Required Report - public distribution

Date: 6/11/2010
GAIN Report Number: NL0019

EU-27

Biofuels Annual

EU Annual Biofuels Report

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Report Highlights: The EU as a whole is not expected to achieve its Directive 2003/30 target of 5.75 percent in 2010. Next year, blending is even expected to stagnate, mainly due to reduced biodiesel use in Germany. In contrast to biodiesel, bioethanol production and consumption is anticipated to trend further upwards during 2011 driven by the introduction of E10. The biofuel targets for 2020, laid down in the EU Energy and Climate Change Package (CCP), were adopted by the European Council on April 6, 2009. This package includes a 10 percent minimum target for renewable energy consumed in transport to be achieved by all EU Member States. Biofuels have to meet certain criteria to be taken into account for this 10 percent goal. EU Member States will have to submit their national action plans by June 2010. This report also covers developments in the EU biogas and biomass market.

Post: The Hague

This report contains the following chapters:

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Executive Summary

Policy and programs

The EU Energy and Climate Change Package (CCP) was finally adopted by the European Council on April 6, 2009. The Renewable Energy Directive (RED), which is part of this package, entered into force on June 25, 2009, and has to be implemented by December 2010. By that time, Member States (MS) will have transposed the Directive into national law. MS will also have to submit national action plans by June 2010.

This CCP includes the "20/20/20" mandatory goals for 2020, one of which is a 20 percent share for renewable energy in the EU total energy mix. Part of this 20 percent share is a 10 percent minimum target for renewable energy consumed in transport to be achieved by all MS. Biofuels have to meet certain criteria to be taken into account for the 10 percent goal, including the sustainability criteria in the RED. One criterion requires biofuels to reduce greenhouse gas (GHG) emissions by at least 35 percent.

In the projections for biofuels, the European Commission (EC) assumes that even though it would be agronomically possible to grow all the feedstock needed to reach the policy goals domestically, some of the feedstock and biofuels will have be imported to reduce price pressure on EU feedstock. The EC expects about 70 percent of the feedstock to be produced internally and 30 percent of the feedstock to be imported.

Conventional Biofuels

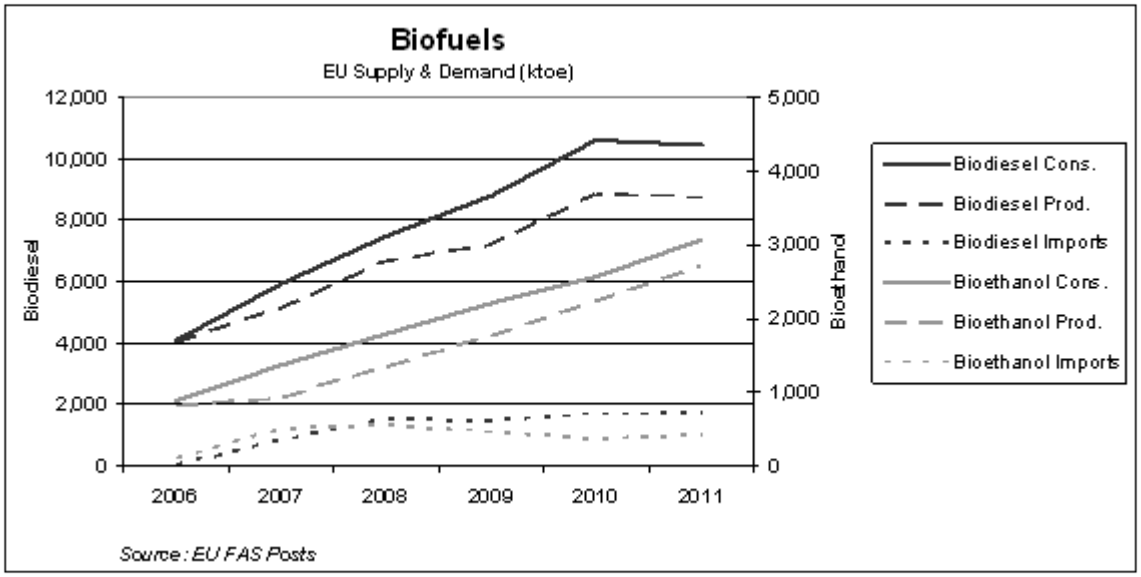
Biofuels supply and demand trends during 2006 – 2009

Biodiesel is the main biofuel for road transport used in the EU and is estimated to account for 80 percent of the biofuels market in 2009 (see table below). Bioethanol has a 20 percent market share. Many expectations rest on cellulosic ethanol and drop-in fuels, such as biomass-to-liquid (BtL), to support the transition to second generation technologies. However, second generation biofuels are still in their infancy and it will take some years before these fuels reach a significant volume. While biofuels as a share of total road transport fuels is anticipated to trend upwards until 2010, the EU as a whole is not expected to achieve its Directive 2003/30 indicative target in 2010 (see table below).

Road Transportation Fuels Consumption (Ktoe)						
Calendar Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Conv. Bioethanol	880	1,380	1,790	2,210	2,560	3,070
of which advanced	0	0	0	5	5	10
Conv. Biodiesel	4,110	5,960	7,490	8,820	10,630	10,460
Drop-in Fuels	0	0	0	2	10	20
Other	0	0	0	0	0	0
Total Biofuels	4,990	7,340	9,280	11,030	13,200	13,550
Diesel	183,702	189,596	192,250	194,942	197,671	200,438
Gasoline	109,829	106,071	105,647	105,224	104,803	104,384
Tot. Fossil Fuels	298,251	300,481	304,387	308,344	312,353	316,413
Tot. Transport Fls.	303,241	307,821	313,667	319,376	325,553	329,963
Actual Blending	1.65%	2.38%	2.96%	3.45%	4.05%	4.11%
Goal (*)	2.75%	3.50%	4.25%	5.00%	5.75%	-

(*) As set in EU Directive 2003/30. Source Biofuels data: EU FAS Posts. Source Fossil fuel data: Eurostat (2006 and 2007) and EC (European Energy and Transport Trends to 2030).

During 2007 and 2008, EU production of both biodiesel and bioethanol increased, mainly driven by the EU Member States' mandates for domestic consumption. Since the summer of 2008, however, the market for biodiesel in the EU has deteriorated substantially because of low crude oil prices, high vegetable oil prices, increasing biodiesel imports, and the financial crisis. While biodiesel production increased only 9 percent 2009, EU bioethanol production surged by more than 30 percent last year. The main reason for this ethanol production boost was that ethanol feedstock prices fell significantly during the second half of 2008 and remained at a relatively low level during 2009. Production margins also benefitted from the elevated ethanol price during the second half of 2009. Furthermore, while EU imports of biodiesel fell only slightly in 2009, EU bioethanol imports already leveled off during 2008 and fell significantly in 2009.



On March 12, 2009, the EC published its Regulation 193/2009 and Regulation 194/2009, containing provisional anti-dumping and countervailing duty measures on imports of biodiesel from the United States. The Regulations and duties entered into force on March 13, and applied for 6 months after which they were made definitive for a 5-year period.

Biofuels supply and demand trends for 2010 and 2011

The introduction of countervailing and anti-dumping duties by the EU on imports of biodiesel from the United States temporarily reduced the pressure on the EU biodiesel market. In 2010, EU biodiesel production is expected to recover by more than 20 percent. In 2011, however, production is forecast to decline as Germany is expected to fill a larger part of its mandate by using bioethanol, to the detriment of biodiesel use. During 2010-2011, EU bioethanol production is expected to continue its steady growth, partly driven by the introduction of E10.

The required feedstock for the anticipated biofuels production in 2010 is estimated at about 9 MMT of cereals, about 10 MMT of sugar beets and about 10 MMT of vegetable oils (crushed from about 17 MMT domestically produced oilseeds, mainly rapeseed). In 2010, total production of byproducts from bioethanol and biodiesel production is forecast to reach nearly 3.3 MMT (mainly DDG) and 10 MMT (mainly rapeseed meal), respectively.

Advanced Biofuels

In the Renewable Energy Directive 2009/28/EC, second generation biofuels will count double towards the ten percent target for renewable energy in transport in 2020. In the EU, the commercialization of advanced biofuel production is in general lagging the developments in the United States. Biorefinery is, however, an important feature of the Bio-energy European Industrial Initiative (BEII), one of the six industrial initiatives of the European Strategic Energy Technology (SET) Plan. The EC and the private sector believe that the realization of commercial and thus profitable production of second generation technologies will take at least five years. There are six second generation biofuel plants operational at demo scale in the EU. Three are based on thermochemical processes and three on biochemical processes.

Biomass for heat and power

Biomass

Biomass plays an important role in meeting the 20 percent target for renewable use by 2002 and in the future reduction of CO_2 emissions in Europe. In 2009, biomass contributed more than 100 Mtoe to the EU's energy consumption, with 79 percent heat, 11 percent electricity, and 10 percent transportation fuels. According to the European Biomass Association, the EU will increase its

biomass consumption from 13 million tons annually in 2010 to 100 million tons by 2020. Wood-based biomass is the main source for bioenergy in Europe, followed by waste and agricultural-based biomass. More than half of EU's biomass electricity production is concentrated in three countries; Germany, Sweden, and Finland.

With the member states' ambitious policy objectives to increase the share of renewable energy sources in the electricity and heating sector, wood pellets will become increasingly important. According to the European Biomass Association, there are currently about 450 pellet plants in Europe producing about eight million tons of pellets per year.

On February 25, 2010, the EC adopted a sustainability report for biomass other than biofuels and bioliquids. In the absence of harmonized rules at EU level, MS are free to put in place their own national sustainability schemes. The report makes recommendations on sustainability criteria in order to avoid obstacles for the functioning of the internal market for biomass.

Biogas

In the EU, the two leading sources for biogas production are landfill collection and production from agricultural crops and manure. European farmers are increasingly investing in biogas digesters to convert agricultural crops, manure, and other farm and food industry residues into methane gas. The primary purpose of these biogas digesters is to generate electricity and heat. However, a growing number of large scale operations is connected to the natural gas grid. The incentive for farmers to invest in biogas digesters is a guaranteed price for the generated electricity which is considerably higher than that for electricity generated from fossil fuels, natural gas coal or nuclear sources. The leader in biogas production is Germany with about 5,300 plants of various sizes in operation in 2010, requiring about 800,000 hectares of cropland (compared to about 3.3 million hectares for wheat production in Germany).

Policy and Programs

The EU Energy and Climate Change Package (CCP) was adopted by the European Council on April 6, 2009. The Renewable Energy Directive (RED), which is part of this package, entered into force on June 25, 2009 and has to be implemented by December 2010. By that time, Member States (MS) will have transposed the Directive into national law. MS will also have to submit national action plans by June 2010.

