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BIODIESEL CHAINS

Promoting favourable conditions to establish biodiesel market actions

Strategy formation

D18 National strategies and recommendations
Case studies: Belgium, Bulgaria, Cyprus, Greece, Poland, Romania

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Intelligent Energy Europe

Biodiesel Chains:

Promoting favourable conditions to establish biodiesel market actions

WP 5 “Biodiesel market status”

Deliverable 18: National strategies and recommendations

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BELGIUM

1. Introduction: current situation of biodiesel production and market

1.1. Main features of the biodiesel market

Belgian biodiesel production started up in 2006. Biodiesel is available at the pump in Belgium since November 2006.

A number of large production facilities were built following the outcomes of the Government call for tenders. Many industrial investments are currently in perspective. However, structural difficulties, notably the reluctance of the mineral oil industry towards biofuels, are positing serious challenges to the establishment of a strong biodiesel market. As a matter of fact, domestic biodiesel production remains limited (compared to installed and planned capacities) and many projects have been postponed by several months.

1.1.1. Production and capacities

The 2006 biodiesel production reached 25 000 tonnes, compared to only negligible quantities the year before. Production capacity at July 2007 stands at 335 000 tonnes/year compared to 85 000 in 2006. Capacities could reach a much higher figure in 2008 (some 660 000 tonnes/year) if all announced projects are effectively implemented.

1.1.2. Major actors of the biodiesel market

1.1.2.1. Biodiesel producers

In July 2007 there were only three biodiesel producers in Belgium: OLEON in Ertvelde, NEOCHIM in Feluy and DOW HALTERMAN in Antwerp. However, Dow had to stop production since the company was not awared a share of the quota for the second phase.

A number of projects should however start in the months to come, provided that the overall climate for biofuels improves.

- *Group Tormans* should set a subsidiary undertaking in Geel for the production of biodiesel with a capacity of 300,000 litres starting 2008.
- *Cargill, Bioro and Vanden Avenne Izegem* have entered into a joint venture to build a biodiesel plant in Ghent with a capacity of 200,000 tonnes. The production should start in 2008.
- *Proviron* will set up a biodiesel plant with a capacity of 100 000 tonnes/year in Oostende.
- *Flanders Biofuels* is planning to produce biodiesel, green electricity and green heat in Gistel. The company received a production quota for the period November 2006/October 2007 but not for the second stage (2007-2013).
- *INEOS* is planning to set up a biodiesel facility in Antwerp.

1.1.2.2. Edible Oil producers

The main vegetable oil producer in Belgium is the company Cargill N.V. located in Antwerp. Producers interests are represented within the framework of the *Fédération des Fabricants Belges de Matières Grasses et Huiles*.

1.1.2.3. Technology providers

The Company De Smet has built a world-wide reputation and experience in providing advance technologies for oil processing and biodiesel production.

1.1.2.4. End users

Since November 2006, *Total* Belgium has been the first, and so far only, oil company to distribute biodiesel in its standard "Excellium Diesel". The company has signed a supply agreement with OLEON.
Other major oil companies operating in Belgium include: Belgian Shell S.A., ESSO Belgium, LUKOIL Belgium, Petroplus Refining Antwerp and Texaco Belgium, Kuwait, Jet.[1]

1.1.2.5. National federations

The Belgium Biodiesel Board (BBB) is being set up officially in 2007 (although it already started meeting in early 2006) to represent the interests of biodiesel producers.

1.1.3. Raw material supply

A number of Belgian farmers have shown interest in switching to energy crops production. In 2007, rapeseed for biodiesel production was cultivated on 9.150 ha.[2] It is estimated that production of biofuel crops may occupy some 60.000-90.000 ha of agricultural land in Belgium. The Belgian Farmers Union estimates that there is scope for expansion of the rapeseed area to 150.000 ha in the longer term.[3] However, this will probably contribute only modestly to feedstock supply for domestic biodiesel production.

1.1.4. Fuel consumption

In 2006 7,86 millions of m^3 of diesel were sold on the Belgian market. 1.282 m^3 of biodiesel have been placed on the Belgian market, which corresponds to 0,01% of the total diesel consumption. 72% of all new cars sold in Belgium in 2006 are diesel cars.

1.1.5. Norms and standards for biodiesel

The Royal Decree of 4 March 2005 provides that biofuels can only be put on the market in case a European standard exists. It has recently been complemented to provide for two exceptions: captive fleets and biofuels sold directly by farmers to the end consumers. With regard to biodiesel, the EU standard EN 14214 applies to blends up to 5%.

1.2. Legislative framework in support of biodiesel production

Legislative framework in favour of biofuels is a combination of detaxation and production quotas. So far, no mandatory blending applies.

1.2.1. Transposition of Directive 2003/30 and national indicative targets

Belgium submitted its first, second, third and fourth report under Directive 2003/30. The national indicative targets, based on the energy content of transport fuels are set as follows (the percentage will be increased yearly by 0,75%.):

- 2005: 2%
- 2006: 2,75%
- 2007: 3,50%
- 2008: 4,25%
- 2009: 5%
- 2010: 5,75%

1.2.2. Detaxation schemes in favour of biofuels/biodiesel

[1] Fédération Pétrolière Belge, http://www.petrolfed.be/index.html.
[2] Etats des Biocarburants en Belgique et Propositions Valbiom, June 2006, www.valbiom.be.
[3] FO Licht's World Ethanol & Biofuels Report, 26 October 2006.

Directive 2003/96/EC has been transposed in Belgian law by the Royal Decree of 29 February 2004, the Planning Acts of 27 December 2004, 11 July 2005, 27 December 2005 and recently the Act of 10 June 2006. A reduced excise rate for biodiesel is in effect since November 1st, 2006.

The rules are rather complicated but the basic concept is that a lower excise duty will be granted to biodiesel blends containing minimum 2.45% in volume of FAME until December 2005, then increasing by 0,92% each year:

- 2.45% until 31st December 2005
- 3.37% as from 31st December 2005
- 4.29% as from 5 March 2007
- 5% as from 31st December 2007

The correspondent excise reduction for blends will be increased in a way to maintain a full exemption for the FAME component.

The legislation also contains some provision that could enable higher tax exemptions for higher blends (such as B30), but this will need a further governmental decree to be effectively applicable.

These measures are of no cost for the Belgian Government since the excise reduction for blends is being accompanied by an increase in the overall excise duty of at least 10€/m³ for both gasoline and diesel, which will enable the Belgian Government to get back the money of the biofuels detaxation. Belgium will probably be the first country to earn money with biofuels, since the increase in the excise has been calculated considering that the Belgian biofuels market will attain immediately the targets, which of course will not be the case, so a part of the excise increase will simply create more income for the Belgian state.

The current excise rates (in effect as of 5th of March 2007) for biodiesel is to be found in the article 419 of the Programme-Law of 27 December 2004, last modified by the law of 25 February 2007 article 2, 3° :

– excise rate (*droit d'accise*): 198,3148 €/m^3
– special excise (*droit d'accise spécial*): 103,7202 €/m^3
– energy tax (*cotisation sur l'énergie*): 14,8736 €/ m^3

A biodiesel blend with a FAME content of at least 4,29% is thus levied a tax of €317/m^3. In July 2007, the excise on diesel amounted to 331,11 €/ m^3.

1.2.3. Mandates

No blending mandate applies in Belgium sofar.

1.2.4. Quotas

In June 2006, the Belgian Parliament adopted the implementation rules detailing the provisions for biofuels amounts to be granted detaxation in the framework of a call for tender starting November 1st 2006.

The following quantities were allocated as quotas:

- November 1st 2006/ September 30th 2007: 286 000 m³
- October 1st 2007/ December 31st 2008: 475 000 m³
- For the period 2009/2012: 380 000 m³ per year
- January 1st 2013/ September 30th 2013: 284 000 m³

In October 2006, the quotas for the period November 1st 2006/ September 30th 2007 were announced. The following companies have been awarded a biodiesel quota: Neochim in Feluy (125 000m³), Oleon in Ertvelde (72 000m³), Flanders Bio Fuel in Gistel (40 680m³) and Proviron in Oostende (48 320m³).

In December 2006, the overall quota of 2 279 000m³ for the period starting October 1st 2007 and ending September 30th 2013 have been announced. The following companies have been awarded a biodiesel quota: Bioro (988 000m³), Proviron (257 000m³), Neochim (650 000 m³) and Oleon (384 000m³).

1.2.5. Direct subsidies

Belgian farmers growing energy crops for biodiesel production benefit from the EU incentive of 45€/hectare.

1.3. Research efforts in favour of biodiesel deployment

A number of research and demonstration projects are ongoing in Belgium to promote the deployment of biofuels technologies. However, none of them is specifically targeted at biodiesel. The Belgian Integrated Platform for Industrial Biotechnology was established in 2005 under the umbrella of the Ministry for Science Policy, in order to develop a long-term strategy both in terms of policy and research. It covers biomass supply, bioprocesses/bioproducts and bioenergy.

In 2007, there were four research projects financed by the federal research program "Science for a sustainable development":

- "Liquid biofuels in Belgium in a global bioenergy context" (LIBIOFUELS): the objective of this project is to analyse the ecological, micro economic and socio-economic sustainability of the most promising large-scale biomass routes in Belgium. The project will notably include a comparison of the potential and sustainability of the chains in Belgium versus imported biomass, liquid befouls or intermediate products as well as a comparison of liquid biofuel chains with bio-CHP and bioelectricity.
- "Biofuels Sustainable End Use (BIOSES): the BIOSES project analyses the impact of different market introduction scenarios of biofuels in the Belgium transport system, with a focus on the demand side.
- "Clean vehicle research: LCAs and policy measures" (CLEVER): the program will analyse the existing barriers to the introduction of clean vehicle technologies in Belgium, establish the environmental impact of vehicles running with conventional and alternative fuels and/or drive trains and determine policy measures to facilitate a sustainable vehicle choice.
- "Decision-making tools to support the development of bioenergy in agriculture" (TEXBIAG): the objective of the project is to ensure the contribution of bioenergy from agriculture to the mitigation of greenhouse gases emissions, to energy security and to farmers' income and rural development.

2. SWOT Analysis

2.1. Strengths

- There is a strong governmental involvement in favour of biofuels across the country.
- The market is protected by a production quota.

2.2. Weaknesses

- Belgium will have to rely heavily on imports to fulfill ambitious biodiesel production targets due to limited arable crops area available. Small farm size and low yields add to the problem. EU premium for energy crop production (45 euros/hectare) is considered an insufficient incentive, especially for small agricultural producers. In

2005, Belgium produced 54 000 tonnes of oilseeds, while imports of rapeseeds reached 765 000 tonnes the same year. [4]

- The biodiesel quota has been awarded too late in 2006 for producers to react quickly. Therefore supply difficulties arise for fuel companies wanting to market biodiesel blends.

- No blending obligation applies for fuel suppliers.

- No tax exemption is granted for higher blends.

2.3. Opportunities

- The proximity of the Belgian (Antwerp) and Dutch (Rotterdam, Amsterdam) ports will ease the import of feedstock for biodiesel production, which should allow production to catch up with existing capacities.

- Belgium has an important potential for the development of biodiesel from waste vegetable oil (see below).

2.4. Threats

- With high price of rapeseed, biodiesel becomes less competitive and some crushing facilities have stopped production.

- Due to the shortages in biofuel feedstock, Belgium could in the future rely extensively on imports of unsustainable produced biomass such as palm oil.

- There is a lack of interest from end users: except for Total, fuel suppliers do not want to blend biodiesel, arguing that a lot of practical and logistical problems remain (supply of biodiesel, storage and blending facilities, transport infrastructure…)

- Public transportation companies show no real interest for biodiesel. As a matter of example the company TEC will buy 270 new vehicles to be operated in the years to come, none of which will be compatible with blends of biodiesel above 5%. The same reluctance to go ahead with biodiesel exists by the STIB and De Lijn companies.

3. Main Drivers of biodiesel production

In Belgium, the main driver for biodiesel production is the willingness from the former Government of Mr. Verhofstadt to comply with Kyoto targets also using the transport sector as an important leverage to mower GHG emissions. EU targets for the promotion of biofuels are rewarded as well an important reason for action.

4. Main obstacles for the further development of the biodiesel market

Biodiesel production is mainly hindered by the absence of any obligation on fuel suppliers to distribute biodiesel. Although Belgium does not have a major local mineral oil producer or refiner (the previous state oil distributor Fina, was purchased by Total 2-3 years ago), the influence of this industry has sofar avoided the implementation of a national obligation to blend biodiesel in diesel and more in general biofuels with conventional fuels.

[4] FEDIOL

5. Trends and future scenarios

In the years to come, Belgium's potential in terms of feedstock production will certainly improve, provided that sufficient incentives for the agricultural sector arise. However, biodiesel feedstock production will remain below what will be required to reach the 10% biofuels target. In that sense, it would be important to already secure supply contracts with Member States or third countries having a large production of biodiesel feedstock. Indeed, Belgium will probably rely extensively on imports coming from the rapeseed very promising regions of Europe (Romania, Ukraine, Belarus, Russia), which will be crucial both for 1st and 2nd generation technologies. This feedstock constrain, however, seems to pose a real challenge to the development of 2nd generation technologies in Belgium.

As a complementary approach, the development of alternative feedstock (used cooking oils, algae) could certainly improve the biomass availability for the purpose of biodiesel production.

6. Recommendations

6.1. Feedstock

6.1.1. Agricultural feedstock

Considering the lack of appropriate feedstock, Belgium should certainly consider granting an additional support to energy crops. The burden for the state budget could be offset by raising the excise on diesel.

6.1.2. Alternative feedstock

In view of Belgium's limited capacity in terms of feedstock supply, the further development of used cooking oils (UCOs) for biodiesel production should be considered. In November 2006 already, a campaign to collect UCOs denominated "*Valor firites*" has been launched. Collecting points are located in supermarkets. In 2005 already some 6.470 tonnes of use oils and fats were collected. 40% of Belgian consumers have participated. There is already a strong incentive in Belgium from the side of the industries of the food and distribution sectors, which have the obligation to recycled used oils and fats. This should be further encouraged and developed, by multiplying collecting points, raisins consumer awareness and possibly by creating some financial incentive for consumers who engage in UCOs recycling. Currently in Belgium 57% of UCOs are recycled into biodiesel. However, transformation occurs mostly outside Belgium, in countries which have developed the appropriate technology (Germany). Belgium companies should develop their own technology to recycle UCOs into biodiesel.

6.1.3. Research on new feedstock

Having access to the sea, Belgium could as well consider research and demonstration projects for the deployment of algae biodiesel.

