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Report Highlights:

In 2020, the COVID-19 outbreak cut EU gasoline and diesel use by 13.0 and 9.4 percent, respectively. Bioethanol and biodiesel consumption, however fell by a lower percentage (10.1 and 3.5 percent, respectively) because biofuels use was supported by the ten percent blending target for transport fuels in 2020. Another important factor was the expanding domestic supply of hydrogenation derived renewable diesel. The reduced demand also led to a decline in production of bioethanol and biodiesel (10.1 and 2.0 percent, respectively). With the gradual lifting of the lockdowns and reinforced by the post-2020 Renewable Energy Directive (known as REDII) support measures, biofuel consumption is forecast to pick up again in 2021 but remain below the pre-COVID level of 2019. Additionally, the EU remained the world's largest wood pellet market in 2020, with consumption of roughly 30.4 million metric tons (MMT). EU wood pellet demand is expected to further expand in 2021 to 32.3 MMT.

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I. Summary

NOTE: EU = "EU" in this report refers to the EU27 and the United Kingdom (UK). In the next report, the EU Biofuels Annual 2022, Brexit will be taken in account and the "EU" term will only refer to the EU27 (without the UK).

Policy and Programs

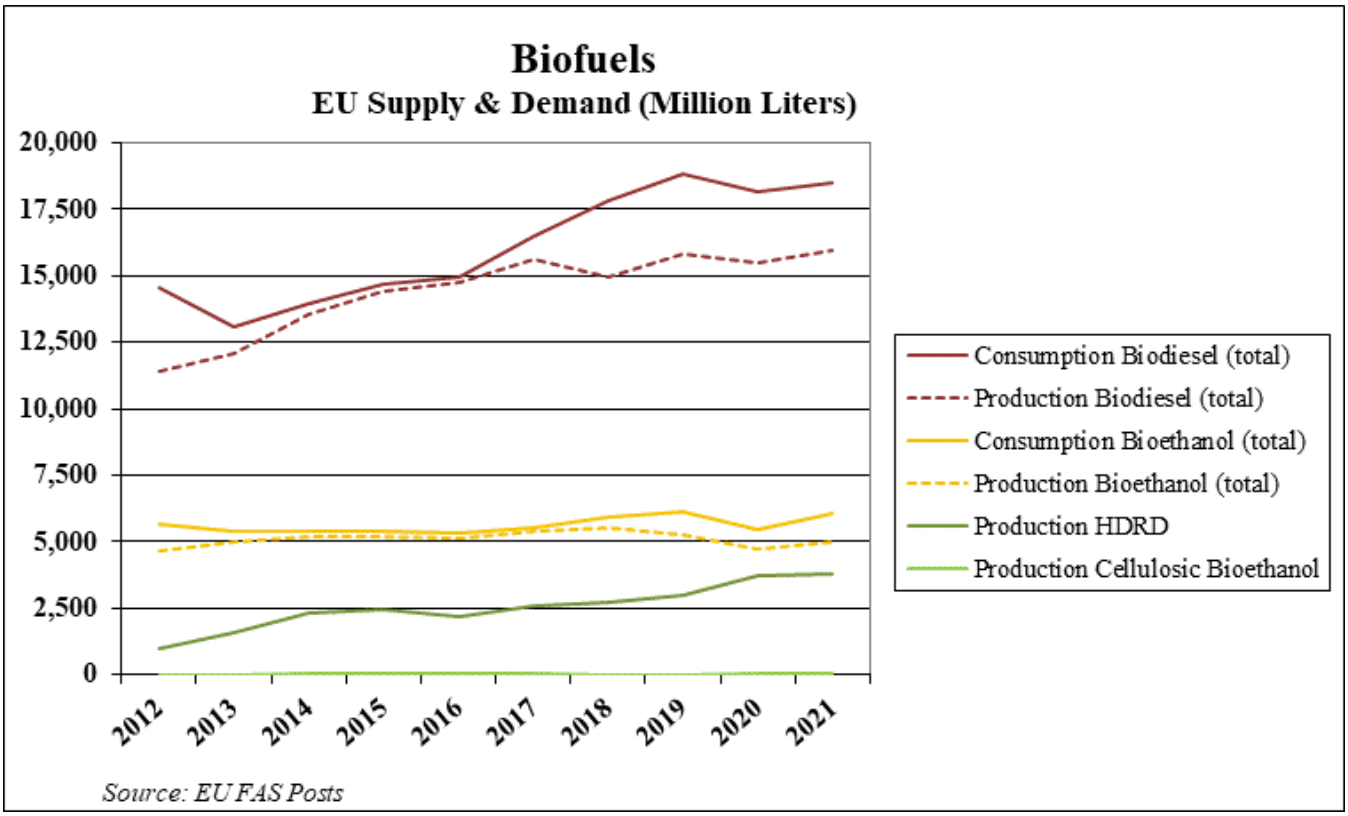
In 2009, the European Union (EU) adopted the Renewable Energy Directive (RED) as part of the EU Energy and Climate Change Package. The Package included the "20/20/20" mandatory goals for 2020, one of which was a 20 percent binding target for renewable energy in the overall energy mix of the EU, and a 10 percent renewable energy blending target for the transport sector for all EU Member States (MS). According to the EU's most recent progress report (2018) the EU was on track to meet its 20 percent target and should have met the binding 10 percent renewable energy target for the transport sector, in part facilitated by 'double-counting' provisions for biofuels and renewable electricity. Without the double counting provisions which artificially inflate actual achievement for select waste feedstock-based biofuels and renewable electricity, most MS would not have achieved the 10 percent goal for transport energy by 2020.

In 2018, the EU adopted the Renewable Energy Directive II (REDII). Most of the provisions of the REDII entered into force on January 1, 2021, but EU MS are required to transpose the REDII by June 30, 2021, into national legislation. The REDII set a new overall renewable energy target of 32 percent and a 14 percent target for the transport sector by 2030. The EU capped the REDII share of conventional/crop-based biofuels to one percent above MS 2020 consumption levels, up to the overall cap of seven percent of final consumption of road and rail transport for each MS. First generation biofuels were already capped at seven percent after the adoption of the Indirect Land Use Change (ILUC) Directive in 2014. The REDII also set ambitious binding targets for the use of advanced biofuels to 3.5 percent by 2030. Additionally, the EU introduced sustainability criteria for biomass and expanded sustainability criteria for biofuels in the REDII. The European Commission (EC) is now

preparing secondary legislation (implementing and delegated acts) to implement the new rules -- most of which should be adopted before the entry into force of the REDII.

In 2019, the EC presented its Communication on the European Green Deal which aims to make the EU carbon neutral by 2050. In 2021 and 2022, the EC will announce several legislative proposals as part of the Green Deal. If adopted, these proposals could affect the biofuels market in the EU, including a revision of the REDII, deforestation-free supply chain requirements, and blending mandates for aviation fuels.

Conventional and Advanced Biofuels



The COVID-19 crisis had a significant effect on the EU biofuels market in 2020. The lockdowns pressed the transport use of both gasoline (-13.0 percent) and diesel (-9.4 percent). As a result, the use of bioethanol (-10.1 percent) and biodiesel also declined (-3.5 percent). However, biofuels were not as adversely impacted as fossil fuels due to increased blending towards the mandate of ten percent in 2020. Another factor which buoyed biofuel consumption was that the blending rate achieved in 2020 will determine the maximum level for food-based biofuels blending until 2030 (incentivizing its use). However, unlike in other years, it was not permitted to make use of excess credits from the previous year (i.e. 2019) to comply with mandates in 2020.

The consumption of bioethanol was supported by the introduction and market expansion of higher blends such as E10 and E85 in several EU MS. However, there were several factors which bolstered

biodiesel consumption. First, the six percent greenhouse gas reduction mandate for all fuels that came into force in 2020. A second factor was the relative minor effect of the lockdowns on diesel-fuel heavy transport vehicles relative to the use of lighter private cars. A third factor was the expanding supply of hydrogenation derived renewable diesel (HDRD) in 2020, about 700 million liters, as more plants entered commercial production.

Most EU bioethanol and biodiesel producers reacted to the shrinking market for transport fuels by temporarily closing their plants. Consequently, EU production of bioethanol and biodiesel fell by 10.1 and 2.0 percent, respectively. Moreover, several bioethanol producers used a portion of their capacity to produce ethanol-for-disinfectants. Despite lower bioethanol use, EU imports of bioethanol increased by 8.6 percent, with the United States and Brazil the main suppliers, which led to elevated stocks at the end of 2020. In contrast, imports of biodiesel fell by 14.0 percent given reduced demand (with Argentina remaining the dominant supplier).

With the gradual lifting of the lockdowns, consumption of both bioethanol and biodiesel is forecast to pick up again in 2021, but remain below the pre-COVID level of 2019. Biofuel consumption is also anticipated to be reinforced by post-2020 (REDII) support measures, including increasing blending mandates and market introduction of higher ethanol blends. Of particular importance is the introduction of E10 in the United Kingdom and Sweden during the last quarter of 2021.

Based on the minimum blending rates for advanced biofuels produced with agricultural and forestry by-products listed in Part A of Annex IX of the RED II, the consumption of these second-generation biofuels must increase significantly beyond 2020. Currently, EU production is limited to roughly four percent of the biodiesels, and five percent of bioethanol. Most of these biofuels are renewable diesels produced from tall and pine oil, bioethanol produced from food waste streams, and to a lesser extent cellulosic ethanol. The most significant production expansion of advanced biofuels produced with feedstocks listed in Part A of the RED II is forecast to take place in Sweden and Finland, which is anticipated to be based on the refining of tall oil.

A larger portion of biofuels is produced using waste oils and fats listed in Part B of Annex IX of the REDII. Nearly thirty percent of the biodiesels (including HDRD) are produced from used cooking oil (UCO) and animal fats. The REDII sets a consumption limit of 1.7 percent of all transport fuels for biofuels produced with these waste oils and fats, but MS can modify this limit, if justified, considering the limited availability of the feedstock. Sourcing feedstocks from third countries could support a production expansion to keep these renewable transport fuels competitive.

Biomass for Heat and Power

With consumption of roughly 30.4 million metric tons (MMT) of pellets in 2020, the EU is the world's largest wood pellet market. In 2020, EU consumption predominantly rose due to increased co-firing of wood pellets with coal in the Netherlands. In 2021, EU demand is expected to further increase to 32.3 MMT, based on continued expansion of the industrial market in the United Kingdom and the Netherlands, and an expansion of residential use in, predominantly, Germany and France. Residential use for heating, which accounts for roughly forty percent of the total pellet market, is relatively stable compared to industrial heat and power generation. In some EU MS, households receive subsidies or tax deductions for heating with biomass. In most countries, however, government funding is limited. EU

demand for pellets has significantly outpaced domestic production over the past ten years, which has led to increasing imports, predominantly from the United States. In 2020, U.S. exports to the EU totaled 7.1 MMT, representing a value of $1.38 billion.

II. Policy and Programs

Brexit

The United Kingdom (UK) withdrew from the European Union (EU) as of February 1, 2020, and the agreement on the withdrawal entered into force on the same date. This Agreement provided for a transition period, which ended on December 31, 2020. During the transition period, EU law was applicable to and in the UK. On December 24, 2020, the EU and UK negotiators reached an agreement that sets the rules on the new partnership which went into effect on January 1, 2021. More information: https://ec.europa.eu/info/relations-united-kingdom/new-normal/consequences-brexit_en

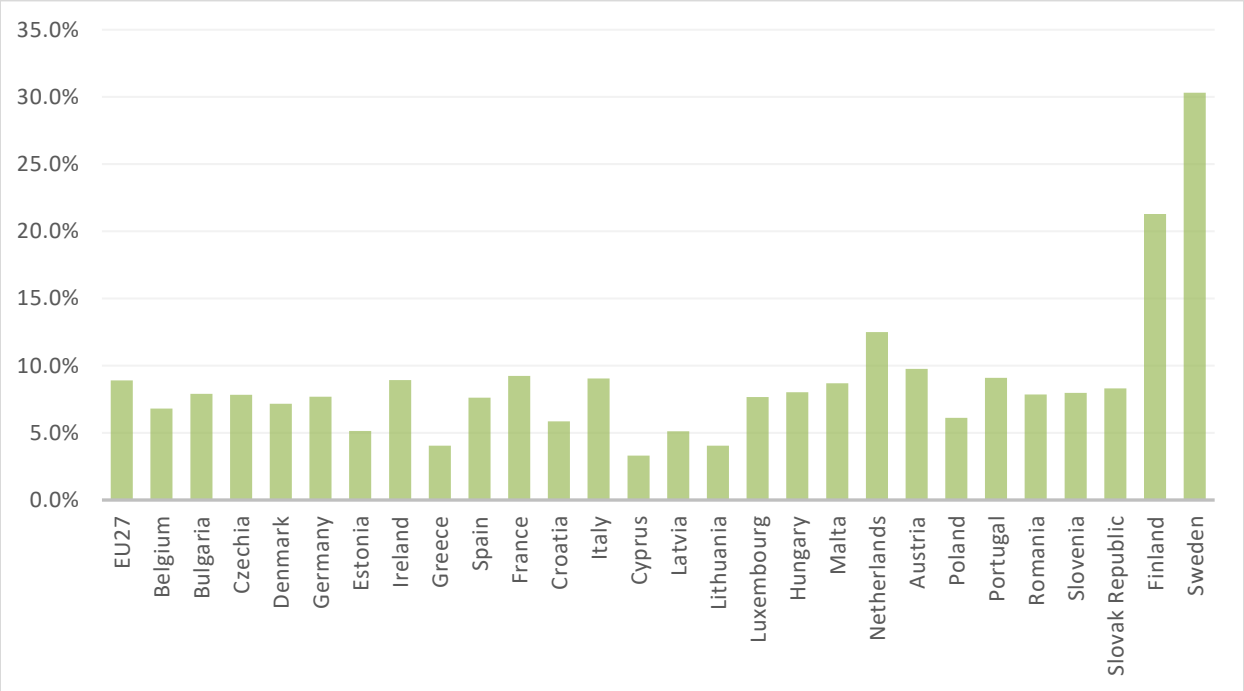
The EU's Renewable Energy Directive (RED)

The EU Energy and Climate Change Package (CCP) ran from 2010 to 2020. The RED, which is part of the CCP package, entered into force on June 25, 2009, and expired on December 31, 2020. The CCP required the EU to achieve a binding target whereby 20 percent of its overall energy use would be powered from renewable sources by 2020.

RED's achievements

In October 2020, the EC published its most recent Renewable Energy Progress Report. This report concludes that, in 2018, EU27 consumption of renewable energy reached 18.9 percent of total energy use, above the indicative trajectory of 16 percent for 2017/2018. However, the transport sector was slightly below the planned trajectory in the MS' National Renewable Energy Action Plans at 8.3 percent (versus 8.5 percent planned). The EC attributes this shortfall to the debate on biofuels policy in the EU. The EC still expects all MS to meet the binding 10 percent target for the transport sector by 2020. In 2018, only Finland and Sweden were above this level and four MS were within one percent of this target (France, the Netherlands, Austria, and Portugal). The EC noted that the remaining MS will need a significant increase in consumption to reach the 10 percent target. Since the publication of the Renewable Energy Progress Report, Eurostat published 2019 data for the progress of RED. For the transport sector, the share of renewable energy reached 8.9 percent for the EU27.

Table A: Share of renewable energy in the transport sector by MS (2019)



Source: Eurostat**,** SHARES 2019

RED: Sustainability Criteria

To qualify for RED targets, biofuels consumed in the EU had to comply with strict sustainability criteria provided in article 17 of the RED. While the RED set clear sustainability criteria guidelines for liquid biofuels, there were no sustainability criteria for pellets and other forms of solid biomass (only non-binding recommendations on sustainability criteria). In the absence of EU-wide 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. All MS sustainability schemes on biomass had to be notified to the EC even though there are no specific EU criteria on sustainability. EU-wide criteria were introduced in the REDII as discussed below. For more information about the sustainability criteria under the RED, please see the Biofuels Annual of 2020.

