UNION ZUR FÖRDERUNG VON OEL- UND PROTEINPFLANZEN E.V.

Biodiesel 2018/2019

Report on Progress and Future Prospects – Excerpt from the UFOP Annual Report

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List of Tables, Graphics and Figures in the Report

Table of contents

Biodiesel & Co.

Excerpt from the UFOP Annual Report 2018/2019

The 2018/19 reporting year ended with a drumroll: Ursula von der Leyen, the European Commission's first female President, took up her post and will be engaging with a newly elected European Parliament to implement her stated legislative aims. The EP's composition hints at interesting but challenging coordination in forthcoming trilogue processes, with a shift in the balance of power held by the EP's political groups that reflects heightened environmental awareness across society. In her pre-appointment speech to the European Parliament, the President-designate presented her proposals for the future design and further development of climate protection policy, which will affect all social strata, the entire economy, and also third countries:

- Enshrining climate neutrality by 2050 in the first European Climate Bill
- Extending the emissions trading system to aviation and shipping with gradual reduction of free emissions certificates
- Introducing a CO_2"marginal tax" to avoid displacement effects
- Concluding a European climate pact including regions, local communities, civil society, industry and schools
- Transforming the European Investment Bank into a Climate Bank for Europe.

Ms. von der Leyen also announced more ambitious targets for reducing greenhouse gas (GHG) emissions and for the pioneering role to be played by the EU in international climate protection negotiations. The climate protection commitment for 2030 is to be increased from 40 % to 55 %. This will be based on a comprehensive plan that also includes a European biodiversity strategy to slow the pace of species extinction over the next five years. Given the importance of rural areas and agriculture in the EU for safe and healthy food, this economic sector is to be developed as part of a new strategy for sustainable food

production from "producer to consumer" along the entire value chain. UFOP considers that she has thus already indicated to the new College of Commissioners the fundamental policy thrust and fields of action to be addressed in the coming term of office, which will require appropriate interlinking between the Directorates-General to achieve synergies. The entire economy, including agriculture, should become visibly "greener" and more sustainable. However, leeway for action and to design policy is constrained by what is known as the "Winter Package" from November 2018, which comprises eight directives and regulations (see UFOP Report 2017/18, p. 42) and includes, inter alia, the recast Renewable Energies Directive (RED II) and the Governance Regulation. The new EU Commission can amend this legislation, which has already been published in the EU Official Journal, within the framework of scheduled revisions of the texts or adapt them in the light of experience gleaned. This concerns not only the stated increase in the EU's GHG reduction obligation to 55 %, but also further opening of the internal market to secure supply of renewable electricity, review of the targets and a possible increase in the share of renewable energies in the transport sector (14 %) as well as review of the criteria for biofuels associated with a high risk of indirect land-use changes (palm oil). In addition, there will be a need to review the effectiveness of provisions to be implemented from 2021 on introducing CO_2 fleet limit values for new passenger cars, light commercial vehicles and, from 2025, for heavy commercial vehicles, including incentives for purchasing zero-emission or low-emission vehicles. The EU Commission must submit a report and may propose changes to EU law. This also applies to the question of offsetting biofuels or renewable fuels from electricity (e-fuels) against fleet limits to avoid or reduce fines that would otherwise be payable to the EU Commission (Fig. 1). In the year covered by this report, UFOP participated intensively in these discussions with the relevant professional associations. National and international prospects for biofuels in the in the context of the new EU provisions and their integration into a national climate protection strategy in the transport sector were also addressed by members of the UFOP expert commission "Biofuels and Renewable Resources" (page 20) along with the c. 650 participants at the 16th "2019 Fuels of

Fig. 1: Framework for climate and energy policy up to 2030 – Agreed targets

	Greenhouse gas emissions	Renewable Energies	Energy efficiency	Electricity interconnection goal	Climate protection in EU-funded programmes	CO_2 emissions
2020	- 20 %	20 %	20 %	10 %	2014 – 2020 20 %	
2030	≥ -40 %	≥ 32 %	≥ 32.5 %	15 %	25 %	cars -37.5 % light vehicles -31 % lorries -30 %

Possibility of increase until 2030 foreseen

Source: Fourth European Commission Report on the State of the Energy Union, 04/2019 the Future" international conference co-organised by UFOP (https://www.fuels-of-the-future.com/rueckblick/).

EU Council – A Bottleneck for Climate Policy

The German government's hesitant response to the EU climate initiative launched by French President Emmanuel Macron reveals the difficulties likely to arise in future when seeking a compromise in the European Council. Chancellor Angela Merkel finally did also declare support for the goal of climate neutrality by 2050, thanks inter alia to pressure from her coalition partner and increasing public pressure for measures to protect the climate. This means that Germany has now made a binding commitment to the 1.5-degree target rather than the 2-degree target. Highly critical stances on this ambitious goal continue to be voiced, with some significant sectors of German industry viewing it as unachievable. This provision was the basis for determining the sector-specific annual emissions laid out in the draft Climate Protection Bill presented by Federal Environment Minister Svenja Schulze in spring 2019.

A binding commitment by the EU to the 1.5-degree target would have sent an important signal to all signatory states of the Paris Agreement to likewise align their national commitment with this target as they develop more of the requisite measures. As an important economic area that shares responsibility for causing climate change, the EU could have underlined or improved its pioneering role and negotiating position. However, that option proved untenable at the European Council in June 2019 due to resistance from Poland and other Member States in eastern Europe. Only one footnote to the resolution states that most Member States aim to achieve climate neutrality by 2050. The most important reason for this rejection lies in concerns about the burden on national budgets that would arise from implementing a rapid transformation process designed to be as socially acceptable as possible. Within a few decades, electricity generation from coal would have to be abandoned, alternative jobs created, and new infrastructure established for production and use of renewable electricity (charging infrastructure). The Member States that blocked the decision called, directly or indirectly, for additional financial support from the EU budget for this ambitious process. In the climate protection debate, there will in future clearly be a need to differentiate between Member States proceeding at differing speeds and with varying intensity, although specific requirements for GHG reduction within the framework of the EU Effort Sharing Regulation already take account of Member States' differing economic strength – measured in terms of gross domestic product per capita (GDP) (see UFOP Report 2016/17, p. 9). Succeeding in this balancing act and seeking compromises with and between the Member States number among the ground-breaking policy tasks and challenges for the new EU Commission. In its Communication "A Clean Planet for All – a European Strategic, Long-term Vision for a Prosperous, Modern, Competitive and Climate-neutral Economy", the EU Commission has pledged to present national climate protection measures and a "2050 Roadmap" by 2020.

National Climate Protection Strategies Behind Schedule – Climate Cabinet under Pressure

Some Member States seem to have just become aware of the time pressure and urgent need for decisions associated with GHG reduction targets under the Paris Climate Protection Agreement, which is binding under international law. Member States were supposed to submit their integrated national climate and energy plans to the Commission in early January 2019. As it became apparent that the Member States were not ready, the Commission extended this deadline to the end of 2019. Against this background, it transpires that Germany is not among the Member States making headway on this front. On the contrary: in Germany, "decision-making assistance" was sought, reflected in the establishment of expert commissions and ultimately the creation of the Climate Cabinet. The Federal Cabinet decided on the 2050 Climate Protection Plan "in good time" on 16 November 2016, allowing then Federal Environment Minister Barbara Hendricks to present the key points two days later in the ministerial meeting at the World Climate Conference. Germany would otherwise have found itself in an embarrassing position in Marrakech. The 2017 federal elections and the ensuing difficulties in forming a government were very time-consuming. In June 2019, the Commission confirmed that concrete resolutions are urgently needed at present, noting that the lack of concrete details made it de facto impossible to assess the draft national energy and climate plan submitted by the German Federal Ministry of Economic Affairs and Technology (BMWi), specifically the measures listed for sectors not covered by the EU emissions trading system (transport, buildings and agriculture). Pursuant to the EU Effort Sharing Regulation, Germany must fulfil a GHG reduction obligation of 38 % (base year 2005) in 2030, otherwise additional mandatory requirements may be introduced and tax revenues would have to be used to purchase emission rights from other Member States to compensate for the shortfall. When the Climate Cabinet meets on 20th September 2019, the Federal Government must therefore decide on concrete measures to be notified to the EU Commission for review and evaluation. The delay described above makes the situation difficult. The measures in question must be articulated in laws and ordinances and adopted by the Bundestag, if necessary in agreement with the Bundesrat. The EU Commission must also assess these legislative proposals. The Governance Regulation provides that the EU Commission may request a Member State to effect appropriate corrections if the measures submitted are not sufficiently "ambitious". This assessment is enormously important for climate protection policy as the EU Commission will for its part incorporate the entire package into the Paris Agreement framework. The signatory states have pledged to submit their national climate and energy plans in 2020. The announcement by the new Commission President that the European Union will initiate a climate protection concept that underscores the EU's exemplary role must also be seen in this context. The Climate Cabinet was created in response to time constraints, with a view to enabling discussion of the requisite measures and taking decisions with the competent federal ministries on the basis of the 2050 Climate Protection Plan's sector-specific targets. This Climate Protection Plan encompasses the measures required for each specific sector, which are listed in relatively concrete terms for agriculture. Federal Agriculture Minister Julia Klöckner presented a ten-point action plan at the Climate Cabinet's first meeting in early April 2019. The cornerstones of this concept were presented at meetings of the Environment Ministry (BMU) "Climate Protection Action Alliance", whereas the transport and housing ministries in particular failed to present any specific measures. Federal Environment Minister Svenja Schulze has repeatedly called on those bodies to present tangible proposals. There has been intensive and extremely critical discussion on introduction of CO_2 pricing, taxation and extension of emissions trading, in particular for the transport sector. The key underlying issue is how to steer the economy and consumer behaviour in the intended direction. As the Federal Ministry of Finance de facto refused to present a concept, the Environment Minister announced that she would continue to work on such plans.

CO_2 Tax, CO_2 Exemption, Emissions Trading – What is on the Agenda Now?

The German Government has announced that its ambitious national climate protection targets will not be achieved. This already holds true for the 40 % target for 2020, but also applies to the climate protection target of 55 % by 2030. The effects of climate change can be felt everywhere. The evidence-based scientific facts can no longer be ignored. Fridays for Future are therefore not the only ones demonstrating. Growing awareness of climate protection issues right across society is also bringing pressure to bear on politicians. The younger generation in particular publicly lambasts politicians' failure to act or take the requisite decisions. The transformation process needed for greater climate protection involves more than technology-based instruments such as CO_2 fleet regulation for vehicles, promotion of e-mobility or more rapid progress in abandoning fossil fuels in the electricity mix; it also includes ensuring as much acceptance as possible for measures designed to have a steering effect on emission avoidance and consequently considering how individual consumer behaviour can be positively influenced to this end. That is the central challenge for any pricing system for fossil-fuel-generated greenhouse gases. The issues are not new. In 2011, the EU Commission submitted proposals to amend the Energy Taxation Directive, envisaging a combined energy and CO_2 tax.

A unanimous vote in the Council of Finance Ministers is required for changes that affect EU tax law and impinge directly on national legislation. The time was obviously not ripe to advance climate protection through this channel. Furthermore, on 1 May 2004, ten more countries, including Poland, Slovakia, Slovenia, the Czech Republic and Hungary, joined the EU. They had to implement the Energy Taxation Directive adopted in 2003, which envisaged a planned gradual increase in national taxation, especially on fuels. At that time, the focus was on tax shortfalls and distortions of competition caused by "cheap petrol tourism" between Germany and Poland, Luxembourg and Austria.

These experiences must be taken into account when evaluating the concepts currently presented. As she had announced, Federal Environment Minister Svenja Schulze presented three expert opinions on restructuring the taxation system (see box below). The Federal Ministry of Economic Affairs' scientific advisory board also submitted an expert opinion in which the

The Three BMU Expert Reports on CO_2 Pricing

- **The German Institute for Economic Research** outlines the basic model: a CO_2 price of 35 EUR per t CO_2 for energy consumed in heat and power generation and for energy consumption in the heating and transport sector would mean additional tax revenues of EUR 11.1 billion per year. In addition, there would be a EUR 1 billion increase in value-added-tax revenues. The climate bonus of EUR 80 per inhabitant per annum would lead to EUR 6.6 billion expenditure per annum. Overall, the reform would be neutral in its economic impact on private households.
- The **Hans Böckler Foundation's Institute for Macroeconomics and Economic Research** considers it "advisable" to introduce compensatory measures to redistribute revenue from a CO_2 tax progressively. Reducing the electricity price or a per-capita climate premium, paid direct to all households, could contribute to this.
- **The Ecological-Social Market Economy Forum (FÖS)** also notes that any additional tax burden should incentivise environmentally friendly behaviour. The revenue could be used to reduce the burden on consumers in other respects. "This would avoid any net additional burden", the FÖS report underlines.

Source: EUWID, 28.2019 / 10.07.2019

concept of CO_2 tax is linked to the benefits of emissions trading. The changes should be introduced in such a moderate and balanced fashion that a European consensus would not be needed for national implementation, even if the emissions trading scheme were extended to include the building and transport sectors. Market distortions should be avoided by setting price corridors for CO_2 pricing. Introducing a uniform price seeks to encourage business and consumers to invest in reducing fossil GHG emissions. There is a broad scientific consensus that a CO_2 tax system must always be accompanied by a reimbursement procedure for households in order to secure public acceptance. The "yellow vest protests" in France have demonstrated that there is a thin line between acceptance and rejection.

A consensus also exists that the emissions trading system should be extended to include the buildings sector and, above all, transport. The agricultural sector is excluded given the very heterogeneous farm structure. It should be clear, however, that CO_2 pricing always gives rise to additional costs for the final consumer, who will adjust their actions accordingly. This applies not just to consumption of fuels, heating oil, etc., but also to use of mineral nitrogen fertilisers in agriculture, which will become more expensive due to CO_2 pricing. That is why the report commissioned by the BMWi also stresses interaction effects resulting from potential divergences in national implementation strategies within the EU and on international energy markets. Reduced demand for oil in the EU leads to a lower world market price for oil, which in turn leads to higher consumption in countries with less ambitious climate protection requirements (carbon leakage). As a result, this system change must be flanked, with international agreements on standardised CO_2 pricing by all Paris Agreement signatory states, along with ambitious reduction targets for GHG emissions compatible with the EU's environmental policy.

