Report for

The Canadian Renewable Fuels Association

How Canada ranks: A comparative study of national biofuels policies world-wide

Submitted by

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S1. Executive Summary

This report was prepared by Agra CEAS Consulting in conjunction with F.O. Licht for the Canadian Renewable Fuels Association. The key findings which seek to identify Canada's renewable fuels policy in the international context are as follows:

- **Canada** currently produces relatively low volumes of biofuels with 2004 production estimated at 250 million litres. However, three provincial governments have introduced biofuels programmes and both major federal parties have established national renewable fuels targets of 5% by 2010. The effect of these measures, if implemented, would be to raise Canada's production of renewable fuels to 1.4 billion litres by 2007 and 3.1 billion litres by 2010 – a twelve fold increase in biofuel production. The comparative analysis and the overview of tax reductions and targets for biofuels market share in key countries presented in the report indicate that Canada at present applies a relatively more limited range of instruments and lower targets than other major producing countries/regions.

- Internationally **Brazil** is the world's largest producer having started a biofuels programme in the 1970s. Renewable fuels production is enhanced by the availability of low cost feedstocks and is receiving a substantial boost now as a result of high domestic sales of flex-fuel cars. As a result of this and growing export demand production is expected to rise from some 15.4 billion litres in 2004 to 26.0 billion litres by 2010.

- In the **United States** a renewable fuels programme has been in operation since the 1980s and the US is the world's second largest producer generating 12.9 billion litres in 2004. In August 2005, following several years of discussion, a new US Energy Bill was adopted. A key provision is the renewable fuels standard (RFS) which raises the amount of renewable fuels to be used in the US fuel pool to 7.5 billion gallons (28.4 billion litres) by 2012, almost double the current use. In his State of the Union address to the US Congress on January 29, 2006 US President Bush extended his support for renewable fuels by stating: "We will also fund additional research in **cutting-edge methods of producing ethanol**, not just from corn but from wood chips, stalks, or switch grass."

- The main drivers for both fuel ethanol and biodiesel production in the **European Union** (EU) are two biofuel directives from the European Commission adopted in 2003. The 'promotional' Directive sets indicative targets for the share of renewable fuels in the transport fuel market (2% by end 2005 and 5.75% by end 2010). In 2004 the EU produced some 526 million litres of ethanol and 2.2 billion litres of biodiesel. While the target for 2005 has not been achieved and only some 1.4% of the fuel incorporated in gasoline was renewable, the industry is now growing rapidly and it is expected that by 2010 the target of 5.75% will be realised. The Directive on the Taxation of Energy Products allows Member States to exempt, in full or in part, products that contain renewable substances (such as bioethanol or biodiesel).

- The international experience of policies in the biofuels sector suggests that a combination of mandates and tax support tend to increase production and consumption of renewable fuels. Although Canada has a well-developed agricultural sector with large potential feedstocks, it has to date shown relatively slow growth in biofuels production. For Canada to be more in line with other producer countries by 2010, both the policies announced by three provinces and a national renewable fuel standard promised by the new government would need to be successfully implemented.

1. Introduction

This report was prepared by Agra CEAS Consulting in conjunction with F.O. Licht for the Canadian Renewable Fuels Association. The work for the study was undertaken by Dr. Christoph Berg, of F.O. Licht together with Ms. Doris Haug and Mr. Conrad Caspari of Agra CEAS Consulting. The work was undertaken in the period November 2005-March 2006 by means of desk research and telephone interviews with relevant stakeholders in the countries studied.

The following section provides an overview of current and likely future ethanol and biodiesel production capacity, as well as policy and regulatory frameworks for biofuels in selected countries world-wide.

Section 3 presents an estimate of fuel ethanol production in the key producing and likely future producing countries for the years 2000 to 2010. On the basis of this review of national biofuels policies, it places Canadian public policy on ethanol and other renewable fuels in context and highlights how this compares with developments in other jurisdictions.

2. Biofuels policies and production volumes

2.1. Canada

Biofuels in Canada

Biofuels production

It is estimated that Canada produced 250 million litres of **fuel ethanol** in 2004, and that production could reach 1.4 billion litres in 2007 rising to 3.1 billion litres by 2010 if current and announced biofuels programmes are implemented. Starting in late 2005, production of **biodiesel** began on a very limited industrial scale.

Biofuels policy

During the recent general election both the main political parties, the federal Liberals and Conservatives, pledged to raise this requirement to a 5% Renewable Fuels Standard for gasoline and on-road diesel by 2010. At the federal level, ethanol-blended fuels benefit from a tax exemption and funds are available to promote construction or expansion of fuel ethanol plants ($118 million CAD have been allocated so far to 11 grain based ethanol plant projects). For **biodiesel**, at the federal level the only support available consists in funds allocated to the Canadian biodiesel industry to address technical and market barriers. There are additional biofuel support mechanisms in place in certain provinces.

2.1.1. Canadian biofuels production

Up until now, biofuels consumption in Canada has been quite low. In 2004, total **fuel ethanol** production and consumption amounted to approximately 250 million litres, i.e. 0.7% of the country's total petrol consumption. Assuming that the government's target regarding the future share of fuel ethanol is achieved, total fuel ethanol output would amount to 1.4 billion litres in 2007. In Canada, ethanol is produced almost entirely from cereals. The company Iogen Corp. maintains a demonstration plant for producing ethanol from cellulose in Ottawa, but this plant produces demonstration, not commercial, quantities of cellulose ethanol. **Biodiesel** is now being produced on an industrial scale at the Rothsay Biodiesel plant in Montreal at an estimated 30 million litres per annum. Another new facility operated by BIOX in Hamilton, producing 66 million litres of biodiesel p.a. is expected to come on line in 2006.

2.1.2. Canadian biofuels policy

During the recent general election both the main political parties, the federal Liberals and Conservatives, pledged to require a 5% Renewable Fuels Standard (RFS) for gasoline and on-road diesel by 2010. This would represent 3.1 billion litres of ethanol and biodiesel a year, more than <u>twelve times</u> what the country currently produces.

To summarise the overall picture Figure 2.1 below shows Canada's production in 2010 assuming the federal and provincial RFS are implemented and what would be likely to occur if current policies alone were to be maintained.

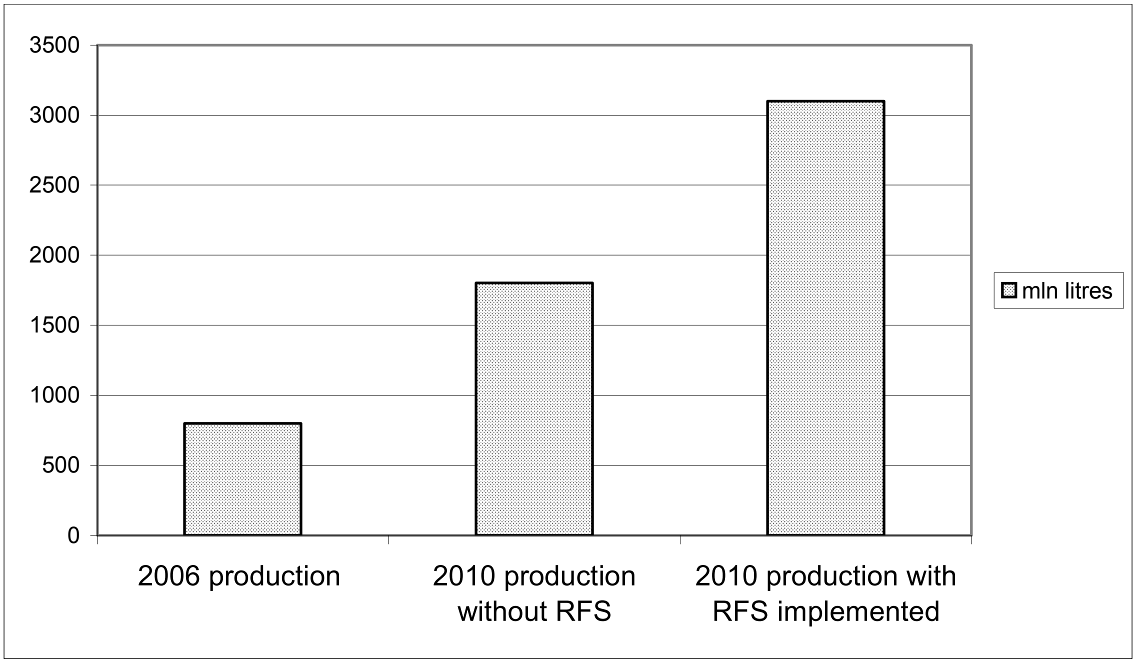

Figure 2.1: Projection of Canadian ethanol production to 2010 with and without RFS

Source: Agra CEAS Consulting and FO Licht 2006.

