 and 2007 have given a real boost to biofuel production in the USA. Most of the ethanol production is now in the agricultural states in the Mid-West, reflecting the fact that about 95% of US ethanol production is from corn, with an important role for local agriculture.
There is however increasing criticism worldwide against the production of ethanol from corn, as a substantial amount (over 30% of US corn production) is used to produce fuel, which seems to have an important effect on world corn prices. Moreover the GHG balance of US ethanol from corn is generally rather poor (sometimes even worse than fossil fuels). US government is therefore increasing its focus on cellulose based biofuels, as well as introducing GHG thresholds for current biofuels.

India has one of the fastest growing economies in the world and fuel consumption is rising with an average of around 5% per year. This will seriously increase India's dependence on imported oil.
India has taken various actions to introduce ethanol and biodiesel in gasoline and diesel fuel respectively. Despite of the existing presence of sugar cane and ethanol production in India (not for fuel purposes), the fuel ethanol story has been hampered by discussions on price, availability, and the lack of appropriate policy framework that accommodates various interest groups, so ambitious targets were not met. One of the main problems is the competition between uses of ethanol and its feedstock.
The strategy on biodiesel is different. From the beginning it is decided that the focus will be on non-edible oils (mainly Jatropha), which do not compete with food markets. Advantage is also that crops can be used which are not very demanding and can use wasteland in difficult climatic conditions. However introduction is going much slower than anticipated and India's commercial production of biodiesel is currently almost negligible.

The experiences outside Europe show that biofuel markets are growing worldwide, but it is not always easy to regulate the market through certain policy choices. Worldwide evolutions play an important role, and crop production remains dependent on various factors (varying climatic conditions, increasing demand for food, …).
While volumes are rising, it is clear that biofuels are now passing from an initial pioneering stage to a more mature market. Biofuel policy should focus on cost-effectiveness and not primarily and exclusively aim at fulfilling a certain target for biofuel consumption, but that the key drivers underlying a biofuel policy must be kept in mind, namely to increase energy security, secure domestic agricultural income and reduce GHG emissions.
With rising volumes, impacts on other markets (e.g. food commodities) become prevalent and policies should also focus to minimizing possible negative impacts (e.g. on other commodity markets or use of land resources). This will be studied in the further course of the ELOBIO project.

1 Introduction

The current market introduction of biofuels has significant impacts on other commodity markets. Such policy-induced market disturbances can become a major barrier for industry and public support for biofuels. Therefore, the ELOBIO project develops low-disturbing policy options, enhancing biofuels but minimising the impacts on e.g. food and feed markets, and markets of biomass for power and heat. The project consists of a review of current experiences with biofuels and other renewable energy policies and their impacts on other markets, iterative stakeholder-supported development of low-disturbing biofuels policies, model-supported assessment of these policies' impacts on food & feed and ligno-cellulosic markets, and finally an assessment of the selected optimal policies on biofuels costs and potentials.

This report shows the combined results of task 2.1 and task 2.2 of the ELOBIO project. Task 2.1 makes an inventory of biofuel policy measures applied or envisaged in the European member states, based on a review of public information and country reports on the progress towards the Biofuel Directive. Learnings from systems applied outside the European Union can also be important, so biofuel policy measures in specific relevant countries in South America (Brazil), North America (USA) and Asia (India) are also listed.
Task 2.2 assesses the impact of biofuel policy measures at country level for the countries mentioned in Task 2.1, with the focus on the amount of biofuels on the national market, type of biofuels, distinction between applications in blended or pure (high concentration) form, amount of biofuel fuel stations (pure or high concentration), development of domestic biofuel production capacity versus biofuel imports.

The approach is based on the PREMIA project, which investigated the effectiveness of policies and support programmes for the market introduction of biofuels in the European Union for the first revision of the Biofuels Directive (mid 2006).

The results of this task are used as input for stakeholder-supported development of low-disturbing biofuels policies. The stakeholders' advice will, in an iterative process, use model-supported assessment of these policies' impacts on food & feed markets into account, as well as model-supported analysis of the relations between the biofuels policies and ligno-cellulosic markets.

2 Types of policy measures

Biofuels are supported and regulated on an EU and Member State level with the instruments being closely interlinked. While support to the agricultural production is regulated on an EU-level (as the Common Agricultural Policy CAP is a common policy under sole EU responsibility), in most other areas, the EU provides the framework (e.g. allowing for tax exemptions of biofuels) and leave the decision on concrete policy measures to the Member States.

There is a wide variety of measures – command and control instruments, economic instruments, procurement instruments, collaborative instruments, communication and diffusion instruments, and these measures can be pointed at various stages of the fuel chain. The following listing shows an overview of possible support and regulation types, relevant for different steps in the biofuel chain. The list was derived from the PREMIA project [Pelkmans et al., 2006].

2.1 Feedstock

Command and Control Instruments

- Allow energy crops & non-food crops on set-aside land up to a certain limit (Blair House Agreement).
- Regulations and legal issues on the use of waste products for biofuel production.
- Imposing sustainability requirements for the production of feedstock (mainly growth of energy crops) for biofuels.

Economic Instruments

- Direct subsidies:
    - Premium for energy crops
    - Subsidies for sustainable energy crops in the frame of regional development.
    - Support to use waste land for energy crops.
- Pricing policies
    - Regulation of minimum levels of feedstock price.
- Funding
    - R&D for applicability of energy crops and crop yield.
    - Demonstration of new energy crops.
    - Set-up of collection systems for waste products and residues.

Collaborative instruments

- Networking between farmers associations and the fuel sector.
- Partnerships and contracts of farmers and biofuel producers.
- Certification and labels: follow-up of factors regarding the sustainability of energy crop growth.

Communication and diffusion instruments

- Information campaigns towards the farmers on energy crops.
- Information campaigns to increase public awareness on collection of residues and waste streams and their valorisation in biofuels.

- Sustainability certification for crops

2.2 Biofuel production

Command and Control Instruments

- Fuel quality standards for biofuels.
- Fuel quality assurance and control system.
- Sustainability requirements for biofuels (incl. feedstock).
- Authorisation quota system for biofuel producers, linked to tax reduction system.
- Regulations concerning import of biofuels (quota, import tariffs, …)

Economic Instruments

- Direct investment and subsidies for biofuel production facilities.
- Financing schemes for biofuel production facilities (cheap loans).
- Tax incentives to biofuel producers (proportional to amount of biofuel produced) to lower the production cost of biofuels.
- Funding of R&D and demonstration efforts for more efficient biofuel production and new biofuel feedstocks (e.g. waste products, cellulose).

Collaborative instruments

- Networking between farmers associations, the biofuel sector and the petroleum sector.
- Partnerships and contracts of farmers and biofuel producers.
- Partnerships and contracts of biofuel producers and fuel distributors (usually petroleum sector).
- Certification and labels: follow-up of factors regarding the sustainability of energy crop and process parameters.

2.3 Distribution

Command and Control Instruments

- Standards
    - Fuel quality standards for biofuels
    - Fuel standards of fossil fuels (allowing certain fraction of biofuels).
    - Allowing certain fuels or blends on the transport market (product norm, e.g. E85).
    - Fuel quality assurance and control system.
    - Labelling of fuels with minimum level of biofuel.
    - Standards for refuelling system design
- Mandates of biofuel blending, meaning that a certain share of blending of fossil fuels with biofuels is obligatory.
- Biofuels obligation: a fuel supplier has to ensure that a certain share of all fuels sold comes from biofuels.
- Mandates for refuelling stations to offer biofuels.

Economic Instruments

- Tax reduction or exemptions for biofuels to get competitive with fossil fuels.

- Direct investment and subsidies for infrastructure adjustments (or new infrastructure).
- Financing schemes (cheap loans) for infrastructure.

Collaborative instruments
- Networking between farmers associations, the biofuel sector and the petroleum sector.
- Partnerships and contracts of fuel distributors and biofuel producers.
- Voluntary agreement with fuel distributors for the uptake of biofuels in their fuel sales.
- Voluntary agreement with fuel distributors to apply sustainability certification for the biofuels they purchase.

Communication and diffusion instruments
- Information campaigns towards fuel distributors on the technical implications of the use of biofuels in their infrastructure.

2.4 Vehicle compatibility

Command and Control Instruments
- Mandates for vehicle manufacturers to produce and sell biofuel-compatible vehicle models.
- Adapt fuel standards to higher biofuel blends.
- Type approval regulations for new technologies (incl. biofuel operation).
- Labelling of biofuel-compatible vehicles.

Economic Instruments
- Subsidies for the purchase of biofuels-compatible vehicles or for conversion costs.
- Tax incentives for biofuel-compatible vehicles (e.g. yearly vehicle tax).
- Funding
    - of R&D and technology development,
    - demonstration efforts for application of high biofuel blends in vehicles.

Collaborative instruments
- Voluntary agreements with vehicle manufacturers to produce biofuel-compatible vehicles.
- Assigning CO_2 benefits to biofuel compatible vehicles (see voluntary agreement on CO_2 reduction with vehicle manufacturers)
- Partnerships between vehicle manufacturers and fuel providers.

2.5 Market

Command and Control Instruments
- Mandates for procurement of clean vehicles (e.g. for certain fleets)
- Exemptions from certain restrictive regulations
    - Access to restricted zones, bus lanes, etc.
    - Exemptions from parking and driving restrictions
- Licensing (inclusion of environmental criteria in licensing procedures).

- Quality contracts (e.g. inclusion of environmental criteria in contracts for procurement of public services and public vehicles, …).

Economic Instruments

- Tax reduction or exemption for biofuels to get competitive with fossil fuels (see distribution).
- Tax incentives for biofuel-compatible vehicles (e.g. yearly vehicle tax) (see vehicle compatibility)
- Subsidies for the purchase of biofuels-compatible vehicles or for conversion costs
- Funding
    - demonstration efforts for application of high biofuel blends in vehicles.
    - market research.
- Pricing policies
    - road pricing (e.g. congestion charge)
    - parking fees

Procurement instruments

- Green procurement of vehicle fleets (minimum % of environmentally friendly vehicles in new vehicle sales), can be voluntary or mandatory.
- Leadership by example. Governments, public transport companies, or private companies include environmentally friendly vehicles in their fleets to serve as example for other potential users.
- Common procurement. Potential customers can group together to reach a sufficient amount of vehicle orders, so it gets more interesting for the vehicle manufacturer to deliver this vehicle model (see FFV procurement in Sweden from 1998).

Collaborative instruments

- Voluntary agreement of fleet owners (to local authorities) to use clean or alternative vehicles, as basis of quality contract.

Communication and diffusion instruments

- External information and awareness campaigns
    - Establish clarity on the advantages and disadvantages of biofuels (also with regard to the competitive use of bio-energy; nature protection).
    - Public educational efforts.
    - Partnerships with people and organisations that can ‘help spread the word’.
    - Commitment of retailers.
- Marketing, focussing on the advantages of alternative motor fuels.
- Vehicles buyers’ guides and vehicle labelling
- Education and training of vehicle-sales personnel, mechanics, emergency services, fleet operators.

2.6 Main policy measures

Not all listed measures are applied, and some only as accompanying measure to other main measures. The following types of measures seem to be most important categories.

Table 1: main policy measures for the support of biofuel introduction

Stage	Measure	Application
Feedstock	Support to agriculture (energy crop subsidy / set aside land)	EU15→27, CZ
Production	RD&D funding	EU + country level
	Loans and subsidies for biofuel production facilities	FR, DE, PL, ES, SWE,…
	Producer tax incentives for biofuel production	CZ, LV
	Authorised quota system for biofuel producers, related to tax reduction	FR, IT, BE
Distribution	Standards (biofuel & normal fuel)	AT, DE, FR, SWE, CZ, IT, EU (2003)
	Tax differential (tax reduction for biofuels)	DE, FR, AT, ES, SE, … EU (Energy Taxation Directive 2003)
	Obligations for fuel distributors	AT, FR, SL, DE, NL, UK,…
	Obligations for filling stations	SWE
	Loans and subsidies for filling stations	DE
Market	Funding of demonstrations	EU + country level
	Procurement methods (green proc., common procurement)	SWE, FR
	User incentives (tax incentives biofuel vehicles, free parking, exemption of congestion charge or other road tax, …)	SWE

Source: [Pelkmans, 2006] & various country reports

3 Biofuels – European and worldwide

First some figures to show the evolution of biofuels consumption and production on European and worldwide level.

3.1 Consumption in the EU

The following figure shows the evolution of biofuel consumption in the EU27, from 1991 up to 2007. The figures for 2007 are preliminary (based on [Biofuels Barometer, 2008]).

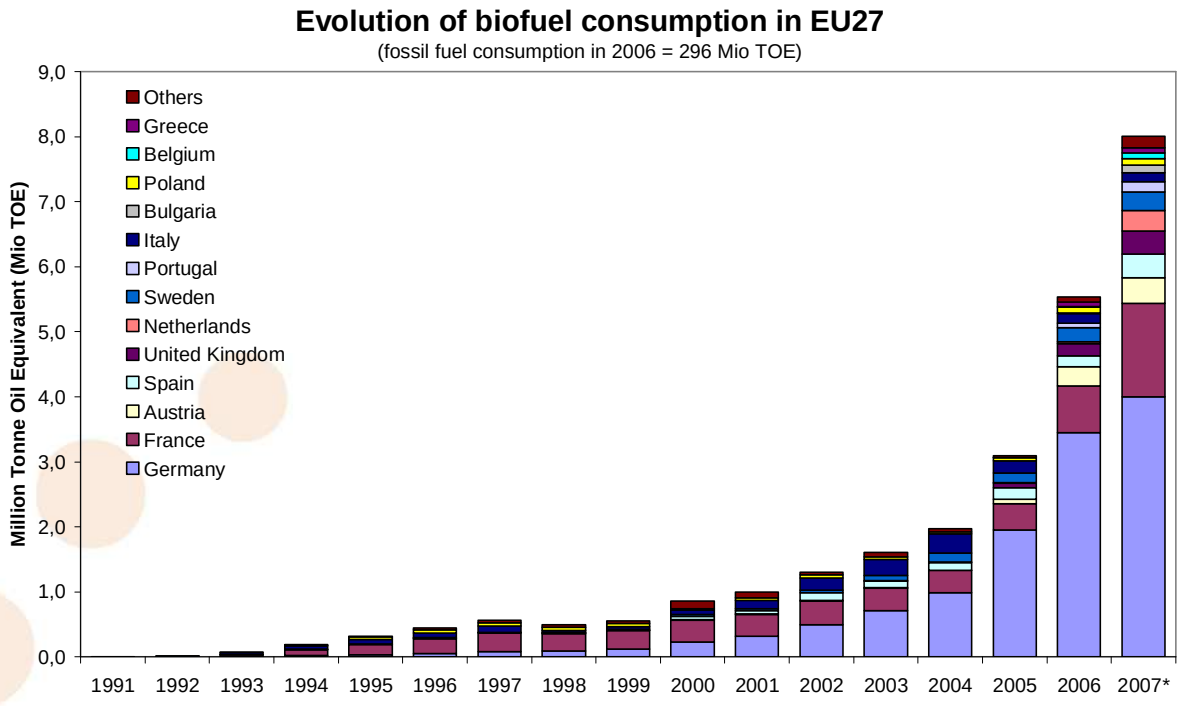

Figure 1: evolution of biofuel consumption in the EU27
Sources: [Pelkmans, 2006], [Biofuels Barometer, 2008]
* 2007 figures are preliminary

The introduction of biofuels in Europe started in the beginning of the 1990s. The following phases can be identified:

- until 1992: first initiatives and demonstration actions of biodiesel and bioethanol,
- from 1993 until 1997: first steady increase in market introduction, mainly dominated by France,
- from 1997 until 1999: stagnation, related to low crude oil prices, and lower set-aside area,
- from 2000 until 2005: steady increase in biofuel market introduction, dominated by Germany,
- from 2006 other countries start to follow, driven by the European biofuels directive.

Around 80% of biofuels in the EU is biodiesel, the rest is bio-ethanol and recently also pure plant oil and biogas [Biofuels Barometer]. Mind that PPO was categorised as biodiesel in Germany until mid 2005.

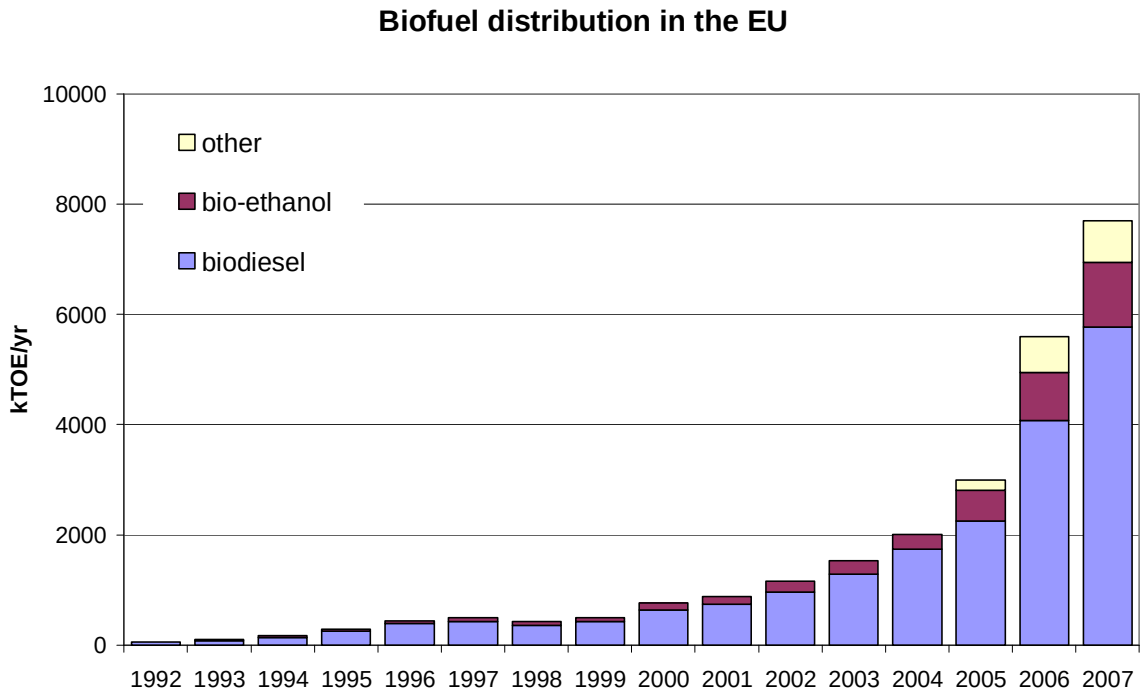

Figure 2: distribution of biofuels between biodiesel – bio-ethanol and others in the EU
[Biofuels Barometer, 2003-2008]

3.2 Worldwide bio-ethanol production

Contrary to the European situation, the most important biofuel worldwide is bio-ethanol. While worldwide biodiesel consumption in 2006 was around 5.3 million toe (5.9 million tonnes), bio-ethanol consumption was more than 20 million toe (31 million tonnes). Its use as transport fuel has a history of more than 30 years, starting in the 1970's in Brazil, focusing on the use of hydrous ethanol in pure form, and anhydrous ethanol as blending component to gasoline (in 20-25% blending rate). In the 1980's ethanol started to be used in the USA as well, mainly focusing on blendings up to 10% (gasohol). The reasons behind the introduction of bio-ethanol in the USA varied between security of energy supply in the beginning (energy crisis in the 1970s), reduction of vehicle pollution in the 1990s and again security of energy supply after 2000. In 2005 the USA overtook Brazil as the biggest bio-ethanol consumer (in terms of volume). Other regions like the EU only represent a minor fraction of total worldwide bio-ethanol use in transport.

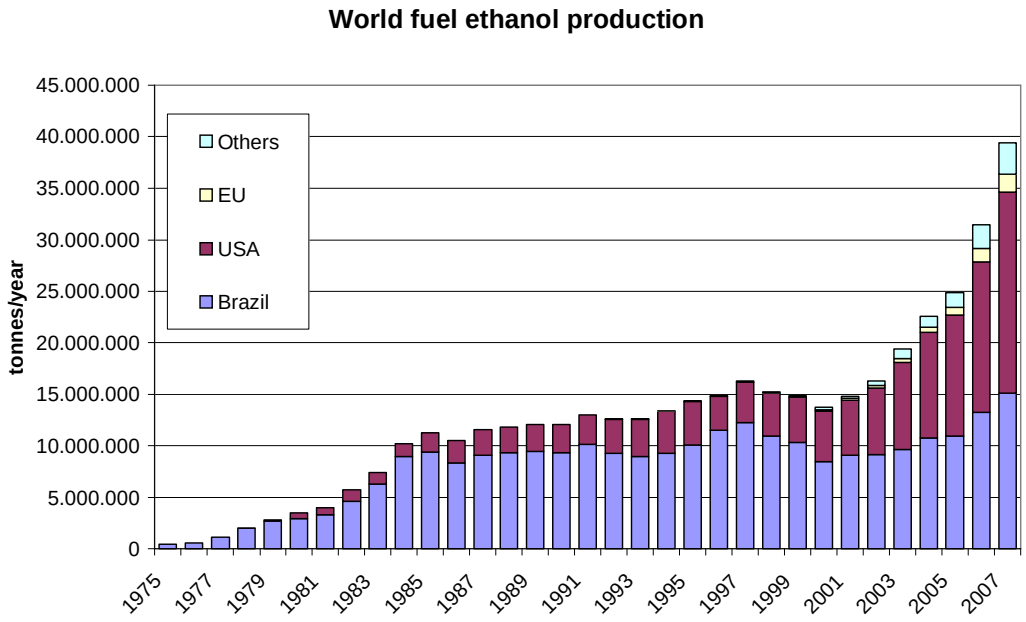

Figure 3: evolution of worldwide fuel ethanol production
[F.O.Licht's, 2007]
* 2007 figures based on estimations

3.3 Worldwide biodiesel production

Biodiesel experiments started in Europe end of the 1980s - begin 1990's, mostly to offer alternative outlets for agriculture, which was facing overproduction at that time. France (focusing on low blending up to 5%) and Germany (focusing on the use of pure biodiesel) were the main fore-players. The growing volumes of biodiesel also coincided with a growing success of diesel cars in Europe. Only in recent years (mainly from 2005) other regions in the world started to introduce biodiesel in their diesel markets.

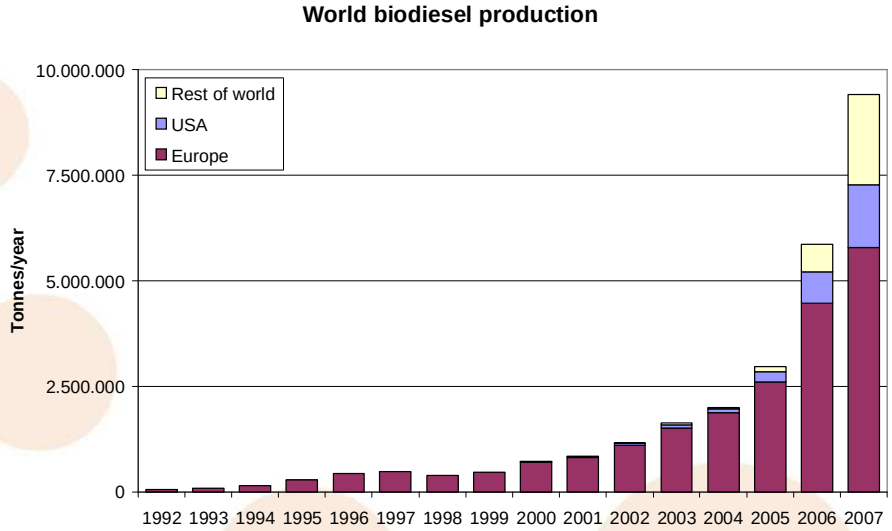

Figure 4: evolution of worldwide biodiesel production
[F.O.Licht's, 2007]
* 2007 figures based on estimations

4 EU policy context

As mentioned before, the European context creates a framework in which countries can form their own policy.