This package includes the "20/20/20" goals for 2020:

- A 20 percent reduction in green house gas (GHG) emissions compared to 1990.
- A 20 percent improvement in energy efficiency compared to forecasts for 2020.
- A 20 percent share for renewable energy in the EU total energy mix. Part of this 20 percent share is a 10 percent minimum target for renewable energy consumed in transport to be achieved by all MS.

The goal for 20 percent renewable energy in total energy consumption is an overall EU goal. The RED sets different targets for different MS within this overall target. This means that some MS will have to reach much higher targets than the 20 percent renewable energy by 2020, whereas other MS will have much lower targets. Sweden will, for example, have to reach 49 percent, while the target for Malta is only 10 percent. The targets for the four largest economies of Europe: Germany, France, UK. and Italy, are 18, 23, 15 and 17 percent respectively. These targets are set by the European Commission (EC) depending on current situation and potential for growth in different MS. In contrast, the 10 percent target for renewable energy in transport is obligatory for all MS.

The EU hopes that a 10 percent target in transport for each MS will address concerns that this sector is projected to account for most of the growth in energy consumption and thus requires the most discipline. People are travelling more, transportation of goods is increasing and automobiles are not improving efficiency at as fast a rate as desired. Fuel use in transportation is growing faster than any other sector, and is anticipated to increase about 1 percent per year to 2020, according to the European Commission's model. The latest official number for the use of biofuel in total transport fuel consumption is 3.3 percent in 2008. There is not yet any official number for 2009. However, the European Bioethanol Fuel Association (eBIO) estimates biofuels use in 2009 at around 4.4 percent.

Biofuels have to meet certain criteria to count towards the 10 percent goal

- They must meet the sustainability criteria outlined below, including reducing GHG emissions by at least 35 percent compared to fossil fuels. From 2017 onwards the reduction has to be 50 percent, and at least 60 percent for new installations.

• Second-generation biofuels will get a double credit. This means that biofuels made out of ligno-cellulosic, non-food cellulosic, waste- and residue materials will count double towards the goal. This calculation is made on an energy basis.
• Renewable electricity consumed by cars will be counted by a factor of 2.5, and like second generation biofuels help countries achieve targets faster.

Sustainability Criteria

For biofuels to be eligible for financial supports and count towards the target they must comply with the sustainability criteria that are provided in the RED. These sustainability criteria have to be met by all biofuels whether produced within the EU or imported from a third country. Member States have 18 months, until December 2010, to implement the renewable energy package into national law. Most MS are expected to use the full transition period.

Specific requirements are laid out for GHG emissions-saving criteria and a 35 percent threshold is set that later increases. Environmental sustainability criteria covering bio-diverse and high-carbon-content lands are also specified. Other sustainability criteria are mentioned and reporting requirements are established, but specific requirements and thresholds are not yet identified. These cover other environmental criteria for soil, water and air quality, as well as social criteria, with a focus on food price impact, and adherence to International Labor Organization conventions.

Biofuels may not be made from raw material obtained from land with high biodiversity value such as primary forest and other wooded land, areas designated by law or by the relevant competent authority for nature protection purposes, highly biodiverse grassland or highly biodiverse non-grassland. The EC is currently developing the criteria for biodiverse grasslands based on an open consultation conducted early in 2010. The criteria apply on land classified as highly biodiverse on or after January 2008. Biofuels shall also not be made from raw materials produced on land with high carbon stock such as wetlands, peatlands, or continuously forested areas.

In addition to the criteria for biodiverse grasslands, the EC is currently developing reporting requirements under the RED. Producers will have to report to the EC on social and environmental items, to make it possible for the EC to measure the effects of its policies.

The agricultural raw materials must also be produced in accordance with the minimum requirements for good agricultural and environmental conditions that are established in the common rules for direct support schemes under the common agricultural policy (CAP) (Article 17 § 6 of the RED). This requirement is only valid for farmers within the EU and means they have somewhat stricter demands than feedstock producers outside the Union.

Impact analysis of sustainability criteria

The application of sustainability criteria will clearly represent an additional burden to operators who wish to sell biofuels on the EU market. However, this burden will be felt equally by EU and third country operators. It would be hoped that not too much confusion would be felt by operators when the criteria become applicable as the RED, which specifies the details of the criteria, has been publicly available since April 2009. Given that these measures apply to the EU market exclusively, it will be interesting to note whether third countries challenge the compatibility with WTO rules. Only Australia formally reacted to the Commission's notification of these measures to WTO in 2008.

GHG emissions

Biofuel must have a GHG emissions saving of at least 35 percent once the RED is implemented through national legislation. Starting in 2017, the GHG emissions saving has to be 50 percent. For biofuels produced in installations for which production starts in 2017 and onwards, the GHG savings must be 60 percent. GHG emissions savings are calculated using lifecycle analysis and following methodologies described in RED annexes.

The European Commission's Joint Research Center (JRC) has defined GHG emissions savings for different raw materials and selected production and supply pathways and the result of these are presented in the RED annex. JRC has calculated GHG emissions for cultivation, processing and transport and distribution for different raw materials, and used this for calculating the GHG emissions savings. Net carbon emissions from land-use change are not yet included. Under the RED, it is possible to use actual numbers and achieve a GHG emissions saving that is above the required 35 percent. It is always possible to claim the default value without any supporting documentation.

The EC continues to attempt to document GHG emissions on different biofuels using different production processes for different countries. The EC has looked into several options regarding what kind of GHG emissions certification they would need to accept a product as being produced according to the sustainability criteria. The three types of "chain of custody" approaches currently under discussion are: identity preservation, mass balance, and confirmation from the producer that the product was produced in a manner that meets minimum GHG emissions savings sustainability criteria.

The mass balance system requires that each container must clearly identify how much of each kind of fuel it contains. For example, the system requires that biodiesel (B100) would also need to be identified as containing 40 percent rapeseed oil, 40 percent animal fats, and 20 percent waste oils. If a portion of the product is removed from the container, what is still in the container must

be clearly marked. MS are responsible for not counting anything as biofuel toward goals, mandates, and eligible for tax credits that does not fulfill sustainability criteria for biofuel. MS have to establish a checklist, are not allowed to have higher or lower sustainability criteria than those set by the EC, and must accept all certification systems recognized by the EC. However, with each MS having different checklists, there will be 27 different national certification schemes that the EC would like to have registered and recognized – applying to EU members as well as third countries.

The mass balance system eliminates the market for biofuels that do not meet the GHG emissions savings threshold. It does not allow for mixing biofuels with different GHG emissions savings values and using the average value for the container in order to meet the threshold value. For example, if two biofuels are mixed, one with a GHG value above 35 percent and one with a GHG value below 35 percent, only the one that has a GHG savings value above the 35 percent threshold can be counted toward goal fulfillment, mandates and tax credits.

	Default GHG[1] savings
Rapeseed biodiesel	38%
Soy bean biodiesel	31%
Sun flower biodiesel	51%
Palm oil biodiesel (Process not specified)	19%
Palm oil biodiesel (process with methane capture at oil mill)	56%
Corn ethanol, Community produced	49%
Sugar beet ethanol	52%
Sugar cane ethanol	71%
Waste vegetable or animal oil biodiesel	83%

Source: European Commission, RED (Indirect land use is not included). (1) Default gives a value derived from a typical value by the application of pre-determined factors and that may, in circumstances specified in this Directive, be used in place of an actual value.

According to the RED, biodiesel made from soya oil does not automatically comply with the GHG emissions savings criteria. Omitting any adjustment for indirect land use, the RED's GHG emissions saving default value for soy diesel is 31 percent, which is below the minimum GHG threshold. On closer examination, this value was calculated using a pathway where soybeans are first shipped from Brazil, then transformed into soy oil and biodiesel in the EU. Using lifecycle analysis, the value for soy-based biodiesel produced in and shipped from the United States, by nature of having a different pathway, would be different. According to EPA, U.S. soy-based biodiesel has a GHG emissions savings value of 80 percent when it is produced and consumed in the United States. If it is shipped to and consumed in the EU that value falls slightly.

If the EC calculates GHG savings for U.S. soy-based biodiesel, it will likely meet the standards. When the GHG calculations were made there was no data available for U.S. soybeans,

therefore no calculations were made on these. Reportedly, the U.S. Soybean Association has submitted numbers to the JRC to get a fair GHG number. However, the EC seems not to wish to have GHG savings for different geographical areas, preferring to base these GHG saving values on other criteria for example no-till farming to allow for easier updates. As such, the data submitted by the U.S Soybean Association has not been used to date.

There are some concerns that the system of calculating GHG savings could be a potential way for the EU to protect its industry.

Indirect Land Use Change (ILUC)

The EC considers that the calculation and inclusion of indirect land use change (ILUC) in GHG emissions saving values is appropriate when crops used for biofuel production are grown on arable land that could be used to grow food crops, and this food crop production then moves to other lands which were previously not used to produce crops. The concern is that the conversion of new lands would lead to additional GHG releases into the atmosphere and that those indirect releases must be counted. It follows that the inclusion of ILUC would lower the GHG emissions savings values for most first generation biofuels.

The EC is developing a methodology to calculate GHG emissions caused by indirect land use changes and adjust current published values. A Commission report on the impact of indirect land use change on GHG emissions saving values is required by December 2010.

On the Commission's "Transparency Platform" there are several pieces of work on ILUC that the EC has launched in order to better understand the effects of indirect land use change associated with biofuels and bioliquids. These documents were originally related to the internal work in the EC, and were only published after a court obliged the EC to do this due to the EU transparency principle. These studies, which can be found on the "Transparency Platform" are to be seen as working documents and do not necessarily express the view of the EC.

Certification of biofuels

There are three different ways for biofuels to be certified sustainable so that they can count towards the 2020 target. Those three options are:

- Voluntary schemes
- Agreement with a specific Member State
- Bilateral or multilateral agreements between the EU and other countries.

The EC says the Voluntary Schemes will be by far the most important way for biofuels to be certified. However, the Directive has to be implemented by December 2010, and there is currently only one scheme approved by the Commission, ISCC in Germany. A certifier can apply either to the authorities in one or several MS to get its certification system approved. The biofuels can then be marketed only in the MS that has approved the certifier. Another option is to get it approved by the EC. Biofuels certified by a certifier who has been approved by the EC can be marketed all over the EU and MS are obliged to accept it, without asking for any additional conditions. There will be a transition period for agreements between economic operators with specific MS until there are sufficient EU voluntary schemes to certify.