The Renewable Energy Directive II (REDII)

The EU adopted the new Renewable Energy Directive for the period 2021-2030 (the REDII) after two years of debate, in June 2018 (the full text was published in the Official Journal in December 2018). Most of the provisions of Directive 2018/2001 entered into force on January 1, 2021. The EU MS are required to transpose the REDII by June 30, 2021 into national legislation. The former RED will be repealed on 1 July 2021.

The REDII Renewables Targets

The REDII sets an overall binding renewable energy target of at least 32 percent by 2030, with a 14 percent target for the transport sector (and a clause for a possible upward revision by 2023). Within the 14 percent transport sector target, food-based biofuels are capped at up to one percent higher than MS 2020 use levels, but with a maximum cap of seven percent for each MS. MS can also set a lower limit for conventional biofuels than prescribed in the REDII. If the cap on first generation biofuels in a MS is less than seven percent, the country may reduce the transport target by the same amount (for example, a country with a food and feed crop cap of 6 percent could set a transport target at 13 percent). For advanced biofuels, the REDII introduces two different sets of targets for feedstock listed in Part A and feedstock listed in Part B of Annex IX. Biofuels made from feedstock listed in Part A must be supplied at a minimum of 0.2 percent of transport energy in 2022, 1 percent in 2025, increasing to at least 3.5 percent by 2030. Biofuels produced from feedstock listed in Part B are capped at 1.7 percent in 2030. Advanced biofuels can be double counted towards both the 3.5 percent and 14 percent targets.

Table B: Advanced Biofuel sources, Part A and Part B of Annex IX in RED II.

Part A	***Part B***
• *Algae if cultivated on land in ponds or photobioreactors* • *Biomass fraction of mixed municipal waste* • *Biowaste from private households subject to separate collection* • *Biomass fraction of industrial waste not fit for use in the food or feed chain* • *Straw* • *Animal manure and sewage sludge* • *Palm oil mill effluent and empty palm fruit bunches* • *Crude glycerin* • *Bagasse* • *Grape marcs and wine lees* • *Nut shells* • *Husks* • *Cobs cleaned of kernels of corn* • *Biomass fraction of wastes and residues from forestry and forest-based industries* • *Other non-food cellulosic material* • *Other ligno-cellulosic material except saw logs and veneer logs*	• *Used cooking oil* • *Some categories of animal fats*

The REDII Sustainability Criteria

In order to qualify for counting towards the REDII targets, biofuels, bioliquids, and biomass consumed in the EU must comply with strict sustainability criteria provided in article 29 of the REDII. This article sets requirements on the minimum level of greenhouse gas (GHG) savings, safeguarding against the conversion of high-carbon content lands, and protecting biodiversity.

High-Risk ILUC Biofuels
The REDII introduces specific criteria for 'high-risk ILUC biofuels.' One of the more heated debates of the REDII surrounded the use of biofuels produced from areas that underwent recent deforestation or conversion of grasslands to croplands. These areas are referred to as indirect land use change (ILUC) areas. The REDII required that the EC must produce a definition for high-risk ILUC biofuels.
In May 2019, the EU published Delegated Act 2019/807 in the Official Journal, which defines high-risk ILUC biofuels as feedstock for which the share of the expansion of production into land with high carbon stock is higher than ten percent (since 2008 and with an annual expansion of more than one percent). Given the EC's calculations, only palm oil falls under this definition as of now. The use of high-risk ILUC biofuels for REDII goals will be capped at the 2019 level until 2023 and then phased out by 2030. The Delegated Act also sets out criteria for certifying low-risk ILUC biofuels, which were already defined in article 2 of the REDII. The delegated act gives the possibility for producers to certify their feedstock as low-risk ILUC.

The EC is currently preparing an implementing regulation with details on the certification of low ILUC-risk biofuels. The expectation was that the text would be adopted by June 2021, but that timeline has slipped. The EC is also preparing a report to review the methodology used to determine which feedstock falls under the high-risk ILUC category in Delegated Act 2019/807, considering the expansion of feedstock production as well as the factors that potentially justify relaxations for certain smallholders. The EC intends to publish this report before June 30, 2021.

Forestry biomass
The REDII introduces EU-wide sustainability criteria for forestry biomass (the former RED only had sustainability criteria for liquid biofuels). Biofuels, bioliquids, and biomass fuels produced from forest biomass will be required to meet specific criteria to minimize the risk of using forest biomass from unsustainable sources. Such criteria include that the country in which forest biomass was harvested has laws applicable in the area of harvest, as well as monitoring and enforcement systems in place. Forestry biomass will also need to follow land-use, land-use change, and forestry (LULUCF) criteria -- notably with management systems to ensure that carbon stock and sink levels in the forest are maintained or strengthened over the long term. Sustainability will be assessed at the country level or at the sourcing area level. On March 31, 2021, the EC published a draft implementing regulation establishing operational guidance on the necessary evidence for demonstrating compliance with the sustainability criteria for forest biomass from Article 29 of the REDII. The final text of the regulation is expected to be published before the end of June 2021.

Additional national sustainability requirements
The REDII allows MS to establish additional sustainability criteria for biomass fuels. Before December 31, 2026, the EC will assess the impact of such additional criteria on the internal market, accompanied, if necessary, by a proposal to ensure harmonization at the EU-level.
The REDII also allows a MS to set a limit lower than the seven percent allowed for biofuels, bioliquids, and biomass fuels produced from food and feed crops. MS can also distinguish between different biofuels, bioliquids and biomass fuels produced from food and feed crops, considering the best available

evidence on ILUC impact. EU MS may, for example, set a lower limit for the share of biofuels, bioliquids, and biomass fuels produced from oil crops.

Voluntary Schemes
One way to ensure that biofuels, bioliquids, and biomass fuels comply with the sustainability and GHG emissions criteria is by certification through a voluntary scheme. EU MS can develop national voluntary systems and international voluntary schemes can also be approved by the EC. The EC is preparing an implementing regulation which details rules, including adequate standards of reliability, transparency, and independent auditing for voluntary schemes applied in the production of biofuels, bioliquids or biomass fuels.

Voluntary schemes that were recognized under the RED must adjust their certification approaches to meet the new requirements laid down by the REDII. More information about the recognition process can be found on the EC's website. The updated assessment protocol can be found here. A full listing of the 14 schemes approved by the EC under the RED is available on the DG Energy's website. On January 30, 2019, the EC announced the recognition of a voluntary scheme developed by the U.S. soy industry. Commission Implementing Decision 2019/142 recognized the U.S. Soybean Sustainability Assurance Protocol (SSAP-RED) program and entered into force on February 19, 2019.

The REDII GHG Savings
The REDII introduces new compliance measures for GHG emission criteria for biofuels used in transport which are to be counted towards the overall 14 percent target. The EC is permitted to revise and update the default values of GHG emissions when technological developments make it necessary. Economic operators have the option to either use default GHG intensity values provided in the REDII or to calculate actual values for their pathway.

Table C: Greenhouse gas savings thresholds in the REDII

Plant Operation start date	Transport biofuels	Transport renewable fuels of non-biological origin	Electricity, heating, and cooling
Before October 2015	50%	-	-
After October 2015	60%	-	-
After January 2021	65%	70%	70%
After January 2026	65%	70%	80%

The sustainability criteria apply to plants with a total rated thermal input above 20 megawatts (MW) for installations producing power, heating, cooling, or fuels from solid biomass and for plants with total rated thermal input capacity equal to or exceeding 2 MW for installations using gaseous biomass fuels.

The Fuel Quality Directive (FQD) and the REDII
As noted above, the REDII covers the decarbonization of transport fuels after 2020. This was previously addressed in the FQD which requires that all fuel suppliers meet a six percent reduction (from 2010) in GHG emissions by 2020, across all fuel categories supplied to the market. In addition, the FQD limits ethanol blends to ten percent or less when ethanol is used as an oxygenate, and places limits on palm oil and soy oil content of biodiesel.

In November 2020, the EC published a report on the quality of petrol and diesel fuel used for road transport in the EU. The report looks at data from 2018 in the EU27 plus the United Kingdom. It shows that the average GHG intensity of the fuels and energy supplied in the EU is 3.7 percent lower than the 2010 baseline. The EC notes that EU fuel suppliers in EU27 plus the United Kingdom, on average, failed to reduce the GHG intensity of transport fuels by six percent by 2020.

The European Green Deal

On December 11, 2019, the EC presented its Communication on the European Green Deal and a proposal for a draft European Climate Law intended to make the EU's 2050 Green Deal climate neutrality objective binding across the EU. The proposal also included a reduction of net GHG emissions by at least 55 percent by 2030 (compared to 1990 levels). The proposed text would also empower the EC to adopt legislation establishing policy pathway to carbon-neutrality by 2050 and initiated by the 2030 target.

Table D: EU targets and Commission's proposed targets for net reduction of GHG emissions compared to 1990 levels.

2020 target	Current 2030 target	Proposed 2030 target	Proposed 2050 target
- 20%	- 40%	- 55%	- 100%

The "Fit for 55" Package
To achieve the Green Deal objective of climate neutrality by 2050, the EC announced that in 2021 it will propose the "Fit for 55" policies to reduce GHG emissions by at least 55 percent by 2030. The proposals will be published on July 14, 2021, and include:

- Revision of the EU Emissions Trading System (ETS), including shipping and aviation;
- Carbon Border Adjustment Mechanism (CBAM) and a proposal for CBAM as own resource;
- Amendment to the REDII to implement the ambition of the new 2030 climate target;
- Revision of the Regulation on the inclusion of GHG emissions and removals from land use, land use change, and forestry (LULUCF); and,
- Revision of the REDII on deployment of alternative fuels infrastructure.

Deforestation-free supply chain initiative
As part of the European Green Deal, the EC has announced a legislative proposal to be published by mid-2021 to combat deforestation and forest degradation linked to agriculture. According to the EC, activities related to forestry and other land use are responsible for twelve percent of GHG emissions, which makes them the second major cause of climate change after the burning of fossil fuels. To tackle this issue, the EC wants to minimize the EU's contribution to deforestation and forest degradation worldwide, as well as to promote the consumption of products from 'deforestation-free supply chains' in the EU.

The EC is currently carrying out an impact assessment but has already identified soy and palm as commodities that could be in the scope of the future legislative proposal. A wide variety of regulatory and non-regulatory policy options are being assessed by the EC such as: mandatory labeling, voluntary commitments and labeling, due diligence, certification schemes, and bilateral agreements. This upcoming legislative proposal will impact imports of oilseeds in the EU and could impact global trade

flows, particularly soy and palm, as EU importers will have to purchase products that comply with the new EU requirements.

The EU Taxonomy for Sustainable Activities
In order to meet the EU's climate targets for 2030 and reach the objectives of the European Green Deal, the EU adopted the Taxonomy Regulation in June 2020. This Regulation establishes the framework for an EU taxonomy for sustainable activities by setting out four overarching conditions that an economic activity has to meet in order to qualify as 'environmentally sustainable.' The Taxonomy Regulation aims to act as a screening mechanism to define sustainable activities to steer private investment to activities the EC deems sustainable. It creates three different categories: "sustainable activities", "transitional activities," and "enabling activities." The taxonomy includes bioenergy activities, and the EC classifies crop-based biofuels and forestry biomass as sustainable activities. More information can be found in GAIN Report - Commission Adopts Taxonomy for Green Investments, published on May 19, 2021.

Sustainable Aviation Fuels
As part of the European Green Deal, the EC has announced that it will propose legislation to boost supply and demand for sustainable aviation fuels in the EU, especially advanced biofuels and electro-fuels. The upcoming *ReFuelEU* initiative is likely to include a blending mandate and increased multipliers to help countries hit renewable energy targets. The legislative proposal is expected to be published in July 2021.

Market Access

Duties
Regulation 2017/2321 laid down the EU's anti-dumping and anti-subsidy rules in 2018. Duty rates for fuels are listed below. For a historical discussion of how EU harmonized system (HS) customs codes have changed and influenced trade, please see the EU Biofuels Annual of 2017.

Table D: MFN Duty Rates for Biofuels and Wood Pellets

HS Code	Description	Duty Rate
38260010	FAME above 96.5 and up to 100% by volume	6.5%
38260090	FAME greater than 30% and up to 96.5% by volume	6.5%
271020	Petroleum oils containing FAME up to 30% by volume	3.5%
220710	Undenatured ethanol	€19.2/hl
220720	Denatured ethanol	€10.2/hl
440131	Wood pellets	0%

Anti-dumping duties against U.S. bioethanol
On May 15, 2019, the EU repealed the AD duty on bioethanol imports from the United States (Regulation 2019/765). For additional information on this case, see the EU Biofuels Annual of 2017.

AD and countervailing (CV) duties against U.S. biodiesel
In 2009, the EU imposed AD and CV duties of up to €409.2 (around $495) per MT on imports of U.S. biomass-based diesel (both biodiesel and renewable diesel) mainly targeting the U.S. federal blenders tax credit of $1/gallon (Council Regulation 598/2009 and Council Regulation 599/2009). In July 2014, the EC initiated a 15-month review of the AD and CV duties against U.S. biodiesel, and on September 15, 2015, the EU extended the duties for an additional five years (to September of 2020) via Commission Regulation 2015/1519. On September 14, 2020, two days before the expiration of the duties, the EC launched an investigation to extend the AD measures against U.S. biodiesel. The investigation follows a request by the European Biodiesel Board, which has asked the EC for another extension of the duties for five years. The EC is expected to finalize the investigation within 12 to 15 months. During this period, the existing duties will remain in place.

Other biodiesel AD and CV duty actions
There have been several other recent developments related to AD duties. On September 19, 2017, the EC removed AD duties on Argentine and Indonesian biodiesel exports after losing a five-year dispute with these countries in the WTO in October 2016. For more information about the history of the case, please see the EU Biofuels Annual of 2019. However, days after lifting the AD duties on biodiesel, in January 2018, the EC announced a Notice of Initiation of anti-subsidy proceedings against Argentina. In February 2019, the EU imposed CV duties on Argentinean biodiesel -- between 25.0 and 33.4 percent depending on the company (Implementing Regulation 2019/244). Duties are linked to an undertaking offer by the Argentine industry which aims to prevent prices from falling below a certain floor price. Implementing Decision 2019/245 establishes price and volume limits – not disclosed publicly - for Argentinean biodiesel. It spares producers who agree to a minimum price from the imposition of CV duties and if volume limits are not exceeded. This is in line with article 18 of the WTO Agreement on subsidies and countervailing measures. Nevertheless, the EU biodiesel industry is concerned with this managed trade agreement and calls on the EC to be vigilant in monitoring prices.

In December 2019, the EU imposed a CV duty on imports of biodiesel from Indonesia via Implementing Regulation 2019/2092. The CV duty ranges from 8 to 18 percent depending on the company.

EU-Mercosur Trade Agreement

In June 2019, the EU and Mercosur reached a political agreement. The two parties are still currently performing a legal revision of the agreed text in preparation for the final, official version of the agreement. However, several EU MS, such as France and the Netherlands, have announced that they will not support ratification due to Amazon rainforest degradation. Without support from the MS, the EC cannot sign the agreement with Mercosur.

While no official text is available, the EC published a document summarizing negotiations results. For ethanol, if adopted, the EU would agree to allow 450,000 MT (570.15 million liters) duty free for chemical uses, as well as 200,000 MT (253.4 million liters) for all uses, including fuel, with an in-quota rate of one third of the MFN (most favored nation) rate. The volume would be phased-in in six, equal annual stages.

