Federal Office for Agriculture and Food

Evaluation and Progress Report 2016

Biomass Energy Sustainability Ordinance
Biofuel Sustainability Ordinance

Published by
Federal Office for Agriculture and Food
Deichmanns Aue 29
53179 Bonn, Germany

Telephone: +49 (0)228 99 6845 – 2550
Telefax: +49 (0)228 6845 – 3040

Email: nachhaltigkeit@ble.de
Internet: http://www.ble.de/Biomasse

Editor
Federal Office for Agriculture and Food
Unit 221 - General Matters of Group 22, Recognition and Accreditation Procedures, Sustainable Biomass

Layout
Federal Office for Agriculture and Food

Picture credits
Federal Office for Agriculture and Food
Cover photo: BLE, Unit 221
Cartographical material: BLE, Unit 214 – Centre of Expertise for Geoinformation

Editorial status as at: **October 2017**
Status of the data base excerpt as at: **May 2017**

Content

List of diagrams

List of tables

Preface

Dear Reader

The Federal Office for Agriculture and Food (BLE) is the competent authority for the compilation of the annual Evaluation and Progress Report, which is published for the seventh time.

As usual, the report is based on the data on the biofuels and bioliquids converted into electricity which were placed on the market in Germany in the reporting year of 2016. The greenhouse gas reduction quota again leads to further emission savings as well as changed commodity flows within Europe and in third countries in 2016. As in the previous year, biofuels and bioliquids with lower emissions were predominantly used in Germany. The quantities with higher emissions were used in other countries of the European Union rather, as well as in third countries.

The purpose of this Evaluation and Progress Report is to inform both the interested public and experts on the developments of biofuels put on the market in Germany.

It contains new additional features, namely the presentation of maps as well as a breakdown of the source materials of German origin.

Dr. Hanns-Christoph Eiden
President of the
Federal Office for Agriculture and Food

1. General Matters

This report provides information on the use of sustainable biomass in Germany. The information on the biofuels and bioliquids quantities is divided into three sections. These are:

- Biofuels that were counted towards the greenhouse gas reduction quota or for which an application was submitted to be considered for tax relief (Chapter 6)
- Bioliquids registered for electricity production and feed-in pursuant to the Renewable Energy Sources Act (EEG) (Chapter 7)
- Biofuels and bioliquids not used for the generation of energy in Germany (Chapter 7)

The database was gathered from the Nabisy public database ("Nachhaltige Biomassesystem"). All biofuel and bioliquid quantities relevant for the German market are filed there.

The BLE as the competent authority is obliged to submit an annual progress report to the German federal government.

1.1 Introduction

On 5 June 2009, the Directive 2009/28/EC of the European Parliament and Council of 23 April 2009 on the promotion of the use of energy from renewable sources (Renewable Energy Directive) was published in the Official Journal of the European Union. It is part of the climate and energy package of the EU adopted by the Council on 6 April 2009. This package of binding legislation is intended to ensure that the EU meets its climate and energy targets by 2020[1].

The directive emphasises that the control of the energy consumption in Europe and the increased **use of energy from renewable sources** together with energy savings and an improved energy efficiency are essential elements of the set of measures that is to reduce greenhouse gas emissions and to provide for **compliance with the Kyoto Protocol to the United Nations Framework Convention on Climate Change** and other community and international commitments to reduce greenhouse gas emissions beyond 2012.

The Directive's aims include increasing the share of energy from renewable sources within the EU[2], reducing dependency on fossil energy sources and decreasing greenhouse gas emissions.
Every Member State is to take relevant measures at a national level and develop instruments which help reach the targets set at European level or even go beyond them.

[1] The three main targets of the package: Reduction of greenhouse gas emissions by 20 % (compared to the 1990 level), 20 % of the EU energy from renewable sources, improvement of the energy efficiency by 20 %

[2] Minimum share of 10 % of the final energy consumption in the transport sector by 2020, Art. 3 para. 4 of Directive 2009/28/EC

The use of energy from renewable sources in the **transport sector** is considered one of the most effective means with which the Community can reduce its dependence on oil imports for the transport sector, in which the problem of a secure energy supply is most acute, and influence the fuel market[3].

