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Biofuels Annual

EU Biofuels Annual 2016

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Report Highlights: In 2015, the European Commission (EC) officially introduced a seven percent cap on food based biofuels thus limiting future production of these first generation or conventional biofuels and ensuring that only the most efficient plants will continue operating. Meanwhile, incentives to encourage second generation or advanced biofuels, such as the production of hydrogenated vegetable oils (HVO) have been very successful. The commercialization of cellulosic ethanol is lagging behind compared to the development of HVO. Imports of biomass, in particular wood pellets for heating and power, are surging.

Post:
The Hague

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Introduction

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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I. Executive Summary

Policy and Programs

Regulations influencing the use of biofuels in transportation as well as biomass in the heat and power market are outlined in the EU Energy and Climate Change Package (CCP) and the Fuel Quality Directive (FQD). The CCP includes mandatory goals for 2020, one of which is a 20 percent share for renewable energy in the total EU energy mix. In the Renewable Energy Directive (RED), specific sustainability requirements are defined for liquid biofuels. These include minimum greenhouse gas emissions (GHG) reductions, land use and protection against conversion of high-carbon content lands, other environmental criteria, as well as economic and social criteria. The implementation of harmonized sustainability requirements for solid biomass has been postponed until after 2020.

On October 5, 2015, the Indirect Land Use Change (ILUC) Directive entered into force, an

amendment to RED and FQD which introduced a seven percent cap (energy basis) on the share of food crop based (conventional) biofuels in EU transportation fuel by 2020 within a wider 10 percent target set by the RED. Furthermore, a non-binding 0.5 percent national target for advanced (non-food) biofuels was included. EU Member States will have until September of 2017 to enact the reformed legislation.

Conventional and Advanced Biofuels

In 2015, the blending of bioethanol and biodiesel was respectively 3.4 and 6.5 percent (energy basis), and thus well below the 10 percent target. The blending of conventional (food based) biofuels is estimated at five percent and still well below the seven percent cap. With the potential outlook of lifting EU wide mandates after 2020, the market conditions appear to be dim for conventional biofuels. A most cost effective approach to further green the transportation sector would be to introduce higher blends such as E10, and open the market for foreign produced biofuels. But both the imports of bioethanol and biodiesel have been cut off by high import and antidumping duties.

The blending of non-food based (advanced) biofuels is about 0.83 percent, and thus already surpassing the non-binding target of 0.5 percent for advanced biofuels by 2020. Since 2011, HVO production has taken of in the EU. In 2015, production is estimated at 2.3 billion liters, and is expected to increase to about 2.9 billion liters in 2017. The current capacity of cellulosic ethanol is about 85 million liters in the EU, and could possibly increase to about 300 million liters in 2020.

Biomass for heat and power

The European Commission (EC) expects the share of biofuels to be roughly twelve percent of the renewable energy use in 2020. While heat and power consumption from solid biomass is estimated to account for approximately 45 percent. The two main renewable biomass energy sources are wood pellets and biogas, the latter produced from a variety of feedstocks. With a consumption of about 20.5 MMT of pellets in 2015, the EU is the world's largest wood pellet market. Based on the EC mandates and Member State incentives, the demand is expected to expand further to nearly 22.5 MMT in 2017. The United States has the potential to supply at least half of the import demand, which would represent a trade value of potentially over US$ 1 billion in 2020.

II. Gasoline and Diesel Markets

Table 1. Fuel Use Projections (Million liters)

Calendar Year	2010	2011	2012	2013	2014	2015[e]	2016[e]	2017[e]
Gasoline Total	116,291	111,483	103,883	100,344	100,172	100,000	99,850	99,700
Diesel Total	267,656	261,954	257,768	257,095	256,065	256,000	256,000	256,000
On-road	192,156	192,919	189,046	189,022	194,022	194,780	195,380	195,990
Agriculture	12,024	11,713	11,193	11,432	11,095	11,000	10,800	10,600
Constr./mining	3,150	3,158	3,090	3,376	3,406	3,500	3,500	3,500
Shipping/rail	6,474	6,103	6,074	5,186	4,811	4,800	4,800	4,800
Industry	6,537	5,597	5,576	4,882	4,576	4,500	4,450	4,400
Heating	30,077	26,644	26,779	27,115	23,529	23,500	23,500	23,500
Jet Fuel Total	58,919	60,528	59,051	58,769	59,297	60,000	60,000	60,000
Total Fuel	442,866	433,964	420,701	416,208	415,534	416,000	416,000	416,000

Source: Eurostat

Based on the current outlook of positive economic growth, the Europeans Commission (EC) projects the transportation sector to continue to growing until 2030. While passenger road transportation is forecast to increase, the efficiency of vehicles is also expected to improve by 21 percent in 2020 and 35 percent in 2030 relative to 2005. In addition, the demand for electrically chargeable vehicles, especially for passenger cars, are forecast to emerge as a more viable option for consumers around 2020 as a result of EU and national policies aiming to boost their penetration. Both the increased efficiency and electrification will reduce the use of gasoline significantly by 2030. The use of diesel is expected to remain relatively stable; however, recently EU Member States have enacted policy measures that restrict the use of diesel and this could potentially lead to higher gasoline consumption. In France, for instance, a carbon tax has been created and the taxes on diesel have increased while taxes on gasoline have decreased. Air transport is projected to be the highest growing sector of all passenger transport modes, mainly due to the increased share of intercontinental aviation. Use of energy by agriculture, construction and mining, and by other industries heavily depends on the economic outlook in the European Union. For more information see the publication of the EC: EU Energy, Transport and GHG Emission Trends to 2050.

III. Policy and Programs

The Renewable Energy Directive

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 the CCP package, entered into force on June 25, 2009, and had to be transposed into national legislation in all Member States (MS) by December 5, 2010. The CCP includes the "20/20/20" goals for 2020:

- A 20 percent reduction in greenhouse 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 by the transport sector, to be achieved by all MS.

The goal for 20 percent renewable energy use in the total energy mix is an overall EU target, but the RED sets a different target for each MS depending on the MS' capacity. In June of 2015, when referencing a progress report over the EU's energy goals, Arias Canete, Commissioner for Climate Action stated, "The report shows once again that Europe is good at renewables, and that renewables are good for Europe." He later stated in December 2015 that the next three years would be spent implementing laws to reach 2030 standards instead of raising standards for after 2020.

In contrast to the 20 percent overall EU total energy mix target, the 10 percent target for renewable energy in transport is obligatory for all MS. The most current official figures available from the EU for renewable energy use in the transport sector show a 6.0 percent share (volume basis) in 2014, up 0.6 percent from 5.4 in 2013.

Revision of the RED and FQD

Directive 2015/1513, covering indirect land use change (ILUC), entered into force on October 5, 2015, and amends both the RED and the Fuel Quality Directive (FQD). The ILUC Directive includes the following key elements:

- Fuel suppliers are required to include ILUC emissions in their reports;
- A seven percent cap (energy basis) to the contribution of food crop based biofuels to the 10 percent target for renewable energy in transport by 2020, leaving three percent to be covered by non-food crop based biofuels. MS are free to set lower caps;
- Multiplication factor of 5 for electricity from renewable sources used for electric road vehicles and of 2.5 for renewable electricity used in rail transport;
- Non-binding national targets for advanced biofuels [1 – see note at end of report] , taking as a reference value 0.5 percent share of the renewable energy consumed by transport in 2020. MS may set up lower targets on certain grounds: a) limited potential for production, b) technical or climatic features of the national market for transport fuels, c) national policies putting particular emphasis on incentivizing energy efficiency and renewable electricity in transport;
- Double counting of the energy contribution of advanced biofuels towards the 10 percent blending target for 2020;
- Members States will be required to respect a waste hierarchy principle when incentivizing waste biofuels. For more information about the waste hierarchy see the Waste Framework Directive; Directive 2008/98.

The EU has set a goal of 10 percent of energy used in transport to come from biofuels by 2020 as the transport sector represents the fastest growing increases in greenhouse gas emissions. The wider target is for clean energy to make up 20 percent of fuel used in transport, power stations, heating stations, and cooling stations combined. National targets will be set for each country's contribution to the overall goals.

Reactions to Revision of the RED and FQD

Industry: The European Biofuels Technology Platform (EBTP) states that the non-binding and double counted advanced biofuels target of 0.5 percent is not ambitious enough to foster the deployment of advanced biofuels. According to EBTP, the seven percent cap on the contribution of biofuels from food crops is a political compromise that affects the healthy sustainable conventional biofuels industry in Europe. ePURE, the EU ethanol industry group, stated that the seven percent cap implemented by the ILUC Directive increased the urgency of implementation for higher blends of ethanol at the fuel pump. ePURE has also called on the EC to prioritize decarbonizing transport fuels in its 2016 Renewable Energy Directive (REDII), which is being drafted this year to cover the period 2020-2030.

Non-Governmental Organizations: Oxfam Europe welcomed the ILUC agreement but lamented the fact that it did not go further in limiting food crops for biofuels. They have called for Europe to completely ban fuels competing with food production. The European Environmental Bureau (EEB) said that the vote sends an important signal: first generation biofuels are not needed in the future of our transport policy.

Transposition of the RED

All MS were required to transpose the RED into national legislation by December 5, 2010. Following this deadline, the EU has handled warning and infringement cases with six MS. Cases for failure to transpose the Directive against Cyprus, Ireland, and Poland were all dropped. In 2015, the EU asked Spain and Poland to correctly apply the provisions of the Directive, stating that both countries had incorrectly transposed it. Specifically, both Spain and Poland suspended the sustainability targets in regards to the 10 percent renewable sourcing requirements for transport fuel. Should Spain and Poland fail to correctly apply the Directive, the EU could potentially seek action with the EU Court of Justice. As of April 2016, the EU had issued an "Urge to Comply" message to Portugal in reference to the RED. Portugal currently favors domestically produced biofuels in addition to imposing stricter sustainability standards for select biofuels—an action not encouraged by the Directive.

National Renewable Energy Action Plans (NREAPs)

The RED required MS to submit National Renewable Energy Action Plans (NREAPs) by June 30, 2010. The NREAPs provided detailed roadmaps of how each MS expects to reach its legally binding 2020 targets.

MS Mandates and Tax Incentives

Each MS is responsible for developing policy and tools to implement the provisions outlined by the RED. A full listing of each MS mandates is available in a separate GAIN report GM16009 - Biofuel Mandates in the EU by Member State. Additionally, each MS is responsible for incentivizing the renewable energy sector. Prior to 2014, subsidies for renewable energy were only available in the form of State Aid that was monitored by the EC. In April of 2014, the EC released guidelines to MS to modernize their individual systems in order to attempt to reduce distortions in energy markets that had caused high energy prices across Europe. Commission Vice President in charge of competition policy Joaquín Almunia said: "It is time for renewables to join the market. The new guidelines provide a framework for designing more efficient public support measures that reflect market conditions, in a gradual and pragmatic way. Europe should meet its ambitious energy and climate targets at the least possible cost for taxpayers and without undue distortions of competition in the Single Market. This will contribute to making energy more affordable for European citizens and companies."

On June 15, 2015, the EC published its most recent and second Renewable Energy Progress Report. This report concluded that the prospects for achieving the 20 percent renewable energy target by 2020 are promising. The majority of the MS are on track to meeting their renewable energy targets. The report also found that achieving the 10 percent target for renewable energy in transport while challenging, is feasible with the development of advanced biofuels. From the regulatory point of view, all articles of the RED are relevant and have contributed to meeting the RED's objectives. However, the effectiveness and efficiency of the measures vary as a result of implementation at national level. The 2015 Renewable Energy Progress Report was voted on in the European Parliament (EP) plenary.

The report outlined the following key findings:

- Renewable energy accounted for 15 percent of the EU gross final energy consumption in 2013 and is estimated at 15.3 percent in 2014;

- 26 MS met their first 2011-2012 interim target and 25 MS are expected to meet their 2013-2014 target. Some have already met their 2020 targets;
- Some MS may need to intensify their efforts in the coming years to keep on track with their targets;
- There is increasing interest from MS to use cooperation mechanisms;
- The share of renewable energy in transport was 5.4 percent in 2013 with a projection of 5.7 percent for 2014. The reason for the slow progress was mainly attributed to the uncertainty over the ILUC proposal.

While the EC had originally planned to publish a dedicated regulatory fitness and performance (REFIT) evaluation of the RED by the end of 2015, such report has not been released. According to the EC's website, new legislative proposals for renewable energy under REFIT were instead included in the EC's 2016 Work Programme under Annex II. In addition to outlining evaluations of several reporting initiatives, an evaluation follow-up on the results of a REFIT evaluation of the FQD was also authorized.

Mid-Term Evaluation of RED

On April 2015, DG Energy published a mid-term evaluation of the RED. The study concluded that a number of provisions are found to be effective and efficient, whereas, the remaining provisions cannot be thoroughly assessed due to lack of data, delays in MS implementation, or limited use of the provisions so far. Meeting the mandatory transport target has been hampered by *inter alia,* the delay in the ILUC decision-making process. Nonetheless, most stakeholders see the RED as a key contributor to the EU-wide renewable energy deployment.

The study recommended that the current provisions should not be modified as stable policies are key to investor security and achievement of the 2020 targets. Furthermore, the study suggested that the longer-term framework for renewable energy resources (RES) regulation in the EU should be decided on before 2020 to provide clarity on market outlook and continuation of the current RED provisions beyond 2020. This would ensure a seamless transition from the 2020 to the 2030 policy package, which will strengthen the current regulation and measures, and encourage investments in RES throughout the EU.

The study also analyzed six MS (Bulgaria, Estonia, Germany, Poland, Spain, and Sweden) on their handling of and attitudes towards the RED. It found that some MS lack ambition to exceed the 2020 RES target. Additionally, they concluded reporting duties under the RED are complicated for several MS. MS suggested that there is a need for binding targets for RES at MS level, rather than an overall EU target.

RED and Sustainability Criteria

The RED establishes two sets of criteria to promote sustainability of biofuels production: 1) GHG emissions savings and land use requirements must meet a 35 percent threshold of GHG emissions savings and will go up to 50 percent in 2017 and 60 percent for new installations in 2018; 2) biodiesel must be certified as having been produced sustainably on land that has not been converted from high carbon density conditions such as rainforest.

In order to receive public support or count towards mandatory sustainability targets, biofuels and bioliquids used in the EU must comply with the EU's sustainability criteria as featured in the RED and FQD as amended by the ILUC Directive. The EU has defined a set of sustainability criteria to ensure that the use of biofuels (used in transport) and bioliquids (used for electricity and heating)

is done in a way that guarantees carbon savings and protects diversity.