III. Ethanol

Bioethanol (ethyl alcohol), or simply ethanol, is produced by fermenting the carbohydrate components of plant materials. The most commonly used feedstocks are grains (e.g., corn, other coarse grains, 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

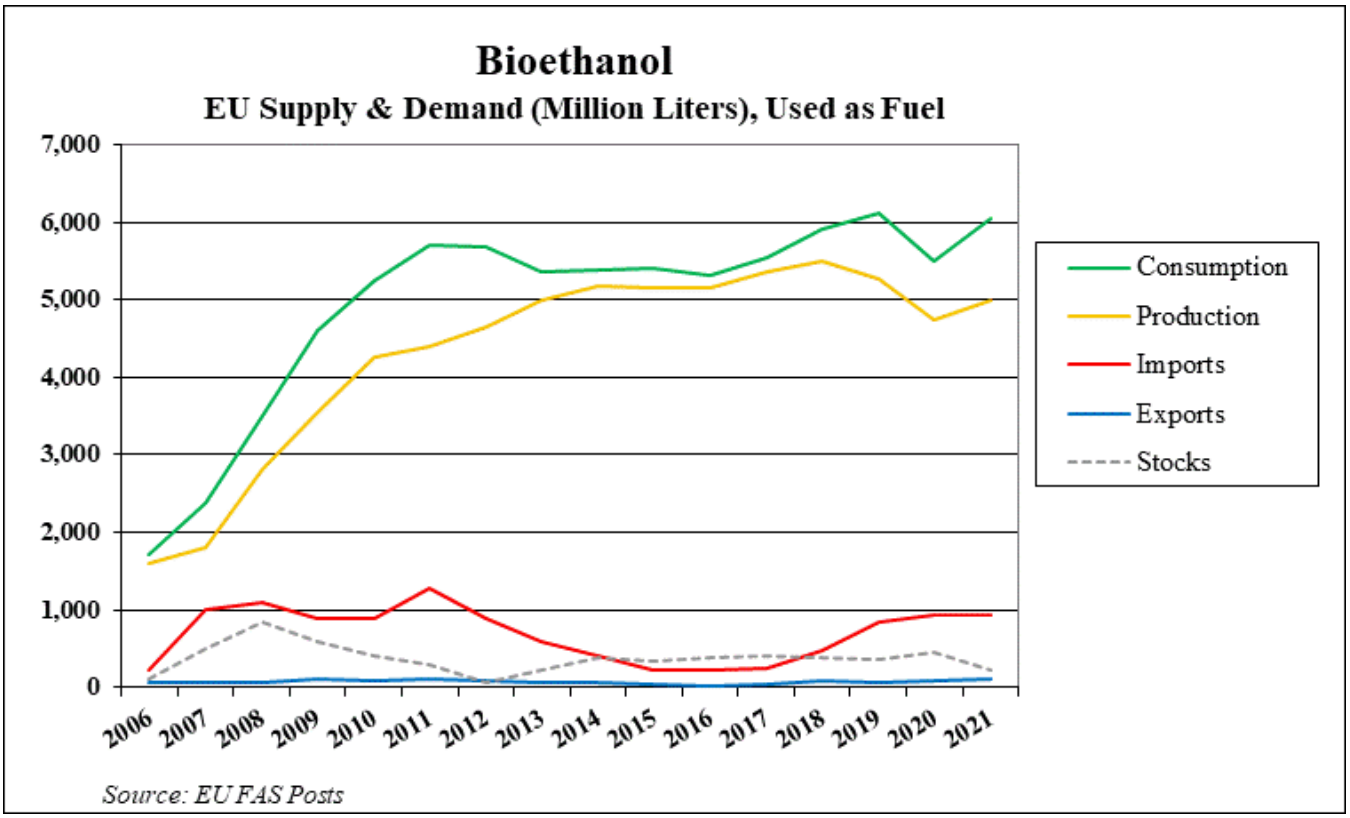
EU Production, Supply and Demand Table

Table 1. Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)

Calendar Year	2012	2013	2014	2015	2016	2017	2018	2019[r]	2020[e]	2021[f]
Beginning Stocks	322	91	256	422	381	417	452	423	393	500
Fuel Begin Stocks	284	57	219	384	335	381	419	393	364	461
Production	5,348	5,741	5,949	6,080	5,887	6,037	6,101	5,861	5,468	5,615
Fuel Production	4,658	5,000	5,190	5,165	5,159	5,373	5,497	5,281	4,747	5,000
>of which is cellulosic (a)	0	0	50	50	50	40	10	10	25	50
Imports	1,772	1,190	835	456	458	482	954	1,702	1,850	1,850
Fuel Imports	886	595	418	228	229	241	477	851	925	925
>of which is ETBE (b)	188	197	109	107	24	9	7	13	25	30
Exports	145	113	113	92	78	91	146	103	130	158
Fuel Exports	95	63	63	42	28	41	96	53	80	108
Consumption	7,206	6,653	6,506	6,484	6,231	6,394	6,938	7,490	7,082	7,545
Fuel Consumption	5,676	5,370	5,380	5,399	5,315	5,535	5,904	6,108	5,495	6,050
Ending Stocks	91	256	422	381	417	452	423	393	500	262
Fuel Ending Stocks	57	219	384	335	381	419	393	364	461	228
Refineries Producing First Generation Fuel Ethanol (Million Liters)										
Number of Refineries	70	71	66	60	55	58	57	56	57	57
Capacity	6,595	7,111	7,215	7,030	7,153	7,502	7,299	8,112	8,150	8,150
Capacity Use	71%	70%	71%	73%	71%	71%	75%	65%	58%	61%
Refineries Producing Cellulosic Fuel Ethanol (Million Liters)										
Number of Refineries	0	0	1	1	1	1	2	2	3	5
Nameplate Capacity	0	0	50	50	50	50	60	60	90	200
Capacity Use			100%	100%	100%	80%	17%	17%	28%	25%
Co-product Production (1,000 MT)										
DDGs (c)	2,962	3,223	3,380	3,454	3,535	3,716	3,834	3,598	3,332	3,481
Corn Oil (c)	136	148	159	151	147	147	200	205	184	188

Feedstock Use for Fuel Ethanol (1,000 MT)										
Wheat Kernels	3,285	3,200	3,306	3,661	3,932	5,197	3,497	2,855	2,510	2,635
Corn Kernels	4,687	5,092	5,483	5,218	5,060	5,065	6,881	7,066	6,350	6,480
Barley Kernels	400	647	447	414	379	383	503	327	435	450
Rye Kernels	367	790	819	712	638	507	501	373	520	520
Triticale	725	567	743	1,031	1,285	720	867	874	835	1,035
Sugar Beets	10,588	11,694	11,330	10,010	8,830	8,292	7,949	8,264	6,670	7,450
Cellulosic Biomass	0	0	200	200	200	160	40	40	100	200
Market Penetration (Million Liters)										
Fuel Ethanol Use	5,676	5,370	5,380	5,399	5,315	5,535	5,904	6,108	5,494	6,050
Gasoline Pool (d)	113,531	109,062	108,618	106,914	107,201	107,853	112,592	115,335	100,320	106,000
Blend Rate	5.0%	4.9%	5.0%	5.0%	5.0%	5.1%	5.2%	5.3%	5.5%	5.7%

Sources/Notes: r = revised / e = estimate / f = forecast of EU FAS Posts. Original data collected in MT, then converted to liters using a conversion rate of 1 MT = 1,267 liters for bioethanol. Ethanol production: Eurostat statistics, ePURE, and FAS Post projections. Production capacity as of December 31 of year stated. Ethanol use: Eurostat statistics and FAS Posts projections. Trade data: See Notes section. (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 (theoretical maximum) based on estimated feedstock use in fuel ethanol production. (d) Includes biocomponents (International Energy Agency).



Consumption

Table 2. Fuel Ethanol Consumption Main Consumers (million liters)								
Calendar Year	**2014[r]**	**2015[r]**	**2016[r]**	**2017[r]**	**2018[r]**	**2019[e]**	**2020[e]**	**2021[f]**
Germany	1,557	1,485	1,485	1,465	1,505	1,470	1,390	1,520
United Kingdom	808	789	757	911	759	759	557	835
France	797	803	823	842	777	795	684	695
Netherlands	252	278	237	253	335	392	390	445
Poland	311	323	329	329	299	372	356	360
Spain	371	375	253	277	319	256	190	195
Sweden	327	263	215	172	224	178	144	190
Total	5,380	5,399	5,315	5,535	5,904	6,108	5,494	6,050

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

From 2013 to 2016, EU consumption of bioethanol stabilized at roughly 5.35 billion liters. The stable use is a result of cutting off the supply of some imports, the double-counting of biodiesels, the adjustment of national blending mandates, and the decline of gasoline use. From 2017 to 2019, consumption picked up again and increased to roughly 6 billion liters. The growth was a result of a gradual increase in blending targets towards the 2020 mandate, the improved competitiveness of bioethanol versus gasoline, and increasing imports from, predominantly, the United States. For more information about the mandates see our FAS GAIN report: Biofuel Mandates in the EU by Member State and the UK - 2021, published on June 11, 2021.

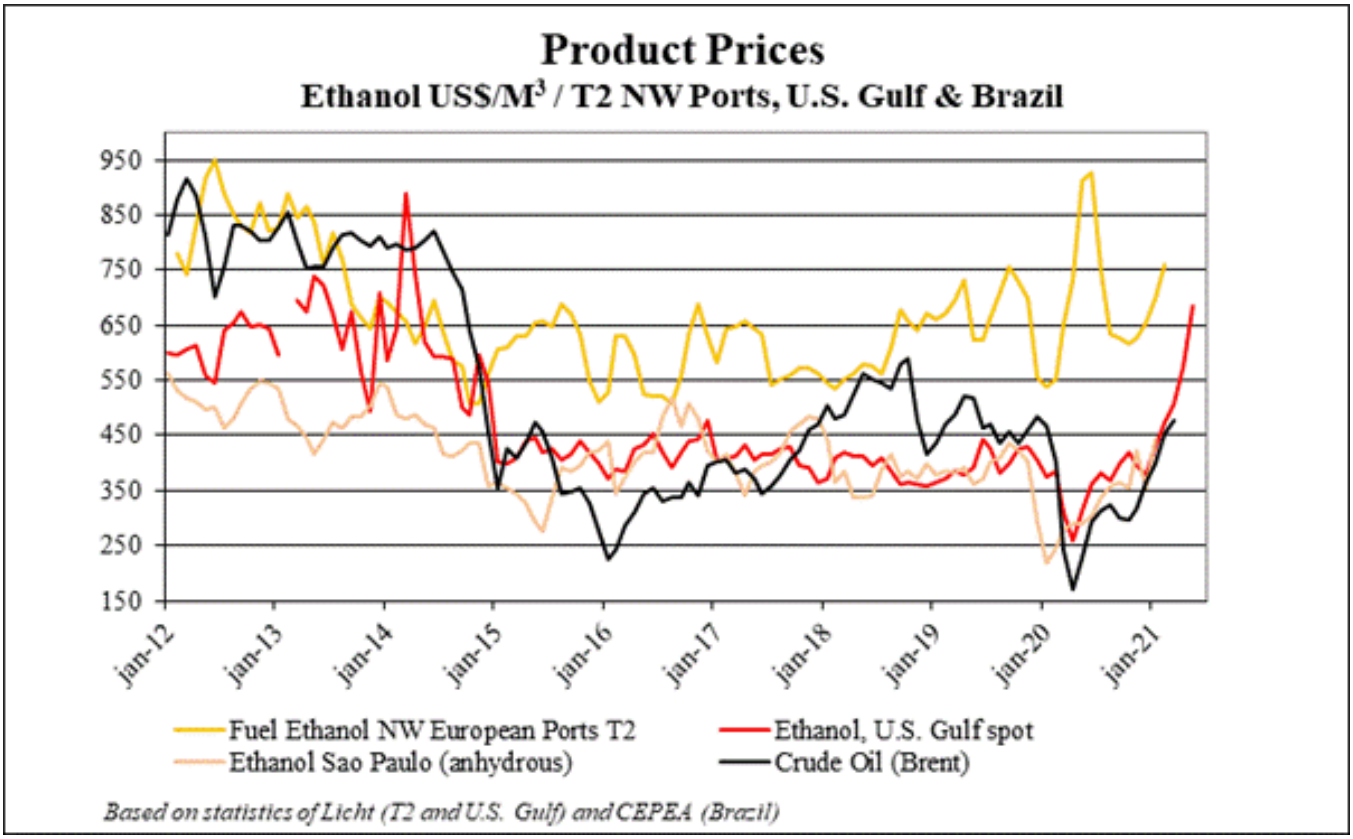
The Impact of the Coronavirus (COVID-19) in 2020.

Due to the COVID-19 outbreak and the resulting lockdowns, EU bioethanol consumption declined by 10.1 percent in 2020 to 5.5 billion liters. This estimate is based on the aggregate of the FAS posts' estimates for each individual EU Member State (MS). In absolute terms, the most significant reductions of bioethanol consumption were expected in the United Kingdom (UK), France, Germany, and Spain.

The Monthly Oil Data Service of the International Energy Agency (IEA) reports a reduction of EU motor gas use by 13.0 percent in 2020. However, bioethanol consumption did not decline equally with motor gas due to MS support measures to reach the national blending mandate of ten percent (for more information see the Policy and Programs chapter). In both the UK and France, the increase of blending mandates partially mitigated the reduction of biofuel consumption relative to fossil fuel consumption. In other MS, the introduction of E10 (the Netherlands, Spain, and Hungary) and further market expansion of E10 (Romania) and E85 (France) supported the domestic use of bioethanol.

During the second quarter of 2020, the greater drop of gasoline prices relative to EU domestic bioethanol prices (T2 NW European Ports) negatively affected the sale of higher ethanol blends such as E10 and E85 (see graph). In Sweden, for instance, the sale of E85 was halved in 2020 -- E85 is often more expensive than gasoline in Sweden as its use is not supported. Furthermore, the sales of new flex-fuel cars reportedly fell. In contrast, in France, consumption of E85 improved significantly in 2020,

supported by an increase in the number of flex-fuel cars. In France it has been possible since December 2017 to turn any vehicle into a flex-fuel vehicle and use E85 by installing a "DriveCleanBox." Another factor which supported bioethanol consumption in some MS was that the blending rate achieved in 2020 will determine the maximum level for food-based biofuels blending until 2030 (see the Policy and Programs chapter). Despite the supporting factors, preliminary fuel statistics indicate that lower gasoline use pressed bioethanol consumption in all top-20 EU Member State markets in 2020.



The Forecast for 2021

To achieve the REDII's goals, each MS has implemented individual national trajectories and measures (see the FAS GAIN report: Biofuel Mandates in the EU by Member State and the UK - 2021, published on June 11, 2021). With the lifting of the COVID-19-related lockdowns, bioethanol consumption in 2021 is forecast to recover to nearly the level achieved in 2019. Consumption is also anticipated to be reinforced by post-2020 (REDII) policy support measures.