Current EU biofuel support policy is embedded in the wider 20-20-20 aims to have by 2020
- 20% improvement of energy efficiency
- 20% reduction of greenhouse gas emissions
- 20% renewable energy

This was presented in the Energy Policy Package on 23 January 2008. Specifically for renewable fuels for transport a binding target of 10% was suggested by 2020.
The following table shows an overview of the main steps on European level in relation to biofuels introduction:

Table 2: main steps on European level in relation to biofuels introduction

1992	Common Agricultural Policy (CAP): bioenergy crops on set-aside
1997	White paper on renewable energies
2000	Green paper on energy supply security
2001	Communication on alternative fuels for road transport
2003	Biofuels Directive (indicative targets 2% by 2005, 5.75% by 2010) Energy Taxation Directive (detaxation allowed, no overcompensation) Revision of the Fuel Quality Directive (gasoline norm EN228) Revision of diesel norm (EN590) & Biodiesel quality norm EN14214 CAP Reform: energy crop premium (45€/ha)
2005	Biomass Action Plan
2006	EU Biofuels Strategy
2007	Renewables Roadmap & Revision of the Biofuels Directive Draft revision Fuel Quality Directive (up to 10% ethanol blending; transport fuel GHG reduction 1% per year between 2010 and 2020)
2008	Draft renewable energy directive (binding target of 10% of renewable fuels in total gasoline/diesel sales by 2020, sustainability criteria for biofuels)

4.1 Impact of agricultural policy

The agricultural policy is mainly driven from European level (CAP – Common Agricultural Policy). There have been 2 major milestones, namely the CAP reform of 1992 and the CAP reform of 2003.

The CAP reform of 1992 created the possibility to grow non-food crops on set-aside land, without loosing the set-aside premium (around 300€/ha, depending on average yields). However, the amount of oilseed grown for biofuels on set-aside is limited by the Blair House Agreement. The Blair House Agreement restricts the maximum EU oilseed area for food use to somewhat less than 5 million ha, and the annual output of oil meal from oilseeds planted on set-aside land for industrial use to 1 million tonnes of soybean meal equivalent.

In the middle of the 1990s most energy crops (mainly rapeseed) were produced on set-aside land. In the period 1997-1999 this changed because of the lower set-aside obligations in the EU (see figure). Total non-food rapeseed production declined and part had to be grown on

basic non-supported land. From 1999 the set-aside obligation stabilized at higher level (10%) up to 2007, and more set-aside land was used for non-food rapeseed.

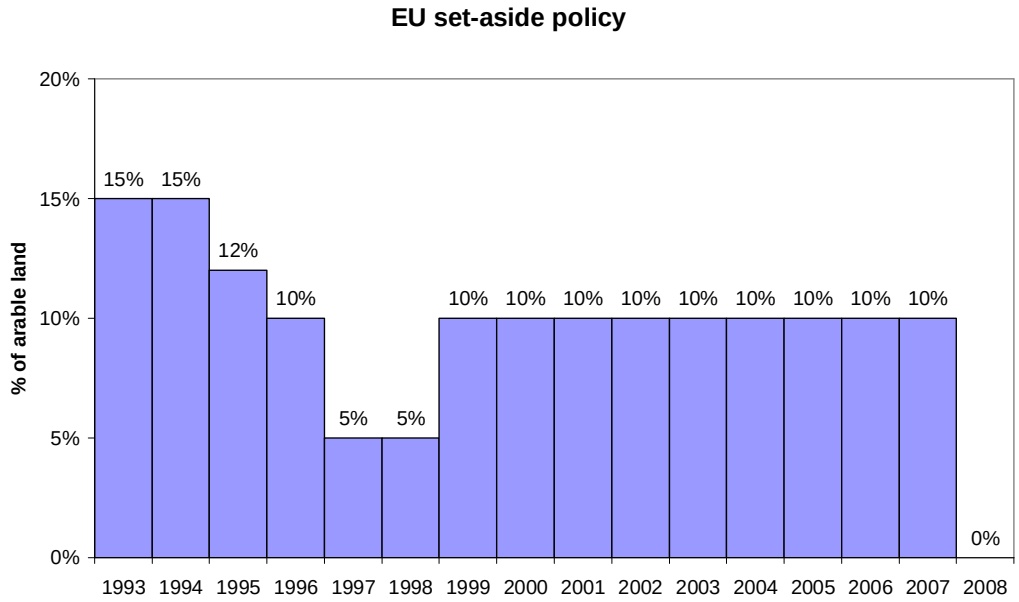

Figure 5: EU set-aside obligation (% of arable land)

After 2000 the demand for biodiesel rose very rapidly, especially in Germany, and it became interesting to grow rapeseed on basic area (no support) for biodiesel production. From 2004 energy crop support of 45€/ha was available in the EU15 for the production of energy crops on basic land (with a maximum of 1.5 million ha). The system was extended to the extension countries in 2007, with an increase of the maximum area to 2 million ha. Initially the response for this premium from agriculture was lower than expected, probably due to the fairly low premium, and the administration needed to receive it. After a few years the energy crop premium started to get more success in the agricultural world; in 2007 the maximum area was reached, and practically no energy crops were grown without this support.

Table 3: EU arable land with energy crops, by type of support

Million ha	**2003**	**2004**	**2005**	**2006**	**2007**
Total non-food land use on set-aside area	0.9	0.5	0.9	1.0	1.0
- oilseeds		0.5	0.7	0.8	0.8
- of which rapeseed		0.4	0.7	0.8	0.8
- cereals		0.0	0.1	0.1	0.1
Total land use on land with crop premium		0.3	0.6	1.3	2.8
- oilseeds		0.2	0.4	0.9	2.0
- of which rapeseed		0.2	0.4	0.8	2.0
- cereals		0.0	0.1	0.2	0.3
Total land use on land without support	0.3	0.8	1.6	1.4	0.2
- oilseeds (rapeseed)		0.8	1.3	0.9	0.1
- cereals			0.3	0.4	0.0
Total	1.2	1.6	3.1	3.7	4.0

[EC DG AGRI, 2008]

This area compares to a total use of arable land of 109 million ha in the EU27 [Eurostat].

In its recent proposals for a “Health Check” of the CAP, the European Commission proposed to abolish the energy crop premium and the compulsory set-aside [EC DG AGRI, 2008]. In

this case no specific support for bioenergy production will be left in the first pillar of the CAP. It is assumed that biomass production for energy will be stimulated by strong demand due to the policy targets for biofuels.
Apart from the measures in the first pillars of the CAP, which aim at increasing the supply of energy crops, there is a variety of instruments in the second pillar of the CAP, the rural development policy, which address both the supply and use of bioenergy. Examples are support for biogas production facilities, perennial energy crops, processing of biomass towards energy, installations and infrastructure for renewable energy from biomass.

4.2 Sustainability criteria

Biofuels and bio-energy play an increasing role in the abatement of greenhouse gas emissions and the reduction of energy dependency. Part of the biomass needs to be imported from outside the EU. Although biomass has a 'green' image, an increasing concern arises about the sustainability of produced biomass (e.g. including impacts on biodiversity, displacement of food production, but also the effectiveness in GHG reduction), specifically for imported biofuels. Various stakeholders, like energy producing companies, end-users, investors, certifiers, governments and NGOs, therefore ask for sustainability criteria to safeguard sustainability issues and guide their business. In the future, sustainability would give them the licence to produce biomass; political and social support for biofuels and bio-energy will depend on the proof of their sustainability.

In 2006, the Dutch government has asked a national group of experts to define principles and criteria for the sustainable production of biomass; the so-called Cramer criteria, named after the chair of that group. The Cramer principles and criteria are divided in six themes [Commissie Cramer, 2007].:

1. greenhouse gas emissions balance,
2. competition with food, local energy supply, medicine and construction materials,
3. biodiversity (no adverse effects on protected areas or valuable ecosystems),
4. environment (management of waste, erosion, water and emissions),
5. prosperity,
6. social well-being (social, human and property rights).

The task of the project group was to formulate principles and criteria for the production and the processing of biomass for energy, transport fuels and chemistry. The aim was that these could also be made applicable to food, feed and fuel.
In parallel or shortly thereafter the UK and German governments have initiated similar activities in the attempt to introduce more sustainable biomass on their internal market. From April 2008, UK suppliers of biofuels in the transport sector need to report the product's sustainability. This Renewable Transport Fuel Order (RTFO) includes the idea that future limits or stricter requirements could be issued. The Renewable Fuels Agency has been given the task to arrange for accreditation and data assessment. In Germany, a Biofuels Sustainability Ordinance has been approved in the beginning of 2008, wherein biofuels will only be credited to the EU-quota obligations and are only eligible for tax reductions if the fulfilment of the requirements of the Ordinance is proofed. Both in Germany and in the Netherlands, pilot studies to initiate sustainable biomass production have been approved by the authorities.

Concerning EU legislation, the proposal for the Renewable Energy Directive (RED) on the promotion of the use of renewable energy sources is directly related to standards for

sustainable biomass. The first official draft by the EC has been presented on 23 January 2008 [EC, 2008]. The first ideas as ventilated by the EC state inter alia that biofuels should deliver a minimum level of greenhouse gas savings, should not be produced from raw material cultivated on land converted from high-carbon-stock or high-biodiversity uses; and should comply with EU environmental requirements for agriculture where applicable. The EC considers it necessary to encourage the diversification of the raw materials used for biofuel production. For this reason, it is deemed appropriate to provide extra incentives for biofuels made from wastes, residues, grasses, straw and lingo-celluloses material.

The need for having criteria for sustainability, including social and environmental issues, is also stressed by the EU Environment Commissioner and the EU Energy Commissioner in response to concerns within society on the EU transport biofuel targets and to requests for tougher standards for biofuel production. The European Council in its March 2008 assembly stated that in meeting the ambitious targets for the use of biofuels it is essential to develop and fulfil effectively sustainability criteria to ensure the commercial availability of second generation biofuels. A task group from the Council drafted a set of sustainability criteria, which are intended for use in both the RED and the Fuels Quality Directive, under revision in parallel.

In any case it will be important to link with existing or new (industry or cooperation) standards, such as like the Better Sugarcane Initiative (BSI), the Roundtable on Sustainable Palm Oil (RSPO), Forest Stewardship Council (FSC), International Biofuels Forum (IBF), International Federation of Agriculture Movements (IFOAM), International Labour Organizations (ILO), International Social and Environmental Accreditation and Labelling (ISEAL), Programme for Endorsement of Forest Certification schemes) (PEFC), Rainforest Alliance (RA), Roundtable for Sustainable Biofuels (RSB), Roundtable on Sustainable Palm Oil (RSPO) and Round Table on Responsible Soy (RTRS).

5 National policies in European member states

By 2006, most Member States had adopted national biofuel targets under the Biofuels Directive. Most national targets followed the reference value of 5.75% by 2010, with Germany obliging fuel suppliers to achieve a minimum blending of 6.75% by 2010 and France aiming for a 7% target.
The progress report on the Biofuels Directive [EC, 2007] proposes that binding targets are set for the year 2020 in order to create investment security for industry and improve the likelihood of targets to be achieved (compared to indicative targets). It proposed a minimum binding target of 10% of all transport fuels to be biofuels by 2020, with Member States being allowed to opt for more ambitious national targets. The proposed Renewable Energy Directive of 23 January 2008 follows this 10% binding target [EC, 2008].

5.1 Overview of biofuel shares and main policy types

The following table shows an overview of biofuel shares in the EU27 member states. 2007 figures are preliminary (based on [Biofuels Barometer, 2008]), and still need to be confirmed by the country reports.

Table 4: Biofuel shares reached in European Member States between 2003 and 2007

	BIOFUEL SHARE (% energy content)				
	2003	**2004**	**2005**	**2006**	***2007****
Austria	0.06	0.06	0.93	**3.54**	*4.23*
Belgium	0.00	0.00	0.00	0.01	*1.0*
Bulgaria	-	-	-	0.45	*5.6 (?)*
Cyprus	0.00	0.00	0.00	n.a.	*n.a.*
Czech Rep.	1.09	1.00	0.05	0.50	*0.5*
Denmark	0.00	0.00	0.05	0.15	*0.1*
Estonia	0.00	0.00	0.00	0.12	*0.06*
Finland	0.11	0.11	0.00	0.02	*n.a.*
France	0.67	0.67	0.97	**1.75**	*3.57*
Germany	1.21	1.72	3.75	**6.30**	*6.7*
Greece	0.00	0.00	0.04	0.75	*1.3*
Hungary	0.00	0.00	0.07	0.28	*0.2*
Ireland	0.00	0.00	0.04	0.09	*0.2*
Italy	0.50	0.50	0.51	0.46	*0.46*
Latvia	0.21	0.07	0.33	0.22	*0.14*
Lithuania	0.00	0.02	0.72	**1.72**	*3.63*
Luxembourg	0.00	0.02	0.02	0.03	*1.5*
Malta	0.02	0.10	0.52	0.58	*n.a.*
Netherlands	0.03	0.01	0.02	0.29	*2.8*
Poland	0.49	0.30	0.48	0.92	*1.0*
Portugal	0.00	0.00	0.00	1.02	*2.3*
Romania	-	-	-	0.07	*0.8*
Slovakia	0.14	0.15	n.a.	0.69	*2.8*
Slovenia	0.00	0.06	0.35	0.27	*0.83*
Spain	0.35	0.38	0.44	0.53	*1.2*
Sweden	1.32	2.28	**2.23**	**3.10**	*4.0*
UK	0.026	0.04	0.18	0.45	*0.84*
EU-27	**0.5**	**0.7**	**1.0**	**1.8**	***2.6***

n.a. no figures available
* 2007 figures are preliminary
figures derived from [Wiesenthal, 2007], various country reports and [Biofuels Barometer, 2008]

Country strategies to reach the biofuel targets differ strongly from country to country. Some countries have focussed on pure biofuels, while other have stimulated low blending from the beginning. While tax reduction has been most popular in the beginning, most countries are now starting to shift to a mandatory regime, often still in combination with tax reduction. The following table shows an overview of the main policy instruments applied in the European Member States for the various biofuel applications.
The currently active policy system is indicated in colour:

- yellow for mixed systems (tax reduction & obligation),
- blue for tax reduction systems,
- red for obligation systems.

Table 5: Main policy tools per biofuel type

	Low biodiesel blends (B5)	B30	B100	Low ethanol blends (E5/ETBE)	E85	PPO
Austria	TR (1999) + SO (Oct 2005)	-	TR (1991)	TR + SO (Oct 2007)	TR	TR
Belgium	TR (quota) (Oct 2006)	-	-	TR (quota) (Nov 2007)	-	TR (2006)
Bulgaria	TR (June 2007)	-	TR (June 2007)	TR (June 2007)	-	-
Cyprus	TR (2006)	-	TR (2006)	TR (2006)	-	-
Czech Rep.	PS + TR (until 2006) SO (Sept 2007)	PS + TR (until 2006)	-	SO (Jan 2008)	-	-
Denmark	TR (CO_2 tax) (2005)	-	-	TR (CO_2 tax) (2005)	-	-
Estonia	TR (July 2005)	-	-	TR (July 2005)	-	-
Finland	SO (Jan 2008)	-	-	SO (Jan 2008)	-	-
France	TR (quota) + SO (Jan 2005)	TR (fleets)	-	TR (quota) + SO (Jan 2005)	TR (Jan 2007)	-
Germany	TR (2004-2006) SO (Jan 2007)	-	TR	TR (2004-2006) SO (Jan 2007)	TR (Aug 2006)	TR
Greece	TR (quota) + SO (Dec 2005)	-	-	-	-	-
Hungary	TR (Jan 2005)	-	-	TR (Jan 2005)	TR (Jan 2007)	-
Ireland	TR (projects) SO (from 2009)	-	TR (projects)	TR (projects) SO (from 2009)	TR (projects)	TR (projects)
Italy	TR (quota) + SO (from 2008)	TR	-	SO (from 2008)	-	-
Latvia	TR (Dec 2006)	TR (Dec 2006)	TR (Dec 2006)	TR (Dec 2006)	TR (July 2007)	TR (Dec 2006)
Lithuania	TR + SO (from 2006)	-	-	TR + SO (from 2006)	-	-
Luxembourg	TR (Jan 2006) SO (Jan 2007)	-	TR (fleets)	TR (Jan 2006) SO (Jan 2007)	-	TR (Jan 2006)
Malta	TR	-	-	-	-	-
Netherlands	TR (2006 only) SO (Jan 2007)	-	-	TR (2006 only) SO (Jan 2007)	-	TR (projects)
Poland	TR + SO (from 2008)	TR (B20)	TR	TR + SO (from 2008)	-	-
Portugal	TR (quota)	-	-	-	-	-
Romania	TR + SO (July 2007)	-	-	TR + SO (July 2009)	-	-
Slovakia	TR + SO (May 2006)	-	-	TR + SO (May 2006)	-	-
Slovenia	TR + SO (Jan 2006)	-	TR (trials)	TR + SO (Jan 2006)	-	-
Spain	TR (Dec 2002) + SO (Jan 2009)	-	-	TR (Dec 2002) + SO (Jan 2009)	-	-
Sweden	TR	-	TR + FSO	TR	TR + FSO	-
UK	TR (2002) + SO (Apr 2008)	-	-	TR (2005) + SO (Apr 2008)	-	-

TR = tax reduction
PS = producer subsidies
SO = substitution obligation
TR + SO = mixed system tax reduction & obligation
FSO = fuel station obligation

In the following section we analyse the approach in certain countries and the impact their policy had on the market.

We focus the analysis on countries with active policies and where most data can be obtained. So we selected the following countries for analysis: Germany, Austria, Sweden, France, Czech Republic, Poland, Lithuania, Spain, United Kingdom, the Netherlands, Belgium.

For these countries we present a factsheet, showing an overview of

- Implemented policies, relevant to biofuel introduction + timing, with focus on
    - tax reduction & mandates,
    - biofuel standards,
    - other incentives / support programmes,
    - specific market conditions.
- Specific figures (evolution over time) showing
    - Fossil fuel tax (average annual),
    - Tax exemption (if any) per litre biofuel, for different biofuel types,
    - fossil fuel annual consumption for road transport,
    - Biofuel annual consumption (subdivided in blends vs. high concentrations when applicable),
    - Biofuel annual production,
    - Domestic vs import (if figures are available)

If other figures are available (e.g. land used for bio-energy crops), they are also mentioned. The policy overview will mention the main actions. It is not intended to give an extensive overview.

5.2 Germany

Germany is the country that is more intensively involved in biofuels production and consumption than any other EU Member State. The involvement of industrial players, a strong support of the agricultural sector and a favourable legislation resulted in a high share of biofuels, especially biodiesel.

In Germany the policy focus was initially on pure biofuels (biodiesel, rapeseed oil), as these were exempt from mineral oil tax since 1993. Since 2004 also blends are exempt from tax. Furthermore, interest in bioethanol became evident in 2004 due to the tax change (see further). In 2006 the tax situation has been revised and taxes on biofuels are gradually being introduced for pure biodiesel and pure plant oil, while general blending of biodiesel to diesel and bio-ethanol to gasoline is regulated through a substitution mandate (without tax reduction).

Germany made its first steps towards biodiesel due to the European CAP reform of 1992 (use of set-aside land), driven by some idealistic entrepreneurs and other stakeholders. Environmental concerns, agricultural deployment and creating economic value were the main driving forces.

5.2.1 Main measures

The main measures in Germany are listed in the following table.

Table 6: overview of the main measures related to biofuels in Germany

		Valid until
	Tax incentives – mandates	
1993	Since 1993 pure biofuels are exempt from mineral oil tax. Mixed biofuel components fall under full taxation like fossil fuels.	2003
1999	Ecological tax reform. Stepwise increase of mineral oil tax. Full exemption of (pure) biodiesel remains.	2003
2004	Amendment of the Mineral Oil Tax Act: not only pure biofuels, but also mixed biofuels are exempted from the excise tax on mineral oils in proportion to the amount of biofuel that they contain. In case of overcompensation, the amount of the tax exemption may be reduced for the following years.	2009
2006	Energy Tax Law: - Biofuel Quota Act: mandate for fuel distributors to include specific quota of biofuels from 2007 (fully taxed). Penalties in case of non-compliance. - introduction of tax on pure biodiesel and pure plant oil, with yearly increase up to 2012 - extended subsidies for 2nd generation biofuels + tax exempted until 2015. E85 regarded as 2nd generation biofuel (biofuel part not taxed).	2012
	Standards	
1994	DIN V 51606 (pre-norm) for biodiesel (PME).	1996
1997	DIN E 51606 for biodiesel (FAME)	2003
2000	RK 5/2000: first quality standard for PPO	2005
2003	DIN EN14214:2003-11, European norm for biodiesel (FAME), valid from 2004	
2006	DIN V51605, preliminary German standard for pure plant oil (PPO)	
2007	E DIN 51625:2007-10: German norm for E85	

2008	E DIN 51626-1:2008-01: German norm for 10%$_{vol}$ ethanol blending in gasoline (E10)	
2008	E DIN 51628:2008-01: German norm for 7%$_{vol}$ biodiesel blending in diesel (B7)	
	Other incentives / support programmes	
1991	Research programme for fuels based on rapeseed (Kraftstoff aus Raps)	1994
1993	The FNR (Agency for Renewable Resources) was initiated by the Federal Ministry of Nourishment, Agriculture and Forestry in order to support research and development in the subject area of renewable resources.	
2000	Market Launch Programme Biogenous Lubricants and Transportation Fuels	
2000	Subsidy of construction or conversion of private filling stations for biodiesel and SVO through a grant of regularly 40 % of the costs, especially in the areas of agriculture, forestry, and building construction.	2006
2007	The German government is planning to set up an environmental certification system for biofuels. A Biofuels Sustainability Ordinance has been approved in the beginning of 2008, wherein biofuels will only be credited to the EU-quota obligations and are only eligible for tax reductions if the fulfilment of the requirements of the Ordinance is proofed	
2008	The German Minister of the Environment has given up on the E10 project that targeted raising the proportion of ethanol in classical petrol from 5% to 10% beginning in 2009. This decision follows a report of the "Automobile Importers Association" (VDIK), which estimates the number of vehicles that shall present technical incompatibilities with this fuel at 3.3 million.	
	Market conditions (apart from measures)	
1990	UFOP was founded (Union for the Promotion of Oil and Protein Plants), basically as an alliance between farmers and oilseed breeders	
1991	Small scale pilot production started at Oelmühle Leer Connemann in Leer.	
1991	First large fleet vehicle trial (taxis) in the city of Freiburg.	
1995	Oelmühle Leer Connemann starts its commercial scale Biodiesel operation with a capacity of 80,000 tons based on an own process technology.	
1995	Communication of Volkswagen to support Biodiesel and to assure the provisions of warranties for nearly all the Diesel models including the brands AUDI, SEAT, SKODA and VOLKSWAGEN from construction year 1996 onwards, valid for all European countries and beyond. Before this public announcement a few other companies had given warranties – mainly for agricultural machinery. Other manufacturers followed (e.g. DaimlerChrysler, MAN and Volvo).	
1996	Law stops marketing of "leaded petrol". More than thousand tanks in public fuel pump stations are open for replacement, thus Biodiesel is adopted as an attractive option by more than 600 free public fuel pump stations within a few months.	
1999	AGQM was founded (Association Quality Management Biodiesel) as an association for quality assurance in biodiesel production and distribution	
2004	Pure biodiesel available in approx 1900 pumps	
2005	VW withdraws the general approval from Euro 4 models	
2008	UFOP reports that the market for pure biodiesel in Germany has collapsed. In January 2008 the wholesales prices of biodiesel were (for the first time) higher than ordinary diesel. In May 2008 UFOP reports that because of increasing diesel prices, biodiesel is attractive again for the market.	
2008	April 2008: start of Choren 'Beta' production plant in Freiberg, able to produce 15000 tonnes of synthetic diesel from wood ('sundiesel').	
2008	The first consignments of certified palm oil delivered under the rules of the Round Table for Sustainable Palm Oil, will arrive in Germany during the second half of the year.	

While biofuels were totally tax exempted until 2006 (from 2004 also in blended form), the German government decided in 2006 to adopt a new system to gradually introduce tax on pure biofuels, and to introduce a mandate system for fuel distributors from 2007.

Table 7 shows the evolution of tax on pure biodiesel and PPO.

The consumption of biofuels in agriculture or CHP stays tax free.

E85 carries 15 % of gasoline tax (~ 0.10 €/litre) and review of overcompensation is previewed.

Blended biodiesel or ethanol is fully taxed from January 2007, as a mandate system is applied.

Mandate system:
All distributors of fuel have to fulfil a quota for biofuels calculated on the basis of their total fuel distribution. For diesel fuel they have to provide evidence of 4.4% of biofuel by energy. For gasoline they have to provide evidence of 1.2% in 2007, 2% in 2008, 2.8% in 2009 and 3.6% from 2010 on (all calculated by energy content).