6.2. Processing

6.2.1. Crushing capacity and technology

In 2005 total crushing capacities for oilseed amounted to 1 497 000 tonnes, significantly less than in 2000 (2 145 000 tonnes). The same observation came be made for the production of vegetable oils and fats (488 000 tonnes in 2005 compared to 677 000 tonnes five years before).[5] Imports of vegetable oils are growing accordingly since 2000 and reached 1 144 000 tonnes in 2005.

6.2.2. Esterification capacity and technology

[5] FEDIOL.

Since most of biodiesel production units are small to medium size, there is probably some room for improvement in the field of esterification technology. This could be done building on currently ongoing projects such as KOBRA (in Flanders), dealing with improved processing of rapeseed.

6.3. Marketing

6.3.1. Marketing of biodiesel

One crucial measure in creating an appropriate market for biodiesel is the development of biodiesel use in captive fleets. In May 2007, the City Council of Brussels has committed to use biodiesel for the most part of its 400 vehicles. The contract would represent some 500 000 liters per year. Belgium should work on the normalization of high blends (B30 for instance), following the example of countries like France where the Government is validating the use of B30. To that purpose, the Government could build on the open attitude of some car manufacturers (PSA Peugeot Citroën and Renault) which seem ready to maintain a warranty on their engines using B30.

Another available option would be to develop heating application for biodiesel, drawing on already available subsidies: in the Flemish region for instance, agricultural companies are granted a 40% support when using biofuels for heating.

6.3.2. Marketing of glycerine

The Belgian pharmaceutical company Solvay Group is developing an innovative process for the use of glycerine. The company recently announced plans to convert glycerine to epicholorohydrin, which can be used as a building block in the manufacture of plastics and polymers. This should be further developed and encouraged by the Government.

6.3.3. Marketing of by-products

In 2005, Belgium produced 344 000 tonnes of rapeseed mills, featuring an important increase from the previous years but still below the level of 2000. At the same time, the country still imported some 184 000 tonnes of rapeseed mills, indicating a demand gap that could be filled in the case of increased domestic biodiesel production. The valorisation of rapeseed cake in animal feed should be further developed.

6.4. Legislation

6.4.1. Excise duty level and detaxation schemes

The excise on conventional diesel amounts to 331,11 €/ m^3, standing at a level below the EU average (409,69€). It could be raise to offset the cost of governmental support measure to be granted in other sectors of the biodiesel chain.

6.4.2. Blending mandate

The introduction of a blending mandate should be seriously considered by the Belgian Government to boost the development of the biodiesel market. This should be accompanied by a penalty system imposed on fuel suppliers that would fail to reach the target. In this regard, the system of the French TGAP could be transposed.

6.4.3. Additional support measures

The production quota should be raised and planned on a longer term perspective (2015, 2020?) to provide a more stable environment for investors. This will be an absolute necessity to reach the 2010 5,75% target.

Similarly, the use of biodiesel should be made mandatory for captive fleets.

Lastly, the launch of a wide ranging communication campaign in favour of biodiesel is crucial. Just as in other EU countries were biodiesel production experiences a difficult start, there is a need to create an appropriate market by changing consumers' behaviour.

Conclusion

The Belgium biodiesel market presents a paradoxical situation. On the one hand Belgium will soon have the industrial capacity to reach the 10% EU mandatory target for 2020. On the other hand current support measures seem largely insufficient to trigger the emergence of a genuine biodiesel market. There is first and foremost a need for more ambitious political targets, legislative support and communication strategies that will create the necessary momentum for biodiesel consumption.

BULGARIA

1. Introduction: current situation of biodiesel production and market

1.1. Main features of the biodiesel market

It is important to underline that the first developments of biodiesel in Bulgaria were made from used cooking oil, supplied by local restaurants.[6] Production from vegetable oils has been developed in a second stage. In parallel, a legislative framework has been slowly elaborated. Today, Bulgaria is at the cross-road in terms of biodiesel production and related policies, with the need for new feedstock, more suitable market conditions and the rapid implementation of ambitious political targets.

1.1.1. Production and capacities

Biodiesel production in Bulgaria started in 2001 with the company SAMPO AD. Although the production capacity remained modest at the time (3 000 tonnes/year), the company was dealing with clients such as the main fuel distributors and the transport company Trayana Trans. Today the company also offers supply of biodiesel production equipment. Capacities were progressively increased to reach 10,000 tonnes/year in 2005.

Another first mover in the biodiesel sector was the Trade Storehouse in Gabrovo, which started operations in 2003. The biodiesel was used as a fuel for the trucks of the company and for heating of the premises during the winter

More recently, the company Green Oil Ltd., started biodiesel production in 2006 in Silistra, using own equipment. In addition to used cooking oils, the company used sunflower and rapeseed oil. Green Oil has as a main client the oil company Prista Oil.

1.1.2. Major actors of the biodiesel market

1.1.2.1. Biodiesel producers

In 2007, the following companies were reported to have biodiesel plants or projects in Bulgaria: *Biodreams* (a project of 20 000 tonnes/year in Lovetch), *Galaksi Oil* (a project of 15 000 tonnes/year in Silistra), *Klas Oil Ltd* (30 000 tonnes/year in Vidin). *Rapid Oil Industries* will start production in early 2008. The company *Sluntchevi Luchi* is said to launch a 100 000 tonnes/year biodiesel plant capacity in 2007.
The edible oil producer Papas Olio is considering biodiesel production, while the company Zlatna Trakia is reported building a biodiesel plant that will use predominantly sunflower oil.

Today, Bulgaria's production capacity amounts to 65,000 tonnes, featuring a considerable increase compared to the previous year. Similarly, the 2006 production reached some 4 Mio tones, compared to very limited quantities in 2005. This means that a number of production capacities became operational last year. It is noticeable that a large part of installed capacities are not yet used, indicating a real potential for biodiesel production.

Indeed, the relatively low production figures should be considered in parallel with the important capacities that are currently set up: 65 000 tonnes in July 2007, possibly 125 000 tonnes for 2008. In its first report under Directive 2003/30, Bulgaria indicates that biodiesel capacities would even reach 415 000 tonnes in 2010.

[6] Ilian Jeliazkov, *Biofuels in Bulgaria*, National Workshop on Business Opportunities for Biodiesel, Nicosia, 18th January 2007.

1.1.2.2. Technology providers

There are several well-established companies providing technology for biodiesel production, such as M Engineering - Pencho Ganev E.T. in Veliko Tirnovo, Gamakol EOOD in Plovdiv or Bioenergomash in Aksakovo.

1.1.2.3. End users

The oil company *Eko Petroleum* is reported to plan a 150 000 tonnes/year biodiesel plant that should be operational as from 2008.
Other major national oil companies include Genimex Lovetch, Eko-Elda Bulgaria (branch of Hellenic Petroleum), Lukoil Bulgaria (branch of the Russian company Lukoil), Naftex Petrol, OMV Bulgaria, Petrol JSC and Prista Oil.

1.1.2.4. National federations

The National Association of Biofuels and Renewable Energy Sources (NABRESB) established in 2001 and later renamed as National Biofuels Association in Bulgaria comprises today some 30 members, 15 of which are biodiesel producers.

Another important organism is the Oilseeds Oil Producers Association founded in 1994 and gathering more than 30 member companies. Finally the Bulgarian Farmers Association is another major representative body for Bulgarian feedstock suppliers.

1.1.3. Raw material supply

The energy crops used as raw material for biodiesel production in Bulgaria are mainly sunflower and to a lesser extend rapeseed.
The average harvest of rapeseed in Bulgaria stands at 1.5 t/ha, while the average harvest of sunflower stands at 1.48 t/ha[7], both quite low average yields when compared to the EU average.

1.1.4. Consumption

Total diesel consumption in Bulgaria stands at 1 Mo tonnes and a growing demand for diesel is anticipated: 1,7 Mo in 2008 and 2,7 Mo in 2020. The 2008 biodiesel consumption should reach some 34,000 tonnes.
Furthermore, reaching the 10% biofuels target for 2020 would mean that 277,500 tonnes of biofuels would have to be marketed in Bulgaria.[8]

1.1.5. Norms and standards for biodiesel

As it started production, the company SAMPO was using the Technical Specification TC 0301 (similar to EN 14214). However, the European Standard EN 14 214 was introduced as Bulgarian State Standard in 2004 to provide for the specifications of pure biodiesel.

1.2. Legislative framework in support of biodiesel production

1.2.1. Transposition of Directive 2003/30 and national indicative targets

Until the adoption of the recent Renewable Energy Law, the legislative basis for introduction of biofuels in Bulgaria did not provide the necessary conditions for their development. Biofuels were indeed treated in several statutory instruments:

The first one is the *Clean Air Act* of July 5, 1999, and more particularly the *Ordinance of the Ministry of Environment and Waters pertaining to the requirements for quality of liquid fuels and the procedure, conditions and manner of their control*, of October 1, 2003.

[7] Vladislava Georgieva, BIOFUELS – the alternative fuel or fuel of the future in United Europe, Ministry of Economy and Energy, 2007.
[8] ESD Bulgaria Ltd, SWOT Analysis, Biodiesel Chains project.

The Ordinance considers the requirements for percentage content and provides for the use of biofuels as additives to conventional fuels. Annex No. 2 concerns the requirements for diesel fuel and allow the addition of up to 5% methyl ester. The ordinance does give any indications/requirements concerning the composition of biofuels and does not provide any definition.

The *Finances Act and Excise and Customs Warehouses Act* (applicable from January 1, 2006) makes it mandatory that biofuels be stored at customs warehouses after June 1, 2006 (Article 66-2). Furthermore, article 32 and article 33 provides for a zero taxation rate for pure biodiesel.

It was thus necessary to draft a legislative act which would unite these pieces of legislation and provide for a unifying statutory instrument.

The *Renewable Energy Law* (proposed by the Ministry for Economy and Energy) was discussed at governmental level during 2006. The aim was to devise a general framework and a specific biofuels regulation. In May 2006, the Ministry for Economy and Energy initiated the preparation of a legislation aiming at supporting the use of renewable energy sources and biofuels.

In December 2006 the Bulgarian Association for Biofuels worked on the seven political axes mentioned in the EU Strategy for biofuels of February 2006 and sent its comments to the Parliamentary Commission of Energy, the Parliamentary Commission of Environment, Parliamentary Commission of Budget, the Ministry of Economy and Energy, Ministry of Environment and waters and the council of ministers.

In the course of the stakeholders discussions held in relation to the drafting of the Renewable Energy Law (RES law), participants suggested three principal scenarios for the development of biofuels production for the period between 2008 and 2015, completed by indicative targets. The following levels for the necessary quantity of biofuels on the domestic market as a percentage of total quantity of fuels used in the period were suggested:
2008: 2%
2010: 5,75%
2015: 10%

1.2.2. Detaxation schemes in favour of biofuels/biodiesel

The Bulgarian RES law was finally published in the official journal on 19 June 2007. It provides for a zero taxation rate for the biodiesel component in blends. As of July 2007, the excise duty on conventional diesel amounts to BGN 535,00 (= € 273,55).

1.2.3. Mandates

Starting January 1st 2008, a 5% mandate will apply for fuel suppliers. The mandate is indexed on the maximum biodiesel share authorised in the European diesel standard EN 590, so that if the standard is revised, the mandate will be adapted accordingly.

1.2.4. Quotas

So far, no quota system applies in Bulgaria for the production of biodiesel.

1.2.5. Direct subsidies

After its accession to the EU, Bulgarian feedstock suppliers could benefit from the EU subsidy scheme for growing energy crops (€45 per hectare). In 2007, about 1000 farmers have made applications for such subsidies.

Bulgaria is granting additional agricultural subsidies for growing oleaginous crops (€ 18 per hectare in 2006) and significant subsidies are expected to be introduced for growing energy crops in NATURA 2000 areas (the Minister of Agriculture recently mentioned the figure of €120 per hectare).[9]

2. SWOT Analysis

2.1. Strengths

- FEEDSTOCK PRODUCTION

Bulgaria has excellent natural conditions for development of the agricultural and forestry sector. Arable land stands at about 4.9 million ha or 44% of the total territory of the country. In 2005, unused agricultural land (fallow land and uncultivated land) amounted to 19% of the entire agricultural land, which could provide significant opportunity for development of biofuels production.[10]
Bulgaria also benefit from a higher mechanisation rate than in most other Eastern European countries.
Reaching the suggested targets for 2008, 2010 and 2015 would require an arable surface of respectively 57.574 ha in 2008, 164.086 ha in 2010 and 438.390 ha in 2015.[11] This would probably not overstretch the country's land resources.

- TAXATION

Since January 2006, pure biodiesel (B100) benefits of a zero excise tax rate.

- BIODIESEL TECHNOLOGY

Several Bulgarian technology providers are ably to supply the market with cost-effective plants and have already gained international experience from building plants in foreign countries such as Latvia and Romania.[12]

2.2. Weaknesses

- METEOROLIGICAL CONDITIONS FOR RAPESEED PRODUCTION

Meteorological conditions prevalent in Bulgaria are not favourable for the production of rapeseed, with low winter temperatures and rapid warming in the period of ripening (May-June). In addition, there is no established tradition for the production of rapeseed, which explains the relatively low output in 2004 (22,388 tonnes only)[13].

- INSUFFICIENT ENERGY CROP SUPPLY

Bulgaria is not a tradition grower of rapeseed, which explains why production, although strongly increasing in the last years (around 20 000 tonnes/year), remains far below the capacity of biodiesel plant currently constructed in the country. Rapeseed cultivation is expected to reach 60 000 MT in the near future but this would certainly remain insufficient.
Soybean is clearly not adapted to Bulgaria's climate conditions and would necessitate important irrigation. As a matter of fact, the annual domestic production remains very limited.

The natural and tradition alternative feedstock – sunflower – is also posing major challenges when it comes to supplying sufficient quantities. One difficulty is the proximity of Turkish market having a huge demand for vegetable oils, which is traditionally satisfied by Bulgarian

[9] Vladislava Georgieva, BIOFUELS – the alternative fuel or fuel of the future in United Europe, Ministry of Economy and Energy, 2007.
[10] Vladislava Georgieva, ibid.
[11] Vladislava Georgieva, ibid
[12] SWOT Analysis for Bulgaria, Biodiesel Chains Project.
[13] Vladislava Georgieva, ibid.

production. This explains why most of sunflower grown in Bulgaria is exported (between 250 000 and 500 000 tons annually).[14]

The lack of modern equipment for agricultural production is a further limitation.