The main support instrument for **fuel ethanol** currently in place is a federal excise tax exemption amounting to 10 cents per litre of ethanol blended with gas. In addition, a Kyoto Protocol compliance plan includes funds to expand Canada's ethanol production. In two rounds, approximately $118 million CAD were allocated to support the construction or expansion of 11 grain based fuel ethanol plants. The federal government expects the projects supported under the Ethanol Expansion Programme to produce a total of about 1.2 billion litres of fuel ethanol per year by the end of 2007, in addition to the 0.25 billion litres which are already being manufactured each year.

In addition to the federal initiatives, several Canadian provinces (including British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, and Quebec) provide varying levels of road tax exemptions for ethanol-blended fuels and some also apply mandatory blending rates (including Saskatchewan, Manitoba, and Ontario).

As part of the Climate Change Plan for Canada to improve the environment by reducing greenhouse gas emissions, a **biodiesel** initiative was adopted in 2003, which allocated funds to address technical and market barriers to the Canadian biodiesel industry.

Ontario

It is in Ontario, Canada's major maize-growing province, where the country's ethanol industry is currently concentrated and where there is the most effective fuel ethanol support programme. In October 2005, a plan to require all gasoline sold in Ontario to contain an average of 5% **ethanol** by 2007 was given cabinet approval. The 10% target would mean that 750 million litres of biofuels would have to be produced each year from 2007. In June, Ontario Premier Dalton McGuinty announced the creation of the Ontario Ethanol Growth Fund and pledged a support package for the setting up of ethanol plants of $520 million CAD over the next 12 years, allowing Ontario to build enough plants to produce 700 million more litres per year. This replaces the previous road tax exemption of 14.7 cents per litre with a producer payment ranging from 0 to 11 cents per litre depending on market conditions.

Manitoba

The provincial government provides a reduction in the gasoline tax of up to 11 cents per litre for gasohol (i.e. E-10) containing a 10% blend of ethanol produced and sold in Manitoba. Some oil companies (Mohawk and Husky) sell E-10 in Manitoba. In 2003 the government of Manitoba passed legislation requiring that 85% of all gasoline sold in the province contains 10% ethanol. Implementation is pending.

In autumn 2005, the Manitoba government announced a plan to promote the development of **biodiesel** in the province. The province will no longer collect the 11.5 cents per litre fuel tax on 100% pure biodiesel. This will offer biodiesel a tax advantage over regular diesel of about 5.5 cents per litre after provincial sales tax has been applied.

Manitoba and Natural Resources Canada will also work together to provide a $1.5 million CAD request for proposals support package to Manitoba biodiesel producers who wish to either increase production or to start a new venture.

Saskatchewan

Following the 15 July 2002 passage of **Saskatchewan's** Ethanol Fuel Act mandating the use of ethanol, the government in Regina announced in October 2003 a set of phased-in ethanol-blending rules for gasoline. Major petroleum companies are reluctant to participate because part of the Saskatchewan mandate stipulates that a minimum 30% of the ethanol sold in the province must come from small firms that produce less than 25 million litres of ethanol. NorAmera Bioenergy has completed construction of a new 25 million litre per year facility in Weyburn, and Husky expects its new 120 million litres per year facility in Lloydminster to be operating by the second quarter of 2006.

The provincial government grants a tax break for ethanol manufactured and consumed in Saskatchewan.

2.2. Brazil

Biofuels in Brazil

Ethanol

Brazil is the world leader in both production (it produced 15.4 billion litres in 2004 and is expected to produce 17.0 billion litres in 2005) and consumption of fuel ethanol. Forecasts put Brazilian fuel ethanol production in 2010 at 26.0 billion litres. Ethanol is almost entirely produced from sugar cane.

Brazil's current very strong position regarding fuel ethanol can mainly be explained by the early introduction of a large ethanol support programme in 1975, favourable feedstock production conditions and the wide-spread use of flex-fuel cars. Current support instruments include blending provisions, minor mineral oil tax reductions for fuels containing ethanol and motor vehicle tax reductions for ethanol-powered cars. Fuel ethanol prices have been very competitive compared to petrol prices. Brazil is the biggest ethanol exporter in the world.

Biodiesel

Brazil's biodiesel sector is under development. The first plant was inaugurated in August 2005, and the Ministry of Mines and Energy (optimistically) estimates that total biodiesel production could reach 143.2 million litres by the end of 2005. In 2006 and 2007, there will be purchase guarantees for a limited amount of biodiesel produced by family enterprises in the North-Northeast of the country. Under blending obligations entering into force in 2008, all diesel sold will have to contain an average 2% biodiesel. From 2013 the percentage is to rise to 5%.

2.2.1. Brazilian biofuels production

In 2004, Brazil produced 15.4 billion litres of **fuel ethanol**. Output is expected to reach 17.0 billion litres in 2005. Based on the current support framework, forecasts of flex fuel sales and ethanol exports in view of growing global ethanol demand, production is forecast to reach 26.0 billion litres in 2010.

However, it is to be noted that ethanol production in Brazil is volatile which makes forecasts difficult. There are at least two reasons for this volatility. The first is the weather. The country's cane growing regions in the Centre/South are exposed to the El Niño and La Niña phenomena, which are usually accompanied by drought and below average sugar cane yields. The second reason is the fact that sugar cane serves as a raw material in two distinct markets, sugar and ethanol, or even four markets, because one can distinguish between the domestic and export market for both products. Cane is usually allocated to the most profitable end-use.

The **biodiesel** sector in Brazil is still under development. The country's first biodiesel plant was inaugurated in August 2005. According to the Ministry of Mines and Energy, total biodiesel production by the end of 2005 could reach 143.2 million litres rising to 473.2 million in 2006 (which however seem to be pretty optimistic estimates). A representative of the Ministry of Agrarian Development said in August 2005 that biodiesel was definitely seen as a growth industry. Production is expected to rise to 800 million litres annually in three years and there would be a market potential for another 40 biodiesel plants around the country.

2.2.2. Brazilian biofuels policy

In 1975, in the view of soaring world oil prices, the government of Brazil launched the **National Fuel Alcohol Programme** or **Proálcool**, the world's first major programme for the production of renewable fuels, aimed at increasing the share of domestically produced fuels in the country's fuel pool. At that time, Brazil was under military rule and largely isolated from the world economy. It was the world's third most dependent country on oil imports and carried the largest foreign debt in the third world. Most observes agree that the implementation of the programme was a political decision, with economic and technical factors playing only secondary roles. Energy dependence and currency savings were key factors.

However, following a crisis of Proálcool, its instruments (such as guaranteed ethanol prices, control of ethanol distribution by a State-owned oil company and financial incentives for construction of distilleries) were gradually abolished and the ethanol market was liberalised between 1997 and 1999.

Currently, State intervention in the fuel ethanol sector is restricted to **ethanol-petrol blending provisions** and **minor tax reductions**. Under the blending obligation, petrol companies have to add between 20% and 25% ethanol to fossil petrol depending on the situation in the alcohol market. The total of value-added tax (VAT), fuel tax and other taxes on ethanol is only about half as much as that applied to petrol. Consequently in 2003, the total of federal and State taxes applied to petrol containing 25% ethanol was about US$0.30 per litre and only approximately US$0.17 for hydrous alcohol. In addition, the motor vehicle tax for ethanol-powered cars is slightly lower than for their petrol-fuelled equivalents.

Another major factor strengthening the position of fuel ethanol vis-à-vis petrol was the introduction of **flex-fuel cars** in 2003, which can run on pure petrol as well as on ethanol-petrol blends at any blending ratio. Due to very competitive ethanol prices compared to petrol prices, sales of flex-fuel cars have been rising considerably since their introduction on the Brazilian market, resulting in increasing demand for fuel ethanol. According to the National Association of Vehicle Manufacturers (Anfavea), during the first 10 months of 2005, 650,883 flex-fuel cars have been sold, representing 49.5% of total car sales. Anfavea expects total flex-fuel vehicle sales to reach 1 million units by the end of 2005. This new technology has provided consumers in Brazil with more choice and has resulted in increased demand for ethanol.

Brazil's **biodiesel support programme** is still under development. In 2006 and 2007, the federal government will guarantee the purchase of biodiesel produced by family enterprises in the North-

Northeast of the country. This provision holds for a maximum biodiesel volume of 2% of total diesel use – any biodiesel exceeding this ceiling will have to be sold on the free market. The National Petroleum Agency (ANP) will define the obligation to purchase biodiesel for producers and importers of petroleum and those companies that commercialise biodiesel in Brazil.

From 2008 onwards, all companies will be obliged to add 2% of biodiesel to conventional diesel under current legislation. From 2013 the percentage is to rise to 5%. The instruments to achieve these targets have not been implemented yet, but in September 2005, official sources said that the government would support biodiesel sales through tax exemptions, fixed prices and capital subsidies.