Penalties for non-compliance have been set rather high (>0,50€/litre), which gives a good motivation for fuel distributors to fulfil the obligation..

Additional in 2009 6.25% of energy content of total fuel consumption have to be biofuels. In 2010 6.75% energy content of total fuel consumption have to be biofuels. [Mabee et al, 2007]. This amount will be gradually raised to 8% in 2015.

5.2.2 Figures for biofuel introduction in Germany

Table 7: tax levels (€/litre) and active policies in Germany

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
diesel	0,32	0,38	0,41	0,44	0,47	0,47	0,47	0,47	0,47	0,47		
B5/B7*						0,00	0,00	0,00	0,47	0,47		
B100	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,09	0,09	0,15	0,21	0,27
PPO	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,10	0,18	0,26
BTL									0,00	0,00	0,00	0,00
gasoline	0,52	0,56	0,59	0,62	0,65	0,66	0,66	0,66	0,66	0,66		
E5/ETBE*						0,00	0,00	0,00	0,66	0,66		
E85*									0,00	0,00	0,00	0,00

* tax on biofuel part (€/litre)

sources: Eurostat & German country reports

= tax reduction
= substitution obligation
= combined system

Table 8: evolution of biofuel consumption in Germany

1000 tonnes of oil eq./yr	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008*
diesel	26081	26256	25995	26360	25569	26285	25528	25908	24091	*26494*
biodiesel	114	220	308	483	703	923	1582	2197	2753	*2213*
in B5					0	229	527	888	1219	*1410*

in B100	114	220	308	483	703	694	1055	1310	1534	*804*
PPO					4	4	175	965	649	*279*
gasoline	31554	30036	29136	28343	26930	26029	24114	22981	20539	*20688*
ethanol					0	42	145	328	294	*354*
in ETBE								287	233	*235*
in E5								41	57	*114*
in E85								0	4	*5*

* 2008 figures are extrapolated from the first half (Jan-June 2008)
sources: Eurostat (fossil fuel figures up to 2006), German country reports, [UFOP 2008], [Biofuels Barometer, 2008], [IEA, 2002]

Germany has known an enormous increase of biodiesel consumption between 2000 and 2007, and this is mainly in its use as pure fuel. Although there was some stabilisation between 2003 and 2004, when also blended biodiesel was introduced, the years after B100 use kept growing. This trend is likely to reverse with tax levels on B100 rising in the following years. Already in 2008 there is a decreasing trend in the use of B100, as is clear from the extrapolated figures for 2008; experts expect that from 2009 B100 will hardly be competitive any more with mineral diesel.

PPO levels have increased tremendously from 2005 to 2006, when tax was introduced on B100, which was not the case yet for PPO use. The trend seems to go down again as tax levels of B100 and PPO are growing towards each other, and these pure biofuels will be less attractive from economic point of view. The markets for biodiesel and PPO in 2008 have fallen to one third of the levels in 2007, and further decline can be expected for 2009 [UFOP, 2008].

Introduction of ethanol in German transport fuel is growing slower than anticipated. It is expected that the substitution obligation for ethanol in gasoline in 2007 has just about been reached, and is even slightly below 2006 levels.

It is also interesting to see how production and capacity figures of German biofuel industry have followed domestic biofuel demand. The following table shows an overview. Production figures are derived from EBB for biodiesel and eBIO for bio-ethanol.

Specific figures for ethanol production capacity were difficult to find, as ethanol production (other than food industry alcohol) is not meant to serve only for production of biofuel, even if this has become the largest part of production. It also serves for pharmaceutical, cosmetic and parachemical purposes. Only part of the production announced by the producers is intended for automotive fuel because the distinction in uses is not always known [Biofuels ObServer].

Table 9: Comparison of biodiesel and bio-ethanol production vs consumption in Germany

1000 tonnes/yr	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Biodiesel									
Consumption	130	250	350	550	800	1050	1800	2500	3132
Production	130	265	364	450	715	1035	1669	2662	2890
Prod capacity	101	217	491	671	1025	1088	1903	2681	4361
Ethanol									
Consumption					0	65	226	478	460
Production					0	20	131	343	313

Sources: German country reports, [UFOP 2008], [EBB 2008], [eBIO 2008]

Biodiesel production seems to keep up with demand in the early years, although it is clear that some biodiesel is imported into Germany from 2002 to 2005, mostly from neighbour countries like Austria and Czech Republic. According to UFOP about 300,000 tonnes of biodiesel have been imported to Germany in 2005 (~15% of biodiesel consumption).

Since 2006-2007 there has been a very strong increase of biodiesel imports. This may be linked to the high increase in American biodiesel imports to Europe, which went from about 80,000 tons in 2006 to more than 1 million tons in 2007 according to EBB. This strong increase in the level of American imports is explained, according to the EBB, by US government subsidies of $300 per ton (€200 per ton) for any biodiesel which is blended with a minor addition, as tiny as it might be, of mineral diesel in the biodiesel. This legislation makes it possible for the USA to export a subsidised fuel composed of 99% biodiesel (B99) that is eligible for the incentive systems of the countries of the EU. In particular German industry has suffered from this competition. The EBB lodged a complaint ("a joint anti-subsidy and anti-dumping complaint") in the name of European industrialists on 25 April 2008 with the European Commission.

Not only the final biofuel can be imported, but also the feedstock can be imported and then converted to biofuel in Germany. To get an idea of the share of imported feedstock, we look at the amount of biofuel (biodiesel and PPO) produced from German rapeseed.

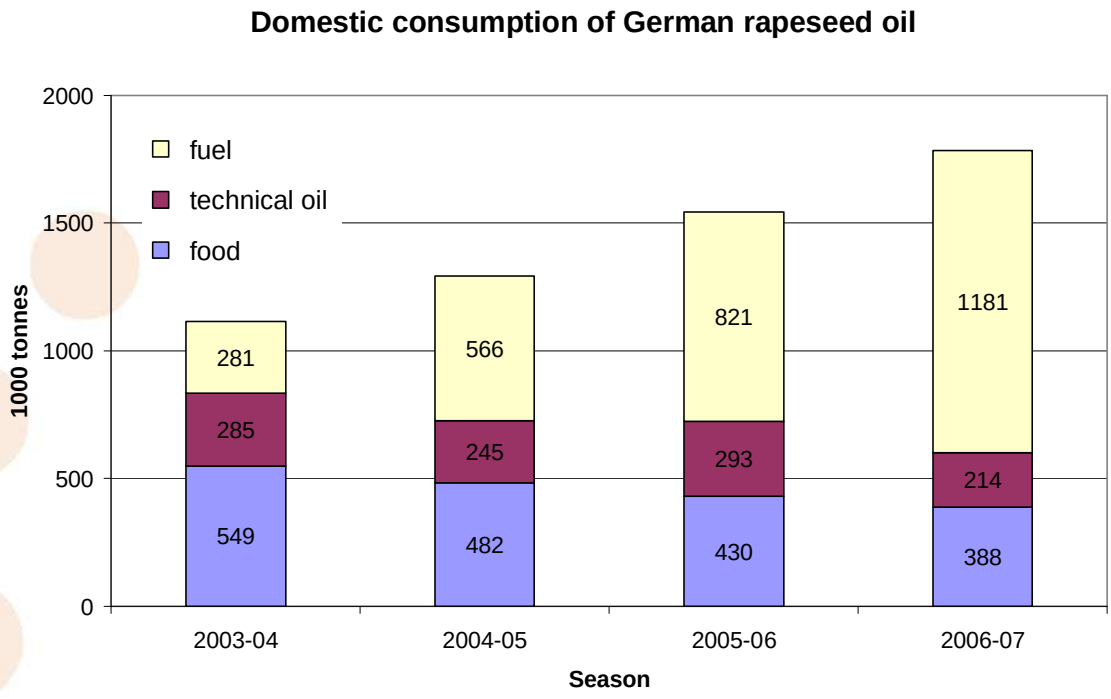

Figure 6: domestic consumption of rapeseed oil produced from German rapeseed
Source: [UFOP, 2007]

When comparing these figures with the consumption of biodiesel and PPO, only 25 to 30% of German biodiesel and PPO consumption comes from domestic feedstock. Most of the imported feedstock is derived from neighbour countries.

5.2.3 Impact assessment

- The full tax exemption of biofuels, together with rising diesel prices has led to the situation where biodiesel was cheaper than fossil diesel (especially on volume basis),

which has been an important incentive for users (mainly transport companies, but also private car owners and agriculture) to use pure biodiesel.

- Since 2004, biofuel in blends has also been exempt from tax, which has led to a very fast switch to 5% biodiesel by the oil companies, as biodiesel was cheaper than diesel. Bioethanol is included as well, but to a lesser extend.
- The biodiesel volumes in Germany have grown considerably, also supported by the fact that there are no quotas, thus making Germany attractive for imports from other countries. More than half of the feedstock for German biodiesel is imported.
- From the beginning German car manufacturers have cooperated in the biodiesel story, making their vehicle models biodiesel compatible. For their newest models however they rather support limited blends of biodiesel due to anticipated problems with diesel particulate filters (DPF).
- The introduction of a steadily increasing tax on biodiesel, is starting to have an effect on the market from 2008. Currently biodiesel (B100) is not cheaper than diesel anymore, which takes away the motivation for most vehicle users driving on B100. A serious decline of these markets has started in 2008, and will probably continue in 2009.

5.3 Austria

In Austria there has been focus on biodiesel (RME and FAME) in pure form for quite a long time, however consumption volumes were never very high (up to 20,000 tonnes per year) compared to Germany or France. In the second half of 2005 Austria introduced a substitution requirement for fuel distributors, combined with a tax exemption for diesel fuel containing 4,4%vol biodiesel. The fuel sector responded practically immediately and a substantial consumption volume was reached from 2006.

Although it is a small country, Austria has been a pioneer in research activities on the production of biodiesel (even dating back to 1973), the technical compatibility with diesel engines and quality standards for biodiesel. The first pilot plant for the production of methyl ester from rapeseed oil was built in 1982 and the first industrial biodiesel production plant was built in Aschach (Upper Austria) in 1991. Several small scale biodiesel production plants were built, owned by agricultural co-operative societies. Austria was also one of the first countries to use used frying oil as a feedstock for biodiesel.

5.3.1 Main measures

Pure biofuels have been tax-exempted from the early years. While since 1999 blended biodiesel was also fully tax exempted, from October 2005 a substitution requirement was introduced. The requirement states that fuel distributors need to include a minimum proportion of 2.5% biofuels in their total fuel sales from October 2005. This amount has been increasing up to 4.3% from October 2007 and 5.75% from October 2008 (all percentages on energy basis).

On top of the substitution requirement, there is also a tax reduction for fuels containing at least 4.4% biofuels on volume basis. For diesel this is valid from October 2005, for petrol from October 2007. Diesel with minimum 4.4%vol biodiesel and low-sulphur content has a tax difference of 0.028€/litre compared to common diesel (from October 2005) and gasoline with minimum 4.4% bioethanol and low-sulphur content has an advantage of 0.033€/litre compared to common petrol (from October 2007).
The tax difference can only partly be attributed to the biofuel content as the sulphur content is also an important condition.
Pure biofuels remain tax-exempted.

The following table lists the measures and market conditions in the past in Austria.

Table 10: overview of the main measures related to biofuels in Austria

		Valid until
	Tax incentives	
1991	Full tax exemption for pure biodiesel	
1999	Full tax exemption of biodiesel in max 3% blend	2004
2005	Tax reduction for 4,4% biodiesel blend: 0.5 ct / litre, compared to sulphur-free diesel. Full mineral tax exemption for 100% biodiesel	
	Substitution requirement, 2.5% as of October 2005, 4.3% as of October 2007, 5.75% as of October 2008.	
2007	Tax reduction also for gasoline blended with bioethanol	

	Standards	
1991	Ö-Norm C1190 (RME)	1996
1997	Ö-Norm C1191 (FAME)	2003
	Market conditions (apart from measures)	
1985	1st pilot plant worldwide for RME in Silberberg	
1991	First industrial scale biodiesel plant (10,000 tonnes/yr) in Aschach	
1993	Foundation of the STAME consortium (Styrian RFOME (=Recycled Frying Oil Methyl Ester)) for the use of used cooking oil for biodiesel	
1994	Start of FAME use by buses in Graz. Today the whole bus fleet of the Graz public transport company GVB is converted to biodiesel. Most of the biodiesel stems from processed used cooking oil.	
2004	In 2004, 55000 tonnes of biodiesel were produced in Austria. From this quantity approximately 90% was sold abroad, as the price which can be obtained for biodiesel in Germany and Italy is higher than in Austria.	

5.3.2 Figures for biofuel introduction in Austria

Table 11: tax levels (€/litre) and active policies in Austria

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Diesel	0,29	0,29	0,29	0,29	0,29	0,31	0,31	0,33	0,35	0,38
B5*	0,00	0,00	0,00	0,00	0,00	0,00	0,30	0,30	0,32	0,35
B100	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
PPO	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Gasoline	0,41	0,41	0,41	0,41	0,41	0,43	0,43	0,43	0,46	0,48
E5*									0,44	0,44
E85**									0,00	0,00

* tax on total fuel (biofuel% > 4,4%vol + S< 10ppm)
** tax on biofuel part (€/litre)
Sources: Eurostat & Austrian country reports
= tax reduction
= substitution obligation
= combined system

Especially the substitution mandate from October 2005 has made an important difference. Before that, only tax exemption of around 0,30€/litre was valid, and this did not seem to be enough to stimulate the market.

Table 12: evolution of biofuel consumption in Austria

1000 tonnes of oil eq./ yr	1999	2000	2001	2002	2003	2004	2005	2006	2007
Diesel			4756	5266	5842	6039	6297	5967	6098
biodiesel	7	9	10	9	11	4	81	282	316
in B5							66	254	254
in B100	7	9	10	9	11	4	15	29	63
PPO								9	16
gasoline	2003	1938	1952	2174	2224	2186	2102	2034	2045
ethanol							0	0	22

Sources: Eurostat (fossil fuel figures up to 2006), Austrian country reports, [Pelkmans, 2006], [Biofuels Barometer, 2008]

Table 13: Comparison of biodiesel production vs consumption in Austria

1000 Tonnes/yr	1999	2000	2001	2002	2003	2004	2005	2006	2007
Biodiesel									
Consumption	8	10	11	10	12	5	92	321	360
Production	16	18	21	25	32	57	85	122	241
Prod capacity	22	28	33	40	50	100	125	134	326

Sources: Austrian country reports, [Pelkmans, 2006], [EBB 2008]

Until 2004-2005 biodiesel production in Austria was consistently higher than in-land consumption, meaning that part was exported to countries with a better biofuel regime. This has changed since the end of 2005. While production capacity is growing, imports are important to keep up with increasing demand.

5.3.3 Impact assessment

- The tax exemption for biodiesel (pure or blends) seemed to be insufficient to really create a difference on the market until 2004. Until mid 2005, biodiesel production was higher than consumption, meaning that a part of the production was exported to other countries, where prices were probably better.
- Currently the market has changed. The obligation from October 2005 has really been the starting point to blend biodiesel at large scale. Most fuel distributors have chosen to distribute the 5% biodiesel blend (higher than the substitution requirement), as this way they could get a tax incentive.
- The early establishment of standards has facilitated the search for alternatives to rapeseed and also had an impact on the building up of a collection system for used frying oil.

5.4 Sweden

Sweden supports a unique strategy as far as biofuels are concerned. In October 2005 the Swedish government announced plans to make Sweden completely independent of oil by the year 2020. Observing a very high gasoline use (rather than diesel) in transport, the Swedish government dedicated extensive resources to the support and promotion of bio-ethanol use in transport. Also, the use of alternative fuels is being very actively promoted at the local level. Sweden is the only EU country with considerable use of biogas in transport. A number of procurement incentives are in place to drive the interest of the end users to the use of alternative fuels. Currently about 80% of the ethanol is imported from Brazil and the rest of Europe, but Sweden is putting a lot of emphasis on second generation bioethanol (from cellulose, of which it has huge resources), by dedicating extensive resources to research for production technologies.

Since 1990 Sweden's biofuel strategy is mainly oriented towards ethanol, used as:

- E95 for diesel engines, neat ethanol with added ignition improver and water content of a few %. This is mainly used for buses. About 400 buses (most in Stockholm) are using this fuel.
- E85 for gasoline engines, anhydrous ethanol with 15% added gasoline. Since 1994 the number of E85 filling stations has been growing from 1 to more than 1000 (especially in the past few years) and there are now over 100,000 FlexiFuel Vehicles in Sweden which can use E85 (status spring 2008), with new sales of around 4,000 per month.
- Blending of 5%vol ethanol in gasoline since 2001. The reason for the 5% is the European fuel quality directive and the EN 228 standard. Currently practically all gasoline (95 octane) is blended with 5%vol ethanol. Sweden is advocating at the European Commission to increase the allowed level up to 10%vol.

Besides, Sweden is also using biodiesel blending to diesel, which is becoming more important in recent years, especially since the generally allowed blending level was increased from 2 to 5%.

Also the production and use of biogas is increasing. Until today, most of the biogas used for vehicle purposes has been produced as a by-product of treating sewage sludge for odour control and to reduce the risk of health problems. Recently there is also focus on anaerobic digestion of agricultural residues.

5.4.1 Main measures

In addition to tax incentives, there is a number of different policy instruments currently used in Sweden for promoting the use of biofuels and environment-friendly cars, for example [USDA, 2008]:

- access to environment-friendly fuels throughout the country. Since April 2006, all major fuel stations in Sweden are required to sell at least one type of biofuel.
- The Swedish government has introduced a cash bonus of SEK 10,000 (€ 900) to private individuals who buy a new 'green' car. The program is scheduled to run from April 2007 until December 2009.
- Free parking for green cars.

- As of August 2007 there is a permanent congestion charge in Stockholm. Green cars are exempt from this charge.
- As of 2007 at least 85% of all cars purchased by government authorities and 25% of emergency services have to be environment friendly.
- Expansion of biogas stations continues to be supported, in the form of investment grants.

The following table shows an overview of the main measures and side conditions in the past in Sweden.

Table 14: overview of the main measures related to biofuels in Sweden

		Valid until
	Tax incentives	
1992	Tax exemption for ethanol and biogas	
1995	Full tax exemption for biofuels for pilot projects	
2002	CO_2-neutral fuels are exempt from CO_2 tax	
2004	CO_2-neutral fuels are exempt from CO_2 and energy tax (0.10€/litre)	
	Standards	
1996	SS 155436, vegetable fatty acid methyl esters	2003
1997	SS 155437, fuel alcohol for high-speed diesel engines	
1999	SS 155438, biogas as a fuel for high-speed Otto engines	
2006	SS 155480, Ethanol E85	
2006	In spring 2006, Sweden decided to revise the diesel standard (which limited RME blending to 2%), in order to allow for up to 5% RME blends in mineral diesel.	
	Other incentives / support programmes	
1992	Swedish "Climate Bill", financial support of approximately 4.7 million Euros for research and development on the fermentation of cellulose to ethanol.	
1996	New Energy Bill, research and development on production from cellulose received an additional governmental support of 23 million Euros.	
1998	Procurement for ethanol-fuelled vehicles. Agreement to purchase more than 3,000 Ford FFVs.	
	Grants for investments in environmentally friendly vehicles including investment in refuelling stations for alternative fuels (approx. €80.5 mil).	2002
2003	Financial support for R&D (23 mil euros) for 124 projects. Sweden supports research, development and demonstration measures for developing more energy-efficient and more cost-effective processes for the production of biofuels. In 2003, the Swedish Energy Agency carried out measures as part of several different programmes for developing production processes for fuels such as ethanol, methanol, dimethyl ether (DME), FT diesel, biogas and hydrogen. State funding for biofuel-related measures is estimated to be at least SEK 50 million per annum.	
2004	Governmental ordinance, SFS no: 2004:1364 (The Ministry of Industry) "Authorities purchase and leasing of environmentally friendly vehicles"	
	Parking measures	
	Financial support for R&D (6 mil euros)	
	Cars powered by alcohol have a 20% tax reduction for company car tax.	
2005	Environmental policy for government fleets. At least 25% of all new government vehicles must be eco-friendly.	
2006	Introduction of congestion charge in Stockholm (test). FFVs are classified as environmental friendly vehicles and exempt from congestion charge.	

	From April 2006, all fuel stations that in 2005 sold more than 300m³ petrol and diesel, should also offer at least one renewable fuel.	
2007	As of 2007 at least 85% of all cars purchased by government authorities and 25% of emergency services have to be environment friendly.	
	Cash bonus of SEK 10,000 (€ 900) to private individuals who buy a new 'green' car. The program is scheduled to run from April 2007 until December 2009.	2009
	As of August 2007 there is a permanent congestion charge in Stockholm. Green cars are exempt from this charge.	
	Market conditions (apart from measures)	
1983	Foundation for Swedish Development of Ethanol (SSEU), later (1999) renamed as Bio Alcohol Fuel Foundation (BAFF).	
1992	Introduction of FFVs, Introduction of neat ethanol (E95) for the use as a fuel in buses with diesel engines.	
1994	First Swedish filling station for E85 was opened in Örnsköldsvik.	
1995	Oil Company OK promised to set up a filling station in every municipality with at least 5 FFVs	
1996	Scania introduces commercial ethanol buses.	
1998	First public biogas station opens	
2001	Ford starts supplying Focus FFVs to the Swedish market.	
2001	All gasoline in Stockholm and southeast is blended with up to 5% ethanol.	
2003	Establishment of non-profit organization BioFuel region (BFR).	
2003	Scania announced to stop the production of ethanol heavy-duty engines, unless there is sufficient market demand.	
2004	All gasoline (95 octane) in Sweden is blended with 5% ethanol.	
2004	Production plant for R&D for ethanol production from cellulose (16 million Euros from the Swedish Energy Administration) in Örnsköldsvik.	
2005	Saab and Volvo introduce new FFV models.	
2006	Since August 2006, Statoil has been incorporating 5% biodiesel into all diesel sold by the company in Sweden.	
2007	Sweden's rising ethanol consumption is based on imports, of which a large share is sourced in Brazil. In 2007, total imports are estimated at about 250 million litres according to Swedish statistics.	
2008	SEKAB announced that it is the first company in the world to supply verified sustainable ethanol. This is ethanol from Brazilian sugarcane for inclusion in E85 and E95 and will be available from August 2008. It is quality assured from environmental, climate and social perspectives, using criteria that cover the entire lifecycle of ethanol from the sugarcane field to its use in cars. Brazilian mills will receive a 5 to 10% premium for the certified product. An independent auditor will monitor performance.	

5.4.2 Figures for biofuel introduction in Sweden

Table 15: tax levels (€/litre) and active policies in Sweden

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Diesel	0,30	0,34	0,33	0,34	0,35	0,36	0,39	0,40	0,40	0,40
B2/B5*	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B100	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Gasoline	0,50	0,53	0,50	0,50	0,51	0,52	0,54	0,57	0,55	0,55
E5*	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E85*	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
E95*	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Biogas**	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

* tax on biofuel part (€/litre)
** €/kg
sources: Eurostat & Swedish country reports
= tax reduction
= combined system: tax reduction + renewable fuel obligation for fuel stations

Table 16: evolution of biofuel consumption in Sweden

1000 tonnes of oil eq./yr	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Diesel	2424	2569	3039	2534	2640	2849	3221	3249	…
Biodiesel	10	5	3	4	4	7	8	50	*101*
in B2-B5						7	7	43	*97*
in B100						1	1	7	*4*
Gasoline	4240	4180	4163	4296	4314	4232	4184	4070	*3988*
Ethanol	8	14	22	38	76	132	145	163	*183*
in E5			12	30	63	119	128	126	*124*
in E85 / E95			9	9	13	13	17	37	*58*
Biogas	3	4	5	8	9	11	14	15	*16*

Sources: Eurostat (fossil fuel figures up to 2006), Swedish country reports, [Pelkmans, 2006], [Biofuels Barometer, 2008], SCB

Until recently ethanol was the main biofuel in Sweden, both by general blending in gasoline as in dedicated fuels (E85 and E95), but recently biodiesel is catching up through general blending in diesel.
While most biofuel volumes are still provided by general blending, most attention is given to the dedicated fuels. Flexible fuel vehicles (FFVs) are actively promoted, as well as the availability of E85 at public fuel stations. The following figure shows an overview of FFV sales and the number of E85 fuel stations. FFVs were actually introduced in Sweden (and Europe) through a common procurement system (for which Ford initially delivered vehicle models to the Swedish market), and when from 2005 also the Swedish manufacturers Saab and Volvo decided to offer FFV models, their sales really increased. Currently about 20-25% of Swedish car sales are FFVs.