[3] Recitals of Directive 2009/28/EC of the European Parliament and of the Council

For biofuels and bioliquids, the Renewable Energy Directive stipulates **sustainability criteria**:

- The reduction of greenhouse gas emissions achieved through the use of biofuels and bioliquids must be at least 35 % (at least 60 % in the case of new installations),

- Biofuels and bioliquids must not be produced from raw materials obtained from high biodiversity areas,

- Biofuels and bioliquids must not be produced from raw materials obtained from high carbon stock areas,

- Biofuels and bioliquids must not be produced from raw materials obtained from areas which were peatlands in January 2008, unless it is proven that the cultivation and harvesting of the respective raw material does not involve drainage of previously undrained soil.

According to Commission Communication 2010/C 160/02, the sustainability criteria for biofuels and bioliquids may be implemented as follows:

1. through a national system,
2. by applying a voluntary system that the Commission has recognised for the purpose,
   or
3. by complying with the terms of a bilateral or multilateral agreement of the European Union with third countries which was concluded by the Commission for that purpose.

By 31.12.2016, the European Commission had published implementing decisions for the recognition of 18 voluntary systems within the scope of the Renewable Energy Directive. Since then, these voluntary systems have been operating alongside the certification systems recognised by the BLE (DE Systems) and national systems of other Member States in the field of sustainable biomass production and some have been recognised anew after five years. Furthermore, the European Commission recognised a greenhouse gas calculation tool.

On 4.8.2010, the German government adopted the National Renewable Energy Action Plan. In addition, on 28.9.2010, it published its energy concept for an environmentally friendly, reliable and affordable energy supply. In order to transpose the Renewable Energy Directive into national law by 5.12.2010, as required by Article 27(1) of the Directive, both the Biomass Electricity Sustainability Ordinance of 23.7.2009 (BioEn SusO, see glossary at the end) and the Biofuel Sustainability Ordinance (Biofuel SusO) of 30.9.2009 were published in the Federal Law Gazette. Both sustainability ordinances implement the Renewable Energy Directive and are part of the measures included in the German National Action Plan and the Federal Energy Concept. With Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC on the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, the European legislator established a ceiling of 7 % for the share of biofuels obtained from food crops (conventional biofuels) and changed the timing of the sustainability criterion of the increased minimum savings from currently 35 % to 50 % (from 2018) and 60 % for new installations (since 01.01.2017)[4].

On 1 January 2015, the energetic biofuel quota was replaced by the greenhouse gas reduction quota in Germany. Since then, parties obliged to provide proof must ensure that the greenhouse gas emissions of the fossil petrols and fossil diesel fuels they put into circulation plus the greenhouse gas emissions from the biofuels they put into circulation are reduced by a defined percentage compared to their individually calculated reference value[5]. The reduction in comparison to the reference value was 3.5 % in 2015 and 2016; from 2017 to 2019 it is to amount to 4 % and to 6 % from the year 2020.

As an accompanying measure to the introduction of the greenhouse gas reduction quota, the BLE regularly compiles reports for the Commission and the voluntary systems as well as the national systems on the sustainability certificates with particularly low emission values entered in Nabisy. If the emission value specified in the certificate is at least 10 % below the so-called typical value or a comparable value it will appear in the evaluation as a “particularly low emission value”. Thus, the BLE provides data that must not be confused with the data for this report. In doing so, the BLE supports certification systems in carrying out their own evaluations.

[4] Art. 17 para. 2 Directive 2009/28/EC

[5] The reference value the greenhouse gas reduction is to be measured against is calculated by multiplying the base value (83.8 g CO2eq/MJ) by the energetic quantity of fossil petrols and fossil diesel fuels put into circulation by the party obliged plus the energetic quantity of biofuel put into circulation by the obliged party. The greenhouse gas emissions from fossil petrols and fossil diesel fuels are calculated by multiplying the base value by the energetic quantity of fossil petrols and fossil diesel fuels put into circulation by the obliged party. The greenhouse gas emissions from biofuels are calculated by multiplying the greenhouse gas emissions established in the proofs recognised according to Article 14 of the Biofuel Sustainability Ordinance in kilograms of carbon dioxide equivalent per gigajoule by the energetic quantity of biofuel put into circulation by the obliged party.