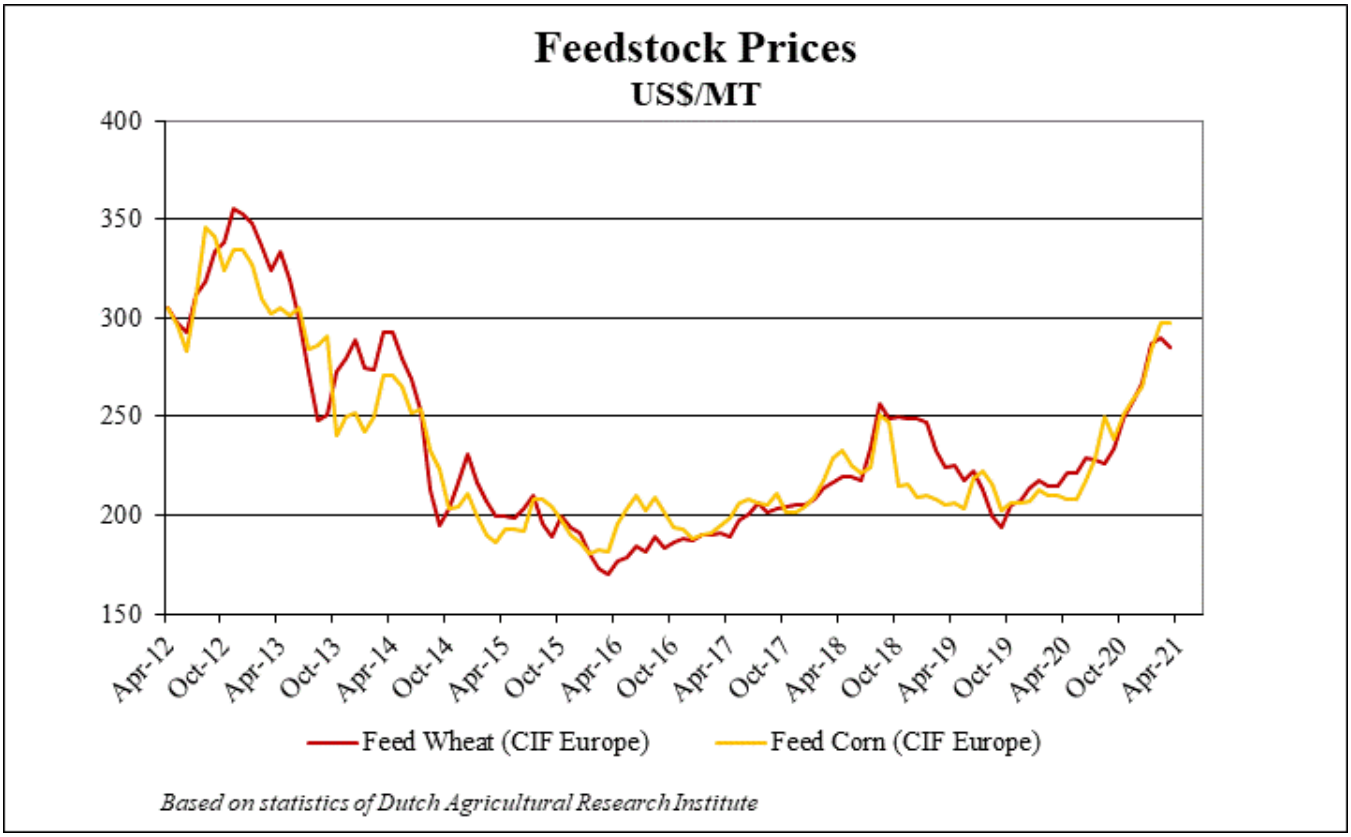
Similar to 2020, increasing mandates (mainly in France, the Netherlands, Belgium, and Poland), and the introduction and further market expansion of higher ethanol blends (in the UK, Sweden, and Finland) will play an important role in the recovery of bioethanol consumption for road vehicle transport. In absolute terms, the most significant recovery is projected in the UK based on the planned introduction of E10 on September 1, 2021. The introduction of E10 in the UK coincides with its introduction in Sweden, which is planned for August of this year. Higher blending in both countries is expected to boost demand during the last quarter of this year. Currently, E10 is available in the following fourteen EU MS: Belgium, Bulgaria, Denmark, Estonia, Finland, France, Germany, Hungary, Latvia, Lithuania,

Luxembourg, the Netherlands, Romania, and Slovakia (source ePURE). In Austria, the introduction of E10 is incorporated in the current government program but has not yet been implemented. Poland is considering introducing E10 in 2022 or 2023.

A further expansion of bioethanol consumption is not expected in 2022 or the following years because the cap on conventional biofuels and increasing minimum level of advanced biofuels which is expected to favor the blending of renewable diesels. Another important factor is increasing e-mobility and declining gasoline consumption. During the 2021 and 2022 crop seasons, high feedstock prices are anticipated to impact the competitiveness of ethanol compared to fossil fuels (see graph and section Feedstock Use and Production of Co-products).

Production & Capacity

After production stabilized from 2014 to 2016, EU bioethanol production expanded in 2017 and 2018, predominantly due to increased domestic consumption. In 2019, however, profit margins for ethanol producers eroded due to increasing feedstock prices (see graph), while producers faced increasing competition from imported U.S ethanol. In 2020, the reduced demand for bioethanol due to the COVID-19 crisis cut EU production by 10.1 percent to 4.7 billion liters. However, elevated imports from third countries led to significant stock building in 2020.



Because demand for bioethanol fell, and the demand for disinfectants increased due to the COVID-19 outbreak, several producers used a portion of their ethanol-for-transport capacity to produce ethanol-for-

disinfectants. The European renewable ethanol producer's association (ePURE) identified fourteen plants in nine EU MS which made the partial switch. According to public information, most plants only allocated one to five percent of their capacity to the production of sanitary ethanol. Based on this information, the elevated production of technical ethanol, at the expense of bioethanol production, is estimated at a few hundred million liters on an annual basis. For this report, the volume is estimated at a minimum level of 100 million liters annually. While increased demand for bioethanol for disinfectants and hand sanitizer has emerged, it is not expected to have compensated for the decline in fuel use in 2020.

Table 3. Fuel Ethanol Production
Main Producers (million liters)

Calendar Year	2014[r]	2015[r]	2016[r]	2017[r]	2018[r]	2019[e]	2020[e]	2021[f]
France	1,018	1,039	987	1,000	1,138	1,299	1,049	1,095
Germany	920	870	882	810	799	676	875	950
Hungary	456	591	633	633	645	689	639	640
Netherlands	519	563	443	532	563	570	538	570
Spain	454	494	328	377	522	547	487	480
Belgium	557	557	570	620	646	620	380	380
Poland	181	214	241	258	259	286	277	285
Austria	230	223	224	235	251	254	241	255
United Kingdom	329	538	658	684	443	190	127	190
Total	5,190	5,165	5,159	5,373	5,497	5,281	4,747	5,000

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

In 2020, bioethanol production fell most significantly in France and Belgium. Both are net exporters of bioethanol, and production suffered from the reduced demand in the domestic market, as well as in export markets (mainly the UK, Sweden, and Finland). In addition, production (particularly in France) was negatively affected by a smaller harvest of sugar beets in 2019 and 2020 as nearly fifty percent of French bioethanol is produced from sugar beets. For more information see the FAS GAIN Sugar Annual, published on April 27, 2021.

In the second half of 2020, high grain prices made it difficult for Belgian and French producers to increase production. In most other MS, production was negatively impacted for only a few months (during the most stringent COVID-19 lockdowns in the Spring of 2020). Among others, bioethanol facilities in Germany, the Netherlands, Spain, and Austria, have managed to partially compensate for the reduction in capacity utilization by delivering ethanol for medical purposes. In Hungary, processing plants have increased their capacities to focus more on starch and non-fuel ethanol products, mostly for chemical use. A notable increase in production was reported in Germany in 2020 as more sugar beet derivatives were available for bioethanol production.

Production is forecast to recover in 2021 with an anticipated increase in demand. However, to what extent production will rebound alongside consumption will depend on the competition from third country imports. Anticipating increased competition from U.S. and Brazilian exports in the expanding UK market, French production is not expected to rebound to production levels achieved in 2019. Additionally, Belgian production is also not expected to return to 2019 levels because of the

expectations of continued high prices for grains. In Germany, production is forecast to improve based on an expected large increase in domestic consumption and an increase in production capacity.

Total EU ethanol production capacity, for fuel, industrial and food uses, is estimated at roughly 10 billion liters in 2021, with nearly 8.2 billion liters of capacity allocated for fuel ethanol (bioethanol). Further expansion of first-generation bioethanol is expected to be limited. Expansion of cellulosic bioethanol production remains constrained due to high costs and a lack of certainty in the EU policy making process (see Policy and Programs and Advanced Biofuels Chapter).

Feedstock Use and Production of Co-products

Bioethanol is mainly produced from grains and sugar beet derivatives in the EU. Wheat is predominantly used in Belgium, Germany, France, and the UK. Additionally, an abundance of corn in Central Europe, particularly in Hungary, supports corn-base ethanol production in that region. Corn is also the preferred grain in the Netherlands, Spain and, to a lesser extent, in the UK. In the Netherlands, Spain and the UK, ethanol plants are located at seaports, and corn is predominantly sourced from the Ukraine. However, in 2021, Spain-based bioethanol industry reports a combination of corn and barley as feedstock in their inland facility. There is an incentive to use non-genetically engineered (non-GE) corn as ethanol producers in northwestern Europe prefer to market their distillers dried grains (DDG) as non-GE for the domestic feed market.

In France, Germany, the UK, the Czech Republic, Belgium, and Austria, sugar beets and their derivatives are also used to produce bioethanol. In France, sugar beets are only processed for bioethanol in sugar beet processing plants that have on-site ethanol distillation capacity. In some other MS, like Austria and Belgium, beet pulp or concentrated juice may serve as a feedstock for ethanol production.

After a large EU grain harvest was realized in 2019, a smaller grain crop was harvested in 2020 due to persistent dry weather conditions. At the same time, the sugar beet crop also declined. For this reason, the feedstock mix has not been significantly changed, except for the use of barley and rye, which were the most competitively priced grains in 2020. This year the grain crop is forecast to recover, but prices are anticipated to remain high. For more information see the FAS GAIN EU Grain and Feed Annual, published on April 21, 2021, the FAS GAIN Sugar Annual, published April 27, 2021, and the latest World Agricultural Supply and Demand Estimates (WASDE).

In the EU, the required cereals volume for 2021 production (5.0 billion liters of bioethanol) is estimated at 11.1 MMT, an increase of nearly 0.5 MMT compared to 2020. This is roughly 3.9 percent of total EU cereal production. Co-products from the bioethanol production process are DDG, wheat gluten, and yeast concentrates. In 2021, the maximum theoretical production level (calculated, using the conversion factors listed at the end of this report) of co-products is forecast to reach 3.5 MMT, an increase of roughly 150,000 MT from 2020. This accounts for 2.1 percent of total EU feed grain consumption.

Trade

On February 23, 2013, the EC imposed an AD duty on ethanol imports from the United States. With the lifting of this duty on May 14, 2019, the remaining factors limiting the export of U.S. bioethanol to the EU are the Most Favored Nation (MFN) import tariffs (€102 per 1,000 liters for denatured ethanol, and

192 euros per 1,000 liters for undenatured ethanol) and the sustainability requirements when fuel ethanol is shipped -- most importantly the required minimum 50 or 60 percent Greenhouse Gas (GHG) emission savings over fossil fuels (depending on when the plant was built). For more information see the Policy and Programs Chapter of this report and the EU Biofuels Annual of 2020.

In 2020, 451 million liters of U.S. non-beverage ethanol, classified under Chapter 22, was shipped to the EU, an increase of nearly ten percent compared to 2019. EU imports of ethanol from Brazil increased significantly from 16 million liters in 2019 to 243 million liters in 2020, of which an estimated 180 million liters was destined for the transport fuel market. In addition, the EU imported an estimated 268 million liters of bioethanol under a zero-duty regime. In 2020, the EU imported roughly 25 million liters of bioethanol as ethyl-tert-butylether (ETBE), almost double the volume imported in 2019. Combined EU bioethanol imports increased steadily -- from roughly 240 million liters in 2017 to nearly 925 million liters in 2020. NOTE: Any "light oils" that may contain ethanol are not included in the balance or trade estimates, but volumes arriving in Europe in this form already blended with gasoline are expected to be small (and would not appreciably affect the balance).

During the first half of 2021, EU ethanol imports stagnated due to high EU stock levels and limited global supply of ethanol. However, in the second half of 2021, EU demand is forecast to recover -- supported by further lifting of the transport lockdowns and the introduction of E10 in the UK and Sweden. The global supply of ethanol will determine to what extent EU producers can benefit from an increase in domestic demand. In 2021, EU imports from the United States are forecast to fall due to the strong domestic market and high corn prices, boosting the price for imported ethanol. Moreover, imports from Brazil are forecast to drop due to lower Brazilian ethanol production in 2021. However, a further rise in ethanol prices could favor cane ethanol over sugar-based ethanol in Brazil. Additionally, increased volumes could be sourced from countries exporting under the zero-duty regime. Overall, EU imports are anticipated to stabilize at roughly 925 million liters.

IV. Biodiesel / Renewable Diesel

Unless otherwise mentioned, the term biodiesel includes traditional biodiesel, fatty acid methyl ester (FAME) and hydrogenation derived renewable diesel or HDRD (previously known as hydrotreated or hydrogenated vegetable oil or HVO). 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 roughly 81 percent of the total transport biofuels market. Biodiesel was the first biofuel developed and used in the EU, adopted by the transportation sector in the 1990s. At the time, rapid expansion was driven by increasing crude oil prices, the *Blair House Agreement*, resulting provisions on the production of oilseeds under Common Agricultural Policy (CAP) set-aside programs, and generous tax incentives, mainly in Germany and France. EU biofuels goals set out in former RED Directive 2003/30/EC (indicative goals) and in the REDII 2009/28/EC (mandatory goals) further pushed the use of biodiesel.

COVID-19 Impact

In 2020, COVID-19 related lockdown measures and increased teleworking resulted in reduced on-road transport and consequently reduced demand for fossil fuels. However, the impact on the demand for biodiesel was much less for 1) diesel and 2) gasoline-ethanol. This is because of a significantly increased blend rate resulting from higher blending mandates across several EU Member States (MS)

combined with the fact that - unlike in other years - excess mandate fulfilment certificates from the previous year were not counted against mandates in 2020. In addition, declines in heavy-duty commercial vehicle use were less severe than declines in light-duty passenger use of diesel, whereas demand for ethanol-gasoline, which is only used in light-duty vehicles, was fully impacted by lockdown measures.

In the early months of 2021, the second and third waves of COVID-19 infections prompted MS to re-install lockdowns, albeit at varying degrees in terms of length and severity of restrictions. The majority of MS started to ease their restrictions in late Spring (May) 2021. Higher vaccination and falling infection rates are expected to result in road transport picking up significantly in the second half of the year. For the full year, biodiesel demand is expected to rebound from 2020 but remain below the pre-COVID-19 level of 2019.