In June 2010, the EC published two Communications, to encourage industry, governments and NGO's to set up certification schemes. One Communication is on the practical implementation of the Sustainability Scheme and one on Voluntary Schemes and default values. A separate GAIN report on the Communications will follow shortly. The voluntary schemes have to cover:

- Green house gas (GHG) emissions savings
- Land use criteria
- Respect the mass balance approach

For GHG emissions savings the voluntary scheme can base its claim on the default values in Annex V of the RED, or it can base its claim on default values for which the conversion process is specified. It can also choose to base its claims on a combination of disaggregated values for some parts of the process and on actual values for other parts. It will have to demonstrate that the raw material used was not produced on lands with high carbon content or land with high biodiversity. The reference date for the land status is January 2008.

The option of using bilateral or multilateral agreements is not the preferred way to go according to the EC. The EC explanation for this is that even if some countries have national legislation in place it would be hard to control if the legislation is being correctly implemented.

Trade Policy

In developing projections for biofuels production and trade, the EC is making the assumption that even though it would be agronomically possible to grow all the feedstock within the EU needed to reach the policy goals, some of the feedstock and biofuels will have be imported to reduce price pressure on EU feedstock. The EC is expecting about 70 percent of the feedstock to be produced internally and 30 percent of the feedstock to be imported.

The RED was notified to WTO in July 2008 as notification G/TBT/N/EEC/200, with a 90 days period

for comments. Only Australia sent in comments. The full text of the notification, and the Australian comments and the answers of the EC to those can be found on the following link.

There are no specific codes for biofuels in international trade nomenclature. Individual trade codes used by the EU and the United States include biofuels as well as other products and so it is impossible to get a close fix on trade volumes and values using codes alone. The codes in the EU system refer to the product regardless of its final use. For ethanol the two main codes are 220710 for undenatured ethanol and 220720 for denatured ethanol. Blends with petrol may also appear under other codes depending on the proportion of the mix. For biodiesel, there is a code that covers fatty-acid mono-alkyl esters (FAMAE) that was introduced in January 2008. However other forms of biodiesel could still enter under other codes depending on the chemical composition.

HS Code	Description	Duty Rate
38249091	FAMAE	6.5% (plus the provisional anti-dumping duty)
220710	Undenatured ethanol	€19.2/hl
220720	Denatured ethanol	€10.2/hl

On March 12, 2009, the EC published its Regulation 193/2009 and Regulation 194/2009, containing provisional anti-dumping and countervailing duty measures on imports of biodiesel from the United States. The Regulations and duties entered into force on March 13, and applied for 6 months, after which they were made definitive for a 5-year period.

Biomass sustainability

On February 25, 2010, the EC adopted a sustainability report for biomass other than biofuels and bioliquids. In the absence of harmonized rules at EU level, MS are free to put in place their own national sustainability schemes. The report makes recommendations on sustainability criteria in order to avoid obstacles for the functioning of the internal market for biomass. The recommended criteria relate to a general prohibition on the use of biomass from land converted from forest or other high carbon stock areas and highly biodiverse areas, and green house gas (GHG) savings compared to the ones for biofuels. In the EU, around 5 percent of the total energy used is bio-energy. Projections are that the use of biomass can be expected to double, to contribute around half of the total effort for reaching the 20 percent renewable energy target in 2020.

According to the EC, at least 90 percent of biomass consumed in the EU comes from EU forest residues and by-products of other industries and therefore a more detailed legislation is, at this stage, not necessary. Only around 5 percent of the biomass used is imported, the rest is internal production. Following the submission of the National Renewable Energy Action Plan that each MS have to submit before July 1, 2010 the EC will consider whether additional measures, such as

common sustainability criteria at EU level, would be appropriate.

Conventional Bioethanol

EU Production, Supply and Demand Table

Compared to the United States and Brazil, the EU is only a minor producer of bioethanol. On energy basis, bioethanol represented about 20 percent of the total biofuels market in the transport sector in 2009.

Conventional and Advanced Bioethanol (million liters)						
Calendar Year	**2006**	**2007**	**2008**	**2009[e]**	**2010[f]**	**2011[f]**
Production	1,630	1,840	2,660	3,480	4,430	5,380
Imports	230	1,000	1,100	900	760	830
Exports	50	60	70	95	130	130
Consumption	1,740	2,720	3,550	4,370	5,060	6,080
Ending Stock	70	130	270	190	190	190
Production Capacity (Conventional)						
No. of Biorefineries	41	54	61	67	74	76
Capacity	2,440	3,990	5,470	6,660	7,190	8,000
Production Capacity (Advanced)						
No. of Biorefineries	1	1	2	2	3	3
Capacity	0.15	0.15	5	5	10	10
Co-products from Conventional Biofuel Production (1,000 MT)						
DDG	1,490	1,350	1,600	2,530	3,280	4,070

r = revised / e = estimate / f = forecast EU FAS Posts. Sources: EU FAS Posts and statistics of Eurostat, World Trade Atlas and the European Bioethanol Fuel Association (eBIO). Production capacity as of December 31 of year stated. DDG = Distillers Dried Grains.

Conventional Bioethanol (1,000 MT)						
Calendar Year	**2006**	**2007**	**2008**	**2009[e]**	**2010[f]**	**2011[f]**
Production	1,290	1,450	2,100	2,750	3,500	4,250
Imports	180	790	870	710	600	650
Exports	40	45	55	75	100	100
Consumption	1,375	2,150	2,800	3,450	4,000	4,800
Ending Stock	55	100	215	150	150	150
Production Capacity						
No. of Biorefineries	41	54	61	67	74	76
Capacity	1,930	3,150	4,330	5,260	5,680	6,330

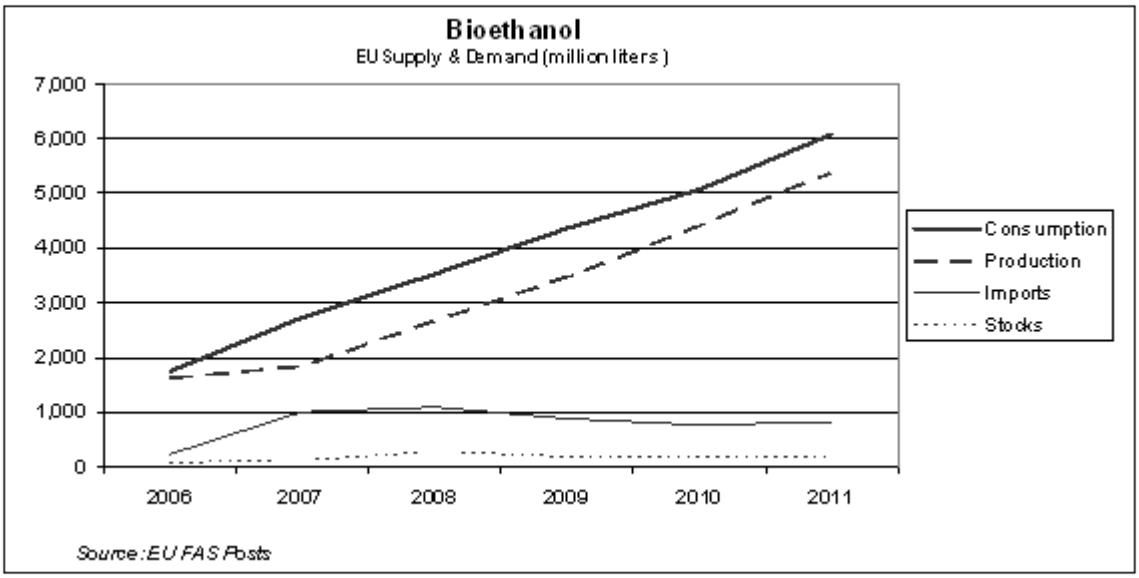
Production

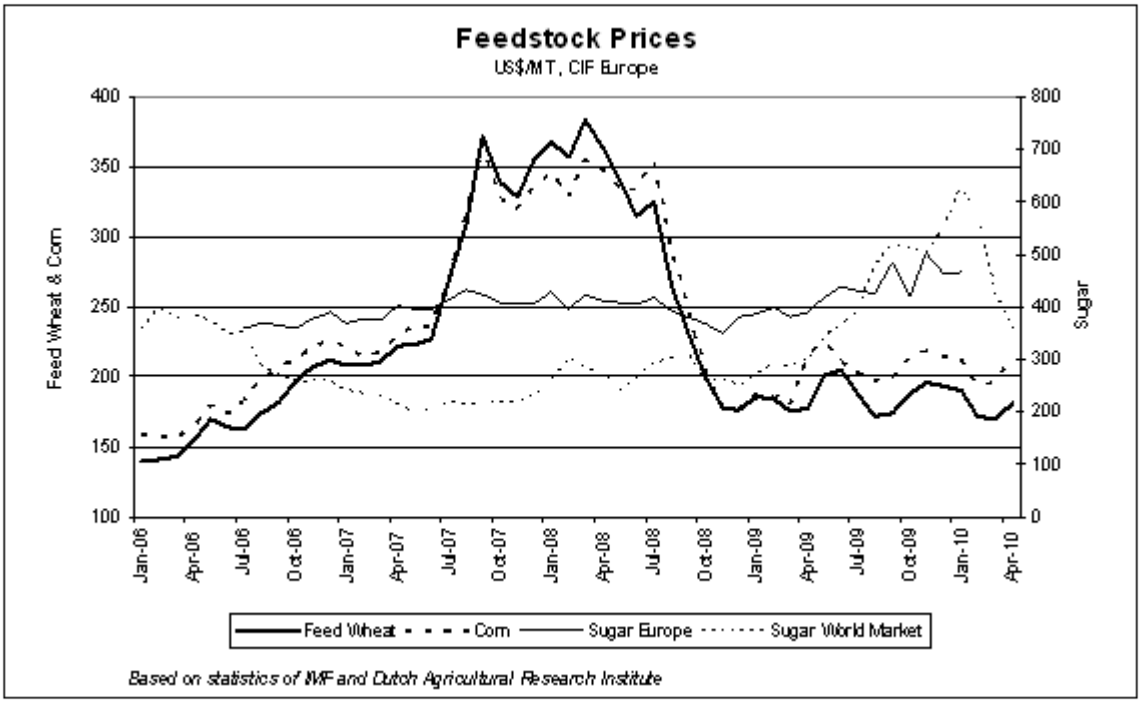
Bioethanol production capacity is forecast to increase from 2,440 million liters in 2006 to 8,000 million liters in 2011. The majority of the production capacity has been installed in France, Germany, the Benelux, the UK, Spain, and Poland. During 2007, 2008, and 2009, only about sixty percent of the available capacity was utilized. This is partly due to the fact that the EU is building its sector and new plants need a start up phase to be fully operational. During 2007 and 2008, utilization was also low due to high grain prices, in particular wheat. Another reason for the underutilization was competitive bioethanol imports from Brazil.