1.2 Summary of important results and events in 2016

- For 113,528 TJ of **biofuels** [113,884 TJ in the previous year] applications were filed for amounts to be counted towards the German greenhouse gas reduction quota or for tax relief (equivalent to 3.334 kilotons of biofuel). About 72 % (82.081 TJ) thereof were made of source materials from the EU [approx. 82 % (93.669 TJ) in the previous year]. The share from America and Asia has increased.

- The main source materials of all types of biofuels were waste and residues (30.1 % [previous year: 19.5 %]), rapeseed (28.5 %, [previous year: 42.7 %]), palm oil (14.7 % [previous year: 10.5 %]), maize (8.8 % [previous year: 9.1 %]) and wheat (8.5 % [previous year: 8.3 %]).

- With 74,517 TJ, biodiesel (FAME) provided the largest share of biofuels, almost 66 % [previous year: 65 %, 73,878 TJ].

- The most commonly used source materials for the **production of biodiesel** were wastes and residues, 32,422 TJ (43.5 % [previous year: 27.8 %]). In the previous year, the most common source had been rapeseed with 48,251 TJ. The use of rapeseed decreased significantly in the reporting year to 32,154 TJ.

- The most commonly used source materials for the **production of bioethanol** were maize, 9,983 TJ (33.1 % [previous year: 33.2 %]) and wheat, 9,647 TJ (32 % [previous year: 30.3 %]). The sugar cane share has almost quadrupled to 2,466 TJ, while the share of sugar beet has almost halved to 2,176 TJ.

- The use of palm oil in biofuels increased by 40.6 % in 2016 compared to the previous year (share in 2016: 14.7 %, =16,744 TJ, 2015: 10.5 %, =11,908 TJ).

- Total savings of **greenhouse gas emissions** of all biofuels (pure) amounted to almost 77 % compared to fossil fuels. This means that through the use of biofuels instead of fossil fuels, around 7.3 million tonnes of CO_2 equivalent could be avoided [previous year: approx. 6.7 million].

- 32,010 TJ of **bioliquids** were converted into electricity. For the feed-in, remuneration pursuant to the Renewable Energy Sources Act was applied for. 88 % [previous year: 87.8 %] are thick liquor from the pulp industry, 11.9 % [previous year:12 %] consist of vegetable oil.

- Total savings of **greenhouse gas emissions** of all bioliquids (pure) amounted to almost 93.8 % compared to fossil fuels. This means that through the use of bioliquids instead of fossil fuels, around 2.7 million tonnes of CO_2 equivalent could be avoided [previous year: approx. 2.8 million].

- 53,100 TJ of the biofuels and bioliquids the sustainability data of which were registered in Nabisy were retired to other states' accounts [previous year: approx. 89,892 TJ]. The corresponding sustainability certificates showed significantly higher emissions compared to the documents submitted in Germany.

- By the end of 2016, the European Commission had recognised a total of 19 voluntary systems, which are considered recognised in Germany, as well. Three systems had received a re-recognition for another five years. The Commission's procedure for re-recognition also had to consider recommendations from the Special Report 18/2016 of the European Court of Auditors.

- Within the framework of their recognition processes, the certification bodies recognised by the BLE (25 on the reporting date of 31.12.2016) carried out 2,547 certifications all over the world in the reporting year. 2,448 thereof were recognised according to the requirements of the voluntary systems and 99 in accordance with the two DE Systems.

- The Biofuel Sustainability Ordinance was amended, transposing the regulations of Directive (EU) 2015/1513.

- Amending the BioEn SusO as of 01.01.2017 terminated a derogation. Installation operators who necessarily require start-up, ignition or auxiliary firing to operate their installation and use bioliquids for this purpose have been obliged to deliver proof of sustainability for these quantities. This led to a significantly increased number of Nabisy accounts created for installation operators in the reporting year; owning a Nabisy account is the prerequisite for receiving a full or partial sustainability certificate.