To qualify for RED and FQD targets, biofuels consumed in the EU must comply with strict sustainability criteria provided in Article 17 of the RED. Rigorous requirements are set by the RED on the minimum level of GHG savings, appropriate land use, and monitoring requirements for any potentially adverse effects.

In order to demonstrate compliance with the EU sustainability criteria, biofuels need to be validated by either national verification systems or by one of 20 voluntary schemes approved by the EC and valid in the EU. Sustainability criteria must be met by all biofuels, whether produced within the EU or imported, and must meet a 35 percent GHG emission savings requirement compared to fossil fuels. As of 2017, the threshold is set to rise to 50 percent and to 60 percent by 2018, for new installations.

Environmental sustainability criteria covering bio-diverse and high-carbon-stock lands are likewise laid out in the RED. The biodiversity criteria apply to land that would have been classified as highly biodiverse in January 2008. The criteria state that biofuels may not be made from raw materials obtained from land with high biodiversity value, such as primary forest and other wooded land, biodiverse grasslands, or areas designated for nature protection purposes. Biofuels also cannot be made from raw materials produced on land with high carbon stock such as wetlands, peatlands, or continuously forested areas.

Agricultural raw materials produced within the EU, including biofuels, must 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 (Cross compliance Article 17 § 6 of the RED). Other sustainability requirements cover environmental criteria for soil, water, and air quality, as well as social criteria, which focus on food price impact and adherence to International Labor Organization conventions.

MS competent authorities are responsible for ensuring that biofuels counted towards targets, mandates, and tax credits fulfill the sustainability criteria. MS 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 could be 28 different national certification schemes that must be registered and recognized by the EC.

The FQD complements the RED and mirrors some of the RED's content such as the sustainability criteria. A key requirement of the FQD is that all fuel suppliers must meet a 60 percent reduction in GHG emissions by 2020 across all fuel categories supplied to the market. This is designed to be consistent with the 10 percent use of biofuels and shift demand towards biofuels with higher GHG savings. In addition, the FQD limits ethanol blends to 10 percent or less when ethanol is used as an oxygenate, and places limits on palm oil and soy oil content of biodiesel.

GHG Emissions

GHG emissions for biofuels and bioliquids are calculated using 'default' values outlined in the FDQ and listed in the RED Annex V (for which an excel spreadsheet tool can be found here). The EC Joint Research Center (JRC) defines the GHG emissions savings for various raw materials, and production and supply pathways associated with the cultivation of the biomass, processing, transport, and distribution. Emissions savings and carbon emissions resulting from land-use change, adoption of improved agricultural practices, carbon capture and storage, or generation of excess electricity through cogeneration are also included. For fuel production pathways that are not included in Annex V, life cycle analyses (LCAs) must be developed to calculate carbon

intensities.

Table 2: Typical and default values for biofuels if produced with no net carbon emissions from land-use change

	Typical GHG[1] savings	Default GHG[2] savings
Rape seed biodiesel	45%	38%
Soy bean biodiesel	40%	31%
Sun flower biodiesel	58%	51%
Palm oil biodiesel (Process not specified)	36%	19%
Palm oil biodiesel (process with methane capture at mill)	62%	56%
Corn ethanol, Community produced (natural gas as process fuel in CHP plant)	56%	49%
Sugar beet ethanol	61%	52%
Sugar cane ethanol	71%	71%
Waste vegetable or animal oil biodiesel	88%	83%

Source: EU Official Journal RED-Directive 2009/28. (1) 'Typical' implies an estimate of the representative GHG emission savings for a particular biofuel production pathway. (2) Default' implies a value derived from a typical value by the application of pre-determined factors and that may, in circumstances specified in RED, be used in place of an actual value.

When the default values are calculated, the EC applies a "discount factor" from the typical value to ensure that the biofuel pathway is not inflated. For example, the RED's GHG savings default value for soy diesel is 31 percent, which is below the minimum 35 percent GHG threshold defined in the RED sustainability criteria. The default GHG value for soybeans was calculated using a pathway where soybeans were first shipped from Brazil, and then transformed into soy oil and biodiesel in the EU. If the GHG value was calculated for soy-based biodiesel produced in the United States and shipped from the United States then it would have a GHG savings value of 40 percent and be above the 35 percent threshold. However, EC officials have stated they do not wish to have GHG saving numbers for different geographical areas, but prefer to base GHG numbers on specific pathways, such as no-till farming, to allow for easier updates. With no international standard in place for the calculation of GHG savings, there are concerns that protectionists could use GHG thresholds to hamper trade.

Amendments to Annex V of the RED (rules for calculating the GHG impacts of biofuels and bioliquids) and Annex IV of the FQD (environmental specifications for market fuels to be used for vehicles equipped with compression ignition engines) were made by Directive 2015/1513. The adoption of these amendments created alterations to how GHG impacts of biofuels, bioliquids, and their fossil fuel counterparts were calculated. This Directive also mandated that the EC was to publish a report on the estimated and typical values in Parts B and E of Annex IV in the FQD every two years in order to evaluate their effectiveness and scientific relevance in achieving the 2020 targets. The next report is due by December 31, 2016.

Voluntary Schemes

One way to ensure that biofuels meet the sustainability and GHG savings requirements of the RED is to have the biofuel certified by a voluntary scheme. Some of the MS have developed national voluntary systems, while others rely on voluntary schemes adopted by the EC. The EC considers voluntary schemes its preferred mean of obtaining certification, but there are no negotiations for bilateral agreements on biofuels certification even though this was an option mentioned in the

RED.

Voluntary schemes (VS) verify compliance with the EU's biofuels sustainability criteria. VS check that biofuel production did not take place on land with high biodiversity, that land with high carbon stock was not converted for biofuel production, and that the production of biofuels leads to a sufficient level of GHG emission savings. For the purpose of certification, the entire production chain from the farmer growing feedstock to the final biofuel product is checked by independent auditors. Recognition by the Commission is granted for up to a period of five years.

Since the ILUC Directive amended the RED, the rules on VS have become stricter and yearly reporting by the VS is required. The reports must cover information on audits performed, transparency of the scheme, stakeholder involvement, market information, and compliance with the scheme and how non-compliance was dealt with. Based on these reports, the EC can prescribe standards on independent auditing. Non-compliance with these standards could result in losing a permit. For EC approved voluntary schemes, this will mean additional administrative burden without additional revenues. In September 2015, the EC issued new standards guidance that all VS would have to comply by.

As of April 2015, the EC had approved 19 voluntary schemes that can certify biofuels for all MS. MS must accept these certification schemes and cannot demand anything more than what is provided by in the scheme. The EC approved voluntary schemes are:

1. ISCC (International Sustainability and Carbon Certification)
2. Bonsucro EU
3. RTRS EU RED (Round Table on Responsible Soy EU RED)
4. RSB EU RED (Round Table of Sustainable Biofuels EU RED)
5. 2BSvs (Biomass & biofuels voluntary scheme)
6. RBSA (Abengoa RED Bioenergy Sustainability Assurance)
7. Greenergy (Brazilian bioethanol verification program)
8. Ensus (Voluntary scheme under RED for Ensus bioethanol production)
9. Red Tractor (Farm Assurance Combinable Crops & Sugar Beet Scheme)
10. SQC (Scottish Quality Farm Assured Combinable Crops scheme)
11. Red Cert
12. NTA 8080
13. RSPO RED (Roundtable on Sustainable Palm Oil RED)
14. Biograce (GHG calculation tool)
15. HVO Renewable Diesel Scheme
16. Gafta Trade Assurance Scheme
17. KZR INIG
18. Trade Assurance Scheme for Combinable Crops
19. Universal Feed Assurance Scheme
20. Austrian Agricultural Certification Scheme (agricultural feedstock and vegetable oils) [2 – see note at end of report]

In April 2015, the U.S. Soybean Export Council (USSEC) submitted an application for recognition of their U.S. Sustainable Soy Assurance Protocol (SSAP) under the RED to DG Energy. USSEC developed a RED specific protocol entitled SSAP/RED. The SSAP/RED recently met the Dutch Feed Industry Association's (NEVEDI) requirements for sustainable feedstuffs. In March of 2016, SSAP was positively benchmarked against the European Feed Manufacturers' Federation's (FEFAC) Soy Sourcing Guidelines through the International Trade Centre's (ITC) customized benchmark tool. USSEC sees this as a significant step towards meeting the EU's sustainability criteria. Archer Daniels Midland Co.'s (ADM) sustainability scheme, The Responsible Soy Standard, had also met FEFAC and ITC Soy Sourcing Guidelines as of November 2015.

Biomass Sustainability

While the current RED sets clear sustainability criteria guidelines for liquid biofuels, the EC had deferred setting mandatory sustainability criteria for pellets and other forms of solid biomass. However, as part of the new Renewable Energy Directive (RED II) for the post 2020 period, the EC is developing a new bioenergy policy expected to be made public in the last quarter of 2016. The legislative proposal on a renewable energy target for 2030 will include sustainability criteria for both biofuels and biomass.

For 2020 through 2030, the EC will develop a biomass policy aimed at maximizing the overall climate and environmental benefits of biomass and contribution to significant GHG emission savings. The EC decision was based on the assumption that current national, EU, and international legislation sufficiently ensures sustainable practices are being used. However, some MS (the largest importers), are moving forward on developing their own sustainability criteria (see the RED Biomass Chapter for more information). For example, in the United Kingdom, the Renewable Transport Fuel Obligation Guidance offers a sustainability scheme that has yet to be recognized by the EC. In the absence of binding criteria for solid biomass, several MS including Belgium, Denmark, and the Netherlands, developed their own rules in response to the growing use of imported wood pellets, particularly in industrial power plants (for more information see the Chapter Biomass for Heat and Power). All MS sustainability schemes on biomass have to be checked by the EC even though there are no specific EU criteria on sustainability.

Commission Communication on 2030 Climate and Energy Goals

In January 2014, the EC published its Communication along with a Proposal revising the EU Emission Trading System (ETS). The Communication, which sets out the 2030 framework, includes a reduction in greenhouse gas (GHG) emissions by 40 percent compared to the 1990 level, an EU-wide binding target for renewable energy of at least 27 percent, and renewed ambitions for energy efficiency. The Communication also states that biofuels produced from food based feedstocks will not receive 'public support' after 2020.

On October 24, 2014, European Heads of State and Government confirmed the EC's proposal by reaching an agreement on the 2030 Framework for Climate and Energy in an effort to maintain what the EU sees as its global leadership on the climate change issue. According to the Conclusions, the 2030 framework will be based on three targets:

- Reducing greenhouse gas emissions by 40 percent;
- Increasing the share of renewable energy to 27 percent of consumption;
- Improving energy efficiency by 27 percent [3 – see note at end of report]

These targets also fall in line with the EU's 2050 low-carbon economy, 2050 energy strategy, and the White Paper 2011 (the long term vision for fueling Europe's transportation sector).

2021-2030 Renewable Energy Framework

The EC is expected to present a new RED post-2020 (RED II) legislative proposal as part of the Renewable Energy Package in conjunction with an initiative outlining a bioenergy sustainability policy for 2030 focusing on:

1. Promoting renewable energy through a comprehensive approach to speed up the replacement of obsolete fossil fuel boilers with efficient renewable heating and increasing the deployment of renewable energy in district heating and Combined Heating and Power (CHP);
2. Supporting the local authorities in preparing strategies for the promotion of renewable energy and heating;
3. Incentivizing the uptake of renewable energy in heat production including CHP.

The RED II would aim at ensuring proper market conditions for the cost-effective development and deployment of renewable energy by:

- Establishing an accountable and reliable system for the achievement of the 27 percent target;
- Creating market conditions allowing for the cost-efficient financing and integration of renewable energy into the market;
- Addressing remaining challenges related to the mainstreaming, deployment, uptake and integration of renewable energy in the EU energy markets and grids;
- Promoting cooperation between MS in regional approaches to renewable energy and market integration and grid operation. In addition it would aim to compensate for market failures, such as inadequate inclusions of externalities in the cost of energy sources, as well as to avoid the creation of new market failures.

Public Consultation

The EC is currently analyzing the results of a public stakeholder consultation, which focused on gathering stakeholder's views on the revision of the RED. The results of the stakeholder's public consultation, which closed in February 2016, are expected to feed into the Commission's work on the proposal and would be available in the coming months.

Trade Policy

In 2012, the EC published a customs regulation which changed the HS code for ethanol used for fuel to HS/CN code 2207. Ethanol and gasoline blends with an ethanol content of 70 percent or more are classified as denatured ethanol under code 22.07.20.00, and charged with an import tariff of €10.20 per hectoliter. Previously, ethanol was imported under code 38.24, at an import duty of 6.5 percent. There seems to still be some uncertainties where blends between E30 and E70 would be classified.

For biodiesel, a code that covers fatty-acid mono-alkyl esters (FAMAE) was introduced in January 2008, and changed in January 2012. However, other forms of biodiesel could still enter under other codes depending on the chemical composition. Diesel with a biodiesel component of less than 30 percent can enter the EU under chapter 27.10.20 at a tariff rate of 3.5 percent.

Table 3: Duty Rates for Fuels

HS Code	Description	Duty Rate
38260010	FAME 96.5-100%	6.5% (plus AD and CV duties for U.S. and most Canadian companies)
38260090	FAME below 96.5%	6.5% (plus AD and CV duties for U.S. and most Canadian companies)
271020	B30 and below	3,5%
220710	Undenatured ethanol	€19.2/hl

220720	Denatured ethanol	€10.2/hl

Bioethanol

During 2009 – 2012, the major part of the bioethanol shipped to the EU was imported with a Binding Tariff Information (BTI) under the HS code 3824.90.97, subject to a tariff of 6.5 percent of the customs value. On April 3 2012, the EU's Customs Code Committee reclassified ethanol blends as denatured ethanol under HS 2207, subject to the higher import tariff of €102 per thousand liters (Regulation 211/2012). This reclassification was, however, insufficient to block trade.

On February 23, 2013, the EC adopted Council Regulation (157/2013) imposing a definitive AD duty on imports of bioethanol originating in the United States. The rate of the AD duty is set at €62.3 per MT, and is applicable in proportion by weight of the total content of pure ethyl alcohol produced from agricultural products. Ethanol for uses other than fuel is exempted from the anti-dumping duty. This duty is in addition to the import tariff of €102 per 1,000 liters, and as a consequence a volume of 1,000 liters of ethanol from the United States is charged with €151.2.