These signatory states must present their national climate and energy plans in 2020. That will be the year when states decide whether the Paris target will be met.

Will a Climate Protection Bill be Adopted? At What Price?

In spring 2019, Federal Environment Minister Svenja Schulze presented a draft Climate Protection Bill as announced in the coalition agreement and by her ministry. It stipulates that all sectors shall be granted specific emission volumes that will decrease annually to 2030 (Fig. 2). The aim is to ensure that the stipulated sector-specific GHG reductions vis-à-vis the 1990 baseline can be achieved by 2030: energy sector -62 %, buildings -67 %, agriculture -34 %, industry -51 %, transport -42 %. This differentiation by sector is rooted in EU legislation and in the 2050 Climate Protection Plan adopted by the Federal Cabinet at the end of November 2016. That means there was certainly sufficient notice of the principles underlying policy design for the sector-specific measures. Each ministry concerned had sufficient time to adjust to the reduction target for its sector. The Bill makes it incumbent on the competent ministries to achieve the specific savings target stipulated for each calendar year in question. If the target is not met, i.e. if the maximum annual emissions volume is exceeded, additional provisions aiming at attaining the targets must be introduced to change course or counteract the situation. Compliance with the targets is also monitored by the EU Commission. If the annual maximum volume is exceeded, tax revenues must be used to purchase "pollution rights" from other Member States. Financing remains a contentious point in this draft Bill. The Federal Environment Ministry considers that costs should not be allocated to the entire federal budget; instead, a polluter-pays principle should be introduced. The relevant ministry would have to ensure financing to purchase emission rights. This will become steadily more expensive, with certificate prices (currently 25 EUR per t) expected to rise. UFOP fears that the EUR 100 million per annum earmarked by Federal Finance Minister Olaf Scholz in the 2021 to 2023 budget plan will prove insufficient. That would trigger reallocations of funds and budgetary cuts for the ministries affected.

As a result of the draft Bill, a "price tag" will be established for climate protection. Although the thriving economy and plentiful tax revenues certainly afford room for manoeuvre, experts believe that funding to the tune of billions will soon be needed. Pricing also means that measures taken to prove that objectives have been achieved must be robust and transparent. Against this backdrop, the consulting firm of the German Institute for Economic Research (DIW Econ) has drawn up a study for the German Biofuel Industry Association (VDB): "Biofuels' Contribution to Achieving the 2030 Climate Targets". It notes that in 2017 biofuels provided 4.6 % of demand for fuel with average fuel consumption of an 81 % reduction in GHG. This corresponds to an absolute saving of about 7.7 million tonnes CO_2 equivalent in contrast to total transport sector emissions of 171 million tonnes CO_2 equivalent. Currently and in the medium term, sustainable biofuels provide a fuel alternative that contributes noticeably to cutting GHG emissions from transport. UFOP has therefore repeatedly queried in political debates whether it is really possible to do without this climate protection contribution when moving towards a reduction strategy that is open-minded about technology and feedstocks, as well as minimising the probable burden on the federal budget. Fig. 3 shows the significance of commercially available biofuels.

According to the study, biofuels will contribute billions to reducing the strain on the federal budget by 2030. The Federal Minister of Finance also participates in Climate Cabinet meetings. UFOP thus hopes that the importance of biofuels will be recognised, at least from a fiscal point of view, especially if the economic cycle slows due to the transformation process yet with a simultaneous need for funding for additional compensation measures or special funds required for infrastructure development (e-mobility).

The outcome of the Coal Commission's work also demonstrates how costly the transformation process will be and thus how crucial it will be to share the burden between as many stakeholders as possible. The German government and the federal states have agreed to provide flanking financial

Fig. 2: Annual emissions by sector

Annual emission quantity in million t CO_2 equivalent	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Power	.	257	.	.	.	.	.	.	.	175
Industry	182	177	172	168	163	158	154	149	145	140
Buildings	113	108	103	99	94	89	84	80	75	70
Transport	145	139	134	128	123	117	112	106	101	95
Agriculture	68	67	66	65	64	63	61	60	59	58
Waste management and other	9	8	8	7	7	7	6	6	5	5

Source: Draft Federal Climate Protection Bill (Annex 2)

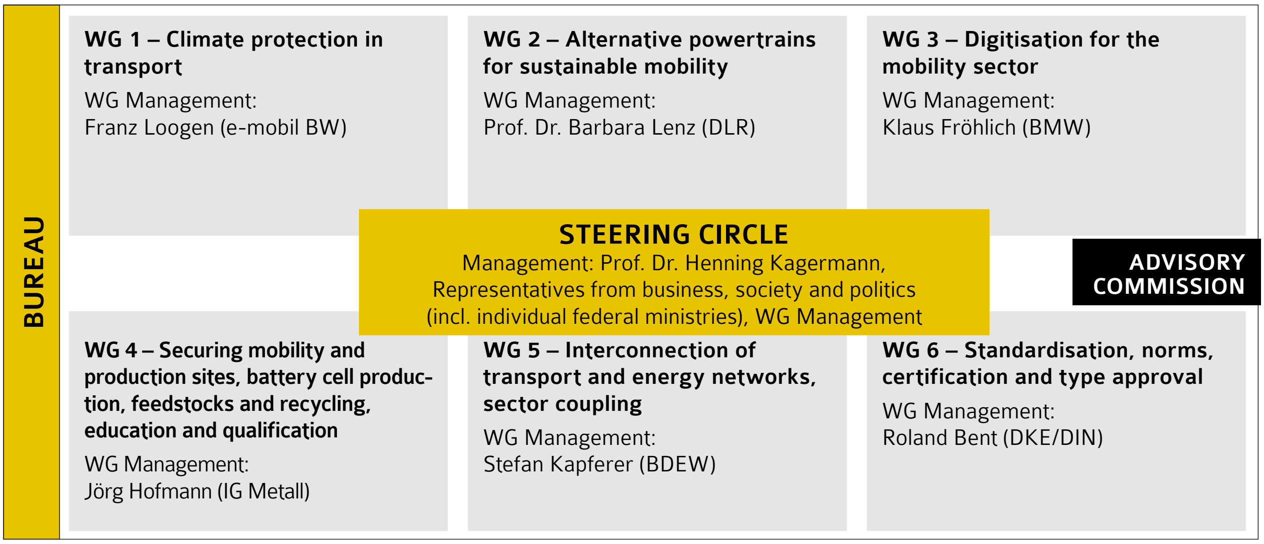
Fig. 3: Biofuels save tax revenue

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total 2021 – 2030
Total – all biofuels											
Emissions avoided (million t CO_2 eq)	9.1	9.1	9.5	10.0	10.4	10.6	10.7	10.9	11.1	11.2	**102.7**
Value of savings at 50 – 100 EUR/t CO_2-eq (million EUR)	456 – 911	454 – 909	477 – 953	499 – 997	520 – 1,040	529 – 1,058	537 – 1,075	546 – 1,091	554 – 1,108	562 – 1,124	**5,133 – 10,266**
Biofuels from cultivated biomass											
Emissions avoided (million t CO_2 eq)	6.0	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.7	**58.5**
Value of savings at 50 – 100 EUR/t CO_2-eq (million EUR)	302 – 604	300 – 600	298 – 596	296 – 591	294 – 587	291 – 583	289 – 579	287 – 574	285 – 570	283 – 566	**2,925 – 5,851**

Source: DIW Econ

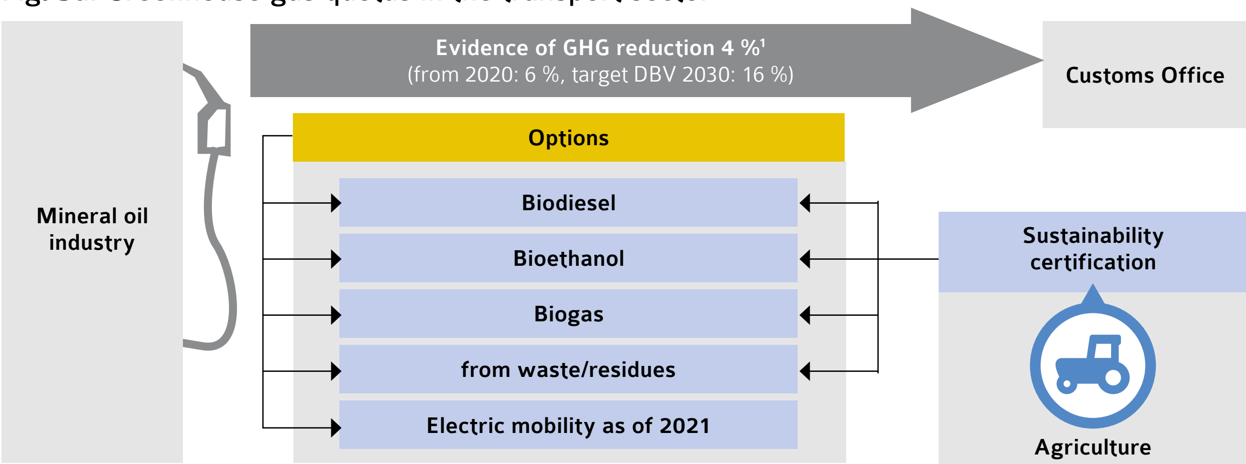
support in the opencast mining regions affected to ensure a socially acceptable exit strategy from coal. By 2038, EUR 1.3 billion a year from federal funds, earmarked for specific purposes, is to be made available to the regions. In addition, the federal states concerned will receive a further EUR 700 million to use at their discretion; total costs will thus amount to around EUR 40 billion by 2038. Efficiency improvements will be needed to compensate for the resulting drop in electricity generation, and renewable energies (wind power, photovoltaics, biomass) and distribution networks will need to be expanded. This challenge will be particularly acute, as a quarter of coal capacity is to be taken off the grid by 2022. At the same time, Germany is also phasing out nuclear energy.

Fig. 4: NPM



Source: NPM

Fig. 5a: Greenhouse gas quotas in the transport sector



Source: DBV

[1] Greenhouse gas reduction obligation as a percentage of fuels sold

"Future of Mobility" National Platform – Too Many Experts?

With the establishment of the "Future of Mobility" National Platform (NPM), the Federal Ministry of Transport implemented the goal enshrined in the coalition agreement: redesigning the existing national platform for electromobility (NPE), taking into account all alternative fuels and drive systems for transport and energy system transformation. To that end, six working groups were set up in addition to the steering committee consisting inter alia of representatives from industry and the federal ministries responsible (Fig. 4) (https://www.plattform-zukunft-mobilitaet.de/the-npm/?lang=en/). UFOP sees the working groups "Climate protection in transport" (WG 1) and "Alternative propulsion systems and fuels for sustainable mobility" (WG 2) as being particularly important. There was a lot of time pressure for all working groups meetings and preparation of the interim report.

UFOP has repeatedly pointed out in its press releases that the measures' effectiveness must be grounded in the climate protection objectives stipulated in the EU Effort Sharing Regulation or the draft Climate Protection Bill. That means it is hard to understand why no biofuel industry representatives were appointed to WG 1 or 2. Biofuels have been an outstanding regulatory element in European and national legislation for years. UFOP considers that the current 4 % GHG reduction obligation introduced in Germany, and 6 % from 2020, has a more targeted impact than a CO_2 tax (Fig. 5a). With phased increases of reduction obligations up to 16 % in 2030 (Fig. 5b) all "options" must be mobilised to avoid fines of EUR 470 per tonne of CO_2 The biofuel industry associations represented in the German Bioenergy Association (BBE) presented a concept to this end that substantiates in greater detail the coalition agreement statement on further developing the GHG reduction obligation.

Fig. 5b: BBE demand – increase in GHG reduction rate until 2030

	2020	2022	2024	2026	2028	2030
RES share in the transport sector	10 %	12 %	14 %	16 %	18 %	20 %
Corresponds to a GHG reduction rate (base year 2010)	-6 %	-8 %	-10 %	-12 %	-14 %	-16 %

Source: BBE

Despite all the clear advantages of biofuels, environmental associations' representatives in the NPM committees generally rejected inclusion of biofuels in measures developed and voted massively in favour of electromobility. UFOP criticized this blockade attitude. It would be absurd if Germany ended up going it alone here, as a result of the NPM's recommendations,while other Member States explicitly encompass biofuels within the framework of their national climate protection concepts for the transport sector. This was underlined by the agriculture ministers of the Visegrád states (Poland, Bulgaria, the Czech Republic, Slovakia and Hungary) in their statement to the EU Agriculture Council meeting in Brussels in April 2019. That is why the presidents and chairmen of biofuel industry associations, including UFOP and the German Farmers' Association, wrote to the Federal Ministers of Transport, Economic Affairs, the Environment and Agriculture, emphatically criticising the one-sided focus on e-mobility. Their letter recalled the restrictive regulations for proof of sustainability of feedstocks for biofuel production and the contribution already made to GHG reduction. It underlined that the focus should instead be on possible synergy effects if the growing role of electric mobility leads to increased use of alternative fuels in areas where it would be enormously challenging to switch to electric propulsion and would trigger substantial investment (infrastructure) and acquisition costs (heavy goods transport). It is also important to bear in mind that even if the 10 million electric vehicles optimistically assumed by WG 1 is achieved in 2030, a fleet of 40 million vehicles with internal combustion engines must also be taken into account in strategy development. Federal government estimates suggest 1 million electric vehicles will be registered by 2020; by 2018, new registrations hit the 36,000 mark, whereas 3.4 million vehicles with internal combustion engines were registered. That makes it logical to promote defossilisation of fuels for use in existing vehicle fleets as a mandatory prerequisite for meeting targets, in addition to electromobility. It is not about opting for either one alternative or another but about developing both. The President of the German Automotive Industry Association, Bernhard Mattes, also emphasised this in his speech at the 16th "Fuels of the Future" international conference in 2019. In response to the unsatisfactory discussion process in the NPM, more intensive cooperation was developed with mineral oil industry associations. In a joint statement, biofuel and mineral oil industries associations (MWV and UNITI) called for the potential of low-CO_2 fuels to be explored as actively as electromobility. Instead of focusing on just one drive technology, biofuels and synthetic fuels from renewable electricity (e-fuels) are equally important strategic elements to reach the targets set. Finally, there is also a need to take account of ever-increasing costs or the considerable tax resources needed to fund support measures financed (development of charging infrastructure, incentive to buy e-cars, loss of tax revenues, etc.). WG 1's interim report "Climate protection in transport" does not take account of biofuels from cultivated biomass, addressing only second-generation biofuels (from residues such as straw), combined with a mandate to WG 2 to present the potential contribution to climate protection targets. At this point, it is once again clear that the Federal Ministry of Agriculture still does not take a firm stand within the German government on the future of biofuels from cultivated biomass for the energy revolution in transport.