- On 30.11.2016, the European Commission proposed a comprehensive legislative package under the name of "Clean Energy for all Europeans", which includes the draft of a new Renewable Energy Directive for the 2021 - 2030 period (RED II draft), among other things. According to the current version, the Member States are to monitor the certifications and the economic operators are to register sustainability certificates in databases. The intention of this is to reduce the vulnerability to fraud by automatically ensuring that a certain amount of sustainable goods can only obtain government funding once, even in the case of cross-border dealings. In addition, the draft proposes to introduce a ceiling for conventional biofuels and a minimum share of advanced biofuels.

- Since as of 2017, biofuels from new installations are only considered as sustainable if they provide savings of at least 60 % compared to the fossil reference value, the BLE collected the date of the installation's initial operation for all systems the participants of which produce biofuels or bioliquids. This date is required by the Nabisy public database for checking the plausibility of the 60 % minimum savings. The BLE received only few registrations of new installations.

1.3 Methodology

This evaluation and progress report describes the existing processes and measures, and analyses the data made available to the BLE. It also includes issues relevant for implementation in Germany such as the transposition of Directive 2009/28/EC in other Member States and the recognition of voluntary systems by the European Commission.

The results of the analysis are presented, compared and explained from various perspectives.

The following presentations refer to data submitted by economic operators to the BLE in its role as the competent authority according to Art. 66 Biofuel SusO and/or Art. 74 BioEn SusO.

The following information does not permit any conclusions as to the actual number of participants in individual voluntary systems or in national systems of other Member States.

Economic operators are obliged to enter sustainability data for their deliveries of biofuels into the public database Nabisy, if those data could become relevant for the German market. Amounts entered by way of precaution, which are not then used for energy generation in Germany are contained in Nabisy without being attributed to Germany. It is the responsibility of the economic operator to enter and book the data correctly. Thus, the entered data are collected in an organised way and systematically documented.

The available information shall be the basis for optimisation processes conducted by decision-makers in politics and economy.

Where the available data allow, this analysis will also serve to verify the measures' effectiveness.

Where information regarding the number of Nabisy users or certifications is provided it should be noted that economic operators who used multiple certification systems simultaneously and/or who acted as producers as well as suppliers were counted more than once. It is therefore impossible to draw conclusions as to the number of operations participating in the measures.

Targets to be achieved with regard to evaluating the measures' effectiveness are:

- increasing the percentage of "renewable energies" where the supply of fuels and electricity production from bioliquids are concerned,
- decreasing greenhouse gas emissions by using sustainable biomass and
- developing more efficient procedures and source materials for the generation of electricity from biomass.

Changes occurring in each respective calendar year are analysed within the framework of the BioEn SusO and the Biofuel SusO.

In concrete terms, the areas to be analysed include:

- the effectiveness of the sustainability ordinances with regard to the objectives of the German government,

and

- potential improvements to be made in implementing the specifications of the Renewable Energy Directive.

which are to be analysed, among other things.

Appropriate methods were chosen to collect, measure and evaluate the data.

Those certificates were examined for which applications had been submitted to be counted towards the biofuel quota obligation for the respective quota year or to be considered for tax relief, as well as certificates which were entered for remuneration pursuant to the Renewable Energy Sources Act (EEG). These are predominantly partial sustainability certificates, which have developed from multiple summaries or divisions along the supply chain through to the final recipient. These certificates were identified by the notations of usage applied by the main customs offices or the network operators.

The data were considered and evaluated with regard to fuel type, quantity, energy content, origin, source materials used for the production and their origin and, finally, the emissions generated. Where graphic representation was not considered adequate, tables were used instead.

Primarily, the focus is on the situation as at 31.12.2016 and on changes in the implementation of the measure during the given (annual) period related to the initial values by way of a statistical comparison.

BLE control measures and/or administrative procedures will also be analysed, evaluated and optimised in this context.