In June of 2016, the EU General Court ruled against the duties created by the 2013 regulations. They found that applying a weighted average duty to all U.S. bioethanol producers as a whole instead of separate duties for each sampled producer was not in keeping with EU law or WTO rules. The EC has two months to appeal the decision. The time requirement to make a decision on an appeal is 12 to 8 months. Based on the current EU Court's ruling the duty will probably be recalculated and imposed on a company-by-company basis instead of executed as a country-wide duty.

Biodiesel

In March 2009, the EC published Regulation 193/2009 and Regulation 194/2009, containing provisional anti-dumping (AD) and countervailing (CV) duty measures on imports of biodiesel from the United States *containing 20 percent or more of biofuels*. Both regulations were imposed by the EC on July 7, 2009 (see Council Regulation 598/2009 and 599/2009) and were due to expire in July 2014. However, the European Biodiesel Board (EBB) lodged a request for a review of the duties on April 9, 2014, based on the grounds that an expiry of the measures would result in recurrence of subsidized imports offered at dumping prices. On July 10, 2014, the EC decided to undertake the investigation and as of September 2015, the EU moved to extend the duties against U.S. biodiesel an additional five years to September of 2020.

In May 2011, the EC published a Council Decision which extended the definitive AD and CV *on biodiesel blends of 20 percent or less* originating from the United States. The measures adopted by the EC were retroactive and extended to August 13, 2012. For U.S. companies that were investigated in 2009, the combined duties will apply €213.8 – €409.2 per metric ton (MT). Other U.S. companies will be subject to the highest combined duty of €409.2 per MT, based on the biodiesel content in the blend. The different duties have drastically reduced the imports of biodiesel from the United States.

In May 2013, the EC published regulation 490/2013 imposing a provisional anti-dumping duty on imports of biodiesel originating in Argentina and Indonesia. The provisional tariffs were effective beginning May 29, and range between 6.8-10.6 percent on imports from Argentina, and between 0-9.6 percent on biodiesel originating in Indonesia. During the investigation period (July 1, 2011-June 30, 2012) all imports from Argentina were found to be dumped, while a low level (2-6 percent) of the Indonesian biodiesel was found not to be dumped. The Argentine and Indonesian biodiesel sectors filed a complaint with the WTO on the EU biofuels quota and tax systems. In November 2013, the anti-dumping duties were made permanent, see Regulation 1194/2013. While

the Indonesian case is currently still pending, in March of 2016, the WTO ruled that while the core of the EU regulations do not violate WTO standards, specific portions of the EU's definition of dumping violated the General Agreement on Tariffs and Trade (GATT) as well as the Anti-Dumping Agreement. Both the EU and Argentina filed appeal claims in May of 2016 which will be heard by the WTO's Appellate court, who will then have 90 days to issue a report.

On October 2014, U.S. industry group, National Biodiesel Board (NBB) filed comments with the EC, challenging import duties that were introduced in 2009. The NBB urged the EC to allow duties to expire that year, citing evidence that global trade for biodiesel had changed since the duties were imposed and that continuing the duties was protectionist and unnecessary. With the renewal of the U.S. tax credit on biodiesel not expected to expire until 2016, the EU's response was to extend the duty imposed on U.S. produced biodiesel until September of 2020 in a move to put European based biodiesel on equal footing with U.S. made fuel.

IV. Ethanol

Bioethanol (ethyl alcohol) or simply ethanol is made by fermenting the sugar components of plant materials. The most commonly used feedstocks are grains (corn, other coarse grain, and wheat kernels) and sugarcane. 'Synthetic' ethanol made from petroleum fuels is restricted to a very small market and is not included in this report. Ethanol used as transport fuel is referred to as bioethanol in this report

EU Production, Supply and Demand Tables

Table 4. Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)

Calendar Year	2010	2011	2012[r]	2013[r]	2014[r]	2015[e]	2016[f]	2017[f]
Beginning Stocks	621	440	315	88	250	349	374	254
Fuel Begin Stocks	588	407	282	55	217	316	341	221
Production	4,918	5,042	5,308	5,650	5,900	5,840	5,700	5,700
Fuel Production	4,268	4,392	4,658	5,000	5,250	5,190	5,050	5,050
-of which cellulosic (a)	0	0	0	0	75	75	75	85
Imports	1,284	1,663	1,245	676	447	295	230	230
Fuel Imports	880	1,285	886	595	367	215	150	150
-of which ETBE (b)	270	261	188	197	109	92	90	90
Exports	126	149	145	113	278	240	200	200
Fuel Exports	76	99	95	63	228	190	150	150
Consumption	6,257	6,681	6,635	6,051	5,970	5,870	5,850	5,820
Fuel Consumption	5,253	5,703	5,676	5,370	5,290	5,190	5,170	5,140
Ending Stocks	440	315	88	250	349	374	254	164
Fuel Ending Stocks	407	282	55	217	316	341	221	131
Production Capacity, First Generation								
Number of Refineries	68	68	70	71	71	71	71	71
Capacity	7,570	7,759	8,468	8,480	8,480	8,480	8,480	8,480
Capacity Use (%)	65	65	63	67	69	68	66	66
Production Capacity, Cellulosic Ethanol								
Number of Refineries	0	0	0	0	1	1	1	2

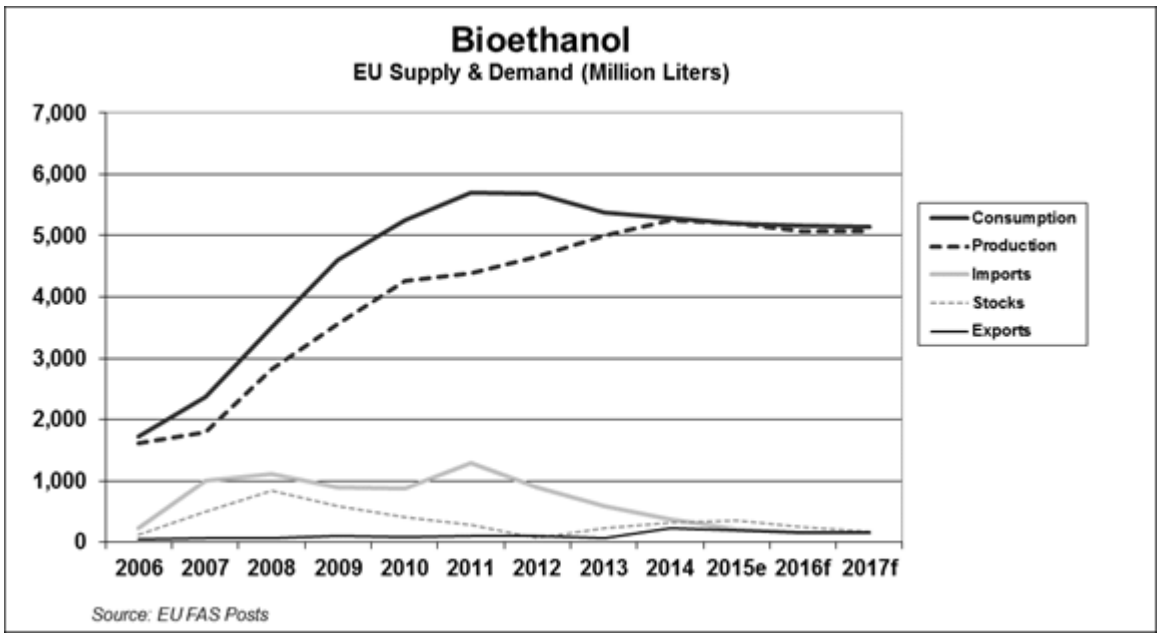
Capacity	0	0	0	0	75	75	75	85
Co-product Production(c) (1,000 MT)								
DDG	2,469	2,508	2,767	2,764	2,929	2,862	2,797	2,834
Corn Oil	68	78	143	141	150	157	150	152
Feedstock Use (1,000 MT)								
Wheat	3,772	3,892	3,073	2,535	2,798	2,575	2,575	2,575
Corn	2,350	2,695	4,924	4,855	5,174	5,415	5,177	5,231
Barley	647	735	440	649	541	525	524	521
Rye	1,119	692	404	792	846	627	661	732
Sugar Beet	9,127	8,308	10,418	10,453	9,364	9,041	8,809	8,808
Cellulosic Biomass	-	-	-	-	270	270	270	300
Market Penetration (million liters)								
Fuel Ethanol	5,253	5,703	5,676	5,370	5,290	5,190	5,170	5,140
Gasoline	116,291	111,483	103,883	100,344	100,172	100,000	99,850	99,700
Blend Rate (%)	4,5	5,1	5,5	5,4	5,3	5,2	5,2	5,2

The ethanol production and exports for industrial chemicals is estimated at respectively 650 and 50 million liters per year. r = revised / e = estimate / f = forecast EU FAS Posts. (a) For more information see section Advanced Biofuels. (b) ETBE in million liters of ethanol. HS code 29091910, ETBE contains 45 percent ethanol. (c) Calculated co-product production based the ethanol production and feedstock used. Source: European Commission, Eurostat, Global Trade Atlas, ePURE and EU FAS Posts.

Production & Capacity

Table 5. Fuel Ethanol Production Main Producers (million liters)								
Calendar Year	**2010[r]**	**2011[r]**	**2012[r]**	**2013[r]**	**2014[r]**	**2015[e]**	**2016[f]**	**2017[f]**
France	942	846	829	995	975	968	970	970
Germany	765	730	776	851	920	937	950	950
Hungary	190	190	291	392	456	637	640	640
Belgium	315	400	410	451	557	560	560	560
Netherlands	100	275	451	524	520	520	450	520
Spain	471	462	381	442	453	494	400	400
United Kingdom	352	89	215	278	329	253	250	250
Poland	194	167	213	235	181	214	241	253
Austria	199	216	216	223	230	235	235	235
Total	**4,268**	**4,392**	**4,658**	**5,000**	**5,250**	**5,190**	**5,050**	**5,050**

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

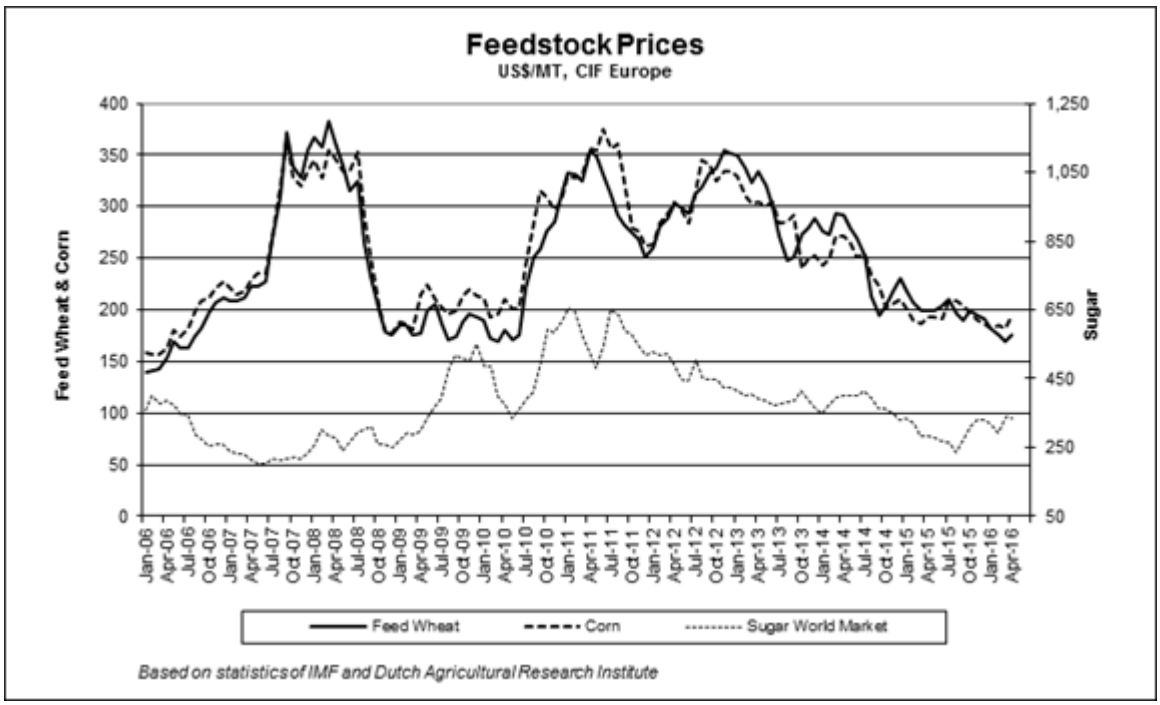


In 2014, EU bioethanol production peaked at about 5.3 billion liters. The sector benefitted from low feedstock prices and restrictive measures on bioethanol imports (see trade section). While production expanded, consumption fell, and as a result the EU reached self-sufficiency in 2014. This market balance was also reached in 2015. Both production and consumption fell to about 5.2 billion liters. On an energy basis, this is equivalent to 32.6 million barrels of crude oil.

In 2016 and 2017, EU bioethanol production is anticipated to decline slightly to about 5.1 billion liters. The domestic bioethanol market has been affected by a shrinking domestic market as gasoline consumption is on the decline and national blending mandates are adjusted downwards (see consumption section). Despite theoretical average EU crush margins have been positive since mid-2015, many producers were subject to financial problems. Lack of capital forced plants to discontinue production in the United Kingdom, the Netherlands and Spain. As well in Romania, production is under pressure due to lack of profitability. Limited expansion is reported in Poland and Germany. In Poland, despite the fact that domestic production faces competition from imports, increasing demand will result in higher production levels. German bioethanol producers are able to increase production and market share as the high energy efficiency of their plants translates into higher greenhouse gas (GHG) reduction values and makes German bioethanol competitive with imports. Only in Hungary has capacity and production expanded significantly. In 2015, capacity was increased by about 80 million liters and that expansion is expected to continue up to 2018.

Since 2012, EU ethanol production capacity stabilized at about 8.5 billion liters. Further expansion of first generation bioethanol is expected to be limited. Expansion of cellulosic bioethanol production is restrained due to the lack of certainty in the EU policy making process (see Policy and Advanced Biofuels Chapter). Also for 2020–2030, the EU renewables policy lacks a specific emission reduction target for transport biofuels.

Feedstock Use



In the EU, bioethanol is mainly produced from grains and sugar beet derivatives. Wheat is mainly used in northwestern Europe, while corn is predominantly used in Central Europe
In 2015, an abundance of corn on the domestic market benefitted production in Central Europe, in particular in Hungary. Corn is also the preferred grain in the Netherlands and Spain, where the majority of the ethanol plants are located at sea ports. While in 2014 and 2015, corn was imported from the United States, the corn for ethanol production is mainly sourced from the Ukraine. This is partly because of its non-GM content. Producers in northwestern Europe prefer to market their distillers dried grains (DDG) as non-GM to the domestic feed market.