- TECHNICAL ISSUES ARISING FROM SUNFLOWER USE

Sunflower grown in Bulgarian is mostly conventional sunflower of low oleic type, which could create difficulties to comply with the EU standard EN 14214 for the iodine value.

- LACK OF FAVOURABLE ENVIRONMENT FOR DEVELOPMENT OF BIODIESEL

The Bulgarian economy still presents features inherited from the socialist period such as a low labour productivity, which could hinder the rapid development of a strong biodiesel industry. The administrative capacity to support nascent business remains too low.
Another issue is the lack of appropriate fixed investments such as refineries, storage houses and delivery network. The access to capital remains also a difficulty for potential producers.
In addition, there is still a significant grey market in vegetable oil and petroleum products, which is not contributing to a fair and safe business environment.
Furthermore, the Government seems rather reluctant to reduce tax receipt by providing fiscal incentives to biofuels.[15]

2.3. Opportunities

- MULTIPLYING EFFECT OF ACCESSION TO THE EU

Bulgaria's accession to the EU represents certainly the major opportunity for the development of the biodiesel industry. Indeed, the demand in other Member States with insufficient agricultural capacities will create additional outlets for national biodiesel production. In addition, the 10% biofuels target set at EU level for 2020 will require an increase in production (some 25 to 28 Mo tonnes will need to be marketed). This will create long-term perspectives for the national industry. More generally, the nascent Bulgarian biodiesel industry will benefit from the EU administrative support (agricultural subsidies, legal assistance, support to research and development, network of contacts…)

- INCREASED ATTRACTIVITY FOR FOREIGN INVESTORS

As a new EU Member State, Bulgaria is becoming increasingly attractive to EU investors, and the biofuels sector is of course not excluded: in parallel with the development of domestic capacities, biodiesel production in Bulgaria is indeed becoming an increasing source of interest for foreign investors. For instance, the Spanish company *Greenfuel Corporacion* is contemplating the construction of a 45,000 t/y plant in the Pleven region. This may increase the ability for local producers to raise capital. It should also facilitate the transfer of new biodiesel technologies.

- NATIONAL OPPORTUNITIES

At national level, the Ministry of energy is aiming at developing higher blends for the public sector and captive fleets (B50), which could give an incentive to biodiesel production.
Overall, biodiesel benefit from a good image in Bulgaria, both for producers and consumers, meaning that if production is sufficient and communication effective, there is room for creating a real biodiesel market.

2.4. Threats

- POSSIBLE FEEDSTOCK SHORTAGES

[14] SWOT Analysis for Bulgaria, Biodiesel Chains Project.
[15] USDA GAIN Report, Biofuels market in Bulgaria, 10/11/2006, p.3

Some producers are already experiencing raw material shortages due to the poor state of the country's farm sector. The Bulgarian Energy Efficiency Agency recently called for a rapid increase of sunflower output by 60% “in order to achieve its ambitious goal for robust biofuel market growth”.[16]

- TECHNICAL OBSTACLES

The iodine content of the biodiesel produced from conventional and non-HOSUN sunflower (the main available feedstock) farmed in Bulgaria exceeds the values set down in the European standard EN 14 214. This is potentially a major obstacle to biodiesel development, since sunflower is the main feedstock available for large-scale biodiesel production in Bulgaria.

- LEGAL HURDLES

Even after the adoption of the new RES law, the excise tax still applies to biodiesel blended with conventional diesel, which is hindering the development of the biodiesel market.

Another legal difficulty is that biodiesel can be produced only at a licensed excise storage/warehouse since it is considered under national law as an excise tax product (although the excise tax is zero). In order to receive a license, companies need to have a registered capital of at least 500 000 leva (approx. €255 000), in conformity with art.47-1 of the excise tax law. This clearly does not reflect the nature of Bulgarian businesses, which are mainly of small and medium size.[17]

3. Main Drivers of biodiesel production

Biodiesel production in Bulgaria is driven by a combination of agricultural opportunities (large available surfaces) and security of supply concerns (growing demand for diesel).

4. Main obstacles for the further development of the biodiesel market

As highlighted above, biodiesel production is mainly hindered by constraints in terms of feedstock supply, unfavourable business climate and the lack of appropriate public policies.

5. Trends and future scenarios

Future developments of biodiesel in Bulgaria will strongly depend from two key parameters: the country’s biomass availability and the legislative support in favour of biofuels. With regard to the first aspect, there is a need to develop more appropriate types of rapeseed and sunflower, while at the same time developing alternative feedstock (animal fats, possibly algae). To avoid biomass shortages, Bulgaria will certainly rely on feedstock imports, most probably from neighbouring Romania, but also Ukraine or Russia.

In terms of legislative support, much will depend from the possible adoption of a mandatory blending target, which would contribute to create a genuine market for biodiesel. Should this legislative support be ensured sufficiently early and biomass constraints solved in an appropriate way, there is an important potential for biodiesel production in Bulgaria.

[16] FO Licht's World Ethanol & Biofuels Report, Bulgarian biofuel producers stifled by red tape, 2 November 2006.

[17] USDA GAIN Report, “Grain and feed – Biofuels Market in Bulgaria 2006”, 11 October 2006.

6. Recommendations

6.1. Feedstock

6.1.1. Agricultural feedstock

Considering the constraints in terms of biodiesel feedstock, support policies should probably follow a two-pronged approach:

- Increasing rapeseed production, still taking into account the limits posed by weather constraints. Cultivation could be concentrated in the most appropriate regions to take advantage of the strong Mediterranean climatic influence in the valleys of Macedonia as well as the lowlands (South of Thrace). More generally, high rapeseed prices in the EU could be an incentive for Bulgarian farmers to plant more rapeseed in the years to come. Another very positive move in that sense is the scientific work already ongoing in the *Institute of Soil Science "Pushkarov" and Agroecology* to select the most suitable variety of rapeseed for the Bulgarian conditions.[18]

- Another strategy could consist in further developing sunflower production. With regard to sunflower, part of the current exports could be redirected to domestic biodiesel production if prices are high enough. Then remains the problem of the iodine value which could be overcome in two ways: either by raising the parameter at national level by derogation from the EU standard, as it is already the case in Spain (140) or by the parallel development of high oleic sunflower (HOSUN). This is probably the best perspective since HOSUN has a much more adapted organoleptic profile suitable for the production of FAME.

In addition to these two options, Bulgaria could also consider increased imports of vegetable oils (from Poland, Ukraine), at least in a medium-term perspective. This would be all the more easy as a lot of buyers have access to Danube or Black See ports

6.1.2. Alternative feedstock

In parallel to the further development of traditional feedstock, there is probably a case for encouraging biodiesel production from alternative feedstock such as used cooking oils. Historically biodiesel developed in Bulgaria from UCOs, hence the possibility to build on the existing experience. There are still a number of small producers that are using UCOs for their own farm vehicles.

Animal fats for biodiesel production could also be envisaged although the problem here is the quantitative limitation of the raw material. Indeed, arable farming predominates over livestock-breeding in Bulgaria. In 2005 and 2006 Bulgarian livestock industry engaged in a wide-ranging restructuring to prepare for the EU accession. The total number of livestock farms diminished by 7,5% in 2005. Demand is structurally exceeding supply. As a result of the above trends, red meat production in 2005 was lower and meat imports continued to increase. In 2006-2007, the livestock and meat industries will continue with further restructuring. The expected results for 2007/2008 are fewer farms, stabilized livestock numbers and improved efficiency and competitiveness of the industry[19]. Should this tendency be confirmed, this could pave the way for tallow-based biodiesel production on a commercial scale.

6.1.3. Research on new feedstock

With an access to the Black Sea, Bulgaria could envisage demonstration projects in the field of biodiesel production from algae. This would not only increase raw material availability for

[18] SWOT Analysis for Bulgaria, Biodiesel Chains Project.

[19] USDA GAIN Report, Bulgaria Livestock and Products - Livestock Annual 2006, 30/08/2006.

Bulgaria itself but also place Bulgaria as one of the leading EU countries in the development of a very promising technology.

6.2. Processing

6.2.1. Crushing capacity and technology

Bulgaria has relatively good crushing capacities considering the importance of the oilseed producing sector (more than 25 middle to large-scale oilseed producers).

6.2.2. Esterification capacity and technology

The first biodiesel production units were mainly using in-house technology (such as SAMPO), which did not always allowed sufficient esterification capacity. The more recent projects however seem to rely on modern esterification technology.

6.3. Quality of final biodiesel products

6.3.1. National standard

There will be a need for higher iodine parameter to take advantage of Bulgaria's potential in terms of sunflower production.

6.3.2. Quality consortium, association of biodiesel producers

Considering that Bulgaria will produce a large part of its biodiesel from sunflower oil the creation of a quality consortium would be highly commendable to evaluate the quality and processing related problems (for instance waxes deposits in plants' reactors) arising from sunflower-based biodiesel.

6.4. Marketing

6.4.1. Marketing of biodiesel

On average, retail price of biodiesel is lower in Bulgaria than in most EU countries (20% less on average).[20] With the 5% mandate applying from 2008, the development of 5% blends can be anticipated. As mentioned above, the Bulgarian Government is also considering the development of higher blends for the public sector and captive fleets (B50). On a longer term perspective, and if sufficient operational capacities are set up, Bulgaria could also export biodiesel to other EU countries where the legislative framework is not favourable enough to trigger a genuine biodiesel market (Slovenia).

6.4.2. Marketing of glycerine

With regard to the by-product glycerine, it would be important to improve the production process to reach a pharmaceutical grade since production is still limited to technical grade in most production sites. This would open new outlets and ease the marketing of glycerine.

6.4.3. Marketing of by-products

Rapeseed or sunflower mills, the other by-product of biodiesel production, can be used as animal feed. Considering that the livestock breeding in Bulgaria remains limited, the best marketing opportunity would certainly be export towards EU countries. Indeed, the EU-27 is suffering from an enduring deficit in vegetable protein, which can be partly covered by mills from biodiesel production.

6.5. Logistics

The only one refinery with appropriate technology to blend biodiesel in Bulgaria is managed by Lukoil and situated on the Black Sea port of Bourgas. Another major company is Petrol. Together, Lukoil and Petrol have some 540 retail stations in the whole country. However, there are not enough petrol stations equipped for retail sales of biodiesel blends. No

[20] USDA GAIN Report, Biofuels market in Bulgaria, 10/11/2006, p.5.

investment was made in this field since the oil industry was waiting the adoption of a harmonized legal framework (RES law).

It will be important to take advantage of the proximity of Black sea and the access to Danube for feedstock and final product transport.

6.6. Legislation

The Bulgarian Government has drafted the necessary legal framework for biofuels production, which now needs rapid implementations. However, Government's concerns about reduced budget revenues are still leading to sub-optimal detaxation policies.

6.6.1. Excise duty level and detaxation schemes

Bulgaria is one of the EU Member States with the lowest excise levied on mineral diesel. In July 2007, the excise amounted to €273/m^3 (compared to €694 in the UK). Considering the 5% blending mandate, it would be useful to consider raising the excise (to offset loss of resources for the state budget) while authorising a full exemption on the FAME content in blends (to stimulate biodiesel production).

6.6.2. Blending mandate

Starting with a 5% mandate as foreseen by the new RES law is a quite ambitious move, which will certainly encourage the rapid deployment of the domestic biodiesel market. However, it seems commendable to introduce a penalty system that will oblige fuel suppliers to blends biodiesel and thus create sufficient demand for biodiesel producers. In that sense, there seems to be case for introducing a similar system as the French TGAP (general tax on polluting activities), whereby fuel suppliers can reduce the amount of the tax by blending the corresponding amount of biofuels.

6.6.3. Support to investments in favour of biodiesel production

Investment support for biofuels production in Bulgaria is granted by the European Bank for Reconstruction and Development (EBRD), the EU-Programme SAPARD, the Bulgarian Ministry for Environment, the Bulgarian EcoFund, the Government Energy Efficiency Fund (granting soft loans to biofuels producers after adoption of the new law).

Support to investment will be crucial as illustrated by the case of the company Papas Olio, which is making its 15 million euro, 100,000 tonnes/year bio-diesel project conditional to low-interest loans by the Bulgarian Government.

6.7. Research and Development

In the field of research and development, projects on new feedstock adapted to the Bulgaria's specific meteorological constraints are to be favoured.

Conclusions

Biodiesel appears as a rapidly developing sector in Bulgaria. Overall, a real potential for biodiesel development in Bulgaria exist. Despite the fact that, sofar, only limited quantities have been produced, a number of facilities exist or are in the process of being set up. These could be improved in the years to come, provided that an appropriate investment framework is ensured. Most importantly, it will be essential to guarantee the existence of a stable and viable market for biodiesel, with sufficient outlets for producers.

In that sense it will be necessary to increase public awareness in favour of biodiesel use. Public information on biodiesel is currently too scarce in Bulgaria and the lack of a large-

scale study conducted by the Government on the potential of biodiesel production is an additional difficulty. Information dissemination on biodiesel use remains largely informal, between involved stakeholders (producers, oil companies, technology providers).[21]

Overall, the transposition of Directive 2003/30 in Bulgaria and the implementation of related support measures will be a multi-faceted task, combining agricultural, transport, fiscal policies but also awareness raising campaigns. Indeed, it will be essential to trigger a change in consumer culture.[22]

[21] SWOT Analysis for Bulgaria, Biodiesel Chains Project.
[22] Vladislava Georgieva, BIOFUELS – the alternative fuel or fuel of the future in United Europe, Ministry of Economy and Energy, 2007.

CYPRUS

1. Introduction: current situation of biodiesel production and market

1.1. Main features of the biodiesel market

1.1.1. Production and capacities

There are only two biodiesel plants already operating in Cyprus since 2005: one in Limassol, producing around 1,000 tonnes per year, the other in Larnaka that started production in 2007 with a 5,000 tonnes/year capacity.

1.1.2 Main actors

Since there are only two small scale domestic biodiesel producers biodiesel production is not continuous and sofar does not have a real market in the island. In Cyprus there are no national biofuel associations.

1.1.3 Raw material supply

No oilseeds are produced in Cyprus as 2005 figures suggest. Cyprus will heavily rely on imports because of scarcity of cultivable lands and lack of irrigated water.

1.1.4 Consumption

Small quantities of biodiesel made from used cooking oils were produced and used for private purposes. About 25.000 litres were blended in 2005 by a small oil distributor.
According to EBB estimations, the 5,75% target would represent respectively 51.000 tonnes (this if only biodiesel - and no bioethanol - would be used to fulfil the target).