In this context, UFOP has repeatedly stressed, inter alia in a letter from UFOP Chairman Wolfgang Vogel to members of the relevant committees in the European Parliament, that securing biodiesel sales is a prerequisite for maintaining rapeseed cultivation at the current level. Rapeseed is grown on approximately 6.5 million hectares in the EU, of which approximately 4 million hectares are used for biodiesel production. Maintaining or further developing this market, along with recognition of the bridging function played by biofuels from cultivated biomass in conversion to low-GHG mobility, will be decisive in ensuring rapeseed cultivation continues to shape the European landscape when everything is in bloom in spring. This is the only way to ensure this will continue to be the most important non-GMO domestic protein source, replacing soya, which is increasingly criticised due to the virtual imports of cultivated land use associated with it. Politicians have not yet managed to link this sales market with the protein plan for Europe. These points are also relevant for European bioethanol production from cereals and sugar beet.

Palm Oil – Is the Problem "Solved"?

Politicians are finding it difficult to develop a holistic strategic approach to sustainable biofuels that can form the basis for a consensus. Palm oil in particular is the real "feedstock problem". In the biofuel statistics, feedstock prices, sometimes with a discrepancy of EUR 250 or more per tonne between rapeseed oil and palm oil, coupled with permanent high pressure on the world market, reveal the displacement effect. As a result of the very variable quality of market reporting, reliable data is not yet available. Fig. 6 shows data from the USDA-GAIN-Reports (NL8027) indicating that palm oil use in biodiesel and HVO plants amounts to about 2.4 million tonnes. An Ecofys study commissioned by the EU Commission's DG Energy in April 2019, on the other hand, shows total palm oil of 2.2 million tonnes (2016). The non-governmental organisation Transport & Environment quotes market reporting agency Oil World's figure of 3.5 million tonnes of biofuels from palm oil consumed in the EU in 2018. UFOP criticises the EU Commission's failure to date to develop and publish satisfactory and continuously updated official statistics. That makes legally sound quantification of indirect land use change impossible. This also includes what are known as feedstock-specific emission factors – iLUC factors – which are maintained in RED II for reporting purposes (see UFOP Report 2017/18, p. 46). Direct "cause and effect" links cannot be identified scientifically, not even through model calculations, as a range of results from various studies have confirmed. The varying quality of national reporting prompted the EU Commission to tighten up requirements in RED II. Member States are required to oblige companies in the biofuel supply chain to carry out qualified certifications or audits, as well as providing concrete information on the geographical origin of biomass imports for production of biofuels or imports of biofuel per se. There is an emphasis on the need for fraud-proof verification. With a view to creating greater transparency, the EU Commission explained in 2018 that all evidence along the supply chain must show the composition of GHG emissions. This is intended to ensure that the biofuel producer, as the last link in the supply chain, can also identify which GHG emissions occurred at the cultivation, feedstock processing and transport stages. The Nabisy system of the Federal Agency for Agriculture and Food (BLE) was adapted to reflect these documentation requirements in January 2019.

The BLE publishes an annual report which, in UFOP's view, complies with current and future requirements. In addition, a plausibility check is carried out, for example, concerning data on GHG reduction. If there is significant data divergence, a review may be arranged. These specific questions will be addressed at the sixth joint BBE/UFOP seminar on "Sustainability of biofuels and renewable electricity" to be held in Berlin on 14 November 2019.

Cultivated Biomass – EU Commission Regulates "Low and High iLUC" Risk

UFOP considers that the more stringent documentation requirements in RED II should also be seen in connection with the outcome of the trilogue procedure to resolve the palm oil problem. In spring 2017, the European Parliament adopted a resolution on banning palm oil, underlining the political will to ensure that biofuels from this feedstock should no longer be counted towards the transport sector's quota obligations in the Member States. The compromise expressed in the RED

Fig. 6: Use of feedstocks for biodiesel + renewable diesel (HVO) in the EU in 1,000 Mt

	2011	2012	2013	2014	2015	2016	2017	2018
Rapeseed oil	6,800	6,500	5,710	6,200	6,290	5,962	6,145	5,120
Used cooking oils (UCO)	690	760	1,150	1,890	2,370	2,595	2,843	2,735
Palm oil	980	1,540	2,340	2,240	2,300	2,300	2,452	2,260
Animal fats	340	350	420	920	1,000	792	795	770
Soybean oil	950	730	870	840	510	609	700	680
Sunflower oil	280	300	290	310	200	244	162	160
Other (pine oil, petroleum, fatty acid)	5	60	150	335	370	485	558	571

Source: USDA-GAIN report, NL 8027 / 03.07.2018

Fig. 7: Definition high-/low iLUC-risk

	Average annual expansion of production area since 2008 (in 1,000 ha)	Average annual expansion of production area since 2008 (in %)	Proportion of expansion to areas pursuant to Article 29(4)(b) and (c) of (EU) Directive 2018/2001	Proportion of expansion to areas pursuant to Article 29(4)(a) of (EU) Directive (EU) 2018/2001
Cereals				
Wheat	-263.4	-0.1 %	1 %	.
Maize	4,027.5	2.3 %	4 %	.
Sugar plants				
Sugar cane	299.8	1.2 %	5 %	.
Sugar beets	39.1	0.9 %	0.1 %	.
Oil plants				
Rapeseed	301.9	1.0 %	1 %	.
Oil palms	702.5	4.0 %	45 %	23 %
Soybeans	3,183.5	3.0 %	8 %	.
Sunflowers	127.3	0.5 %	1 %	.

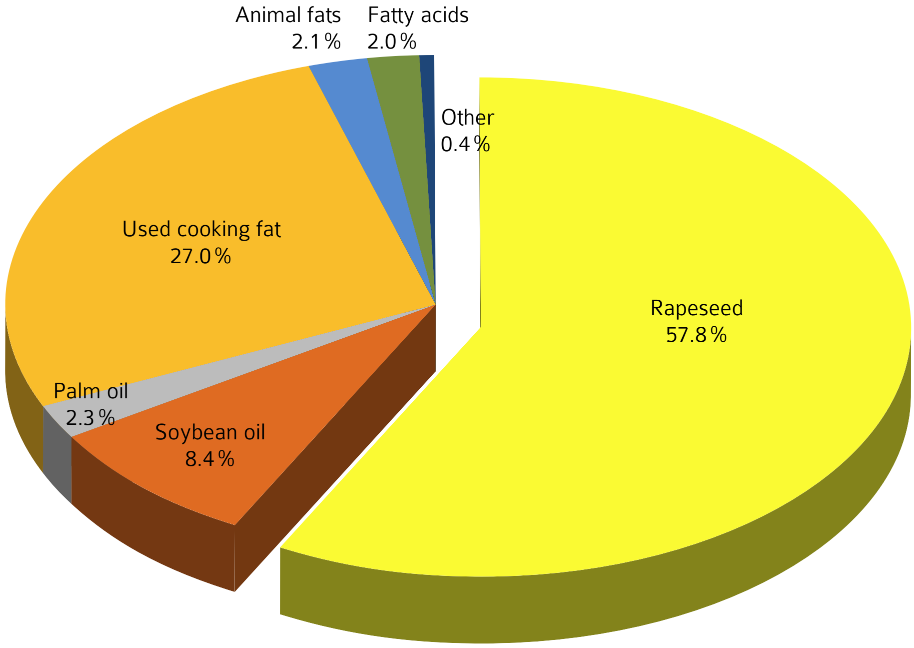
Source: Delegated Regulation (EU) 2019/807

II provisions (Art. 26) stipulates that biomass feedstocks or biofuels with a high risk of indirect land use changes (iLUC risk) are limited ("capped") until 2023 on the basis of volume consumed by each Member State in 2019. This baseline volume shall cease to apply from January 2024, and be fully phased out by the end of 2030 at the latest. In early 2019, the EU Commission presented a draft Delegated Regulation concerning a legal definition. Biomass feedstocks are to be classified as having a high iLUC risk if the area under cultivation for this feedstock has grown by over one percent per annum since 2008, with such increases in each case being more than 100,000 ha. At the same time, 10 % of this additional cultivation area expansion must have occurred on areas with high CO_2 storage capacity.

This definition is directed to primeval forest regions on peat bog sites in Indonesia. If these forests are cleared, enormous amounts of CO_2 are released when the rainforest is burnt but above all in subsequent years due to decomposition of soil carbon. The area under cultivation (10 %) was calculated for the crops listed in Fig. 7. Prior to this, the EU Commission carried out extensive research and public consultations, including review of relevant scientific literature, evaluation of GIS data (Geo-Information-System) and consultation of experts in several meetings. Fig. 6 confirms that only palm oil falls within the scope of the definition. Rapeseed oil is per se classified as a low-iLUC-risk feedstock. The draft Regulation underwent a consultation process involving UFOP and its members. Possible loopholes were criticised, for example the definition of small plantations of 2–5 ha, the proofs of ownership to be provided and the potential legalisation of cleared areas that might arise as well as ways in which the system might be circumvented on the ground, as reflected in a possibly sharp increase in the number of small plantations. In the final version of the Regulation, small plantations are defined as being 2 ha in size. UFOP welcomed this provision and repeatedly called on the biofuel and mineral oil industries to stop producing and using biofuels from palm oil in 2019. However, it will not be possible to determine how much of an impact this stance has had until the evaluation report to be submitted by BLE becomes available in autumn 2020.

France has demonstrated that biofuels from palm oil can be excluded from quota accounting immediately. This option is already envisaged for Member States in the iLUC guideline from 2015 (2015/1513/EU). It is also maintained in RED II. In early 2020, an ordinance will come into force in France that excludes biofuels from palm oil, but also excludes these biofuels from the mass balance systems of companies subject to obligatory caps. In UFOP's view, this means that the corresponding fuel volume must be exported if palm oil is processed. "Paper proof" will no longer be sufficient. In France, this particularly affects petroleum group Total. In July 2019, the company brought online a refinery at the La Mède site for production of HVO with a capacity of 500,000 tons per year. The proportion of palm oil was to be limited to a maximum of 300,000 tonnes. In 2018, the refinery and feedstocks concept led to demonstrations by the French Farmers' Association (FNSEA) at filling stations and refinery sites. Total subsequently agreed to process at least 50,000 tonnes of rapeseed oil from French crops per year too. UFOP called on the German government to exclude palm oil as soon as possible, following the French example, as capacity utilisation of the plants could possibly lead to displacement effects with a negative impact on markets in other Member States. Because of its "winter quality", HVO, like biodiesel from rapeseed oil, can be added to diesel blends all year round.

Fig. 8: Feedstock shares of biodiesel production in Germany in 2018 – 3.2 million t



Source: VDB 2019 | Estimate based on industry data

Biodiesel Market 2018 – Rapeseed Oil Remains the Most Important Feedstock

Fig. 8 shows the basic trend towards an altered composition of feedstocks for biodiesel production in the EU. With 5.1 million tonnes of biodiesel from rapeseed oil, rapeseed remains by far the most important feedstock.

However, this figure also reveals the changed production policy framework as well as the supply and price pressure on vegetable oil markets. As a result of double-counting of biofuels from waste oils and fats, legislation created a competitive advantage that drives biodiesel from rapeseed oil off the market, as has previously been the case with biofuels from palm oil (biodiesel/hydrogenated vegetable oil – HVO). Imports of palm oil methyl ester were de facto prevented from 2012 on as a result of the introduction of import duties. In the same period, however, import and use of palm oil in southern European biodiesel plants and in facilities producing HVO increased. From the point of view of European rapeseed producers, punitive tariffs on biodiesel imports were more or less ineffective. Against this background, UFOP expects that trade policy to reduce the share of palm oil in the EU market will have an impact and that the sales window for rapeseed oil will open up accordingly. Rapeseed oil prices are decisive drivers of the producer price, thus determining the economic attractiveness of rapeseed in crop planning. Germany enjoys an investment advantage as it has the largest processing capacity in the EU for rapeseed and biodiesel production, at just under 10 million tonnes and around 4 million tonnes respectively. The German biodiesel industry mainly uses rapeseed oil as a feedstock for biodiesel production. In 2018, 3.2 million tonnes of biodiesel were produced in Germany, of which approx. 1.8 million tonnes were made from rapeseed oil. (Fig. 8). This corresponds to an area under cultivation of about 1.3 million ha. Soya and palm oil play a comparatively small role as feedstocks in Germany; according to the German Biofuels Industry Association (VDB), animal fats, fatty acids and other feedstocks make up only 5 % of the total. Thanks to biodiesel, oil companies can meet their GHG reduction obligation. The Federal Office for Economic Affairs and Export Control (BAFA) notes that 2.3 million tonnes were used in 2018. The current 4 % reduction obligation will increase to 6 % from 2020. It is expected that this increase will lead to rising demand for rapeseed oil for biodiesel production, if biodiesel from palm oil is simultaneously limited EU-wide to 2019 levels. BAFA's data are published monthly in the "Market information" section of UFOP's website.