In France, Germany, Belgium and the Czech Republic sugar beets are used for the production of bioethanol. Use of beets for ethanol production is expected to remain at about 9 MMT (see FAS EU Sugar Annual). As from October 2017, the EU sugar market will be liberalized. Beet ethanol produces higher savings towards the German GHG standards compared to wheat and corn. Investments for building new plants or refurnishing plants to produce beet ethanol are unlikely in the short term.

In the EU, the required feedstock for 2016 production (5,050 million liters of bioethanol) is estimated at 8.9 MMT of cereals and 8.8 MMT of sugar beets. This is about 2.9 percent of total EU cereal production and about 7.0 percent of total sugar beet production. Co-products of the bioethanol production are DDG (Distillers Dried Grains), wheat gluten and yeast concentrates. In 2016, the maximum theoretical production of co-products is forecast to reach 3.0 MMT. This is about 1.7 percent of total EU feed grain consumption.

Consumption

Table 6. Fuel Ethanol Consumption Main Consumers (million liters)								
Calendar Year	**2010**	**2011**	**2012**	**2013[r]**	**2014[r]**	**2015[e]**	**2016[f]**	**2017[f]**

Germany	1,475	1,568	1,581	1,532	1,557	1,487	1,455	1,390
United Kingdom	797	823	981	1,038	1,041	949	975	1,010
France	773	768	790	778	803	805	805	805
Spain	468	443	395	337	371	375	355	355
Poland	301	301	305	305	311	323	325	330
Sweden	378	399	406	354	349	329	315	305
Netherlands	263	295	244	247	253	255	255	260
Italy	306	480	463	349	215	251	250	250
Total	**5,253**	**5,703**	**5,676**	**5,370**	**5,290**	**5,190**	**5,170**	**5,140**

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

While EU bioethanol production reached its peak in 2014, consumption has already been on the decline since 2011. This trend can mainly be explained by lower gasoline use and the adjustment of blending mandates. Another factor is the blending of biofuels which count double towards the mandate. The reduction of the fossil fuel prices did not have a significant effect on biofuel consumption in the markets which are regulated by mandates and thus consumption of biofuels is fixed. Also has the price increase been tempered by the weakening of the € against the US$. Sales of the higher ethanol blends however are significantly negatively affected by the low gasoline prices. In 2015, bioethanol consumption is estimated at about 5.2 billion liters and is anticipated to gradually decline to about 5.1 billion liters in 2017.

- A declining consumption trend is reported in Germany, despite the switch in biofuels mandates from being based on energy content to greenhouse gas (GHG) savings. Based on the GHG savings, this new system was anticipated to create a preference for ethanol above biodiesel. However, as actual GHG saving values of the biofuels improved physical demand for bioethanol decreased.
- In the Netherlands, the lower consumption can partly be attributed to the blending with double counting biodiesel, bioethanol, bio-MTBE and biomethanol.
- In Sweden, E85 sales are plummeting as gasoline prices declined and new government energy taxes disadvantaged the use of E85. These taxes will reportedly be adjusted in August 2016.
- In Spain, the elimination of the bioethanol specific targets could further reduce marketing opportunities for bioethanol producers. Blenders would likely opt for meeting mandates just with biodiesel and hydrogenated vegetable oil (HVO) produced from waste feedstocks, which don't count against the seven percent cap on crop-based biofuels (see Policy Chapter), but are eligible for mandate compliance.
- In the Czech Republic the consumption of biofuels is on the decline as the excise tax on biofuels was increased as from January 2016. Because of this situation it is uncertain the Czech Republic will be able to meet its goals in GHG savings in 2017.
- Despite lower transport fuel use, French bioethanol consumption is expected to remain stagnant. Consumption is supported by the increased number of stations that sell E85, currently 8 percent of the fuel stations in France.

Against the EU trend, bioethanol use is expected to increase in the United Kingdom and Poland.

- Polish consumption of bioethanol is expected to increase during 2016 and 2017 as mandates gradually rise, and a limited share is fulfilled with double counting biofuels.
- Also in the United Kingdom, biofuels consumption is expected to receive sufficient support to increase consumption. In plans published in January 2016, the UK Transport Department set out a proposed trajectory for increasing the supply of renewable transport fuel to meet the EU requirement of 10 percent renewable transport fuel by 2020. A

Transport Energy Taskforce set up last year concluded that "displacing petrol with higher bioethanol levels" such as E10 would "probably be required" to meet the EU target, as well as increased levels of biodiesel in diesel fuels. Currently, E10 fuel is primarily available in France, Germany and Finland. The United Kingdom will review its blending targets and will look at options on how to meet the EU requirements by shifting from crop-based biofuels towards renewable fuel from waste.

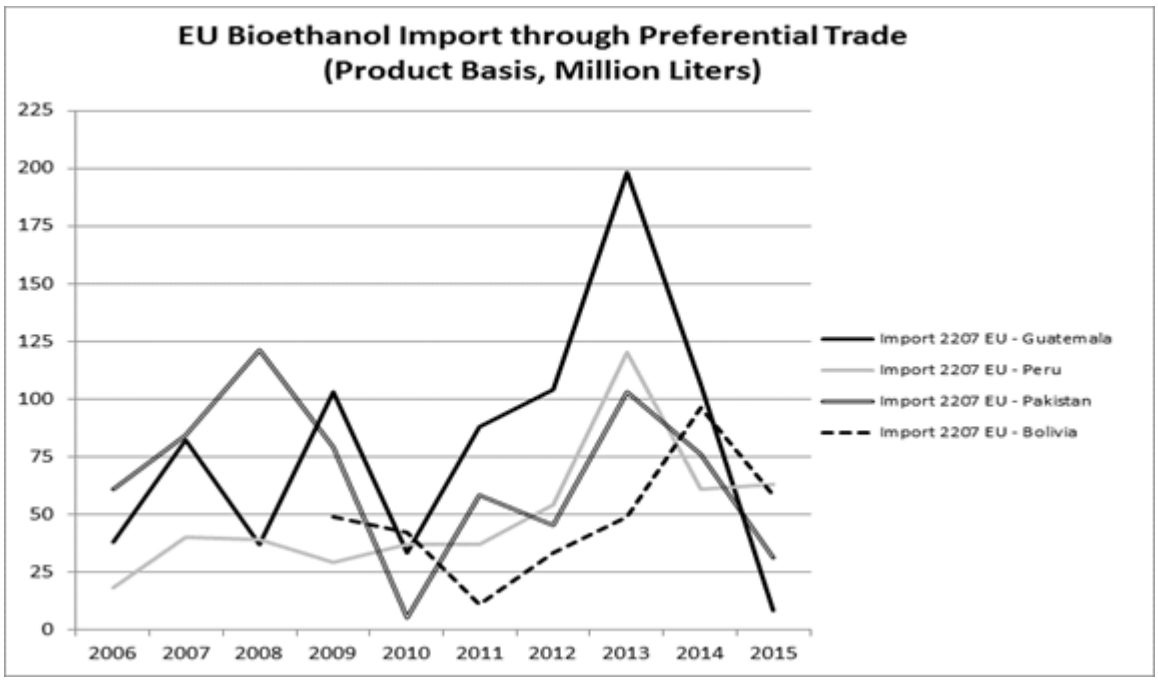
A surplus will be available in the France, the Netherlands, Belgium and in some Central European countries, mainly Hungary. Germany, the United Kingdom and Italy are expected to remain the main deficit markets in 2016 and 2017. A deficit is furthermore anticipated in the Nordic countries; Denmark, Finland and Sweden.

With the cap of seven percent for conventional biofuels and the potential outlook of lifting EU wide mandates after 2020, the market conditions appear to be dim for bioethanol. Conventional biofuels will likely be out competed with fossil fuels unless Member States will implement national policies to support feedstock and biofuels production. A most cost effective approach to further green the transport sector would be to introduce higher blends such as E10, and open the market for foreign produced biofuels. But both the imports of bioethanol and biodiesel have been cut off by high import and antidumping duties.

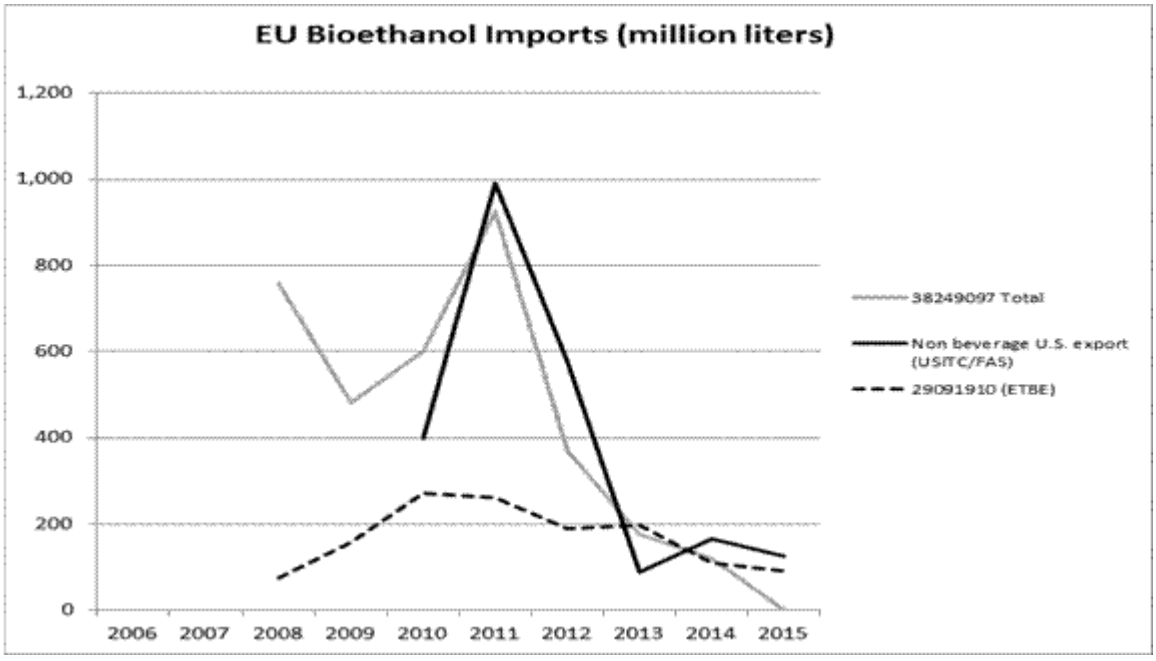
Trade

The European Commission (EC) imposed an anti-dumping duty on the bioethanol imports from the United States. On February 23, 2013, the duty was set at €49.20 per 1,000 liters for the coming five years (see the Policy Chapter). Adding up to the already imposed import tariff of €102 per 1,000 liters, a volume of 1,000 liters of ethanol from the United States is charged with €151.2. This rate significantly cut U.S. exports of bioethanol to the EU, and other less competitive suppliers that receive preferential duties were able to gain access to the EU. In 2013 and 2014 respectively, about 450 and 375 million liter of ethanol has been supplied through zero duty quotas, mainly used by Guatemala, Peru, Pakistan and Bolivia (see graph below). During 2015, however, these EU bioethanol imports dropped further. The rising price of sugar is expected to reduce the cane ethanol production in Brazil as well as other South and Central American countries during 2016 and through 2017.

Currently of the 215 million liters of bioethanol, about 125 million liters is imported from the United States, and about 90 million liters is imported as ETBE (Ethyl tert-butyl ether). Similar to the cane ethanol from South and Central America, EU imports of corn ethanol from the United States are not anticipated to increase during 2016. In 2016, corn ethanol production in the United States is expected to stagnate, with limited volumes available for export. Currently EU domestic ethanol prices are too low to even attract significant volumes of duty free ethanol from foreign markets. Continuous plant outages could, however, cause a local shortage situation, and support a price increase sufficient to induce imports. The graph below shows the correspondence between EU imports of E90 (HS 3824.90.97) and the U.S exports of non-beverage ethanol to the EU.



On June 9, 2016, the EU General Court ruled that the EC violated EU legislation by issuing a country-wide duty rather than imposing specific duties for each of the exporters. But even if the duty is dropped entirely, U.S. suppliers face several challenges in the EU market. Imports of U.S. ethanol will have to compete with duty free imports. Another barrier is the minimum greenhouse gas savings criteria which are rising to 50-60% from the current 35% threshold. Given these constraints it is not expected that even after full abolishment of the antidumping duty, U.S. exports will reach the 2011 record of 1.1 billion liters of ethanol of which about 900 million liters bioethanol.



V. Biodiesel / Renewable Diesel

Unless mentioned otherwise in this chapter the term biodiesel includes traditional first generation biodiesel (FAME) and hydrogenated vegetable oil (HVO).

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 and, on an energy basis, represents about 80 percent of the total transport biofuels market. Biodiesel was the first biofuel developed and used in the EU in the transport sector in the 1990s. At the time, rapid expansion was driven by increasing crude oil prices, the *Blair House Agreement* and resulting provisions on the production of oilseeds under Common Agricultural Policy set-aside programs, and generous tax incentives, mainly in Germany and France. EU biofuels goals set out in Directive 2003/30 (indicative goals) and in the RED 2009/28/EC (mandatory goals) further pushed the use of biodiesel.