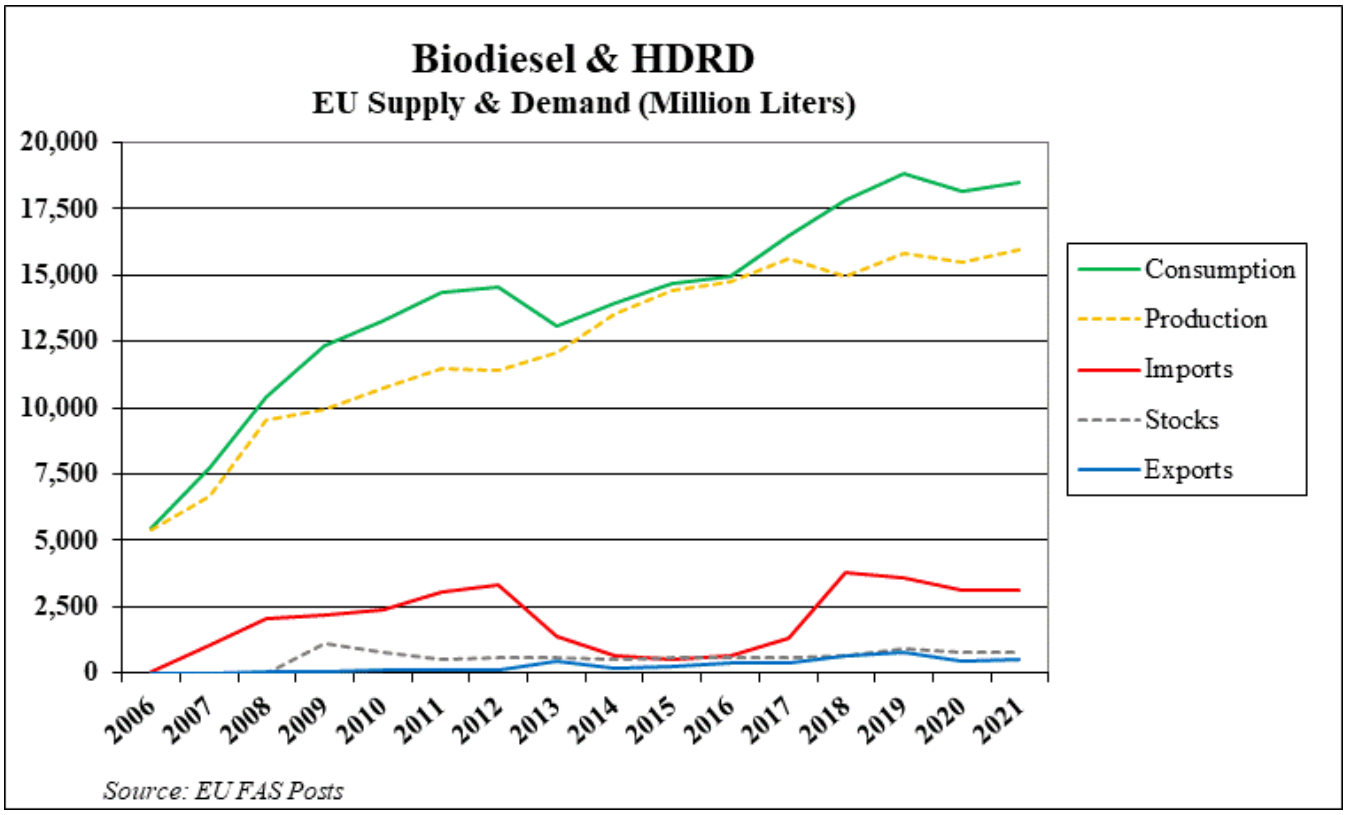
EU Production, Supply and Demand Table

Table 4. Biodiesel & Renewable Diesel (HDRD)
(Million Liters)

Calendar Year	2012	2013	2014	2015	2016[r]	2017[r]	2018[r]	2019[r]	2020[e]	2021[f]
Beginning Stocks	575	580	520	565	590	610	670	930	750	730
Production	11,382	12,064	13,549	14,397	14,728	15,622	14,946	15,781	15,534	16,110
>HDRD Production	960	1,604	2,311	2,470	2,190	2,582	2,705	2,938	3,610	3,780
Imports	3,294	1,392	631	540	629	1,332	3,781	3,613	3,106	3,100
Exports	115	416	181	244	408	372	645	759	465	530
Consumption	14,556	13,100	13,954	14,668	14,929	16,522	17,822	18,815	18,195	18,660
Ending Stocks	580	520	565	590	610	670	930	750	730	750
Production Capacity, Biodiesel (Million Liters)										
Number of Biorefineries	284	244	220	201	196	187	186	186	187	187
Nameplate Capacity	25,490	25,025	22,830	21,930	21,520	20,124	21,030	21,130	21,230	21,230
Capacity Use	40.9%	41.8%	49.2%	54.4%	58.3%	64.8%	58.2%	60.8%	56.2%	58.1%
Production Capacity, Renewable Diesel (HDRD) (Million Liters)										
Number of Biorefineries	4	5	10	11	11	13	14	15	15	15
Nameplate Capacity	1,695	1,830	2,830	3,395	3,395	3,606	3,610	5,210	5,210	5,280
Capacity Use	56.6%	87.7%	81.7%	72.8%	64.5%	71.6%	74.9%	56.4%	69.3%	71.6%
Feedstock Use for Biodiesel + Renewable Diesel (HDRD) (1,000 MT)										
Rapeseed oil	6,500	5,710	6,100	6,350	6,700	6,800	6,000	6,000	5,500	5,800
UCO	800	1,150	1,890	2,400	2,644	2,700	2,800	3,150	3,300	3,400
Palm oil	1,535	2,340	2,200	2,340	2,300	2,800	2,500	2,650	2,650	2,630
Animal fats	360	420	900	1,030	730	710	870	900	1,150	1,150
Soybean oil	720	870	840	540	630	700	900	1,000	1,000	950
Sunflower oil	300	290	310	210	255	246	247	265	245	230
Other	220	335	370	559	444	564	627	768	662	675
Biodiesel + Renewable Diesel (HDRD) Use Compared to Fuel Pool Demand 1/ (Million Liters)										

Biodiesel+HDRD, on road /2	13,974	12,633	13,789	13,417	13,245	14,157	16,180	17,213	16,500	16,900
Biodiesel+HDRD, on/off-road use	14,556	13,100	13,954	14,668	14,929	16,522	17,822	18,815	18,195	18,660
Diesel Pool, on/off-road /3	232,120	233,698	238,779	243,908	250,321	256,628	259,111	256,216	232,065	244,084
Diesel Pool, total /4	329,811	328,260	326,409	338,886	344,136	349,697	348,507	348,712	319,191	338,862
Jet Fuels/Kerosene /5	67,424	67,602	67,963	69,678	72,221	76,826	79,592	81,002	39,344	46,929

Sources/Notes: r = revised / e = estimate / f = forecast EU FAS Posts.
1/ Fuel pools are defined as fossil fuels plus all "bio-components" (biofuels).
2/ Covers on road transport only. Source: 2012-2019: Eurostat, 2020+2021: FAS Post
3/ All on/off-road transport incl. construction & agriculture; excludes rail, heavy marine diesels & stationary power. Source: Diesel use International Energy Agency (IEA.)
4/ Covers all on/off-road uses as defined above plus rail & heavy marine diesels and stationary power. Source: IEA.
5/ Covers all private-commercial-military kerosene-type jet fuels (fossil and bio-based, both Jet A-1 and naphtha-kerosene blend Jet B) + other fuel applications. Source: IEA.
Original biodiesel/HDRD data collected in MT, then converted to liters using a conversion rate of 1 MT = 1,136 liters for biodiesel; 1,282 liters for HDRD. Production capacity as of December 31 of year stated. Trade data: Trade Data Monitor (TDM); HDRD trade is assumed to be happening under a variety of customs code as no separate trade code for HDRD exists and may be underreported. Feedstock use: Data is not available. The figures above represent estimates by EU FAS posts. The category "other" includes but is not limited to pine oil, tall oil, tall oil pitch, palm fatty acids, and free fatty acids. Beginning/ending stocks: In the absence of reliable data and except for 2017 and 2018, data for stocks assumes that average stocks amount to the equivalent of two weeks' supply of consumption.



Consumption

Biodiesel (FAME and HDRD) consumption[1] is driven almost exclusively by EU and MS mandates and, to a lesser extent, by tax incentives. In 2020, a six percent GHG reduction mandate became applicable for all fuel suppliers in the EU (see Policy and Programs chapter). This favors the use of FAME with high GHG reduction values and HDRD, especially in those countries that are already close to the seven percent volumetric blending limit for FAME (stipulated in the FQD[2]). This, and the use of double counting feedstocks/biofuels, limits the effect of increasing mandates on physical blending volumes as less biofuel is needed to fulfil the mandate. As a result, actual physical blend rates remain quite a bit lower than the nominal mandates stipulated in EU and MS legislation.

In 2021, higher mandates compared to 2020 are applicable in Italy, the Netherlands, Poland, Portugal, Slovakia, Spain, and the United Kingdom (UK). In all other countries the mandates remain the same as in 2020. For more information about the mandates see our FAS GAIN report: Biofuel Mandates in the EU by Member State and the UK - 2021, published on June 11, 2021. In 2021, EU biodiesel consumption is expected to rebound from the COVID-19 induced dip and increase by 2.6 percent (but remain below the 2019 consumption level). The increase is prompted by economic recovery and/or higher mandates. Increased biodiesel consumption is expected in Belgium, the UK, France, Ireland, the Netherlands, Bulgaria, Denmark, Poland, Slovakia, the Czech Republic, Austria, Romania, Lithuania, Greece, and Slovenia. In contrast, consumption is forecast to decline in Germany, Hungary, and Portugal. In Germany, the decline is a combination of the re-instated option to use excess GHG reduction certificates from the previous year and the increased use of biodiesel/HDRD with higher GHG reduction values. The latter reduces the physical volumes of biofuel needed to fulfil the mandate. In Hungary, the decline is mainly a result of higher fuel prices. In the case of Portugal, it relates to the extensive use of double counting feedstocks.

In 2020, EU biodiesel consumption is estimated to have decreased by 3.5 percent because of COVID-19 induced movement restrictions, economic recession, and resulting reductions in diesel use. However, the decline in biodiesel use was lower than the decline in diesel use as recorded by the IEA (minus 9.4 percent) since increasing blending mandates partially compensated for the COVID-19 effect. In some countries the increase in blending mandates even outweighed the effect of movement restrictions. This was the case in Germany, the Czech Republic, Hungary, Finland, Slovakia, the Netherlands, and Greece (by order of magnitude.)

The top five consumers of biodiesel in the EU in 2020 were Germany, France, Sweden, Spain, and the UK. Together they accounted for 64 percent of the total EU biodiesel consumption (see table). For consumption developments prior to 2020 please consult page 27 of our Biofuels Annual of 2019.

[1] For some MS (e.g. Bulgaria, Germany, Romania) the consumption number given in this report refers strictly to on-road transport while for other MS (e.g. Austria, Belgium, Italy) it includes on/off-road transport (including rail/agriculture/aviation.)

[2] Annex II of the FQD limits the volumetric FAME content in diesel fuel to seven percent. Higher percentages are possible but only if the resulting fuel is labelled accordingly.

Table 5. EU Biodiesel/HDRD Consumption Main Consumers (million Liters)										
Calendar Year	**2012**	**2013**	**2014**	**2015[r]**	**2016[r]**	**2017[r]**	**2018[r]**	**2019[r]**	**2020[e]**	**2021[f]**
Germany	2,874	2,581	2,752	2,483	2,498	2,522	2,669	2,779	3,518	3,500
France	2,653	2,658	2,931	3,254	3,267	3,276	3,208	3,301	3,200	3,260
Sweden	415	569	568	720	1,613	1,922	2,342	1,744	1,596	1,690
Spain	2,563	941	1,036	1,091	1,293	1,546	1,979	2,275	1,900	1,920
UK	493	863	839	736	724	750	1,100	1,677	1,430	1,500
Italy	1,598	1,447	1,269	1,581	1,095	1,451	1,212	1,257	1,136	1,140
Poland	837	843	730	795	909	954	966	1,000	966	980
Netherlands	270	250	317	229	175	261	487	613	619	650
Austria	567	575	708	710	641	572	529	578	506	510
Finland	131	195	469	475	119	391	354	427	454	480
Czech R.	275	259	342	344	308	345	316	359	412	420
Belgium	354	364	375	436	452	573	650	600	310	400
Romania	181	153	172	190	268	278	254	386	384	390
Portugal	359	336	391	404	337	358	387	374	349	340
Hungary	77	86	98	169	178	159	187	231	283	270
Others	911	2,064	957	1,050	1,051	1,163	1,181	1,214	1,133	1,210
Total	**14,556**	**13,100**	**13,954**	**14,668**	**14,929**	**16,522**	**17,822**	**18,815**	**18,195**	**18,660**

r = revised / e = estimate / f = forecast EU FAS Posts. Source: FAS EU Posts based on information collected in MT, then converted to liters using a conversion rate of 1 MT = 1,136 liters for biodiesel and 1,282 liters for HDRD.

Production and Production Capacity

In 2020, EU biodiesel production declined by two percent compared to 2019, largely due to lower domestic consumption and lower demand from the world market. However, this masks different developments for FAME and HDRD. FAME production declined by seven percent while HDRD production grew by 23 percent, notably in France and Italy, where new plants that entered commercial production mid-year 2019 produced year-round for the first time.

For 2021, production is forecast to increase by 3.7 percent prompted by increased consumption and exports. On a percentage basis, the expansion for HDRD production (plus 4.7 percent) is forecast to show a higher increase than the rebound of FAME production (plus 3.4 percent;) -- in absolute terms, the production increase for FAME exceeds that for HDRD. However, should the European rapeseed harvest remain below expectations and feedstock prices continue their rally in the second half of the year, it could be possible that EU biodiesel production will be lower than forecast. In this case demand would be met with higher imports.

Table 6. EU FAME Main Producers (Million Liters)										
Calendar Year	**2012**	**2013**	**2014**	**2015**	**2016r**	**2017r**	**2018r**	**2019r**	**2020e**	**2021f**
Germany	3,106	3,307	3,808	3,505	3,543	3,644	3,799	4,070	3,862	4,100
France	2,175	2,170	2,386	2,866	3,152	3,135	2,806	2,556	2,045	2,045
Spain	538	659	1,017	1,103	1,319	1,721	2,008	1,835	1,550	1,450
Netherlands	974	790	1,056	795	638	1,112	1,010	1,081	1,102	1,100
Poland	673	736	786	861	985	1,019	1,001	1,091	1,081	1,090
Italy	326	521	452	625	398	599	511	616	616	620
UK	352	640	554	572	496	490	500	620	550	570
Other	1,214	1,638	1,179	1,600	2,007	1,320	606	974	1118	1,335
Total	**10,422**	**10,460**	**11,238**	**11,927**	**12,538**	**13,040**	**12,241**	**12,843**	**11,924**	**12,330**

Ranked by production in 2021, r = revised / e = estimate / f = forecast. Source: FAS EU Posts based on information in MT and converted to liters using a conversion rate of 1 MT = 1136 liters.

Table 7. EU HDRD Production (Million Liters)										
Calendar Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018r**	**2019r**	**2020e**	**2021f**
Netherlands	410	872	1,013	1,192	1,154	1,218	1,218	1,218	1,218	1,220
Italy	-	-	323	323	323	323	323	397	910	910
France	-	-	-	-	-	-	128	150	385	500
Spain	73	179	377	262	418	465	482	549	480	460
Finland	317	392	438	533	135	383	354	424	423	420
Sweden	160	160	160	160	160	160	160	160	160	230
Portugal	-	-	-	-	-	32	37	37	32	32
Czech Republic	-	-	-	-	-	-	3	3	3	3
Total	**960**	**1,604**	**2,311**	**2,470**	**2,190**	**2,582**	**2,705**	**2,938**	**3,610**	**3,780**

Ranked by production in 2021 e = estimate / f = forecast. Source: FAS EU Posts based on information in MT, converted to liters (conversion rate of 1 MT = 1282 liters).

The structure of the EU biodiesel sector is quite diverse. Plant sizes range from an annual capacity of 2.3 million liters owned by a group of farmers to 680 million liters owned by a large multi-national company. Biodiesel (FAME) production facilities exist in every EU MS, except for Finland, Luxembourg, Croatia, and Malta. In contrast, HDRD production is concentrated in only eight countries (see table above). The majority of HDRD capacity consists of dedicated HDRD plants, while in Spain and Portugal HDRD is co-processed with conventional fuel in oil refineries.

EU FAME production capacity increased by 0.5 percent in 2020 due to expansions in Poland and Greece, but is expected to remain flat in 2021. However, numerous plants throughout the EU are operating below capacity or are temporarily shut down due to negative market conditions, already present before the COVID-19 crisis. After a large increase in 2019, EU HDRD production capacity remained flat in 2020. In 2021, EU HDRD is projected to increase by 1.3 percent due to an expansion of the plant in Sweden.

Feedstock Use and Co-products Production

Rapeseed oil is still the dominant biodiesel feedstock in the EU, accounting for 38 percent of total feedstock use in 2020. The popularity of rapeseed oil is grounded in its domestic availability as well as in the higher winter stability of the resulting rapeseed methyl ester (RME) compared to other feedstocks. This is more important in the northern MS than for those situated in Mediterranean region with warmer winters. However, rapeseed oil's share in the feedstock mix has continuously decreased since its peak in 2008, when it accounted for 72 percent. This is partly due to a higher use of recycled vegetable oil (such as used cooking oil, UCO) and palm oil.