2.3. US

Biofuels in the US

Ethanol

The US is the world's second largest producer of fuel ethanol, and manufactured 12.9 billion litres in 2004 (total output 2005 is estimated at 15.1 billion litres). Based on current biofuels programme, it is expected to expand production to 25.7 billion litres in 2010. Ethanol is mainly produced from maize.

Currently, the main support instruments are the fixing of a mandatory share of biofuels by 2012 (Renewable Fuels Standard) and various tax incentives at the federal and State level. In addition, the Clean Air Act requiring minimum oxygen levels in petrol in polluted US cities in combination with the ban of a widely used oxygen, MTBE, in many US States gave a boost to ethanol, the only other oxygenate currently acceptable.

In his State of the Union address to the US Congress on January 29, 2006 US President Bush strongly extended his support for biofuels when he stated: "We will also fund additional research in **cutting-edge methods of producing ethanol**, not just from corn but from wood chips, stalks, or switch grass."

Biodiesel

US refineries produced 95 million litres of biodiesel in 2004. Output in 2005 is forecast at a total of 285 million litres. Soybean oil is the most common source of biodiesel in the United States.

There is a federal tax incentive for biodiesel and regional support programmes in a number of US States. Demand for biodiesel is rising, also helped by a general shortage in the (conventional) diesel market. There are plans to build 54 new biodiesel plants.

2.4. US biofuels production

US distilleries manufactured 12.9 billion litres of **fuel ethanol** in 2004, and are estimated to produce a total of 15.1 billion litres in 2005. Based on the current biofuels programme, the country is expected to produce 25.7 billion litres by 2010.

Total **biodiesel** production amounted to 95 million litres in 2004 and is expected to be three times higher in 2005, i.e. 285 million litres. As of September 2005, there were 45 active biodiesel production plants in the US, and 54 more proposed for construction. Although made from any fat or vegetable oil, soybean oil is the most common source of biodiesel in the United States.

2.5. US biofuels policy

The US fuel ethanol industry started expansion in the early 1980s, when policymakers at the State and federal level increased tax and production incentives in order to address the farm crisis. In the early 1990s, the Clean Air Act and the Reformulated Gasoline (RFG) Programme was introduced, which mandate the use of cleaner burning fuels by requiring minimum oxygen levels in petrol in US cities with high air pollution. Until 2004, **MTBE** (Methyl Tertiary Butyl Ether) was the most widely used oxygenate. However, the ban of this substance in several US states as a result of its negative effects on the environment and human health has boosted the blending of petrol with ethanol, the only other oxygenate component currently acceptable as an MTBE substitute.

There are tax reductions for both fuel ethanol and biodiesel at the federal and State level. The most important incentive for **fuel ethanol** is the federal tax credit which is valid until 2010 and amounts to US$0.52 per gallon of pure ethanol (where used in a 10% blend with petrol, i.e. US$0.052/gallon of E-10[1]). Additionally, since January 1993, ethanol-petrol blends consisting of 7.7% or 5.7% alcohol have received a prorated exemption[2]. There are also income tax credits for alcohol fuels, federal incentives for the production of clean-fuelled vehicles that use 85% alcohol (E-85) fuels and the Federal Bioenergy Programme and USDA programmes to promote the industrial use of selected agricultural commodities in the production of biofuels. The latter include loans, loan guarantees and grant programmes to assist farmers and biofuel producers.

In addition to the support at federal level, a number of individual State governments offer incentives for the production and use of fuel ethanol. These include direct payments to fuel ethanol producers on a per-gallon-of-output basis; direct grants or low-interest loans to assist financing of ethanol production facilities; credits against ethanol producers' state income tax liability calculated either on a per-gallon-of-output basis or on the amount of facility investment; additional fuel tax exemptions; market mandates; public fleet requirements etc.

For **biodiesel**, the excise tax credit at federal level amounts to 1.0 US cents per percentage point of biodiesel blended with petroleum for 'agri-biodiesel' (i.e. biodiesel produced directly from agricultural feedstocks such as soybeans), and 0.5 US cents per percentage for biodiesel made from other sources (e.g. waste oil). It is taken at the blender level with the intended effect of lowering the cost of biodiesel to consumers in taxable and tax exempt markets. In addition, a number of US States offer regional support programmes for biodiesel (e.g. grants for the construction of biodiesel plants or mandatory blending rates as in the case of Minnesota).

More than 600 major fleets use biodiesel nation-wide. Those include the National Park Service, State departments of transportation and the military. More than 600 retail filling stations make biodiesel blends available to the public. Demand for biodiesel is rising, also helped by a shortage in the (conventional) diesel market. According to the National Biofuels Board, the use of biodiesel yields

[1] The federal excise tax on motor fuel amounts to US$0.184 per gallon.

significant environmental benefits, such as reducing emissions, and has the best energy balance of any transportation fuel.

In August 2005, following several years of discussion, a new **US Energy Bill** was adopted. A key provision is the renewable fuels standard (RFS) which raises the amount of renewable fuels to be used in the US fuel pool to 7.5 billion gallons (28.4 billion litres) by 2012, almost double the current use. It also extended a federal excise tax credit on biodiesel from 2006 to 2008. The proposal to phase out MTBE nation-wide in four years was not included in the final text, keeping the issue at State level. Because of the lack of liability protection, it is likely that most MTBE users will switch to ethanol in the coming months, which would result in additional fuel ethanol demand.

- It is widely expected that the Bill will result in another investment boom in the ethanol industry, and at least 50 to 60 new plants may be built in the next 7 years. While the new US Energy Bill also promotes biodiesel, the lion's share will go to ethanol. President Bush is a firm supporter of the use and manufacture of fuel ethanol and biodiesel, which he sees as a 'win-win' situation for both US farmers and energy companies. In his State of the Union address to the US Congress on January 29, 2006 US President Bush reaffirmed this support by stating: 'We will also fund additional research in **cutting-edge methods of producing ethanol**, not just from corn but from wood chips, stalks, or switch grass.

2.6. EU

Biofuels in the EU

Ethanol

In 2004, total fuel ethanol output in the European Union amounted to approximately 526 million litres. The most important producers in 2004 were Spain, France, Sweden and Poland, however, Germany also started production in late 2004 and is expected to become the third biggest producer in 2005. Ethanol is mainly produced from sugar beet and grain.

Biodiesel

The EU is the leading region of the world in terms of development of a biodiesel sector. In 2004, it counted 11 producer countries (Germany, France, Italy, Denmark, Czech Republic, Austria, Slovakia, Spain, the UK, Lithuania and Sweden) manufacturing a total of almost 2.2 billion litres. Other EU Member States have also decided to go into biodiesel production, and the first plants are currently under construction in Portugal and Finland, while the UK started industrial scale biodiesel production

[2] The partial exemption from the tax on motor fuels applies only to alcohol derived from renewable resources such as corn, not to alcohol derived from petroleum, natural gas or coal.

in early 2005. Oilseed rape (Northern Europe), waste oil and sunflower oil (Southern Europe) are the most important feedstocks for biodiesel production in the EU.

Biofuels policy

The main drivers for both fuel ethanol and biodiesel production in the EU are two biofuel directives from the European Commission adopted in 2003. The 'promotional' Directive sets indicative targets for the share of renewable fuels in the transport fuel market (2% by end 2005 and 5.75% by end 2010). The Directive on the Taxation of Energy Products allows Member States to exempt, in full or in part, products that contain renewable substances (such as bioethanol or biodiesel). As a result, many EU Member States have introduced national legislation to support biofuels, mainly by mineral oil tax reductions, but also by investment support for the production of biofuel plants and mandatory targets for the market share of biofuels.

In addition, under the provisions of the reform to the EU's Common Agricultural Policy (CAP) farming policies in the EU encourage the growth of non-food and energy crops, a trend that will continue.

2.6.1. EU biofuels production

In 2004, significant volumes of **fuel ethanol** were produced in Spain, France, Sweden and Poland (254 million litres, 102 million litres, 71 million litres and 48 million litres respectively). In Germany, three major plants with a combined annual production capacity of more than 600 million litres have started operation recently, and German fuel ethanol output is expected to reach 175 million litres in 2005 compared to only 25 million litres in 2004. In addition, Netherlands, Latvia, Lithuania and Italy are now producing minor volumes of fuel ethanol, and bioethanol plants are currently under construction or in the planning stage in the UK, Belgium and Austria.

Most of the biofuels in the EU consist of biodiesel as the diesel market in Europe is still growing while the petrol market is contracting. The rise of **biodiesel**'s importance in Europe, as observed over the last ten years, accelerated in 2004. Production was close to 2.2 billion litres vs. 1.7 billion litres in 2003 (including new member countries), i.e. 29% growth in a single year. This production is still below current production capacities which, according to the European Biodiesel Board, were in the region of 2.5 billion litres in 2004. The biggest biodiesel producer in the EU is Germany (1,150 million litres in 2004), followed by France (387 million litres in the same year) and Italy (356 million litres).