Germany is also an important import and export trading platform. In 2018, around 1.2 million tonnes of biodiesel were imported and just under 2 million tonnes exported. Exports in the 1st quarter of 2019 already amounted to approx. 0.6 million tonnes. These figures also underline Germany's position as the most important European location for biodiesel production and trade. The decisive factor when considering sales of biodiesel from rapeseed oil is total consumption of diesel fuel in the calendar year in question as the basis for calculating the GHG reduction obligation in accordance with statutory requirements and the offer price in relation to GHG reduction efficiency. Despite the increase in GHG efficiency of biofuels to an average of 81 % and the decline in diesel consumption, the share of biodiesel rose by 0.1 million tonnes compared with 2018 to approx. 2,320 million tonnes (Fig. 9). Blend share rose from 5.7 % to 6.2 %. At the time of going to print, no information was available on feedstock composition of the biofuel used for quota fulfilment, as BLE's evaluation report for the 2018 quota year will only be published in October 2019. UFOP assumes that biodiesel from waste oils will continue to dominate the market in 2018, followed by biodiesel from rapeseed oil. In this context, UFOP criticised the maintenance in RED II, of double counting of these biofuels towards the national target of 10 % (2020) and 14 % (2030) for the share of renewable energies in the transport sector, which leads to excessive support. As a result of these provisions, large quantities of used oils and fats are imported into the European Union from China, Indonesia, Malaysia and increasingly also from the USA. The NNFCC Biocentre study "Applications of Imported Used Cooking Oil (UCO) as a Biodiesel Feedstock" (05/2019) notes that approx. 0.5 million t. of feedstocks designated as waste oils were imported in 2018. These increasing imports run counter to the bio-economy principle of closing material cycles at the regional level.

Anti-subsidy Cases Against Argentina and Indonesia

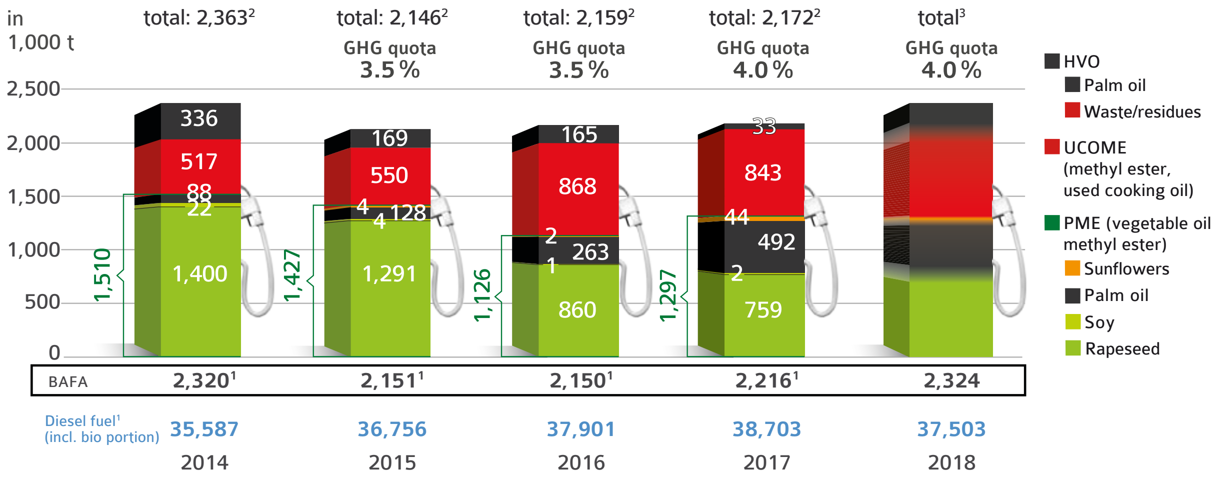
Argentina and Indonesia successfully lodged complaints with the WTO against EU anti-dumping provisions in 2017. At the start of 2018, the EU Commission initiated anti-subsidy proceedings, initially against Argentina and subsequently against Indonesia too (see UFOP Report 2017/18, p. 17). At the same time, existing customs duties were withdrawn and the EU Commission opted not to introduce retroactive punitive duties in the current proceedings. The President of the European Oilseed Alliance (EOA), Arnaud Rousseau, commented on the EU Commission's attitude in view of the resulting marked rise in biodiesel imports: "European farmers are once again being held hostage". On 30th January 2019, the EU Trade Defence Committee (TDC) voted to impose company-specific countervailing duties (25 % to 33.4 %) and a pricing agreement (minimum import price MIP). Members of the Argentine Chamber of Biofuel Producers (CARBIO) were authorised to export a maximum of 1.2 million tonnes of biodiesel duty-free to the EU each year. In order to avoid market distortions arising from export peaks, no more than 37 % of this annual volume (around 0.44 million tonnes) may be traded in any quarter. The MIP is calculated quarterly in advance on the basis of the average monthly soybean oil prices published by the Argentinian Ministry of Agriculture. For example, the average soybean oil price for the 2nd quarter (Apr – Jun) would correspond to the average price for the preceding December, January and February. Fig. 10 illustrates the greater importance now assumed by these biodiesel imports from Argentina. UFOP considers that the EU Commission's simultaneous negotiations to conclude a free trade agreement with the Mercosur states explains why a rapid agreement was reached at the expense of the European biodiesel industry. The soy sector is economically important in Argentina and thus significant for the national budget.

The anti-dumping proceedings against Indonesia are also on the home straight. At the end of July 2019, the EU Commission decided on provisional company-specific duties of between 8 % and 18 % as part of the ongoing investigation procedure. UFOP welcomed the decision, but questioned its effectiveness in avoiding imports. There are grounds to fear that the compromise reached with Argentina will serve as a blueprint in the proceedings against Indonesia. It is ultimately the European Union that has approached members of the ASEAN group seeking to conclude a free trade agreement. In order to further increase pressure to negotiate, the governments of Malaysia and Indonesia have announced that they will bring legal action before the WTO against the RED II provisions on excluding biofuels from palm oil.

Palm oil is only part of the problem for the EU biofuel market.

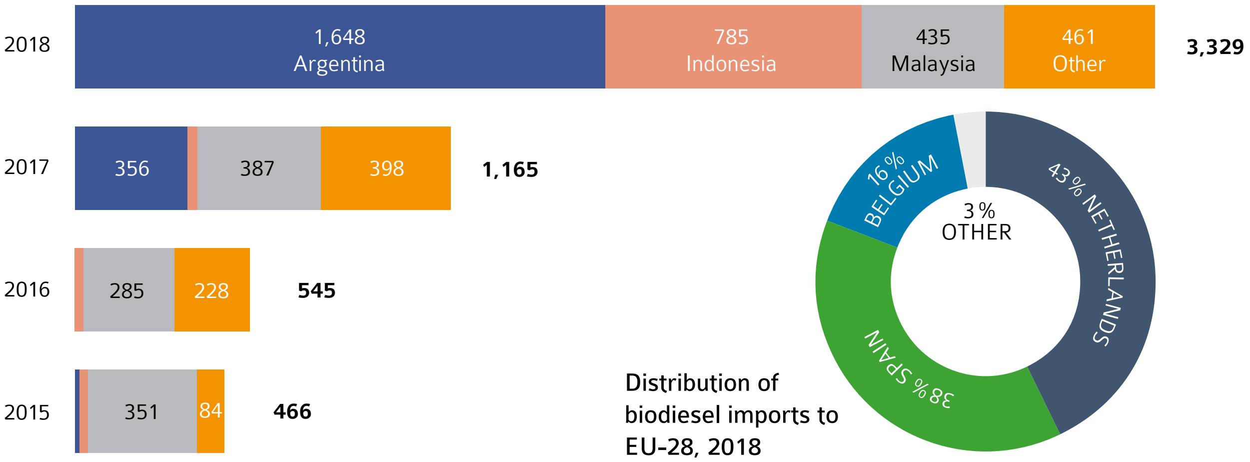
Fig. 9: Sales development of biodiesel in Germany | Feedstock composition | Diesel consumption

Domestic consumption 2014–2018[1] | Counted towards quota[2]



Sources: [1]BAFA, [2]BLE, [3]BLE evaluation report 2018 expected for October 2019

Fig. 10: EU biodiesel imports, also from ARG/IND in million t



Sources: Eurostat, AMI

These import volumes threaten continued rapeseed cultivation for biodiesel production at the current level. The associated price pressure is also caused by Member States' introduction of capping limits for biofuels from cultivated biomass below 7 %; the quantity of biodiesel blended with diesel (B7/EN 590) is in any case limited to a maximum 7 % by volume. Under this "technical cap", biodiesel from cultivated biomass competes with biodiesel from waste oils. The sales valve urgently needs to be opened wider. Biodiesel manufacturers and their associations must now participate intensively in discussing and implementing national climate protection measures to help develop a national fuel strategy, with a view to being able to market diesel as B 30, e.g. for heavy goods traffic. A European fuel standard has been in place for this blend for some time. In most EU Member States, which must attain less ambitious climate protection targets by 2030 than Germany, biofuels are to date the only alternative for GHG reduction in the transport sector.

If biofuels over-fulfil the national climate protection obligation, any surplus can be sold as emission rights.

Biofuels in Agriculture and Forestry – Approval Procedures in Limbo

During the reporting period, UFOP maintained its efforts to ensure continued state aid authorisation for tax benefits related to use of biofuels in agriculture and forestry. UFOP and some of its members participated in the consultation procedure initiated by the EU Commission on the previous guidelines on state aid for environmental protection and energy. A particular point of criticism of the previous guidelines is that biofuels from cultivated biomass are explicitly excluded from tax incentives from 2020. The backdrop to this is full refund of the energy tax (EUR 0.45 per litre) through the refund procedure for agricultural diesel. UFOP repeatedly emphasized that this "isolation" of cultivated biomass contradicted the notion of a closed cycle in bio-economics. Material use of renewable feedstocks from cultivated biomass would also – in keeping with the EU Commission's logic – have to be subsidised, e.g. through a utilisation requirement in regulatory law (biolubricants) or as a condition in public calls for tender.

The iLUC regulation gives domestic biomass cultivation a fair chance as rapeseed is not a feedstock with an iLUC risk. Rapeseed oil fuel or rapeseed oil methyl ester for use in agriculture pose no risk of rainforest deforestation. On the contrary: non-GMO protein feed produced during feedstock processing in German/European oil mills compensates for virtual import of cultivated areas for soy from South America. Given the difficult situation on agricultural markets too, UFOP feels there is a lack of a balanced promotion and market policy, which would ultimately also benefit income generation for agriculture in the EU. As agriculture has a sector-specific contribution to make in cutting GHG emissions, this option should also be utilised. Federal Minister of Agriculture Klöckner was therefore asked to advocate vis-à-vis the Commission that the state aid authorisation be maintained.


H415

Expert Commission on Biofuels and Renewable Feedstocks

At the start of the expert commission meeting on 19th June 2019, Dieter Bockey, UFOP, explained the current status of European and national biofuel policy. The focus was on the EU Commission Delegated Regulation addressing the "palm oil issue". This Regulation defines biofuels made from feedstocks that constitute a low or high risk of triggering land use changes (iLUC), as well as ambitious certification requirements for low-risk iLUC biofuels. Criticism from the Indonesian and Malaysian governments, coupled with threats to cease purchases of passenger aircraft from the EU, soon emerged. Furthermore, relations with Indonesia are burdened by an ongoing anti-dumping case. However, the anti-dumping proceedings between the EU and Argentina have been concluded. As a result, Argentinian biodiesel producers may export about 1.2 million tonnes of soybean methyl ester duty-free to the EU each year. However, a minimum price may not be undercut. Quantities in excess of this amount are subject to an import duty of between 25.0 % and 33.4 %. UFOP fears that this negotiation result could serve as a "blueprint" for negotiations with Indonesia.

In addition, debate focused on the draft Climate Protection Bill presented by Federal Environment Minister Svenja Schulze. It provides for sector-specific greenhouse gas (GHG) emission levels that will decrease annually from 2021. Exceeding these levels would mean that emission rights would have to be purchased, using tax revenues, from other Member States. UFOP notes that the climate protection targets are thus having a price effect for the first time, as the level of tax expenditure will also depend on the prices of the emission certificates. UFOP considers the budget estimate of EUR 100 million set by Federal Finance Minister Olaf Scholz for financial years 2021–2023 to be completely inadequate. Consequently, the question of counter-financing from the federal budget or from the budgets of those ministries responsible for sectors with surplus emissions arises. A study by DIW ECON GmbH, the consulting company of the German Institute for Economic Research (DIW), shows the "savings effect" for the federal budget that will be achieved from 2021 with the GHG savings achieved through biofuels today. Members of the expert commission critically discussed the challenges of introduction of CO_2 fleet limits for passenger cars and light and heavy commercial vehicles. The associated fines will be payable by vehicle manufacturers, as a function of the fleet composition in each case. This pushes stakeholders to switch to e-mobility, with the enormous effort and high corporate risk this entails, although defossilisation of fuels in existing vehicle fleets would meet with greater acceptance from operators – especially in heavy goods transport. UFOP therefore calls for a balanced strategy for conversion to new engines and renewable and sustainable alternative fuels. Using fuel blends with higher proportions of biodiesel (B 20 / B 30) is one option that could already be implemented today to avoid fines, provided that the renewable fuel content could be offset against CO_2 fleet limits. The automotive industry also advocates this approach, but solely for synthetic renewable fuels. UFOP questions whether the quantities required will be available for the 2021 to 2030 commitment period.