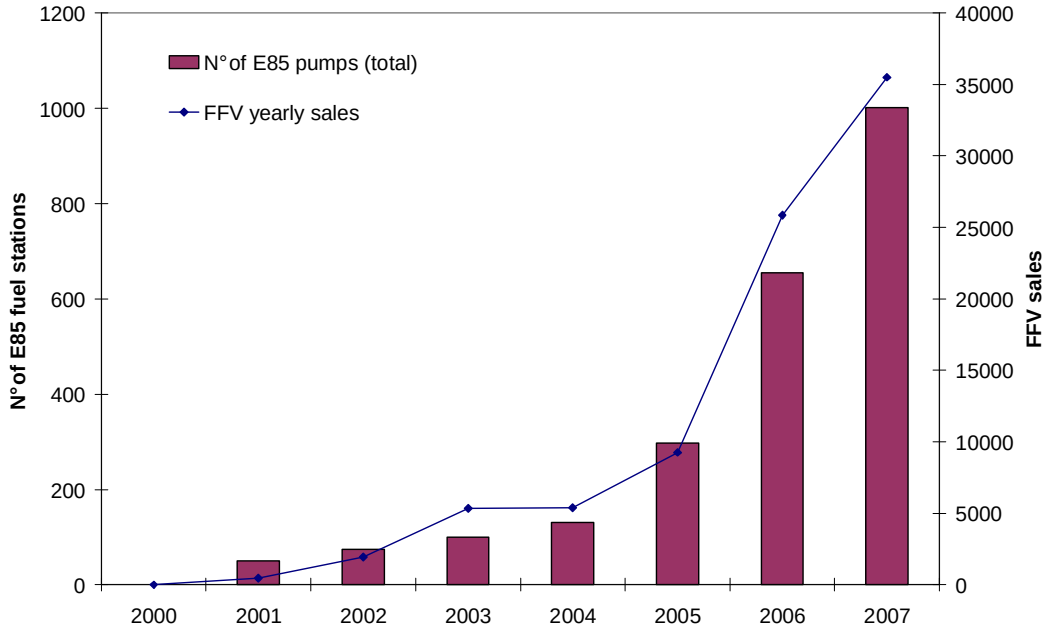

Figure 7: FFV sales and E85 public fuel stations in Sweden
Source of the data: BAFF

When comparing biofuel production and consumption figures, it is clear that Sweden is importing quite a lot of processed biofuels (mainly ethanol) into Sweden. Specifically for ethanol in 2007 only 25% was domestically produced while the rest was imported from Brazil and the rest of Europe. Nevertheless on the long term Sweden is putting a lot of effort in the development of second generation ethanol based on wood, in view of the enormous Swedish wood potential.
In the meantime, Sweden puts a lot of focus on the sustainability assurance of imported biofuels. Recently the ethanol distributor SEKAB reached an agreement with Brazilian ethanol suppliers to deliver verified sustainable ethanol to the Swedish market.

Table 17: Comparison of biodiesel and bio-ethanol production vs consumption in Sweden

1000 Tonnes/yr	1999	2000	2001	2002	2003	2004	2005	2006	2007
Biodiesel									
Consumption	11	6	3	4	5	8	9	57	115
Production						1	1	13	63
Prod capacity					8	8	12	52	212
Ethanol									
Consumption	12	22	34	60	119	207	226	255	285
Production	12	22	34	50	52	57	122	140	70

Sources: Swedish country reports, [EBB 2008], [eBIO 2008], SCB

5.4.3 Impact assessment

- The exemption of "CO_2-neutral fuels" from fuel tax (CO_2 and energy tax) has significantly boosted the ethanol consumption in blends, since the strategic choice of oil companies for E5. From 2004 practically all Swedish gasoline is blended with 5% ethanol. Since the blending limit is now reached, further growth should come from a change of the Fuel Quality Directive (increase of the allowed ethanol in gasoline up to 10%) or from the promotion of high blends.

- Biodiesel (RME) use is catching up recently, with most diesel fuel being blended with 5% biodiesel.
- The common procurement to bring FFVs on the Swedish market has initiated the E85 market and a demand for FFVs. Because of this growing demand various European car manufacturers have decided to develop FFV models for the European market.
- The market for E85 and FFVs is steadily growing, but the speed of introduction is much slower than for low blends.
- Fuel tax reduction, combined with the tax reduction for cars and specific user incentives are the drivers to FFVs to enter in the vehicle market. Especially the announcement of the Stockholm congestion charge has really made the difference. Currently more than 20% of car sales in Sweden are FFV.
- While 90% of ethanol is sold in low blends compared to 10% in high blends, most of the public interest (newspapers, …) goes to the application of high blends and pure biofuels. So visibility and awareness raising is much higher with high blends.
- Less than half of ethanol consumption in Swedish transport comes from domestic feedstock, the rest is imported from South Europe (mainly wine alcohol) and Brazil. Sweden is at the forefront of the discussions to implement practical sustainability certification schemes for biofuels.
- Sweden has a large forest area compared to the rest of Europe. So in the future Sweden is counting on forest products and residues to produce second generation biofuels (mainly ethanol) from ligno-cellulose. Sweden's strategy to introduce ethanol vehicles, mostly relying on imported bioethanol, is related to its long-term vision to rely on its own feedstock (for second generation ethanol) in the longer term.
- Significant research and investment grants have been given to promote the domestic production of ethanol from ligno-cellulose. A lot of activities are supported in the "Biofuel Region".

5.5 France

From the beginning of the 1990s France has been quite active in the production and use of biofuels, currently being the 2nd largest producer of biodiesel (following Germany), while at the same time its ethanol production is just behind Spain. France has declared a very ambitious target of 7% for biofuels in transport for the year 2010.

The agricultural sector in France is large and it has a long tradition. So the first motive for the French government to stimulate the production and use of biofuels was the European CAP (Common Agricultural Policy) reform of 1992, and the possibility to support its agricultural sector. Next, environmental protection was also added as a significant driving force.

Incentives were put in place and the first significant quantities of biofuels were commercially produced in 1993. France chose to use all biofuels as a blending component in conventional gasoline and diesel fuel because that does not require vehicle modifications and the existing fuel distribution infrastructure can be used.

So far two different types of biofuels are used in France: biodiesel or VOME (vegetable methyl oil ester) based on vegetable oil and ETBE (ethyl tertiary butyl ether) based on bioethanol. They are used in the following blends:

- Up to 5% biodiesel blended in diesel fuel. This is allowed without special notification at the refuelling pump. In 2008 the allowed biodiesel share was increased to 7% by volume.
- Under special agreements that have improving urban air quality as a background, 30% biodiesel in diesel fuel is used in captive fleets like city buses.
- Until 2004 it was not allowed to blend bioethanol directly in conventional fuels. Bioethanol is converted into ETBE before it is blended in gasoline, to a maximum of 15%. Since 2004 direct blending of ethanol is allowed, but so far it occurs only on a very limited scale.
- From 2007 the use of E85 is promoted, however so far the success is very modest.

Since 2000 France relies on an accreditation system (quota) for biodiesel, ETBE and ethanol (since 2004), which allows biofuel production companies to put a certain amount of biofuel (quota) on the market under reduced tax. The tax reduction is yearly revised to avoid overcompensation. After 5 years of fairly constant quota between 2000 and 2005, France increased the production quota in order to reach a biofuel share of 5.75% in 2008, 7% in 2010 and 10% in 2015.

Since January 2005 resellers of automotive fuels are imposed an extra tax (TGAP) on the amount of fuels they sell. The TGAP is based on the selling price of the fuels, before VAT. The tax rate is 1.2% in 2005 up to 5.75% in 2008 and 7% in 2010, according to the schedule in the table. The TGAP rate is diminished by the percentage of biofuel in the fuel. This way the fuel distributors have an incentive to include biofuel blends in their fuel sales. The method can be compared with a substitution requirement (mandate) system, where fuel distributors pay a penalty when they do not reach a certain level of biofuels in their fuel sales.

Table 18: TGAP rate in France per year

	2005	2006	2007	2008	2009	2010
TGAP (%)	1.2	1.75	3.5	5.75	6.25	7.0

Source: [van Walwijk, 2005]

5.5.1 Main measures

The main measures and market situations in France are presented in the following table.

Table 19: overview of the main measures related to biofuels in France

		Valid until
	Tax incentives	
1992	(Partial) tax exemption from TIPP (internal tax on petroleum products) of 100% for biodiesel and 80% for bioethanol incorporated as ETBE in gasoline.	
2000	Introduction of an accreditation system, which allows biofuel production companies to put a certain amount of biofuel (quota) on the market under reduced tax. Tax exemption from TIPP is yearly revised, related to the extra cost of biofuels. In 2003 the TIPP reduction for biofuels was first revised.	
2004	TIPP reduction also valid for direct bioethanol blending.	
2005	Extra tax TGAP (general tax on polluting activities) for fuel resellers. TGAP is zero if a target percentage biofuels is reached.	
	Standards	
1993	Journal officiel – RME	
	From April 1994 onwards 5% RME can be blended to diesel fuel, without notification of the client. To improve air quality in urban areas, the French government allows the use of 30% biodiesel in diesel fuel for captive fleets under special arrangements.	
1997	Journal officiel – VOME	
2007	Decision to allow B7 from 2008	
	Other incentives / support programmes	
1994	Establishment of AGRICE to co-ordinate the research work on the use of agricultural products in the chemistry and energy sector. During its first years of operation, the emphasis was on biofuels. AGRICE is managed by the French Agency for the Environment and Energy (ADEME).	
2004	Plan climat, plan biocarburants was first announced.	
2005	Prime Minister De Villepin announces in September that in 2008 the amount of biofuels used in France would increase to 5.75% of road fuel consumption. The long-awaited French 'Plan Biocarburants' is now starting to take shape.	
2006	A group led by former car pilot Alain Prost is commissioned to look into the introduction of E85 ('Super-éthanol') and Flex-fuels. Based on their report in September 2006 the government announces a promotion plan for E85. The government aims to have 500 E85 pumps all over France by the end of 2007, wit a fuel price of around 0.80€/litre, and several FFVs offered by car manufacturers.	
	Market conditions (apart from measures)	
1980's	IFP (Institut Français du Pétrole) research into biodiesel production process.	
1991	In 1991 the IFP started a large 2 year validation programme to investigate if 5% or 20% RME blends could be generally allowed in common diesel fuel. As a result from 1994 up to 5% RME can be blended to diesel fuel, without notification of the client.	
1992	The first industrial RME production unit was built in Compiegne in 1992 with financial support of the EC. Its initial production potential was 20,000 tonnes/year.	
1993	Creation of Diester Industrie for the commercial production of biodiesel. Diester is currently dominant on the French biodiesel market. It has been granted most of the total 2004 authorised production in France.	

1994	Establishment of 'Club des Villes Diester' network to exchange information and experiences on using diester (B30). In 2003 the name was changed to 'Partenaires Diester' and it became possible for enterprises to become member.	
	PSA cars (Peugeot, Citroën) are warranted for diesel blends up to 30% biodiesel. Since 2001 the in-house fleet of Peugeot and Citroën (about 800 vehicles) is running on B30 (14 million km/year)	
2006	Since the fall of 2006 Renault offers two light commercial vehicle models (Trafic and Master) compatible with B30. The new B30 vehicles represent the first step in implementing the Renault Commitment 2009, whereby all diesel engines sold by the company in Europe by 2009 will be able to run on B30	
2007	From 2007 RATP (public transport in Ile-de-France) will run one third of its buses on B30. It will launch experiments on B100 to learn about the engine behaviour using this fuel. Based on the results of these trials, in 2009 the company will draw a strategy towards 2025.	
2007	From 2007 6 FFV models (E85) are commercially available in France. Ford and Saab offer their existing FFV models, while Renault launches a Megane Flexfuel in 2007 and will offer 50% of its gamma in flexifuel version in 2009. PSA commercialises a Peugeot 307 and a Citroen C4 in the summer of 2007.	
2008	The success of E85 fuel station introduction is lower than expected. Mid 2008 around 200 fuel stations offer E85 (compared to the envisaged 500).	

5.5.2 Figures for biofuel introduction in France

Table 20: tax levels (€/litre) and active policies in France

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
diesel	0,38	0,39	0,37	0,38	0,39	0,42	0,42	0,42	0,43	0,43
B5/B7*	0,00	0,00	0,00	0,00	0,04	0,09	0,09	0,17	0,18	0,21
B30	0,00	0,00	0,00	0,00	0,04	0,09	0,09	0,17	0,18	0,21
gasoline	0,59	0,59	0,57	0,57	0,59	0,59	0,59	0,59	0,60	0,60
ETBE*	0,12	0,12	0,11	0,11	0,21	0,21	0,21	0,26	0,27	0,33
E5*						0,22	0,22	0,26	0,27	0,33
E85*									0,27	0,33

* tax on biofuel part (€/litre), in quota system
sources: Eurostat, French country reports

= tax reduction

= combined system: tax reduction + TGAP

When looking at the consumption volumes in the following table, we see that between 2000 and 2004 volumes were fairly constant, which has to do with the system of the authorised quota (volumes were not increased in this period, partly because French government wanted to keep their tax losses under control). From 2005, the quota were increased to meet the targets set by the French government. Meanwhile tax reductions could be reduced, because the TGAP system gave enough motivation for the fuel sector to follow the biofuel targets.

Table 21: evolution of biofuel consumption in France (1000 tonnes of oil equivalent)

1000 tonnes of oil eq / yr	1999	2000	2001	2002	2003	2004	2005	2006	2007
Diesel	25902	28020	28935	29057	29482	30176	30441	31124	31799
Biodiesel	220	277	277	299	283	285	324	555	1161
Gasoline	14940	14133	13732	13244	12402	11769	11006	10218	10351
Ethanol	58	60	58	58	49	52	75	150	273

in ETBE	58	60	58	58	49	51	73	141	245
in E5						0	2	9	28
in E85								0	…

Sources: Eurostat (fossil fuel figures up to 2006), French country reports, [Pelkmans, 2006], [Biofuels Barometer, 2008]

From the beginning France has focussed on domestic supply of biofuels, nevertheless they needed to use a European tender to assign the authorised quota. Until 2005 the share of foreign production units was very modest (less than 5% of the quota) and domestic consumption could be met with domestic production – there was even some extra production which could be exported to Germany; with the increase in the years after also production units from outside France received significant quota.
With the more or less closed authorised quota system, France does not suffer the worldwide competition of a.o. subsidized American biodiesel.

Table 22: Comparison of biodiesel and bio-ethanol production vs consumption in France, also in comparison to the authorised quota

1000 Tonnes/yr	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Biodiesel												
Consumption	250	315	315	340	322	324	369	631	1321			
Production	250	320	320	366	357	348	492	743	872			
Prod capacity	400	400	400	400	500	502	532	775	780**			
Authorised quota		317	317	317	333	387	417	677	1343	2478	2728	3148
Ethanol												
Consumption	91	93	90	91	77	81	117	234	426			
Production	91	93	90	91	77	81	117	233	459			
Authorised Quota – ETBE*				109	109	99	130	169	224	224	224	224
Authorised quota – ethanol						12	72	137	337	717	867	867

* only ethanol part is counted (47%vol of ETBE)
** capacity around June, extra capacity started in 2nd half of the year (so production higher than June capacity)
Sources: French country reports, [EBB 2008], [eBIO 2008], [Pelkmans 2006]

5.5.3 Impact assessment

- With its focus on low blends, France had a fast take-off of biofuel introduction in transport fuels, and up to 2000 France had the highest biofuel consumption in the EU. The example shows that only a few years (1993-1997) were needed to achieve a market share of 300,000 tonnes biodiesel and 100,000 tonnes bioethanol.
- Tax incentives were the main policy instrument, creating an incentive for the fuel industry to participate.
- A very important factor was also the organized way the market was approached (both from the agricultural sector, the biofuel production sector and the fuel distribution sector), with long-term contracts, finance participation, etc.
- As in other countries biofuel consumption stalled in 1998-1999 due to economic side conditions (record low oil prices) and the reduction of set-aside obligations.
- The introduction of the quota system from 2000 has been effective in maintaining the production and consumption to the predefined levels. Nevertheless the system had the following side effects:

  - There was no incentive for the market to go beyond the quota. Because of this, total biofuel consumption has remained merely constant between 2000 and 2004, while other countries have seen serious increases in the same period. In that period France lost its leading position in biofuel applications.
  - There was a lack of private initiatives (investments, capacity building), as the market is 'controlled' by the government.
  - The authorized quantities were merely monopolised. In 2005, Total controlled 100% of the ETBE quota, while Diester controlled 97% of the biodiesel quota. There is an administrative burden for other parties to join the market.
- Starting from 2005 the French government systematically increased the quota to reach a 7% target in 2010.
- The closed system of authorised quota has protected the French market from worldwide competition of a.o. subsidized American biodiesel.
- The application of B30 is an interesting case, however it was limited to special agreements (merely municipalities) and the B30 market remained quite modest. Nevertheless B30 seems promising as some major French car manufacturers are very positive towards this application.
- Important research activities are performed (IFP), and their technology finds direct applications in industry (link with Diester).

5.6 Czech Republic

Since the beginning of the 1990s the Czech Ministry of Agriculture launched the "Oleoprogram" (Oil programme) to investigate the scope for converting oilseed rape to an alternative fuel for diesel engines and promoting its establishment on the domestic market. Through state assistance, RME production was established in short time.

Since 1997 a mixture of diesel and 31% biodiesel is produced for the domestic market according to the national standard ČSN 656508. This product is distributed separately from conventional diesel at petrol stations.

The Czech Republic has used a variety of measures. Research grants for the production of biofuels have been granted as early as the beginning of 1990s. In 1991-1995 refundable state grants were given so as to establish manufacturing capacity for RME.

In 1999-2001 direct subsidies have been given to manufacturers, so as to cover the higher costs of biofuel production. In 2001-2004 this compensation was given in the form of price rebates for raw material grown on set-aside land, while manufacturers received additional support for processing rapeseed oil for non-food use for a maximum of 100,000 tonnes per year.

Since 1992 biodiesel carries zero excise duty. Since 2003 the same applies to the biofuel part in the blend of 31% RME.
In 2007 Czech Republic launched a system of compulsory low-percentage blending of biofuels in motor fuels. It is not known whether this is linked to a penalty system for non-compliance.

5.6.1 Main measures

The following table lists the measures in the Czech Republic.

Table 23: overview of the main measures related to biofuels in the Czech Republic

		Valid until
	Tax incentives	
1992	Zero excise duty on produced biodiesel	
1992	Return of part of the excise duty to final customers of mixed fuel	1998
1999	Direct subsidies CZK 3.0 per kg of produced biodiesel	2001
2003	Act No353/2003 / excise duties, the excise duty on blended fuel/biodiesel containing 31% RME (RME incorporated in a fuel blend) carries zero excise duty	2007
2004	Aid to authorised biodiesel producers	
2005	Continuation of direct subsidies (7000 CZK/tonne RME) to RME producers.	2006
2007	Decision to change to a compulsory system for biodiesel blending in diesel from September 2007, and ethanol blending in gasoline from January 2008.	
	Standards	
1997	National biodiesel standard ČSN 656508.	

	Other incentives / support programmes	
1992	CZK 772.7 million loans to 16 enterprises for constructing facilities to produce RME and mixed fuel.	2000
early 1990's	Oleoprogram" (Oil programme) to investigate the scope for converting oilseed rape to an alternative fuel for diesel engines and promoting its establishment on the domestic market.	
1998	Programme of non-food utilization of a part of agricultural production.	
2001	Price rebates for the raw material (oilseed rape) grown on set-aside land.	2001
2002	Price rebates for the raw material (oilseed rape) grown on set-aside land, limit to 230,000 tonnes processed rapeseed oil.	2004

5.6.2 Figures for biofuel introduction

Table 24: tax levels (€/litre) and active policies in Czech Republic

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
diesel					0,30	0,32	0,33	0,35	0,35	0,35	0,35
B5*									0,35	0,35	0,35
B31*						0,00	0,00	0,00			
gasoline						0,38	0,39	0,41	0,42	0,42	0,42
ethanol*										0,42	0,42

* tax on biofuel part

Sources: Eurostat & Czech country reports

= tax reduction

= substitution obligation

= subsidies for biofuel producers

= combined system: tax reduction + subsidies for biofuel producers

Table 25: evolution of biofuel consumption in Czech Republic

1000 tonnes of oil eq / yr	1999	2000	2001	2002	2003	2004	2005	2006	2007
Diesel	1709	1843	2055	2245	2640	2857	3293	3470	…
Biodiesel	44	62	54	35	61	41	3	18	33
Gasoline	2022	1953	1998	2024	2207	2199	2160	2112	…
Ethanol						0	0	1	0

Sources: Eurostat (fossil fuel figures up to 2006), Czech country reports, [Pelkmans, 2006], [Biofuels Barometer, 2008]

Czech Republic reached a substantial biodiesel consumption already in 1999-2000, in the order of 3% of diesel consumption. Nevertheless consumption dropped in the years after. Especially in 2005 practically all produced biodiesel was exported.

Table 26: Comparison of biodiesel and bio-ethanol production vs consumption in Czech Republic

1000 Tonnes/yr	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Biodiesel												
Consumption	25	38	42	50	70	62	40	69	47	3	20	37
Production	25	38	42	50	70	62	40	69	47	133	110	61
Prod capacity	47	50	80	80	100	100	100	100	154	188	203	203
Ethanol												
Consumption											2	0.2
Production										1	15	33

Sources: Czech country reports, [IEA 2003], [EBB 2008], [eBIO 2008]

5.6.3 Impact assessment

- Certainly in the second half of the 1990s, Czech Republic was one of the leading countries in Europe on biodiesel. The main policy measures that helped the introduction of biodiesel in Czech Republic were:
    - The grants given initially for constructing production facilities, which have succeeded in creating facilities with a total capacity of 100,000 tonnes RME per year.
    - Direct subsidies for biofuel producers.
- From 2001 policy has changed with varying support options (subsidies for production, price rebates for raw material, excise duty exemption), which however did not prove to be very stable. As a result the production of RME was quite unstable. Biodiesel producers have now resumed their interest, however most of their production is exported, mainly to Germany.
- The obligation system introduced from end 2007 may be able to revive the inland biodiesel consumption, on condition that there is a sufficient penalty system for non-compliance.

5.7 Poland

Poland is the only country among the eastern Member States that has developed the bioethanol sector to a significant extent. Poland introduced bioethanol in the transportation sector, blended with conventional petrol, in the early 1990s. Overproduction of alcohol, resulting from necessity of processing a surplus production of cereals, potatoes and beet molasses in the beginning of 1990s, gave a push for the production of gasoline with bioethanol as additive.

The Polish regulation allows up to 5 $\%_{vol}$ maximum of ethanol (99.6% pure) to be added to unleaded gasoline, and this blend may be sold as regular gasoline.

The introduction of biodiesel (FAME) in Poland was relatively late. In 2005 biodiesel blends containing up to 5% of biodiesel appeared on the market, in 2007 also a 20% blend was introduced. At the moment, most of the biodiesel produced in Poland is exported, as it is more profitable for its producers in comparison to selling it on the domestic market.

Poland has one of the largest potential in biofuels production, mainly because of the large available areas, ideal for growing oil seed rape, and the good climatic conditions for rapeseeds and potato. The key feedstock for bioethanol production in Poland is potato and it is cheaper than bioethanol from wheat and sugar beet.

5.7.1 Main measures

The main measures are given below. Tax exemptions were in place as early as in 1993. Poland had established also a standard since 1992.