2.6.2. EU biofuels policy

Today, the main drivers for fuel ethanol and biodiesel production in the EU are two biofuel directives from the European Commission adopted in 2003, the 'promotional' Directive and the Directive on the Taxation of Energy Products. They followed the Green Paper 'Towards a European strategy for energy supply' published by the European Commission in 2000. This paper highlighted the fact that the EU will become increasingly dependent on external energy sources and that eastward expansion will worsen the situation (import dependence was expected to reach 70% in 2030, compared to 50% in 2000). The Commission also emphasised the environmental aspect. At present, greenhouse gas emissions in the European Union are rising, making it difficult to respond to the challenge of climate change and to comply with Kyoto objectives. In addition, although not explicitly mentioned in the Green Paper, the EU's biofuels policy aims at creating a new stimulus for the rural economy.

Under the **'promotional' Directive (Directive 2003/30/EC)**, which entered into force in May 2003, Member States shall achieve a 2% share of renewable fuels (pure biofuels, blended fuel or ETBE[3]) by the end of 2005 and a 5.75% share by end 2010. These are indicative targets based on the energy content of all petrol and diesel for transport purposes placed on the market.

The **Directive on the Taxation of Energy Products (Directive 2003/96/EC)**, in force since October 2003, allows Member States to exempt, in full or in part, products that contain renewable substances (such as bioethanol or biodiesel). In some Member States, including Spain, France and Sweden, there has already been a tax exemption or reduction for biofuels in place since before the EU directive entered into force.

There is also support from the European Union for research projects on biofuels, e.g. for a 4-year project to develop cost-effective and environmentally friendly methods to mass produce ethanol as fuel for motor vehicles, which is being funded with EUR12.8 million and conducted by 21 universities, research institutes, and companies.

In addition, the latest **reform of the EU Common Agricultural Policy** in June 2003 maintained/introduced financial support to farmers growing energy crops as feedstocks for biofuels production:

- The provision to allow the production of energy crops on set aside land was maintained. In the case of sugar beet however, no payments are made for set aside land grown with beet for non-food use.
- A 'carbon credit' payment of EUR45 per hectare was introduced for land grown with 'energy crops' (excluding sugar beet) that are processed to fuel or gas, on condition that the farmer concludes a contract with a processor. Payments are subject to an upper limit of 1.5 million ha. The provision for an exclusion of sugar beet grown for bioethanol production from the 'carbon credit' and set aside payment will most likely change once the reform of the sugar market organisation has been implemented.

Outlook

Based on Member States' reports on national biofuels plans submitted to the European Commission by November 2005, the EU will only reach a 1.4% share of renewable fuels by end 2005, thereby missing its 2% target. Figure 2.2 shows the details for each Member State. It has to be emphasised

[3] Ethyl Tertiary Butyl Ether, an oxygenated additive for petrol.

that the percentages presented in the graph are based on the plans put forward by the national governments. They are not mandatory, so the actual share of biofuels is likely to be somewhat lower than the 1.4%. Sweden looks likely to achieve a 3% share, and the Czech Republic and Austria also expect to exceed the EU target. However, other Member States are still far from reaching a 2% share of renewable fuels, including Denmark which does not use any biofuels at all and Ireland and Finland which both have a 0.1% target for 2005. The Commission is reportedly currently working on an update of the EU biofuels directive.

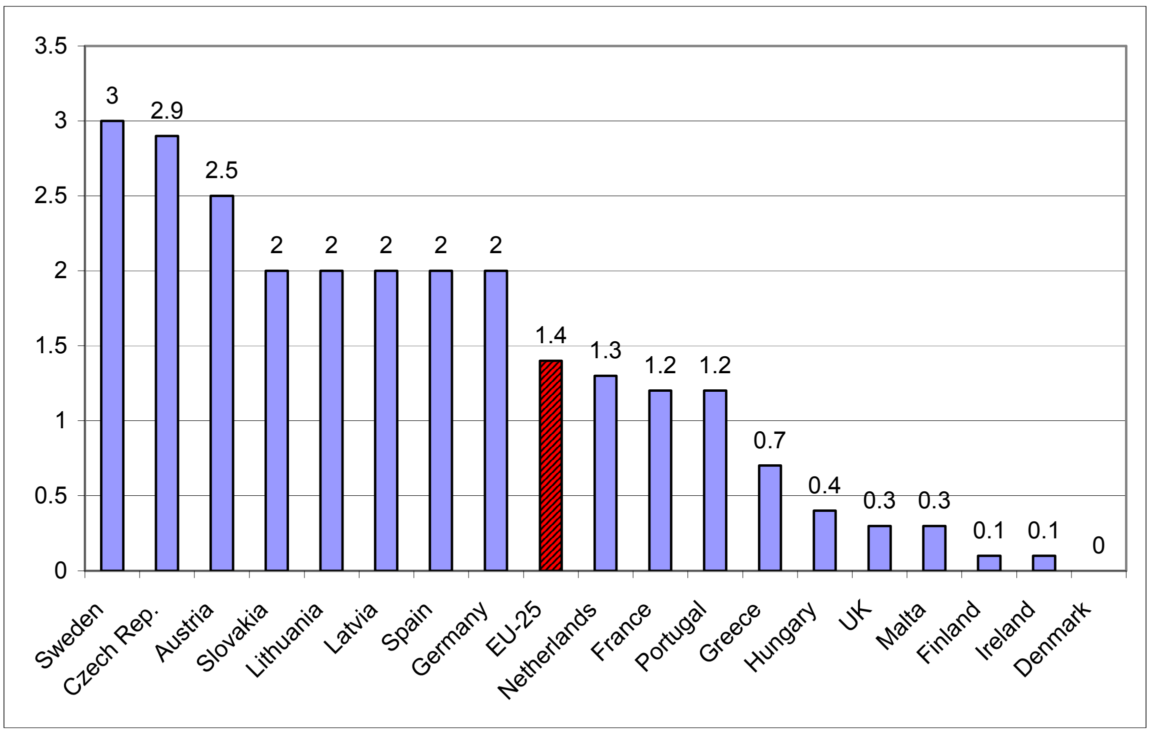

Figure 2.2: Biofuels market share in the EU at end 2005 (in %)

Source: FO Licht 2005.

In December 2005 the European Commission published a 'Biomass and Biofuels Action Plan' aiming to increase the use of renewable energy sources in the EU, and a Communication on biofuels was published ion February 2006. The Commission estimates that the measures proposed in the plan will increase the use of biomass to about 150 million tonnes of oil equivalent by 2010 compared to 69 million tonnes of oil equivalent produced in 2003.

2.6.3. Spain

Spain is the biggest **fuel ethanol** producer in the EU. In 2004, approximately 254 million litres of fuel ethanol were manufactured in Spain. Current ethanol production capacity of approximately 326 million litres will be expanded by 200 million litres in 2006, when a new big plant is expected to start production.

In Spain, a limited volume (quota) of ethanol is eligible for a full exemption from the mineral oil tax of EUR37 per hectolitre (hl). This tax incentive expires in 2012.

Spain started up its biggest **biodiesel** production unit (280 million litres) in May 2004 in the region of Cartagena. Total biodiesel production amounted to approximately 14 million litres in 2004. Biodiesel is also fully exempt from the hydrocarbon tax.

Outlook

In its Renewable Energy Plan for 2005-2010, the Spanish government earmarks EUR2.85 billion of sales tax breaks for bioethanol and biodiesel producers over the five-year period, in order to reach a total share of 5.83% of biodiesel and bioethanol in the total consumption of diesel and petrol in Spain by 2010. As a result the use of biofuels is to more than quadruple by 2010 when it will reach 2.2 million tonnes of oil equivalent against 500,000 tonnes at present.

2.6.4. France

France has the longest tradition within the EU, over 10 years, on the promotion and use of biofuels. It is the second biggest fuel ethanol producer in the EU (102 million litres in 2004, and probably 226 million litres in 2005), and also comes second in EU biodiesel production (approximately 390 million litres in 2004).

In France, **fuel ethanol** is not used in its pure form but is converted into ETBE. The most important instrument for supporting the use of bioethanol in transport fuel is an excise tax reduction. It currently amounts to EUR38/hl for ethanol used in the form of ETBE[4], i.e. a reduction of 60% of the normal tax level[5]. The tax exemption is only valid for a limited volume of ethanol (and therefore ETBE). The government fixes quotas for distinct periods of time on an irregular basis. Between 2004 and 2005, the quota was doubled and for 2005 amounts to approximately 250 million litres of ethanol, corresponding to roughly 445,000 tonnes of ETBE.