E-Fuels – Status Quo, Opportunities and Challenges

Tobias Block, German Association of the Automotive Industry (VDA), put this challenge at the centre of his presentation and explained the ambitious CO_2 reduction targets for the transport sector up to 2050. In view of these challenges, the automobile industry advocates a technology mix rather than focusing the transformation process exclusively on electric drives. Renewable fuels from renewable electricity are a forward-looking option, especially for regions with the right natural conditions to generate electricity from wind and sun. Data from German institutes and studies conducted throughout Europe unanimously demonstrate degressive costs or the cost benefits of various scenarios with electrically generated fuels (Power-to-X / PtX). Openness to new technologies will provide the only viable response to an upsurge in traffic volumes and the parallel issue of the efficiency of combustion engines and electric drives, now reaching their limits. Studies show that by 2030 – despite a comprehensive switch to e-mobility – there will still be a GHG reduction shortfall of 25 million t CO_2 equivalent, which will be made up by biofuels and e-fuels. However, VDA takes the view that the supply of commercially available, sustainable biofuels from cultivated biomass has been exhausted. On the other hand, biofuels from residual materials (e.g. straw) still seem to offer some potential, provided that they are produced in compliance with sustainability requirements. In contrast, the potential of electricity-based fuels (liquid, gaseous, including hydrogen) is enormous as, in addition to domestic production, they can also be imported from preferential areas. Mr. Block addressed various production paths and called into question the critical discussion on the efficiency of electricity use (electric direct drive vs. hydrogen/fuel cell or e-fuels), asking if this discussion is really helpful. He noted that CO_2 avoidance costs should instead play a decisive role in determining the future strategic policy orientation and ensuring acceptance. VDA therefore welcomes the German government's initiative to support the technological development in German companies producing e-fuel to the tune of c. EUR 400 million. In principle, these technologies have reached market maturity; the issue now is to support capacity development too. Mr. Block gave a critical appraisal of the EU legal framework conditions for CO_2 regulation in the transport sector, critiquing the decision not to authorise offsetting of e-fuels against CO_2 fleet limits after 2020. The EU Commission should therefore take this option into account in the review procedure scheduled for 2023 for passenger cars and light and heavy commercial vehicles. A concept for proposed crediting of e-fuels, based on legal provisions in Switzerland, was presented. Further raising fossil fuel prices in future, along with simultaneous cost reduction effects in e-fuel production, would nevertheless require reliable political framework conditions as a prerequisite for investment security, such as introduction of a minimum quota in the light of changes in GHG quota provisions.

NPM – Suggestions, Consequences and Action Needed

These topics and questions were addressed by the expert groups of the " Future of Mobility National Platform" (NPM) set up by the Federal Ministry of Transport (BMVI). Prof. Dr. Christian Küchen, German Petroleum Industry Association (MWV), presented the NPM's structure, in particular the composition of WG 1 (climate protection in transport) and its tasks. Basic task: closing the "CO_2 gap" in the transport sector. The NPM has defined six fields of action to this end, including drive switching and increased efficiency in private cars and trucks, as well as renewable fuels. Differing views adopted by environmental associations and institutions on measures to achieve GHG reduction proved problematic and time consuming. Conflict potential is reflected in particular in environmental associations' demands for complete transformation of the mobility system (traffic turnaround), with simultaneous conversion to electric propulsion for all means of transport (including heavy goods vehicles) and a rejection of biofuels on principle. In contrast, business representatives and the vehicle industry advocated step-by-step change and greater diversity, which, in addition to electrification, would take account of the need for a growing proportion of renewable fuels for the large vehicle fleet with internal combustion engines that will still be in operation in 2030. To ensure acceptance of measures, the pace of transformation must be geared to the resilience of the economy and society. Prof. Küchen points to study results demonstrating that all available options must be used to achieve the 40 % climate protection target: in addition to electric mobility, not only maintaining but gradually increasing the proportion of sustainable commercially available biofuels and synthetic fuels (around 6–8 million tonnes or 15–20 %) in the vehicle fleet. The interim report from NPM WG 1 even shows demand of 6–11 million tonnes of biofuels/PtX fuels. The BMVI has announced measures to support hydrogen production (EUR 2 billion from 2021) and promote research and investment in production facilities for progressive biofuels. When it comes to freight transport, the BMVI intends to increase federal funding for implementation of infrastructure measures (rail freight transport) and inland waterway transport (modernisation). For cars and commercial vehicles, however, the ministry is also relying on the GHG reduction effect that it is hoped will set in from 2021 as a result of CO_2 fleet regulation. Furthermore, there are plans to continue and increase the state purchasing premium for electric vehicles, to improve tax incentives for climate-friendly company cars and to inject an additional EUR 1 billion in the short term to help drive expansion of charging infrastructure. Prof. Küchen responded to the argument of comparatively high costs for e-fuels by pointing out that the final fuel price will show only a moderate increase if the share of biofuels added to blends is increased gradually. This would be more justifiable in terms of consumer acceptance than introducing an additional CO_2 tax on fossil fuels, another idea also currently up for discussion. Prof. Küchen pointed out that federal tax revenues from road traffic are essentially based on the energy tax plus pro-rata value added tax (double taxation), which is about EUR 40 billion per year or roughly 10 % of the federal budget. The issue of compensation for loss of tax revenue would inevitably arise if e-mobility were introduced as the sole option as proposed by environmental associations. MWV advocates a balanced funding framework that includes promotion of renewable synthetic fuels.

The committee members were informed about the status of the following projects funded by UFOP:

Ongoing UFOP Projects

Fuels for Plug-in Hybrid Electric Vehicles (PHEV)

Project Support:

Oel-Waerme-Institut GmbH, Kaiserstraße 100, 52134 Herzogen-Rath, Germany
Automotive Technology Centre,Coburg University of Applied Sciences and Arts(TAC),
Friedrich-Streib-Straße 2, 96450 Coburg, Germany

Runtime:

May 2017 to December 2018

As a result of ever more stringent climate protection obligations for the transport sector as part of the decarbonisation strategy, drives are also set to adapt in parallel. Legislation on CO_2 reduction per kilometre obliges vehicle manufacturers to move towards increasing electrification combined with the combustion engine, with a view to securing the current overall range as far as possible. The combustion engine therefore remains indispensable for the time being. The ambitious CO_2 reduction target of 95 g CO_2 per kilometre, to be implemented from 2020, will accelerate the market launch process for hybrid vehicles and change vehicle owners' utilisation behaviour to a greater or lesser degree in terms of preferred use of the electric or fuel motor drive. This will also alter refuelling patterns, thus impinging on the service life of fuels in vehicle tanks. Such fuels are however not homogeneous blends, but include a range of fossil components, depending on the origin of the crude oil, and varying proportions of biofuels, such as biodiesel and/or hydrogenated vegetable oil (HVO). Hybridization and the associated steady increases in electrical range and the consequently longer service life of fuel in tank leads to interactions and ageing processes that can be influenced by biodiesel as an oxygen carrier.

This project addresses that question. The project aims to investigate ageing behaviour corresponding to assumed tank behaviour within the framework of a representative EU fuel matrix for Germany and the EU. As well as focusing on chemical ageing processes, it examines interactions with fuel-carrying components.

The project will be supplemented by a further fuel matrix, which envisages only rapeseed oil methyl ester (RME) as a blend component.

Development of an On-board Sensor System for Early Detection of Deposits in Biodiesel-containing Fuels

Project Support:
Coburg University of Applied Sciences and Arts,
Friedrich-Streib-Str. 2, 96450 Coburg, Germany

Runtime:
November 2016 to October 2019

Fuel ageing is particularly important against the background of market launch of plug-in hybrid vehicles. Due to predominantly electrical operation, the tank service life of fuels will be considerably extended. This may lead to the formation of undesirable ageing products. It seems likely that the spotlight will be turned on biofuels as the cause of negative interaction effects, even if this is only partly justifiable. Intensive, pro-active studies will be needed to identify complex effects in this field. The project aims to develop an on-board sensor that averts misfuelling, as well as being particularly useful in conjunction with engine management to ensure that the EURO VI emissions standard can be met with B7 or different blend proportions of biodiesel and diesel fuel. In addition, the option of onboard determination of fuel ageing ensures that, if necessary, a signal can indicate that fuel must be used or exchanged. In this scenario, the combustion engine would be initiated to consume the aging fuel.

SAVEbio – Strategies to Prevent Deposits at Injection Nozzles in Multi-fuel Use of Biogenic Fuels

Project Support:
Oel-Waerme-Institut GmbH (project coordinator), Kaiserstraße 100, 52134 Herzogenrath, Technology and Production Centre in the Competence Centre for Renewable Resources (TFZ), Schulgasse 18, 94315 Straubing, Germany

Runtime:
October 2016 to March 2019

This comprehensive collaborative project addresses deposition of vegetable oil fuels in modern common rail engines. Rising injection pressures, the demand for lower fuel consumption and optimised combustion behaviour by means of multiple injection are increasingly reducing tolerance ranges in injection systems, particularly with regard to the injectors. Even the slightest deposits can lead to considerable coking effects, reduced performance and higher exhaust emissions. At TFZ, the test bench tests are carried out with tractors. The injectors are removed from the injection nozzles after the endurance runs and inspected. These results are in turn compared with test bench runs (ENIAK) at the OWI Institute to evaluate deposit formation. At the OWI test bench, the requisite test-bench runs (injection pressures, temperatures etc.) can be simulated. However, real test runs are required to compare results. The causes of deposit formation can be traced and individual influencing parameters can be changed on the ENIAK test bench to determine the cause. This makes it possible to compare the actual deposits on the test bench with the simulation. As a result, it is also possible to investigate deposit formation at certain critical operating points and develop reduction strategies.

Furthermore, in cooperation with additive manufacturer ERC, causes of deposition effects will be investigated and additive concepts developed to avoid these.

Multi-fuel Tractor Level V ("MuSt5-Trak")

Project Support:
JOHN DEERE GmbH & Co. KG
John-Deere-Str. 70, 68163 Mannheim, Germany

Runtime:
March 2018 to February 2021

As part of this project, an engine model is to be developed and applied in order to support and optimize the realization of a safe fuel recognition system and automated specific engine adjustment for various vegetable oil and diesel fuels and/or their blends. Fuel recognition and automated engine adjustment are to be implemented using existing sensors for the engine, exhaust aftertreatment system or other vehicle sensors (exhaust gas temperature, injection quantity, etc.), working on a real tractor, with functionality validated under real operating conditions. During the development work, fuel detection is carried out redundantly and further fuel sensors are installed. The investigations aim to ascertain whether sufficiently reliable fuel detection can be achieved even without these additional sensors. In addition, fuel consumption is to be further reduced, engine oil change intervals extended, the limit for cold starts lowered to –20 °C and the exhaust aftertreatment system optimized with regard to emission reduction and costs. The results of the project are to be brought to the attention of the relevant German and European standardization committees.

Biodiesel as an Integral Component of Future Diesel Fuels: the example of OME

Project support:
Coburg University of Applied Sciences and Arts,
Friedrich-Streib-Str. 2, 96450 Coburg, Germany

Runtime:
December 2018 to September 2019

This project aims to test use of RME as a solubilizer in blends of paraffinic fuels obtained by Fischer-Tropsch synthesis (FT) and oxymethylene ether (OME) and at the same time to obtain an estimate of the ageing behaviour of these fuels as biodiesel blends.

Should RME prove to be a suitable solubilizer, it would be possible for it to become established as an essential technical component in an ideal power-to-liquid (PtL) fuel blend.

That would offer a way to improve RME's competitiveness.

Projects Completed during the Reporting Period

Research fellowship for "Investigations into sludge formation in engine oil when using biogenic fuels"

Project support:
Hochschule für angewandte Wissenschaften Coburg, Friedrich-Streib-Str. 2, 96450 Coburg

Runtime:
September 2013 to February 2019

The influence on polymerisation effects of engine oil and its composition in combination with biodiesel input and its ageing products (oxygen content in biodiesel) was investigated under the aegis of this scholarship. An extensive study of the literature study was conducted and the effects of biodiesel were investigated on the basis of model substances. The study succeeded tor the first time in analytic identification of the reaction products thus obtained: this demonstrated that along with biodiesel, compounds from the engine oil or components of the diesel fuel that may also enter the engine oil lead to oil sludge formation processes. The molecular structure of large masses can be determined with liquid chromatography quadropole time-of-flight mass spectrometry (LC-QTOF-MS) coupling. Further investigations of the substances present with this measuring instrument focused on determining the molecular structure, which provides insight into the composition of the polymerised molecules and their "origin" – biodiesel, engine oil or diesel fuel. The final project report can be downloaded free of charge at www.ufop.de.

final report

Tabular annex

Biofuels

Biofuel mandates

Tables of the German Federal Office for Agriculture and Food

Legend/explanation of symbols in the tables:

–	nothing or less than one unit
.	no information available until editorial deadline
0	less than half of 1 in the final digit shown, but more than nothing
/	no information, since the numeric value is not reliable enough
()	Numeric value statistically relatively unreliable

Biofuels

Tab. 1: Germany: Development of fuel consumption since 1990

Year	Biodiesel[1)]	Vegetable oil	Bioethanol	Total renewable fuel supply
				Data in 1,000 tonnes
1990	0	0	0	**0**
1995	35	5	0	**40**
2000	250	16	0	**266**
2001	350	20	0	**370**
2002	550	24	0	**574**
2003	800	28	0	**828**
2004	1,017	33	65	**1,115**
2005	1,800	196	238	**2,234**
2006	2,817	711	512	**4,040**
2007	3,318	838	460	**4,616**
2008	2,695	401	625	**3,721**
2009	2,431	100	892	**3,423**
2010	2,529	61	1,165	**3,755**
2011	2,426	20	1,233	**3,679**
2012	2,479	25	1,249	**3,753**
2013	2,213	1	1,208	**3,422**
2014	2,363	6	1,229	**3,598**
2015	2,149	2	1,173	**3,324**
2016	2,154	3	1,175	**3,332**
2017	2,216	0	1,156	**3,372**
2018	2,324	0	1,187	**3,511**