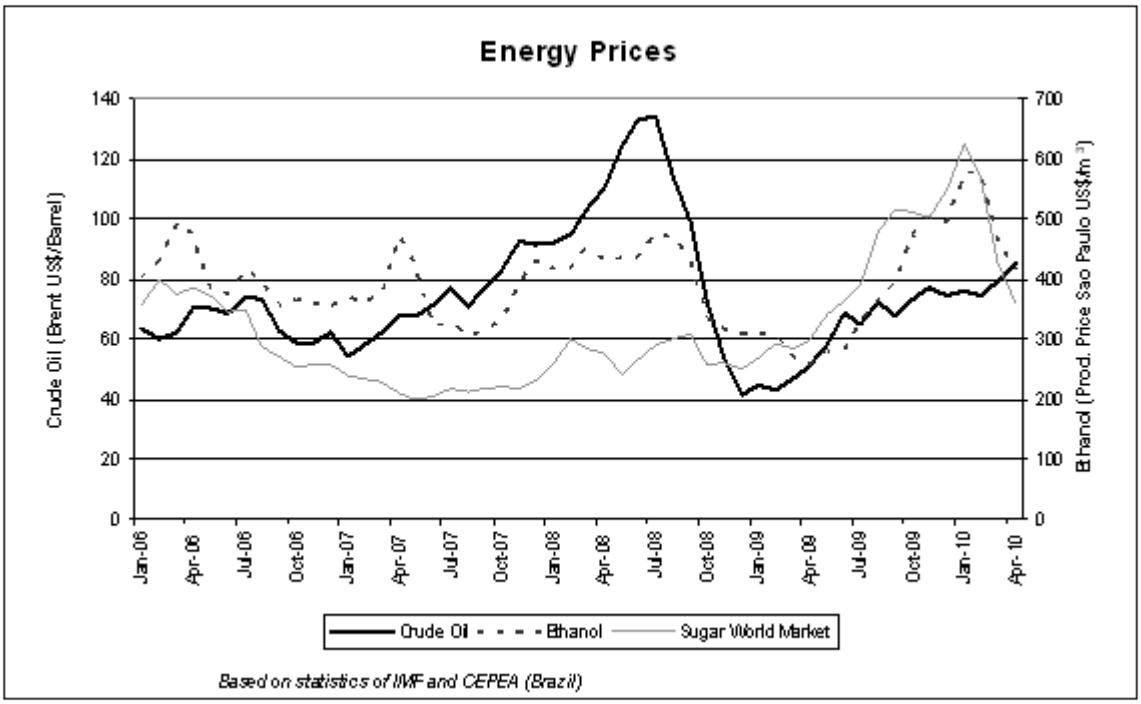
EU Bioethanol Production – Main Producers (million liters)						
Calendar Year	**2006**	**2007**	**2008[r]**	**2009[e]**	**2010[f]**	**2011[f]**
France	300	530	740	890	950	950
Germany	430	400	580	750	820	860
Benelux	20	40	80	270	510	820
United Kingdom	0	0	50	70	280	700
Spain	400	360	350	580	580	580
Poland	160	200	240	440	510	510
Other	320	310	620	480	780	960
Total	**1,630**	**1,840**	**2,660**	**3,480**	**4,430**	**5,380**

r = revised / e = estimate / f = forecast EU FAS Posts. Source: EU FAS Posts

In 2009, EU bioethanol production surged by more than 30 percent to 3,480 million liters (see graph below). On an energy basis, this is equivalent to 23.8 million barrels of crude oil. The main reason for this production boost was that domestic feedstock prices fell significantly during the second half of 2008 and remained at a relatively low level during 2009 (see graph below). Production margins also benefitted from the elevated ethanol price during the second half of 2009 (see graph below). In addition, while prices for ethanol feedstock such as wheat plummeted, prices for the by-products, mainly Distillers Dried Grains (DDG) remained at a high level supported by the limited availability of vegetable proteins on the EU market (see FAS EU Oilseeds Annual). In general, producers experienced the best margins during the last two quarters of 2009.


Bioethanol
EU Supply & Demand (million liters)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2006
2007
2008
2009
2010
2011
Consumption
Production
Imports
Stocks
Source: EU FAS Posts


Feedstock Prices
US$/MT, CIF Europe
Feed Wheat & Corn
Sugar
400
350
300
250
200
150
100
800
700
600
500
400
300
200
100
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Feed Wheat
Corn
Sugar Europe
Sugar World Market
Based on statistics of IMF and Dutch Agricultural Research Institute



During 2010 and 2011, EU bioethanol production is expected to increase further. However, producer margins reportedly deteriorated due to plummeting ethanol prices during the first quarter of 2010. In 2010, the EU bioethanol industry will possibly face the same problems as the EU biodiesel industry previously experienced namely an oversupply on the market due to elevated domestic production, slackening demand and competitive imports (see Biodiesel section of this report). In order to cope with this market situation, some bioethanol producers reportedly switched to producing ethanol for beverage use or for use by the chemical and pharmaceutical industries. Consolidation of the sector, with closure of smaller plants and investments in larger size plants, seems inevitable, and is expected to take place when market conditions improve. At the moment, plants are owned by large multinationals as well as by larger and midsized domestic cooperatives and processors, such as corn wet millers and sugar producers.

During 2010 - 2011, production in France, Germany, Spain, and Poland is expected to stabilize or increase only moderately, a major expansion is forecast in the UK and the Benelux countries. UK bioethanol production is set to get a boost with a new plant coming on stream in the first half of 2010 and another due to open in late 2010/early 2011. Both new plants are expected to produce 400 million liters of bioethanol each once they reach full capacity. It is anticipated that production will be mostly exported since the UK has little appropriate storage facilities and the domestic market for bioethanol is not strong. Production is also expected to surge in the Netherlands and Belgium as the seaports in this region can deliver feedstocks from a wide range of suppliers. Rotterdam also serves as a hub for fossil fuel logistics, which makes it also a strategic location for biofuels blending and further distribution. In the port of Rotterdam, a

bioethanol plant with a capacity of about 570 million liter is expected to start production mid 2010.

Feedstock Use

Feedstock Used for Bioethanol Production (1,000 MT)						
Calendar Year	**2006[r]**	**2007[r]**	**2008[r]**	**2009[e]**	**2010[f]**	**2011[f]**
Wheat	1,350	1,330	1,640	2,510	4,060	5,900
Corn	400	550	1,180	2,200	2,640	2,770
Rye	1,040	790	960	1,370	1,790	1,830
Barley	1,220	980	550	740	370	500
Sugar beet	3,100	5,140	9,050	8,930	9,830	10,570

r = revised / e = estimate / f = forecast EU FAS Posts. Note: Official data for feedstock use is scarcely available. The figures above represent estimates by EU FAS posts.

In the EU, bioethanol is mainly produced from wheat, corn, rye, and sugar beet derivatives. A limited volume of bioethanol is produced from barley and the surplus of wine alcohol. During 2008/2009 and 2009/2010, an abundance of wheat reduced cereal prices (see graph above). The 2010 grain crop is expected to exceed the crop in 2009 (see FAS EU Grain and Feed Annual). In general, positive margins on bioethanol production with cereals as feedstock are anticipated during good crop years, with an oversupply on the EU market. The use of corn is expected to increase in Spain and Central Europe, mainly in Hungary and Poland. In Hungary, for instance a new bioethanol refinery will be completed by the end of 2011, processing annually about 500,000 MT corn at full capacity. The ethanol production of the plant will be about 200 million liter per year and the DDG output annually about 170,000 MT. The corn-based bioethanol plant will be equipped by technology from the United States. In Northwestern Europe, wheat is expected to remain the major feedstock.

During the second half of 2007 and the first half of 2008, grain prices were at a high level (see graph above), which made sugar beet derivatives, mainly sugar syrup, a favorable feedstock for bioethanol production. As from the start of 2009, sugar prices have risen as a consequence of restricted world supply. As a result, bioethanol production from sugar beets has risen only moderately. Further expansion is anticipated in France, Germany, and Belgium (see FAS EU Sugar Annual).

The required feedstock for the anticipated production in 2010, 4,430 million liters of bioethanol, is estimated at about 9 MMT of cereals and about 10 MMT of sugar beets. This is about 3 percent of total EU cereal production and 10 percent of total sugar beet production. Co-products of the bioethanol production are Distillers Dried Grains (DDG), wheat gluten and yeast concentrates. In 2010, total production of co-products is forecast to reach 3.3 MMT, of which the majority will be marketed to the domestic livestock industry. This is nearly 2 percent of total EU feed grain

consumption in the EU.

Consumption

EU Bioethanol Consumption – Main Consumers (million liters)						
Calendar Year	**2006**	**2007**	**2008[r]**	**2009[e]**	**2010[f]**	**2011[f]**
Germany	600	580	750	1,000	1,070	1,110
France	290	540	870	910	950	950
Spain	230	250	190	300	430	460
Benelux	35	170	290	350	400	440
United Kingdom	0	190	220	270	320	410
Sweden	330	380	290	320	380	380
Poland	120	110	300	320	380	380
Other	135	500	640	900	NA	NA
Total	**1,740**	**2,720**	**3,550**	**4,370**	**5,060**	**6,080**

r = revised / e = estimate / f = forecast EU FAS Posts. NA = Not Available (depends on introduction of E10) Source: EU FAS Posts

During 2006 – 2009, EU bioethanol consumption expanded steadily by 0.8 to 1 million liters per year. Germany, France, the Benelux, and Sweden were the main consumers during this period. In the Benelux and Sweden, most of the bioethanol consumed originated from Brazil, while in the other two main markets, bioethanol was predominantly produced domestically. In 2008, consumption was supported by the high crude oil price (see graph above) which made substitution, or blending, of gasoline with bioethanol attractive. After a sharp reduction during the end of 2008, crude oil prices increased during 2009, but at a lower pace than bioethanol prices. This price development made substitution of gasoline with bioethanol unattractive for oil companies and car holders. In Sweden for instance flexi-fuel drivers have abandoned ethanol because gasoline cost less. However, consumption of ethanol has remained rather high mainly due to buses, taxis, and company cars running on bioethanol. Another factor is the financial crisis, which reduced demand for transport fuels, both fossil fuels and biofuels.