Similarly, there is a limited quota of **biodiesel** which is eligible for a mineral oil tax reduction of EUR33/hl of biodiesel[6]. In 2005, the quota amounts to 550 million litres.

[4] The tax reduction only applies to the ethanol component in the fuel. It can be calculated on the basis of the ETBE-petrol blending ratio, and taking into account the fact that ETBE consists of 45% of ethanol and 55% of iso-butylene.

[5] In early 2003, the French government reduced the excise tax break from 80% (EUR50.23/hl) to 60% (EUR38/hl) due to shortages in the state budget. Currently, the French Finance Ministry seeks to further reduce the tax reduction bioethanol by 5 Euro-cent to 33 Euro-cent a litre.

[6] It is however reported that the French Ministry of Finance plans to reduce the tax incentive for biodiesel by 8 Euro-cent to 25 Euro-cent a litre.

In order to encourage distributors to put the totality of the authorised quantities (biodiesel, ETBE or pure bioethanol) onto the market, the 2005 Finance Law introduced a 'new' tax called the TGAP ('General Tax on Polluting Activities')[7] for those cases where biofuels are not made available for consumption. This has been applied since 1st January 2005 for all transport fuel sold. Every distributor is liable to pay a tax of 1.2% of the value of the fuel product in 2005. This is lower or even nil for fuels containing renewable components, depending on the share of the biofuel in the final product. The 1.2% rate corresponds to the desired percentage of biofuels incorporation in fuels in 2005. In this manner, the incorporation percentage will increase each year to reach 5.75% in 2010 (in line with the European Commission's target).

Outlook

In autumn 2005, France announced plans to respond to current high oil prices by increasing its target of incorporating biofuels in other fuels to 5.75% by end 2008[8], rising to 7% by end 2010 and 10% by end 2015. This would go beyond the EU objective of a 5.75% market share for biofuels by 2010. According to Prime Minister Dominique de Villepin, this target will be complemented with a policy of boosting production of agriculture-based biofuels, including an increase of the ethanol and biodiesel quotas eligible for the tax reduction (plus 980 million litres for fuel ethanol, and plus 2 billion litres for biodiesel for the period 2005-08).

2.6.5. Germany

In 2004, the share of biofuels (both ethanol and biodiesel) in total fuel consumption was 2.2% in Germany. Biodiesel plays a much more important role than ethanol - Germany has only recently started producing **fuel ethanol**. In late 2004, the country's first two fuel ethanol plants were inaugurated with a combined production capacity of 350 million litres per year. They are both located in Eastern Germany and mainly use rye as a feedstock. A third plant started operation in summer 2005 with an annual capacity of 260 million litres. In 2004, Germany produced 25 million litres of fuel ethanol. Total production is expected to reach 175 million litres in 2005.

In the **biodiesel** sector, Germany is the biggest player in Europe. It produced 1,150 million litres of biodiesel in 2004, which represents a 45% growth compared to the previous year and more than half of the total EU output (53.5%). In 2005, biodiesel sales are estimated at 2 million tonnes which would be equivalent to 3.8% of total fuel sales.

The current law provides for full detaxation for biofuels (subject to annual revisions) until 2009. All biofuels (pure, blended or in processed form such as ETBE) are exempt from the tax on mineral oil products. Currently, this amounts to EUR64.7/hl of ethanol for direct blending or in the form of ETBE, and to EUR47/hl of biodiesel. This are the highest tax rebates in absolute terms within Europe. In the same way, biofuels in Germany are not subject to the 'ecology tax' established in 1999, which is added to the taxes levied on petroleum products.

[7] In fact, the tax is not really new, because it has been in place since 1st January 1999, but it did not apply to transport fuel before 2005.

[8] The previous target was 5.75% by end 2010.

Pure biofuels have benefited from the mineral oil tax incentive since 1999, while renewable fuel components such as ethanol in E-5 (a blend of 5% ethanol and 95% petrol) or ETBE have only been eligible for the tax exemption since 1 January 2004. Therefore, fuel ethanol production and consumption has only taken off in 2004, while the biodiesel sector is already well established.

In addition, the German State offers investment aid for the construction of biofuel plants.

Outlook

The elections in September 2005 resulted in a change in the governing parties in Germany. The new government is considering the abolition of the tax exemption for *blends* of biofuels with conventional fuels from the middle of 2006. However, biofuels sold in their pure form, i.e. pure biodiesel (B-100), will continue to benefit from the full tax exemption. At the same time, the government plans to introduce mandatory blending as provided for by the EU's biofuel directive, i.e. a 2.75% share of biofuels by the end of 2006 rising to 5.75% by the end of 2010.

2.6.6. Sweden

Even if Sweden is not among the biggest EU biofuel producers in absolute terms, it is the biggest user of biofuels in relative terms. It is expected to achieve a 3% share of renewable fuels in the transport fuel sector in 2005. Domestic production of biofuels amounted to 71 million litres of fuel ethanol and 1.6 million litres of biodiesel in 2004. However, fuel ethanol consumption is much higher, in the region of 260 million litres. Most of the fuel ethanol used in Sweden is imported, originating from Brazil (sugar cane ethanol) and Italy (wine alcohol). However, imports from outside the EU may decrease from 2006 onwards because of a change in the tax rule for fuel ethanol (see below).

Feedstocks used for ethanol production are cereals and waste sulphite liquor (i.e. a waste product from producing sulphur paper). One Swedish producer also upgrades imported wine alcohol to fuel quality. In addition, the country is developing new technologies for the production of ethanol from forest raw materials using both weak acid hydrolysis and enzymatic hydrolysis.

So far, Sweden is the only EU Member State which uses direct blending to a significant degree and which runs flexible fuel vehicles, e.g. the 'Ford Focus'. There are several incentives to use such cars, including free car parks in city centres and an exemption from the city tax. Sweden applies both low (E-5, accounts for approximately 85% of total fuel ethanol use) and high blending (E-85, accounts for approximately 15% of total fuel ethanol use).

In Sweden, there is a tax exemption of 100% (EUR52.5/hl), enabling petrol stations to offer ethanol blended fuel at the same price as pure petrol. Currently, all Swedish petrol stations are offering E-5 blends, and 160 of the 4,000 existing stations are also selling E-85 blends. In 2004, the average blending rate over all petrol sold amounted to 5.5% of bioethanol.

Outlook

In its latest budget proposal the Swedish government indicates it wants to extend the tax exemption on fuel ethanol until 2013. Under existing regulations this exemption is due to end in 2009.

2.6.7. Poland

Poland is the only country among the new EU Member States to have developed a significant **fuel ethanol** sector. Fuel ethanol is mainly added to petrol in the form of ETBE. Bioethanol production decreased sharply in 2004 by more than 40% to approximately 48 million litres. This situation can be explained by the fact that in 2004 the Polish Constitutional Court did not ratify the Biofuels Law that had been previously adopted by Parliament in November 2003. This law provides for a tax exemption for the production of ethanol mixed with petrol, the final percentages and the amount of the exemption are to be determined on a yearly basis after approval of the annual budget. The Biofuels Law is presently still under revision.

The country only produces limited amounts of **biodiesel** to date. The first industrial scale biodiesel plant with a capacity to produce 110 million litres a year[9] came online in December 2004 in Trzebinia (Southern Poland). Most of its output is exported to Germany, however, since May 2005, part of the biodiesel produced is being sold on the Polish market as B-20 (a blend of 20% biodiesel and 80% conventional diesel). The 20% biodiesel blend benefits from a full excise tax exemption of PLN2.2 (ca. US$0.66) per litre. In addition, the company Elstar Oils S.A., Elblag, plans to start construction of a 55 million litres[10] biodiesel plant in Poland in the 2006.

According to the National Statistical Office (GUS), the share of liquid biofuels in the transportation sector (in calorific values) amounted to only 0.3% in 2004. This share is expected to increase to 0.5% in 2005 and 1.5% in 2006.

2.6.8. Netherlands

So far, the Netherlands have only produced minor volumes of fuel ethanol (14 million litres in 2004) and no biodiesel at industrial scale, because there is no support programme for biofuels yet. However, in autumn 2005, the government announced plans to introduce a blending obligation for biofuels. In 2007, petrol and diesel sold in the Netherlands will have to contain 2% biofuel (either bioethanol or biodiesel). This will rise to 5% in 2010 and 20% in 2020. In addition, the government plans to introduce a duty exemption of EUR0.5 per litre for bioethanol and biodiesel for 2006. The money to be spent on this measure shall be limited at EUR50 million. This is equivalent to a market share of 1.5% for ethanol by energy content. The Netherlands aims to stimulate the use of biofuels after warnings from the European Commission on the risk of non-compliance with the indicative targets for biofuels usage.

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[9] However, annual production capacity can easily be increased to 170 million litres.

[10] Later on capacity is to rise to 110 million litres.