Discrepancies in the sum totals in this report are due to rounding.

2. BLE responsibilities

The BLE is the competent authority in Germany for the implementation of the sustainability criteria laid down in the Renewable Energy Directive in the area regulated by the sustainability ordinances.

BLE responsibilities in the field of sustainable bioenergy include

- in the **biofuels sector** - **making data** which are required to count biofuels towards the biofuel quota or in connection with granting tax relief **available** to the biofuels quota body and the main customs offices,
- in the **bioelectricity sector** - **making data** which are required for EEG remuneration and for the energy crops bonus (NawaRo bonus) for installation operators **available** to network operators,
- in the **emissions trading sector** - **making data available** for the Emissions Trading Authority,
- **administration of data** on the sustainability of biofuels and/or liquid biomassin the **public web-based database Nabisy** and issuance of partial certificates of sustainability at the request of the economic operators,
- the regular **evaluation of the sustainability ordinances** and **compilation of an annual progress report** for the federal government,
- regular compilation of **reports on particularly low emissions** of the sustainability certificates for voluntary systems, national systems and for transmission to the EU Commission,
- the **recognition** and **supervision** of **certification systems** and **certification bodies** pursuant to the sustainability ordinances.

In addition, and within the scope of its responsibilities pursuant to Art. 74 BioEn SusO and/ or Art. 66 Biofuel SusO, the BLE regularly carried out the following measures to implement the sustainability ordinances:

- office audits at the certification bodies on a yearly basis and risk-oriented evaluation of the audit work of the certification bodies (witness audits),
- maintenance and development of the BLE website with information and documents in German and English,
- maintenance and development of a continuous system to recognise certification systems and bodies and to monitor compliance with legal requirements,
- maintenance and development of the public database Nabisy for the documentation of biofuels' type and origin and the sustainability certificates, general issues regarding the documentation and plausibility validation of the data on the sustainability of biofuel supplies, exchange of data with other Member States' databases,
- maintenance and development of the register of information pursuant to Art. 66 BioEn SusO and/or Art. 60 Biofuel SusO,
- hosting the meetings of the advisory council for sustainable bioenergy,
- hosting events with certification systems, certification bodies and the industry to exchange knowledge and other information,
- presentations at informative events for multipliers such as associations, certification systems, certification bodies, German federal states' representatives and competent authorities of other Member States,
- representation at various special events and trade fairs,
- cooperation and coordination of the implementation with the implementing authorities of other Member States in the REFUREC (Renewable Fuels Regulator Club) bodies and as an observer in relevant CA-RES (Concerted Action-Renewable Energy Sources Directive) working groups,
- training of BLE Control Service staff employed as assessors in the field of sustainable biomass production,
- training of users of the Nabisy web application.

3. Certification systems, voluntary systems and national systems of other Member States

The Renewable Energy Directive and its national implementation by means of the sustainability ordinances require all economic operators along the entire value chain to comply with the sustainability provisions for biomass and the biofuels and bioliquids made thereof. To guarantee and control this is the task of the DE Systems and the voluntary schemes recognised by the European Commission or national systems of other Member States.

Certification systems must ensure, organisationally, that the requirements of the Renewable Energy Directive and of the national legislation adopted for its implementation are met in the field of production and supply of biomass. Their system documents contain details which further determine the requirements for evidence of their implementation and for verifying such evidence.

3.1 Certification systems pursuant to Art. 33 Nos. 1 and 2 BioEn SusO and/or Biofuel SusO recognised by the BLE

By 31.12.2016, the BLE had received the following number of applications for recognition of certification systems:

Table 1: Applications of DE certification systems

Total number of applications submitted by 31.12.2016	**4**
rejected	1
accepted	3
recognition withdrawn	1
currently recognised by the BLE ISCC System GmbH, Cologne REDcert GmbH, Bonn	**2**

The BLE has granted recognition in the context of their application to the DE Systems of the following states:

- all Member States of the European Union, and
- Argentina, Australia, Belarus, Bolivia, Bosnia and Herzegovina, Brazil, Burkina Faso, Cambodia, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Ecuador, Egypt, El Salvador, Ethiopia, Georgia, Ghana, Guatemala, Hong Kong, India, Indonesia, Israel, Ivory Coast, Kazakhstan, Kenya, Laos, Madagascar, Malaysia, Mauritius, Mexico, Moldavia, Mozambique, Nicaragua, Norway, Panama, Papua-New Guinea, Paraguay, Peru, Philippines, Republic of Korea, Russia, Serbia, Singapore, South Africa, Sudan, Switzerland, Tanzania, Thailand, Togo, Turkey, Uganda, Ukraine, United Arab Emirates, Uruguay, USA, Uzbekistan, Venezuela and Vietnam.

3.2 Voluntary systems pursuant to Art. 32 No. 3 BioEn SusO and/or Biofuel SusO

According to the first sentence of the second subparagraph of Article 18 (4) of Directive 2009/28/EC, the European Commission may decide that voluntary national or international systems setting standards for the production of biomass products contain accurate data for the purposes of Article 17 (2). These data may be used as evidence that consignments of biofuel comply with the sustainability criteria set out in Article 17 (3) to (5) of the directive. The recognition of these voluntary systems is valid for a term of no more than five years.

Pursuant to Article 41 of the BioEn SusO and/or Biofuel SusO, these voluntary systems are considered as recognised in Germany if and for long as they are approved by the Commission of the European Communities. By 31.12.2016, the Commission of the European Communities had approved or re-approved the following 18 voluntary schemes as well as one greenhouse gas calculation tool:

Table 2: Voluntary systems (EU systems) – as of 31.12.2016

Voluntary systems	Registered in	Recognised on	Re-approved on
2BS Association	France	10.08.2011	28.08.2016
Greenergy	United Kingdom	10.08.2011	[6]
Bonsucro	United Kingdom	10.08.2011	[7]
ISCC System GmbH	Germany	10.08.2011	11.08.2016
Roundtable on Responsible Soy Association (RTRS)	Argentina	10.08.2011	[6]
Abengoa	Spain	10.08.2011	[6]
Roundtable on Sustainable Biomaterials (RSB)	Switzerland	10.08.2011	11.08.2016
ENSUS UK	United Kingdom	14.05.2012	
REDcert GmbH	Germany	15.08.2012	[7]
NTA 8080	Netherlands	20.08.2012	
Roundtable on Sustainable Palm Oil RED (RSPO)	Malaysia	13.12.2012	
HVO Renewable Diesel Scheme for Verification of Compliance with the RED sustainability criteria for biofuels	Finland	29.01.2014	
KZR INiG	Poland	23.06.2014	
Red Tractor Farm Assurance Combinable Crops & Sugar Beet Scheme	United Kingdom	06.08.2012	
Scottish Quality Farm Assured Combinable Crops Limited	United Kingdom	13.08.2012	
Gafta Trade Assurance Scheme	United Kingdom	23.06.2014	
Trade Assurance Scheme for Combinable Crops		07.10.2014	

[6] not re-approved yet
[7] re-approved in 2017

Universal Feed Assurance Scheme		07.10.2014	
Biograce GHG calculation tool		19.06.2014	

3.3 National systems of other Member States

National systems of other Member States also ensure organisationally that the requirements regarding the sustainability criteria for the production and supply of biomass laid down in the Renewable Energy Directive are met. They regulate the standards which further determine the requirements for evidence of their implementation and for verifying such evidence.

In 2016, data of the national systems of Hungary, Slovenia, Slovakia and Austria were available in Nabisy. Operations based in the territory of Austria are obliged to enter their sustainability data into the Austrian database elNa.

3.4 Economic Operators

Economic operators throughout the value chain in the field of sustainable bioenergy work in accordance with the requirements of a certification system, a voluntary system or a national system of another Member State, users exempted (installation operators and parties under the obligation to provide proof). These must comply with additional national regulations in order to obtain remuneration pursuant to the Renewable Energy Sources Act or to have quantities counted towards the biofuel quota.