Table 27: overview of the main measures related to biofuels in Poland

		Valid until
	Tax incentives	
1993	Tax exemption and tax relief schemes, according to orders set by the Minister of Finance	
2004	Order of the Minister for Finance of 26 April 2004 on exemptions from excise duty (Official Gazette No 97, item 966) for biofuels mixed with petrol and diesel. The definitive percentages and the size of this exemption are determined on a yearly basis after approval of the annual budget.	
2006-2007	Amendments to the tax exemptions	
2008	From 1 January 2008, an obligation will be in force to ensure that biocomponents achieve a specified share of the transport fuel market, arising out of the Biocomponents and Liquid Biofuels Act.	
	Standards	
1992	Polish standard, regulating gasoline quality and composition PN-92/C-096025 (later updated to PN-EN228:2006). This standard allows the mixing of organic oxygen compounds, e.g. dehydrated ethyl alcohol, but not more than 5% by volume with petrol, with maximum total oxygen content 2.8% by weigh. The standard also allows use of bioethanol as addition to all type of gasoline.	
	Polish norm for anhydrous ethanol: PN A 79521	
2004	Polish norm for FAME: PN EN 14214:2004	
2006	Regulation of 8 September 2006 on liquid biofuel quality requirements: for pure biodiesel and B20	

	Other incentives / support programmes	
1994	R&D for biodiesel (EPAL - Polish rape biofuel for Diesel engines)	1997
2003	Law of 2 October 2003 on biocomponents used in liquid fuels and liquid (Official Gazette No 199, item 1934)	
2006	Adoption of 25 September 2006 on Biocomponents and Liquid Biofuels Act and the Fuel Quality Monitoring and Control Act	

5.7.2 Figures for biofuel introduction

Table 28: tax levels (€/litre) and active policies in Poland

	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
diesel						0,25	0,29	0,30	0,31		
B5*									0,003	0,003	0,003
B20*									0,003	0,003	0,003
B100									0,003	0,003	0,003
gasoline						0,35	0,40	0,36	0,43		
ethanol*									0,003		

* tax on biofuel part

Sources: Eurostat, Polish country reports

= tax reduction

= substitution obligation

= combined system

Table 29: evolution of biofuel consumption in Poland

1000 tonnes of oil eq / yr	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Diesel	3228	2607	2818	2707	3894	4767	5453	6375	
Biodiesel						0	15	42	15
Gasoline	6001	5213	4835	4428	4275	4315	4144	4251	
Ethanol	42	26	33	42	38	24	28	54	85

Sources: Eurostat (fossil fuel figures up to 2006), Polish country reports, [Pelkmans, 2006], [Biofuels Barometer, 2008]

Table 30: Comparison of biodiesel and bio-ethanol production vs consumption in Poland

1000 Tonnes/yr	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Biodiesel												
Consumption									0	17	48	18
Production									0	100	116	80
Prod capacity										100	150	250
Ethanol												
Consumption	80	88	79	66	41	52	65	60	38	43	84	133
Production	80	88	79	66	41	52	65	60	38	64	161	155

Sources: Polish country reports, [EBB 2008], [eBIO 2008]

5.7.3 Impact assessment

Poland introduced bioethanol in the transport sector, blended with conventional gasoline, in the early 1990s. From 1995 the use of ethanol fuel varied between 40,000 and 80,000 tonnes per year, which represents a share of 1 – 2% compared to the petrol market.

Poland has stipulated ethanol use as a leaded and unleaded petrol component (ethanol 4.5% - 5%). The market share of gasoline containing ethanol was almost 30% in 2002.

While Poland had a substantial use of biofuels, in the period 2004-2006 it was faced with political and legislative difficulties concerning biofuels. Since 2007 there is more clarity in the legislative situation and the obligation system from 2008 might be a driving force for local fuel suppliers to adopt biofuels in their fuel mix. The success may depend on a very severe penalty system for non-compliance, which is included in the Law on biocomponents and liquid biofuels. The penalty is equal to 5 x V x (NG-R), where V is the volume of all transport fuels sold in a given year, NG is the national goal for a given year and R is a realisation of this goal.

5.8 Spain

After the adoption of the EU Biofuel Directive, Spain notified the Commission that it had set its national indicative target at 2% for 2005. Also in line with the Directive, in August 2005 the country adopted the 'Plan for Renewable Energy 2005-2010'. According to this plan, the amount of biofuels will rise to 2.2 Mtoe in 2010, approximately 5% of the foreseen amount of transport fuels used in Spain in 2010. Besides the current feedstocks of barley, wheat, wine alcohol and waste vegetable oil, it is foreseen that seed oil plants could account for approximately half of the target by 2010. Since these are hardly used now, mainly because of their high local production costs, measures are proposed to promote seed oil plant production.

5.8.1 Main measures

Excise duty reductions
Fiscal incentives, in Tax on Hydrocarbons, for biofuels commercialization were established in Law 22/2005. It establishes that until end of year 2012, the rate of the Hydrocarbons Tax for biofuels will be of zero euros per 1000 litres. This special rate will be exclusively applied to the biofuel volume contained in the mixture.

Additionally, there exist an indirect tax called 'Tax on the retail sales of certain hydrocarbons' with two sections: a national section with a rate of 24€ per 1000 litres, and a regional section (Madrid, Asturias, Galicia, Cantabria) with a rate of also 24 €/1000 litres.

Biofuel obligations
In June 2007, the Spanish government has passed a new law (16th Additional regulation to the Law 34/1998 of the Hydrocarbons Sector) making the blending of biofuels into petroleum fuel obligatory. Law 12/2007 transposition is being carried out by means of a Ministerial Order project which is nowadays in a consultation procedure.

It has set an interim target for 1.9% of biofuels to be blended into regular fuels in 2008, which will become mandatory proportions of 3.4% in 2009 and 5.83% in 2010. Sanction could reach 30 millions €.

Fiscal incentives
Detaxation for biofuel pilot plants
By a December 2002 change in the law on Tax, Administrative and Social Measures, all biofuel pilot plants receive a full detaxation for five years and all industrial plants receive a full detaxation until at least December 2012.

Tax benefit for investment in biofuel production
Besides, Law 36/2003 created special fiscal deduction in the Company Income Tax. It can be deducted 10% in the down payment for investments made in equipments and installations to convert agricultural products in biofuels.

Investment subsidies
Subsidy to biofuel R&D projects
The Spanish government has granted a subsidy of 22 million Euro to a biodiesel R&D project in which several Spanish companies are involved. The objective of the project is to reduce

production costs and to select and test new biomass feedstocks, including seaweed, waste cooking oils and animal fats.

Subsidy to bioethanol R&D projects
The Spanish government has also granted a subsidy of 13.9 millions € to a bioethanol R&D project leaded by Abengoa. The objectives of the project are to promote the energy crops development, to make progress in the bioethanol thermochemical production, to develop the bioethanol market by introducing bioethanol-diesel mixtures, and to support the public research centres and universities to improve their knowledge and research capacities.

Other measures stimulating the biofuels
Support for farmers
Farmers can receive from the EU, depending of the crop, a grant of 45 €/ha for growing energy crops, until the total surface in the EU devoted to energy crops do not exceed 1.5 Mha. It should be noted that this measure is being now under reconsideration. The alternative to use set-aside land to grow energy crops in Spain has not been very successful, since productivity is around one-third less than in Germany or France, and compensatory grant received up to 2.5 less than in those countries.

Promotion of second generation biofuels
Spain does not have any particular promotion plan or target for the utilisation of second generation biofuels. Few R&D projects have been funded by the Spanish research policy (one in 2004, two in 2005 and three in 2006). They are mostly concentrated in the conversion of ligno-cellulosic biomass into ethanol and only one has received funds to research in biohydrogen production.

The following table summarizes the present biofuel policies in Spain.

Table 31: biofuels promotion policies in Spain

Support to biofuels	**Royal Decree 61/2006** (31st January, 2006) That modifies the **Royal Decree 1700/2003**	Indicative	To reach 5.75% (minimum share of commercialization), on the base of energy content, in all the gasoline and diesel used for transportation. Deadline: 31st December, 2010
	Plan for Renewable Energy 2005/2010 – IDAE	Indicative	To reach 5.83% (minimum share of commercialization), on the base of the energy content, in all the gasoline and diesel used for transportation. Deadline: 31st December, 2010. This means 2.2 million teps. Bioethanol y biodiesel shares will reach 39% and 61% respectively.
Treasury	**Law 22/2005** (18/11/2005) That modifies the Special Taxes **Law 38/1992** (28 /12/1992)	Compulsory	0% taxes (until 31st December, 2012) for bioethanol and biodiesel, only applied to the biofuel volume, not to the mix with other fuels. It is applied as long as the comparison of the production cost evolution of oil products and biofuels recommends it. Besides, art 51.3 of the Law exempts the tax to the production and import of biofuels to be used in pilot projects which target is the technological development of less pollutant products.
	Royal Decree 774/2006 (23/06/2006) That modifies **Royal Decree 1165/1995** (7/07/1995)	Voluntary	Gives the chance to mix biofuels with fossil fuels in vehicles supply and final use installations.

	Law 36/2003 of Economic Reforms (11 /11/2003) That modifies the **Law 43/1995** regarding Corporate tax (27/12/1995)	Compulsory	10% of reduction in the corporate tax is allocated to investments on equipments and facilities to convert agricultural products into biofuels.
Sectoral regulation	**Law 12/2007** (2/07/2007) That modifies **Law 34/1998** (07/10/2007) for the hydrocarbon sector (the objective is to adapt Law 12/2007 to the European Directive 2003/55/CE) (26/06/2003)	Indicative and compulsory	Introduces the differentiation between biofuels and biomass and extends the list of products susceptible of being considered as biofuels Sets annual objectives to biofuels and other renewable fuels commercialization for the period 2008-2010. Fixes indicative 1.9% by 2008, compulsory 3.4% by 2009 and compulsory 5.83% by 2010. Entitles the Industry, Tourism and Trade Ministry to enact the necessary resolutions to regulate a mechanism of promotion of biofuels and other renewable fuels in order to meet the annual objectives.

According to this table, the objectives of the different policies, such as the ones fixed by Law 12/2007, specify an aggregated biofuel consumption objective.
As a result of the uncertainty of a lack of differentiated objectives for biodiesel and bioethanol, different groups involved in the biofuels sector demand the Government the definition of specific objectives for each biofuel. At the same time, other groups have confronted positions. Oil producers are in favour of a total flexibility to reach the objective while the renewable energy producers association (APPA) is in favour of establishing egalitarian objectives.

It is worth noting that the Law 12/2007 transposition was carried out by means of the Ministerial Order project which is nowadays in a consultation procedure.

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5.8.2 Figures for biofuel introduction

Table 32: tax levels (€/litre) and active policies in Spain

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
diesel	0,27	0,27	0,27	0,29	0,29	0,30	0,30	0,30	0,31	0,31	0,31
B5*				0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
gasoline	0,37	0,37	0,37	0,40	0,40	0,40	0,40	0,41	0,41	0,41	0,41
ethanol*		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

* tax on biofuel part (€/litre)
Sources: Eurostat & Spanish country reports

= tax reduction
= substitution obligation
= combined system

Table 33: evolution of biofuel consumption in Spain

1000 tonnes of oil eq / yr	1999	2000	2001	2002	2003	2004	2005	2006	2007
Diesel	15944	17142	18483	19535	21074	22542	23622	24975	…
Biodiesel	0	0	0	0	58	…	23	54	261
Gasoline	9383	8958	8913	8624	8449	8107	7630	7281	…
Ethanol		51	51	120	97	106	113	115	113

Sources: Eurostat (fossil fuel figures up to 2006), Spanish country reports, [Pelkmans, 2006], [Biofuels Barometer, 2008]

Despite of the strong position of Spain regarding ethanol, after 2002 there is no increase in ethanol consumption. Only biodiesel consumption is rising recently. Nevertheless production figures of ethanol are rising, but an increasing fraction is exported to other European countries.

The existing bioethanol plants are the following:

- Ecocarburantes españoles: IDAE (5%) and Abengoa (95%); stating in 2000, uses cereals (barley and wheat, 300 kton/year) and wine alcohol, produces 51.2 Ktep/y (150 million litres) directed to ETBE conversion.
- Bioetanol Galicia: Abengoa (90%) and XesGalicia (10%); starting in 2002, uses cereals (barley and wheat, 340 kton/year) and wine alcohol, produces 54.5 Ktep/y (176 million litres) directed to ETBE conversion.
- Biocarburantes Castilla y Leon: Abengoa (50%) and Ebro Puleva (50%), starting in 2006, uses cereals (wheat and barley, 585 kton/y) and straw (60 kton/y), and produces 195 million litres directed to direct blend at 5% (E5). Last news is that the plant is not working at the moment due to difficulties in the sector.
- Bioetanol de La Mancha: Acciona Bioenergia (50%), uses wine alcohol and produces 120 million litres

Links: www.abengoabioenergy.com, www.acciona-energia.com, www.biocarburantesclm.es, www.bionorte.com, www.bioneteuropa.com

Concerning biodiesel, currently there are 24 biodiesel conversion plants ready to operate.

Table 34: Comparison of biodiesel and bio-ethanol production vs consumption in Spain

1000 Tonnes/yr	1999	2000	2001	2002	2003	2004	2005	2006	2007
Biodiesel									
Consumption					66	…	26	62	296
Production					6	13	73	99	168
Prod capacity						70	100	224	508
Ethanol									
Consumption		80	80	187	152	166	177	179	176
Production				177	160	202	240	314	276
Prod capacity							346		520

Sources: Spanish country reports, [EBB 2008], [eBIO 2008]

5.8.3 Impact assessment

The introduction of ethanol in Spain has mainly been driven by the industrial company Abengoa and its alliances with major oil companies. The tax exemption in Spain has helped to

create an initial consumption for ethanol, which however has remained stable. It seems that this tax exemption alone is insufficient to create a difference in the consumption.

The production of ethanol is higher than consumption and it is expected to increase even more due to the activities undertaken by the company active in this area. Part of the production is exported to other countries.

The situation on biodiesel is different, and currently Spain is an importer of biodiesel. This may however change in short term, with a fast growing production capacity.

5.9 United Kingdom

The UK has initiated some legislation to support the introduction of biofuels, but so far its success was rather modest. A lot of effort was put in the preparation of a Renewable Transport Fuels Obligation (RTFO), which came into force from April 2008. To ensure that biofuels are sourced sustainably, the Government developed a carbon and sustainability assurance scheme as part of the obligation. Obligated companies are required to report on the level of carbon savings achieved and on the sustainability of their supplies.

5.9.1 Main measures

UK has set a duty incentive of 20 pence per litre (~0.30 Euro/litre) for biodiesel since July 2002 and for bioethanol since January 2005. Biodiesel is produced from waste vegetable oils, especially recycled cooking oil or from imported palm and soybean oil, to a lesser extent. This is mainly sold in 5% blends, but there are also filling stations providing pure biodiesel. Bioethanol is imported.

The UK has introduced a Renewable Transport Fuels Obligation (RTFO) from April 2008, which requires that a certain percentage of all UK retail fuel will come from a renewable source. The following obligation levels are set out [UK country report 2006]:

Financial year	Level of obligation
2008/09	2.5 $\%_{vol}$
2009/10	3.75 $\%_{vol}$
2010/11	5 $\%_{vol}$

To ensure that biofuels are sourced sustainably, the Government developed a carbon and sustainability assurance scheme as part of the obligation. Obligated companies are required to report on the level of carbon savings achieved and on the sustainability of their supplies. The government has set up a certification and credit trading mechanism as part of the RTFO. An oil company will receive certificates from an administrator to demonstrate how much biofuel it has sold. If the company sells more than its obligation requirement it would then be able to sell those certificates to other companies who need more to meet the obligation. A buy-out will also be possible, and is set at 15 pence per litre in the first year of the obligation.

The UK's Renewable Fuels Agency (RFA) has recently published the guidance which will require companies supplying biofuels to provide information on the origin, greenhouse gas savings and production practices for every batch of biofuel entering the UK market.

In July 2008 the Renewable Fuels Agency (RFA) published the Gallagher review about the indirect effects of biofuels [Gallagher, 2008]. In this report the RFA proposes that the current RTFO target for 2008/09 (2.5% by volume) should be retained, but the proposed rate of increase in biofuels be reduced to 0.5% (by volume) per annum rising to a maximum of 5% by volume by 2013/14. This compares with the RTFO's current target trajectory of 5% by 2010. RFA recommends that the RTFO is further reviewed in 2011/12 to complement and coincide with the 2011/12 EU review of member states' progress on biofuels targets. During the period to 2011/12, RFA states that comprehensive, mandatory sustainability criteria

within the EU Renewable Energy Directive should be implemented for biofuels and bio-energy, including requiring feedstock that avoids indirect land-use change.

The measures active in the UK are given below.

Table 35: overview of the main measures related to biofuels in the UK

		Valid until
	Tax incentives / mandates	
2002	20 pence per litre (0.30 €/litre) duty incentive on biodiesel	
2005	20 pence per litre (0.30 €/litre) duty incentive on bioethanol	
2008	Renewable Transport Fuel Obligation (RTFO) in force from April 2008	

5.9.2 Figures for biofuel introduction

Table 36: tax levels (€/litre) and active policies in the UK

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
diesel	0,76	0,73	0,68	0,69	0,68	0,67	0,72			
B5*		0,43	0,38	0,39	0,38	0,37	0,42	0,42		
gasoline	0,76	0,73	0,68	0,69	0,68	0,70	0,72			
ethanol*					0,38	0,40	0,42	0,42		

* tax on biofuel part (€/litre)
sources: Eurostat & UK country reports
= tax reduction
= substitution obligation
= combined system

Table 37: evolution of biofuel consumption in the UK

1000 tonnes of oil eq / yr	2001	2002	2003	2004	2005	2006	2007
diesel	16705	17222	18022	18838	19776	20498	21373
biodiesel	0	0	8	16	25	132	271
gasoline	21999	21868	20932	20476	19685	19068	18812
ethanol				0	44	48	78

Sources: Eurostat (fossil fuel figures up to 2006), UK country reports, [Pelkmans, 2006], [Biofuels Barometer, 2008]

Table 38: Comparison of biodiesel and bio-ethanol production vs consumption in the UK

1000 Tonnes/yr	2001	2002	2003	2004	2005	2006	2007
Biodiesel							
Consumption			9	18	29	150	308
Production		3	9	18	51	192	150
Prod capacity			5	15	129	445	657
Ethanol							
Consumption				0	68	76	122
Production						0	16
Prod capacity							

Sources: UK country reports, [EBB 2008], [eBIO 2008]

Consumption of ethanol is far above the domestic production levels. Most is imported from Brazil.

5.9.3 Impact assessment

The fuel duty incentive used seems to be too low to boost biofuels consumption to the required levels and assure the quality of the produced fuel. The UK Governments seeks to accelerate biofuel introduction through the Renewable Transport Fuels Obligation system. A lot of emphasis is put on the sustainability performance of the biofuels. The UK is therefore closely cooperating with the Netherlands to develop criteria and a CO_2 tool to calculate the CO_2 reduction. The UK aims to reward biofuels under the RTFO in accordance with the carbon savings that they offer from April 2010. Sustainability criteria will be introduced one year later.

5.10 Lithuania

Lithuania is one of the new Member States very actively trying to introduce biofuels through its policy. It was one of the first countries to introduce an obligation system, in combination with a tax reduction.

5.10.1 Main measures

Table 39: overview of the main measures related to biofuels in Lithuania

		Valid until
	Tax incentives / mandates	
2005	Tax exemption for blended biofuels Obligation for 3-5% biodiesel in diesel fuel; 7-15% ETBE or 5% ethanol in gasoline	

5.10.2 Figures for biofuel introduction

Table 40: tax levels (€/litre) and active policies in Lithuania

	2004	2005	2006	2007	2008	2009
diesel	0,25	0,25	0,25	0,25		
B3/B5*		0,00	0,00	0,00	0,00	0,00
gasoline	0,29	0,29	0,29	0,29		
ETBE7-15/E5		0,00	0,00	0,00	0,00	0,00

* tax on biofuel part (€/litre)
sources: Eurostat & Lithuania country reports

= tax reduction
= substitution obligation
= combined system

Table 41: evolution of biofuel consumption in Lithuania

1000 tonnes of oil eq / yr	2004	2005	2006	2007
Diesel	633	696	756	1037
Biodiesel	0	3	14	42
Gasoline	358	351	360	405
Ethanol	0	1	6	12

Sources: Eurostat (fossil fuel figures up to 2006), Lithuania country reports, [Biofuels Barometer, 2008]

Table 42: Comparison of biodiesel and bio-ethanol production vs consumption in Lithuania

1000 Tonnes/yr	2004	2005	2006	2007
Biodiesel				
Consumption		8	16	47
Production	2	7	10	25
Prod capacity		10	10	42
Ethanol				

Consumption		1	9	19
Production	2	7	14	15
Prod capacity				

Sources: Lithuania country reports, [EBB 2008], [eBIO 2008]

5.10.3 Impact assessment

Lithuania is a very small country, with low fuel consumption numbers. On the one hand this makes it easier to reach certain targets (as required volumes would remain low), on the other hand it does not give a good scale to deploy industrial activities and have some weight on the markets.
Nevertheless Lithuania did achieve to introduce biofuels in its fuel mix. It is not clear if this is totally due to the obligation system; we could not find any data on possible penalties for fuel distributors not complying to the requirements.

5.11 The Netherlands

The Netherlands has a high level of industrialisation and is one of the major import/export countries in Europe, so a considerable number of industrial players have expressed interest to invest in biofuel production units, mainly in the sea harbours, based on imported feedstock.

Only recently did the legislation concerning biofuels in the Netherlands clear up, with a tax reduction system in 2006 and a mandate system in force from 2007, making the involvement in the production and consumption of biofuels more attractive for stakeholders.
The Netherlands is putting a lot of focus on sustainability of biofuels and has played a prominent role in the European discussion through the Cramer Commission for Sustainability Criteria for bio-energy [Commission Cramer, 2007]. In this context, the government is also preparing its obligation system for allowing specific, e.g. 2nd generation biofuels, to count heavier towards the quota than conventional ones.

5.11.1 Main measures

Table 43: overview of the main measures related to biofuels in the Netherlands

		Valid until
	Tax incentives / mandates	
2003	Since 2003, a tax exemption has been granted on a project basis for pure biofuels (three projects on PPO, one on biodiesel). The total amount of PPO and biodiesel that can benefit from this exemption is limited to 7.5 million litres per year.	
2006	In 2006, a general tax reduction was given for max 2%vol of biodiesel and ethanol blended in diesel and gasoline, respectively. This tax reduction was only valid in 2006.	2006
2007	Transport Biofuels Act 2007: from January 2007 a biofuel obligation is in place. The obliged parties (fuel distributors) have to show administratively that 2% (by energy) of their overall amounts of gasoline and diesel consist of biofuel. Pure biofuels also count towards this requirement, as long as the required market share is achieved. Suppliers may also trade any surplus market share with other suppliers. The obligation gradually increases by 1.25% per year to 5.75% by 2010. For the gasoline and diesel markets separately, minimum shares start with 2% in 2007 and increase by 0.5% per year to 3.5% in 2010.	
	Other incentives / support programmes	
2005	A project group under the leadership of prof. dr. Jacqueline Cramer started formulating sustainability these criteria for bio-energy at the end of 2005. Their report was presented mid 2006, and indicates how the government can prevent biofuel and green electricity production from damaging nature and the environment. In order to achieve this, the government plans to include sustainability criteria in the regulations concerning biofuels for road transport and the MEP scheme (environmental quality electricity production)	
2006	A subsidy scheme for R&D projects on 'innovative biofuels for transport' was established.	2007
2007	The Dutch Cabinet will be looking into the possibilities in Europe of demanding a higher percentage (20%) of biofuels, should these meet sustainability criteria.	
2008	The Dutch government has decided to cancel implementation of the Reporting Sustainability of Biofuels Act on 1 January 2009. The government plans to harmonise its efforts with the European approach. Developing national policy for	

	matters covered by a proposed guideline is also not in line with European procedures.	