Several plans to construct biofuel plants have been announced recently, mainly for the production of biodiesel from rapeseed. In July 2005, Solar Oil Systems opened the Netherlands' first biofuel plant, producing pure rapeseed oil and having an annual production capacity of 3.5 million litres. In Northern Netherlands, the country's first biodiesel plant with an annual capacity of 33 million litres is currently under construction and expected to start production in spring 2006. On 1 November 2005, the country's first commercial bio-ethanol pump was opened in Gorinchem.

2.6.9. Austria

Austria does not produce any **fuel ethanol** as yet. However, the sugar company Agrana plans to build a 190 million litre plant using cereals (mainly wheat) and sugar beet as feedstocks in Pischelsdorf. This plant is scheduled to start production from mid-2007.

The Austrian **biodiesel** sector has recently increased very rapidly, with biodiesel production rising by 78.1% to 63 million litres between 2003 and 2004. In June 2006, the largest Austrian biodiesel plant with an annual capacity of more than 100 million litres is expected to start production.

Since 1 October 2005, transportation fuel distributors in the country are obliged to blend in 2.5% of biofuels. The national target for the share of biofuels in the transport sector is 2.5% by October 2005, rising to 4.3% by October 2007 and to 5.75% by October 2008. However, it is unlikely that large quantities of ethanol will be blended before 2007. Instead, the oil industry has started to offer diesel with a 5% biodiesel content. Total sales of diesel in Austria in 2004 were almost 6 million tonnes while sales of petrol reached only 2.1 million.

2.6.10. Italy

Italy hardly produces any **fuel ethanol** to date. However, production is expected to increase because for the 2005-07 period, an annual quota of 100 million litres of ethanol will be eligible for a total tax exoneration of EUR73 million each year.

By contrast, Italy is the third biggest producer of **biodiesel** in the EU, manufacturing approximately 360 million litres in 2004, 17% up on 2003. More than 90% of this production was intended for the fuels market, with the rest being destined for building heating applications. As in the case of fuel ethanol, a limited amount of biodiesel is eligible for a mineral oil tax reduction each year. In contrast to France and Germany, the biodiesel situation will probably deteriorate in Italy in 2005, because the volume of biodiesel benefiting from the tax incentive decreased by 110 million litres to 220 million litres in 2005. This decrease in quotas is due to the introduction of tax break quotas for ethanol in 2005. This decision is justified by the fact that biodiesel is mainly produced using imported vegetal oils while Italy possesses a sizeable capacity for producing its own alcohol of cereal and wine origin.

2.6.11. UK

The UK does not produce any ethanol for fuel purposes at present, and only small amounts of biodiesel. Fuel ethanol requirements are exclusively being covered through imports from Brazil. In the first three quarters of 2005, total Brazilian ethanol imports into the UK amounted to 92.2 million litres against negligible amounts the previous year. However, 2 ethanol plants with a combined production capacity of 190 million litres are currently in the planning stage (Wessex Grain in Henstridge and British Sugar in Wissington). The first large scale biodiesel plant with a capacity to produce 50 million litres per year started production in March 2005, and a second plant is currently under construction.

In the UK, the government supports biofuels (both ethanol and biodiesel) through a GBP0.20 per litre duty incentive. This has stimulated sales of around 10 million litres biofuels a month, i.e. approximately 0.25% of all road fuel sales.

In addition, under the renewable transport fuels obligation (RTFO), the government requires that 5% of all fuel sold in the UK should come from renewable sources by 2010. The RTFO has only been officially announced in November 2005 and is not expected to be implemented before April 2008. It will work through a system of certification. Oil companies will receive certificates from an administrator to demonstrate how much biofuel they have sold. If a company sells more than its 5% obligation, it would then be able to sell those certificates to other companies who need more to meet the obligation.

There are also government subsidies available for the construction of biofuel plants.

2.7. Australia

Biofuels in Australia

Biofuels production

Australia produced 23 million litres of **fuel ethanol** in 2004. There is a national biofuels target of 350 million litres by 2010, i.e. 1.75% of total petrol consumption at current level. The country only produces small amounts of **biodiesel** to date, however, several industrial scale plants are in the planning or construction phase.

Biofuels policy

In order to achieve the national target of 350 million litres of biofuels by 2010, the federal government offers an excise tax exemption of biofuels in both petrol and diesel, together with capital subsidies for new or expanded capacity for biofuels production. In view of low consumer confidence in ethanol, the government launched a campaign in September 2005 to encourage greater use of fuel ethanol. There is additional support at regional level in certain States (including Queensland), e.g. for biofuel marketing, the development of blending and distribution facilities and technical support for biofuel use.

2.7.1. Australian biofuels production

In Australia, there are at present only two **fuel ethanol** producers in the country, privately-owned Manildra in New South Wales and CSR in Queensland. In 2002, 75 million litres of fuel ethanol were produced and sold in Australia, however, in 2004, production and consumption fell to approximately 23 million litres. Bioethanol is produced from grain and sugar cane molasses.

Australia only produces small amounts of **biodiesel** to date. However, several industrial scale plants are on the drawing board or in the construction phase.

2.7.2. Australian biofuels policy

The fuel ethanol industry is still waiting for the big breakthrough, but political support for the industry is growing. Australia is a net importer of crude oil, and biofuels are considered to be increasingly important in view of surging world oil prices. Advocates of ethanol production also cite benefits for the ailing domestic sugar cane industry. The federal government and the four main oil companies set a target to increase Australia’s annual usage of biofuels to 350 million litres by 2010, which corresponds to a share of 1.75% in total fuel consumption based on a current petrol consumption of approximately 20 billion litres.

There are two major instruments in place to support the biofuel sector in the country. First, the government waives an excise of AUD0.38143 a litre payable on petrol and diesel sales, with the excise on ethanol only starting to phase in over four years from July 2008. Second, it provides capital subsidies for new or expanded capacity for biofuels production.

Nevertheless, in September 2005, a report of the Biofuels Task Force warned market resistance would see the government struggle to meet its already modest target of 350 million litres of ethanol in the nation's fuel supply by 2010. The government launched a major campaign in autumn 2005 to encourage greater use of ethanol. Measures included allowing service stations to sell petrol blended with up to 5% ethanol without labelling it.

The development of the fuel ethanol industry has been struggling in the face of consumer rejection of the fuel after a public opinion campaign. However, in autumn 2005, international car companies have agreed to label their Australian-made cars as compatible with a blend of 10% ethanol in petrol. Blending of ethanol with petrol is so far confined to a small number of BP and Caltex petrol stations in Queensland, but oil company Shell said that in October 2005 it would launch a 5% ethanol blend petrol through its Coles Express outlets in Australia. This is expected to give the country’s fuel ethanol industry a major boost.

The State government of **Queensland**, the largest sugar-producing State in Australia, in summer 2005 committed AUD7.3 million over the next two years to promote the fuel under the Queensland Ethanol Industry Action Plan. The funding also includes more than AUD2.28 million for a marketing campaign, a similar amount for blending and distribution facilities and just over AUD1 million to help introduce operational guidelines for diesel-ethanol blends and engine conversion.

2.8. China

Biofuels in China

Ethanol

Total Chinese **fuel ethanol** production in 2004 amounted to approximately 1.5 billion litres. Based on existing bioethanol programmes, output is expected to reach 2.5 billion litres in 2010. Fuel ethanol benefits from an exemption of consumption and value-added tax. Producers have priority in purchasing grains at competitive prices from State grain stores. Currently, the use of E-10 is mandated in 5 provinces, and 4 provinces sell E-10 on part of their territory. Under a Renewable Energy Plan, the government set a target of 11 million tonnes of biofuels (bioethanol and biodiesel) production by 2020.

Biodiesel

There are no support instruments for **biodiesel** yet, and only minor amounts of the biofuel are produced at very small-scale plants.

2.8.1. Biofuels production in China

In 2004, China produced approximately 1.5 billion litres of **fuel ethanol**. Based on existing bioethanol programmes, output is expected to reach 2.5 billion litres in 2010. The biggest ethanol plant owned by Jilin Fuel Ethanol Co. Ltd. in the Northeast of the country currently has an annual production capacity of 375 million litres, but there are plans to double capacity to 750 million litres. In China, more than 80% of ethanol is produce from grains (corn, cassava, rice etc.), about 10% from sugar cane, 6% from paper pulp waste residue and the remainder is produced synthetically. So far, no significant amounts of **biodiesel** have been produced in China. There are no industrial scale biodiesel plants in the country.