1.1.5 Norms and standards for biodiesel

Cyprus went for an early implementation of CEN standard EN 590 and EN 14214. This was provided for in Ministerial Order KDP 318/2004 issued under the Law on the specifications of oil products and fuels n°148(I)2003. Furthermore, the Ministerial Order allows the use of higher biofuels blends (above 5% in volume) and biofuels in pure form, provided that the standard EN 14214 is applied and emission requirements are met.

1.2. Legislative framework in support of biodiesel production

1.2.1. Transposition of Directive 2003/30 and national indicative targets

Directive 2003/30/EC has been transposed in national law by a specific legislation on the promotion of the use of biofuels or other renewable fuels for transport purposes (n°66/(I)2005), which has been in force since June 2005. It specifically provides for long-term national programmes to promote the use of biofuels The Ministry of Commerce has set national goals for diesel substitution by Biodiesel at 1% for 2005. The ministerial ordinance 318/2004 allows blending mineral diesel with biodiesel setting the relevant specifications.

1.2.2. Taxation

The excise duty for regular diesel amounts to 143 CYP/m³ which equals to about 245€/m³.

The law n° 66(I) of 2005 regarding excise duty taxes was amended by a bill and a decree of the Department of Customs and Excise providing for a full exemption of the excise duty for biofuels.
That exemption scheme was notified to the Commission in October 2006 with further information in February 2007 and raised no objections. The aid scheme would cost about 3.77 Million € and is approved until the end of 2010. The biofuel part of the transport fuel will be fully exempted from the excise tax , but will still be subject to the 15% VAT and to a levy of 0.33 Cyprus cents per litre (0,56 €cents/litre) for covering costs of maintaining security stocks of fossil fuels.

1.2.3 Direct subsidies

Since February 2004, a grant scheme exists for investments in renewable energy sources and is being operated by the Energy Service under Law N.33 (I) /2003. It can cover a maximum of 40% of the amount required, with the maximum eligible amount being 680.000€. Four applications have been submitted for subsidizing biodiesel plants of a total capacity of 6.000 tonnes a year.

The grant scheme also provides for subsidies for legal entities under the category "Energy Saving " of about 1.200€ for hybrid and vehicles running on alternative fuels. The maximum number of cars per company is limited to 7.

1.3. Research efforts for the promotion of biodiesel

Since October 2004, the Research Promotion Foundation of Cyprus is funding a project entitled "*Evaluation of Energy Crop Potential in Cyprus*". The aim is to assess the feasibility of some species as energy crops on the basis of experimental cultivations. The project is being implemented by the Cyprus Institute of Energy, the Agriculture Research Institute and the National Technical University of Athens. The grant aid for this project is 136.000 CYP (236.000 Euro). Results are expected to be presented by the end of 2007.

2. SWOT Analysis

2.1. Strengths

The supply chain of biodiesel can be characterised by relatively short transport distances, in case of domestically produced and locally used feedstock. The increasing need of feedstock will contribute to the use of set-aside land and prevent further land degradation (anti-desertification). Any plant has a good access to sea. In Cyprus, small & medium scale producers are enthusiastic to participate in the process of Biodiesel market development which can also build up a "positive image" of the industry (decentralised and small-scale producers).

2.2. Weaknesses

There is a significant lack of available cultivable land and water for irrigation in Cyprus. Additional small farming size and low yields prevent cost effectiveness. As a consequence, biomass production cost is too high, mainly due to irrigation and nitrogen input requirements. Due to the high biomass costs and the lack of adequate land and water availability, feedstock quantities, heavy imports of either seeds or vegetable oils are expected.
Biodiesel produced by conventional sunflower oil does not to comply with the maximum admissible iodine number, specified in EN 14214.
Domestic exploitation/processing of by-products is difficult.
There is a lack of administration and management know-how at every stage of the emerging biodiesel market.
There is no crushing capacity for vegetable oils in Cyprus. Economic viability is low because of seed yields and absence of domestic market for the by-product glycerine.
The lack of land and water imposes Biodiesel imports. This fact drives for a major counterproductive factor (lack of significant motives toward domestic feedstock production).
The energy cropping premium of 45 €/ha is too low to be considered as an incentive for farmers with low farming size. Additionally the statutory framework for biodiesel in Cyprus is still incomplete.
Finally there is a quality debate between biodiesel & pure plant oil.

2.3. Opportunities

Waste vegetable oils could be an interesting raw material.

Identifying low input supply options is part of the land use strategies for the future climate (e.g. water restrictions, etc.). New and more efficient conversion technologies may be found and existing technologies may be improved. Expansion of the diesel market should enhance the development of biodiesel, as it can reduce imports. Opportunity to increase the energy cropping premium or shift the existing subsidies from agricultural cropping systems towards energy cropping systems.

Develop a National Biomass Action Plan that would coordinate biomass policy to promote heating, electricity and transport.

Opportunity to ensure consistency between energy and environmental policies and enhance the cooperation between relevant organizations

2.4. Threats

Biofuel production is limited to feedstock production and land availability. Feedstock production largely depends on many variables of nature, including extreme weather conditions – such as frequent draught years as in Cyprus.

There is a lack of normalisation of high blends and technical difficulties concerning the control of quality and economics of the market force the relevant governmental departments to delay the Biodiesel market development instead of promoting it.

The absence of public transportation in Cyprus hampers a larger and structured market development for biodiesel, since there is not the possibility of:

- ⇒ exploiting the public fleets for biodiesel promotion
- ⇒ immediate use of Biodiesel (as for the effort of achieving the national goal) in such fleets

Other threaths may be represented by the low cost supply from neighbouring Balkan countries, the very strong political lobby for fossil fuels in Cyprus, the fact that environmental unions are bringing forth concerns about the import of GMOs used for biofuels.

Eventual end-users' concern about biodiesel performances in new cars and trucks engines could be amplified by the lack of public information on biodiesel.

3. Main Drivers of biodiesel production

The necessity of complying with EU biodiesel and biofuels targets under Directive 2003/30 as well as political pressure form DG Transport and Energy represent a major driver. The tourist based economy of the island linked with a tradition of welcoming guests in an environmentally protected frame also plays an important role towards environmental efforts. Tax exemption schemes established for biofuels represent the practical driver for producers.

4. Main Obstacles for the further development of the biodiesel market

The main obstacles that prevent an emerging biodiesel market in Cyprus are firstly the lack of water for irrigation and secondly the scarcity of cultivable land. Additionally small plot sizes make domestic biodiesel feedstock production nearly impossible. Imports are required. Limited end users (no public transportation). Marketing of pure biodiesel is illegal under present legislative provisions.

5. Trends and future scenarios

Given the fact that wood potential is low in Cyprus and second generation technology very expensive it is questionable whether that technology would be economically viable at present conditions.

6. Recommendations

6.1. Feedstock

6.1.1. Agricultural feedstock

A prerequisite for obtaining biodiesel feedstock is to ensure that favourable conditions for cultivation are realised. The main problem is irrigation and water availability. The advantage of being an island is that there is an easy access to sea-water transported supply. Because of highest solar potential of the EU (Cyprus is the first EU ranked in per capita solar thermal power installed) concentrated solar power desalinisation plants could provide enough irrigation water and renewable electricity. Irrigation methods could be applied from best practice countries having similar conditions (e.g. Israel).

The ongoing efforts to find suitable energy crops for Cyprus needs to be pursued, the ongoing project “Evaluation of Energy Crop Potential in Cyprus” is a good initiative heading in this way. New adapted oilseed plants requiring low inputs and which may grow in semi arid conditions need to be identified, in this respect Jatropha may be a very promising alternative crop.

6.1.2. Non-agricultural feedstock

There is considerable potential for using recycled vegetable oils due to the tourist sector. A great number of hotels and restaurants could deliver the necessary raw materials which needs adequate incentives and facilities for recycling. The potential of supply of used cooking oil in Cyprus should be evaluated.

6.1.3. Research

The research project on energy crops for Cyprus is still ongoing; results are expected to be disseminated by the end of 2007. Another research should be focussed on the evaluation of the potential of used cooking oils for biodiesel production. The possibility to produce biodiesel from algae is currently investigated in Malta, which would ensure the country’s self-sufficiency in terms of available raw materials. KOSECP is setting up a research centre with Russian scientist to explore this possibility. Since the conditions of Malta are similar to the ones in Cyprus in this respect, the outcome of that research project would be very interesting to the Cypriot situation.

6.1.4. Long-term contract with feedstock suppliers

Long-term supply contracts should be concluded between used cooking oil producers (hotels, restaurants) and biodiesel producers. Those supply contacts would provide for “win-win situations” since biodiesel made of used cooking oil is a revalorisation of waste having thus the best GHG balance.

Bilateral trade agreements and long term contracts for feedstock supply from neighbouring countries of the Balkan could also constitute a main driver for the biodiesel industry in Cyprus. Since supply costs are lower in those countries, the transport costs could largely be offset. This would especially be the case since most of the transport is made by sea and all the plants have an easy access to imported goods. More imports would also benefit to the taking off of crushing capacities in Cyprus and provide valuable meals used for animal feeding.

6.2. Processing

6.2.1. Crushing capacity and technology

There is only one small oil seed crusher company “Ambrosia” situated in Larnaka which uses predominantly imported rapeseeds. The crushing capacity is evaluated at around 6.000 tonnes per year which is sufficient for supplying current capacities. The easy access to sea is a good strategic location for processing plants with a potential to supply the domestic market depending on imports of vegetable oils. Since Cyprus depends on imports of oilseeds establishing higher crushing capacities would provide for the development of the local economy and job opportunities.

6.2.2. Esterification capacity and technology

The esterification capacities are very small (6.000 tonnes) and of own technologies. As those plants are mainly “home made technology” that may pose serious biodiesel quality problems.
Multi-feedstock plants would allow wider uses of feedstock and in the same time modern technology are more adapted to produce high quality biodiesel in a more efficient way. In theory, only one small multi-feedstock plant with a typical capacity of 50.000 tonnes/year would suffice for Cyprus fulfilling the 2010 target, but it would be recommendable to install and use a very high technology plant in order to fully benefit from a versatile production unit able to transform the widest possible range of biodiesel raw material in a suitable quality end product.

6.3. Quality of final product

6.3.1. National standard

Biodiesel produced by sunflower oil does not to comply with the maximum admissible iodine number, specified in EN 14214. With high oleic types of sunflower (HOSUN), this problem could be solved. Otherwise derogations shall apply to Cyprus for a broader use of biodiesel feedstock.

6.3.2. Quality consortium, association of biodiesel producers

There is no national biodiesel association or authority dealing with biodiesel quality issues. This is mainly due to the lack of know-how in this field. The lesson learned in Germany indicated that quality assessment is crucial for the pure biodiesel market to take off. Therefore it is crucial to establish a neutral authority monitoring the biodiesel quality of domestically produced or imported biodiesel (the strict application of the EN 14214 norm is fulfilling this purpose).

6.4. Marketing

6.4.1. Marketing of biodiesel

The market is quite limited in Cyprus because of its small population (below 800.000). However the per capita car ownership is the 5th highest in the world. This is largely due to the fact that public transportation is either inexistent or undeveloped. There were about 3.300 buses, 120.000 trucks, 2.000 taxis and 350.000 private vehicles registered in 2005. Diesel engines largely dominate in the transport sector (42% diesel, 25% gasoline).
Focus should therefore be driven to the marketing of biodiesel in the emerging public fleets and private passenger cars.

6.4.2. Marketing of glycerine

There are currently no processors of glycerine in Cyprus. Therefore the market is inexistent.

6.4.3. Marketing of by-products

There is no domestic production of meals, so all meals need to be imported. In 2005, 118.000 tonnes of soya meal and 39.000 tonnes of sunflower meals were consumed. That situation would change once the crushing capacities would be increased.

6.5. Logistics

Cyprus has the advantage to allow easy access of the market players to sea. The processing industries should therefore ideally be located close to the shipments terminals and the necessary infrastructure consolidated in order to minimize transportation costs and increase efficiency of the production chains.

6.6. Legislation

6.6.1. Excise duty level

The excise duty for regular diesel amounts to 143 CYP/m³ (245€/m³) which is the second lowest excise in EU-27. The minimum excise adopted by the Energy Taxation Directive 2003/96/EC is set at 302€/m³ and the average EU excise amounts to 322,48€/m³. Therefore it would be highly recommended that the diesel excise is considerably increased, possible with a budget neutral approach where the tax increase could correspond to the necessary de-taxation needed to make biodesel fully competitive into the local market.

6.6.2. Detaxation schemes

A biofuels aid scheme providing for full excise tax exemption for biofuels was introduced in 2007 which would cost about 3,77 Millions € and is in force until the end of 2010. However, the biofuel part will still be subject to the 15% VAT and to a levy of 0.33 Cyprus cents per litre (0,56 € cents/litre) for covering costs of maintaining security stocks of fossil fuels.
Since the excise duty level is by far too low considering high feedstock prices, the effectiveness of this aid scheme is highly questionable. Promoting the domestic production of biofuels coupled with more imports of biodiesel would also lower the necessity to maintain security stocks of fossil fuels subject to more volatile market conditions.

6.6.3. National mandates and obligations

The Ministry of Commerce supports efforts regarding the launching of the biodiesel market and indicated that blending of mineral diesel with biodiesel will eventually become mandatory. Biofuel mandates have proven to be an effective promotion tool if the sanctions in case of non-fulfilment of the targets are considerably higher than the biofuel production costs.
Placing additional biofuels obligation on mineral oil suppliers would also lower the burden on the state budget. Therefore rapid implementation is essential. However considering the fact that the lobbying power of the fossil fuel industry is strong in Cyprus, it is unlikely that an effective biofuel mandate (i.e. with strong sanctions in case of non fulfilment) would be implemented in Cyprus.
In this respect an appropriate “policy mix” would provide for blending obligation coupled with a general obligation to bring into the market biodiesel in pure form (captive fleets, adapted vehicles). The latter should be subject to full tax exemption.
The Ministry of Commenrce has assigned the preparation of a national Biomass Action Plan, to set up targets and guidelines for the biomass contribution to heat and power generation and transport biofuels.

6.6.4. Support to investment

Direct aid shall be granted upstream to the feedstock supply chain which constitutes the main barrier to the increase of biodiesel production in Cyprus. The forms of direct investment could take the form of aid to farmers cultivating oilseeds or other alternative crops suitable for the climate of the island and incentives for collection of used cooking oil and recycling of animal fats if used for biodiesel production. Investments should be targeting the adaptation of the logistics in a view to process higher imports of feedstock or biodiesel. In priority crushing capacities need to be increased. Dedicated infrastructure for pure biodiesel use shall be developed in urbanised areas.