Sources: BAFA, BLE
[1)] as of 2012 incl. HVO

Tab. 2: Germany: Domestic consumption of biofuels 2013 – 2018 in 1,000 t

	2013	2014	2015	2016	2017	2018
Biodiesel admixture	2,181.4	2,310.5	2,144.9	2,150.3	2,215.9	2,324.4
Biodiesel pure fuel	30.1	4.9	3.5	.	.	.
Total biodiesel	**2,211.5**	**2,315.4**	**2,144.9**	**2,150.3**	**2,215.9**	**2,324.4**
Vegetable oil	1.2	5.5	2.0	3.6	.	.
Total biodiesel & veg oil	**2,212.8**	**2,320.9**	**2,150.3**	**2,153.9**	**2,215.9**	**2,324.4**
Diesel fuel	34,840.4	35,587.1	36,756.4	35,751.0	36,486.7	35,179.1
Share of admixture in %	6.3	6.5	5.8	5.7	5.7	6.2
Total fuels	**34,871.8**	**35,597.5**	**36,761.8**	**35,754.6**	**38,702.5**	**37,503.4**
Bioethanol ETBE	154.5	138.8	119.2	128.8	111.4	109.9
Bioethanol admixture	1,040.5	1,082.0	1,054.2	1,046.7	1,045.1	1,078.7
Bioethanol E 85	13.6	10.2	6.7	.	.	.
Total bioethanol	**1,208.6**	**1,231.0**	**1,174.5**	**1,175.4**	**1,156.5**	**1,188.7**
Petroleum fuels	18,422.3	18,526.6	17,057.0	17,062.3	17,139.5	16,843.2
Petroleum + bioethanol fuels	18,433.5	18,535.1	18,230.4	18,237.7	18,296.0	18,031.9
Share of bioethanol in %	6.6	6.6	6.9	6.4	6.3	6.6

Sources: German Federal Office of Economics and Export Control, AMI

Tab. 3: Germany: Monthly domestic consumption of biofuels 2013 – 2018 in 1,000 t

	2013	2014	2015	2016	2017	2018
Biodiesel admixture						
January	146.27	167.03	159.92	174.56	160.22	182.81
February	156.15	172.77	173.73	167.74	134.45	176.12
March	183.56	176.93	188.86	194.59	206.45	203.28
April	156.84	198.67	190.02	191.14	174.91	197.76
May	191.17	216.23	204.96	184.26	178.44	204.94
June	189.65	187.11	191.21	203.36	190.17	197.08
July	189.72	207.78	190.25	194.50	205.92	225.16
August	210.23	211.41	185.33	186.81	207.11	211.31
September	192.94	189.59	165.14	172.73	200.18	190.12
October	193.40	190.92	159.41	159.06	189.94	184.91
November	187.05	200.01	167.24	160.88	193.99	173.44
December	184.43	192.06	168.83	160.68	174.14	177.17
Average	**181.78**	**192.54**	**178.74**	**179.19**	**184.66**	**193.67**
Total volume	**2,181.41**	**2,310.48**	**2,144.90**	**2,150.29**	**2,215.90**	**2,324.08**
Biodiesel pure fuel						
January	7.19	0.17	.	.	.	.
February	3.01	0.23	.	.	.	.
March	9.24	0.15	.	.	.	.
April	1.40	0.20	.	.	.	.
May	2.37	0.25	.	.	.	.
June	0.60	0.45	.	.	.	.
July	-1.58	0.40	.	.	.	.
August	1.51	0.49	.	.	.	.
September	1.43	1.29	.	.	.	.
October	2.41	0.41	.	.	.	.
November	2.27	-0.43	.	.	.	.
December	0.29	1.28	.	.	.	.
Average	**2.51**	**0.41**	.	.	.	.
Total volume	**30.13**	**4.89**	.	.	.	.
Total biodiesel						
January	153.46	167.20	159.92	174.56	160.22	182.81
February	159.16	173.00	173.73	167.74	134.45	176.12
March	192.80	177.07	188.86	194.59	206.45	203.28
April	158.24	198.88	190.02	191.14	174.91	197.76
May	193.54	216.48	204.96	184.26	178.44	204.94
June	190.25	187.56	191.21	203.36	190.17	197.08
July	188.15	208.18	190.25	194.50	205.92	225.16
August	211.74	211.90	185.33	186.81	207.11	211.31
September	194.37	190.87	165.14	172.73	200.18	190.12
October	195.81	191.33	159.41	159.06	189.94	184.91
November	189.32	199.58	167.24	160.88	193.99	173.44
December	184.71	193.33	168.83	160.68	174.14	177.17
Average	**184.30**	**192.95**	**178.74**	**179.19**	**184.66**	**193.67**
Total volume	**2,211.55**	**2,315.38**	**2,144.90**	**2,150.29**	**2,215.90**	**2,324.08**

continued on Page 28

	2013	2014	2015	2016	2017	2018*
Vegetable oil						
January	0.07	0.06	0.03	0.09	.	.
February	0.02	0.12	0.01	0.00	.	.
March	0.06	0.12	0.11	2.55	.	.
April	0.10	-0.18	0.11	0.00	.	.
May	0.14	0.12	0.08	0.84	.	.
June	0.08	2.04	0.06	0.10	.	.
July	0.12	0.15	0.09	0.09	.	.
August	0.13	0.19	0.13	0.13	.	.
September	0.14	2.43	1.09	0.10	.	.
October	0.17	0.20	0.15	0.00	.	.
November	0.12	0.16	0.10	0.04	.	.
December	0.07	0.11	0.02	0.00	.	.
Average	**0.10**	**0.46**	**0.16**	**0.33**	**.**	**.**
Total volume	**1.21**	**5.53**	**1.97**	**3.94**	**.**	**.**
Bioethanol						
January	92.82	94.99	78.98	93.38	88.22	104.92
February	80.65	83.84	85.04	80.02	77.26	88.50
March	99.73	86.36	90.78	89.75	90.33	98.15
April	98.98	107.83	98.76	90.30	99.86	96.61
May	108.11	114.48	108.24	98.41	105.50	106.85
June	110.36	96.42	100.65	107.85	95.47	103.01
July	111.92	110.17	107.01	112.06	106.32	104.91
August	103.73	117.60	109.16	103.16	102.98	109.72
September	101.06	99.66	99.39	96.38	96.11	92.64
October	108.73	98.00	99.15	101.30	102.59	95.94
November	97.95	98.20	94.53	99.65	91.55	93.70
December	94.54	121.75	101.78	103.20	100.33	94.75
Average	**100.72**	**102.44**	**97.79**	**97.95**	**96.38**	**99.14**
Total volume	**1,208.58**	**1,229.29**	**1,173.48**	**1,175.45**	**1,156.52**	**1,189.72**

Note: Data for 2018 provisional
Sources: German Federal Office of Economics and Export Control, AMI

Tab. 4: Germany: Foreign trade with biodiesel 2013 – 2018 in t

	2013	2014	2015	2016	2017	2018
Biodiesel import						
January	24,087	17,431	43,895	48,778	43,930	85,583
February	18,576	19,252	27,362	61,229	45,251	78,456
March	26,276	31,719	32,017	78,121	58,354	115,706
April	50,057	43,875	50,179	105,342	67,174	116,581
May	62,616	49,385	54,036	66,152	69,232	138,737
June	60,835	56,013	58,882	61,900	57,016	130,556
July	78,429	81,779	57,543	75,016	78,880	121,159
August	73,280	74,013	48,775	60,430	80,471	92,421
September	49,626	58,514	38,478	74,432	75,286	127,237
October	40,602	40,081	28,195	50,256	82,373	79,313
November	42,430	52,173	35,383	40,634	70,296	55,765
December	31,740	59,742	46,227	34,433	59,883	75,638
Total	**558,553**	**583,977**	**520,972**	**756,722**	**788,145**	**1,217,150**
Biodiesel export						
January	116,281	150,584	139,212	86,117	113,367	141,099
February	80,558	128,301	100,653	105,759	121,281	152,680
March	134,784	143,442	89,716	103,757	101,721	143,594
April	92,598	112,718	134,858	102,930	152,217	172,016
May	116,369	105,689	127,422	138,783	137,679	114,488
June	122,473	157,472	120,061	121,659	148,797	162,563
July	152,273	145,959	137,746	135,787	114,460	144,578
August	185,278	162,282	116,958	130,781	127,871	191,730
September	159,922	169,149	134,234	118,485	155,532	173,519
October	144,816	164,607	141,910	178,807	165,812	181,676
November	158,488	163,970	124,179	180,361	120,172	170,864
December	135,309	109,276	124,996	139,180	149,643	176,551
Total	**1,599,154**	**1,713,449**	**1,491,944**	**1,542,406**	**1,608,550**	**1,925,356**

Note: Data for 2017 provisional
Sources: German Federal Office of Economics and Export Control, AMI

Tab. 5: Germany: Export of biodiesel [FAME] in t (2013 – 2018)

	2013	2014	2015	2016	2017	2018
Belgium	78,995	117,930	120,899	89,366	84,487	132,413
Bulgaria	6,101	366	981	1	1	1
Denmark	16,120	29,146	39,953	43,271	88,317	39,511
Estonia	0				24	
Finland	19,562	8,729	855	8,512	12,734	9,156
France	92,078	221,641	182,315	85,006	76,339	64,943
Greece	389	808	25	6	2	3
United Kingdom	92,994	68,243	29,623	12,581	40,016	50,581
Ireland	18	14	2,225	886		
Italy	63,920	77,297	44,221	12,954	11,698	5,410
Croatia	0					
Latvia	2	5	143			52
Lithuania	5,704	76	769	407	1,198	658
Luxembourg	13		0		0	308
Malta	1		43			
Netherlands	502,476	600,089	419,613	588,598	583,289	648,581
Austria	149,295	107,803	134,615	71,627	97,500	185,335
Poland	176,255	163,724	125,453	229,517	236,404	242,008
Portugal	0	0	0		9	8
Romania	3,954	1,925	0	11,912	0	0
Sweden	24,025	55,829	111,136	60,176	73,089	138,524
Slovakia	3,180	10,376	155	939	5,595	12,486
Slovenia	1,410	201	1,530	165	1,651	14,988
Spain	32,145	49,312	7,799	30,865	33,388	274
Czech Republic	47,018	60,411	120,092	98,446	88,212	61,155
Hungary	55,467	25,637	7,664	56	3,488	4,902
Cyprus	13,540	15,796	81			
EU-28	**1,384,664**	**1,615,358**	**1,350,189**	**1,345,289**	**1,437,439**	**1,611,298**
USA	180,200	8,544	10,870	84,953	70,091	197,412
Norway	28,378	76,525	110,020	65,277	29,976	18,035
Other countries	5,912	13,022	20,865	46,887	71,044	98,611
Gesamt	**1,599,154**	**1,713,449**	**1,491,944**	**1,542,406**	**1,608,550**	**1,925,356**

Note: Data for 2018 provisional
Sources: Federal Statistics Office of Germany, AMI

Tab. 6: Germany: Import of biodiesel [FAME] in t (2013–2018)

	2013	2014	2015	2016	2017	2018
Belgium	129,453	48,852	82,412	101,252	136,199	236,149
Bulgaria	-	-	-	3,664	20,388	33,142
Denmark	699	-	29	217	3,599	532
France	639	7,826	22,446	8,774	14,283	9,661
United Kingdom	3,470	1,845	942	954	608	709
Italy	157	20,643	15,776	-	3,003	827
Lithuania	-	-	-	-	-	536
Netherlands	338,887	315,859	132,452	286,324	300,959	618,523
Austria	26,608	41,371	60,225	95,174	92,837	90,538
Poland	47,683	34,472	64,119	93,602	70,498	88,955
Sweden	38	0	277	168	140	1
Slovakia	-	682	1,096	15,604	6,549	959
Slovenia	156	-	76	1,190	1,929	1,341
Spain	-	-	-	10	-	1,001
Czech Republic	2,253	5,058	5,989	12,384	2,460	922
Hungary	-	-	-	50	193	-
Cyprus	-	75	-	-	-	-
EU-28	**550,044**	**476,684**	**385,837**	**619,369**	**653,647**	**1,083,795**
Malaysia	880	100,348	132,041	129,042	124,458	128,109
Indonesia	7,585	6,121	2,412	5,822	3,309	718
Philippines				686	2,989	2,988
Andere Länder	44	824	682	1,803	3,742	1,540
Insgesamt	**558,553**	**583,977**	**520,972**	**756,722**	**788,145**	**1,217,150**

Note: Data for 2018 provisional
Sources: Federal Statistics Office of Germany, AMI

Tab. 7: Biodiesel production capacities 2018 in Germany

Operator / Plant	Location	Capacity (t/year)	
ADM Hamburg AG - Hamburg plant	Hamburg	not available	●
ADM Mainz GmbH	Mainz	not available	●
Bioeton Kyritz GmbH	Kyritz	80,000	
BIO-Diesel Wittenberge GmbH	Wittenberge	120,000	
BIOPETROL ROSTOCK GmbH	Rostock	200,000	
Biowerk Sohland GmbH	Sohland	80,000	●
Bunge Deutschland GmbH	Mannheim	100,000	
Cargill GmbH	Frankfurt/Main	300,000	●
ecoMotion GmbH	Sternberg	100,000	
ecoMotion GmbH	Lünen	162,000	●
ecoMotion GmbH	Malchin	10,000	
german biofuels gmbh	Falkenhagen	130,000	●
Glencore Magdeburg GmbH	Magdeburg	64,000	
Gulf Biodiesel Halle GmbH	Halle	56,000	
KFS Biodiesel GmbH	Cloppenburg	50,000	
KFS Biodiesel GmbH	Niederkassel-Lülsdorf	120,000	
KFS Biodiesel GmbH	Kassel/Kaufungen	50,000	
Louis Dreyfus commodities Wittenberg GmbH	Lutherstadt Wittenberg	200,000	●
Mercuria Biofuels Brunsbüttel GmbH	Brunsbüttel	250,000	
NEW Natural Energie West GmbH	Neuss	260,000	●
Rapsol GmbH	Lübz	6,000	●
REG Germany AG	Borken	85,000	
REG Germany AG	Emden	100,000	
TECOSOL GmbH	Ochsenfurt	75,000	●
Verbio Diesel Bitterfeld GmbH & Co. KG (MUW)	Greppin	190,000	●
Verbio Diesel Schwedt GmbH & Co. KG (NUW)	Schwedt	250,000	●
Total (without ADM)		**3,038,000**	