The following economic operators are to be considered in particular:

Growers

Growers are agricultural holdings and operational sites that grow and harvest biomass.

First gathering points

First gathering points are establishments and operational sites which first acquire the biomass required to produce biofuels from the holdings that grow and harvest such biomass for the purpose of trading it on (e.g. agricultural traders).

Originators

Establishments or private households generating waste and residues.

Gatherers

Gatherers are establishments and operations that first take on the biomass required for the production of biofuels in the form of waste and residues from the operations or private households which generated the waste and residues for the purpose of trading it on.

Conversion operation

There are two different groups to be distinguished:

a) Establishments and operations which process biomass from sustainable cultivation or from biogenic waste or residues and supply the semi-finished products to further processing stages for the purpose of biofuel or bioliquids production (e.g. oil mills, biogas plants, fat preparation plants or other plants the process step of which is not sufficient to achieve the quality level required for final use).

b) Establishments and operations that process liquid or gaseous biomass up to the quality class required for final use (e.g. oil mills, esterification plants, ethanol plants, hydrogenation plants or biogas processing plants).

Operations along the production and supply chain that require certification and are connected with the certification systems are referred to as interfaces. In this context, first gathering points and gatherers are referred to as first interface, while conversion operations that process the biomass up to the required quality level are referred to as final interface.

Supplier or trader within the value chain

Suppliers are economic operators located between the first gathering point and the conversion operation or between the final interface and the distributor of biofuels or the installation operator who supplies electricity generated from biofuels. If suppliers after the final interface are not subject to customs supervision, they are required to join a DE certification system or a voluntary system recognised by the EU.

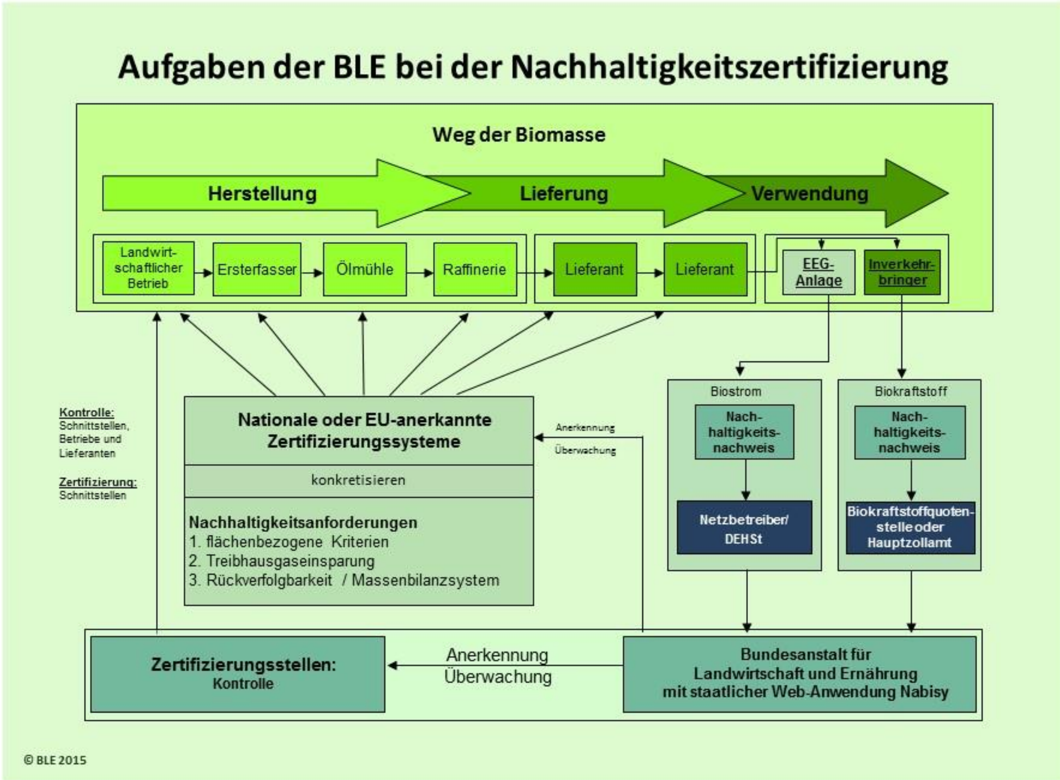
Installation operators

Installation operator refers to those using an operation for the generation of electricity from renewable energy and feeding in the electricity, regardless of ownership. For this, the installation operator receives remuneration pursuant to the Renewable Energy Sources Act from their grid system operator on presentation of appropriate sustainability certificates.