Based on the mandates and national policy incentives (see policy section of this report), bioethanol consumption is forecast to continue to grow to 6,080 million liters in 2011. This anticipated growth is taking into account the introduction of E10, most probably in Germany and Sweden. During 2010 and 2011, the main markets will remain Germany and France. France will be self sufficient, while Germany will partly depend on imports. Another deficit region is Scandinavia. A surplus will be available in the Benelux countries, the UK, Spain, and Poland. This surplus will have to compete with third country imports. Due to the lower imports from Brazil and expanding domestic production, intra-EU trade of bioethanol is expected to increase.

Trade

The majority of the bioethanol is imported by the UK, Sweden, and the Benelux countries through the port of Rotterdam. On April 11, 2008, the Dutch and Brazilian Governments signed a Memorandum of Understanding in which the strategic location of the Rotterdam port for the transit of biofuels to the EU was recognized. A part of the bioethanol imports is blended with gasoline in Rotterdam, but most of the biofuel is blended at its final destination to fulfill local EU Member State requirements.

The EU has two schemes for preferential trade regarding ethanol imports; first the new Generalized System of Preferences (GSP), including the Everything But Arms (EBA) initiative, and secondly the Cotonou Agreement. Countries eligible under these two schemes can export ethanol to the EU without paying any tariffs. Egypt and Norway have a separate agreement with the EU for duty free access of their ethanol exports. The two schemes apply for the following countries;

• GSP scheme: Bolivia, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Panama, Peru, El Salvador, Venezuela, Georgia, Sri Lanka, Mongolia, Moldova, and under the EBA initiative: the Least Developed Countries.
• Cotonou Agreement: the African, Caribbean, and Pacific (ACP) countries excluding South Africa.

The EU tariff on undenatured ethanol is 192 Euro per thousand liters, while the tariff on denatured ethanol is 102 Euro per thousand liters. Most EU Member States only permit blending with undenatured ethanol, by which their domestic market is protected by the higher tariff rate. The UK and the Dutch governments, however, also permit blending with denatured ethanol. From 2004 until 2007, bioethanol was also imported under the HS code 3824 into Sweden, which was subject to a lower tariff, 6.5 percent of the customs value. This was achieved by blending the ethanol with gasoline under customs control (processing under customs control). In 2007, this quota was terminated but has been reopened in April 2010 with an import license for a period of one year. Imports through this quota are estimated at about 150 million liters. Sector sources also report of loopholes by which ethanol is blended with up to 12.5 percent gasoline, which classifies it as a chemical with a duty of 6.5 percent Ad Valorem (about 25 Euro per 1,000 liter instead of 102 Euro per 1,000 liter).

During 2009, EU bioethanol imports declined by nearly twenty percent due to the high stocks on the EU market, the elevated domestic production, and restricted world supply, mainly from Brazil. While ethanol imports from Brazil nearly halved, imports from other suppliers stabilized. Imports from Guatemala, Nicaragua and Costa Rica increased. In 2010, EU imports are expected to decline further following the anticipated growth in domestic bioethanol production, and continuing restricted world supply. This restricted supply is based on the anticipation of high sugar prices and increased demand for bioethanol on the domestic market, mainly in Brazil (see FAS Brazil Sugar Annual). Imports from other origins than Brazil are expected to stabilize or increase further. During the first three months of 2010, U.S. ethanol

exports to EU surged to nearly 100 million liters. It is questionable if these imports of corn based ethanol will continue after implementation of the new sustainability requirements (see policy section of the report). In the Renewable Energy Directive 2009/28/EC, the EC laid down sustainability requirements for biofuels. The Directive is anticipated to be implemented in December 2010. The restrictions on the Greenhouse Gas savings, at least 35 percent, and the restrictions on land use are not expected to affect bioethanol produced from sugarcane. In 2011, EU imports are anticipated to recover following an increased demand, partly due to the introduction of E10, and recovering supply from Brazil.

Ending Stocks

As a result of elevated domestic production and imports, ethanol stocks have been building, in particular during 2008. It is estimated that the stock production ratio has reached ten percent at the end of 2008. The storage capacity for ethanol in the port of Rotterdam is estimated at about 450 million liters, and will be expanded in 2010 to 600 million liters. During 2009, stocks were reduced and are expected to stabilize at around 4 percent of annual production.

Conventional Biodiesel

EU Production, Supply and Demand Table

The EU is the world's largest biodiesel producer. Biodiesel is also the most important biofuel in the EU, on energy basis representing about 80 percent of the total biofuels market in the transport sector. Biodiesel was the first biofuel developed and used in the EU in the transport sector in the 1990s. At the time, the rapid expansion was driven by an increasing crude oil price, the *Blair House Agreement* [1] and resulting provisions of the EU's set-aside scheme, and generous tax incentives mainly in Germany. EU biofuels goals set in directive 2003/30/EC (indicative goals) and in the RED 2009/28/EC (mandatory goals) further pushed the use of biodiesel.

Conventional & Advanced Biodiesel (million liters)						
Calendar Year	**2006**	**2007**	**2008[r]**	**2009[e]**	**2010[f]**	**2011[f]**
Production	5,360	6,820	8,810	9,610	11,700	11,590
Imports	70	1,140	2,020	1,945	2,215	2,320
Exports	0	80	70	75	100	100

Consumption	5,430	7,880	9,780	11,660	14,045	13,820
Ending Stocks	0	0	980	810	580	570
Production Capacity (Conventional Fuel)						
No. of Biorefineries	119	185	241	256	264	262
Capacity	6,540	12,920	18,710	23,100	25,670	26,110
Production Capacity (Advanced Fuel)						
No. of Biorefineries	0	0	0	1	1	1
Capacity	0	0	0	18	18	18

r = revised / e = estimate / f = forecast EU FAS Posts. Production capacity as of December 31 of year stated. Sources: FAS Posts, World Trade Atlas (GTA), European Biodiesel Board (EBB).

Conventional & Advanced Biodiesel (1,000 MT)						
Calendar Year	**2006[r]**	**2007[r]**	**2008[r]**	**2009[e]**	**2010[f]**	**2011[f]**
Production	4,720	6,000	7,755	8,400	10,300	10,200
Imports	60	1,000	1,780	1,711	1,950	2,040
Exports	0	70	60	66	90	90
Consumption	4,780	6,930	8,710	10,260	12,360	12,160
Ending Stocks	0	0	865	710	510	500
Production Capacity (Conventional Fuel)						
No. of Biorefineries	119	185	241	256	264	262
Capacity	5,760	11,370	16,470	20,330	22,600	22,980
Production Capacity (Advanced Fuel)						
No. of Biorefineries	0	0	0	1	1	1
Capacity	0	0	0	16	16	16

Source: EU FAS Posts 1 MT = 1,136 liters

Production Capacity

The EU biodiesel capacity almost tripled from 2006 to 2008. A further but less pronounced expansion is estimated for 2009 (23 percent) and forecast for 2010 (11 percent), while capacity is forecast to stagnate in 2011. Spain, the Benelux, and Italy reported the largest production capacity increases in 2009. Spain, the Benelux, and France are forecasting the largest increases for 2010.

However, the comparatively low crude oil prices, high vegetable oil prices, increasing imports, and the financial crisis resulted in a difficult market for biodiesel that does not support all of the capacity increase. As a result, use of capacity dropped from 70 percent in 2007 to a mere 46 percent in 2009. Already in 2007 and 2008, first cases of companies closing their operation or declaring insolvency occurred in the U.K., Austria, and Germany. This development continued in 2009, and spread to the Benelux. In 2010, Italy is expected to be also affected. In addition, a number of plants all over the EU temporarily stopped production.

Under the current market conditions it is questionable that the EU biodiesel market can support all existing - let alone projected - production capacity, as the projected increase in EU biodiesel

consumption is a lot smaller than the current as well as projected capacity. Consequently, one can expect to see a number of plants closing their operation or even having to file for bankruptcy in the coming years. The structure of the biodiesel sector is very diverse and plant sizes range from an annual capacity of 2,000 MT owned by a group of farmers to 500,000 MT owned by a large multi-national company.

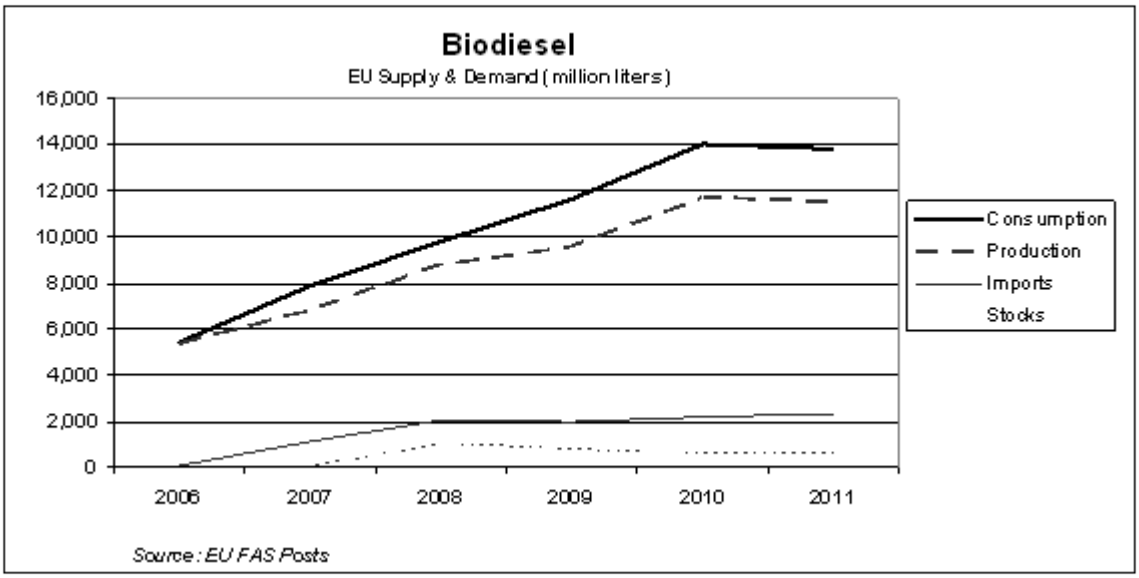
Production

In 2009, biodiesel production continued to increase and was 9 percent higher than in 2008. However, due to large stocks and high imports, the increase was lower than in previous years and lower than the increase in consumption (18 percent). In 2010, EU biodiesel production is expected to increase further. In 2011, however, production is forecast to drop following a cut in German consumption (see under Consumption). In addition, EU domestic production will have to compete with growing biodiesel imports.

In 2006, the top three producing MS (Germany, France, and Italy) together accounted for 76 percent of the EU's biodiesel production. In 2008, the share of the top three producing MS (Germany, France, and Benelux) dropped to 66 percent and the share is expected to drop to 56 percent by 2011. This is a clear indication that the production of biodiesel is gradually increasing in the other MS, as these are increasing their domestic production to meet the various MS domestic biofuel mandates.