Note: ● = AGQM member;
Sources: UFOP, FNR, VDB, AGQM/Some names abreviated
DBV and UFOP recommend the biodiesel reference from the circle of members of the working group
Status: unchanged since 2017

Tab. 8: EU production of biodiesel and HVO 2011 – 2018 in 1,000 t

	2011	2012	2013	2014	2015	2016	2017	2018
Belgium	311	314	305	454	252	239	350	350
Denmark	79	109	200	200	140	140	120	120
Germany	2,800	2,600	2,600	3,000	3,100	3,200	3,200	3,050
United Kingdom	180	250	268	143	149	344	375	425
France	1,595	2,120	2,264	2,254	2,280	2,138	2,000	1,960
Italy	591	287	459	580	577	350	500	800
Netherlands	204	332	606	734	650	636	932	400
Austria	310	265	217	292	340	307	295	300
Poland	364	592	648	692	759	871	904	920
Portugal	355	296	297	326	349	325	260	300
Sweden	136	111	125	126	92	82	60	40
Slovenia	1	6	15	0	0	0	0	0
Slovakia	125	110	105	103	125	110	109	111
Spain	649	472	581	894	971	1,160	1,515	1,150
Czech Republic	210	173	182	219	168	149	157	150
EU others	**557**	**669**	**724**	**722**	**754**	**811**	**672**	**690**
EU-27	**8,622**	**8,868**	**9,550**	**10,856**	**10,842**	**11,000**	**11,595**	**10,942**
HVO[1]	**580**	**1,258**	**1,326**	**2,009**	**2,370**	**2,411**	**2,666**	**2,832**
Total	**9,202**	**10,126**	**10,876**	**12,865**	**13,212**	**13,411**	**14,261**	**14,598**

Source: F.O. Licht

[1] Cumulative estimate (Sp, Fin, Fr, It)

Tab. 9: EU production capacities for biodiesel 2010 – 2014 and 2018 in 1,000 t

	2010	2011	2012	2013	2014	2018
Germany	4,933	4,932	4,968	4,970	3,038	3,038*
France*	2,505	2,505	2,456	2,480	2,480	2,080
Italy*	2,375	2,265	2,310	2,340	2,340	1,525
Netherlands*	1,328	1,452	2,517	2,250	2,495	2,505
Belgium	670	710	770	959	959	846
Luxembourg	.	.	20	.	.	0
United Kingdom	609	404	574	577	577	528
Ireland*	76	76	76	76	76	74
Denmark	250	250	250	250	250	250
Greece	662	802	812	.	762	729
Spain	4,100	4,410	5,300	4,320	3,900	3,398
Portugal	468	468	483	470	470	639
Austria	560	560	535	500	500	524
Finland*	340	340	340	340	340	430
Sweden	277	277	270	270	270	362
Estonia	135	135	110	.	.	.
Latvia	156	156	156	.	.	154
Lithuania	147	147	130	.	.	147
Malta	5	5	5	.	.	5
Poland	710	864	884	900	1,184	1,239
Slovakia	156	156	156	156	156	166
Slovenia	105	113	113	125	125	100
Czech Republic	427	427	437	410	410	464
Hungary	158	158	158	.	.	188
Cyprus	20	20	20	.	.	20
Bulgaria	425	348	408	.	.	356
Romania	307	277	277	.	.	295
EU-27[2]	**21,904**	**22,257**	**24,535**	**21,393**	**20,332**	**21,199**

Note: The share of capacities that are now disused is not measurable for every member state.
* = incl. production capacities for hydrogenated vegetable oil (HVO)/co-refining

Sources: European Biodiesel Board (Statistics not continued as of 2014), national statistics
[1)] without ADM
[2)] Volumes of other EU countries not relevant for collection

Tab. 10: Global biodiesel and HVO production 2011–2018 (in 1,000 t)

	2011	2012	2013	2014	2015	2016	2017	2018
Biodiesel production								
EU-27	8,444.00	8,720.00	9,436.00	10,775.00	10,738.00	10,980.00	11,955.00	11,654.00
Canada	106.00	88.00	154.00	300.00	260.00	352.00	350.00	375.00
USA	3,222.30	3,299.90	4,523.20	4,230.10	4,216.80	5,226.00	5,316.00	6,175.30
Argentina	2,425.30	2,455.30	1,997.80	2,584.30	1,810.70	2,659.30	2,871.40	2,429.00
Brazil	2,352.00	2,391.40	2,567.40	3,009.50	3,464.80	3,345.20	3,776.30	4,708.00
Colombia	454.40	490.10	503.30	518.50	513.40	447.80	509.80	480.00
Peru	14.00	16.00	16.00	2.00	1.00	0.00	33.00	50.00
India	5.00	5.00	60.00	40.00	30.00	25.00	20.00	20.00
Indonesia	1,531.00	1,880.00	2,411.00	3,162.00	1,283.00	2,877.00	2,742.00	3,550.00
Malaysia	50.00	238.00	446.00	414.00	680.00	618.00	720.00	950.00
Philippines	117.00	121.00	136.00	151.00	180.00	199.00	194.00	199.00
Singapore								
Thailand	555.50	788.70	923.60	1,032.00	1,089.00	1,084.20	1,256.30	1,391.80
Rest of the world	877.00	988.00	944.00	887.00	1,147.00	1,236.00	1,308.00	1,355.00
TOTAL	20,153.5	21,481.4	24,118.3	27,105.4	25,413.7	29,049.5	31,051.8	33,337.10

HVO production*	2011	2012	2013	2014	2015	2016	2017	2018
EU-27	747.00	1,344.00	1,410.00	1,944.00	2,087.00	2,144.00	2,832.00	2,738.00
USA	186.00	150.00	480.00	1,075.00	875.00	1,050.00	1,300.00	1,450.00
Singapore	194.00	750.00	811.00	871.00	942.00	1,000.00	960.00	768.00
Thailand	0.00	0.00	10.00	15.00	15.00	15.00	15.00	15.00
TOTAL	1,127.0	2,244.0	2,711.0	3,905.0	3,919.0	4,209.0	5,107.0	4,971.0
Sum total Biodiesel/HVO production worldwide	**21,280.50**	**23,725.40**	**26,829.30**	**31,010.40**	**29,332.70**	**33,258.50**	**36,158.80**	**36,843.00**

* HVO = Hydrogenated Vegetable Oil
Source: F.O. Licht, Status: 2018

Tab. 11: Global biodiesel and HVO consumption 2011–2018 (in 1,000 t)

Biodiesel production	2011	2012	2013	2014	2015	2016	2017	2018
EU-27	11,507.00	11,511.00	10,571.00	11,540.00	10,987.00	10,714.00	11,611.00	13,608.00
Canada	221.00	257.00	335.00	335.00	470.00	387.00	331.00	536.00
USA	2,951.70	2,994.50	4,759.20	4,719.30	4,976.70	6,946.20	6,611.60	6,311.90
Argentina	748.70	874.80	885.00	970.10	1,013.90	1,033.30	1,173.30	1,098.50
Brazil	2,259.60	2,304.40	2,510.00	2,879.60	3,367.70	3,332.50	3,753.40	4,677.80
Colombia	450.00	488.20	505.70	518.70	523.40	506.00	513.30	480.00
Peru	238.80	251.00	261.20	257.20	277.80	293.60	290.40	291.20
India	10.00	0.00	0.00	0.00	10.00	0.00	15.00	30.00
Indonesia	253.00	471.00	737.00	1,299.00	585.00	2,306.00	1,999.00	2,900.00
Malaysia	15.00	110.00	165.00	172.00	255.00	278.00	299.00	326.00
Philippines	108.00	121.00	135.00	143.00	177.00	192.00	180.00	185.00
Thailand	559.40	801.90	897.80	1,074.80	1,134.90	1,025.30	1,254.50	1,422.30
Rest of the world	857.00	1,019.00	1,279.00	3,245.00	1,316.00	1,471.00	1,477.00	2,192.00
TOTAL	20,179.20	21,203.80	23,040.90	27,153.70	25,094.40	28,484.90	29,508.50	34,058.70

HVO consumption*	2011	2012	2013	2014	2015	2016	2017	2018
EU-27	583.00	1,456.00	1,177.00	1,789.00	2,056.00	2,255.00	2,542.00	2,290.00
USA	15.00	139.00	149.00	154.00	77.00	63.00	67.00	70.00
Singapore	186.00	293.40	1,093.10	1,437.90	1,514.90	1,745.30	1,952.40	1,786.60
Thailand	0.00	0.00	10.00	15.00	15.00	15.00	15.00	15.00
Rest of the world	83.00	101.00	43.00	184.00	123.00	84.00	264.00	370.00
TOTAL	867.00	1,989.40	2,472.10	3,579.90	3,785.90	4,162.30	4,840.40	4,531.60

Sum total biodiesel/ HVO consumption worldwide	**21,046.20**	**23,193.20**	**25,513.00**	**30,733.60**	**28,880.30**	**32,647.20**	**34,348.90**	**38,590.30**

* HVO = Hydrogenated Vegetable Oil
Source: F.O. Licht, Status: 2018

Biofuel mandates

Tab. 12: Biofuel mandates from selected EU member states in 2019

In 2019, applicable biofuel mandates are in bold

a) Austria

	Overall Percentage (energy content, % cal)	Biodiesel (% cal)	Bioethanol (% cal)	Double counting*
Seit 2012	**5.75**	**6.3**	**3.4**	**Ja**
2020	8.75			

Source: Fuels Order 2012

* Double counting: Waste materials and residual products from agricultural and forestry production including fisheries and aquaculture, residues from processing, cellulosic non-food materials or lingo- cellulosic materials

b) Belgium

	Overall Percentage	Biodiesel (% energy content)	Bioethanol (% energy content)	Double counting
Until Dec 31, 2016		6.0	4.0	**Possible upon approval**
From January 1, 2017		**6.0**	**8.5**	
From January 1, 2020		8.5	8.5	

Source: Law of July 7, 2013; Law of July 21, 2017

c) Bulgaria

Biodiesel (% vol)	Bioethanol (% vol)		Cap on crop based biofuels (% vol)	2nd Generation (% cal)	Double counting
	September 1, 2018	8			
5/1*	**March 1, 2019**	**9**			**No**
	January 1, 2020	10	7	0.05	

* Since September 1, 2018, the mandate is split into five percent conventional first generation biodiesel and one percent second generation biodiesel.

d) Croatia

	Overall Percentage (% cal)	Biodiesel	Bioethanol	Double counting
2019	**7.85**	**6.61**	**0.98**	**Second generation and waste based biofuels**
2020	8.81	7.49	1.00	

Source: Act on Biofuels for Transport (Official Gazette 65/09, 145/10, 26/11 and 144/12)
http://narodne-novine.nn.hr/clanci/sluzbeni/2010_04_42_1066.html
http://narodne-novine.nn.hr/clanci/sluzbeni/2010_11_125_3243.html

e) Czech Republic

	Shares of biofuels and renewable electricity in transportation on total consumption (% cal)	Obligation to reduce total GHG emissions (%)	Biodiesel (% vol)	Bio-ethanol (% vol)	Double counting
2019		**3.5**	**6**	**4.1**	**Ja**
2020	10	6			

Tab. 12: Biofuel mandates from selected EU member states in 2019

In 2019, applicable biofuel mandates are in bold

f) Denmark

	Overall Percentage (% cal)	Advanced Biofuels (% cal)	Biodiesel (% cal)	Bioethanol (% cal)	Double counting
Since 2012	**5.75**				
2020	5.75	0.9*			

Source: Stratas | * The advanced mandate excludes UCO and animal fats.

g) Finland

	Overall Percentage (% cal)	Biodiesel	Bioethanol	Double counting
2019	**18**			
2020 and onwards	20			

Source: Stratas

h) France

	Bioethanol (objective, % cal)	Biodiesel (objective, % cal)	Double counting
Since 2017	**7.5 of which up to 0.3 % double-counted bioethanol**	**7.7 of which up to 0.35 % double-counted biodiesel**	**Cellulosic biofuels and waste biofuels up to the maximum values stated on the left**

i) Germany

	Overall Percentage (% cal) 1)	% GHG savings* (BImSchG)1)	Cap on crop based biofuel3 (% cal)	2nd Generation (% cal)	Double counting2)
2018–2019		**4.0**	**6.5**		**No**
2020		6.0	**6.5**	0.05 a)	**No**
2021		6.0	**6.5**	0.1 b)	**No**
2022–2023		6.0	**6.5**	0.2 c)	**No**
2025 and onwards		6.0	**6.5**	0.5	**No**

Sources:

1) § 37a Federal Act on Protection against Air Pollution (Bundes-Immissionsschutzgesetz) http://www.gesetze-im-internet.de/bimschg/ 37a.html

2) § 37b Federal Act on Protection against Air Pollution http://www.gesetze-im-internet.de/bimschg/ 37b.html

3) §13 +14 of the 38th Implementation Ordinance on the Federal Act on Protection against Air Pollution http://www.gesetze-im-internet.de/bimschv_38_2017/ 13.html http://www.gesetze-im-internet.de/bimschv_38_2017/ 14.html

*Percentage of GHG savings of total fuel use (fossil and renewable) compared to the hypothetic GHG emissions had all the fuel been of fossil origin

a) Companies that put on the market 20 PJ or less of biofuels in the previous year are exempted

b) Companies that put on the market 10 PJ or less of biofuels in the previous year are exempted

c) Companies that put on the market 2 PJ or less of biofuels in the previous year are exempted

Year	Penalty
Since 2015 2	0.47 Euro per kg CO_2 eq underallocated

Tab. 12: Biofuel mandates from selected EU member states in 2019
In 2019, applicable biofuel mandates are in bold

j) Greece

	Overall Percentage (% cal)	Biodiesel	Bioethanol	Double counting
2019		**7**	**1**	**No**
2020		7	3.3	

k) Hungary

	Biodiesel	Bioethanol	Double counting
1/1/2019 – 12/31/2020	**6.4**	**6.4**	**Nein**

Sources:
- Government Decree No. 343/2010 on requirements and certification of sustainable biofuel production (overruled in 2017)
- Government Decree No. 279/2017 on sustainability requirements and certification of biofuels
- Double counting: §2 (4) of CXVII/2010 Act on promoting the use of renewable energy and the reduction of greenhouse gas emission of energy used in transport
- Hungary's National Renewable Energy Action Plan.

l) Ireland

	Overall Percentage (% vol of fossil fuel to be added)	Overall Percentage (% vol of fossil fuel to be added)	Double counting
2019 and onwards	**11.11**	**10**	**UCO, Cat 1 Tallow, Spent Bleached Earth (SBE), Palm Oil Mill Effluent (POME), Whey Permeate**

Further information on Ireland's Biofuels Obligation Scheme can be found at: http://www.nora.ie/biofuels-obligation-scheme.141.html
Section 44C(3)(b) of the NATIONAL OIL RESERVES AGENCY ACT 2007
http://revisedacts.lawreform.ie/eli/2007/act/7/revised/en/html#SEC44C.

m) Italy

	Overall biofuels (% by energy content)	Of which advanced biofuels (% by energy content, double counted)	Advanced biofuels necessary for fulfilling the targets (% by energy content)	
			% of advanced biomethane	% of other advanced biofuels
2019	**8**	**0.2**	**0.60**	**0.20**
2020	9	1.0	0.68	0.23
2021	9	1.6	1.13	0.38
2022 and onwards	9	2	1.39	0.46

n) The Netherlands

	Overall Percentage (% cal)	Of which advanced biofuels (% cal)	Cap on conventional crop based biofuel (% cal)	Double counting
2019	**12.5**	**0.8**	**4**	**Yes**
2020	16.4	1,.0	5	

Source: Dutch Emission Authority.