6.7. Research and Development

The main focus of research should be aimed at finding suitable crops to the conditions of Cyprus. Once the potential and feasibilities of domestic feedstock supply assessed, the remaining need of feedstock shall be covered by imports. Given the political situation, the need for further feedstock from the more agricultural northern part of the island and/or from neighbouring countries like Turkey could offer good opportunities for the political parties to work for a common goal like the development of a sustainable energy policy stimulating mutual benefits for the two Cypriot communities.

GREECE

1. Introduction: current situation of biodiesel production and market

1.1. Main features of the biodiesel market

1.1.1. Production and capacities

Production started only in December 2005 with 420 tonnes biodiesel produced by Hellenic Biopetroleum. Biodiesel production took off in the next year totalling about 42.000 tonnes of biodiesel.
Biodiesel capacities more than doubled from 35.000 tonnes in 2005 to 75.000 tonnes in 2006. A sharp increase of biodiesel projects has been realised. Currently 9 biodiesel plants with a total capacity of 440.000 tonnes per year are operational in Greece. However capacities are expected to have only but marginal increase if current market conditions persist.

1.1.2. Main actors

The bigger biodiesel producer is Agroinvest SA with a total capacity of 200.000 tonnes per year concentrated in a single production unit. Other biodiesel producers run biodiesel plants with an average capacity of 30.000 tonnes.
One of the main actors in the field of renewable energy is the Centre for Renewable Energy Sources (CRES).

1.1.3. Raw materials

Most of biodiesel raw materials (70%) are imported by Greek producers (mostly rapeseed and soybean oils). The remaining 30% is domestically produced: cotton-seed, sunflower and used cooking oils. In 2005 most of the oilseeds produced locally were cottonseeds (720.000 tonnes) which produced 39.000 tonnes of cottonseed oil. About 26.000 tonnes of sunflowerseeds were produced in 2005, the quantity rode to 31.000 tonnes in 2006. In 2007 is expected a production of 22.000 tonnes.

1.1.4. Consumption

In 2004 fuel consumption for transport purposes in Greece reached 2.036.000 tonnes of diesel and 3.814.000 tonnes of petrol. The estimated consumption of diesel for 2010 is evaluated at about 2.3 Million tonnes. About 55.600 tonnes of biodiesel were consumed in Greece (including imports) in 2006.
It is estimated that in order to reach the 5,75% target for 2010 about 150.000 tonnes of biodiesel would be required.

1.1.5. Norms and standards for biodiesel

Biodiesel distributed in Greece has to comply with the specifications of the ELOT EN 14214 standard, adopted by Decision 334/2004 of the Supreme Chemical Council on automotive fuels. The ELOT EN590 allows to blend biodiesel up to 5% in volume. At a later stage, the Greek government planned to distribute blends of biodiesel with diesel exceeding 5% in volume and also pure biodiesel.

1.2. Legislative framework in support of biodiesel production

1.2.1. Transposition of Directive 2003/30 and national indicative targets

Directive 2003/30 has been transposed through the Greek Act 3423/2005 on the introduction of biofuels and other renewable fuels on the Greek market. This legislation sets down a national indicative target of 5,75% for 2010.

1.2.2. Taxation

In Greece, the normal excise duty for diesel is of 276€. Biodiesel produced within the quotas is totally exempted from the excise.

1.2.3. Direct subsidies

No direct subsidy is applicable for biodiesel sofar in Greece.

1.2.4. Mandates

According to the Greek authorities, legislative measures applying to biofuels should be revised as from 2008 and should establish mandatory targets, both for biodiesel and for bioethanol.

1.2.5. Quotas

A provision incorporated in Article 34 of Act 3340/2005 provides for a full exemption from excise duties for the following quantities of pure biodiesel:
- for 2005: 51 000 m³ (in 2005)
- for 2006: 91 000 m³ (published by the end of 2005)
- for 2007: 114 000 m³ (published in December 2006)

The full exemption represents about 33 million € for the year 2007.

1.3. Research efforts for the promotion of biodiesel

Greece has focused on some pilot tests for biofuels only.

2. SWOT Analysis

2.1. Strengths

Beside a quite high and encouraging awareness about biodiesel among Greek citizens, Greece can count on diverse feedstock options: e.g. sunflower, rapeseed, soy and especially cotton (because of the flourishing Greek cotton industry). Biodiesel production capacities are very high. Uncertain policy framework (CAP reform) leads farmers to seek new cropping options. Another asset is represented by the establishment of some regional support for the first Biofuels Platform (in central Greece).

2.2. Weaknesses

Semi-arid climate conditions restrict yield potentials and lack of available cultivable land: average yields for rape and sunflower seed are about 1,75 tonnes/ hectare which is nearly half of the EU average. Oil yields of cotton seeds are low (about 325 litres of oil/ ha). Irrigation and temperated climate is quite essential for crops like rape which is lacking in Greece.

Small farming size and low yields prevent cost effectiveness; therefore most of the biodiesel plants rely on imports. It is estimated that only about 1/3 of the feedstock for biodiesel production may be supplied domestically. The current quota system does not create secure market conditions for investors. There is also an ongoing quality debate on biodiesel versus pure plant oil.

2.3. Opportunities

There is a need to identify low input supply options as part of land use strategies to cope with more stringent future restrictions (e.g. water restrictions, etc.). Optimisation of the use of residues and processing of by-products could also be crucial to improve biodiesel economics.

Increase biodiesel uses for heating applications may also provide more market opportunities. The introduction of a ‘policy mix’ with tax exemptions & mandatory targets will enable to create more certain market conditions.

2.4. Threats

Quality: Variety of feedstocks with different physical and chemical properties.

Market: not well established, limited end uses (only transport sector in certain areas for certain end users) and inflexible production quotas.
Policy: uncertainty deriving from the annual quota system and annual allocation of detaxation.
Sustainability: careful selection of crops to minimise risks of erosion, water scarcity, etc. in the future supply chains.
International trade: low cost supply from neighbouring Balkan countries although this is also an opportunity for cheap raw materials use.
Awareness: Create communication channels & synergies with the farming community.

3. Main Drivers of biodiesel production

Fossil fuel taxes are not applied to biofuels but limited to annual production quotas.

4. Main Obstacles for the further development of the biodiesel market

The main obstacle for further development of biodiesel production is due to the low availability of domestically produced feedstock. The market for diesel driven vehicles is also restricted in Greece with private diesel cars only authorised in the region of Athens.

5. Trends and future scenarios

The potential for 2nd generation technologies is rather limited because of limited growth of bushes and straws and limited forest areas, most of which protected.

6. Recommendations

6.1. Feedstock

6.1.1. Agricultural feedstock

Olive oil is extensively produced in Greece with very good yields but is a very expensive commodity which would not allow biodiesel made of olive oil to be competitive. Currently only cottonseed and sunflowerseeds are produced in Greece. Average yields for rape and sunflower seed are very low for Greece (about 1,75 tonnes/ hectare) and oil yields of cotton seeds are low (about 325 litres of oil/ ha). However, recent figures have demonstrated that it is possible to grow rapeseed in Greece (around 500 ha in 2007). Synergies have to be established with the existing industries like the dominant cotton industry.
New adapted oilseed plants need to be produced in Greece requiring low inputs and which may grow in semi arid conditions.

Most of the raw material would need to be imported if no alternatives to rape, sunflower and cotton would be used. The necessary feedstock may be supplied by neighbouring countries like Bulgaria, Romania, FYROM and Turkey provided that transport costs remain low.

6.1.2. Non-agricultural feedstock

Used cooking oil and animal fats may also play an important role for biodiesel production in Greece. The potential and availability of such feedstock need to be further assessed.

6.1.3. Research

New adapted oilseed plants need to be produced in Greece requiring low inputs and which may grow in semi arid conditions, in this respect Jatropha may be a very promising alternative crop. A focus should also be taken on the use of cottonseed oil for biodiesel

purposes. Research in order to provide low cost olive oils and allow a better use of olive oil residues may also be an alternative. Research initiatives on higher-yielding crops and more efficient growing techniques have been initiated in Greece. Those initiatives need to be supported and results widely disseminated.

6.1.4. Long-term contract with feedstock suppliers

Bilateral trade agreements and long term contracts for feedstock supply from neighbouring countries of the Balkan could also constitute a main driver for the biodiesel industry in Greece. Since supply costs are lower in those countries, the transport costs could largely be offset. More imports would also benefit to the existing crushing capacities in Greece and provide valuable meals used for animal feeding.

6.2. Processing

6.2.1. Crushing capacity and technology

The national seed crushing capacity of Greece is quite important. The major oilseed crushed in 2005 were soybean and cottonseed with (respectively 352.000 tonnes and 296.000 tonnes) followed by sunflowerseeds (54.000 tonnes). The three biggest crushing facilities are located in Korinth (Soya Mills SA), Evia (Soya Hellas SA) and central Greece (Agroinvest S.A). Cotton seed crushing takes place in more than 60 plants disseminated in Greece.

6.2.2. Esterification capacity and technology

The existing esterification capacity would already allow Greece to fulfill its 5,75% target by 2010 with current projection of diesel consumption. If running at full capacity, Greece could even export about 50% of its domestic biodiesel. Greek biodiesel plants rely on a quite recent and performing engineering technology, since most of them were built up quite recently (between 2006 and 2007) and the large majority are multi-feedstock plants.

6.3. Quality of the final biodiesel product

6.3.1. National standard

Biodiesel distributed in Greece has to comply with the specifications of the ELOT EN 14214 standard, adopted by Decision 334/2004 of the Supreme Chemical Council on automotive fuel. Since 2007, the ELOT EN590 allows to blend biodiesel up to 5% in volume. At a later stage, the Greek government planned to distribute blends of biodiesel with diesel exceeding 5% in volume and also pure biodiesel. Giving the favourable climate conditions in summer time, there are good opportunities to use pure biodiesel made of various feedstocks suitable to hot climate conditions (animal fats, palm oil etc). The standards would need to be adapted accordingly either by a local decision of the standardisation body or by law.

6.3.2. Quality consortium, association of biodiesel producers

There is no national association of biodiesel producers, nor oilseed crushing association which effectively promotes the biodiesel use in Greece. At EU level the major producers are federated in the EBB. In addition, the current quality debate for biodiesel and pure plant oil is not adequately addressed by local technical and research bodies on biofuel quality.

6.4. Marketing

6.4.1. Marketing of biodiesel

The Greek diesel market is quite particular since diesel cars can only be owned by companies and not by private companies (at the exception of Athens). Diesel engine passenger cars and light commercial vehicles circulation in urban areas such as Athens and Thessalonica are not permitted (the fumes are said to destruct monuments). Therefore demand for diesel also blended with biodiesel is limited within those conditions. An

exemption to ownership rules and circulation in rural areas should apply to captive fleet and light commercial vehicles running on pure biodiesel.

6.4.2. Marketing of glycerine

-no data available-. Glycerine can be used in a lot of sectors (energy, chemical and feed). Currently there is no plant in Greece allowing to upgrade the crude glycerine to pharma grade glycerine which offers a wider potential for chemical applications.

6.4.3. Marketing of by-products

In 2005 about 482.000 tonnes of meals have been produced in Greece of which 326.000 tonnes were imported. The major part of meals were originated from the processing of soya and cotton. The import/export balance indicated a clear deficit of meals (262.000 tonnes for 2005).
Domestic biodiesel production will therefore considerably increase the self-sufficiency ratio of domestically produced high quality meals.

6.5. Logistics

There is currently no logistic for the marketing of high blends or pure biodiesel in Greece.

Public filling stations for captive fleets and other end users (haulage sector) should be developed in priority in urbanised areas. The costs related to the infrastructure should be shared between fuel suppliers, government funds and biodiesel producers within long-term supply contracts.

6.6. Legislation

6.6.1. Excise duty level

The normal excise duty for diesel is set at 276€/m³ which is at the low end of EU-27 excise duties and below the minimum excise of 302€/m³ adopted by the Energy Taxation Directive 2003/96/EC. The average EU excise is set at 322,48€/m³. It would be recommended to increase the diesel excise in order to create more differential and thus incentive and secondly in order to make biodiesel detaxation cost-neutral for the national finances.

6.6.2. Detaxation schemes

The detaxation schemes have proven to be efficient for bringing biodiesel into the Greek market. In order to secure a favourable framework for investments in the sector, it is recommended to launch additional quotas at least with one year in advance with increasing amounts to secure investments. Maintaining full tax exemption for the biodiesel components while increasing the excise on diesel would also ensure that the scheme is profitable for biodiesel producers.

6.6.3. Mandate

According to the Greek authorities, as from 2008 the biofuel legislation should be revised and should establish mandatory targets. Biofuel mandates have proven to be effective if the sanctions in case of non-fulfilment of the targets are considerably higher than the biofuel production costs.
Placing additional biofuels obligation on mineral oil suppliers would also lower the burden on the state budget. Therefore rapid implementation could be very positive, provided that the penalties for non-implementation are consequent.

6.6.4. Support to investment

Direct aid shall be granted upstream to the feedstock supply chain which constitutes the main barrier to the increase of biodiesel production in Greece. The forms of direct investment could take the form of incentives for collection of used cooking oil and recycling of animal fats if used for biodiesel production and investments for logistics adapted to greater shares of imported oilseeds.

Bilateral trade agreements and common investment projects favourable for feedstock production with neighbouring countries could also constitute a main driver for the biodiesel industry in Greece.

6.7. Research and Development

Research activity should be concentrated on the development of crops adapted to the conditions of Greece. In order to create more favourable acceptance the impact of biodiesel combustion emissions on ancient monuments should also be evaluated by an independent research institute.

POLAND

1. Introduction: current situation of biodiesel production and market

1.1. Main features of the biodiesel market

1.1.1. Production and capacities

In 2005 Poland produced 100.000 tonnes of biodiesel which slightly rose to 116.000 tonnes during the following year, in 2006. Current biodiesel production capacity is quite limited, but number of large-scale projects should be realised in the next year 2008.
Capacities increased from 100.000 tonnes per year in 2005 to 150.000 tonnes in 2006. Currently there are three plants operating totalling a capacity of 250.000 tonnes. By the beginning of next year such capacities expected to double at least.

1.1.2 Main actors (biodiesel producers, end users, national federations)

Rafineria Trzebinia S.A is today the major biodiesel producer in Poland with an annual capacity of 100.000 tonnes. The biodiesel industry is supported by the Polish association of Rapeseed Producers (KZPR).