5.11.2 Figures for biofuel introduction

Table 44: tax levels (€/litre) and active policies in the Netherlands

	2004	2005	2006	2007	2008	2009
Diesel	0,38	0,38	0,38	0,38	0,38	0,38
B5*			0,08	0,38	0,38	0,38
B100			0,02	0,02	0,02	0,02
PPO			0,02	0,02	0,02	0,02
Gasoline	0,66	0,66	0,66	0,66	0,66	0,66
Ethanol*			0,16	0,66	0,66	0,66

* tax on biofuel part (€/litre)
sources: Eurostat & Dutch country reports

= tax reduction
= substitution obligation
= combined system

Table 45: evolution of biofuel consumption in the Netherlands

1000 tonnes of oil eq / yr	2004	2005	2006	2007*
Diesel	6263	6365	6653	*6779*
Biodiesel		0	20	*217*
PPO			2	3
Gasoline	4370	4306	4381	*4402*
Ethanol	0	0	18	*84*

* 2007 figures are preliminary
Sources: Eurostat (fossil fuel figures up to 2006), Dutch country reports, CBS, VNPI, [Biofuels Barometer, 2008]

Table 46: Comparison of biodiesel and bio-ethanol production vs consumption in the Netherlands

1000 Tonnes/yr	2004	2005	2006	2007	2008
Biodiesel					
Consumption			17	246	
Production			18	85	
Prod capacity			0	115	571
Ethanol					
Consumption			24	140	
Production			12	11	
Prod capacity					

Sources: EBB, Dutch country reports, [Biofuels Barometer, 2008]

5.11.3 Impact assessment

With the introduction of its obligation system, the Netherlands has seen an enormous increase of biodiesel consumption in 2007. The total biofuel consumption in 2007 even exceeds the obligation of 2%, most probably because distributors, expecting markets to decline, were allowed to 'bank' between years. Most of the biodiesel is coming from imports, through the harbour of Rotterdam, the origin of the biodiesel remains unknown.

Currently a lot of production capacity is prepared, but it remains the question if these can compete with the biodiesel imports from abroad. As in the German case, the industry will probably suffer from low-cost soybean-based biodiesel from the US.
Although a lot of biofuel production capacity is being built in the Netherlands, the feedstock for these facilities will mostly be imported.

The Netherlands is at the forefront of the European discussion on sustainability assurance of biofuels, together with the UK, Germany and Sweden. The proposed EC guideline includes proposals for sustainability criteria, many of which are derived from input submitted to Brussels by the Netherlands. The government now plans to harmonise its efforts with the European approach.

5.12 Belgium

As well as the Netherlands, Belgium has a high level of industrialisation and is one of the major import/export countries in Europe, so a considerable number of industrial players have expressed interest to invest in biofuel production units, mainly in the sea harbours, based on imported feedstock.
Despite of government announcements from the beginning of 2004, legislation on biofuels in Belgium has remained quite unclear until mid 2006 (introduction of quota system, comparable to France), and investments on production facilities were postponed.

5.12.1 Main measures

In Belgium, after a long policy procedure, biodiesel, bioethanol and pure plant oil (PPO) have received a political support for market introduction.

The use of **PPO** is tax-exempted but there are some constraints:
- production by farmers or farmer cooperatives;
- use of Belgian rapeseed;
- direct commercialisation to final users.

In July 2006, a European call for tenders for biodiesel and ethanol was launched and the producers of these biofuels (with adapted tax rates) are known since October 2006 (1st period biodiesel and full period ethanol quota) and December 2006 (2nd period biodiesel quota).
The volumes and eligible blends for tax advantages of **ethanol** are the following [Pelkmans et al, 2008] :
- 250,000 m³/yr from 01/10/2007 to 30/09/2013;
- tax advantage for min. 7% ethanol (possibly through ETBE).

The volumes and eligible blends for tax advantages of **biodiesel** are the following:
- 380,000 m³/yr from 01/11/2006 to 30/09/2013;
- tax reduction if min. 3.37% biodiesel in 2006, 4.29% in 2007 and 5% from 2008;
- possibility of tax reduction for higher blends only for regional public transport companies.

Table 47: overview of the main measures related to biofuels in Belgium

		Valid until
	Tax incentives / mandates	
2006	PPO exempt from tax, on condition of local scale	
2006	Quota system for biodiesel, with tax reduction from October 2006	2013
2007	Quota system for bio-ethanol, with tax reduction from October 2007	2013
	Other incentives / support programmes	
1994	Support to fleet demonstrations of biodiesel	
2007	Investment support to bio-ethanol facility in Wallonia.	
2008	Flemish minister for transport stops initiative of public transport company to drive on B5	
	Market conditions	
1996	In 1996 there was already 80,000 tonnes biodiesel	

	production capacity in Belgium, mainly supplying the French market. In 2000 these facilities were stopped or only used for oleo-chemical purposes.	
2007	Market uptake of biodiesel is disappointing, with only a quarter of the biodiesel quotum put on the market.	

5.12.2 Figures for biofuel introduction

Table 48: tax levels (€/litre) and active policies in Belgium

	2005	2006	2007	2008
diesel	0,34	0,33	0,33	0,33
B5*		0,32	0,31	0,31
PPO		0,00	0,00	0,00
gasoline	0,58	0,59	0,59	0,59
ETBE15*			0,55	0,55

* tax on total fuel, with minimum level of biofuel content, in quota system
sources: Eurostat & Belgian country reports
= tax reduction, under quota system

Table 49: evolution of biofuel consumption in Belgium

1000 tonnes of oil eq / yr	2005	2006	2007
diesel	6303	6424	6575
biodiesel		1	83
gasoline	1852	1540	1465
ethanol		0	0

Sources: Eurostat (fossil fuel figures up to 2006), Belgian country reports, [Biofuels Barometer, 2008], BPF

Table 50: Comparison of biodiesel and bio-ethanol production vs consumption in Belgium, also in comparison to the authorised quota

1000 Tonnes/yr	2005	2006	2007	2008	2009	2010
Biodiesel						
Consumption		1	95			
Production		25	166			
Prod capacity	55	85	335	665		
Authorised quota	0	46	317	334	334	334
Ethanol						
Consumption		0	0			
Production		0	0			
Prod capacity		0	0	392		
Authorised quota		0	33	199	199	199

Sources: EBB, Dutch country reports, [Biofuels Barometer, 2008]

Although a lot of biofuel production capacity has been built, the feedstock for these facilities will mostly be imported. Belgium only has an area of around 10,000 ha rapeseed, which could only supply less than 5% of the authorised biodiesel quota.

5.12.3 Impact assessment

Because of the long procedure, there was serious delay in the start-up of biofuel production units in Belgium. So the quota could not be produced from the beginning.
Moreover, only few fuel distributors seem to be willing to blend biofuels in their fossil fuels in the current circumstances. In 2006, 1282 m^3 of biodiesel were put on the Belgian market, which is equivalent to 0.01% by energy of transport fuel consumption [Belgian country report, 2007]. In 2007, 107,592 m^3 biodiesel were commercialised in Belgium, corresponding to 1% by energy of the gasoline and diesel market [Pelkmans et al, 2008]. This is still much below the quota of 380,000 m^3/yr.

For ethanol, the quota system has started in October 2007, but by mid 2008, no ethanol has come to the Belgian market yet.

In view of the current discussion on sustainability of biofuels and the impact on food prices, biofuels are in the middle of a political and societal debate in Belgium. An initiative of the Flemish public transport company (De Lijn) to drive their buses on 5% biodiesel, was even stopped by the Flemish minister for Transport from May 2008.

6 Policies outside Europe

In this chapter, we will look into evolutions in the USA, Brazil and India.

6.1 United States

Research on alternatives for petroleum fuels in the USA fluctuated over the years, with interest peaking during emergency situations, such as World Wars I and II and the energy crisis of the 1970s, when petroleum fuel supplies were interrupted. More recently, issues related to the environment and energy security have increased the attention for alternative fuels such as ethanol, natural gas, and biodiesel. Legislation, such as the Clean Air Act Amendments (CAAA) of 1990 and the Energy Policy Act of 1992, has opened markets for alternative fuels that can be produced from US domestic resources and give an environmental advantage over petroleum-based fuels. In addition, many US farmers and policymakers support the development of ethanol and biodiesel, as a means of creating new markets for agricultural commodities. Recently the Renewable Fuels Standards of 2005 and 2007 have given a real boost to biofuel production in the USA.
Concerning biofuel types, the focus in the United States has mainly been on ethanol from corn. Research is pointed at ethanol from cellulose. In the past years the biodiesel share has also been growing, although still at a far lower level than bio-ethanol.

The following table shows an overview of ethanol and biodiesel related legislative actions.

Table 51: overview of ethanol- and biodiesel-related legislative actions in the US

1974	The first of many legislative actions to promote ethanol as a fuel, the **Solar Energy Research, Development, and Demonstration Act** led to research and development of the conversion of cellulose and other organic materials (including wastes) into useful energy or fuels. Currently the use of cellulose as a feedstock is regaining interest.
1975	U.S. begins to phase out lead in gasoline. Ethanol becomes more attractive as a possible octane booster for gasoline. The Environmental Protection Agency (EPA) issued the initial regulations requiring reduced levels of lead in gasoline in early 1973. By 1986 no lead was to be allowed in motor gasoline.
1978	The first time “gasohol” was defined, was in the **Energy Tax Act** of 1978. Gasohol was defined as a blend of gasoline with at least 10 % alcohol by volume, excluding alcohol made from petroleum, natural gas or coal. For this reason, all ethanol to be blended into gasoline is produced from renewable biomass feedstock. The Federal excise tax on gasoline at the time was 4 cents/gallon. This law amounted to a 40 cents/gallon (0.11US$/litre) subsidy for every gallon of ethanol blended into gasoline.
1979	Marketing of commercial alcohol-blended fuels began. Amoco Oil Company began marketing commercial alcohol-blended fuels, followed by Ashland, Chevron, Beacon, and Texaco.
1980	First U.S. survey of ethanol production was conducted. The survey found fewer than 10 ethanol facilities existed, producing approximately 50 million gallons (190,000m³) of ethanol per year. This was a major increase from the late 1950s until the late 1970s, when virtually no fuel ethanol was commercially available.
	US Congress enacted a series of tax benefits to ethanol producers and blenders. These benefits encouraged the growth of ethanol production.
	The **Energy Security Act** offered insured loans for small ethanol producers (less than 1 million gallons / 3800m³ per year), up to $1 million in loan guarantees per project that could cover up to 90% of construction costs on an ethanol plant, price guarantees for biomass energy projects, and purchase agreements for biomass energy used by federal agencies.

	Congress placed an import fee (tariff) on foreign-produced ethanol. Previously, foreign producers, such as Brazil, were able to ship less expensive ethanol into the United States.
	The **Gasohol Competition Act** banned retaliation against ethanol resellers.
	The **Crude Windfall Tax Act** extended the ethanol-gasoline blend tax credit.
1983	The **Surface Transportation Assistance Act** increased the ethanol subsidy to 50 cents/gallon (0.13US$/litre).
1984	The number of ethanol plants in the U.S. peaked at 163.
	The **Tax Reform Act** increased the ethanol subsidy to 60 cents/gallon (0.16US$/litre).
1985	Many ethanol producers went out of business, despite the subsidies. Only 74 of the 163 commercial ethanol plants (45%) remained operating by the end of 1985, producing 595 million gallons (2.25 million m^3) of ethanol for the year. Main reason is the very low price of crude oil and gasoline.
1988	Ethanol was first used as an oxygenate in gasoline. Denver, Colorado mandated oxygenated fuels (i.e., fuels containing oxygen) for winter use to control carbon monoxide (CO) emissions. Other oxygenates added to gasoline included MTBE (Methyl Tertiary Butyl Ether - made from natural gas and petroleum) and ETBE (Ethyl Tertiary Butyl Ether - made from ethanol and petroleum). MTBE dominated the market for oxygenates.
	The Alternative Motor Fuels Act of 1988 (AMFA) grants CAFE credits for producing and selling alternative fuelled vehicles (including E85 FFVs).
1990	**Omnibus Budget Reconciliation Act** decreased the ethanol subsidy to 54 cents/gallon (0.14US$/litre) of ethanol.
1992	The **Energy Policy Act** of 1992 (**EPAct**) provided for two additional gasoline blends (7.7% and 5.7% ethanol). EPACT also defined ethanol blends with at least 85% ethanol as "alternative transportation fuels." It also required specified car fleets to begin purchasing alternative fuel vehicles, such as vehicles capable of operating on E85. The EPACT also provided tax deductions for purchasing (or converting) a vehicle to that could use an alternative fuel such as E85 and for installing equipment to dispense alternative fuels.
	The **Clean Air Act Amendments** (CAAA) mandated the winter-time use of oxygenated fuels in 39 major carbon monoxide non attainment areas (areas where EPA emissions standards for carbon monoxide had not been met) and required year-round use of oxygenates in 9 severe ozone non attainment areas in 1995.
	MTBE was still the primary oxygenate used in the U.S.
1995	The excise tax exemption and income tax credits were extended to ethanol blenders producing ETBE.
	The EPA began requiring the use of reformulated gasoline year round in metropolitan areas with the most smog.
1995-1996	With a poor corn crop and the doubling of corn prices in the mid-1990s to $5 a bushel, some States passed subsidies to keep the ethanol industry solvent.
1997	Major U.S. auto manufacturers began mass production of flexible-fuelled vehicle models capable of operating on E85, gasoline, or both. Despite their ability to use E85, most of these vehicles used gasoline as their only fuel because of the scarcity of E85 stations.
	Congress approves biodiesel as alternative for compliance with the Energy Policy Act of 1992 (EPAct)
1998	The ethanol subsidy is extended through 2007 but will be gradually reduced. The ethanol subsidy of 54 cents/gallon (0.143US$/litre) will be reduced gradually to 51 cents/gallon (0.135US$/litre) in 2005.
1999	Some States began to pass bans on MTBE use in motor gasoline because traces of it were showing up in drinking water sources, presumably from leaking gasoline storage tanks. Because ethanol and ETBE are the main alternatives to MTBE as an oxygenate in gasoline, these bans will increase the need for ethanol as they go into effect.
2000	EPA recommended that MTBE should be phased out nationally.
	USDA issues final rule for bioenergy program (under the Commodity Credit Corporation),

	designed to encourage production of environmentally friendly fuels made from soybeans, corn and other crops
2001	A 1998 law reduced the ethanol subsidy to 53 cents/gallon (0.140US$/litre) starting January 1, 2001.
2002	U.S. automakers continued to produce large numbers of E85-capable vehicles to meet federal regulations that require a certain percentage of fleet vehicles to be capable of running on alternative fuels. Over 3 million of these vehicles were in use. At the same time, several States were encouraging fuelling stations to sell E85. With only 169 stations in the U.S. selling E85, most E85 capable vehicles are still operating on gasoline instead of E85.
2003	A 1998 law reduced the ethanol subsidy to 52 cents/gallon (0.137US$/litre) starting January 1, 2003.
	The **Renewable Fuels Standard** legislation (RFS) was passed in the US Senate in June 2003. Among other things, the RFS calls for the phase out of MTBE, ensures that refiners use 5 billion gallons (19 million m³) of renewable fuels by 2012 and eliminates the Clean Air Act 2% oxygenate requirement.
	As of October 2003, a total of 18 States had passed legislation that will ban MTBE - but none of the states that are major users of MTBE, such as CA, CT, KY, MO and NY have their ban in effect yet.
2004	The increase in requirements among U.S. states to include 10% ethanol in all gasoline fuels is growing the demand for ethanol — and for new ways to process materials not normally used in the manufacturing of ethanol. President Bush has set a goal for U.S. usage of ethanol from starch and biomass to double by 2010. As a complementary alternative to starch-based ethanol production, the conversion of biomass (e.g., corn leaves and stalks or grasses) to road fuel, or bioethanol, can increase fuel supplies.
	The **American Jobs Creation Act** (Jumpstart our Business Strength 'JOBS' Act, H.R. 4520), which President Bush signed into law in October 2004, includes several important tax changes for ethanol, such as the Volumetric Ethanol Excise Tax Credit (VEETC), which extends the ethanol tax incentive (51 cents/gallon) to 2010 and eliminates any impact of the ethanol program on the Highway Trust Fund. It also includes modifications to the Small Ethanol Producer Tax Credit, which allows cooperatives to fully participate in the program. The JOBS Act also creates a new biodiesel tax incentive of 50 cents/gallon (0.13US$/litre) for biodiesel produced from waste and animal fats and $1.00/gallon (0.26US$/litre) for "agri-biodiesel" (produced from soybeans) beginning October 1, 2004 through December 31, 2006. The credit can be claimed in both taxable and non-taxable markets (so also off-road applications). Under the new "fuel-fraud" provisions in the JOBS Act, all ethanol and biodiesel producers must be registered with the Secretary of the Treasury.
2005	On August 8, 2005, President Bush signed the **Energy Policy Act of 2005** (H.R. 6) into law. This includes a nationwide renewable fuels standard (RFS) that will double the use of ethanol and biodiesel by 2012 up to 7.5 billion gallons (28 million m³) a year. The RFS also provides that beginning in 2013, a minimum of 250 million gallons (0.95 million m³) a year of cellulose derived ethanol be included in the RFS. A credit trading program will be put in place that allows refiners to use renewable fuels where and when it is most efficient and cost-effective for them to do so. RFS credits have a lifespan of 12 months. Every gallon of cellulose-derived ethanol is equal to 2.5 gallons of renewable fuel. The Energy Policy Act also creates a new 'Small Agri biodiesel Producer Credit' equal to 10 cents/gallon (2.6cents/litre) on the first 15 million gallons (57000 m³) of agri-biodiesel produced at facilities with annual capacity not exceeding 60 million gallons (227000m³). The credit lasts until end 2008. The Energy Policy Act also creates a new credit (Alternative Fuels Installation Fuel Refuelling Property) that permits taxpayers to claim a 30% credit, up to $30,000, for the cost of installing clean-fuel vehicle refuelling property (e.g. E85)..
2007	The Energy Independence and Security Act of 2007 (H.R. 6) was signed into law on December 19, 2007. A key provision of the act is a major expansion of the renewable fuel standard (RFS) to 36 billion gallons (136 million m³) a year in 2022. Of this, 3 billion gallons (11 million litres)

	must be 2nd generation biofuels in 2016, increasing to 21 billion gallons (80 million m³) in 2022.
2008	The 2008 US Farm Bill, passed in May 2008, includes US $1 billion in funds for renewable energy programs and new feedstock production for bioenergy. The bill reauthorizes several programs, including the 2002 Farm Bill's energy title. Programs include grants and loan guarantees for rural communities and farmers to install renewable energy and energy efficiency systems, feedstock diversification and production and biomass research and development. Along with the reduction for subsidies for corn-based fuels, the package would give a new production tax credit of up to $1.01 a gallon for cellulose ethanol through 2012. The changes to the ethanol incentives are part of a more than $1.5 billion tax package included in the larger five-year farm bill overseeing energy, conservation, nutrition and crop programs. The package would drop the current 51-cents-a-gallon tax credit for corn-based ethanol to 45 cents per gallon.

Source: [Pelkmans, 2005], [Duffield, 2008]

6.1.1 Federal incentives

The U.S. government has, since 1978, continuously maintained national tax incentives to encourage ethanol fuel production and use. Several revisions, additions and extensions of the federal ethanol tax incentives have been enacted by Congress since the original implementation. The federal ethanol incentives are provided in the form of a motor fuel excise tax exemption or an alternative income tax credit, along with an additional income tax credit for small ethanol producers. The federal ethanol fuel incentives, primarily the reduced excise tax on ethanol/gasoline blends, are generally acknowledged as the driving force for ethanol production and use in the U.S. Without this long-standing federal energy policy, it is highly unlikely that ethanol production and use in the U.S. would have reached its current level. The small producer credit contributes to an industry trend toward more producers and smaller plant sizes.
There is also a tariff on imported ethanol that gives domestic ethanol producers a competitive advantage over foreign producers.

6.1.2 Federal regulations

6.1.2.1 Air quality regulations

Federal air quality regulations have contributed indirectly to the use of ethanol for gasoline blending. These include: (1) phase-out of lead as a gasoline octane-enhancing additive and (2) introduction of oxygenated gasoline requirements. Both of these federal initiatives have served to increase the marketing of ethanol as a gasoline component.
The ethanol program received a boost from US Congress in 1990 with the passage of the Clean Air Act Amendments (CAAA), which included the Oxygenated Fuels Program, and the Reformulated Gasoline Program (RFG). The Oxygenated Fuels Program, was designed to reduce carbon monoxide (CO) emissions, mainly in metropolitan areas (carbon monoxide non-attainment areas). In these areas only gasoline with a minimum oxygen content of 2.7% (mass) was allowed in certain periods of the year (mainly winter time). The Reformulated Gasoline Program (RFG) was focussed at ozone non-attainment areas, mandating a minimum level of 2.0% oxygen content in the gasoline.
The two most common methods to increase the oxygen level of gasoline are blending with MTBE and blending with ethanol. Unfortunately, ethanol's high volatility, measured by Reid vapour pressure (RVP), limits its use in hot weather, where evaporative emissions can contribute to ozone formation. So as a result MTBE captured most of the RFG market (which is about one third of the total US gasoline market), and ethanol captured the bulk of the small oxygenated fuels market.

As MTBE use increased, many areas began experiencing incidents of MTBE groundwater contamination primarily from leaking underground storage tanks. Laws to prohibit or restrict the use of MTBE have already been passed in several states. As a result, the amount of RFG containing ethanol is now greater than the amount of RFG containing MTBE. Especially with the addition of the New York and California markets (which had a high reliance on MTBE) in 2004 the US ethanol use swelled to record levels.

6.1.2.2 Fleet requirements

The Energy Policy Act of 1992 (EPAct) requires certain Federal, State, and alternative fuel provider-owned light-duty-vehicle fleets to gradually switch to alternative-fuelled vehicles. US DOE's FreedomCAR & Vehicle Technologies (FCVT) Program manages the regulatory aspects of EPAct through Federal Fleet Requirements and the State & Alternative Fuel Provider Rule. EPAct's voluntary activities are being implemented through the U.S. Department of Energy's (DOE) Clean Cities initiative. EPAct's vehicle-purchase requirements have never been satisfied by all covered fleets. EIA estimates that AMF from APACT-mandated fleet requirements will account for at most 3% of the highway transportation fuels by 2010.
Most of the covered fleets belong to the Federal or State governments. Costs for alternative fuels and alternative-fuelled vehicles are higher than costs for conventional fuels and vehicles, yet no funding is appropriated specifically to defray the added costs. Compliance with the EPAct would therefore reduce funding available to carry out the agencies' functions. In addition, the EPAct has never been rigorously enforced, so it is not surprising that many fleets are not in compliance.

6.1.2.3 CAFE credits

The Alternative Motor Fuels Act (AMFA) of 1988, extended by the Automotive Fuel Economy Manufacturing Incentives for Alternative Fuelled Vehicles Rule of 2004, encourages the production of motor vehicles capable of operating on alternative fuels. This incentive gives a credit of up to 1.2 mpg toward an automobile manufacturer's average fuel economy which helps it avoid penalties of the corporate average fuel economy (CAFE) standards. A gallon of alternative fuel used in an alternative fuel vehicle is counted in the calculation of the CAFE as equivalent to 15% of a gallon of gasoline. Because of this credit, automakers sold FFVs for comparable prices as standard models. As a result about 6 million E85 FFVs have been introduced on the US market (up to 2007). However most of these vehicles are operated on gasoline.

6.1.2.4 Renewable Fuels Standard

The Energy Policy Act of 2005 includes a nationwide renewable fuels standard (RFS) to double the use of ethanol and biodiesel by 2012 up to 28 million m^3 per year. The RFS also provides that beginning in 2013, a minimum of 0.95 million m^3 a year of cellulose derived ethanol be included in the RFS.

Meanwhile evolutions have gone so fast, that the target figures had to be increased. End 2007 President Bush signed a new Energy Bill, setting the Renewable Fuel Standard target for 2008 to 34 million m^3 of biofuel, increasing to 136 million in 2022. Of this, 11 million m^3 must be 2^{nd} generation biofuels in 2016, increasing to 80 million (of the total 136 million) in 2022.

6.1.3 State incentives

A number of state incentives are currently in place in the states addressing the production and/or use of biofuel (traditionally valid for ethanol, recently also for biodiesel). The various types of state ethanol incentives that were identified can be categorized as follows:

6.1.3.1 Production Incentives

- Direct producer payments – direct payments of state funds to qualifying biofuel producers on a per-gallon-of-output basis, usually for specified maximum amounts of annual production and for specified maximum numbers of years;
- Income tax credits – credits against biofuel producers' state income tax liability calculated either on a per-gallon-of-output basis or on the amount of facility investment;
- Transferable tax credits – credits on a per-gallon-of-output basis saleable by the producer to biofuel marketers for use against state fuel tax liability;
- Grant and loan programs – direct grants or low-interest loans (or combinations of the two) to assist financing of biofuel production facilities;
- Property or business tax exemptions – partial or full exemptions from property tax, sales tax (e.g., on equipment purchases) or other taxes normally owed to the state by biofuel producers;
- Siting/permitting process facilitation or exemption – legislative or regulatory measures to shorten and/or reduce the steps in the approval process for construction of biofuel production facilities.