EU Biodiesel Production – Main Producers (million liters)						
Calendar Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
France	650	1,310	2,370	2,610	2,610	2,610
Germany	2,730	3,280	3,250	2,870	3,410	2,500
Benelux	50	290	430	800	1,250	1,650
Spain	140	170	220	590	980	1,080
Poland	100	60	190	430	680	850
Italy	680	530	760	680	680	680
Others	1,010	1,180	1,590	1,630	2,090	2,220
Total	**5,360**	**6,820**	**8,810**	**9,610**	**11,700**	**11,590**

Source: EU FAS posts



Feedstock Use

Rapeseed oil forms the major feedstock in the EU. The use of soybean and palm oil is limited by the EU biodiesel standard DIN EN 14214. Soybean-based biodiesel does not comply with the iodine value prescribed by this standard (the iodine value functions as a measure for oxidation stability). Palm oil-based biodiesel reportedly does not provide enough winter stability in northern Europe. However, it is possible to meet the standard by using a feedstock mix of rapeseed oil, soybean oil, and palm oil. The vast majority of soybean oil is used in Spain and France, while in Germany since 2009, blenders use imported soybean oil-based biodiesel rather than domestically produced biodiesel from soybean oil. This explains the reduction in soybean oil use shown in the table below. Recycled vegetable oils and animal fat are not as popular feedstock as vegetable oils. However, with the high vegetable oil prices at the end of 2007 and first half of 2008 they formed a cheaper alternative feedstock and their use increased.

Feedstock Used for Biodiesel Production (1,000 MT)						
Calendar Year	**2006[r]**	**2007[r]**	**2008[r]**	**2009[e]**	**2010[f]**	**2011[f]**
Rapeseed oil	3,900	4,400	5,140	5,900	7,500	7,270
Soybean oil	400	700	950	770	740	750
Palm oil	120	250	530	540	660	740
Sunflower oil	10	70	170	250	250	250
Other virgin veg. oils	230	300	385	400	400	400
Recycled veg. oils	70	200	295	370	565	620
Animal fats	50	130	280	270	320	320
Other	-	-	30	35	40	40
Total	**4,780**	**6,050**	**7,780**	**8,535**	**10,475**	**10,390**

Note: Data for feedstock use is not available. The figures above represent estimates by EU FAS posts.

Consumption

In 2009, Germany, France, Spain, Italy, and the U.K. were the largest biodiesel consumers in the EU. For 2010, EU consumption is forecast to further increase to 10.8 billion liters, driven almost exclusively by MS mandates and tax incentives. With the current comparatively low fossil diesel price it is difficult for biodiesel to compete based on price. For 2010 further consumption increases are projected, most prominently in Spain, Germany, the Benelux countries, the Czech Republic, and Poland. This development is again driven by mandates.

Germany is an exception to the overall trend of increasing consumption and the reason overall EU consumption slips in 2011. Since 2006, Germany has been in the process of transferring support from tax incentives to mandates and is gradually increasing the energy tax on pure biodiesel (B100). As a result, since 2009, the majority of biodiesel consumption is mandate driven, as B100 outside the mandate is no longer competitive with fossil diesel. In 2010, the German overall biofuel mandate increases from 5.25 to 6.25 percent. In the absence of E10, B100 will be used to fill the gap between the mandate and what can be filled with B7 and E5. However, industry expects the introduction of E10 to occur towards the end of 2010. As a consequence, a larger portion of the overall non-specific mandate will be filled by increasing bioethanol blending in 2011, to the detriment of biodiesel use. The rationale is that mineral oil companies prefer higher bioethanol blending to using B100 because of easier handling and to avoid the bureaucracy involved. The projected lower biodiesel consumption in Germany is also expected to put France in the pole position as the largest EU biodiesel market for the first time in 2011.

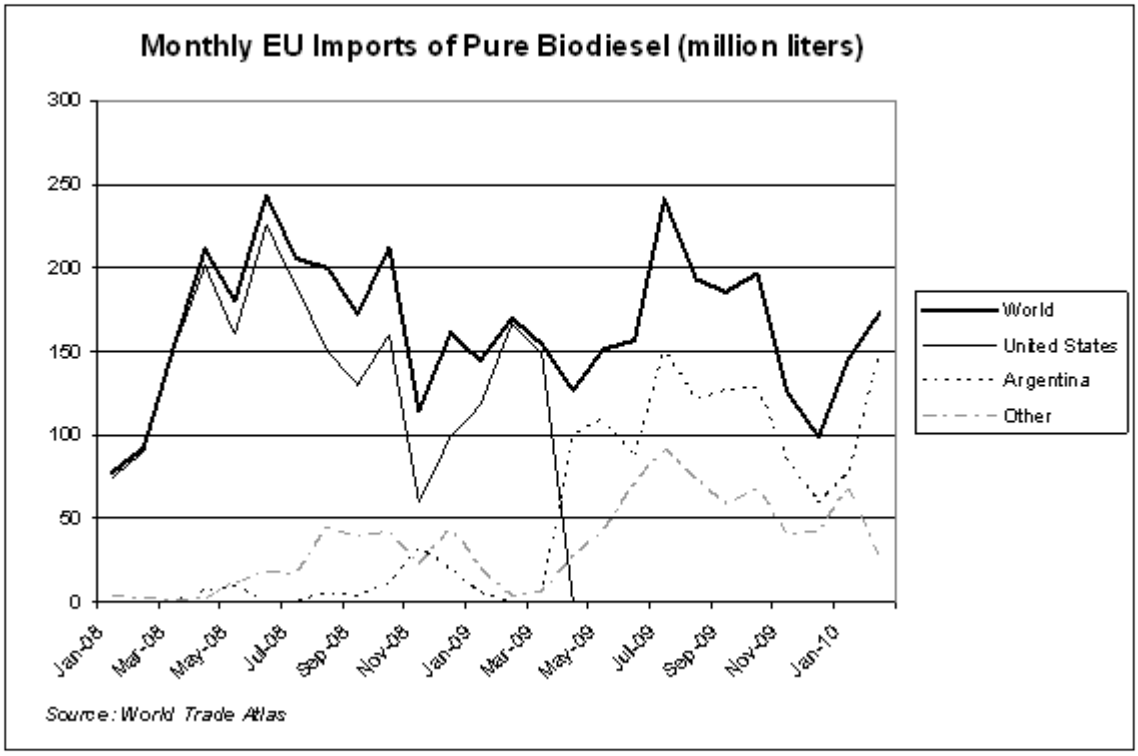
Biodiesel Consumption – Major Consumers (million liters)						
Calendar Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
France	720	1,480	2,390	2,620	2,620	2,620
Germany	3,270	3,560	3,060	2,860	3,410	2,500
Spain	70	330	670	1,150	1,930	2,190
Italy	250	230	810	1,060	1,250	1,360
United Kingdom	250	470	630	970	1,020	1,080
Benelux	30	420	390	510	760	850
Poland	20	20	140	400	630	740
Austria	370	420	460	460	460	470
Czech Republic	30	40	100	110	370	370
Portugal	100	220	170	320	330	340
Other	320	690	960	1,200	1,265	1,400
Total	**5,430**	**7,880**	**9,780**	**11,660**	**14,045**	**13,820**

Source: EU FAS posts

Trade

As expected, the introduction of countervailing and anti-dumping duties on U.S. exports of

biodiesel to the EU by the EC in March 2009 dramatically reduced EU biodiesel imports from the U.S. Hopes by the EU domestic biodiesel industry that this would reduce the pressure on the market were only partially fulfilled as the void was filled with increased biodiesel imports mainly from Argentina, and to a lesser extent from Canada, Indonesia, and Malaysia. Biodiesel exports from Argentina benefit from differential export taxes that are lower for biodiesel exports than for the export of soybeans and soybean oil. Consequently, Argentina is expected to remain a strong competitor for EU domestically produced biodiesel.



Stocks

Reliable data for biodiesel stocks is not available. The numbers in the PSD above are based on the following assumptions: In 2006 and 2007, most biodiesel was used as B100 and consumed shortly after its production. Commercial stocks are estimated to have been fairly small and are included in the consumption figure. In 2008, blending started to play a bigger role and stocks were held by traders, blenders, and the minerals oil industry.

In 2008, the use of B99 substantially increased and prompted the EC to start an anti-dumping investigation. In anticipation of the EU imposing anti-dumping and countervailing duties on biodiesel imports from the United States, European traders and mineral oil industry accumulated large stocks at the end of 2008. These were partially reduced in 2009. In 2010 and 2011, stocks are expected fall to the assumed average level. In the absence of reliable data, it is assumed

that average stocks amount to the equivalent of two weeks supply of consumption.

Sustainability Criteria

The EU sustainability criteria (SC) that are part of the EU climate change package (see policy section) are expected to go into effect at different times in the various MS. Germany is likely to be the first MS to require sustainability certification starting January 2011, for all biofuel that is produced from biomass harvested after 2009. This means that feedstock from the 2010 harvest will already be affected. U.S. exports of soybeans, soybean oil, and biodiesel to Germany will then only be competitive if the biomass and all stages of the production chain are accredited and the consignment is accompanied by a sustainability certificate. Other MS are expected to take longer for the implementation but will have to follow suit eventually.

In the long run, SC are expected to favor the use of feedstock that is certified to be sustainable according to an EU-accredited system. As the SC are also applied to imports, this could cause changes in the sourcing pattern of EU biodiesel and feedstock importers.

[1] The *Blair House Agreement* allowed the EU to produce oilseeds for non-food use of up to 1 million MT of soybean equivalent. For details please refer to page 5 of report GM4048 http://www.fas.usda.gov/gainfiles/200411/146118126.pdf

Advanced Biofuels

For reporting purposes, advanced biofuels includes all "next" generation technologies and feedstock beyond the conventional sugar, starch, oilseed and animal fat-based biofuels produced commercially through 2009. Advanced biofuels are generally derived from non-food crops or waste biomass.

In the Renewable Energy Directive 2009/28/EC (see policy section of this report), second generation biofuels will get a double credit. This means that biofuels made out of ligno-cellulosic, non-food cellulosic, waste and residue materials will count double towards the 10 percent target for renewable energy in transport in 2020. In the EU, the commercialization of advanced biofuel production is in general lagging the developments in the United States. Biorefinery is, however, an important feature of the Bio-energy European Industrial Initiative (BEII), one of the six industrial initiatives of the European Strategic Energy Technology (SET) Plan. Its objective is that by 2020 at least 14 percent of the EU energy mix will be bio-energy. The European Commission (EC) has drawn up Technology Roadmaps for the period 2010-2020 for the implementation. The BEII proposes to build about thirty plants across Europe to take full account of differing geographical and climate conditions and logistical constraints. The total public and private investment needed in Europe over the next ten years is estimated at Euro 9 billion. The

technology objectives of the BEII are:

1. Commercialization of the most promising technologies.
2. Optimize biomass feedstock availability.
3. Develop an R&D program to support the Bioenergy industry beyond 2020.