1.1.3 Raw material supply

Poland has extended surfaces of agricultural land, which position the country as the 3rd potential agricultural producer in the EU (after France and Spain). Agricultural land represents 60% of the surface of Poland.
The areas under cultivation include arable lands and those with permanents crops. They represent 14,3 Mio hectares in Poland. Rapeseed is the main feedstock processed in Poland. In 2005, Poland produced about 1.6 Million tonnes of rapeseeds of which 184.000 tonnes were exported. In 2006 production increased to 1.82 Million tonnes using an area of 700.000 ha.
According to the KZPR, rapeseed oil production increased by 52% between 2000 and 2005.

1.1.4 Consumption

Biofuels amounted to 0,92% of all transport fuels used in 2006 (compared to 0,47% in 2005), other sources suggest that the share of biodiesel in diesel consumption was 0,70% in 2006 (compared to 0,32% in 2005).
In 2006, 45.000 tonnes of biodiesel and 84.000 tonnes of bioethanol (Poland has an important tradition in terms of food ethanol – wodka etc. – production) were used in the transport sector.
In 2006, FAME production amounted to 116.000 tonnes but a large part of that was sold abroad to more favourable markets (especially in Germany).

Polish diesel consumption is estimated at 5 Million tonnes and 6 Million tonnes in 2005 and 2006 respectively. According to official figures, biofuels production in 2008 is estimated at 310.000 tonnes for biodiesel and 230.000 tonnes for bioethanol. According to USDA (October 2006), the 5,75% target means that in 2010 an estimated 650.000 tonnes of biodiesel and 370.000 tonnes of bioethanol will be used each year (based on estimation of fuel consumption for 2010).

1.1.5 Norms and standards for biodiesel

The *Act* on *Biocomponents and Liquid Biofuels* of July 21, 2006 as well as the *Fuel Quality Monitoring and Control Act*, of 25 August 2006 provide for technical requirements for biofuels. On 8 September 2006, a regulation from the Ministry of Economic Affairs providing for quality requirements entered into force. As a result of this new legislation, B100 and B20 can be sold for public and private use from 3rd of October 2006 onwards from labelled pumps. Both products have to meet quality standards published in the regulation.

The European Norm EN 14214 for esters has been adopted. The Polish diesel standard is as well adapted to the EU norm, currently as polish standard PN-EN 590.

1.2 Legislative framework in support of biodiesel production

1.2.1 Transposition of Directive 2003/30 and national indicative targets

Before the entry into force of the *Biocomponents and Liquid Biofuels Act*, the national indicative targets, based on the energy content of transports fuels were as follows:

- 2005: 0,5%
- 2006: 1,5%
- 2007: 2,3%

The level of the targets will be increased each year so that Poland can meet the 5,75% in 2010. In June 2007, the Polish Government announced the adoption of mandatory targets for the next six years (see mandates).

1.2.2 Taxation

On January 1st, 2007 a new decree from the Ministry of Finance amending the 2004 Regulation on Exemptions from Excise Duty, entered into force. The previous taxation scheme was revised because exemptions granted were larger than allowed under EU legislation. The Parliament approved additional incentives for biofuel production on May 11, 2007. Under the new legislation, the excise tax exemption for biofuel producers has been increased by about 5% for each litre of esters added to biodiesel while the excise tax for 100% biodiesel fuels has been reduced to almost zero:

- regular excise on diesel = 1 048 PLN/m^3 (279,61€/m^3)
- tax exemption for biodiesel blends (minimum 2% biocomponents) = 1,048 PLN per litre of added biodiesel (instead of 1,00 PLN/liter)
- final excise tax on B100 has been reduced to 10 PLN/m^3 (approx. €2,6/m^3), instead of PLN 212/m^3. B100 is also exempted from the additional road tax that is imposed on regular diesel, which was not the case in the previous version of the tax law.

The new taxation shall be implemented as from the date of publication of a European Commission decision confirming compliance of the state aid envisaged with the rules of the common market (this should be the case in the fall 2007.)

1.2.3 Direct subsidies

On September 24th, 2007 a new Act introducing an additional concession for producers of bio-components was adopted. The aim is to partly compensate the increased production costs of biodiesel. Producers would be able to subtract 19% of the difference between biofuel production costs and the costs involved in the manufacturing process of fuels with similar characteristics. The allowance will cover income gained from the beginning of 2007 and will be in force until 2014. This new provision, which still needs to receive EC Commission DG Competition approval, should cut state budget revenue for 2007 by some 31 Million €. In July, the Polish Ministry of Finance calculated that producing biodiesel is about PLN 1.5 (€0.40) more expensive than regular diesel. The aim of the new law is precisely to reduce this difference.

An additional support for farmers of 176 PLN per hectare is to be granted for those signing the long term contracts to supply feedstock to biofuel producers.

1.2.4 Mandates (if applicable)

As from 2008, yearly mandatory targets should apply for biofuels subject to fines in case of non-compliance.

2 SWOT Analysis

2.1 Strengths

Biomass is largely available locally employing traditional crops (sunflower, rape seed and even some cotton seed) and using conventional growing methods and equipment.

The supply chain of biodiesel can be characterised by relatively short transport distances (biofuels and biodiesel locally produced and locally used).

Biodiesel quality is regulated by a European norm, EN14214 and its corresponding Polish standard.

2.2 Weaknesses

There is lack of legal guarantees that the tax reductions and exemptions in Poland will be maintained in the long term, even though they have already been in place for more than a decade. Only since January of 2007 three different draft legislations have been presented.

The lack of clear legislation prevents trade in biofuels and rules out investment decisions in Poland. A proper information campaigns for farmers and consumers is missing.

2.3 Opportunities

In Poland individual groups of farmers are allowed and even encouraged to produce biodiesel for their own purposes, which constitutes a good opportunity, at same time representing a kind of threat.

There is an opportunity to develop a National Biomass Action Plan that would co-ordinate biomass policy to promote heating, electricity and transport. EU Directives and Polish national fuel strategies would represent a good opportunity for promoting biofuels, especially if their text was defined in a permanent way.

Additional area payment for energy cops would also be required in Poland to further exploit its agricultural potential for non-food. A mandatory blending of fossil fuels with biofuels if adopted quickly with the necessary fines in case of non-compliance could also have a very important positive impact. Tax exemptions and mandatory blending obligations could largely increase the use of pure plant oil and biodiesel.

2.4 Threats

One of the major threats is represented by the difficulty to keep a high quality level especially in biodiesel produced at the farm, the situation is worsened by the lack of normalisation for high biodiesel blends. The fact that individual groups of farmers are allowed and even encouraged to produce biodiesel for their own purposes could represent a risk if low quality product (which is normally the one produced in a farm) is then distributed for normal engines. The variety of feedstock with different physical-chemical properties may also affect quality.

Biofuels had a market share below 1% (2006) in Poland. Most of the Polish national production of biofuels is exported, confirming sofar the absence of real internal market condition for biodiesel, which, if they are not established may represent a threat for the future development of the industry.

3 Main Drivers for biodiesel production

Biodiesel production was triggered by simplified procedures allowing farmers to produce biofuels for own use and the early promotion of high biodiesel blends and pure biodiesel.
Mandatory targets will apply for biofuels as from 2008 under the pool principle subject to fines in case of non-compliance, if finally approved and enforced such a system will

constitute a main step in order to implement the strong political will existing in the Polish government towards the elaboration of norms improving environmental impact and giving the transport sector the opportunity of improving its performances towards Kyoto. This is in fact the main political driver behind all Polish efforts on biofuels, together with the intention of guaranteeing an additional outlet for the national agriculture which is now ending its re-conversion and integration within the CAP.
A new taxation scheme has also been notified to DG Competition by Polish authorities: it provides in practice for an almost complete tax exemption for the biodiesel part of blends. Pure biodiesel is also exempted from road tax, which constitute a further impulsion.

4 Main Obstacles for the further development of the biodiesel market

The governmental instability and the number of different biofuels legislation projects elaborated in the last years in Poland represents a major weakness for a sector which would need enough stability and a reliable legislative base to allow long term investment. Investors hope in a rapid implementation of the favourable legal framework set in 2007, however the new tax breaks seem to be still too small to offset additional costs related to biofuel production. Consequently, the price difference between biofuels and crude-oil based fuels may still be insufficient for resulting in a real shift of consumers' demand.

5 Trends and future scenarios

Poland has a huge biomass production potential offering different possibilities for end uses (biodiesel but also electricity, heating and cooling and transport). About 28% of Poland's area is covered by forests, second generation technology therefore has a potential to be developed there.

With the entering into force of the new legislatives measures elaborated and discussed in 2007, Poland will have more favourable market conditions for biodiesel, provided that the national agriculture will also continue to follow.

6 Recommendations

6.1 Feedstock

6.1.1. Agricultural feedstock

As already mentioned, Poland has considerable resources of agricultural land and the country ranks as the 3rd EU agricultural state. The KZPR forecasts 2007/08 acreage and production of rapeseed in Poland to increase by more than 10%. In September 2006, the Commission made a proposal aiming at extending the energy crops aid scheme to all Member States, including Poland. This further support increased the possibility to grow crops for energy use on Polish land.
Rapeseed oil is the most suitable feedstock for biodiesel use in Europe, Poland has a very good potential to increase yields and increase Rapeseed production under the proposed measures (it is worth reminding that rapeseed oil production increased by 52% between 2000 and 2005), in this sense it would be appropriate that measures to stimulate the full use of this encouraging farming potential are elaborated. This could include rules to promote log-term contracts between farmers and biodiesel producers, and or research in the field of new crop varieties suitable for biodiesel production.

6.1.2. Non-agricultural feedstock

Poland has a large number of private farms in its agricultural sector with the potential to become a leading producer in the EU. Poland has also an important potential in terms of

meat production and therefore a proven ability to supply animal fats that could be used for biodiesel production. However that potential has not been evaluated yet. It would be recommendable to establish a framework for such evaluation if not to build up the first steps towards a structured collection and recycling of these materials in Poland.

6.1.3. Research

Two projects for the building of innovative FAME production units were carried out under the framework "Programme of the Polish Federation of Engineering Associations, Special purpose projects for small and medium size enterprises". The two projects were subsidised with an amount of 68.378 € (271 500 PLN).

6.1.4. Long-term contract with feedstock suppliers

An important new provision of the recently adopted law states that 75% of biofuels produced in Poland should rely on special long term contracts (generally 5 years) with local farmers, providing for fixed raw material prices. In practice, this means that the share of feedstock that can be bought on the free market or imported from non-EU countries should not be greater than 25% of the total production. The 5-year contract agreement should include:

- The type and volume of raw material to be supplied in respective years to the contract
- The price per unit of the raw material delivered
- The definition of minimal requirements for the raw material
- Sanctions for breaching the contract

This provision obliges the biodiesel producers to buy almost exclusively raw materials for biodiesel production originated from Poland, while the mineral oil industry is explicitly authorised to buy outside Poland the biofuels that they will blend. The Polish Farm lobby pushed for this provision, considering that it could stabilise farm incomes by creating steady prices and consistent demand for grains used to produce biofuels. However it also significantly restricts the type of raw material available for biodiesel producers, since it is mainly rapeseed oil that can be provided by Polish producers under these special contracts. In the long term, this could lead even to a shortage in rapeseed production for the food sector. Overall, it does impose serious constrains on the biodiesel industry and makes the production less competitive than in other countries.
In that respect, the Government needs to ensure that additional demand of the feed and food sector may be satisfied and that additional feedstock may be used by biodiesel producers under the same conditions from imported raw-materials. Those measures would also prevent the risk of distorting the internal EU market.

6.2. Processing

6.2.1. Crushing capacity and technology

Crushing capacities are substantial in Poland. In 2005 about 1.2 Million tonnes of oilseeds have been crushed of which 98% were rapeseeds. Only one of the current 3 biodiesel plants runs a combined crushing facility (Elstar Oils – ONT Biopaliva SA in Malbork).

6.2.2. Esterification capacity and technology

Current capacity is at 250.000 tonnes per year, which will be increased to 520.000 tonnes in January 2008. If all the announced projects for 2008 would be realised, Poland may easily fulfil its 5,75% target for 2010. If favourable investment conditions persist, biodiesel capacity could reach about 890.000 tonnes per year by the end of 2009.
The existing plants are rather big plants (with 100.000 tonnes per year capacity in average) using recent technology of known technology suppliers (Agrartechnik, Ballestra etc).
However it is not clear yet whether multi-feedstock plants would be constructed in the near future allowing also biodiesel production from animal fats and used cooking oil. It is therefore

recommended to install and use a large scale multi-feedstock plant in order to fully benefit from transforming a wider range of biodiesel raw material in a suitable quality end product. That would also stimulate additional demand for recycled feedstock (animal fats and used cooking oil) for biodiesel production.

6.3. Quality of the final biodiesel product

6.3.1. National standard

On 8 September 2006, a regulation from the Ministry of Economic Affairs providing for quality requirements entered into force. As a result of this new legislation, B100 and B20 could be sold for public and private use from 3rd of October 2006 onwards. According to the new regulation, these products can be sold on petrol station only from labelled pumps. Both products have to meet quality standards published in the regulation

The European Norm EN 14214 for esters has been adopted instead. The Polish diesel standard is currently the PN-EN 590. In November 2005, the Polish Ministry of Economics signed a regulation which allows adding up to 5% of bio-components in regular diesel (this fuel do not need to be labelled on a petrol station). In September 2006 Polish Ministry of Economics signed regulation which allows using 20% blends and pure FAME as fuels (these fuels must be labelled at petrol station).

6.3.2. Quality consortium, association of biodiesel producers

There is national association representing the biofuel industry in Poland. The Polish National Chamber of Biofuels (KIB) represents 35 Polish biofuel producers which is acting also for the improvement in technological cooperation between producers and research institutes.

The Polish Association of Rapeseed Producers (KZPR) acts since 2000 as a lobby organisation for the oilseed growers and processors. That association is supported by the Polish Federation of Crop Producers.

A Regulation of the Minister of Agriculture and Rural Development of January 6th 2004 provides for quality certificates and accreditation of certification units and research laboratories for biofuels. Monitoring and controlling systems have also been in place for biofuels since the beginning of 2004.

Those bodies need to join and concentrate their efforts in an aim to ensure a high quality of the biodiesel products marketed in Poland. This would create more consumer confidence and secure demand for the pure biodiesel market. Providing strict monitoring activities and technical expertise may also constitute valuable cooperation towards the regulatory authorities who may need know-how in this rather new field.

6.4. Marketing

6.4.1. Marketing of biodiesel

The introduction of the concept of “captive fleet” in the new law has made it possible to use a wide range of liquid biofuels with high biocomponent content, other than those granted marketing authorisation, in vehicles and machines forming part of “captive fleets”.