In addition, the prohibition on the use of three insecticides of the neonicotinoid class (i.e., clothianidin, imidacloprid and thiametoxam) and three years with insufficient precipitation took its toll on EU rapeseed production and increased prices for rapeseed and rapeseed oil. Consequently, EU RME had difficulties competing with cheaper imported soybean oil methyl ester (SME) and palm oil methyl ester (PME). This development continued during the first five months of 2021 when rapeseed oil prices reached new record highs. According to AMI[3], rapeseed oil prices fob Germany reached 1,213 Euro/MT in May 2021 compared to 736 Euro/MT in May 2020. Nevertheless, for the full calendar year of 2021, the use of this feedstock is expected to rebound, partially because of higher biodiesel production. In addition, the forecasted higher production of rapeseed in 2021 is expected to lead to lower rapeseed oil prices in the second half of the year, which will make this feedstock more attractive.

UCO was the second most important feedstock in 2020, accounting for 23 percent of the total feedstock. The increased use of this feedstock is driven by the eligibility of the derived UCO-Methyl Ester (UCOME) for double-counting in the majority of MS and the fact that its fatty acid composition is better suited for HDRD production than that of rapeseed oil. In 2020, a growing share of UCO had to be imported. Throughout the EU, UCO collection dwindled during the COVID-19 lockdowns as many MS ordered restaurants to temporarily close down or restrict their services to take-away and delivery. While this phenomenon also occurred in other parts of the world, it did so at different times of the year, which made imports possible during times of low domestic supply. According to TDM, the EU's UCO imports were 20 percent higher in 2020 (1.7 MMT) than in 2019 (1.4 MMT); with Malaysia, China, the United States, Russia, and Indonesia being the largest suppliers. Of these five origins, only the United States shipped less UCO in 2020 than in 2019. In 2020, the largest EU producers of UCOME were the Netherlands, Germany, the United Kingdom, Italy, Spain, Portugal, and Austria. Together they accounted for 91 percent of this feedstock use. Smaller amounts of UCOME were produced in France, Poland, Ireland, Bulgaria, the Czech Republic, and Hungary. In 2021, the use of UCO is forecast to increase by another three percent and to include a higher share of domestically collected UCO.

Palm oil was third in terms of feedstock use in 2020 (18 percent). Palm oil was mainly used in Spain, Italy, France, and the Netherlands, and to a much lesser extent in Belgium, Finland, Germany, and Portugal. Negligible amounts are also used in Romania, Greece, and Poland. In 2021, expensively-priced palm oil use is forecast to marginally decline, due to expected lower HDRD production in Spain in response to exceptionally high palm oil prices. In the future, palm oil use will be affected by the phase-out of biofuels deriving from high-risk ILUC crops (see the Policy and Programs chapter of this report). According to the REDII and EU Delegated Act 2019/807 the use of high-risk ILUC biofuels is

[3] Agrar Markt Informiert (AMI) UFOP :: Chart of the Week

capped at the 2019 level until 2023 and then phased out by 2030. Several MS have announced earlier phase-outs. France spearheaded this movement and excluded palm oil-based biofuels effectively since January 2020. Austria, Belgium, and Germany will follow in July 2021, January 2022, and January 2023, respectively. However, the bans only affect the eligibility for counting against mandates (i.e. consumption) and not production. Therefore, palm oil based HDRD/PME can still be produced in countries with a ban but will have to be exported. As a result, the effect on the EU feedstock mix will only be felt when more countries apply such bans.

Animal fats accounted for eight percent of total biofuel feedstocks. It benefitted less from double-counting than UCO, as there are fewer MS that allow double-counting for animal fat (Denmark, Finland, France, the Netherlands, and the United Kingdom) than for UCO. In addition, in Germany, Tallow Methyl Ester (TME) use does not count against the biofuel mandate and its production is exported to other MS. Increased animal fat use is the result of new plants (or capacity increases at existing plants) rather than a function of feedstock prices, as using animal fat requires changes to the technical equipment. In 2020, Italy was by far the largest user of animal fat for biodiesel production, followed by the Netherlands and France. Finland, Germany, Denmark, the Czech Republic, Spain, the UK, Austria, Ireland, Hungary, and Poland also used animal fats but to a much lesser extent.

The use of **soybean oil** and palm oil in conventional biodiesel is limited by the EU biodiesel standard DIN EN 14214 and colder weather conditions. SME does not comply with the iodine value prescribed by this standard (the iodine value functions as a measure for oxidation stability). Additionally, PME has a higher cloud point than RME and SME and does not provide enough winter stability in northern Europe. However, the incentive persists to maximize the use of SME and PME due to their lower cost. The standard can be met by using a feedstock mix of rapeseed oil, soybean oil, and palm oil. Most of the soybean oil is used in Spain, followed by Germany and the Netherlands. Smaller amounts are being used in France, Belgium, Italy, Portugal, Bulgaria, Romania, Austria, and Greece.

Sunflower oil accounted for only two percent of the total biodiesel feedstock, and is mainly used in Greece, France, and Bulgaria -- collectively accounting for 63 percent of EU sunflower oil-based biodiesel production. Small amounts of sunflower oil are also being used in Hungary, Romania, Lithuania, and Poland.

The category "**other**" includes pine oil and wood (Sweden), free fatty acids (Germany and Finland), tall oil (Finland), palm fatty acids (Finland), and cottonseed oil (Greece.)

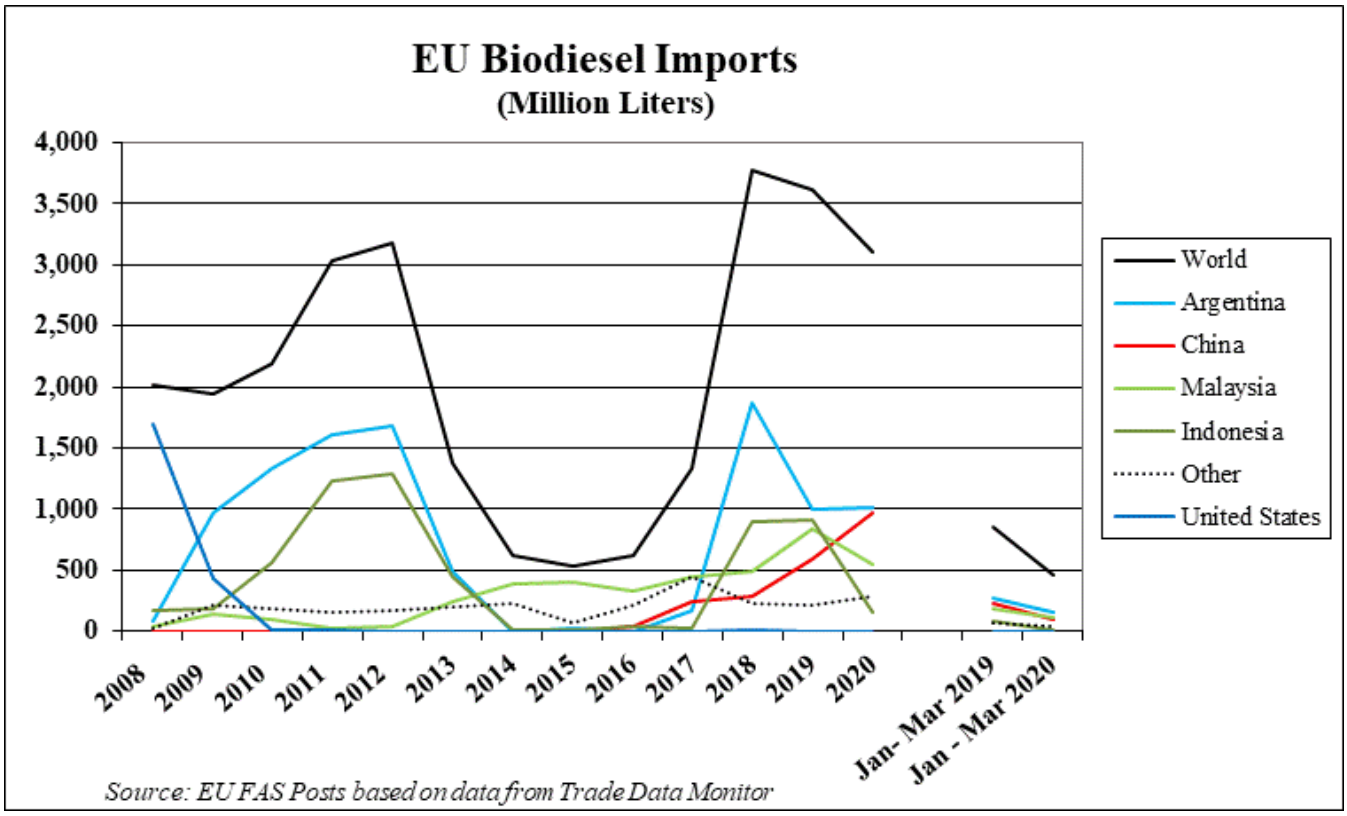
Origin of feedstocks and by-products generated

A large share of EU soybean oil is crushed from imported soybeans. In contrast, most of the rapeseed oil is of domestic origin. The 2021 projection of 5.8 MMT of rapeseed oil used in RME is equivalent to about 14.5 MMT of rapeseed. This also generates roughly 8.7 MMT of rapeseed meal as a byproduct, most of which is used for animal feed. Similarly, the 950,000 MT soybean oil will be crushed from 4.75 MMT of soybeans and generate about 3.8 MMT soybean meal (see also FAS EU Oilseeds Annual).

Trade

Currently, EU Customs combines HDRD with other products under a single 10-digit code, and therefore exact HDRD trade volumes remain difficult to determine. It is reported by the trade that HDRD is traded under CN 27.10.19, but it is not clear which 10-digit code is used. China's HDRD industry, mainly using UCO feedstock, reportedly first shipped product to the EU in 2017 and continues to ship. Although targeting mostly North American markets, Singapore's HDRD plant (built and operated by the Finnish company Neste) now undergoing expansion to include sustainable aviation fuel (SAF) production has reportedly also shipped limited HDRD to Europe. The trade flow discussed below is limited to biodiesel codes 38.26.00 and 27.10.20 converted to a B100 equivalent and should not include HDRD when classified elsewhere.

In 2020, EU imports of biodiesel decreased by 14 percent compared to 2019. Despite the EU imposing CV duties on biodiesel from Argentina in February 2019, Argentina was able to defend its place as the largest supplier of biodiesel to the EU. This was possible as Argentina offered an undertaking (an offer to prevent prices from falling below a certain floor price, see also see Policy and Programs chapter), which provided planning certainty for Argentine exporters and EU importers.



In 2020, the dominant suppliers of biodiesel to the EU were Argentina, China, Malaysia, Indonesia, and South Korea, accounting for 33, 31, 18, five, and four percent of EU biodiesel imports, respectively.

Imports from China increased by 60 percent compared to 2019, all of which is UCOME (possibly some PME) while imports from South Korea quadrupled.

In 2021, EU biodiesel imports are forecast to remain flat. Trade data for the first three months of 2021 show a decline in imports. However, one needs to keep in mind that the comparable period in 2020 was largely unaffected by COVID-19 restrictions as these were first implemented at the end of March 2020. It is expected that imports will increase during the remainder of the year, when COVID-19 restrictions are lifted, and biodiesel demand picks up. Imports could even be higher than forecast, if high feedstock prices in the EU persist beyond the local rapeseed harvest and negatively impact the EU produced biodiesel's competitiveness. EU biodiesel exports to destinations outside the bloc remain marginal and normally amount to less than five percent of production (and are thus not discussed in this report).

Stocks

In the absence of reliable data, the data for stocks is based on the assumption that average stocks are equivalent of two weeks' supply of consumption. However, after the lifting of AD duties on biodiesel from Argentina, and in anticipation of the outcome of EU anti-subsidy proceedings against Argentina, European traders and petroleum companies accumulated large stocks at the end of 2018. These are assumed to have been reduced throughout 2019 and, by the end of the year, returned to the assumed average level.

V. Advanced Biofuels

The EU's RED, extended under RED II, establishes an overall policy for the production and promotion of energy using "advanced" biofuels in the EU. As lower carbon emission biofuels replace higher carbon emission fossil fuels (based on full life-cycle analysis) in the transportation sector, EU policy is structured to limit further expansion of "conventional" biofuels and incentivize expanding use of "advanced" biofuels. This is because advanced biofuels (as defined) are less likely to result in land use change and may use waste-stream feedstocks or feedstocks that don't require any land use. Please refer to the Policy and Programs chapter of this report for more information.

HDRD, also known originally as hydrotreated or hydrogenated vegetable oil (HVO), is a drop-in fuel that can fully replace fossil diesel, and, with some modification, can be used as jet fuel. It is therefore treated as an advanced biofuel in this report, but would only be considered advanced under EU policy when made with qualifying waste-stream feedstocks.

The Second Renewable Energy Directive (RED II) and Advanced Biofuels

On June 14, 2018, the EC, EU Council, and Parliament negotiators forged a political agreement on the new RED. The RED II adopted the seven percent cap for conventional biofuels put forward in the Council Proposal and set a climbing target for advanced biofuels produced from agricultural and forestry by-products (Part A of Annex IX) of 0.2 percent in 2022 to 3.5 percent in 2030. As a result of double counting, the blending rate of 3.5 percent translates into a physical minimum blending rate of 1.75 in all transport fuels in 2030. The RED II set a limit of 1.7 percent for biofuels produced with waste fats and oils (Part B of Annex IX) but Member States (MS) can modify this limit if justified by considering the

availability of the feedstock. The EC is able to add feedstocks listed in Part A and B of Annex IX but cannot remove them. For more information about the policy related to advanced biofuels see the Policy and Programs chapter of this report.

Some EU MS plan to achieve higher blending rates of advanced biofuels than required by the REDII. In February 2019, Finnish Parliament approved a law that mandates an advanced biofuel share of two percent in 2023, increasing to ten percent in 2030. The Netherlands intends to impose a mandate of 3.5 percent blending of advanced biofuels (produced from feedstocks listed in Part A of Annex IX) in 2025 and seven percent in 2030. In the two main fuel markets in the EU (Germany and France), the mandates for advanced biofuels are more conservative. In Germany, legislative procedure is under way to raise the established advanced biofuels targets (0.1 percent in 2021, 0.2 percent in 2023, and 0.5 percent in 2025.) If finalized, the new targets would gradually increase to 2.6 percent in 2030. In France, the blending objective of advanced biofuels is 3.8 percent in gasoline and 2.8 percent diesel by 2028 (including double counting). For more information about the mandates see our FAS GAIN report: Biofuel Mandates in the EU by Member State and the UK - 2021, published on June 11, 2021.

The bioeconomy is one of the key research areas of the EU. The Bioeconomy Strategy and the Bioeconomy Action Plan, both published in October 2018, contribute to the Green Deal. For more information see the Bioeconomy research and innovation website of the EC. In July 2014, the Bio-Based Industries Joint Undertaking (BBI-JU) was launched. The BBI-JU is a €3.7 billion Public-Private Partnership between the EC and the Bio-based Industries Consortium (BIC). 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 biorefineries. Examples of projects funded by the Bio-Based Industries Joint Undertaking (BBI-JU) include:

- The LIGNOFLAG project aims to build and operate a commercial flagship production plant for biochemical lignocellulose conversion to cellulosic ethanol with a yearly production capacity of up to 75 million liters. The companies are in Germany, Hungary and Austria. The project started in June 2017 and will run for 5 years. The overall budget is €35.0 million with a €24.7 million contribution from the EC.
- Another example is the project OPTISOCHEM where two companies cooperate to produce cellulosic bio-isobutene from straw. The bio-isobutene can be used as renewable feedstock to produce a wide range of chemicals such as biofuels, adhesives, and flavors. The project is conducted in a pilot plant in France and in Germany. The project started in June 2017 and was granted €9.8 million by the BBI-JU as part of the EU's R&D Horizon 2020 program.