According to scientists, the technology is available but feedstock logistics and policy incentives are not yet put in place. The EC and private sector believe that the realization of commercial and thus profitable production of advanced biofuels will take at least five years. First generation biofuels production will need to generate cash flow for the private industry and develop the market for biofuels. There are six advanced biofuel plants operational at demo scale in the EU (see table below). In addition to these demo scale plants, extensive research is conducted in several EU MS, for instance France (see Related Reports from USEU Brussels and MS Posts in the EU).

Advanced Biofuels Plants in the EU					
Country	**Process**	**Biofuel**	**Feedstock**	**Capacity (million liters per year)**	**Year of Opening**
Thermochemical					
Sweden	Gasification	DME	Black liquor	2	2009
Finland	Gasification	BtL	Forestry products	N.A.	2009
Germany	Gasification	BtL	Wood Waste	18	2010
Biochemical					
Sweden	Hydrolysis	Ethanol	Forestry products	0.15	2005
Spain	Hydrolysis	Ethanol	Barley straw	5	2008
Denmark	Hydrolysis	Ethanol	Wheat straw	5	2010

Source: EU FAS Posts DME = Dimethyl Ether, BtL = Biomass to Liquid

Thermochemical processes

Sweden: In Piteå in northern Sweden, the company Chemrec produces synthesis gas from black liquor at its pilot plant. The Chemrec gasification technology will be implemented in a new industrial-scale demonstration plant at Domsjö Fabriker biorefinery for production of about 100,000 MT of the renewable motor fuels BioDME and Biomethanol per year.

Finland: In 2009, Neste Oil and Stora Enso opened a demonstration plant in Varkaus for biomass to liquids production utilizing forestry residues. A 50/50 joint venture NSE Biofuels OY, has been established first to develop technology and later to produce on commercial-scale biodiesel. The demonstration facility at Stora Enso's Varakus mill includes a 12 MW gasifier. The demonstration

process units will cover all stages, including drying of biomass, gasification, gas cleaning and testing of Fisher-Tropsch catalysts.

Germany: In cooperation with the automobile makers Volkswagen and Daimler, the Choren Industries Company produces up to 15,000 MT of BtL fuels per year at their pilot plant in Freiberg in the State of Sachsen. The fuels are marketed under the brand names SunFuel, Biotrol, and SunDiesel. Choren uses fast growing wood as feedstock. An alternative project for the research and production of BtL fuels is run by the Karlsruhe Institute for Technology (KIT). It is known as the Bioliq project. KIT works on processes to convert crop residues and wood residues into diesel and gasoline fuels. The bioliq process allows the physical separation of the pyrolysis from the rest of the process. This means that feedstock (for example crop residues and wood residues) can be converted into pyrolysis oil in decentralized plants which is then shipped to a central plant for final conversion. This helps to reduce volume and costs for feedstock transport.

Biochemical processes

Sweden: Due to its vast forestry resources, Sweden has a long history of processing cellulosic raw materials from forestry products. SEKAB is one of the world's leaders in the developing technologies for production of ethanol from cellulose. The company's pilot plant in Örnsköldsvik in northern Sweden has been in continuous operation, producing ethanol from forestry waste products, since 2005. The pilot plant produces 300-400 liters of ethanol per day from a feedstock input of 2 tons of dry biomass. The plant is designed for a two-step dilute acid hydrolysis process and a combination with enzyme hydrolysis. The feedstock is wood chips from pine trees, but other raw materials from sugarcane, wheat, corn, energy grass and recycled waste are also of future interest for the project.

Spain: Abengoa Bioenergy has built a demonstration plant in Babilafuente (Salamanca). The plant construction was completed in December 2008 and it has been operating since September 2009. This plant has a 5 million liter/year production capacity, and uses wheat and barley straw as feedstock. The process is based on enzymatic hydrolysis. This second generation plant is located inside the grain facility Biocarburantes de Castilla y León in Babilafuente, so both facilities share services and process chains.

Denmark: Inbicon's demonstration plant in Kalundborg is using wheat straw to produce bioethanol. Novozymes and Danisco are supplying enzymes for the plant. The plant is reportedly the largest cellulosic ethanol demonstration plant in Europe. Inbicon's parent company is Dong Energy, one of the leading energy groups in Northern Europe. In addition to ethanol, the plant is expected to produce 13,000 metric tons of lignin pellets, which will be supplied to the Dong Energy power plant to replace coal and 11,000 metric tons of C5 molasses for animal feed.

Biomass for Heat and Power

Biomass plays an important role in the European energy market in meeting the 20 percent target for renewable use by 2020 and in the future reduction of CO_2 emissions in Europe. In 2009, biomass contributed more than 100 Mtoe to the EU's energy consumption, with 79 percent heat, 11 percent electricity and 10 percent transportation fuels. According to the European Biomass Association, the EU will increase its biomass consumption from 13 million tons annually in 2010 to 100 million tons by 2020. According sector sources, a major part will have to be sourced out of the EU.

Wood-based biomass is the main source for bioenergy in Europe, followed by waste and agricultural-based biomass. Most of the biomass is used for heat, and to a lesser extent, in combined heat and power (CHP) applications. In 2008, wood and wood waste accounted for 77.8 percent of biomass, black liquor for 15.4 percent and agricultural waste for 6.8 percent.

The share of biomass in the energy mix differs widely among the EU member states. The main producers in Europe are countries with large territories and large forestry resources such as France, Sweden, Germany, Finland and Poland. These five countries represent 56 percent of primary energy production coming from solid biomass. The principal users of biomass are the Nordic countries, the Baltics, and Austria.

The main reasons for the wide use of bioenergy in the Swedish and Finnish energy systems are the availability of forests and raw materials, a developed forest products industry, and the wide use of district heating systems. About 90 percent of bioenergy used in Sweden and Finland today comes from the forestry sector. The raw materials used include forestry residues such as brash (branches and tree tops), and waste products from the saw mill and pulp industry, such as sawdust and bark. However, the largest source of bioenergy in Sweden and Finland today is black liquor from the forestry industry. Most of this energy is used directly in the pulp production process but also for district heating and electricity production.

Primary Energy Production of Solid Biomass in the EU (Mtoe)					
Calendar Year	**2007**	**2008**	**2009[f]**	**2010[f]**	**2011[f]**
Wood	28,200	29,149	30,200	31,500	32,500
Wood waste	21,872	23,498	25,000	27,000	28,500
Black liquor	9,401	9,095	10,000	11,000	12,000
Organic materials & waste	7,715	8,550	9,000	10,500	12,000
Total	67,188	70,292	74,200	80,000	85,000

f = forecast EU FAS Posts. Source: Eurobserver Solid Biomass Barometer 2009 and 2008

On February 25, 2010 the European Commission adopted a biomass sustainability report for biomass for heat and electricity. This is part of the 2009 Renewable Energy Directive (RED). In the absence of harmonized rules at EU level, Member States are free to put in place their own national sustainability schemes. The report makes recommendations on sustainability criteria in order to avoid obstacles for the functioning of the internal market for biomass. The recommended criteria include the prohibition on the use of biomass from land converted from forest or other high carbon stock areas and highly biodiverse areas. In 2011, the Commission will consider whether common sustainability criteria at EU level would be appropriate.

The heating and cooling sector is responsible for almost 50 percent of Europe's energy demand, and thus, development of this sector will be most important in order to reach the energy targets. In April 2010, the Council adopted a position at first reading (5386/10 ADD1) on the energy performance of buildings directive (5386/10) which requires all EU countries to enhance their building regulations and to introduce energy certification schemes for buildings. All new buildings must be nearly zero energy buildings by December 31, 2020, Member States should set intermediate targets for 2015 and new buildings occupied and owned by public authorities have to be nearly zero energy buildings after December 31, 2018.

The Eurobserver Biomass Barometer for 2009 reports that biomass-based electric power production in the EU has almost tripled since 2001, from 20.3 TWh in 2001 to 57.8 TWh in 2008. The reason for the increase of biomass electricity production is primarily the development of cogeneration plants. Today, combined generation of heat and power plants provides 62.6 percent of all electricity produced from solid biomass.

More than half of the EU's biomass electricity production (51.2 percent in 2008) is concentrated in three countries; Germany, Sweden, and Finland. In Germany, a new law promoting heat production from renewable sources came into force on January 1, 2009. The law obliges owners of new buildings to cover part of their heat demand from renewable energy including a compulsory 50 percent to be covered by heating appliances using biomass fuels. The most important policy instrument in promoting renewable electricity production in Sweden is the electricity certificate system that was introduced in 2003. The objective of the electricity certificate system is to increase the production of renewable electricity by 25 TWh by 2020 compared to 2002. In Sweden, district heating accounts for about 40 percent of the heating market. Finland's electricity production reached 10.2 TWh in 2008, of which cogeneration plants delivered 84.1 percent. Biomass accounts for about 30 percent of Finland's energy consumption and 20 percent of its electricity.

Electricity Production from Biomass in the EU (TWh)			
	Electricity Plants	**CHP Plants**	**Total Electricity**

Calendar Year	2007	2008	2007	2008	2007	2008
Germany	6,973	7,331	2,893	3,116	9,866	10,447
Finland	1,049	1,630	8,612	8,606	9,661	10,236
Sweden	0	0	8,496	8,899	8,496	8,899
Austria	1,285	1,326	1,777	1,933	3,062	3,259
Poland	0	0	2,360	3,200	2,360	3,200
UK	2,920	2,768	0	0	2,920	2,768
Italy	1,666	1,929	815	817	2,482	2,746
Netherlands	735	1,228	1,235	1,335	1,970	2,563
Belgium	1,287	1,773	513	711	1,799	2,484
Spain	272	676	1,281	1,212	1,553	1,888
Denmark	0	0	1,828	1,803	1,828	1,803
Hungary	1,331	1,715	43	43	1,374	1,758
France	470	488	1,163	1,224	1,633	1,712
Portugal	166	163	1,366	1,338	1,532	1,501
Czech Republic	372	514	596	656	968	1,171
Other	19	63	607	1,275	626	1,337
Total EU	**18,545**	**21,604**	**33,585**	**36,168**	**52,130**	**57,772**

Source: Eurobserver Solid Biomass Barometer 2009

Pellets

Wood pellet use in the EU mainly occurs in Sweden, Denmark, the Netherlands, Belgium, Germany, Austria, and Italy although there are signs of dynamic growth in other member states as well. With the member states' ambitious policy objectives to increase the share of renewable energy sources in the electricity and heating sector, wood pellets will become increasingly important. According to the European Biomass Association, there are currently about 450 pellet plants in Europe producing about eight million tons of pellets per year. The number of plants is increasing continually due to the dynamic market development and AEBIOM estimates that up to 80 million tons of pellets could be used in the EU by 2020, which corresponds to 33 million tons oil equivalent.