Tab. 12: Biofuel mandates from selected EU member states in 2019
In 2019, applicable biofuel mandates are in bold

o) Poland

	Overall Percentage (% cal)	Biodiesel (% cal)	Bioethanol (% cal)	Double counting
2019	**8**			Yes
2020	8.5			

Source: FAS Warsaw

p) Portugal

	Overall Percentage (% cal)	Biodiesel (% cal)	Bioethanol/ETBE (% cal)	Double counting
2019	**7**	–	–	Yes
2020	10	–	–	

Sources: Consumption targets: Decree-Law 117/2010, Decree-Law 69/2016, and Law 42/2016 and Budget Law for 2018 and 2019. Double counting: Decree-Law 117/2010 and Annex III in Implementing Order 8/2012.

q) Romania

	Overall Percentage (% cal)	Biodiesel (% cal)	Bioethanol (% cal)	Double counting
2019		**6.5**	**8.0**	Yes
2020	10	6.5	8.0	

Sources: Government Decisions 1121/2013 and 931/2017

r) Slovak Republic

	Overall Percentage (% cal)	2nd Generation Biofuels (% cal)	Double counting
2018	5.8		Yes
2019	**6.9**	**0.1**	
2020	7.6	0.5	
2021	8.0		
2022–2024	8.2		
2025–2030		0.75	

Source: Act no. 309/2009 amended by Act no. 309/2018 on Support of Renewable Energy Resources

s) Slovenia

	Overall Percentage (% cal)	Biodiesel (% cal)	Bioethanol (% cal)	Double counting
2010	5			Yes
2011	5.5			
2012	6			
2013	6.5			
2014	7			
Seit 2015	**7.5**			

Since 2015

Tab. 12: Biofuel mandates from selected EU member states in 2019

In 2019, applicable biofuel mandates are in bold

t) Spain

	Overall Percentage (% cal)	Biodiesel (% cal)	Bioethanol (% cal)	Double counting
2019	**7**	**-**	**-**	**Yes**
2020	8.5	-	-	

u) Sweden

The Swedish Government submitted a proposal in 2017, which was implemented on 1 July 2018. The system's structure is based on gradual increasing the reductions of greenhouse gas emissions achieved by adding biofuels to petrol and diesel. From July 1, 2018, the system aims to reduce emissions from diesel by 19.2 percent and emissions from petrol by 2.6 percent. The level of reduction is to increase subsequently over time, in order to achieve the target of reducing greenhouse gas emissions by 40 percent by 2030. The system aims to create more stable rules for producers and traders in the long term.

v) United Kingdom

Current and future blend mandates:

	Overall Percentage (% cal)	Development fuel target (% cal)	Double counting
2019	**9.180**	**0.109**	**Certain waste or residue feedstocks determined by scheme Administrator; plus energy crops and renewable fuels of non-biological origin; also development fuels**
2020	10.637	0.166	
2021	10.679	0.556	
2022	10.714	0.893	
2023–2031	Increasing each year in 0.025 percent increments by volume until:	Increasing each year in 0.23 percent increments by volume until:	
2032	10.959	3.196	

Definitions:

% Cal =	percent energy content
% Vol =	percent volume
% Biodiesel =	minimum percentage of biodiesel in total diesel use
% Bioethanol =	minimum percentage of bioethanol in total gasoline use.
Biodiesel =	Fatty acid methyl ester produced from agricultural or waste 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
Cat 1 (2 and 3) =	Risk categories for animal-by-products as defined in EU Regulation (EC) 1069/2009, with cat 1 having the highest and cat 3 the lowest risk.
Double counting =	Certain biofuels are counted twice against the mandates. Definition and eligible feedstocks vary by MS.
ETBE =	Ethyl tert-butyl ether, an oxygenate gasoline additive containing 47 % vol ethanol
EU =	European Union
FAME =	Fatty acid methyl ester
HVO =	Hydrotreated Vegetable Oil
MJ =	Megajoule
POME =	Palm Oil Mill Effluent
SBE =	Spent Bleached Earth
UCO =	Used cooking oil/ recycled vegetable oil UCOME = UCO based methyl ester biodiesel

Source and further information: **USDA-GAIN Report**

Tables of the German Federal Office for Agriculture and Food

Tab. 13: Germany: Feedstocks of the biofuels in Terajoules [TJ][1]

Fuel type	Bioethanol			Biomethane			Biomethanol
Quota year	2015	2016	2017	2015	2016	2017	2015
Feedstock							
Waste/residual material	156	118	46	1,251	1,373	1,615	0.04
Barley	1,353	1,435	1,665	.	.	.	.
Maize	10,313	9,983	14,369	.	.	.	.
Palm oil	.	.	.	.	.	.	.
Rapeseed	.	.	.	.	.	.	.
Rye	2,292	2,028	2,272	.	.	.	.
Soya	.	.	.	.	.	.	.
Sunflowers	.	.	.	.	.	.	.
Triticale	2,717	2,341	1,753	.	.	.	.
Wheat	9,395	9,641	7,940	.	.	.	.
Sugar cane	650	2,466	1,071	.	.	.	.
Sugar beets	4,177	2,176	875	.	.	.	.
Total	**31,053**	**30,195**	**29,991**	**1,251**	**1,373**	**1,615**	**0.04**

Source: BLE
[1] Discrepancies in totals are due to rounding

Tab. 14: Germany: Feedstocks of the biofuels in 1,000 tonnes [kt][1,2]

Fuel type	Bioethanol			Biomethane			Biomethanol
Quota year	2015	2016	2017	2015	2016	2017	2015
Feedstock							
Waste/residual material	6	4	2	25	27	32	0,002
Barley	51	54	63	.	.	.	.
Maize	390	377	543	.	.	.	.
Palm oil	.	.	.	.	.	.	.
Rapeseed	.	.	.	.	.	.	.
Rye	87	77	86	.	.	.	.
Soya	.	.	.	.	.	.	.
Sunflowers	.	.	.	.	.	.	.
Triticale	103	88	66	.	.	.	.
Wheat	355	365	300	.	.	.	.
Sugar cane	25	93	40	.	.	.	.
Sugar beets	158	82	33	.	.	.	.
Total	**1,173**	**1,141**	**1,133**	**25**	**27**	**32**	**0,002**

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] the conversion to tonnage was made based on the verifications, which were counted towards the quota

FAME			HVO			Vegetable oil		
2015	2016	2017	2015	2016	2017	2015	2016	2017
20,549	32,422	31,508	227	269	80	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
4,776	9,816	18,373	7,132	6,928	1,361	.	.	.
48,251	32,154	28,381	.	.	.	343	246	26
.	.	.	.	.	.	.	.	.
164	46	62	.	.	.	.	.	.
139	79	1,631	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
73,878	**74,517**	**79,955**	**7,359**	**7,197**	**1,441**	**343**	**246**	**26**

FAME			HVO			Vegetable oil		
2015	2016	2017	2015	2016	2017	2015	2016	2017
550	868	843	5	6	2	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
128	263	492	164	159	31	.	.	.
1,291	860	759	.	.	.	9	7	1
.	.	.	.	.	.	.	.	.
4	1	2	.	.	.	.	.	.
4	2	44	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
1,977	**1,994**	**2,140**	**169**	**165**	**33**	**9**	**7**	**1**

Tab. 15: Germany: Feedstocks of the biofuels according to origin in Terajoules [TJ][1,2]

Region	Africa			Asia			Australia		
Quota year	2015	2016	2017	2015	2016	2017	2015	2016	2017
Feedstock									
Waste/residual material	5	7	8	73	177	186	1	1	1
Barley	.	.	.	.	.	.	.	.	.
Maize	.	.	.	.	.	.	.	.	.
Palm oil	.	.	.	291	413	462	0.03	.	.
Rapeseed	.	.	.	1	.	.	12	9	9
Rye	.	.	.	.	.	.	.	.	.
Soya	.	.	.	.	.	.	.	.	.
Sunflowers	.	.	.	.	.	.	.	.	.
Triticale	.	.	.	.	.	.	.	.	.
Wheat	.	.	.	.	.	.	.	.	.
Sugar cane	3	.	.	.	.	.	.	.	.
Sugar beets	.	.	.	.	.	.	.	.	.
Total	**8**	**7**	**8**	**366**	**590**	**648**	**13.03**	**10**	**10**

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] the conversion to tonnage was made based on the verifications, which were counted towards the quota

Tab. 16: Germany: Total feedstocks of the biofuels[1]

	[TJ]			[kt]		
	2015	2016	2017	2015	2016	2017
Feedstock						
Waste/residual material	22,183	34,183	33,249	586	906	879
Barley	1,353	1,435	1,665	51	54	63
Maize	10,313	9,983	14,369	390	377	543
Palm oil	11,908	16,744	19,734	291	422	523
Rapeseed	48,594	32,400	28,408	1,300	867	760
Rye	2,292	2,028	2,272	87	77	86
Soya	164	46	62	4	1	2
Sunflowers	139	79	1,631	4	2	44
Triticale	2,717	2,341	1,753	103	88	66
Wheat	9,395	9,647	7,940	355	365	300
Sugar cane	650	2,466	1,071	25	93	40
Sugar beets	4,177	2,176	875	158	82	33
Total	**113,884**	**113,528**	**113,029**	**3,353**	**3,334**	**3,339**

Source: BLE
[1] Discrepancies in totals are due to rounding

Europe			Central America			North America			South America		
2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
466	631	616	.	0.3	0.3	32	77	53	8	13	15
51	54	63	.	.	.	.	.	.	.	.	.
390	377	543	.	.	.	.	.	.	.	.	.
.	.		.	8	61	.	.	.	.	.	.
1,287	858	751	.	.	.	.	.	.	0.1	.	.
87	77	86	.	.	.	.	.	.	.	.	.
.	.	1	.	.	.	.	.	.	4	1	1
4	2	44	.	.	.	.	.	.	.	.	.
103	88	66	.	.	.	.	.	.	.	.	.
349	365	300	.	.	.	.	.	.	6	.	.
.	.		10	18	12	.	.	.	12	76	28
158	82	33	.	.	.	.	.	.	.	.	.
2,894	**2,534**	**2,503**	**10**	**26.3**	**73.3**	**32**	**77**	**53**	**30.1**	**90**	**44**

Tab. 17: Germany: Emissions and emission savings of biofuels[1]

	Emissions [t CO_{2eq} / TJ]			Savings [%][2]		
	2015	2016	2017	2015	2016	2017
Biofuel type						
Bioethanol	24.53	20.58	14.58	70.73	75.44	82.6
Biomethane	13.17	8.03	7.77	84.28	90.42	90.73
Biomethanol	22.6	.	.	73.03	.	.
FAME	24.62	17.84	16.1	70.62	78.71	80.79
HVO	32.03	31.66	29.64	61.78	62.22	64.64
Vegetable oil	35.7	35.34	30.09	57.4	57.83	64.09
Weighted average of all biofuels	**24.98**	**19.37**	**15.75**	**70.19**	**79.89**	**81.2**

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] Savings compared to fossil reference value for fuel 83.8 g CO_{2eq} / MJ

Tab. 18: Germany: Emissions and emission savings of bioliquids[1]

	Emissions [t CO_{2eq} / TJ]			Savings [%][2]		
	2015	2016	2017	2015	2016	2017
Bioliquid type						
from cellulose industry	1.58	1.73	1.80	98.26	98.10	98.02
FAME	46.47	45.25	37.18	48.93	50.27	59.14
HVO	.	44.50	44.50	.	51.10	51.10
Vegetable oil	36.90	34.26	33.73	59.45	62.35	62.93
UCO	14.00	.	.	84.62	.	.
Weighted average of all bioliquids	**5.88**	**5.65**	**5.99**	**93.54**	**93.79**	**93.41**

Source: BLE
[1] Discrepancies in totals are due to rounding
[2] Savings compared to fossil reference value for liquid fuel for electricity generation 91.0 g CO_{2eq} / MJ

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