On February 23, 2021, the EC has agreed on the successor of BBI JU: the Circular Bio-based Europe Joint Undertaking (CBE JU). The new partnership aims to build on the BBI JU and the BIC and contribute to the EU's climate targets, in line with the European Green Deal. The European Parliament and Council will now study the proposal before adopting its final version towards the end of 2021.

Commercial Production of Advanced Biofuels

Since 2012, the production of HDRD has taken off in the EU. HDRD can be produced from waste oils and fats and can be fully substituted for diesel. In 2020, HDRD production rose more than twenty

percent, to roughly 3.6 billion liters, mainly due to production expansion in Italy and France. In 2021, HDRD production is forecast to increase to roughly 3.8 billion liters based on additional production expansion in France and new capacity in Sweden. HDRD consumption in road transport was not hit by the COVID-19 crisis, but increased because of the waste-based double-counting content of HDRD fuels and the superior technological properties by which full substation of fossil diesels can be achieved. In addition, because of lower demand from the aviation sector, higher volumes of HDRD were available for use in road transport.

The commercialization of cellulosic ethanol is lagging behind the development of HDRD. The main factors that prevent operators from investing in cellulosic biofuels are high research and production costs and regulatory uncertainty. It is anticipated that the EU capacity for cellulosic ethanol production could possibly reach nearly 200 million liters in 2021. However, considering the novelty of the technology, the actual production is not expected to be more than 50 million liters. Production of advanced ethanol from non-cellulosic waste materials listed in Part A of Annex IX of the REDII, such as food waste, is estimated at 240 million liters in 2019 by ePURE.

The table below outlines the operational or close to operational advanced biofuel plants, at a commercial scale, in the EU.

Table 8. Advanced Biofuels Plants in the EU

Country	Biofuel	Feedstock	*Capacity* (million liters per year)	Year of opening
Finland	HDRD	Oils and fats	430 (2 lines)	2007
The Netherlands	Methanol	Biogas	75	2010
Spain	HDRD	Palm oil	945 (7 plants)	2011
The Netherlands	HDRD	Oils and fats	1,280	2011
Italy	HDRD	Vegetable oils, animal fats, UCO, and algae extracts	465 (770 in 2020)	2014
Finland	HDRD	Tall oil	115	2015
Sweden	HDRD	Tall oil	220	2015
Portugal	HDRD	Palm oil	50	2017
Finland	Ethanol	Saw dust	10	2018
Germany	Bio-CNG	Straw	-	2018
France	HDRD	Oils and fats (50 percent palm oil)	640	2019
Italy	HDRD	Vegetable oils, animal fats, UCO, and algae extracts	965	2019
Sweden	Methanol	Pulp mill side-streams	6	2020
Italy	Ethanol	Biomass	28[S]	2020
Austria	Ethanol	Wood sugar	30	2020
Romania	Ethanol	Wheat Straw	65	2021

Bulgaria	Ethanol	Corn Stover	50	2021

Source: EU FAS Posts HDRD = hydrogenation derived renewable diesel (also known originally as hydrotreated or hydrogenated vegetable oil or HVO, a unknown portion is Sustainable Aviation Fuel), S=for sanitary use

Hydrogenation Derived Renewable Diesel and Pyrolysis Oil)

- *Finland and the Netherlands*: In Finland, Neste operates one plant with two lines of roughly 215 million liters each. In 2011, Neste opened a renewable diesel plant with an annual capacity of 910 million liters in Rotterdam. In addition to drop-in biofuels, the Neste plants produce renewable naphtha, propane, and alkanes. Current annual production capacity at the plant in Rotterdam is a maximum of 1.28 billion liters. Neste is planning to build another plant in the port of Rotterdam with a capacity of roughly 2 billion liters. In 2019 and 2020, roughly 85 percent of the feedstock used by Neste to produce HDRD consisted of waste fats and oils. The waste and residues consist of UCO, palm fatty acid distillate (PFAD), bleaching earth oil, technical corn oil, and animal fats. On November 3, 2020, Neste announced that it would acquire Bunge's Loders Croklaan's palm oil refinery plant in Rotterdam. Netste's goal is to reach a 100 percent waste and residues share by 2025.
- *Finland*: In 2015, UPM opened a HDRD plant in Lappeenranta. The capacity of the plant is roughly 115 million liters of advanced biofuels per year, and the plant is using tall oil, a residue of pulp production, as a feedstock. The company is studying the opening of another plant in Kotka or Rotterdam with a capacity of roughly 550 million liters of advanced biofuels (including jet fuel) and biomaterials. The targeted feedstocks are forest by-products. The plant will supply biofuels to the road, marine, and aviation transport sectors.
- *Finland:* Green Fuel Nordic Oy partnered with a Dutch company, BTG, to produce 25 million liters of pyrolysis oil at its plant in Lieksa. The first delivery of bio-heating oil was conducted in December 2020. Other companies which are planning to erect advanced biofuel plants in Finland are: Nordfuel, BioEnergo, and Fintoil. Nordfuel is planning to build a biorefinery producing annually 80 million liters ethanol from wood. BioEnergo is planning to build a similar plant with an annual capacity of approximately 60 million liters. Fintoil is building a crude tall oil refinery with a capacity of 200,000 MT (as feedstock for roughly 100 million liters of renewable diesel), which is planned to become operational in the summer of 2022.
- *Spain*: CEPSA (since July 2011) and REPSOL (since 2013) are producing HDRD. For more information see GAIN Report – Spain's Biodiesel and Renewable Diesel Overview.
- *Italy*: In 2014, an HDRD plant was opened by Eni in Venice, Italy. Since then, the plant has produced approximately 325 million liters per year. Production is forecast to increase to 540 million liters in 2024 as a result of additional upgrades. The feedstock will include an increasing proportion of used oils, animal fats, and by-products from palm oil production. Following the model adopted for Venice, Eni converted a Gela refinery in Sicily into a renewable diesel production facility (to produce 770 million liters per year). The reconversion started in April 2016 and the facility opened in August 2019. In 2020, the plant produced about 585 million liters.
- *Sweden*: In Gothenburg, Preem produces nearly 160 million liters of HDRD per year from tall oil. The company recently expanded its production capacity to 220 million liters. Preem sources a variety of raw materials, including raw tall oil diesel from SunPine, and food waste including UCO. The company is reportedly planning to further expand to 1.3 billion liters in 2023, and 5 million liters in 2030. To achieve this, a plant of 950 million liters is expected to become

operational in 2024 in Lysekil. The company is currently investigating the use and sourcing of other raw materials.

- *Sweden*: The Finnish company, St1 plans to produce up to 250 million liters of HDRD and jet fuel in Gothenburg, Sweden, beginning in 2023. The feedstocks will likely be UCO and tall oil. St1 is also investigating the construction of another plant with a capacity of 500 million liters of biofuels per year, beginning operations in roughly five years. One of the raw materials which will be used by Preem and St1 for their expanded production is biocrude oil made from tall oil. To increase the supply of biocrude oil, SunPine is increased its capacity from about 100 million liters to 150 million liters in 2021. Pyrocell, owned by Preem and Setra, is constructing a plant to produce nearly 30 million liters of biocrude oil. The plant will reportedly be operational by the end of 2021.
- *France*: The Total HDRD plant located in La Mede (Southern France) began producing HDRD in July 2019. This plant has a maximum capacity of 640 million liters per year. In 2020, production is estimated to have been 385 million liters. Feedstocks were expected to be 60 to 75 percent vegetable oils, and 25 to 40 percent waste oil such as UCO and animal fats. In January 2020, palm oil's tax advantages for biofuel production were removed which likely resulted in the plant using more canola oil (from Canada) and less palm oil than expected. On February 24, 2021, the French Council of State confirmed the ban on the use of palm oil in biofuels. Reportedly there are still tax advantages for palm fatty acid distillate (PFAD). Another project in France is the BioTFuel project, a cooperation of Avril, Axens, CEA, IFPEN, ThyssenKrupp, and Total. This project aims to produce 230 million liters of advanced biodiesel and bio-jet fuel per year from one MMT of biomass. The demonstration-scale plant is located at Total's former Flandres refinery in Dunkerque.
- *Portugal*: Since 2017, GALP has been producing HDRD in their facilities in Sines. Production capacity is estimated at 35 million liters. Since Portugal's production is palm oil based, it will face limits imposed on this type of feedstock. Palm oil producers may certify their feedstock as low-risk ILUC to keep their presence in the EU market beyond 2023.
- *Czech Republic*: Unipetrol RPA produces HDRD at an experimental scale of roughly 3.2 million liters per year.

Cellulosic Ethanol

- *Italy*: In November 2017, the Beta Renewables cellulosic ethanol plant in Crescentino, Piedmont shut down. Operational since 2013, the Crescentino plant had an annual production capacity of 50 million liters using 200,000 MT of biomass. The feedstock consisted of wheat straw, rice straw, and husks. On February 8, 2020, Versalis, Eni's chemical subsidiary, announced that all the plants at Crescentino will be up and running again by the first half of 2020. However, due to the COVID-19 crisis, the plant suspended fuel ethanol production, and is producing sanitary ethanol instead.
- *Finland*: A cellulosic ethanol plant, with an annual capacity of 10 million liters, started production in 2018. There are plans to expand production to roughly 50 million liters using saw dust as a feedstock. This Cellunolix® project is managed by St1 Biofuels Oy in cooperation with North European Bio Tech Oy. St1 plans to build three similar plants, each with a capacity of 50 million liters in Kajaani (Finland), Pietarsaari (Finland) and Follum (Norway).
- *Norway* (outside the EU): The company, Borregaard, operates a plant with an annual capacity of 20 million liters. In Follum, a paper mill is planned to be converted into an ethanol plant

applying the Cellunolix® technology. The plant will have a capacity of 50 million liters and will use forest residues as feedstock. It has been forecast to become operational in 2021.

- *Other*: More biorefinery projects have been announced for the conversion of cellulosic biomass into ethanol. Projects are being planned for plants in Slovakia and Romania. Both plants will have a capacity of roughly 65 million liters and will each use approximately 250,000 MT of cereal straw. Construction of the plant in Romania is ongoing, and the opening is now scheduled for the end of 2021. Construction of the plant in Slovakia has been put on hold reportedly due to an unclear legislative environment and market conditions for the second-generation biofuels in the EU, as each EU MS transposed the RED in their own way using their own definitions. In addition, plants are being converted to produce ethanol from their by-products. An example is the Austrian cellulose producer Austrocel which started building an advanced bioethanol plant at the beginning of 2020. The feedstock for the future production is sourced from the remainders of its cellulose production. The plant went into operation by the end of 2020 and delivered its first advanced biofuels shipment of 1.3 million liters in January 2021. The plant has a capacity of 30 million liters per year. Another example is a starch plant in Bulgaria, which is planned to start production in June 2021. The plant has a total capacity of roughly 50 million liters.

  Other projects focus on the conversion of the sugars and lignin into high value products. An example is the cooperation of the U.S. technology provider, Sweetwater Energy, and the Estonian wood pellet producer, Graanul, to integrate their technology into existing and new plants in the Baltic States. Another project is the cooperation of the Dutch companies, Avantium and Akzo Nobel, to build a demonstration biorefinery in the port of Delfzijl in the Netherlands. For more information about biorefineries see our FAS GAIN Report - Case Studies for a Biorefinery.

Biomethanol

Biomethanol can be used as a platform chemical to produce other chemicals such as lactic acid and formaldehyde. It can also be used as a transport fuel and blended with biofuels, diesel, and gasoline, or used to produce bio-methyl tertiary butyl ether (bio-MTBE), bio-dimethyl ether (bio-DME).

- *The Netherlands*: The advanced biofuel plant BioMCN produces biomethanol from biogas. BioMCN produces about 75 million liters of biomethanol annually. Additionally, a consortium of Enerkem, Shell, Air Liquide, Nouryon and the Port of Rotterdam is planning to build a waste to biomethanol plant in Rotterdam. The facility will convert 360,000 MT of waste into 270 million liters of biomethanol.
- *Spain:* Enerkem has plans to realize a similar project in Spain.
- *Sweden*: In 2020, Södra began production of biomethanol at a pulp mill in southeastern Sweden. The plant has an annual capacity of about 6 million liters of biomethanol which is extracted from the pulp mill side-streams. The biomethanol can be used as an energy source for the mill, as renewable transport fuel, or as platform chemical. The first deliveries are expected to be shipped to Denmark and used to produce biodiesel.

Biomethane

- *Germany*: Verbio is producing biomethane from straw at its plant at the Schwedt/Oder site. The plant has a capacity of 16.5 MW, meaning it can produce approximately 140 GWh of biomethane per year - produced from approx. 40,000 MT of straw. The biomethane is destined for use in the transport sector as bio-CNG/LNG and will qualify to count against the mandate for advanced biofuels under the national implementation of REDII in Germany.

Sustainable Aviation Fuel (SAF) and Marine Biofuels

In 2011, the EC, Airbus, and the aviation and biofuel producers' industries, launched the European Advanced Biofuels Flightpath. This action was scheduled to achieve two million MT, about 2.5 billion liters, of sustainable biofuels for use in the EU civil aviation sector by 2020. In 2018, the organization determined that the progress was insufficient to achieve the two million MT target in 2020. The conclusion was that one of the main barriers for the introduction of bio-jet fuels is the investment needed to expand production on a commercial scale. Other complications were the lack of harmonization of EU MS policies and the evolving political developments regarding the sustainability requirements for biofuels.

In the EU, Copenhagen Airport, Schiphol Airport (Amsterdam), and Frankfurt Airport have biofuel distribution for airplanes. A part of the supply at Schiphol Airport is currently covered by imports from the United States. SkyNRG is planning to produce biokerosene for Schiphol Airport in Delfzijl, a seaport in the Northern part of the Netherlands. With the technical expertise of Shell Aviation, the plant will convert waste fats and oils with a capacity of nearly 125 million liters. The company reportedly has an offtake agreement to deliver the biokerosene to KLM for ten years and production is scheduled to begin in 2022. Additionally, SkyNRG, in cooperation with Lanzatech, is planning to build a plant which converts waste-based ethanol into jetfuel. The plant will produce roughly 38 million liters annually and is scheduled to become operational in 2024.

In 2019, the EU production of bio-jet fuel totaled 30 million liters (source: Eurostat), with Finland as the sole producer. The current jet fuel capacity of Finland's Neste is about 125 million liters, but most of this capacity is reportedly located in Singapore. Neste plans to increase its renewable jet fuel capacity to 1.9 billion liters in 2023, including in the port of Rotterdam. The Swedish company, Preem, also expressed its intention to begin producing of up to 300 million liters of bio-jet fuel in 2022.

Another potential for biofuels is the marine fuel market. The Dutch biofuel distributor, GoodFuels, has partnered with several ship owners to supply marine biofuels to ships in the Port of Rotterdam and other European ports.

VI. Biomass for Heat and Power

This chapter describes the EU market for solid biomass intended for the household and industrial production of heat or power. In the EU, nearly 60 percent of the renewable energy consumed is generated by bioenergy. Of this, approximately 70 percent is contributed by solid biomass (Bioenergy Europe based on Eurostat statistics). The biomass is sourced from the agricultural and related food

processing sector and the forestry sector. Wood chips and pellets are increasingly used as input for renewable heat and power production. Because wood pellets are generally traded over longer distances than chips, this chapter is restricted to the wood pellet market.