Table 7. Biodiesel & Renewable Diesel (HVO)
(Million Liters)

Calendar Year	2010	2011	2012[r]	2013[r]	2014[r]	2015[e]	2016[f]	2017[f]
Beginning Stocks	807	528	562	820	534	550	555	560
Production	10,707	11,041	11,082	11,983	13,341	13,535	13,680	14,155
>of which HVO production	430	467	933	1,531	2,388	2,356	2,558	2,865
Imports	2,400	3,164	3,293	1,393	632	538	530	545
Exports	117	100	116	416	183	243	320	260
Consumption	13,268	14,070	14,001	13,246	13,774	13,825	13,890	14,430
Ending Stocks	528	562	820	534	550	555	555	565
Production Capacity, Biodiesel								
Number of Biorefineries	250	266	267	250	238	237	237	238
Nameplate Capacity	23,201	24,727	26,384	25,852	25,440	24,927	24,927	25,495
Capacity Use (%)	44.3%	42.8%	38.5%	40.4%	43.1%	44.8%	44.6%	44.3%
Production Capacity, HVO								
Number of Biorefineries	1	4	4	5	10	11	11	13
Nameplate Capacity	430	1,610	1,610	1,745	2,748	2,863	2,863	4,260
Capacity Use (%)	100.0	28.9	58.0	87.7	86.9	82.5	89.6	67.4
Feedstock Use for Biodiesel + HVO (1,000 MT)								
Rapeseed oil	6,700	6,660	6,100	5,750	6,100	5,880	5,680	5,800
UCO	500	700	740	1,080	1,800	2,060	2,210	2,300
Palm oil	690	700	1,430	2,000	1,580	1,700	1,790	1,940
Soybean oil	1,085	950	740	860	890	800	880	930
Animal fats	300	340	360	415	920	970	980	1,000
Sunflower oil	140	280	300	300	320	330	300	305
Other (pine oil, fatty acids)	10	90	140	145	170	175	200	205
Market Penetration, Biodiesel + HVO (Million Liters)								
Biodiesel+HVO, on-road use	13,268	14,070	14,001	13,246	13,774	13,825	13,890	14,430
Diesel, on-road	192,156	192,919	189,046	189,022	194,022	194,780	195,380	195,990
Blend Rate (%)	6.9	7.3	7.4	7.0	7.1	7.1	7.1	7.4
Diesel, total use	267,656	261,954	257,768	257,095	256,065	256,000	256,000	256,000

r = revised / e = estimate / f = forecast EU FAS Posts. Production capacity as of December 31 of year stated. The PSD is built on information in MT and converted to liters using a conversion rate of 1 MT = 1,136 liters. Sources: Trade data: Global Trade Atlas (GTA), Diesel use: 2008-2014: Eurostat, 2015-2018 extrapolated with average yearly increase from 2008-14 of 0.3099 % All other: FAS Posts. Note: Data for feedstock use is not available. The figures above represent estimates by EU FAS posts.

Production Capacity

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 600,000 MT owned by a large multi-national company. EU biodiesel production capacity is expected to remain flat in 2016 at 24.9 billion liters and increase to 25.5 billion liters in 2017, when a new biodiesel facility in France is expected to start production. Biodiesel production facilities exist in every EU member state with the exception of Luxemburg. In contrast, hydrogenated vegetable oil (HVO) production is concentrated in only five countries (see table 8 below). The majority of HVO capacity consists of dedicated plants, although in Spain HVO is co-processed with conventional fuel in oil refineries. EU-28 HVO production capacity stands currently at 3.0 million liters and is forecast to increase to 4.2 million liters in 2017, when two new facilities will start production in Italy and France.

Production

EU biodiesel production is driven by domestic consumption and competition from imports. In 2014, EU production benefitted from substantially lower imports and higher domestic consumption. As a result, biodiesel production increased by 11 percent, mainly in Germany, Spain, and the Netherlands. The increase in the Netherlands production can largely be attributed to increased HVO production. In 2015 and 2016, production is estimated to remain fairly stable while 2017 is forecast to see a small increase of 3 percent. The latter is the result of new HVO plants in France and Portugal, and a mandate increase in Germany.

The ranking of the top five producing EU Member States (Germany, France, Netherlands, Spain, and Poland) remains unchanged, while the United Kingdom is forecast to drop from seventh place in 2015 to tenth in 2017. This drop is caused by imports from other Member States, which are more competitive than domestic production.

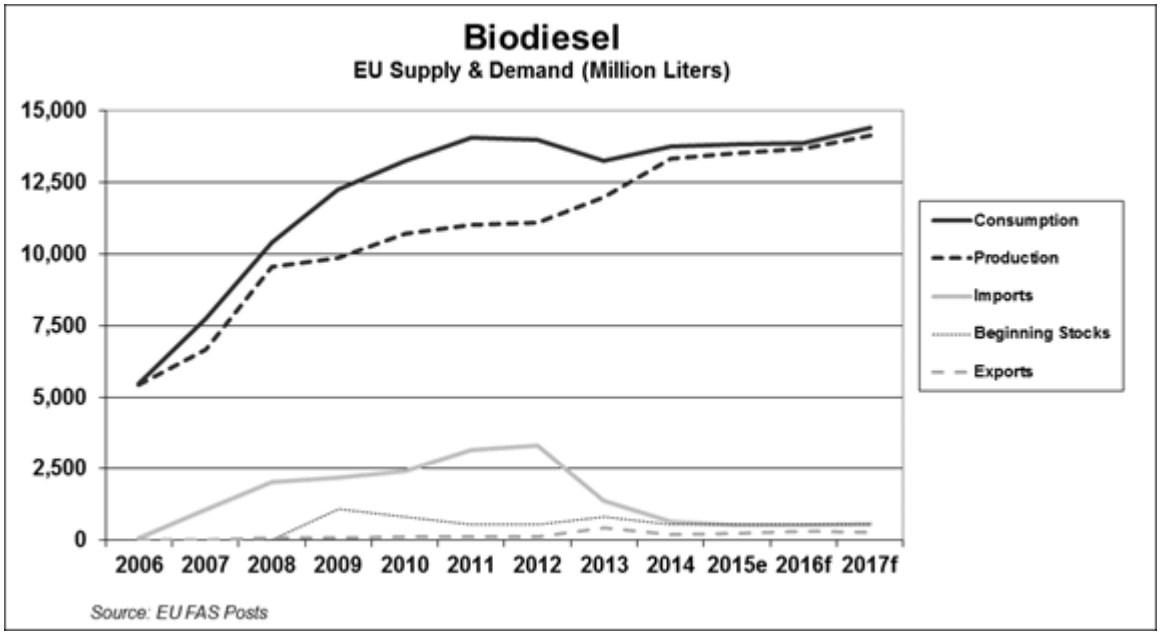
Table 8. EU Biodiesel/HVO Production Main Producers (Million Liters)

Calendar Year	2010	2011	2012	2013	2014	2015[e]	2016[f]	2017[f]
Germany	3,181	3,408	3,106	3,307	3,808	3,351	3,350	3,410
France	2,295	2,090	2,516	2,476	2,681	2,442	2,215	2,390
Netherlands	434	558	1,337	1,562	1,954	1,988	1,990	1,990
Spain	1,041	787	545	668	1,016	1,103	1,070	1,080
Poland	432	414	673	736	786	795	800	800
Italy	908	704	326	521	658	665	665	665
Belgium	494	536	568	568	568	568	570	570
Portugal	328	419	356	307	325	440	443	455
Finland	375	253	320	399	409	409	440	440
United Kingdom	227	261	364	648	648	648	650	420
Others	992	1,611	971	791	488	1,126	1,487	1,935
Total	**10,707**	**11,041**	**11,082**	**11,983**	**13,341**	**13,535**	**13,680**	**14,155**

e = estimate / f = forecast EU FAS Posts. Source: FAS EU Posts based on information in MT and converted to liters using a conversion rate of 1 MT = 1,136 liters.

Table 9. EU HVO Production (Million Liters)								
Calendar Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015[e]**	**2016[f]**	**2017[f]**
Netherlands	0	0	410	872	1,013	1,013	1,218	1,218
Italy	0	0	0	0	462	462	462	577
Finland	430	430	430	430	430	545	545	545
Spain	0	28	73	197	377	262	260	160
France	0	0	0	0	0	0	0	192
Portugal	0	0	0	0	0	0	0	31
Total	**430**	**467**	**933**	**1,531**	**2,388**	**2,356**	**2,558**	**2,865**

e = estimate / f = forecast EU FAS Posts. Source: FAS EU Posts based on information in MT and converted to liters (conversion rate of 1 MT = 1,282 ltrs).



Feedstock Use

Rapeseed oil is still the dominant biodiesel feedstock in the EU, accounting for 49 percent of total production in 2015. However, its share in the feedstock mix has considerably decreased compared to 72 percent in 2008, mostly due to the higher use of recycled vegetable oil / used cooking oil (UCO) and palm oil.

UCO was the second-most important feedstock in 2015. The use of UCO has received a push after some Member States (Austria, Belgium, Croatia, France, Hungary, Ireland, the Netherlands, Poland, Portugal, Slovenia, and the United Kingdom) introduced double-counting (for details see the Policy Chapter). The double counting measure wasn't implemented in all Member States partly as it negatively affects biofuels consumption. The largest EU producers of UCOME (biodiesel produced from UCO) were the Netherlands, the United Kingdom, and Germany.

Palm oil came in third place in terms of feedstock use in 2015. Its use has further increased mainly because of its use for HVO production. Currently, palm oil is mainly used in the Spain, the Netherlands, Finland, Italy, and France, and to a much lesser extent in Germany, Portugal, Romania, and Poland.

The use of soybean and palm oil in conventional biodiesel is limited by the EU biodiesel standard European Norm EN14214. 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 conventional biodiesel reportedly does not provide enough winter stability in northern Europe. The higher iodine number permitted in Spain allows for an intensive use of soybean and palm oil in biodiesel production for domestic consumption. The iodine number for Spain is 140 g/mg, as defined in Royal Decree 61/2006 different to the 120 g/mg established by EN14214. 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, France, and Italy. Smaller amounts are being used in Portugal, Germany, Bulgaria, Romania and the United Kingdom.

Animal fats benefitted far less from double-counting as the range of Member States that allow double-counting for animal fat (Denmark, Finland, France, the Netherlands and the United Kingdom) is smaller than that for UCO. In addition, in Germany TME (biodiesel made from tallow) use does not count against the biofuel mandate at all and its production is exported to other Member States. Increases of animal fat use are a result of new plants rather than a function of feedstock price, as using animal fat requires changes to the technical equipment. In 2015, the Netherlands were by far the largest user of animal fat for biodiesel production, followed by France, the United Kingdom, Germany, Denmark, Spain and Austria. Although at a smaller scale, in 2015, UCO and animal fat use registered a steady increase in Portugal.

Sunflower oil only comprised three percent of the total biodiesel feedstock and is mainly used in France and Greece, together accounting for 81 percent of EU sunflower oil based biodiesel production. The category "other" includes pine oil and wood (Sweden), fatty acids (Germany), and cottonseed oil (Greece).

The majority of palm oil is imported, while a large share of soybean oil is crushed from imported soybeans. In contrast, the majority of rapeseed oil is of domestic origin. The 5.68 MMT of rapeseed oil feedstock projected for 2016 is equivalent to about 14.2 MMT of rapeseed. This also generates about 8.5 MMT of rapeseed meal as byproduct, most of which is used for animal feed. Similarly, the 0.88 MMT soybean oil will have to be crushed from 4.4 MMT of soybeans. This will generate about 3.5 MMT soybean meal (see FAS EU Oilseeds Annual).

Consumption

Biodiesel consumption is driven almost exclusively by Member State mandates and to a lesser extent by tax incentives. After years of rapid use increases, EU biodiesel consumption peaked in 2011 and declined in 2012 and 2013, by 3 and 5 percent, respectively. The decline was largely the result of two factors: double-counting and reduced mandates. Double-counting of certain biofuels was applied in Germany (2011-2014), the Netherlands, the United Kingdom, Portugal, Austria, Italy (2012 until early 2014). In Spain the measures were published in April 2014, but will only enter into force after more detailed guidelines are issued. With double-counting a reduced volume of biofuels is needed to reach the mandate. In addition, Spain reduced its consumption mandates from 7.0 percent down to 4.1 percent at the beginning of 2013. In 2014, consumption rebounded by 4 percent as decreasing consumption in Italy, Poland and the United Kingdom was more than offset by increases in France, Austria, and Germany. In 2015, consumption remained more or less flat as decreases in Germany, the United Kingdom, and the Czech Republic were

compensated by an increase in Sweden and smaller increases in a variety of other Member States. In Sweden, biodiesel consumption benefitted from a tax change that put E85 at a disadvantage.

For 2016, EU biodiesel consumption is expected to show a marginal 0.5 percent increase, again masking different developments across Member States. Forecasted consumption increases are driven by a mandate increase in the Netherlands and increased total diesel use in France. The decrease in Germany is a result of the transition from an energy-based use mandate to a minimum greenhouse gas (GHG) reduction mandate in 2015. Companies are inclined to calculate actual GHG values rather than using the default values of the RED as fuel companies favor biofuels with a better GHG reduction value. This reduces the physical amount of fuel needed to meet the mandate. In the Czech Republic an increase in the excise tax for biofuels makes biodiesel more expensive compared to fossil diesel. For 2017, consumption is forecast to increase by 2.8 percent as mandates increase in Spain, Portugal, and the Netherlands. France expects an increase in total diesel and biodiesel use.

In 2015, France, Germany, Italy, the United Kingdom, and Sweden were the largest biodiesel consumers in the EU, accounting for 63 percent of EU biodiesel consumption (see table 10). Projections for the following years indicate that the top five countries will remain the same.

Table 10. EU Biodiesel/HVO Consumption Main Consumers (million liters)

Calendar Year	2010	2011	2012	2013	2014	2015[e]	2016[f]	2017[f]
France	2,579	2,624	2,914	2,971	3,232	3,249	3,270	3,290
Germany	2,933	2,756	2,816	2,513	2,630	2,442	2,390	2,270
Italy	1,670	1,654	1,623	1,517	1,313	1,320	1,320	1,320
United Kingdom	966	1,034	636	977	954	909	910	1,020
Sweden	784	289	415	569	682	852	910	970
Spain	1,553	1,830	1,677	700	679	762	765	810
Poland	541	1,079	837	843	730	738	740	740
Austria	602	576	567	575	702	704	710	710
Portugal	219	395	358	352	373	381	390	470
Netherlands	423	222	270	250	317	341	360	400
Denmark	209	106	286	286	329	341	340	340
Others	1,596	1,436	848	2,222	1,855	1,860	1,860	1,940
Total	14,075	14,001	13,247	13,775	13,796	13,899	13,965	14,280

e = estimate / f = forecast EU FAS Posts. Source: FAS EU Posts based on information in MT and converted to liters using a conversion rate of 1 MT = 1,136 liters.