The major raw material for pellets has traditionally been sawdust and by-products from sawmills. With the increasing competition for the sawdust resources there is now increased interest in searching for alternative raw material. The issue of pellet raw material and the pricing will be crucial for future market development.

Sweden is the largest producer and consumer of wood pellets. There are over 90 pellet factories supplying nearly 2 million metric tons of pellets to the Swedish market. In Germany, production of wood pellets reached 1.6 million metric tons in 2009 compared to 1.47 million metric tons in 2008. Domestic consumption is estimated at 1.1 million metric tons.

Biogas

European farmers are increasingly investing in biogas digesters to convert agricultural crops, manure and other farm and food industry residues into methane gas. The leader in this production segment is Germany with about 5,300 plants of various sizes in operation in 2010. The prime purpose of these biogas digesters is to generate electricity and heat. However, a growing number of large scale operations are purifying the biogas before it is entered into the natural gas grid. The use of purified biogas as transportation fuel is still marginal.

The incentive for farmers to invest in biogas digesters is a guaranteed price for the generated electricity which is considerably higher than that of electricity generated from fossil fuels, natural gas coal or nuclear sources.

As biogas production has already reached a considerable level requiring about 800,000 hectares of cropland in Germany (compared to about 3.3 million hectares for wheat production), environmental NGOs, organic farm organizations, and livestock farmers are increasingly expressing concerns that this production sector represents unfair competition to conventional food and feed producing farmers. Farm land prices in the neighborhood of biogas producing farmers are said to rise faster than in other agricultural regions. Similar criticism has not yet been reported from other EU countries.

	No. of biogas plants	**Feedstock**
Austria	342	N.A.
Belgium	40	manure, corn silage, ag and food waste
Czech Republic	75	corn silage, grains, manure
Denmark	81	manure
Finland	60	municipal waste
France	80	manure, wastes
Germany	5,300	corn and rye silage, grains, manure, wastes
Hungary	21	manure, sewage sludge, food industry waste
Italy	535	manure
Netherlands	120	manure, corn silage, ag and food waste
Poland	140	manure, corn silage, wastes
Spain	N.A.	landfill collections, ag wastes, sewage sludge
Sweden	230	waste materials, manure, crops
United Kingdom	10	N.A.

Source: EU FAS Posts

The Eurobserv'ER Barometer for 2009 reports increasing collection of biogas in the EU. Data for 2008 indicate that landfill collection and production from agricultural crop including manure are by far the two leading sources. It is noticeable that biogas production in Germany focuses on agricultural crops while in the United Kingdom biogas collection is predominantly taking place over landfills. Many European countries are currently at the initial stage of building on-farm

biogas digesters. In Germany about 2.5 percent of the electricity is produced from biogas. On the EU level the contribution of biogas to the electricity production is roughly estimated at one percent.

Biogas for Heat and Electricity in the EU (Ktoe)						
Calendar Year	**2006**	**2007**	**2008**	**2009[f]**	**2010[f]**	**2011[f]**
Landfill	2,007	2,795	2,915	3,000	3,050	3,100
Sewage Sludge	868	925	995	1,050	1,100	1,200
Field Crops/Manure	1,331	3,504	3,632	4,550	5,000	6,000
Total	4,899	7,224	7,542	8,600	9,150	10,300

f = Forecast EU FAS Posts Source: Eurobserv'ER, Barometer 2008 and 2009 http://www.eurobserv-er.org/pdf/barobilan9.pdf

Notes on Statistical Data

Bioethanol

Production and consumption figures are based on statistics of Eurostat, the European Bioethanol Fuel Association (eBIO) and FAS Posts. FAS Posts based their estimates on figures of national industry organizations and government sources. Ethyl tert-butyl ether (ETBE) is not included in production, but is included in consumption figures. ETBE is predominantly consumed in France, Spain, the Netherlands and Poland.

Trade figures are based on World Trade Atlas (WTA) data and figures of eBIO. As the EU has no Harmonized System (HS) code for bioethanol, trade numbers are difficult to assess. Bioethanol trade numbers in this report include ethanol imports under HS code 2207 (80 percent ethanol), HS code 29091910 (ETBE, 45 percent ethanol) and HS code 38249097 (solely import from Brazil, 87.5 percent ethanol). It is assumed that the increase of EU ethanol imports under HS 2207 since 2002 is entirely attributed to expanding bioethanol imports.

Feedstock and co-product figures: Official data for feedstock use is scarcely made available by industry and government sources. The figures in this report represent FAS Posts estimates of the percentage of bioethanol (MT) produced by feedstock (MT). The conversion factors used are; wheat: 0.31; corn: 0.32; barley and rye: 0.19; and sugar beet: 0.075 (source: USDA publication "The Economic Feasibility of Ethanol Production from Sugar in the U.S."). The applied conversion factor for the production of DDG is 0.37 (source EBIO).

Biodiesel

Production and consumption figures are based on statistics of the European Biodiesel Board (EBB) and adjusted by EU FAS Posts using additional information obtained from national industry

organizations and government sources.

Trade figures are based on Global Trade Atlas (GTA) data. A specific customs code for biodiesel (3824 90 91) was only introduced in the EU in January 2008. Prior to this date, biodiesel entering the EU was subsumed under the CN code 38 24 90 98 (other chemicals). CN stands for "Combined Nomenclature" and is the equivalent of the "Harmonized System" used in the United States. Therefore, biodiesel imports prior to 2008 are estimated based on industry information.

Feedstock and co-product figures: Data for feedstock use is not available. The figures in this report represent estimates by EU FAS posts.

Abbreviations and definitions used in this report

Benelux = Belgium, the Netherlands and Luxembourg
Biodiesel = Fatty acid methyl ester produced from agricultural feedstock (vegetable oils, animal fat, recycled cooking oils) used as transport fuel to substitute for petroleum diesel
Bioethanol = Ethanol produced from agricultural feedstock used as transport fuel
BtL = Biomass to Liquid
Bxxx = Blend of mineral diesel and biodiesel with the number indicating the percentage of biodiesel in the blend, e.g. B100 equals 100% biodiesel, while B5 equals 5% biodiesel and 95% conventional diesel.
CEN = European Committee for Standardization (Comité Européen de Normalisation)
DDG = Distillers Dried Grains
EBB = European Biodiesel Board
Exxx = Blend of mineral gasoline and bioethanol with the number indicating the percentage of bioethanol in the blend, e.g. E10 equals 10% bioethanol and 90% conventional gasoline.
GHG = greenhouse gas
GJ = Gigajoule = 1,000,000,000 Joule or 1 million KJ
Ha = Hectares, 1 hectare = 2.471 acres
HS = Harmonized System of tariff codes
Ktoe = 1000 MT of oil equivalent = 41,868 GJ = 11.63 GWh
MJ = Megajoule
MMT = Million metric tons
MS = Member State(s) of the EU
MT = Metric ton (1,000 kg)
Mtoe = Million tons of oil equivalent
MWh = Mega Watt hours = 1,000 Kilo Watt hours (KWh)
MY = Marketing Year
NMS = New Member State(s) = Countries that joined the EU in/after 2004

PVO = Pure vegetable oil used as transport fuel
RME = Rapeseed Methyl Ester
Toe = Tons of oil equivalent = 41,868 MJ = 11.63 MWh
TWh = Tera Watt hours = 1 billion Kilo Watt hours (KWh)
USD = U.S. Dollar

Energy content and Conversion rates [1] :

Gasoline = 43.10 MJ/kg = 43.1 GJ/MT
Ethanol = 26.90 MJ/kg
Diesel = 42.80 MJ/kg
Biodiesel = 37.50 MJ/kg
Pure vegetable oil = 34.60 MJ/kg
BtL = 33.50 MJ/kg

1 Toe = 41.87 GJ

1 MT Gasoline = 1,342 Liters = 1.03 Toe
1 MT Ethanol = 1,267 Liters = 0.64 Toe
1 MT Diesel = 1,195 Liters = 1.02 Toe
1 MT Biodiesel = 1,136 Liters = 0.90 Toe
1 MT Pure veg Oil = 1,087 Liters = 0.83 Toe
1 MT BtL = 1,316 Liters = 0.80 Toe

[1] Based on information from:
Massachusetts Institute of Technology (MIT) http://web.mit.edu/mit_energy/resources/factsheets/UnitsAndConversions.pdf
,
- German Federal Agency for Renewable Resources (FNR)

Disclaimer: This report presents the situation and outlook for biofuels in the EU. This report presents the views of the authors and does not reflect the official views of the U.S. Department of Agriculture (USDA). The data are not official USDA data. Official government statistics on biofuels are not available in many instances. This report is based on analytical assessments, not official data.

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Related Reports from USEU Brussels and MS Posts in the EU

Related reports from FAS Post in the European Union:

Country	Title	Date
France	First Generation Biofuels Gain Credibility- Next Generation Projects	05/31/10
EU-27	Grain and Feed Annual	05/01/10
EU-27	Sugar Annual	04/29/10
EU-27	Oilseeds and Products Annual	04/26/10
Germany	Status of Biomass Sustainability Certification in Germany	03/12/10
Denmark	Biorefinery and Biogas Tour	02/18/10
Denmark	Dane launches Low-Cost 2nd Generation Ethanol Enzyme	02/18/10
EU-27	Commission Consultation Paper for Highly Biodiverse Grasslands	12/22/09
France	French Agriculture Addressing Climate Change	12/08/09
Germany	Reduction of German Biofuel Use Mandates Enter into Force	08/13/09

Sweden	Biofuels Annual	06/25/09
EU-27	Biofuels Annual 2010	06/16/09
Sweden	Swedish Ethanol Plant's Bi-Product Becomes Main Product	04/28/09
Albania	Italy to Build $1.3 Billion Biomass Plant in Albania	02/10/09
Sweden	Bio-Fuels Cooperation- The Next Big Thing for FAS?	02/04/09
Germany	EU action requires Germany to revise changes to biofuel law	01/30/09

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