Producer payments and production-based tax credits are the primary measure used by states to support expansion of biofuel production. Both of these approaches supplement the federal ethanol/biodiesel excise tax's effect of allowing producers to supply biofuels to motor fuel markets at a price close to that of petroleum fuels by underwriting a portion of the higher cost of biofuel production (versus that of petroleum fuels).

6.1.3.2 Application Incentives

- Fuel tax exemptions – reduction of state motor fuel tax on ethanol/gasoline or biodiesel/diesel blends,
- Market mandate – state law requiring marketing of ethanol-blended gasoline or biodiesel-blended diesel,
- Public fleet requirements – legislative or administrative policy directives for use of ethanol-blended gasoline or biodiesel-blended diesel and/or use of E85 in FFVs by state government vehicle fleets and, in some cases, other public fleets,
- Tax credits for alternative fuel vehicles and infrastructure – credits against business or personal income tax liability for investments in alternative fuel vehicles and fuelling facilities (for E85 or B20),
- Grant, loan and rebate programs – state grants, low-interest loans or partial rebates for investments in alternative fuel vehicles and fuelling facilities (for E85 or B20).

Many states employ one or more forms of inducement for the marketing of ethanol-blended gasoline, the purchase of flexible fuel vehicles capable of operating on E85, installation of E85 fuelling facilities and/or marketing or purchase of E85 fuel.
Reduction in state excise tax and/or sales tax on ethanol/gasoline blends is the oldest type of incentive for ethanol use practiced in the U.S. Such state tax incentives, applied at the point of fuel distribution, add to the effect of the federal ethanol excise tax incentive (albeit at much

smaller amounts), which is to increase the price the fuel marketer can pay the ethanol producer by reducing the marketer's tax liability, thus making ethanol more competitive with gasoline in the motor fuel marketplace.

Many states have active incentive programs to encourage the acquisition of alternative fuel vehicles (AFVs) and/or installation and operation of alternative fuelling facilities to serve these vehicles. Corporate and/or personal tax credits against state income tax or property tax are the most common form of such incentives. In most cases, E85 and vehicles capable of operating on E85 qualify for these incentives. The advent of flexible fuel vehicle (FFV) production by the "Big Three" U.S. auto makers is prompting many states to implement specific incentives for E85 fuelling infrastructure. Purchase of the FFVs themselves may or may not benefit from state AFV incentives, since these incentives typically (but not always) apply only to the incremental cost of such vehicles, over and above the cost of a standard gasoline version.

6.1.4 Market

6.1.4.1 Bio-ethanol

At the current time the ethanol market in the US is mainly driven by tax incentives, clean fuel standards including the RFG oxygen requirement, restrictions on MTBE and rising gasoline prices. Also the current RFS has given a boost on ethanol production.

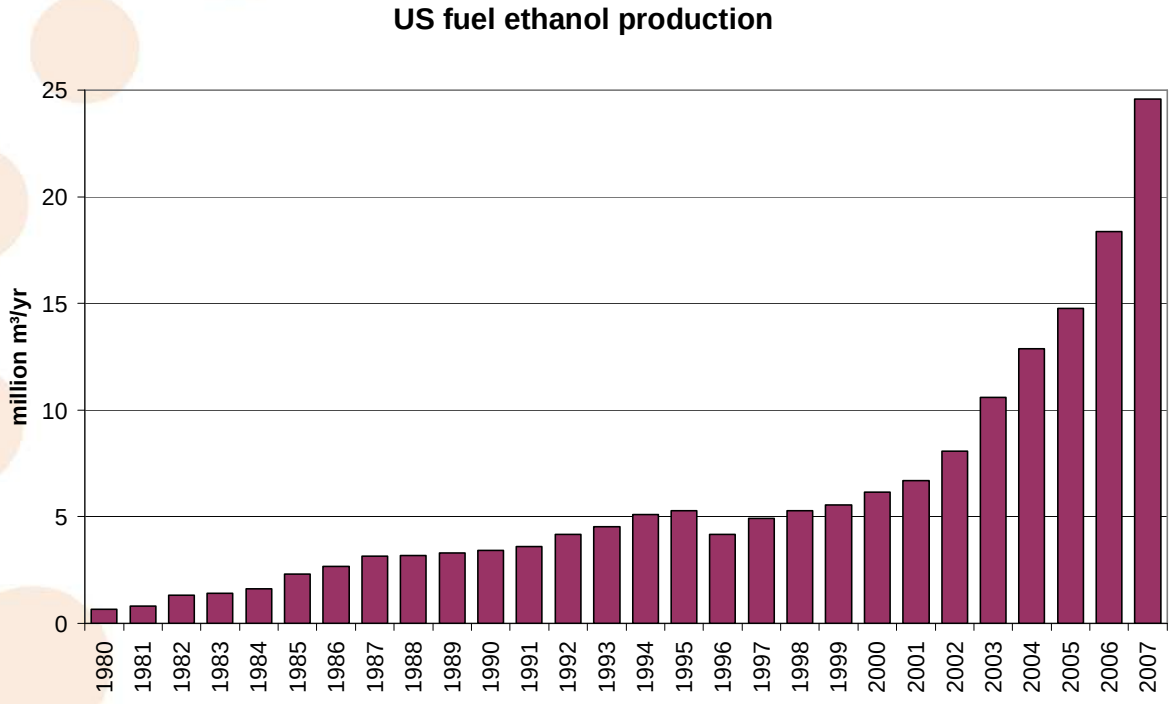

Figure 8: evolution of US fuel ethanol production [RFA, 2008]

Table 52: ethanol plants and production capacity in the US [RFA, 2008]

Year	Jan 1999	Jan 2000	Jan 2001	Jan 2002	Jan 2003	Jan 2004	Jan 2005	Jan 2006	Jan 2007	April 2008
Total Ethanol Plants	50	54	56	61	68	72	81	95	110	134
Ethanol Production Capacity (1000 m³)	6441	6619	7274	8885	10245	11737	13791	15857	20792	27363

Production is quite close to capacity.

Table 53: fuel ethanol import into the US (expressed in million m³/year) [RFA, 2008]

Country	2002	2003	2004	2005	2006	2007
Brazil	0,0	0,0	0,34	0,12	1,64	0,71
Costa Rica	0,05	0,06	0,10	0,13	0,14	0,15
El Salvador	0,02	0,03	0,02	0,09	0,15	0,28
Jamaica	0,11	0,15	0,14	0,14	0,25	0,28
Trinadad & Tobago	0,0	0,0	0,0	0,04	0,09	0,16
Canada						0,02
China						0,02
Total	**0,17**	**0,23**	**0,61**	**0,51**	**2,47**	**1,61**

While most of the domestic consumption is provided by in-land production, imports are getting more important (in the range between 5 and 10% of consumption).

6.1.4.2 Biodiesel

Biodiesel has been under attention in the United States for research purposes, but for now did not achieve the same success as ethanol. To a certain extent this has to do with the high fraction of gasoline use, and the low reputation and acceptance of diesel vehicles in the US. However in recent years biodiesel use in the US is growing, certainly now also legislative actions have been taken to promote the use of biodiesel. The expansion of biodiesel production observed in recent years was triggered by a 1998 amendment to the 1992 Energy Policy Act and cash support from the USDA Commodity Credit Corporation's Bioenergy Program. Further support was created through the American Jobs Creation Act of 2004 and the Energy Policy Act of 2005.

While soybeans are not the most efficient crop solely for the production of biodiesel, their common use in the United States for food products has led to soybean biodiesel becoming the primary source for biodiesel in the US. Soybean producers have lobbied to increase awareness of soybean biodiesel, expanding the market for their product.

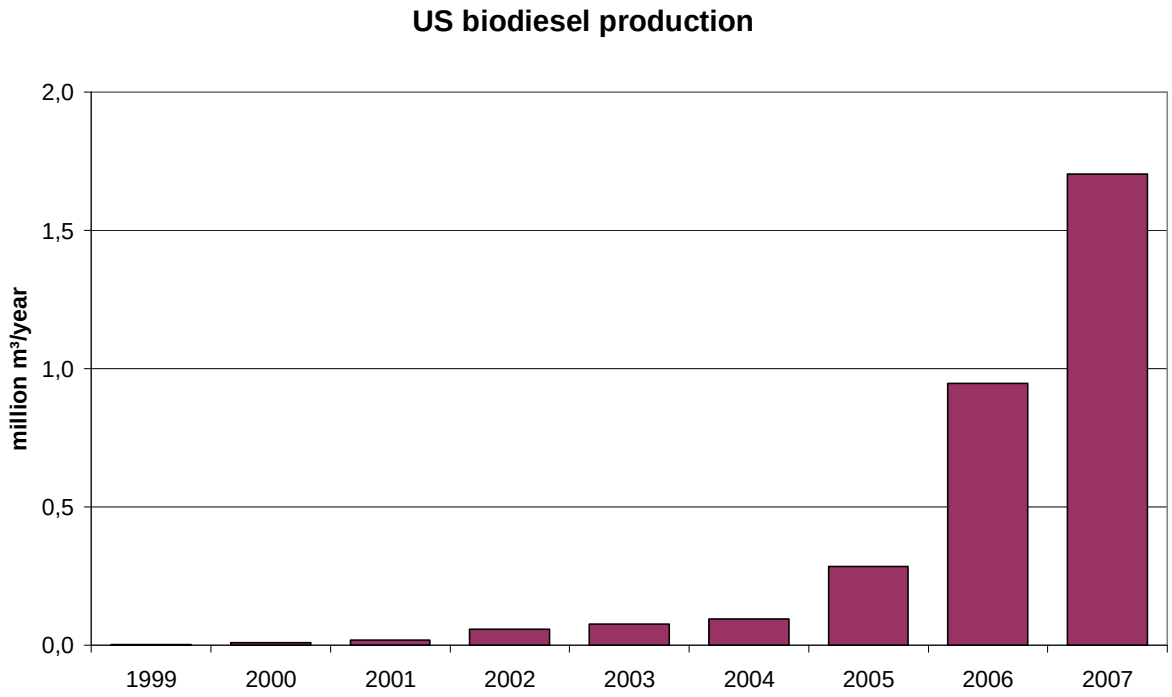

Figure 9: evolution of US biodiesel production [NBB, 2008]

6.1.5 Conclusion

The US has a long ethanol history, which is mainly focused on blends up to 10% (gasohol). Biodiesel is expanding rapidly, however its production level is still 10 times lower than ethanol.

The reasons behind the introduction of bio-ethanol in the US varied between security of energy supply in the beginning (energy crisis in the 1970s), reduction of vehicle pollution in the 1990s and again security of energy supply after 2000. The fact that the fuel is domestically produced is an important factor, and biofuels can reduce to some extent the major oil imports into the US.

Since 1978, there have been continuously maintained national tax incentives to encourage ethanol fuel production and use. This has been supplemented with fuel regulations (oxygenates and RFG), fleet requirements, import tariffs, CAFE credits and research funding. On top of Federal initiatives, also State initiatives play an important role. State incentives, which come on top of federal incentives at the end, can make the difference. These State incentives often depend on the role of lobby groups and local stakeholders. Most of the ethanol production is now in the agricultural states in the Mid-West, reflecting the fact that about 95% of US ethanol production is from corn, with an important role for local agriculture. There is however increasing criticism worldwide against the production of ethanol from corn, as a substantial amount (over 30% of US corn production) is used to produce fuel, which seems to have an important effect on world corn prices. Moreover the GHG balance of US ethanol from corn is generally rather poor (sometimes even worse than fossil fuels). US government is therefore increasing its focus on cellulose based biofuels, as well as introducing GHG thresholds for current biofuels.

6.2 Brazil

Brazil is probably the country that has gone furthest with regard to large scale use of biofuels in the automobile fuel sector. The oil crises in the 1970s led the military government (Brazil had a nationalist military government between 1964 and 1985) to start promoting the use and production of ethanol intensively. The ethanol program was a response to high oil prices, sugar low prices and surplus production. Initially, in the 1970s, the government created the Brazilian National Alcohol Program (Proalcool) and intensified the use of gasohol (a mixture of ethanol and gasoline) to fuel common petrol cars. Then, since 1980, automobile factories have produced dedicated ethanol-fuelled cars. This makes Brazil one of the few countries in the world that has managed to separate a significant part of the automobile industry from petroleum dependency.

6.2.1 Proalcool Program

Proalcool basically consisted of two phases. During phase one (1975–1979), the government policies searched to facilitate both distillery expansions and higher conversion rates in the mixture gasoline–alcohol. The Brazilian experience with mixed fuel showed that conventional gasoline engines could efficiently operate using a mixture of up to 20% of anhydrous ethanol. Also, the government started giving subsidies to expand distilleries. In this phase, there was no rigid commitment to supplying alcohol intensively, since the proportion of alcohol in the mixture could vary without affecting car efficiency and alcohol production was still low. It would be only a question of trade-off between sugar and alcohol production. If the sugar prices fell, sugar production could be shifted to alcohol, or vice-versa, without affecting the consumers and without large adjustment costs.
In phase two, from 1980, the Brazilian government kept authorizing and subsidizing the vast expansion of sugarcane production capacity and industrial investments in mills and in distilleries. Different from phase one, phase two introduced the use of dedicated ethanol-fuelled cars. The technology for these cars was primarily developed at public research centres in the 1970s, and then passed to the private sector, which keeps developing it. Moreover, autonomous alcohol-only processing plants were built using government subsidies to achieve the agricultural output necessary to fulfil future demand for alcohol. These plants cannot produce sugar as an alternative end product. Therefore, at this point, the situation of the alcohol program became irreversible, once part of the market depended exclusively on ethanol to fuel their cars, and the alcohol production could not be completely shifted to sugar.

6.2.2 Policies

Proalcool came as a mix of distributive and regulatory policies. On the one hand, the government distributed several incentives to alcohol related activities, satisfying the demands of many interest groups that influenced the adoption and implementation of an alcohol policy. On the other hand, regulations were adopted to make automobile industries to produce alcohol-fuelled cars and to make fuel distribution companies to work with alcohol. The primary purposes of these incentives and regulations were to create and keep a market for alcohol, to increase alcohol production and to foster technological development in the alcohol sector. Thus, the government was trying both to increase demand and supply of alcohol related activities. Briefly, the main incentives in the Proalcool program have been the following:

- Subsidies to the industrial and agricultural sectors. Cheap credit was a very important subsidy to alcohol activities. The Brazilian government offered credit for agricultural

and industrial investments in alcohol production at interest rates well below the market rate. Other features of credit contract, such as a sizable grace period, made the incentives even greater.

- Protection against alcohol imports. The Brazilian government secured that all production of alcohol was commercialized at a price above the minimum price, and imports are not allowed in normal situations. Thus, sugarcane entrepreneurs had guaranteed that if they invested in the expansion of alcohol production, they would have a market for it.
- Subsidies to consumers. To ensure that alcohol production was absorbed by the market, alcohol pumps had to be installed at all gas stations, and the government guaranteed, through price control, alcohol prices per mileage much lower than the gasoline prices. These factors stimulated sales of alcohol-powered cars and ensured car owners that they would have a secure supply of cheap fuel for a long period.
- Incentives to research on alcohol related fields. Many universities, research institutes and companies were given incentives to undertake research on alcohol related activities, mainly concentrated from biotechnology for genetic improvement to mechanical engineering for the development of engines. More precisely, the increase in the production and use of ethanol as a fuel was made possible by three government actions:

Since its inception the fuel price policy adopted to open the way for the use of ethanol was the following: the government indexed the consumer price of alcohol to the price of gasoline and charged for gasoline an extra tax, which made gasoline price double the price in the United States. The proceedings of this "tax" on gasoline were used to reduce the cost of other petroleum derivatives (LPG and naphta), and in the case of ethanol to cover its higher production costs. The justification for such a policy was the beneficial environmental and social consequences of the program.
Apart from this cross-subsidy, which was created to subsidize ethanol through taxation in gasoline and diesel oil, other economic incentives -either to producers or consumers- are practically nonexistent today. In the Northeast region, however, incentives are still offered to producers within the context of regional development policies.

The incentives and subsidies of Proalcool were planned to be the transitional step in order for ethanol to become competitive over gasoline which would face ‘problems’ resulting from the high price that it was planned to reach. ‘Economy of scale’ was another factor that was forecasted that would assist the development of ethanol, as it happened.
Low oil prices during the second half of 1980’s created serious problems to the Brazilian government. The discontinuation of government incentives in the form of subsidies would result in a serious problem in the market as millions of people were relying on ethanol that at that time could not compete without support over gasoline.
The subsidy to cover the difference between alcohol costs and prices was kept with declining proportions until the end of 1998, when major changes in fuel pricing policy took place. Gasoline prices, until then regulated, were allowed to get stable by the market. Alcohol subsidies were also gradually extinguished and alcohol prices were also allowed to fluctuate with the market.

6.2.3 Public response

The response from the public was very strong resulting to an ethanol production in 1987 that was 30 times more than that of the late 1970’s. By the mid 1980’s, most new cars in Brazil were dedicated ethanol cars. At that period ethanol was competing fully with gasoline. The trend of ethanol changed in 1989 when a shortage in ethanol could not meet the demand of

the consumers. Proalcool was about to terminate, when the Gulf war created again an opportunity for ethanol. Nevertheless, the public lost its confidence with pure ethanol while vehicles dedicated for ethanol fuel could not operate due to the shortage.
In the 1990's the declension started taking place for ethanol. The main initial reasons were a poor cane harvest, higher sugar prices that led to a shortage, and a large number of alcohol driven cars which were short of fuel. The instability that was created to the market resulted to the creation of a bad 'reputation' for pure ethanol and led people back to the conventional fuels.

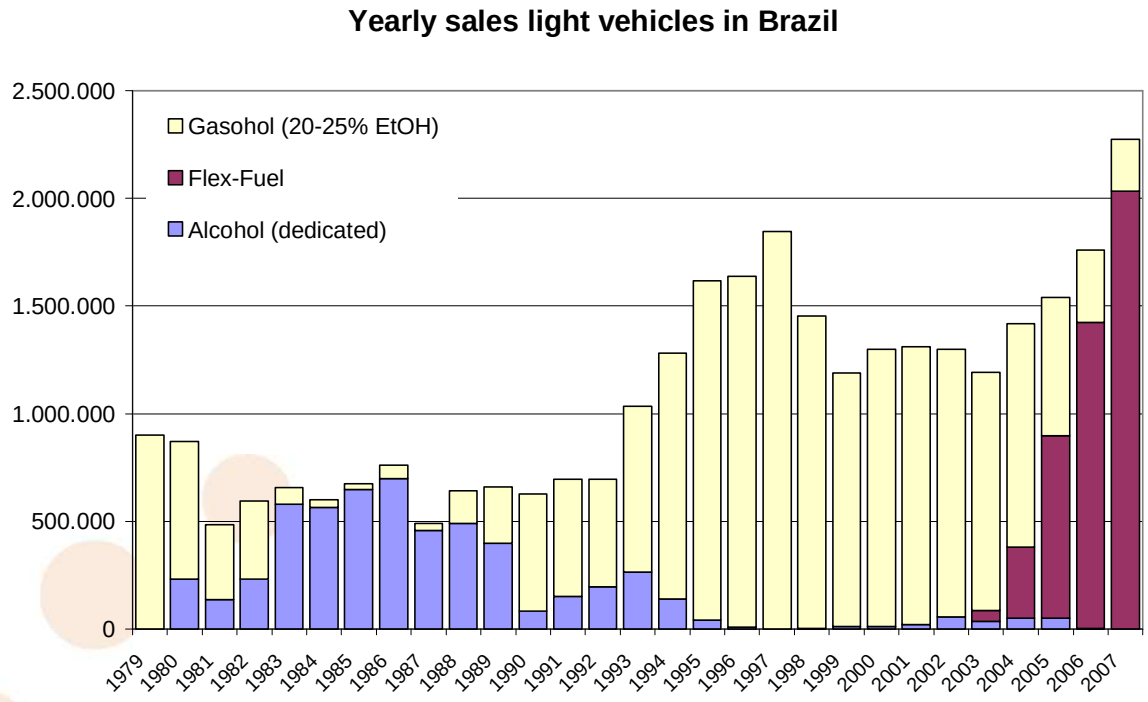

Figure 10: yearly sales of light duty vehicles in Brazil
Based on figures of ANFAVEA (Brazilian Vehicle Manufacturers Association)

While the interest for dedicated ethanol vehicles declined, anhydrous ethanol was still generally blended with gasoline in concentrations between 20 and 25%.

6.2.4 Recent evolution

Since 2001, due to a larger price difference between ethanol and gasoline, sales of dedicated ethanol cars have risen again. Also the interest from the public arose again due to the growing interest in environmental problems. This renewed interest has given an incentive to car manufacturers to introduce flexible fuel vehicles to the Brazilian market in 2003. This has been a very important milestone, which created a revival of vehicles able to run just powered by ethanol. Mid 2005 the sales of FFVs surpassed the sales of gasoline cars, and currently about 90% of car sales are FFV. As of August 2008, the fleet of flex-fuel cars and light commercial vehicles had reached 6 million new vehicles sold, representing 23% of the Brazilian light vehicle fleet. The success of FFVs, together with the mandatory use of E25 blend of gasoline throughout the country, allowed Brazil in 2008 to achieve more than 50% of fuel consumption in the gasoline market from sugar cane-based ethanol.

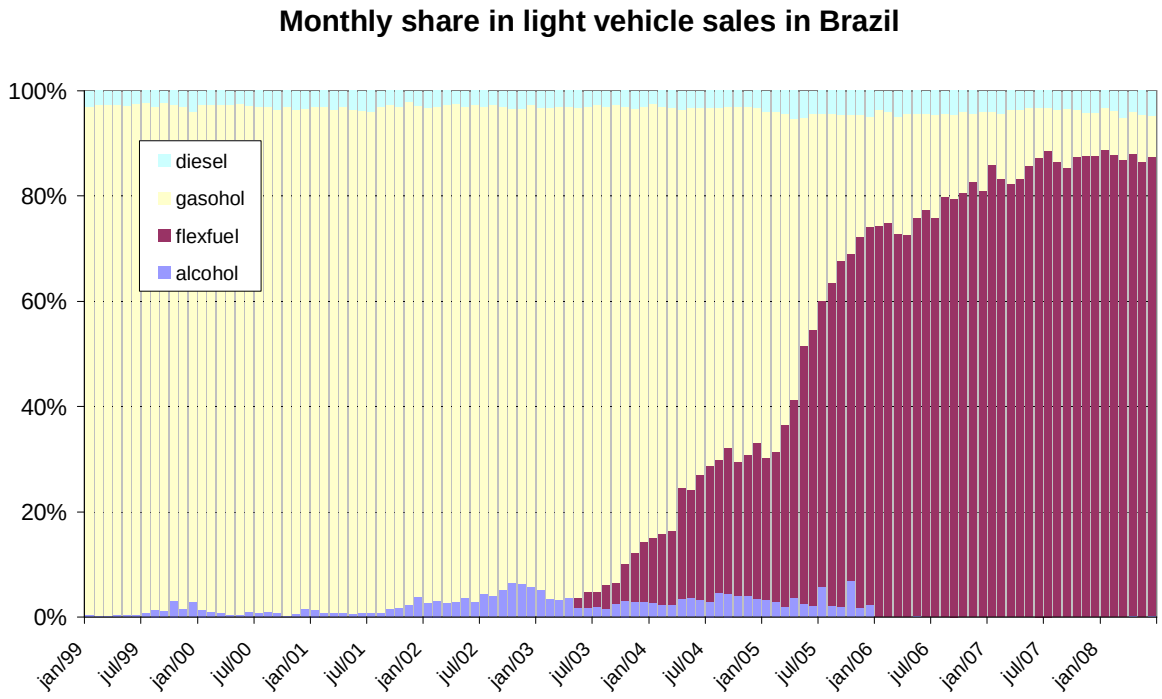

Figure 11: share of flexfuel and dedicated alcohol vehicles in monthly share of light vehicles in Brazil
Based on figures of ANFAVEA (Brazilian Vehicle Manufacturers Association)

With interest growing again within Brazil and with the growing interest in biofuels all over the world, Brazil is considering a serious expansion of its ethanol production. While current production in Brazil amounts 19 million m³/year in 2007, plans are announced to extend this production to 35 million m³/year in 2015, of which 20% would be for export.