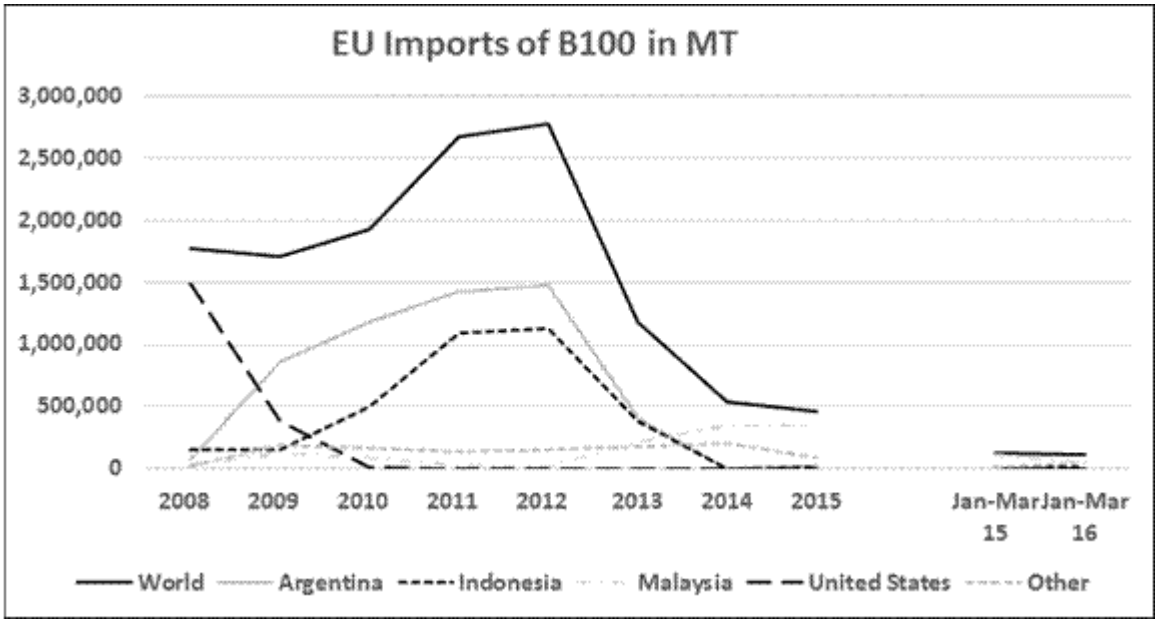
Trade

In an attempt to curb down the biodiesel imports from Argentina and Indonesia, the EC enforced anti-dumping duties (AD) on biodiesel imports from these origins as of May 29, 2013. As a result, imports from both countries have dropped considerably in 2013 and almost ceased in 2014. The void was partially filled with domestic EU production and partially with higher imports from countries not covered by AD. Here the biggest beneficiaries were Malaysia, South Korea, India, and Brazil.

In 2015, most biodiesel, about 527 million liters, was imported under HS code 3826.00.10 containing at least 96.5 percent biodiesel. The equivalent of 1 million liters and 10 million liters was respectively imported as blend under HS code 3826.00.90 (containing between 30 and 96

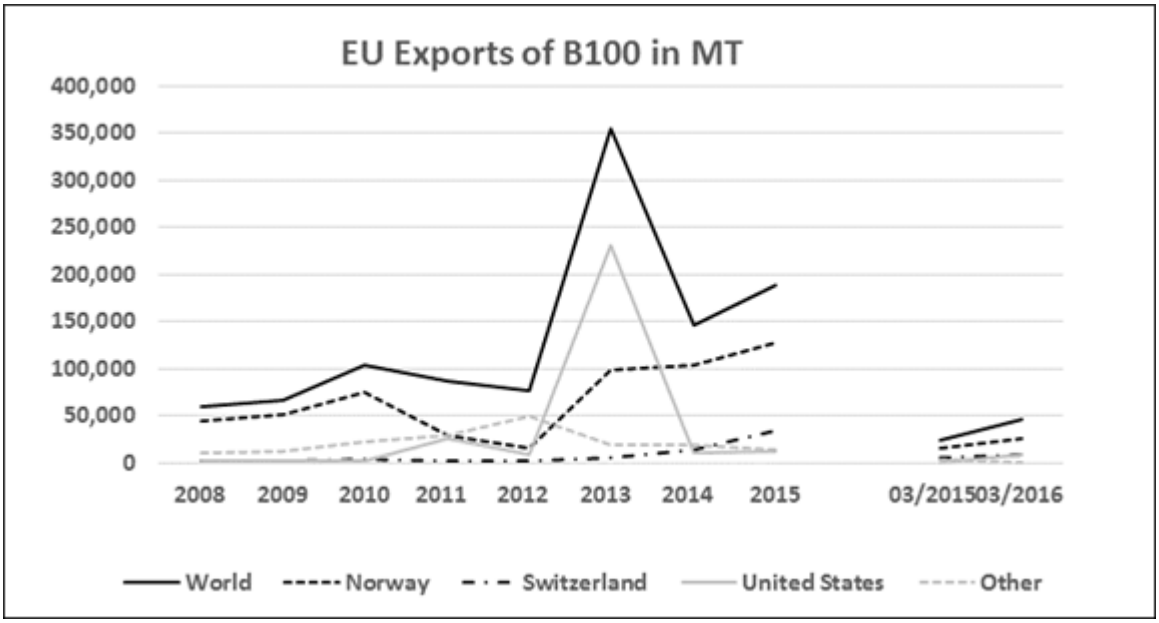
percent of biodiesel) and 2710.20.11 (containing at most 30 percent biodiesel), respectively. It is assumed that most of the product traded under the last HS code is B5. The majority of biodiesel imports occur through the Netherlands, Spain, and Bulgaria.

Biodiesel imports are constrained by the sustainability requirements laid down in the Renewable Energy Directive (RED). Since April 1, 2013, all biofuels must achieve greenhouse gas (GHG) savings of at least 35 percent. Default values of biodiesel produced from both soybean oil and palm oil are set lower than that in the RED (see Policy Chapter). As a result, instead of applying default values, actual GHG values have to be calculated for each shipment using the provisions of article 19/part C of Annex V of the RED.



Source: FAS EU post based on data from GTA 2008-2011
CN 3824.90.91, 2012-2016 CN 3826.00.10

EU biodiesel exports to destinations outside the bloc are marginal and normally only amount to around one percent of production. The exceptional increase of exports in 2013 was due to higher exports to the United States and can be attributed to one company taking advantage of an elevated demand and the U.S. blenders' credit. The latter expired at the end of 2013 and was only reintroduced for 2014 very late in the year. As a result, EU exports to the United States and thus total exports dropped sharply in 2014. In 2015, the top three export destinations were Norway, Switzerland and the United States receiving 68, 28, and 6 percent of EU exports, respectively. The blenders' credit was reinstalled in December 2015 until the end of 2016. As a result, exports picked up again in the first three months of 2016. In addition, biodiesel exports increased to Norway and Switzerland. For the full calendar year exports are expected to increase by 30 percent. However, if realized this would still be less than three percent of EU production. For 2017, exports are forecast to fall back as the U.S. blenders' credit expires at the end of 2016.



Source: FAS EU post based on data from GTA 2008-2011
CN 3824.90.91, 2012-2016 CN 3826.00.10

VI. Advanced Biofuels

As biofuels replace fossil transport fuels and generally have lower greenhouse gas (GHG) emissions, they are considered an important product of the bio-economy. In particular advanced or second generation biofuels, fuels produced from non-fossil, non-food materials. Because hydrogenated vegetable oils (HVO) can supply specific fuel markets such as aviation, and can fully replace fossil fuels in a mix (drop-in fuels) they are considered advanced biofuels in this report, but are not necessarily produced from non-food feedstocks. In the RED (Renewable Energy Directive 2009/28, see Policy Chapter of this report), biofuels produced from non-food feedstocks get a double credit. On April 28, 2015, the European Parliament supported a 0.5 percent non-binding Member State target for such non-food based biofuels in 2020. With the goal to support the commercialization of advanced biofuels and the bio-based economy in general EC developed the following programs:

-On February 13, 2012, the EC adopted a strategy entitled "Innovating for Sustainable Growth: a Bioeconomy for Europe". The main goal of the strategy is to reduce the EU's dependency on fossil resources; for more information see the Bioeconomy website of the EC. One of the policy areas under the strategy is bio-refinery, including the production of biofuels. The EC funds bio-refinery research and commercialization by the Horizon 2020 program.

-In July 2014, the Bio-Based Industries Joint Undertaking (BBI JU) was launched. The Bio-Based Industries Joint Undertaking is a € 3.7 billion Public-Private Partnership between the EC and the Bio-based Industries Consortium. The fund is a summation of € 975 million of EU funds (Horizon 2020) and € 2.7 billion of private investments. The goal of the program is to convert biomass into common consumer products through innovative technologies by bio-refineries. As of October 26, 2015, the BBI JU will function as an independent body, with its own staff and offices and able to manage its own budget and launch its own open calls for proposals, grants and public procurement.

-On February 4, 2015, the European Bioeconomy Alliance (EBA) was launched. The EBA is an informal alliance of European organizations which are active in the bio-economy.

-On April 12 and 13, 2016, the fourth BioEconomy Stakeholders' Conference was held in Utrecht. On the conference the European Council launched the European BioEconomy Stakeholders Manifesto. This declaration will serve as input in determining the new strategy for the EU bio-economy. The Manifesto stated that the bio-economy is an economy which is not depending on fossil resources, and is in itself a solution to the Millennium Development Goals as climate change, food security, and contributes to the jobs and growth agenda of the EU. Furthermore, is the bio-economy key to achieve the UN Sustainable Development Goals, including the Cop21 agreement to address climate change. The development of the bio-economy has also a close link to the European discussion about circular economy. The EC published the Circular Package in December 2015.

Production of Advanced Biofuels

Since the past six years, the production of hydrogenated vegetable oils (HVO) has taken off in the EU. HVO can be produced from waste oils and fats and can fully substitute petroleum fuels, such as kerosene. In 2015, HVO production is estimated at 2.3 billion liters, and is expected to increase to about 2.9 billion liters in 2017. With new plants in Italy and France, production could further expand to about 4 billion liters in 2020. The commercialization of cellulosic ethanol is lagging behind compared to the development of HVO. The current capacity is about 85 million liters in the EU. Expansion of capacity has been announced in Finland (200 million liters) and France (315 million liters). But given the limited support, the capacity for cellulosic ethanol production could possibly increase to a maximum of about 300 million liters.

Specific mandates are important for the further commercialization of advanced biofuels. Italy was the first EU Member State to mandate the use of advanced biofuel. The Decree requires gasoline and diesel contain at least 1.2 percent of advanced biofuel as of January 2018 and 2019, rising to 1.6 percent in 2020 and 2021, and 2 percent by 2022. Reportedly also Denmark considers to implement a specific target, namely 0.9 percent blending mandate by 2020 for use in transportation. Below table 11 with the operational or close to operational advanced biofuel plants at commercial scale in the EU.

Table 11. Advanced Biofuels Plants in the EU

Country	Process	Biofuel	Feedstock	Capacity (million liters per year)	Year of opening
Thermochemical					
Finland	H	HVO	Oils and fats	430 (2 lines)	2007
The Netherlands	P/FT	Methanol	Glycerin	250	2010
Spain	H	HVO	Oils and fats	700 (7 plants)	2011
The Netherlands	H	HVO	Oils and fats	1,280	2011
Italy	H	HVO	Palm Oil	465	2014
Finland	H	HVO	Tall Oil	115	2015
Italy	H	HVO	Oils and fats	680	2017
France	H	HVO	Oils and fats	570	2017
Biochemical					
Italy	HL/F	Ethanol	Wheat straw	75	2013
Finland	HL/F	Ethanol	Saw dust	10	2016

Source: EU FAS Posts BtL=Biomass to Liquid, DME=Dimethyl Ether, F=fermentation, FT=Fischer Tropsch synthesis, G=gasification, H=hydrogenation, HVO=Hydrogenated Vegetable Oils, HL=hydrolysis,

OS=oxygenate synthesis, P=pyrolysis

Hydrogenated Vegetable Oil (HVO)

Finland / The Netherlands: Neste Oil has developed a process of hydrogenation to produce hydrogenated vegetable oils (HVO) with the product name NExBTL. The product is sold as drop-in fuel for road transport and used by commercial airlines. In addition to drop-in biofuels, the Neste plants also produce renewable naphtha, propane and alkanes. In Finland, Neste operates one plant with two lines of about 215 million liters each. In 2010, Neste Oil opened up a renewable diesel plant in Singapore with an annual capacity of 910 million liters and a similar scale plant in Rotterdam in 2011. Current annual production capacity of the plant in Rotterdam is a maximum of 1,280 million liters. During 2015 and the first half of 2016, all HVO plants operated at full or nearly full capacity with the exception of a nine week outage of the plant in Rotterdam. In 2013, 2014 and 2015, Neste exported significant volumes of its product to the United States and Canada. By the end of 2016, Neste plans to produce annually about 40,000 MT of renewable propane at the site in Rotterdam. Neste Oil is gradually replacing palm oil with waste fats and oils. In 2015, 68 percent of the feedstock consisted of waste fats and oils. The waste and residues consist of mainly palm fatty acid distillate (PFAD), animal fats, UCO, and in smaller volumes, tall oil pitch, technical corn oil, and spent bleaching oil. The company's goal is to use only waste oils and fats as feedstock as from 2017.

Spain: In July 2011, the company CEPSA started producing HVO at two refineries and since February 2012, the company REPSOL started producing HVO at one refinery. Spanish HVO production increased from 179 million liters in 2013 to 376 million liters in 2014. For more information see GAIN Report SP1321 - Spain's Bioethanol Standing Report.

Italy: In 2014, an HVO plant with an annual capacity of 400 million liters was opened in Venice, Italy by Energy Group Eni SpA. Up to mid-2017, the biorefinery is expected to produce approximately 460 million liters per year. By the second half of 2017, the facility is forecast to produce 540 million liters of advanced biofuels per year. The feedstock, currently palm oil, will then include also animal fats, used oil, oils from algae, and various types of biological waste. On January 20, 2016, the biofuel was distributed to 3,500 fuel stations across Italy, with the final fuel containing 15 percent renewable diesel. Eni is expected to convert the Gela refinery in Sicily into a renewable diesel production facility to produce 680,000 million liters per year. The reconversion is expected to start in 2016 and the facility is likely to be fully operational in 2017. The reconversion will follow the model adopted for plant in Venice (see GAIN Report IT15110 - Biofuels Overview – Italy).

Finland: In 2015, the forest product company UPM opened a HVO plant in Lappeenranta, Finland. The capacity of the plant will be about 115 million liters per year. The feedstock used is tall oil, a residue of pulp production. In December 2015, the Finnish Market Court judged that the advanced process of UPM doesn´t fall under the scope of the patents of Neste.

France: Commercial production of HVO has not yet taken off in France but several projects have recently been announced. In April 2015, the French group Total stated that it will convert its refinery site in La Mede (southern France) into the largest biodiesel plant in France. The new biorefinery would be put into operation by the end of 2017. Total is planning to invest € 200 million to produce 570 million liters of HVO per year. In addition, it aims at producing jet fuel for civil aviation, the objective being to account for 30 percent of EU market shares in the jet fuel sector. The biorefinery is planning to produce around 40 percent of HVO out of waste oil, and to import vegetable oils in addition. Current biodiesel producers have expressed concern that this project could lead to an overcapacity situation in the French biodiesel sector and to a drop in rapeseed

production in France. Another project in France is the BioTFuel project, a cooperation of Avril, Axens, CEA, IFPEN, ThyssenKrupp and Total. This project aims at producing 230 million liters of advanced biodiesel and bio-jet fuel per year from one MMT of biomass by 2020.