Biodiesel producers can therefore sell 3 kinds of blends on the market: B5, B20 and B100. B100 is authorized for use in specific machinery and vehicles. Contrary to B5, B20 and B100 should be labelled at petrol stations. Selected fleets could use biofuels with different blendings, but should respect quality requirements that were edited in the decree issued by the Minister of Economy in September 2006.

As from 1st January 2007, farmers were allowed to produce biofuels for their own use at up to 100 litres per hectare of agricultural land, this without having to pay the Value Added Tax on these products. However, they will not be allowed to sell their own biodiesel on the market.

Although labelling requirements may act as an additional burden to the marketing of biodiesel products, it may also stimulate public awareness and additional demand for high blends and pure biodiesel. The costs associated with separate blending shall therefore be

covered by the fuel distributors. The burden of assuring quality controls could be shared by the quality consortium to which Polish biodiesel may join on a voluntary basis.

6.4.2. Marketing of glycerine

Glycerine could be sold as animal feeding stuff or as a chemical intermediate to the Polish chemical industry. A specific market needs to be created and in this sense the establishment of a Polish biodiesel producers association may have as a short-medium term aim the finding of potential valuable outlets for the glycerine product.

6.4.3. Marketing of by-products

Poland is an important rape meal producer, around 668.000 tonnes were produced in 2005 and 323.000 tonnes were exported. However Poland is importing considerable amounts or soya meal (1.8 Million tonnes in 2005). Boosting the domestic biodiesel production from rapeseed feedstock will therefore considerable increase the self-sufficiency ratio of domestically produced high quality meals.

6.5. Logistics

Since 3 kinds of diesel type fuels exist on the Polish market with separate labelling requirements, petrol stations need to have 3 pumps: B5, B20 and B100. Contrary to B5, B20 and B100 should be labelled at petrol stations.
Having those high biodiesel blends available will encourage car manufacturers to market vehicles able to run on those fuels. A national technology platform possibly including national biodiesel producers, car manufacturers, the newly created quality consortium and the fuel distributors should be created with an aim to address the new challenges posed by the different kind of fuels on the market.

6.6. Legislation

6.6.1. Excise duty level

There are currently three different levels of excise taxes for diesel in Poland, which are set as follow:
- Diesel <50mg/kg sulphur = 1180 PLN/m³ (314,95€/m³)
- low sulphur >10mg/kg sulphur and <50mg/kg sulphur = 1099 PLN/m³ (293,37€/m³)
- zero sulphur or less than 10 mg/kg sulphur = 1048 PLN/m^3 (279,61€/m³)

The excise duties for diesel are at the low end of EU 27 excise duties and below the minimum excise of 302€/m³ adopted by the Energy Taxation Directive 2003/96/EC.
The average EU excise is set at 322,48€/m³. In this frame it would be recommendable that the diesel excise levels would be appropriately increased. This especially crucial in order to make pure biodiesel competitive, since its cost structure sofar suffers from high feedstock prices.

6.6.2. Detaxation schemes

In response to continued industry complaints that tax breaks were too small to offset additional costs related to biofuel production, a new legislation was passed in May 2007. The excise tax exemption for biofuel producers has been increased by about 5% for each litre of esters added to biodiesel while the excise tax for 100% biodiesel fuels has been reduced to almost zero.

The tax exemption for biodiesel blends (minimum 2% bio-components) amounts to 1,048 PLN per litre of added biodiesel (instead of 1,00 PLN/litre). The final excise tax on B100 has been reduced to 10 PLN/m^3 (approx. €2,6/m^3), instead of PLN 212/m^3.

B100 is also exempted from the additional road tax that is imposed on regular diesel, which was not the case in the previous version of the tax law.

The new taxation is more favourable than the previous legislation (but needs to be approved by the European Commission). However, the National Biofuels Chamber still considers these changes as insufficient to avoid a reduction in the planned investment in biofuel production facilities. They stress that the tax breaks are still too small to offset additional costs related to biofuel production. Consequently, the price difference between biofuels and crude-oil based fuels is insufficient for the consumers demand to shift. This corroborates the idea developed also above that the excise tax for regular diesel should be considerably increased.
The Ministry of Agriculture also strongly criticised the new taxation scheme, fearing that it would fail to stimulate new investments in biofuel production, which would create a situation of oversupply of rapeseed, but this looks as quite unlikely to happen given the important potential demand for biodiesel if the product would be made competitive by appropriate excise duty levels.

6.6.3. Mandates

In June 2007, the Polish Government announced the adoption of mandatory targets for the next six years in energy content, which will be as follow:

2008: 3,45%
2009: 4,60%
2010: 5,75%
2011: 6,20%
2012: 6,65%
2013: 7,10%

These yearly targets must be reached in terms of volume of the fuels produced and sold on the market, the legislation does not specify the respective shares for biodiesel and bioethanol (total pool principle). Penalties are foreseen for companies failing to reach the mandatory targets. There will be three types of penalties, depending on branch sector, which the company represents.
The principle of the penalty will be a result of: K=5xWx(M-R)/100%, where K is the amount of the penalty (in PLN), W, the total income from fuels and biofuels that have been sold by company (in PLN), the M - national yearly target (in %) and R the percentage of bio components used by the company in total volume of fuels and biofuels sold and/or used.

The levels of target seems to be ambitious enough and move to the right direction of achieving a minimum 10% target by 2020 which Poland may easily achieve because of high domestic raw material availability. The penalty system may be quite effective and looks proportionate to the efforts spent in achieving the biofuel target, it needs to be proven if this mechanism can serve as a good example for future biofuel obligation schemes, but it is certainly recommendable to carry on in this direction.
In order to secure early and timely investments for the biodiesel sector, it is advisable to provide for binding targets in 2020 at least 10 years in advance.

6.6.4. Support to investment

An additional support for farmers of 176 PLN per hectare is to be granted for those signing the long term contracts to supply feedstock to biofuel producers.

Additional support for bio components and liquid biofuels production will also be provided under the Long-Term Biofuel Promotion Project 2008-2014 (implementing Art. 37 of the *Bio components and Biofuels Act*). The aim is to improve the cost effectiveness of the process as a whole, from the cultivation of crops, the production of bio components and the manufacture of liquid biofuels and liquid fuels blended with bio components up to the end use

of the biofuels. The programme should also ensure a stable operating environment for all market participants.

Fiscal solutions should continue to play a major role in ensuring cost-effectiveness of the production. In addition to excise duty relief at a rate close to the maximum allowed by Council Directive 2003/96/EC of 27 October 2003, corporation tax relief is also planned (the Sejm is currently preparing a Draft Act amending the Corporation Tax Act, which introduces corporation tax relief for biocomponent manufacturers). This measure could provide for additional support and incentives for moving to cleaner production methods.

Other financial support instruments offered by the programme include: removing biocomponents used as direct fuel from the list of products subject to fuel duty, a system of subsidies for farmers cultivating energy crops for use in bio component manufacture, investment support out of EU funds and a reduction of air pollution charges for entities using liquid biofuels in their vehicles.
Those financial support measures constitute a good example on how the polluter pays principle may be implemented or corrected when internalisation of external costs failed to apply.

Preferential treatment for public transport operating in conurbations, holiday resorts and nature conservation areas will be granted in case of use of vehicles using environmentally friendly fuels. An incentive to the use of biofuels, which will also apply to private individuals, will be a reduction of parking charges.
The effect of that measure needs to be monitored since price signals tend to have an impact on consumer behaviours. If the effect would lead to higher biodiesel demand is too early to predict since consumer behaviour may depend on wider factors (fluctuation of biodiesel prices, & availability of adapted vehicles etc).

Preferential treatment of public procurement purchases of vehicles and machinery fitted with engines able to use liquid biofuels is also foreseen. Most importantly, government departments will be required to gradually replace their vehicle fleets with vehicles able to run on liquid biofuels.
The green public procurement measure is considered as an effective tool to redirect state investments in renewable energy applications while showing the good example to its citizens.

The Programme also includes education and information measures, notably the introduction of liquid biofuels as a subject in curricula at all teaching levels, broad information campaigns addressed to all vehicle users and actions to encourage and motivate vehicle manufacturers to adapt their vehicles to the use of biofuels.
Raising awareness is essential and therefore should not only be limited to consumers and vehicle manufactures but shall definitely be extended to farmers who are the first target group of the biodiesel production chain.

Overall, those additional measures seem to be promising to the promotion of biodiesel and need to be implemented quickly.

6.7. Research and Development

There are eleven research projects relating to biofuels with completion deadline between 2006 and 2009. (The list of the different projects is available at EBB's secretariat). The funding allocated for these research projects amounts to 492.007€ (1 872 800 PLN). Additional 4 research and development projects were funded in 2006 for a total of 655.662€ (2 496 290 PLN).

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Although in the last years biofuels production was almost inexistent in Romania – the country missed the 2% EU target for 2005 - the biodiesel market is experiencing a recent but strong development. This is mainly due to adoption of a set of legislative support measures, notably the introduction of a 2% blending mandate for biodiesel. This was adopted as a response to recurrent criticisms by stakeholders for the lack of appropriate framework supporting biofuels deployment. Indeed, Romania had to wait its accession to the EU and the subsequent entry into force of the new Fiscal Code on January 1st 2007, to grant tax exemption for biofuels. The recently adopted scheme is giving significant perspectives for the biofuels/biodiesel, giving rise to considerable investments in that sector.

1. Introduction: current situation of biodiesel production and market

1.1. Main features of the biodiesel market

While the current biofuels production in Romania remains modest, investors have shown increasing interest in setting up biodiesel production facilities over the last months. Apart from the recent governmental incentives, this sudden interest can be explained mainly by the large farmland area available for biodiesel raw materials production, as well as low labour costs.

1.1.1. Production and capacities

In 2006, Romanian biodiesel production amounted to approximately 10 000 tonnes while production capacity was already 81 000 tonnes/year. Production capacity is estimated to reach 200 000 tonnes/year in 2007 and 400,000 t/year already at the end of 2008 which would be more than what is requested to reach the EU 10% target.

1.1.2. Major actors of the biodiesel market

1.1.2.1. Biodiesel producers

The biodiesel market presents a variety of actors, with both large production units and a number of very small projects.

In 2005, *Martifer* pioneered in announcing plans to invest in biodiesel production plants and raw materials in Romania, through its division *Prio (*formerly *Biomart*). The company announced plans to invest €47 million in building a biodiesel plant at Lehliu Gara, in the Calarasi County. The production should start end 2007 with a 100 000 tonnes/year capacity. An additional €16 million should be invested in a refinery. At a later stage, investments should also be made in crushing capacities.
Prio aims at providing some 30% of the biodiesel demand in Romania. *Martifer* also announced plans to acquire some 50 000 ha of land from *Agromart* - a rapeseed and flaxseed supplier - to guarantee biodiesel raw materials supply for this plant.

Since 2007, the Romanian edible oil producer *ULEROM* (part of the domestic food and agriculture holding company *RACOVA*) is operating a 60 000 tonnes/year biodiesel production plant, located alongside the company's edible oil plant in Vaslui, northeast Romania. The company is already planning to expand capacity to 120 000 tonnes/year, provided that sufficient demand for biodiesel on the local and international market arises.

Another company, *Man Ferrostaal* (division of the German truck manufacturer MAN) announced also in 2005 its plans to establish a farm centre and a biodiesel factory at Atel and Loamnes, Sibiu. The Atel project is expected to start production by the end of 2007,

while construction of the biodiesel refinery should have started in May already and the plant should be operational by 2008. *Man Ferrostaal* estimates that it would need approximately 120 000 ha of rapeseed each year, of a total 3 400 000 million ha of farmland in Romania.

Other producing companies include the crushing company *Ultex Tandarei* (60 000 t/y capacity), and *Autoelite* in Baia Mare (20 000 t/y).

Biodiesel projects that are currently being developed include the Constanta-based *Argus* company, *Expur SA* in Slobozia (Ialomita county) with 100 000 t/y capacity and *Procera Biofuels* in Fundulea (Calarasi county) with a 35 000 t/y capacity. Spanish investors are said to plan spending some €18 million in the north eastern county of Iasi. The Romanian edible oil producer *Prutul* intends to invest €25 mln over the next three years to modernise production facilities and build a new oil and possibly biodiesel plant.

1.1.2.2. Edible Oil producers

The crushing company *Prutul* produced some 25 000 tonnes of edible oil in 2006 and is planning to reach a 12% market share. Other major edible oil producers include *Bunge Romania*, *Argus*, *Cargill Oils*, *Ulvex* and *Ulerom*.
Romania holds a very strong position as a producer of edible oils in Europe. With investments estimated at €20 million in 2005, the industry has been evolving rapidly in the past couple of years towards high concentration, given the presence of large players, both domestic and international (*Bunge, Cargill, Argus, Agricover, Ardealul* currently account for 85% of the oil market). The value of the domestic market is estimated at over $300 million (which does not include the value of the 20 000 tonnes of oil obtained in rural crushing plants for household self-consumption).

1.1.2.3. Technology providers

Romania seems to rely mainly on EU technology providers, at least for the most recent biodiesel projects (Desmet Ballestra notably). However, the US-based Greenline Industries will supply the equipment for the ULEROM project and seems to be particularly well equipped for the Romanian market since the design allows a rapid deployment of small- to medium-sized plants.

1.1.2.4. End users

Since the announcement of the biofuels mandate, major domestic fuel suppliers such as *Rompetrol* and *Lukoil* signalled their willingness to invest in captive biofuel facilities

The oil company *Rompetrol* is building a 60 000 tonnes/year bio-diesel unit in Navodari, with an expected start in 2008. *Rompetrol Downstream* has already introduced in its stations and warehouses network a B2 blend branded ‘Efix Diesel’, which will be distributed in more than 350 petrol stations. The firm has signed a 20 000 tonnes contract for bio-diesel supply with the Portuguese group *Prio/Biomart,* part of *Martifer*.

The local branch of the Russian oil company *Lukoil* will invest 15 million dollars in a biodiesel production line at its Petrotel refinery and should start biodiesel production in the first half of 2008.

ULEROM has negotiated distribution contracts with local oil companies *Petrom* and *Rompetrol*.

1.1.2.5. National federations

The Association of Biofuels of Romania was created in 2003.

1.1.3. Raw material supply

Although sunflower seed prices have constantly depreciated throughout 2005/06 compared to the previous marketing year in Romania, national authorities expect an increase in that areas planted with this crop. Official statistics released in the first week of May 2006 by the Romanian Ministry of Agriculture, Forests and Rural Development indicates that sunflower seed plantings made up 486 000 ha.