2.8.2. Biofuels policy in China

China, the world's second-largest oil consumer, decided to launch a **fuel ethanol** programme in 2000 in order to improve the fuel supply situation in view of rapidly growing demand for transportation fuels, to tackle the surplus grain stocks accumulated in the late 1990s, to reduce air pollution in big cities and to support the rural economy. Fuel ethanol is exempt from consumption tax (5%) and value-added tax (17%). Biofuel producers have priority in obtaining feedstock released from the State grain reserves at competitive prices. Currently, five provinces blend 10% of ethanol into all their petrol throughout their whole territory (Jilin, Heilongjiang, Liaoning, Henan and Anhui), and four provinces sell E-10 blend in part of their territory (Shandong, Jiangsu, Hebei and Hubei). Over 20 cities across the country are also pioneering E-10. According to a researcher from Tsinghua University in Beijing, total E-10 consumption will reach more than 10 million tonnes by the end of 2005, which equals about ¼ of total current petrol consumption.

However, worries about feeding the world's most populous nation could limit the growth of China's biofuels industry. China has long been concerned about its food security, and the top priority for land use is food crops. Because of serious sugar shortages in the country, a plan for substituting vehicle fuel with ethyl alcohol refined from sugarcane has been stalled for the time being in August 2005.

In contrast to bioethanol, there is no **biodiesel** programme as yet. Currently, a couple of small plants with a capacity of 5 to 25 million litres per year are in operation, using mainly waste cooking oil but also oilseeds as feedstock. Part of the output is exported. Considerable research is currently being conducted on biodiesel production technology.

Outlook

Under China's Renewable Energy Plan, the government set a target of 11 million tonnes of biofuels (bioethanol and biodiesel) production by 2020. According to Tsinghua University in Beijing, total transport fuel (petrol and diesel) consumption is expected to reach 228 million tonnes in 2020, so that a production level of 11 million tonnes of biofuels would mean an average share of 5% of renewable fuels in 2020. Fuel ethanol demand will continue to expand in China, as more provinces will introduce the compulsory use of ethanol-blended petrol.

2.9. India

Biofuels in India

Biofuels production

Ethanol production capacity is very high in India (2.7 billion litres), but the capacity utilisation rate is rather low (1.7 billion litres ethanol output in 2004), and only approximately 100 million litres of **ethanol** were blended with petrol in 2004. Output in 2010 is expected to reach 1.5 billion litres based on the current fuel ethanol programme. Ethanol is mainly from sugar cane molasses.

The Indian **biodiesel** sector is still under development with several plants already producing and others under construction.

Biofuels policy

Fuel ethanol is supported via a tax reduction for E-5, a blending obligation (E-5) in a number of regions and government regulation of the ethanol selling price on the basis of ethanol production costs. Additional fiscal incentives are offered to local ethanol production in several Indian States. However, following a serious feedstock (sugar cane molasses) shortage, the blending obligation has been suspended in 2004. With a better sugar crop being expected for 2005/06, the fuel ethanol programme will most likely resume in the near future. Under the government's longer-term plans, 5% ethanol is to be blended over the whole country, later rising to 10% blending. There are even proposals to achieve 20% biofuels use by 2012.

Biodiesel

Public support for biodiesel is increasing in India. The government is considering abolishing the tax on biodiesel and oil companies will have to incorporate straight vegetable oil in conventional diesel in future.

2.9.1. Biofuels production in India

India is the second largest producer of ethanol in Asia and one of the world's largest sugar producers. Installed ethanol production capacity amounts to approximately 2.7 billion litres but capacity utilisation rates are usually rather low (total ethanol production in 2004 amounted to 1.7 billion litres). In 2004, only approximately 100 million litres of **ethanol** were used for blending with petrol. Assuming that the ethanol programme will be implemented in those States and Union territories originally envisaged by the government, the projected demand for fuel ethanol will be 1.5 billion litres in 2010 if E-10 is sold.

Biodiesel output has not reached significant volumes yet in India, however, production might increase in the near future promoted by the new biodiesel support policy.

2.9.2. Biofuels policy in India

In India, a **fuel ethanol** programme was introduced in 2003. Measures currently in place include an excise tax reduction for E-5, the obligation[11] to blend all petrol with 5% ethanol in certain regions since January 2003 and government regulation of the ethanol selling price on the basis of ethanol production costs. Currently, 5% ethanol blends are used[12] in 10 sugar producing States and 3 contiguous Union Territories[13]. In addition to the federal moves, several Indian States have also attempted to support local ethanol production through the use of additional fiscal measures.

However, recently, the Indian fuel ethanol programme suffered from a crisis. Following a drought, the 2003/04 and 2004/05 sugar crop and therefore also molasses output was unusually low, which resulted in sharply increased feedstock prices for ethanol production. It became more lucrative for local producers in India's Southern States to concentrate on industrial and potable alcohol. The ethanol blending obligation was temporarily suspended in the autumn 2004. In the meantime, India has become increasingly dependent on molasses and ethanol imports to meet its ethanol

[11] However, due to supply problems, this 'obligation' was suspended in 2004.

[12] Under normal conditions, the blending of 5% ethanol is mandatory, however, the blending obligation was suspended in late 2004.

[13] Andhra Pradesh, Damman and Diu, Goa, Dadra and Nagar Haveli, Gujrat, Chandigarh, Haryana, Pondicherry, Karnataka, Maharashtra, Punjab, Tamilnadu, Uttar Pradesh.

requirements. However, it is likely that the molasses supply will increase substantially over the coming years with the recovery of cane production. It is expected that the fuel ethanol programme is set to make a comeback in the 2005/06 season (deals were already signed in summer 2005 but the ethanol will only be delivered in 2005/06), and that industry will restart its investment drive and continue to install new distilling capacity over the next couple of months.

The government is currently developing a new **biodiesel** support programme for the country. According to Petroleum Ministry officials, biodiesel is likely to be fully exempt for excise duty in the 2006 budget year. Under the government's new biodiesel (vegetable oil) purchasing policy, public sector oil firms will purchase straight vegetable oil extracted from plants, such as jatropha, pongamia etc. for mixing in diesel at INR25 (ca. US$0.55) a litre beginning January 2006. In a first step, 5% straight vegetable oil will be mixed with diesel during trial runs and will be increased to 20% in phases. In 2003, the country's Planning Commission had drafted plans to encourage the widespread planting of Jatropha curcas trees and use the oil produced for blending with conventional diesel. It set a target of a 'vegetable oil for fuel use' output of 13 million tonnes per year. In Bangalore, there are plans to transform a plant producing straight vegetable oil from Karanjia and Jatropha into a biodiesel production unit.

Outlook

In November 2005, Petroleum Ministry officials were quoted as saying that under the next State budget, the excise duty on both biodiesel and ethanol would be likely to be made nil and states would be asked to have a favourable sales tax regime. The government plans to achieve a countrywide ethanol-petrol blending rate of 5% in the near future, which would require 500 million litres of ethanol. Later on, it plans to increase the ethanol content in petrol to 10% and to blend conventional diesel with 5% ethanol. The country's Planning Commission proposes increasing the proportion of biofuels used in India from 5% to 20% by 2012.

3. Biofuels in Canada in the global context

Figure 3.1 below shows past (2004) and Figure 3.22 forecast (2005-2010) fuel ethanol output of all countries in the world which are currently producing relevant amounts of fuel ethanol or are expected to do so in the next 5 years. This Agra CEAS/FO LICHT forecast is based on existing biofuels programmes or on programmes which have been adopted and are may be implemented in the near future. In the case of Canada the dotted line in Figure 3.2 represents what could be achieved if the RFS were to be implemented.