Biomethanol

The Netherlands: In June 2010, the advanced biofuel plant BioMCN started production. The plant has a capacity of 250 million liters and produces biomethanol from glycerine. The glycerine is a byproduct of biodiesel production. Biomethanol can be blended with gasoline or used for the production of bio-MTBE, bio-DME, or synthetic biofuels. On December 18, 2012, BioMCN received a grant of €199 million for the construction of a commercial scale biomass refinery using wood residues as feedstock. Through torrefaction and gasification, the feedstock will be transferred into syngas and finally biomethanol. Full commercialization of the project is expected to take four years.

Cellulosic Ethanol

Spain: In 2008, Abengoa Bioenergy completed a demonstration plant in Babilafuente (Salamanca). The plant has an annual capacity of 5 million liters and used wheat and barley straw as feedstock. The process is based on enzymatic hydrolysis. Since 2013, the plant has been converted to waste to biofuels technology, by which 25,000 MT of urban solid waste per year can be processed to produce 1.5 million liters of biofuels. The straw-based technology is now being implemented at a commercial stage in Hugoton (Kansas). For more information see GAIN Report SP1318 - Spain's Bioethanol Standing Report. The announcement of the sale of all Abengoa's non-core assets (such as the first generation biofuels business units) as part of a debt-restructuring plan, may affect advanced bioethanol production in Spain, as second generation assets share location and services with first generation plants.

France: Abengoa was planning to build a second-generation bioethanol in France but there has been uncertainty about this project for years and the launch date is still to be determined. The feedstock would be corn stover and wheat straw. The capacity of the new plant would be about 315 million liters of ethanol per year. The total investment amounts to € 200 million.

Italy: In 2013, Beta Renewables started the commercial production of cellulosic ethanol. Beta Renewables is a joint venture between Biochemtex, a company of the Italian Mossi Ghisolfi Group and the U.S. fund Texas Pacific Group (TPG). The Crescentino plant has an annual production capacity of 75 million liters using 270,000 MT of biomass. The feedstock consists of wheat straw, rice straw and husks, and Arundo donax, an energy crop grown on marginal land. Wood waste from the forest industry and lignin from the ethanol plant are used as feedstock at the attached power plant. Based on the specific government mandates, advanced biofuels production is expected to expand further in Italy during the next five years.

Finland: By the end of 2016, a cellulosic ethanol plant with an annual capacity of 10 million liters plans to be operational. The capacity can be scaled up to 100 million liters. The feedstock will be saw dust. This Cellunolix project is managed by St1 Biofuels Oy in cooperation with North European Bio Tech Oy. In addition, there are plans to build two larger plants of about 50 million liters.

So far, commercial production of cellulosic ethanol is limited in the EU. In France, the main factors that prevent operators from investing in cellulosic biofuels are high research and production costs, and regulatory uncertainty. French experts estimate that cellulosic biofuels will be produced at a

commercial scale a few years before 2020 at the earliest. However, France is active in research on second generation biofuels. Launched in 2008, the French pilot project Futurol aims at developing a process of production of cellulosic ethanol. This project associates eleven partners. The process will be commercialized by the French company Axens. A pretreatment unit on an industrial scale is being built at the Tereos de Bucy-Le-Long site, with the production scheduled to start in 2016. The final plant is expected to have an annual capacity of 180 million liters of cellulosic ethanol. The GAYA project launched by the French energy company Engie aims at producing second generation biomethane from lignocellulosic biomass. The biomethane would be used as fuel or for heating. The production process uses a thermochemical route. The research and development site will be put into operation in 2015 and the industrialization of the process is planned for 2017.

Use of conventional and advanced biofuels by the aviation sector

In 2011, the EC, Airbus, and the aviation and biofuel producers industries, launched the European Advanced Biofuels Flightpath. This action is scheduled to achieve two MMT of sustainable biofuels used in the EU civil aviation sector by the year 2020. Since 2008, the aviation sector has been conducting test flights with biofuels. The project is planning to make 300,000 MT of aviation biofuels available in 2016, and 2 MMT in 2020.

VII. Biomass for Heat and Power

This Chapter describes the EU market for biomass intended for the production of heat or power. The heat or power is either generated through direct combustion or through the production of biogas. Forestry products, such as chips and pellets are the main feedstock for direct combustion, while for the production of biogas, a wide range of inputs are used.

Wood Pellets

EU Production, Supply and Demand Table

Table 12. Wood Pellets (1,000 MT)

Calendar Year	2009	2010	2011	2012	2013	2014	2015[c]	2016[c]	2017[c]
Beginning Stocks	393	467	696	713	642	506	1,148	1,182	1,002
Production[a]	7,940	9,186	9,470	10,652	12,200	13,000	13,500	14,000	14,500
Imports[b]	1,698	2,515	3,115	4,367	6,096	6,547	7,172	7,500	8,000
Exports[b]	64	72	68	90	132	105	138	180	200
Consumption[c]	9,500	11,400	12,500	15,000	18,300	18,800	20,500	21,500	22,500
Ending Stocks	467	696	713	642	506	1,148	1,182	1,002	802
Production Capacity									
No. of Plants[a]	499			497	516				
Capacity[a]	13,694	14,845	15,000[c]	15,980	17,000[c]	18,500[c]	19,000	19,500	20,000
Cap. Use (%)	58%	62%	63%	67%	72%	70%	71%	72%	73%

Source: (a) The European Biomass Association (AEBIOM), (b) GTIS, (c) FAS Post Estimates

The EU is the world's largest wood pellet market, with consumption of about 20.5 MMT of pellets in 2015 (see table 12). Based on the EC mandates and Member State incentives, the demand is expected to expand further to nearly 22.5 MMT in 2017. Future consumption will significantly

depend on a range of market factors and in particular Member State incentives and conditions.

Table 13. Main Pellet Producers (1,000 MT)							
Calendar Year	**2010**	**2011**	**2012**	**2013**	**2014[e]**	**2015[e]**	**2016[e]**
Germany	1,750	1,880	2,200	2,250	2,100	2,000	2,200
Sweden	1,650	1,340	1,340	1,310	1,490	1,550	1,550
Latvia	615	713	979	1,200	1,300	1,350	1,350
France	465	550	680	750	870	1,000	1,130
Austria	850	940	893	962	945	960	980
Portugal	627	675	700	900	900	900	900
Poland	510	600	600	600	600	600	600
Spain	185	240	250	300	350	475	500
Total	**9,186**	**9,470**	**10,652**	**12,200**	**13,000**	**13,500**	**14,000**

Source: AEBIOM and Member State sector organisations, e = estimate EU FAS Posts.

With a production of about 13.5 MMT in 2015, about fifty percent of global production, the EU is the world's biggest producer of wood pellets. Compared to production plants in North America, plants in the EU are mainly small or medium-sized. Most of the main pellet producing countries have a sizeable domestic market for residential heating pellets. Recent growing demand for pellets has supported a further increase in domestic production. Exceptions in table 13 are Latvia and Portugal, which are producing mainly for export and use in large scale power plants abroad.

Germany is the third largest wood pellet producer in the world after the United States and Canada. It has currently about seventy production facilities for wood pellets with a total annual production capacity of 3.5 MMT. In 2015, production amounted to 2.0 MMT, 90 percent of which were produced from residues of the timber industry. The second largest producer in the EU is Sweden. Depending on domestic use, Swedish self-sufficiency fluctuates between 70 and 90 percent. In years of high demand, Sweden imports from Russia and the Baltics. French wood pellet production expanded significantly during the past five years. The growth in pellet production is driven by a strong increase in the demand for collective residential heating and industrial power production. Also in Austria pellet production is steadily rising. Like Germany, Austria is a net exporter of wood pellets. Another growing pellet producer is the Czech Republic. Czech production increased from about 150,000 MT in 2010 to 200,000 MT in 2015. About half of this production expansion is exported, mainly to Italy and Austria. There is an excess of capacity present in most Member States, but particularly in Spain. Only about a third to a half of annual production is being used. Use of this capacity has, however, shown steady growth during the past four years supported by increased domestic demand.

The Baltic Region and Portugal are almost exclusively producing for the export market. Wood pellet production has expanded rapidly in Latvia, Lithuania and Estonia. In 2015, exports totaled 2.7 MMT, an increase of 0.5 MMT compared to 2014. The main markets are Denmark, the United Kingdom, Italy and Sweden. With about 1.5 MMT, Latvia is the main producer in this region. The Baltics are producing both for the residential and industrial markets, and production expansion is expected for both markets. Portugal has increased its production since 2008, and exports nearly its entire production to the United Kingdom and Denmark.

The major raw material for pellets has traditionally been sawdust and byproducts from sawmills. With increasing competition for sawdust resources, a broader sustainable raw material is becoming necessary. There is increased interest in forest residues, wood waste and agricultural residues, but even these additional feedstocks will not be sufficient for supplying the full demand in Western Europe. Overall, EU wood pellet production is not expected to be able to keep up with the demand from both the residential heating market and for power generation.

Consumption

While the EU produces about fifty percent of world production, EU demand represents about 75 percent of the market. In 2015, total EU consumption was 20.5 MMT of which about 65 percent was used for heating and 35 percent for power. Residential use for heating is a relatively stable market compared to industrial use for power generation. About 60 percent of the pellet demand is estimated to be for household use. However, the past three winters have been relatively mild and coupled with the low prices for fossil inputs, has tempered the use of pellets for residential heating. Medium-size use of pellets for energy use by industries or public buildings such as hospitals and swimming pools is generally less dependent on weather conditions. Demand for industrial pellets depends primarily on EU Member State mandates and incentives, which accessibility in some Member States, such as the Netherlands, has been uncertain or put on hold. The major users of wood pellets in the EU are the United Kingdom, Italy, Denmark, Germany, Sweden, Belgium, France and Austria.

Table 14. Main Pellet Consumers (1,000 MT)

Calendar Year	2010	2011	2012	2013	2014[e]	2015[e]	2016[e]
UK	180	1,000	1,400	3,700	4,900	6,700	7,200
Italy	1,650	1,950	2,200	2,500	2,900	3,300	3,500
Denmark	1,600	1,600	2,100	2,400	2,100	2,100	2,150
Germany	1,200	1,400	1,700	2,000	1,800	1,850	2,025
Sweden	2,280	1,880	1,700	1,860	1,650	1,650	1,650
Belgium	920	1,200	1,700	1,500	900	1,250	1,250
France	400	400	550	690	880	950	1,080
Austria	660	720	790	880	950	1,000	1,000
Spain	175	200	250	380	700	700	700
Netherlands	910	1,000	1,250	1,200	500	300	600
Total	**11,400**	**12,500**	**15,000**	**18,300**	**18,800**	**20,500**	**21,500**

Source: AEBIOM and Member State sector organisations, e = estimate EU FAS Posts

Residential Use of Pellets

In Italy, Germany, France and Austria pellets are mainly used in small-scale private residential and medium-sized industrial boilers for heating. In some Member States, such as Sweden, Germany, Austria, France and Spain, household heating with biomass as input receives subsidies or tax deductions by the federal and local governments. In most countries, however, government funding is limited. Italy expects to be the largest European market for the household use of pellets; according to the National Renewable Energy Action Plan statement, the use of pellets was 3.3 MMT in 2015 and will increase further to 5 MMT in 2020. However, only 20 percent of domestic demand is met by domestic production, with the remaining 80 percent being covered by increasing imports. Market logistics and economics indicate that in the close future North America will become the major supplier.

Industrial Use of Pellets

In markets such as the United Kingdom, Belgium, and the Netherlands residential use is negligible and the demand is dominated by large scale power plants. The large scale use of wood pellets by power plants is driven by the EU mandates for renewable energy use in 2020. The governments of

these countries opted to fulfill their obligations mainly by the use of biomass for the generation of electricity. As these countries lack a sufficient domestic production of pellets they largely dependent on imports.

The UK Government enforced the Industrial Emissions Directive, which boosted consumption from 1.4 MMT in 2012 to 6.7 MMT in 2015. In 2016, consumption is expected to reach 7.2 MMT. The UK government has mandated electricity suppliers to source an increasing proportion of their electricity from renewable production (see GAIN Report UK Wood Pellet Market). The market will continue to increase for wood pellets in the near-term. Existing capacity is expected to reach full operation in the next year; the conversion of an additional large electricity generator capable of using 1.5 MMT of wood pellets in the place of coal is set to be completed mid-2017.

The wood pellet market in Sweden and Denmark is diverse. Wood pellets are being used in small boilers in private homes, medium-sized district heating plants and in large Combined Heat and Power (CHP) plants. Both countries have a high target for renewable energy use in 2020, 49 and 30 percent respectively. Both goals have already been reached, with a major part obtained from biomass. In Denmark, CHP plants are mainly using pellets for the generation of heat during the cold season. During 2012 – 2016, Danish consumption of pellets stagnated around 2.1 MMT but as more coal plants are converted to using pellets this is expected to grow in 2017.

Current Belgian industrial use is estimated at about 1 MMT to 1.3 MMT per year. A stable market is foreseen for wood pellets in 2016 and 2017. However, the closing of a power plant in Ghent scheduled for 2018 would imply a reduction in imports into Belgium of between 500,000 tons and 600,000 tons annually. Further increases are uncertain as the Belgian government recently retracted funding for a new plant. In addition, the license of a power plant in Wallonia, which uses between 400,000 MT and 500,000 MT of wood pellets annually, will expire in 2017. However, significant interest in tendering for this plant has been demonstrated.

In the Dutch Energy Accord co-firing of biomass is capped annually at about 3.5 MMT of wood pellets. In the Accord it was furthermore decided that biomass will be subject to specific sustainability criteria. It is still uncertain what the implications of this will be for the sourcing of pellets (for more information see *Pellet Sustainability Criteria*). Apart from the Dutch power sector, the Dutch chemical sector was planning to use wood pellets; however, due to low fossil fuel prices these plans have reportedly been put on hold. The Dutch use of pellets is expected to gradually increase as of mid-2017.

Also in France, there is a potential for industrial use of pellets. There is pressure from the local forest sectors to use local wood, but demand is gradually outpacing domestic supply. Some new bioenergy projects are located close to harbors and are already using imported pellets.

Besides wood pellets, large quantities of wood chips and briquettes are used. The EU sector estimates the current EU consumption of wood chips at 15 MMT and expects it to grow to 28 MMT in 2020. Growth in demand is supported by increased investments in medium seized combined heat and power (CHP) plants. The main wood chips consuming EU Member States are: Germany, Finland, France, Sweden and Poland. Most chips are sourced locally, but Scandinavia is regarded as a potential growth market for imports from non-EU destinations. Wood pellets are traded more internationally.