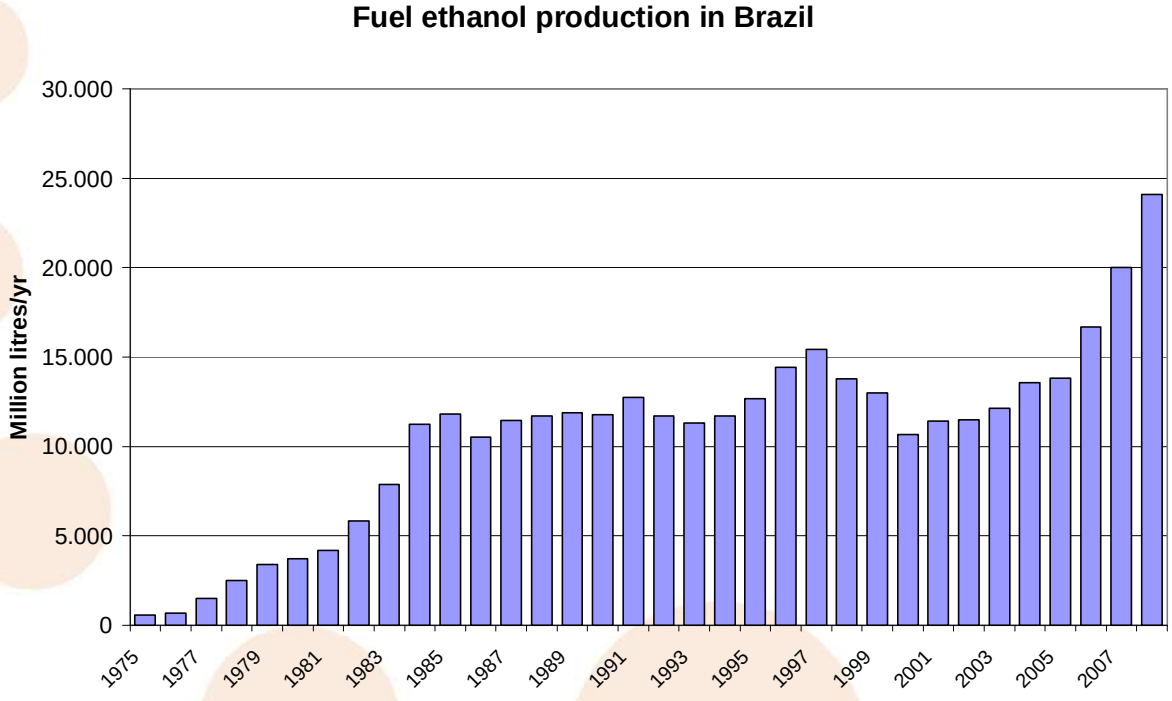

Figure 12: evolution of fuel ethanol production in Brazil
Source of the data: [F.O.Lichts, 2008]

An increasing part of the fuel ethanol production in Brazil is exported to other regions in the world. The main destinations are the US, EU, Caribian area and Japan.

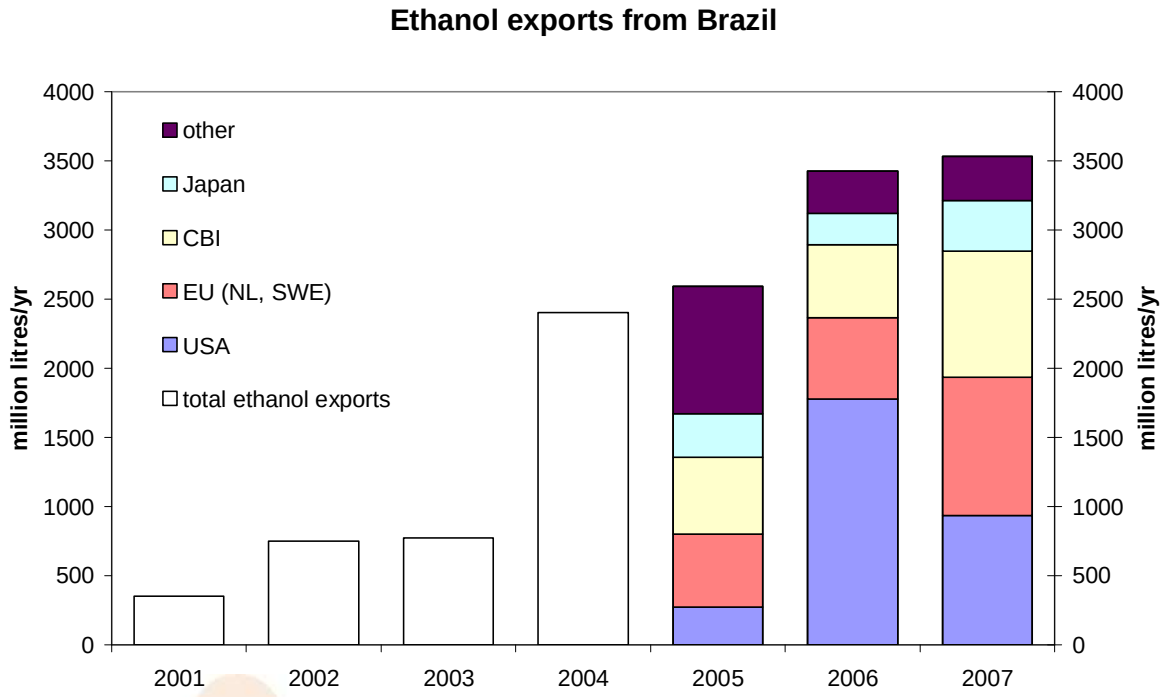

Figure 13: ethanol exports from Brazil
Source of the data: F.O.Lichts

6.2.5 Conclusion

As a general conclusion one may state that the Brazilian government started building up some competitive advantages to sugarcane ethanol use as an automobile fuel by investing in technology research, creating an alcohol industrial policy and offering incentives for the private sector. The economic context of the 1970s can justify Proalcool as a reasonable policy to attempt to deal with oil crisis. Also, as the world has become more environmentally conscious and oil becomes scarce and expensive in the future, ethanol is a real option for worldwide substitution of liquid fossil fuel and can be an important alternative to achieve reductions in CO_2 emissions.

Brazil has built some competitive assets that can put it in a privileged situation in the market of ethanol production and technology in the long term. This case shows the importance of public policies in allowing the creation of a market for renewable energy. Proalcool reveals that mechanisms for implementing economic and technology policies, though significantly complex and uncertain, can lead the private sector, and society in general, towards the accomplishments of planned national or environmentally sustainable goals. On the other hand, Proalcool's decline in economic competitiveness due to the fall in oil prices in the 1990s illustrates the difficulties of long-range planning, which is one of the key points for planning sustainable development strategies. Nowadays, as environmental interests and values are much stronger, public policies towards the use of renewable energy policies are likely to receive much support. The recent market change, with the availability of flexible fuel vehicles, creates a serious rise in demand, which finds its basis in the 30 year ethanol experience in Brazil.

6.3 India

The rapid growth of India's transport sector is increasing the dependence of India's oil imports. Half of India's oil needs are related with the transportation sector. India currently imports around 75% of the oil that it uses [Malhotra, 2005].

6.3.1 Ethanol

India has an important sugarcane industry, with 4 million hectares used for sugarcane, resulting in 6 to 9 million tonnes of molasses per year and 1.2-1.8 million m^3 ethanol per year (most of which for potable use or industrial use) [F.O.Licht's, 2005]. The Indian government has introduced a programme in order to increase the production of ethanol. Surplus of sugar and molasses are being used in order to produce ethanol which is nowadays exported to the world market. The sugar industry lobbied the government to embrace a bio-ethanol programme for several years.

6.3.1.1 Government program

At first instance government supported pilot projects to test the feasibility of blending ethanol with gasoline. In March 2002 the government gave the permission for the sale of E-5 across India. In September 2002, India's government mandated that nine states and four Union territories would have to sell E-5 by law from January 2003. Their combined demand was estimated at 345000 m^3/yr. This was accompanied by an excise duty exemption for ethanol. In the next phase, supply of 5% ethanol-blended gasoline would be extended to the whole country. Subsequently the percentage of ethanol mixture in gasoline would be increased to 10% [F.O.Licht's, 2005].

6.3.1.2 Implementation problems

In view of supply constraints from the sugar industry, the Government of India had decided to supply 5% ethanol-blended gasoline only in 4 States from January 2003.
Implementation of the excise duty for ethanol was delayed until February 2003 due to opposition from the chemical industry, in fear of higher prices and shortages of alcohol. During the last years, pricing became an unsurpassed obstacle. So, in June 2003 India's Petroleum Ministry announced that it would appoint a Tariff Commission to fix an appropriate price for ethanol sourced from sugar mills. Ethanol pricing in India is also complicated by differences in excise duty and sales tax across states and the central government is trying to rationalize ethanol sales tax across the country. More significantly, there are still substantial differences in the profitability of potable alcohol compared to fuel alcohol in several states. This, in turn, has brought on production of insufficient fuel alcohol to meet demand.
Moreover, with the cane crop shortfall of the seasons 2003-2004, India has had to import molasses and even ethanol to cover domestic needs. The Indian industry tried to bridge the supply gap by importing extra molasses from neighbouring Pakistan and by purchasing alcohol from Brazil. By September 2004 alcohol supplies had come to a virtual halt and the Indian government suspended the mandatory blending of ethanol in gasoline because of poor ethanol supply. The recovery in sugar and molasses output during the 2005-2006 crop year resulted in a renewed interest in the ethanol programme. With a strong growth in sugarcane production in 2006-2007, the government announced in September 2006 the second phase of the scheme which mandated 5% blending of ethanol with gasoline, subject to commercial

viability in 19 states and eight Union Territories with effect from November 2006. Again the programme was not fully implemented due to high state taxes, excise duties and levies, which made the ethanol supplied unviable for commercial blending.
In October 2007 the government introduced a E-5 mandate to the whole nation, and E-10 is scheduled to be introduced nationwide from October 2008 [F.O.Licht's, 2008]. Nevertheless considerable barriers to success remain with, for example, the country's oil industry continuing to be reluctant to blend ethanol at higher percentages, and feedstock supply in the following seasons may fall again after a few years of higher production.
So the success of the Indian ethanol programme has been hampered by problems related to feedstock supply, price agreements and reluctance of domestic oil companies and the implementation success of the programme remains to be seen given India's track record..

6.3.2 Biodiesel

India considers the use of edible oils for biodiesel production not an option at this stage since edible oils and seeds should be used in order to fulfil other primary needs. Thus the use of non-edible seeds is seen as the only solution in which development should focus. There is ample scope for cultivation of non-edible oil seeds plants in most Indian States. Some of these plants, especially Jatropha, can be grown in areas with low availability of water and even in deserts. At the national level, 10 million hectares of wasteland could give about 5 million tonnes of biodiesel output. Non-edible oilseeds can be grown along railway lines, wastelands, highways and fencing of various types.
It is for this reason that the Planning Commission has proposed a National Mission on biodiesel and Jatropha curcas, which includes large scale plantation, collection of seeds and setting up of plants for producing biodiesel.

6.3.2.1 National Mission

The National Mission biodiesel program consists of two phases. The first phase consists of demonstration projects covering both forest and non-forest lands in various states across the country. The phase II of the mission will focus on uncovered areas with a target to achieve 20% blending of bio-diesel with diesel.
The phase II of national mission is proposed to be people driven with the government playing the role of facilitator. It aims to expand the program to cover up to 11 million hectare in phase II. The implementation will be done in phased manner – The first step is to achieve a 5% biodiesel blend in diesel in 9 states; then aim at a 5% biodiesel blend all over the country. Later the biodiesel blend percentage will be increased to 10% across the country and lastly work towards more than 10% biodiesel blend in the entire country.
In order to achieve the set targets, the National Mission looks into nurseries development, plantation on forest and non-forest lands, seed collection and oil extraction centres, transesterification units, blending and marketing arrangements and research and development (R&D) studies to fill gaps in knowledge. In order to manage the entire program, there is a proposal to create a National Biodiesel Board.

6.3.2.2 Implementation problems

In October 2005, the Ministry of Petroleum and Natural Gas announced a "biodiesel purchase policy," by which oil companies would purchase biodiesel and blend it with diesel at a 5% blending ratio. This would take place in 20 procurement centres spread across major

producing areas in the country, effective January 2006. The biodiesel will be procured at a pre-determined price (reviewed every six months by the ministry). Market sources report that the cost of production of biodiesel is 40 to 80% higher than this purchase price, resulting in no sales of biodiesel at the centres. The government does not provide any direct financial assistance for the production of biodiesel or for investment on plant and necessary facilities. Although the central government has exempted biodiesel of the central excise tax, most state governments do not provide any excise or sales tax exemptions for biodiesel or biodiesel blended diesel. [USDA, 2007]

So far there has been negligible production of biodiesel in India, also because the progress of Jatropha plantations has been very slow to date. The total Jatropha plantation in the country is estimated at only around 400,000 hectares in 2007, of which about 70-80 % are new plantations (1-3 year old) that are not yet into production. An overall 5% blending in 2007 would have required about 2.1 to 2.5 million hectares of Jatropha plantation in full production. Consequently, there are insufficient Jatropha seeds to crush for biodiesel production units for sale to oil marketing companies for blending purposes.
India's commercial production of biodiesel is almost negligible. Due to high edible oil prices in the domestic market, it is not economically feasible to produce biodiesel from vegetable oils. The small quantities of Jatropha and other non-edible oilseeds procured by traders are mostly crushed for oil, which is used for lighting lamps and other non-edible uses.
Reliable production information on India's bio-diesel is not available, and a rough estimate can range anywhere between 200 to 500 tons per year [USDA, 2007].

Industry sources expect the biodiesel blending program to gather momentum in the next 4-5 years, with expected improved availability of Jatropha seeds as more areas are brought under plantation and as the plantations mature. However, it is too early to say if the program will fully succeed as several problems still need to be overcome.

6.3.3 Conclusion

India has one of the fastest growing economies in the world and fuel consumption is rising with an average of around 5% per year. This will seriously increase India's dependence on imported oil.
India has already taken actions to introduce ethanol and biodiesel in gasoline and diesel fuel respectively. Despite of the existing presence of sugar cane and ethanol production in India (not for fuel purposes), the fuel ethanol story has been hampered by discussions on price, availability, and the lack of appropriate policy framework that accommodates various interest groups, so ambitious targets were not met. One of the main problems is the competition between uses of ethanol and its feedstock.
The strategy on biodiesel is different. From the beginning it is decided that the focus will be on non-edible oils (mainly Jatropha), which do not compete with food markets. Advantage is also that crops can be used which are not very demanding and can use wasteland in difficult climatic conditions. However introduction is going much slower than anticipated and India's commercial production of biodiesel is currently almost negligible.

7 Conclusions and recommendations

Biofuels are supported on an EU and Member State level with the instruments being closely interlinked. While support to the agricultural production is regulated on an EU-level (as the Common Agricultural Policy CAP is a common policy under sole EU responsibility), in most other areas, the EU provides the framework (e.g. allowing for tax exemptions of biofuels) and leaves the decision on concrete policy measures to the Member States.

The assessment of past biofuel support, both in the EU and abroad, shows that a successful policy mix needs to simultaneously:

- create stable "technical" preconditions, such as fuel standards, fuel availability and compatibility with engines;
- create a financial or regulatory framework that takes away the price difference for the consumer between biofuels compared to fossil fuels;
- create long-term investment security for investors: this requires a stable predictable framework and binding targets, a political commitment and support from stakeholders.

Country actions in fulfilling these criteria differ widely, as does their progress in biofuel production and consumption. Some countries really played a pioneer role, looking at Brazil, the USA and recently also Sweden for bio-ethanol, and Germany, Austria and France for biodiesel. In recent years, however, more Member States have introduced an active biofuel support policy and developed domestic production capacities. Despite different national objectives for promoting biofuels, this converging trend is likely to continue.
At the same time, due to efforts from some pioneering countries and the EU, key preconditions for a wider market introduction are now fulfilled on an EU level with the existence of fuel standards, the compatibility of engines to low blends and the availability of vehicles that can use high blends or pure biofuels. Furthermore, with the creation of substantial production capacities, a market momentum has been created.

Measures to stimulate biofuel demand

There are two main instruments which are actually the basis of biofuels supports schemes in the EU (and also worldwide): subsidisation to compensate the extra costs of biofuels compared to fossil fuels, or prescription of a mandatory uptake in the market.
The first option is implemented in the EU by a tax exemption scheme, which has proven successful although it caused important revenue losses for governments. In the second option, fuel suppliers are obliged to achieve a certain biofuel share in their total sales. Here, fuel suppliers and ultimately the transport users will carry the additional costs. Both instruments can be complemented by a number of other incentives, such as support to dedicated vehicles.

Past experience shows that partial or total exemptions from fuel taxes for biofuels were vital in promoting biofuels in the EU. All Member States with a high penetration of biofuels have, or have had, a favourable tax regime in place, e.g. Germany (until the end of 2006), Sweden, Austria, France and Spain.
As the tax exemption must not exceed the level of the fuel tax, the instrument has proven most successful in countries with high enough fossil fuel tax levels to compensate the additional production costs of biofuels compared to the fossil alternatives. This relation becomes very clear for Germany, where the introduction of a continuously rising ecotax on

fossil fuels from 1999 onwards, combined with a full tax exemption for biofuels eventually led to biodiesel pump prices falling below those of fossil diesel.

A switch towards obligation schemes can recently be observed as a consequence of the high revenue losses resulting from tax exemption schemes. Since 2005, 12 EU Member States – accounting for almost 90% of the total EU biofuels consumption in 2006 – have switched or will switch from a tax exemption to an obligation scheme in the very short term. In many Member States, some mixed schemes are in place, in which quota either limit the amount of biofuels that will benefit from a tax exemption, or tax exemptions only apply to certain biofuels (often high blends) while the large volume biofuels fall under an obligation scheme.

Low vs high blends

In most European Member States, there seems to be a tendency towards low-blend fuels as implementation costs and time-to-market are lower than for pure or high blend biofuels. Yet there are arguments to also include pure biofuels or high blends in the strategy:

- existing low-blend fuels alone will not be sufficient to meet the 10% target for 2020, because of fuel quality limitations (EN590 for diesel, EN228 for gasoline),
- preparedness for the use of high blends might also be a means to enhance responsiveness to an abrupt increase in oil prices or supply problems,
- adapting the engine to high biofuel blends can also help in reducing exhaust gas emissions; some biofuels (e.g. E95, bio-methane, DME) have inherent low emissions,
- the use of pure biofuels and dedicated technology is important for raising public awareness on biofuels and clean transport in general.

Compared to low blending, high-blend fuels still require more structural adjustments in vehicle technology and fuel distribution systems before they can make a concrete impact. Therefore the market for high blends needs a different approach than general blending. High blends are difficult to include in a mandatory system, a tax differential remains the most important policy tool for these fuels, combined with concrete user incentives (e.g. free parking or congestion charge exemption).

Differentiation between biofuels

Within a large biofuel market, it is possible – and desirable – to differentiate between different biofuels and production pathways, and their performance towards overall policy goals, namely avoided greenhouse gas emissions, security of supply or agricultural income, while avoiding an excessive impact on other markets (like food).

Recently there is a serious debate going on about the sustainability of current biofuels. Traceability and certification of biofuels will be key, including a ranking of different biofuel production pathways based on the efficient use of biomass, the carbon content and GHG savings potential, production costs and interference with food markets would be helpful to identify those pathways that should primarily be supported to best fulfil the main objectives in supporting biofuels. So a government may thus decide to differentiate support to different biofuels in order to minimise potential negative impacts. Other measures will therefore ideally complement the main instrument that creates the market demand (obligation or tax exemption).

Measures on the supply side have had a limited impact up to now in developing a market demand, but their significance may increase as a tool to steer a growing biofuel market into the desired direction.

- A crop-specific feedstock support subsidy may help to direct the crop mix into an environmental- and landscape-beneficial pathway. For example, the current revision of the energy crops scheme extended the support to perennials.
- Investment subsidies for production facilities were only partially successful in the past. However, they become more important in the future if more advanced biofuels are desired. Production facilities for advanced biofuels have much higher capital costs than those for conventional biofuels.
- Collaboration with car manufacturers is very important where pure or high concentration biofuels intend to be used, and this was successful for biodiesel in Germany and ethanol-FFVs in Sweden. Depending on whether there will be a policy push for high blends in addition to low blend options, collaboration and dedicated subsidies for adapted cars can be of importance as Sweden demonstrated with the successful introduction of flexi-fuel vehicles. Moreover, it should be noted that pure biofuels also lead to increasing public awareness for biofuels.
- Certification of biofuels becomes more important with the market reaching a certain share. Only with additional measures such as certification (either of fuels or of the fuel suppliers) it can be ensured that the GHG balance is good and that other environmental impacts are limited. Several countries have taken initiatives in that direction (Netherlands, UK, Germany), and the proposed Renewable Energy Directive has given first guidance for practical implementation of sustainability requirements.

Long term stability

Creating a long-term stable framework for farmers, biofuel producers, oil companies and car manufacturers is an important factor for a successful biofuel policy. This can best be met by setting long-term targets and a predictable policy. From an industry point of view, this would argue in favour of a unique EU biofuel policy.
If targets are set, these should ideally be binding targets, in order to create investment stability for industry. When setting the targets, the designated biofuel policy needs to be set into context with other existing legislation (in particular energy and agricultural policies) and other policies aiming at similar objectives in order to achieve a consistent, cost-efficient overall approach. If, for example, GHG emission reductions were the only objective for promoting biofuels, other policies are likely to achieve the same results at lower costs. In this respect, the proposal for a renewables roadmap asks Member States to provide National Action Plans on their optimal mix of renewables.

Standards for biofuels are best taken on an EU-level. This will be beneficial for transport users and car manufactures as well as the biofuel industry. Also a certification scheme to ensure sustainability of domestic and imported biomass is most efficient on an EU and even worldwide scale. Furthermore, current European legislation (i.e. fuel quality directive) will need to be adapted so as to allow for higher shares of biofuels, the process of which has already started.

Additionally, RTD is necessary in a coordinated way between the national and EU-levels. In particular, advanced biofuels are a promising technology that requires further R&D. Additionally, there should be an emphasis on R&D for dedicated energy feedstock. Today's production techniques use traditional food/fodder crops. These crops can be further optimized for energy/biofuel production. Also new crops can become interesting for advanced biofuels.

Overall conclusions

The experiences show that biofuel markets are growing worldwide, but it is not always easy to regulate the market through certain policy choices. Worldwide evolutions play an important role, and crop production remains dependent on various factors (varying climatic conditions, increasing demand for food, …).
While volumes are rising, it is clear that biofuels are now passing from an initial pioneering stage to a more mature market. Biofuel policy should focus on cost-effectiveness and not primarily and exclusively aim at fulfilling a certain target for biofuel consumption, but that the key drivers underlying a biofuel policy must be kept in mind, namely to increase energy security, secure domestic agricultural income and reduce GHG emissions.
With rising volumes, impacts on other markets (e.g. food commodities) become prevalent and policies should also focus to minimizing possible negative impacts (e.g. on other commodity markets or use of land resources). Certification schemes and worldwide collaboration will be key to achieve this.

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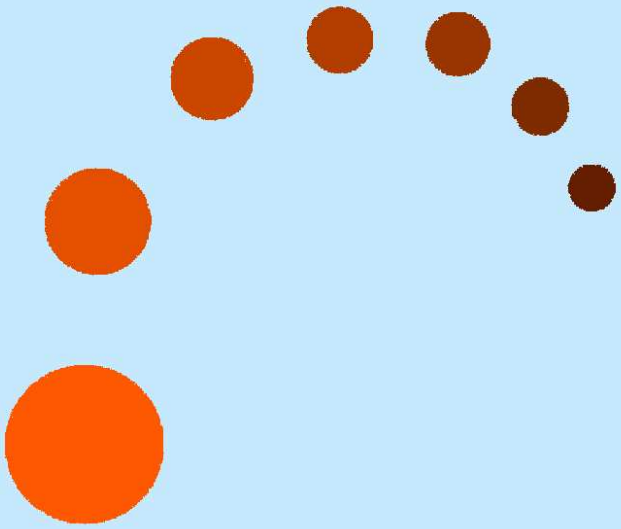

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