In parallel, the rapeseed cultivated area and production are increasing continuously. The large majority (90%) of Romanian rapeseed production is exported (mainly to Germany, Denmark and Sweden). Rapeseed used in Romania goes mainly in textiles and chemistry applications.

Stimulated by an increasing demand for rapeseed oil for biodiesel production, farmers planted in the fall of 2005 over 175 000 ha with this crop, but extensive winterkill reduced the cropland area to just 90 000 ha. Yields on the area that survived are also expected to have been affected by the long and cold winter (especially in terms of plant density per hectare). Over 12 000 ha were planted by mid-May with spring varieties of rapeseed.

1.1.4. Fuel consumption

The fuel consumption pattern in Romania mirrors the situation at EU level with a strong and increasing demand for diesel. In 2006 1,4 Mo tones of gasoline and 3,1 Mo tones diesel were marketed in Romania.[23] The diesel market is expected to increase sharply by 2020, and the number of diesel cars to be 3 times more than in 2005.

1.1.5. Norms and standards for biodiesel

The European standard EN 14214 was transposed into national law as SR EN 14214.

1.2. Legislative framework in support of biodiesel production

1.2.1. Transposition of Directive 2003/30 and national indicative targets

Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels was transposed into the Romanian legislation by the Governmental Decision no. H.G. 1844/2005 concerning the use of biofuels and other renewable fuels for transport, published in the Official Monitor n°44 of 18 January 2006.
Romania has adopted the following targets:

- 2% by 2007 (date of Romania accession to the EU)
- 5,75% by 2010

1.2.2. Detaxation schemes in favour of biofuels/biodiesel

Within the Romanian Fiscal Code (Law 571/2003), the non conventional biofuels (biodiesel) are exempted from taxes.
A New Fiscal Code (Law 343/2006) is applying as from January 1st 2007. The Law 343/2006 in its 201 article gives a full detaxation for biodiesel. The full exemption from the excise tax applies only for the FAME content. The Ministry of Economy and Trade and the Ministry of finance are working in collaboration with Petrom, Lukoil and Rompetrol on methodology norms regarding biofuel tax exemption in the new code fiscal.
In July 2007, the excise on conventional diesel was RON 918,938 (= €260).

1.2.3. Mandates

A new legislation has been adopted in May 2007 (Government Decision no 456/2007, published in the Official Monitor no. 345 from 22 May 2007). It modifies Decision no. 1844/2005 to provide for the gradual introduction of mandatory targets (by volume):

[23] Romania first report under Directive 2003/30/EC.

- From 1st July 2007: 2%
- From 1st January 2008: 3%
- From 1st July 2008: 4%

Governmental Decision 456/2007 also introduces a new article 12 indicating the level of sanctions in case of failure to blend in the above-mentioned proportions: a fine between 7500 and 15,000 lei will apply.

1.2.4. Quota

At present, no quota for the production of biodiesel applies in Romania.

1.2.5. Direct subsidies

The Romanian state gives farmers 50 euros per hectare in subsidy, in addition the EU 45 euros/ha grant for growing energy crops.

1.3. Research efforts in favour of biodiesel deployment

Biofuels technologies were considered within several Research and Development projects. INMA, the national R&D institute for Machinery in Agriculture and Food Industry, ICECHIM, the Chemical Research Institute and ZECASIN developed studies and pilot installations for biofuel production.

In recent years and notably as EU accession negotiation progressed, Romania has been participating in some EU-funded projects related to biofuels, including the BIO-EAST project (2002-2004) that aimed at identifying the potential of raw material production in Romania for biodiesel production, both for internal use and export. The Romanian project partner organisation was ENERO (*Centre for Promotion of Clean and Efficient Energy in Romania*), and coordinating organisation was the international consulting company EXERGIA-Greece.

2. SWOT Analysis

2.1. Strengths

- Feedstock supply

While the most part of Romania has a continental climate, the Romanian seaside benefits from a slightly warmer climate with less extreme phenomena such as heatwaves and winter severe cold spells.
Feedstock for biodiesel production can therefore be produced locally using traditional crops (mainly sunflower and rape seed) as well as conventional growing methods and equipment.
Romania has a huge potential in terms of biodiesel crop production. The country could theoretically produce 3 to 4 times more than what is necessary to comply with the 5,75% target.

- Logistics

Biodiesel production will certainly benefit from Romania's good inland waterways and maritime network, with both direct access to the Black Sea and the proximity with the Danube river. As a matter of example, it is worth underlining that the Port of Constanța is the largest seaport on the Black Sea and is located at the crossroads of major trade routes linking the markets of the landlocked countries from Central and Eastern Europe with Central Asia and the Far East. In 2006 the Port of Constanța handled a total traffic of 57 131 million tons of cargo making it the 9th busiest cargo port in Europe. Most importantly, the port is also connected with the Danube river through the Danube-Black Sea Canal. Other major Romanian ports are Mangalia (near the Bulgarian border), Năvodari, as well as Galați, Brăila and Tulcea, all situated on the Danube.

- Legal framework in support of biodiesel production

Since July 2007, a 2% blending obligation applies in parallel to a detaxation of the FAME content in blends. The obligation will rise at 4% in 2008. Most importantly, a penalty is foresseen for those fuel suppliers that would fail to reach to mandatory share of FAME.

2.2. Weaknesses

- Meteorological constraints for feedstock production

All regions of Romania are not suitable for biodiesel crops production (sunflower and rapeseed) because of extreme weather conditions.

- Road transport network

While Romania is a major crossroad for international economic exchanges in Europe, so far insufficient investment has been made in the transport infrastructure.

2.3. Opportunities

- Capitalizing on the rural economy

Although Romania' economy is nowadays mainly service-driven, the agricultural sector still makes up 10% of the country's GDP.

- Accession to the EU and related opportunities

Since Romania still holds an important position in terms of agricultural production, the country will certainly be in a position to supply other EU countries in need of additional feedstock for biodiesel production, or even export its finished product to some of them.

- Synergies with neighbouring countries

Romania, as the whole south-East part of the EU and the Balkan region has a very high potential for biodiesel production. If the additional potential of Ukraine is exploited, it is estimated that the region could satisfy about 25% of the EU needs. Romania could also export biodiesel feedstock towards Bulgaria, which is lacking appropriate feedstock for the time being.

- Investments in the transport sector

In the recent years, Romania has benefited from several grants for the modernization of the road transportation (EU funds from ISPA, World Bank, IMF, etc.) so that it could rapidly catch up with EU15 standards.

- Governmental support measures

The Romanian Government is considering a promotion campaign in favour of biofuels, if the recently adopted measures (mandate) are not triggering a rapid change in consumer behaviour.

2.4. Threats

- Level of the blending mandate and related penalty

At present, the blending mandate of 2% is probably too low to trigger the emergence of an effective biodiesel market. In addition, the level of the penalty for fuel suppliers failing to reach the mandate is probably too low (up to 15 000 Ron) to create a sufficient incentive.

- Absence of production quota – Impact on public finances

In the absence of a production quota, detaxation of the FAME content theoretically apply to unlimited quantities. In view of Romania's considerable potential for biodiesel production, this could represent a burden for the public finances.

3. Main Drivers for biodiesel production

Currently, there are two main drivers for Romania's going ahead with biodiesel production: the country's considerable agricultural capacity and the recently adopted legislative support measures. In recent years the main driver for Romania as for many other accession countries to establish national biofuels measures has been to conform their national law to EU provision in order to prepare accession. Today there is also political pressure from various groups in order to improve the national performance of Romania under Kyoto.

4. Main obstacles for the further development of the biodiesel market

One of the main obstacles to the further development of the biodiesel market lies in the fact that stakeholders did not adapt yet to the recently adopted support measures. There is also quite some resistance due to the archaic condition of part of the farmland, although a new kind of well structured agricultural company is now emerging.

5. Trends and future scenarios

In the next years Romania has the potential to develop both larger and larger surfaces of oilseeds crops suitable for the transformation into biodiesel and build up a flourishing industry based on the first and second transformation of agricultural raw materials. In this sense, given the importance of sunflowerseeds and rape cultures already now in the nation, there is reasonable hope that Romania will become one of the main providers of biodiesel and biodiesel raw materials in the EU.

The scenarios, however may differ a lot depending on whether Romania will be able to fully exploit its present potential or not. In terms of agricultural surfaces for instance, the ideal scenario would be that Romania fully exploits its capability and its surfaces of sunflowerseeds in order to fuel the growing biodiesel sector; if this will include a large development of HOSUN cultivation then the impact on the overall future biodiesel production chain will be multiplied. If on the contrary the opportunity deriving from the cultivation of HOSUN will not be exploited appropriately, the scenarios will be more modest.

In this respect a lot will depend on the local agricultural policy and on the national trade approach to imports coming from the rapeseed very promising regions of Ukraine. Import form this country, Belarus and Russia itself may represent another very important opportunity. If they will be fully exploited, in parallel with the local potential coming from Romanian arable lands they may represent a solid basis for making Romania a net biodiesel transformer and eventually even an exported of the finished product. As far as the development of the so-called 2nd generation technologies, since Romania has a much more important agricultural surface that wood or marginal land availability, it would look more wise to exploit the normal arable lands and also those which are little employed today instead of trying or test a massive exploitation of marginal forest areas in mountain areas of the country.

6. Recommendations

6.1. Feedstock

6.1.1. Agricultural feedstock

To take full advantage of Romania's potential in terms of feedstock supply, it will be essential to enhance production efficiency, which is still lower than in other EU countries. The gradual introduction of modern technology and machinery in Romania will probably lead to an increase in productivity and yields in the very next years. Provided that such improvement occurs rapidly (through the use of so far uncropped arable land and investments in more performing agricultural equipment) it is estimated that up to 1 000 new hectares may become available for biofuels raw material production by 2020.

Most importantly, it is estimated that Romania will receive from the European Union some €7.5 billion funding between 2007 and 2013 for rural infrastructure improvements.

6.1.2. Alternative feedstock

As in the case of Bulgaria, Romania could consider taking advantage of its access to the Black Sea for the purpose of demonstration projects in the field of algae biodiesel. The cultivation of High oleic Sunflower Oil (HOSUN) would also be an intelligent solution to unlock all the potential of Romanian sunflowerseeds surfaces for the production of biodiesel.

6.1.3. Research on new feedstock

Since part of Romania is less suitable for feedstock production, research on more appropriate feedstock (more resistant rapeseed) should be envisaged. In this framework, it would be appropriate to ensure synergies with similar projects already ongoing in neighbouring Bulgaria on HOSUN and on adapted varieties of rapeseeds for instance.

6.2. Processing

6.2.1. Crushing capacity and technology

Today, Romania benefits from good crushing capacities, which in some cases are integrated with biodiesel production unit. Indeed, many investments in the processing of rapeseed installations have been made with more than 30 projects announced.

6.2.2. Esterification capacity and technology

Given that most of the capacity has been and is being installed these years, the largest part of biodiesel projects in Romania can rely on modern esterification technologies (Desmet, Lurgi, Greenline...).

6.3. Quality of final product

While Romanian biodiesel production should respect the specifications of the EU standard EN 14214, it would be commendable to initiate a quality consortium concerning the production of sunflower biodiesel, which in some case might exceed the iodine value set in the EU standard, and therefore adapt the standard accordingly at least locally. However it would probably be much more recommendable to promote the culture of sun of HOSUN quality which would represent a solution both for the iodine number (it has a lower iodine level) and for the increased quantities needed for the Roamanian esterification industries.

6.4. Marketing

6.4.1. Marketing of biodiesel

Considering Romania's important potential for biodiesel production, it is important to avoid that overproduction situation arise in the medium term. It is therefore essential to ensure a genuine market for Romanian biodiesel both internally as well as in the EU. With regard to

market opportunities in Romania, it seems essential to devise a wide-ranging information campaign targeting the public on the main advantages of biodiesel. Another option would be the promotion of high blends towards public transportation companies and captive-fleets managers.[24] On the export side, Romania could already secure market opportunities with EU countries lacking of biodiesel (Slovenia, Malta, Cyprus…)

6.4.2. Marketing of glycerine

With regard to glycerine, Romania should probably ensure additional outlets for biodiesel glycerine by investing in pharmaceutical grade refining capacities, which is still missing sofar.

6.4.3. Marketing of by-products

As an EU Member State benefiting from the advantages of the internal market, Romania would certainly benefit from exporting the meals resulting from biodiesel production to cover EU deficit in vegetable proteins.

6.5. Logistics

As highlighted above, there are still some considerable hurdles in terms of feedstock transportation inside Romania. Although there is much to wait from the country's accession to the EU, it seems recommendable to invest massively in the railways network which account today for around 45% of the freight movement in the country but still needs rapid modernization. The channels and rivers network may also be quite efficient if only appropriate restoration work were organized for the transport of agricultural raw materials from and to various important areas of the country.

6.6. Legislation

While an important support scheme has been set up by Government Decision 456/2007, this now needs rapid iimplementation measures. Regrettably, an announced Action Plan to implement the biodiesel deployment strategy is not yet in force. This should be done in the next months to secure stakeholders' and investors' confidence in the sector.

6.6.1. Excise duty level and detaxation schemes

Just as Bulgaria, Romania levies a low excise duty on diesel (€275/m^3). In this context, the Government should consider raising the excise to offset the burden of the detaxation for the public finances, while at the same time creating an additional incentive for fuel suppliers to blend FAME.

6.6.2. Blending mandate

While the idea of setting up a mandatory blending target is a very positive initiative from the Romanian Government, the level of the mandate, if confirmed, seems to be rather low with regard to Romania's biodiesel production capacity.

6.6.3. Additional support measures

Additional support measures could be orientated in two ways:

- Supporting investments in favour of biodiesel production: it will be necessary to ensure that interested parties have access to sufficient information regarding biodiesel opportunities in Romania and possible funding sources.
- Increasing communication around biodiesel in Romania: improving communication between stakeholders (farmers, producers, technology providers, investors, traders…) and drawing on their expertise and lessons learned will be certainly the best way to design efficient legislative measures for the next steps (implementation phase) of the national support strategy.

[24] SWOT Analysis Romania, Biodiesel Chains Project.

Conclusions

By adopting a comprehensive set of support measures, Romania has already made a great leap forward to create an appropriate biodiesel market. This ambitious move will need to be confirmed in the near future to raise awareness and acceptance by all interested parties (fuel suppliers, consumers, raw material suppliers…). This will be the necessary condition for Romania's potential in terms of biodiesel production to be fully exploited, which would not only serve the country itself but the EU as a whole.