Trade

Table 15. Main EU Importers of Wood Pellets

(1,000 MT)				
	Total Imports[a]		Imports from U.S.	
Calendar Year	**2014**	**2015**	**2014**	**2015**
United Kingdom	4,715	6,519	2,895	3,528
Denmark	2,146	2,068	86	28
Italy	1,956	1,640	180	48
Belgium	657	989	423	629
Sweden	522	355	29	0
Germany	419	418	4	2
Austria	344	369	0	0
France	168	137	0	13
Netherlands	451	130	272	38
Total EU28	**-**	**-**	**3,890**	**4,287**

Source: GTIS (HS Code: 440131) (a) Includes EU intra-trade.

Despite their significant domestic production, the Scandinavian countries, mainly Denmark and Sweden, partly depend on imports from the Baltic Region and Russia. The port restrictions in Scandinavia are favoring the Baltic Sea supply, which generally ship with smaller vessels than used in the Atlantic trade. In Denmark, one plant is located at a deep seaport and is supplied from North America. Improved flexibility in the infrastructure is expected to further increase the sourcing from North America. The market for pellets in Germany, Austria and lesser extent France and Italy is more isolated and depends mostly on the production in this region itself.

Table 16. Main Suppliers of Wood Pellets to EU (1,000 MT)						
Calendar Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
United States	763	1,001	1,764	2,776	3,890	4,287
Canada	983	1,160	1,346	1,963	1,259	1,475
Russia	396	477	645	702	826	786
Belarus	90	101	112	116	122	158
Ukraine	57	150	217	165	136	149
Other	226	226	283	374	314	317
Total	**2,515**	**3,115**	**4,367**	**6,096**	**6,547**	**7,172**

Source: GTIS (HS Code: 44013020 and 440131 as from 2012)

Since 2008, EU demand for pellets has significantly outpaced domestic production. This has resulted in increased imports from the United States. In 2015, U.S. exports totaled 4.3 MMT, representing a value of US$ 825 million. If trade flows remain consistent with current patterns, the United States has the potential to supply at least half of the import demand, which would represent a trade value of potentially over US$ 1 billion in 2020. Other significant exporters of pellets to the EU are Canada and Russia. In response to the EU demand for industrial pellets, capacity has expanded in the supplying regions. These third country imports could, however, be affected by the implementation of sustainability requirements by the individual Member State governments, in particular by the Dutch, Danish and Belgian Governments.

Pellet Sustainability Criteria

A key factor to being able to capture the demand in the EU market and benefit from its growth potential is the sustainability of the supply. European traders and end-users of industrial wood

pellets are calling for clear, consistent, harmonized and long term government regulations. The EC was expected to come forward with a proposal on sustainability criteria for biomass destined for the generation of power, heat and cooling, but the EC has announced such regulations will not be implemented before 2020 (for more information see the Policy Chapter of this report).

As a result, imports into the EU continue to be affected by biomass sustainability requirements imposed by the individual Member State governments. Awaiting the sustainability criteria of the Member States, the industry is actively formulating their own criteria. For *non-industrial wood pellets*, the European Pellet Council (EPC) developed sustainability criteria called ENplus, based on EN 14961-2. It includes sustainability requirements for the entire supply chain. In 2015, nearly 7.7 MMT were ENplus certified. For *industrial pellets*, the Sustainable Biomass Partnership (SBP) developed a sustainability scheme based on existing programs, such as the Forest Stewardship Council (FSC) or Program for the Endorsement of Forest Certification (PEFC). The SBP made their program compliant with requirements in the United Kingdom, Denmark, and Belgium.

In the Dutch Energy Accord of September 2013, it was decided that the biomass will have to be subject to strict sustainability criteria, requiring forest level certification. In addition the Dutch require information on greenhouse gas (GHG) emissions, carbon debt and indirect land use changes (ILUC). These strict conditions may make it impossible for Dutch byers to implement long term contracts with pellet producers. If the Dutch requirements are not harmonized with the other EU markets, this would not allow pellets to be traded as a commodity between the different markets.

Biogas

The European biogas sector is very diverse. Depending on national priorities, i.e. whether biogas production is primarily seen as a means of waste management, as a means of generating renewable energy, or a combination of the two, countries have structured their financial incentives (or the lack thereof) to favor different feedstocks. According to the latest available data, in 2014, Germany and the United Kingdom, the two largest biogas producers in the EU represented the two ends of the scale. Germany generates 93 percent of its biogas from the fermentation of agricultural crops and crop residues while the United Kingdom, along with Greece, Estonia, Ireland, and Portugal, relies almost entirely on landfill and sewage sludge gas. All other countries use a variety of feedstock combinations.

Table 17. Biogas (KTOE)

Calendar Year	2010	2011	2012	2013	2014	2015[e]	2016[f]	2017[f]
Landfill	2,657	2,739	2,744	2,816	2,751	2,750	2,750	2,750
Sewage Sludge	1,017	1,169	1,195	1,368	1,358	1,360	1,360	1,360
Field Crops/ Manure/ Agro-food industry waste	4,856	6,509	8,247	9,708	10,758	11,700	12,500	13,000
Total	8,530	10,416	12,185	13,892	14,866	15,810	16,610	17,110

Sources: 2008-2014 Eurostat table nrg_109, downloaded on May 9, 2016; 2015-2017: e, f = Estimate/Forecast EU FAS Posts

Germany is the leader in biogas production accounting for 65 percent of total EU production in 2014. Italy, the Czech Republic, the United Kingdom and Austria followed with a production share of 14, 5, 3, and 3 percent, respectively. The incentive for farmers in Germany to invest in biogas digesters was a guaranteed feed-in price for the generated electricity which is considerably higher than that of electricity generated from fossil fuels, natural gas coal, or nuclear sources. This feed-

in price was guaranteed for 20 years from the erection of the plants. However, changes to the German renewable energy law (EEG) in 2012 and 2014, reduced the attractiveness of investing in new plants. As a result, further increase in biogas plants will be minimal. Instead, investments will likely focus on rejuvenating existing plants.

Biogas production is increasing in the Czech Republic (driven by feed-in tariffs to compensate for the cost of production) and Denmark (driven by the goal to use 50 percent of livestock manure for biogas production by 2020). In France, the government seeks to increase the number of biogas facilities by means of investment support and electricity purchase prices, however, the administrative burden and a lack of profitability for investors is limiting expansion. According to its National Renewable Energy Action Plan (NAP), Hungary wants to increase its biogas production capacity from 45 MW to 55 MW by 2020. However, the increase is stifled by problems with the green energy feed-in system and the low electricity purchase prices, which make further investments into biogas facilities economically unattractive. In the Netherlands, low electricity prices have even led to a decline in biogas production.

The majority of the biogas is used to generate electricity and/or heat. The trend is toward the so-called cogeneration plants which produce electricity and capture the process heat at the same time (Germany, the Netherlands, Austria, Czech Republic, and Poland). The heat can be supplied to nearby buildings or sold to district heating systems. A growing number of large scale operations are purifying the biogas, which contains 50-75 percent methane, to bio-methane (99 percent methane) and subsequently entering it into the natural gas grid (Germany, Austria).

The use of purified biogas as transportation fuel is still marginal in most EU countries with the exception of Sweden and Germany. In 2014, the EU consumed 134 MT of oil equivalent (TOE) of biogas for transportation uses: 84 TOE in Sweden and 50 TOE in Germany.

Table 18. Overview of the EU-28 Biogas Sector by Member State

Country	**No. of biogas plants**	**Total capacity in MW**	**Biogas production in TOE** (Eurostat 2014)	**Electricity production GWh**	**Feedstock**
Austria (2015)	384	114	292	543 from biogas plus 26 from sewage and landfill gas (CY2014)	Corn silage, manure, agricultural and food waste, sewage gas, landfill gas
Belgium (2012)	39		206		Manure, corn silage, agricultural and food waste
Czech Republic (2015)	507	358	608	2,189	Corn silage, hay, industrial and municipal waste
Croatia	NA	NA	26	NA	NA
Denmark (2015)	21		123		Manure
Estonia (2013)		4	10	16	Landfill gas, sewage sludge, manure
Finland (2010)	70		100		Municipal waste
France	410 (2013)		441	1,700	Municipal waste, sewage sludge, industrial waste, farm waste
Germany (2015)	8,928	4,177	7,434	30,110 for electricity 18,980 for heat 530 for fuel	Corn and rye silage, grains, manure, waste, sugar beets
Greece		44	87		Manure and agricultural waste

Hungary (2014)	74	45	76	107	Manure (867,000 MT), corn silage (165,000 MT), sugar beet slices (200,000 MT) (together 47 plants); sewage sludge (11 plants); landfill gas (16 plants)
Italy (2015)	> 1,000	900	1,961		Manure, agro-industry waste, OFSUW
Latvia (2013)		45	75	222	Manure, municipal and food processing waste, waste water treatment sludge
Lithuania (2013)	9	15	21	42	Agricultural crops, food industry waste, sludge, energy crops
Netherlands (2014)	101		313		Manure, corn silage (250,000 MT), agricultural and food waste
Poland (2015)	78	67 electricity 68 heat	207	429 for electricity 225 for heat	Sewage sludge, landfill gas, energy crops, plant and animal waste
Portugal (2011)	100	42	82	140	Manure Landfill gas, OFSUW
Slovakia (2014)	100	102	96	810	Corn silage, manure, agricultural waste
Slovenia (2010)	21	21	31	n/a	Manure, agricultural crops, waste water, landfill gas
Spain (2014)	94	223	353	907 (163 KTOE)	Landfill collections (60 plants); agro-industrial waste (29 plants); sewage sludge (15 plants); OFSUW (6 plants)
Sweden (2011)	230		153	1,400	waste materials, manure, crops
United Kingdom (2010)	325	500	2,126	1,750	Food waste, brewery waste, OFSUW, animal slurry & manure

OFSUW = organic fraction of solid urban waste. MW = Mega watt, GWh = Giga watt hours, NA = Not Available.
Sources: Eurostat table nrg_109 (column biogas production in TOE) EU FAS Posts (all other)

VIII. Notes on Statistical Data

Bioethanol

Production capacity, production and consumption figures are based on statistics of the European Commission, Eurostat, the European Renewable Ethanol Association (ePURE) 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 ethanol production, but is included in the consumption figures. ETBE is predominantly consumed in France, Spain, the Netherlands and Poland.

Bioethanol import figures during 2006-2009 are based on estimates of ePURE. Other trade figures are based on Eurostat and Global Trade Atlas (GTA) data, which are sourced from EU MS customs data, and the U.S. Bureau of Census. As the EU has no Harmonized System (HS) code for bioethanol, trade numbers are difficult to assess. The estimation of the EU import figures after 2009 is based on EU imports through preferential trade under HS 2207, EU imports from Brazil under HS code 3824.90.97, U.S. exports to the EU under HS 2207, and EU imports of HS code 29091910 (ETBE, 45 percent ethanol).

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 the following; 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 0.31 across all grains.

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, which are sourced from EU MS customs data, and the U.S. Bureau of Census, and adjusted for U.S. exports of biodiesel blends. A specific customs code for pure biodiesel (B100) and biodiesel blends down to B96.5 (HS 3824.90.91) was first introduced in the EU in January 2008. In January 2012 the code was changed to HS 3826.00.10 for blends containing at least 96.5 percent biodiesel, HS code 3826.00.90 (containing between 30 and 96 percent of biodiesel), and HS 2710.20.11 for blends containing at most 30 percent biodiesel. In this report it is assumed that these codes represent a blend of 99, 95, and 5 percent, respectively.

Prior to 2008, 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. The U.S. Bureau of the Census introduced HTS export code 3824.90.40.30 in January 2011 which exclusively covers pure biodiesel (B100) and biodiesel blends above B30.

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

Appendix I - Abbreviations

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.
FAME = fatty acid methyl ester
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
HVO = Hydrogenated Vegetable Oil
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
MW = Mega Watt = 1,000 Kilo Watt (KW)
MWh = Mega Watt hours= 1,000 Kilo Watt hours (KWh)
MY = Marketing Year
Nordics = Denmark, Sweden, Finland, Norway and Iceland
PVO = Pure vegetable oil used as transport fuel
RED = EU Renewable Energy Directive 2009/28
RME = Rapeseed Methyl Ester
SME = Soybean Methyl Ester
TME = Tallow Methyl Ester, biodiesel made from animal fat
TOE = Tons of oil equivalent = 41,868 MJ = 11.63 MWh
UCO = Used cooking oil/ recycled vegetable oil
UCOME = UCO based methyl ester biodiesel
US$ = U.S. Dollar

Appendix II - Energy Content and Conversion rates

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

Appendix III - Related Reports from USEU Brussels and MS Posts in the EU

Related reports from FAS Post in the European Union:

Country	Report Nbr	Title	Date
EU	GM16009	Biofuel Mandates in the EU by Member State	06/24/16
EU	E16025	EU Rules Against Anti-Dumping Duty on U.S. Ethanol	06/17/16
EU	E16020	EU Sugar Annual	04/25/16
EU	AU1603	EU Oilseeds Annual	04/12/16
EU		Grain and Feed Annual	04/07/16
Italy	IT5104	Biofuels Overview – Italy	01/06/16
Italy	IT1556	The Italian Wood Pellet Market	12/07/15
EU	E15040	EU Sugar Semi-Annual	10/05/15
Bulgaria	BU1526	Biofuels Sector Update - Bulgaria	08/26/15
Portugal	SP1519	Portugal Biofuels Standing Report 2015	08/13/15
Poland	-	Biofuels Market Outlook in Poland 2015	08/11/15

EU	AU1504	Oilseeds Market Update	08/15/15
Czech Rep.	EZ1509	Biofuels Annual 2015	07/29/15
EU	NL5028	EU Biofuels Annual 2015	07/22/15

The GAIN Reports can be downloaded from the following FAS website:

http://gain.fas.usda.gov/Pages/Default.aspx

[1] The European Industrial Bioenergy Initiative (EIBI) defines advanced biofuels in the following manner: those (1) produced from lignocellulosic feedstocks (i.e. agricultural and forestry residues, e.g. wheat straw/corn stover/bagasse, wood based biomass), non-food crops (i.e. grasses, miscanthus, algae), or industrial waste and residue streams, (2) having low CO2 emission or high GHG reduction, and (3) reaching zero or low ILUC impact.
[2] Scheme found in compliance in May 2016 and as such, no specifics surrounding the program are available as of this time.
[3] All targets to be compared to 1990 levels.