EU Production, Supply and Demand Table

Table 9. Wood Pellets (1,000 MT)										
Calendar Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020[e]**	**2021[f]**
Beginning Stocks	713	642	506	948	1,270	1,797	1,595	1,880	1,778	2,195
Production	10,652	12,200	13,100	14,100	14,400	15,400	16,900	17,800	18,400	18,900
Imports	4,367	6,096	6,547	7,163	8,095	8,693	10,355	11,479	12,569	13,200
Exports	90	132	105	141	118	195	170	181	152	150
Consumption	15,000	18,300	19,100	20,800	21,850	24,100	26,800	29,200	30,400	32,300
Ending Stocks	642	506	948	1,270	1,797	1,595	1,880	1,778	2,195	1,845
Production Capacity										
Number of Plants	497	516			637	707	719			
Capacity	15,980	17,000	18,500	20,500	21,950	22,861	23,353	24,000	25,000	25,800
Capacity Use (%)	66.7	71.8	70.8	68.8	65.6	67.4	72.4	74.2	73.6	73.3

Sources: Bioenergy Europe, Trade Data Monitor, and FAS Post Estimates. e=estimate f=forecast

The EU is the world's largest wood pellet market, with consumption of roughly 30.4 MMT pellets in 2020. Based on EC mandates and EU MS incentives, demand is expected to further expand to 32.3 MMT in 2021. Future consumption will significantly depend on a range of market factors and EU MS incentives and conditions.

Consumption

While the EU accounts for about 45 percent of world production, EU demand represents nearly 75 percent of the global market. Since 2014, residential (below 50 kW) and small-to-medium scale commercial (more than 50 kW) use of pellets represented approximately 55 percent of EU pellet consumption, leaving 45 percent for large scale industrial use of pellets, with a capacity of generally more than 5 MW (Source: Bioenergy Europe). The major users of wood pellets in the EU are the UK, Italy, the Netherlands, Germany, France, Belgium, Denmark, Sweden, and Austria. The COVID-19 crisis has had a limited effect on total EU pellet consumption in 2020 and 2021. The EU MS lockdown measures have predominantly restricted transport activities resulting in a reduction in liquid biofuel use. Solid biomass applied for heat and power has been less affected, save for a shift from office to residential use. However, lower than anticipated industrial use led to increased stocks in 2020.

Table 10. Main Pellet Consumers (1,000 MT)							
Calendar Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020[e]**
United Kingdom	4,900	6,700	6,900	7,470	8,540	9,200	9,400
Italy	3,400	3,300	3,200	3,400	3,300	3,400	3,400
Netherlands	500	120	190	360	610	1,240	2,875
Germany	1,840	1,760	2,000	2,100	2,190	2,300	2,330

France	1,088	908	1,207	1,335	1,430	1,800	1,900
Belgium	1,200	1,600	1,340	1,375	1,490	1,500	1,200
Denmark	2,450	2,500	2,570	3,160	3,075	3,000	1,500
Sweden	1,650	1,650	1,605	1,530	1,785	1,730	1,500
Austria	815	850	895	960	950	930	1,015
Total	**19,100**	**20,800**	**21,850**	**24,100**	**26,800**	**29,200**	**30,400**

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

Residential Use of Pellets

Residential use for heating, between 35 and 40 percent of the total pellet market, fluctuates annually, but is a relatively stable market compared to industrial heat and power generation. The demand depends on the winter temperatures and fossil fuel prices. Medium-sized users of pellets for energy generation (by industries or public buildings such as hospitals and swimming pools) are generally less dependent on weather conditions.

The EU MS with a large residential market for wood pellets are Italy, Germany, France, Austria, Sweden, Spain, the Czech Republic, and Croatia. Most of these MS are also important producers of wood pellets, except for Italy, which is a major importer. The most significant growth in the residential market was reported in Germany and France. The shift from office use of energy to residential use during the COVID-19 crisis has partly been impacted by the mild winter in 2019 and 2020. In 2020, significantly fewer imports of pellets were reported for Italy and Sweden.

In some EU MS, such as Sweden, Germany, Austria, France, Spain, and the Czech Republic, household heating using biomass qualifies for subsidies or tax deductions by national and local governments. In most countries, however, government funding is limited.

Industrial Use of Pellets

In markets such as the UK, the Netherlands, Denmark and Belgium, residential use is relatively small and the demand for wood pellets is dominated by large scale power plants. The governments of these countries opted to fulfill their obligations for renewable energy use using biomass for the generation of electricity. These countries largely depend on imports as they lack sufficient domestic production of pellets.

The largest industrial market for pellets in Europe is the UK. The conversion of large electricity plants firing biomass instead of coal is a key part of the UK Government's plans to reach its renewable energy targets. The largest user of pellets in the UK converted four of the six units in its plant from coal to biomass combustion. Each of these four units combusts 2.3 MMT of wood pellets per year. While the consumption of the main user will soon level off, the second largest user has been ramping up its use of pellets since 2020. At full capacity, the power generation of this plant will utilize about 1.4 MMT of pellets. In addition, the use of wood pellets for heating purposes is increasing in the UK. In 2021, the total UK pellet use is forecast at 9.8 MMT, leading to an increase in imports of approximately five percent.

In 2020 and 2021, the Netherlands was the leading EU growth market for industrial pellets. In 2020, Dutch wood pellet imports reached a new high, totaling 2.76 MMT valued at $511 million. The United States was the leading non- EU supplier to the Netherlands. All the imported wood pellets which are used for renewable energy generation funded by the Dutch government are subject to stringent sustainability requirements. Dutch pellet imports are estimated to increase to approximately 3 MMT in 2021. In the future, the Dutch government will place more emphasis on the use of biomass for higher value applications. For more information see the FAS GAIN Report - Dutch Wood Pellet Imports Reached a New High, published on April 26, 2021.

The third largest industrial pellet market was Denmark. From 2017 to 2019, Danish annual pellet consumption surpassed 3.0 MMT because combined heat and power (CHP) plants have been converted to pellets, as the power sector is phasing out coal. On May 19, 2020, the EC approved a €550 million state aid scheme to support the production of electricity by Danish biomass installations. The scheme will be in place until December 31, 2029. The goal of the program is to phase out coal and generate 55 percent of electricity from renewable energy by 2030. A large portion of the pellets consumed in Denmark are imported. In 2020, Danish imports dropped to 2.6 MMT from 3.2 MMT in 2019 due to an increase in co-firing wood chips and straw. Danish imports of wood chips have risen steadily since 2016, most notably from Norway, Brazil, and Germany.

Another important industrial pellet market is Belgium. However, as is the case for Denmark, consumption is forecast to fall. From 2012 to 2020, Belgian pellet use was estimated at about 1.5 MMT per year. Due to closure of the main bioenergy plant in Wallonia, the annual use is forecast to decline to roughly 1.2 MMT in 2021.

Production

Table 11. Main Pellet Producers (1,000 MT)

Calendar Year	2014	2015	2016	2017	2018	2019	2020[e]
Germany	2,100	2,000	1,950	2,250	2,415	2,820	3,100
Latvia	1,380	1,500	1,570	1,465	1,575	1,600	1,625
France	1,040	950	1,150	1,250	1,350	1,500	1,600
Austria	945	1,000	1,070	1,225	1,345	1,440	1,540
Sweden	1,490	1,550	1,665	1,680	1,845	1,630	1,500
Estonia	1,000	900	1,195	1,175	1,290	1,300	1,325
Poland	610	850	900	1,000	1,200	1,250	1,300
Portugal	700	700	500	700	780	800	825
Spain	410	475	550	530	595	715	750
Total	**13,100**	**14,100**	**14,400**	**15,400**	**16,900**	**17,800**	**18,400**

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

Compared to production plants in North America, wood pellets plants in the EU are predominantly small or medium-sized. Most of the leading pellet producing countries have a sizeable domestic market for residential heating pellets. Recent increases in demand for pellets has supported a further increase in domestic production. In 2020, production expanded in Germany, France, and Austria, supported by increased domestic use. Production also further expanded in the Czech Republic (486,000 MT in 2020) and Croatia (380,000 MT in 2020), which are rising from smaller to midsized producers in the EU (both

mainly producing for exports -- with Italy as a key market). The Czech Republic and Croatia have shown steady production growth since 2010. Last year, in the Czech Republic, five new pellet plants were established adding 30 thousand MT to the country's total production capacity. Sweden, the fourth largest producer in the EU, is one of the few EU MS where pellet production fell as production was reportedly cut due to forest fires and unfavorable harvest conditions.

Latvia, Estonia, and Portugal predominantly produce wood pellets for export. Wood pellet production has expanded rapidly in the Baltic Region (Latvia, Estonia, and Lithuania) over the past five years. In 2019 and 2020, exports stabilized at nearly 4.0 MMT. The Baltics are producing both for the residential and industrial markets, mainly in Denmark, the UK, and the Netherlands. Separately, in 2020, Portuguese exports reached 605,000 MT, with Denmark, the UK and Spain its main pellet export markets.

In the EU, secondary feedstocks, such as sawdust, wood industry residues, and shavings, comprise nearly 85 percent of the raw materials used for pellet production (Source: EPC survey 2019). At the beginning of the COVID-19 pandemic, it was anticipated that the production of pellets would be negatively affected as the supply of by-products from wood processing fell. However, due to increased construction activity, the demand for wood improved, generating an increased volume of wood residues as feedstock for pellets. Nevertheless, with increasing competition for sawdust resources, a broader sustainable raw material is becoming necessary. There is increased interest in forest and agricultural residues, but even the volume of these additional feedstocks will not be sufficient to satisfy the full demand in Western Europe. Overall, EU wood pellet production is not expected to be able to keep up with the increasing demand from both the residential heating market and for power generation.

Trade

Table 12. Main EU Importers of Wood Pellets (1,000 MT)

	Total Imports[a]		Imports from U.S.	
Calendar Year	**2019**	**2020**	**2019**	**2020**
United Kingdom	8,857	9,078	5,484	5,766
Netherlands	1,236	2,614	130	544
Denmark	3,155	2,566	506	176
Italy	2,461	1,802	67	34
Belgium	1,217	1,335	592	573
France	407	411	0	13
Germany	317	281	0	0
Sweden	436	119	0	0
Total EU28	**-**	**-**	**6,779**	**7,107**

Source: Trade Data Monitor (HS Code: 440131) (a) Includes EU intra-trade.

The large power utilities in the UK, the Netherlands, and Belgium are sourcing most of their pellets from non-EU suppliers, mainly the United States and Canada, due to their location at seaports and limited domestic production. The port restrictions in Scandinavia are favoring supplies from the Baltic Sea, which generally ship with smaller vessels than those used in 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 markets for pellets in Germany, Austria, and, to a lesser extent, France and Italy are more isolated and depend mostly on the production in the regions themselves.

Table 13. Main Suppliers of Wood Pellets to EU (1,000 MT)

Calendar Year	2015	2016	2017	2018	2019	2020
United States	4,278	4,902	5,205	6,139	6,779	7,107
Canada	1,475	1,685	1,478	1,762	1,624	2,095
Russia	786	834	1,269	1,365	1,689	1,826
Belarus	158	145	212	262	375	524
Ukraine	149	165	214	380	431	442
Brazil	23	33	103	177	263	361
Total	**7,163**	**8,095**	**8,692**	**10,355**	**11,479**	**12,569**

Source: Trade Data Monitor (HS Code: 44013020 and 440131 as from 2012)

EU demand for pellets has significantly outpaced domestic production over the past ten years, resulting in increased imports from the United States. In 2020, U.S. exports to the EU totaled 7.1 MMT, valued at $1.38 billion. Other significant exporters of pellets to the EU were 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 individual EU Member State governments.

Pellet Sustainability Criteria

A key factor in 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. In the absence of EU-wide binding criteria for solid biomass, several EU MS (including Belgium, Denmark, and the Netherlands) have developed their own rules in response to the growing use of imported wood pellets.

Under RED II, sustainability of biomass production is assessed at the sourcing level, and not at the forest-holding level, as originally proposed by the EC. EU MS may place additional sustainability requirements for biomass fuels. By December 31, 2026, the EC shall assess the impact that such additional criteria may have on the internal market to ensure harmonization of sustainability criteria for biomass fuels (for more information see the Policy and Programs chapter of this report).

Meanwhile, the industry is actively formulating its 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. 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 the current requirements in the UK, Denmark, Belgium, and the Netherlands.

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 are based on TDM data, which are sourced from EU Member State 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 is based on EU imports through preferential trade under HS 2207, EU imports from Brazil under HS code 3824.90.97, U.S. fuel ethanol 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 and are based on the conversion and yield rates listed in the Appendix.

Biodiesel

Production and consumption figures are based on statistics of Eurostat and Member State official statistics and adjusted by EU FAS Posts using additional information obtained from national industry organizations and government sources.

Trade figures are based on TDM data, which are sourced from EU Member State 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.

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 and based on the conversion and yield rates listed in Appendix II.

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
EC = European Commission
EU = "EU" in this report refers to EU27+UK. In the next report, the EU Biofuels Annual 2022, the Brexit will be taken in account and the "EU" will refer to the EU27 without the UK.
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
HDRD = hydrogenation derived renewable diesel (also known originally as hydrotreated or hydrogenated vegetable oil or HVO
HS = Harmonized System of tariff codes
KTOE = 1000 MT of oil equivalent = 41,868 GJ = 11.63 GWh
MJ = Megajoule
MMT = Million metric tons
MS = Member State(s) of the EU
MT = Metric ton (1,000 kg)
Mtoe = Million tons of oil equivalent
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
PME = palm oil based methyl ester biodiesel
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

1 MT Gasoline = 1,342 Liters = 1.03 toe
1 MT BtL = 1,316 Liters = 0.80 toe
1 MT of HDRD = 1,282 Liters = 1.00 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

Yields Ethanol
Corn kernels: 1 MT = 402 to 417 liters (has risen since 2006)
Wheat kernels: 1 MT = 393 liters
Rye/Barley kernels: 1 MT = 241 liters
Sugar beets: 1 MT = 95 liters

Yields Biodiesel
Soybean oil, crude: 1 MT = 1,113 liters
Soybean oil, 1x refined: 1 MT = 1,128 liters
Crude palm oil (CPO): 1 MT = 1,087 liters
Animal fats/grease: 1 MT = 1,043 liters
Used cooking oil (UCO): 1 MT = 1,043 liters

Yields Ethanol Co-products (maximum theoretical yield)
Corn kernels: 1 MT = 313 kg of DDGs + up to 29 kg of corn oil
Other grain kernels: 1 MT = 313 kg of DDGs (negligible vegetable oil)

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

Country	Title	Date
EU+UK	Biofuel Mandates in the EU by Member State and UK - 2021	06/08/21
EU	EC Adopts its EU Taxonomy for Green Investments	05/14/21
Netherlands	Dutch Wood Pellet Imports Reach New High	04/26/21
EU	Sugar Annual 2021	04/22/21
EU	Grain and Feed Annual 2021	04/16/21
EU	Oilseeds and Products Annual 2021	04/15/21
Belgium	Belgium To Ban Palm and Soya Oil for Use in Biofuels from 2022	04/08/21
Germany	Call for Technology Neutrality Dominates Fuel of the Future Congress	02/01/21
EU	EU Launches Public Consultation on the Review of the RED	11/20/20
EU	EU Launches Expiry Review of CV Duties Against US Biodiesel	09/16/20
EU	EC Launches Public Consultation on Possible Revision of REDII	08/22/20
Spain	Spain Biofuels Policy and Market	07/29/20
Netherlands	Dutch Government Advised to Cascade Biomass	07/14/20
EU	EU Biofuels Annual 2020	06/29/20
Poland	Wood Pellets Market Brief	06/16/20
EU	Biofuel Mandates in the EU by Member State in 2020	05/28/20
Netherlands	Dutch Wood Pellet Imports Surge to a New Record in 2019	05/26/20
Romania	Romania Approves New Biofuels Blending Exemptions	04/30/20
Austria	Agricultural Processor AGRANA Starts Disinfectants Production	04/17/20
Portugal	Portugal Biofuels Policy and Market	03/16/20

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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.

Attachments:

No Attachments