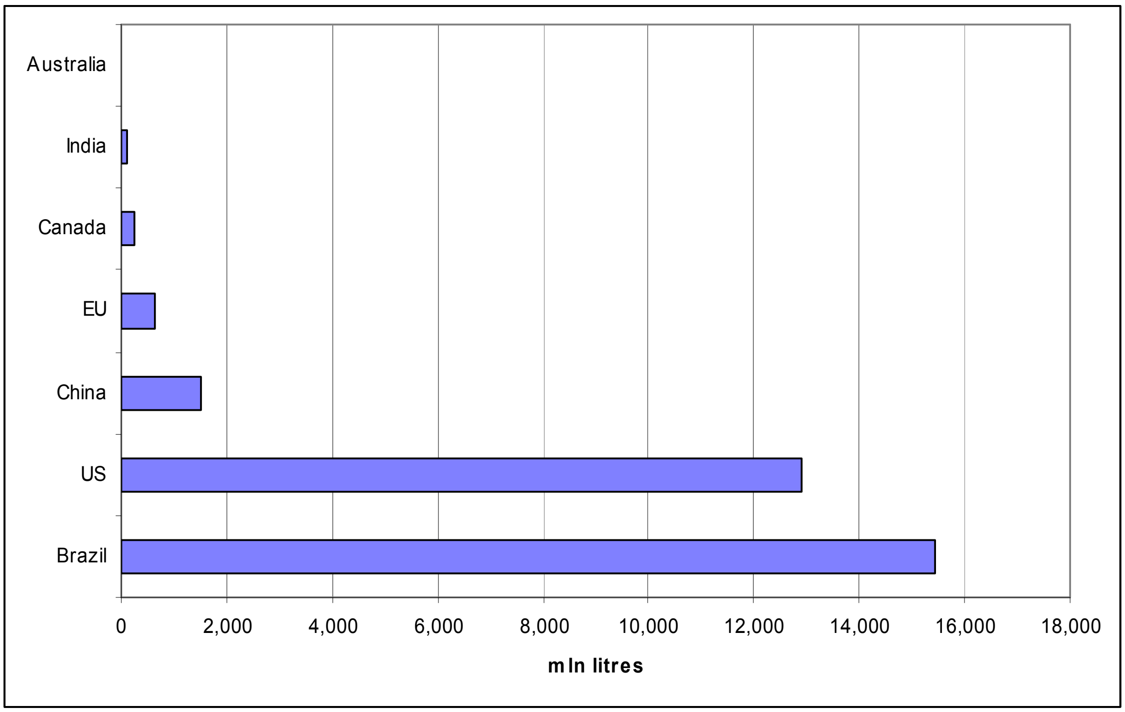
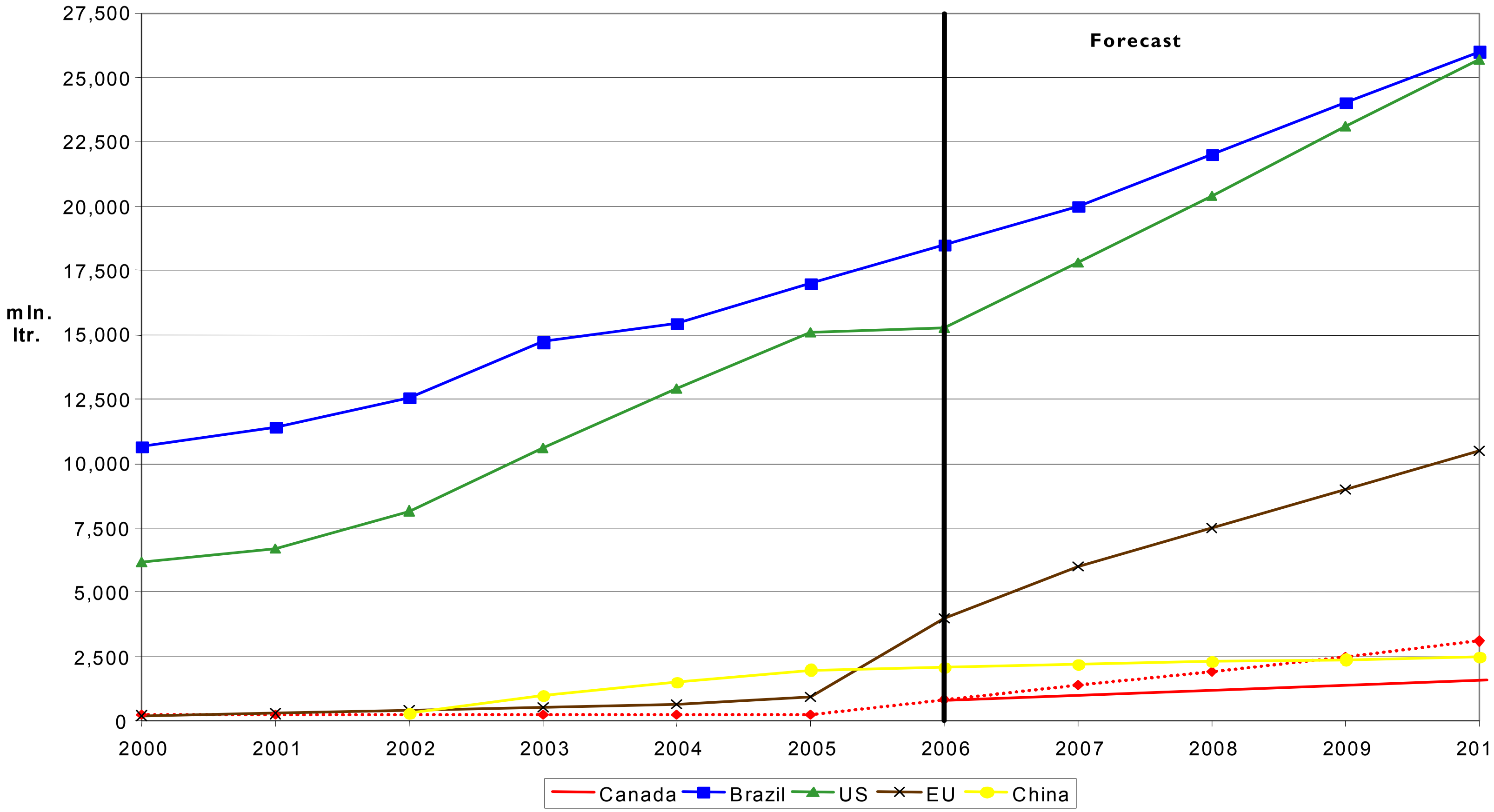


Figure 3.1: Fuel ethanol production 2004

Source: FO Licht 2005.

Figure 3.2: Fuel ethanol production in major producing countries, 2000-2010 (forecast on the basis of existing and/or planned fuel ethanol programmes)



Note: Canadian projection dotted line assumes RFS implemented.

Source: Agra CEAS Consulting and FO Licht 2006.

Global outlook

Internationally, support for biofuels is growing as countries around the world seek to reduce greenhouse gas emissions in order to comply with the Kyoto Protocol, utilise surplus farm commodities, and reduce energy imports. The latter has increased in importance in view of the recent rise of world oil prices. Currently sugar, along with maize, are the most important feedstocks for bioethanol worldwide. However, as world sugar prices rise making this feedstock marginally less competitive the range of feedstock crops used is likely to expand to include alternatives such as palm oil and cassava (tapioca). In addition, security concerns remain, not only with heightened tensions in Iraq and Saudi Arabia, but also political unrest in Venezuela and Nigeria, as well as terrorist attacks on New York, London, Madrid and other Western capitals.

The reasoning for supporting biofuels world-wide includes elements of the following three benefits expected from a biofuels policy:

- Environmental benefits: countries increase the use of biofuels as a response to the challenge of climate change;
- Producing biofuels domestically reduces energy dependency and increases security of supply, which is becoming increasingly relevant in view of recent oil price rises and security concerns; and,
- Biofuels policy aims at creating a new stimulus for the rural economy.

The analysis in Section 2 and the overview of tax reductions and targets for biofuels market share in key countries presented in Table 3.1 below indicates that Canada at present applies a relatively more limited range of instruments and lower targets than other major producing countries/regions.

The international experience of policies in the biofuels sector reviewed here suggests that a combination of mandates and tax support tend to increase production and consumption of renewable fuels. Although Canada has a well-developed agricultural sector with large potential feedstocks, it has to date shown relatively slow growth in biofuels production. For Canada to more into line with other producer countries by 2010, both the policies announced by three provinces and a national renewable fuel standard promised by the new government needs to be successfully implemented.

Table 3.1: Tax reductions and targets for a biofuel market share in key countries

	Tax reduction for biofuels	Target for biofuels volumes/ market share
Canada	Federal excise tax exemption of ten cents per litre of ethanol blended with petrol, and 4 cents per litre for biodiesel. Additional fiscal incentives in several provinces.	Minimum 5% mix of renewable fuels in gasoline and diesel by 2010.
Brazil	The total of value-added tax (VAT), fuel tax and other taxes on ethanol is only about half that applied to petrol.	Obligation to blend between 20% and 25% ethanol with fossil petrol depending on the situation in the alcohol market.
US	Federal tax credit of US$0.52 per gallon of pure ethanol. Additional fiscal incentives in several States.	Renewable fuels standard (RFS) mandates the use of 7.5 billion gallons (28.4 billion litres) of biofuels by 2012.
EU	Varying level of tax reductions in different EU Member States (between 0 and 100%).	Indicative targets for the share of renewable fuels in the transport fuel market of 2% by end 2005 and 5.75% by end 2010.
Australia	Full excise tax exemption for both fuel ethanol and biodiesel (AUD0.38143 per litre), i.e. ca. 1.75% of total petrol consumption at current level.	National target of 350 million litres of biofuels by 2010.
China	Fuel ethanol is exempt from consumption tax (5%) and value-added tax (17%).	Use of E-10 is mandated in some provinces. National target of 11 million tonnes (8,800 litres) of biofuels (bioethanol and biodiesel) production by 2020.
India	Tax reduction for E-5. Additional fiscal incentives in several provinces.	Obligation to blend 5% ethanol with fossil petrol (E-5) in a number of regions. Longer term targets: 1) countrywide ethanol-petrol blending at 5%; 2) countrywide ethanol-petrol blending at 10%; 3) blending conventional diesel with 5% ethanol.