Party under the obligation to provide proof

Parties under the obligation to provide proof are economic operators who, according to Art. 37a of the Federal Immission Control Act, are obligated to reach certain minimum savings in greenhouse gas emissions of the total amount of fuels they declared for taxation in the course of a calendar year. To that effect, they may place sustainable biofuels on the market. Parties under the obligation to provide proof also include those who apply for tax relief for biofuels pursuant to the Energy Tax Act.

Diagram 1: *Control system*



3.4.1 Economic operators reported to the BLE

Within the framework of the sustainability ordinances, voluntary national or international systems which make requirements for the production of biomass products are considered as informally recognised by Germany alongside the BLE-recognised certification systems as long as and to the extent they are recognised by the European Commission. The same applies to national systems of other Member States.

The registration of participants in BLE-recognised certification systems (DE Systems) is mandatory. With regard to voluntary systems and national systems, only those participants are considered which have been registered with the BLE, as the biofuels or bioliquids they produce or trade are or could become relevant for the German market and they need access to the Nabisy database. By now, the majority of participants have joined an EU-recognised voluntary system.

By 31.12.2016, **3,849 participants** (previous year: 3,723) were registered with the BLE along the supply chain, producing or trading in biofuels and/or bioliquids.

The overall figures result from all participants reported to the BLE. If a company has multiple roles at the same time, e.g. producer of biofuels and supplier after the final interface and/or participates in more than one certification systems, this will result in multiple counting.

Fewer and fewer companies are participants of a DE System. Participants that leave the DE Systems can be assumed to transfer to the voluntary systems. The total number of participants increased by 3.4 %.

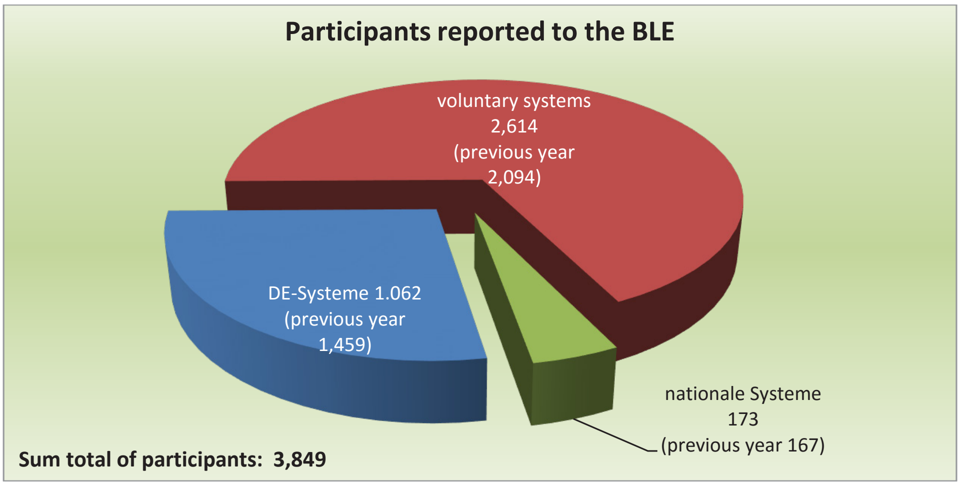


Diagram 2: Participants reported to the BLE

3.4.2 Suppliers subjected to supervision by German customs offices

If suppliers after the final interface are under supervision by German customs offices in terms of Art. 17(3) No. 2 Biofuel SusO, they will not necessarily be required to participate in a DE System or a voluntary system recognised by the European Commission. A prerequisite for this exception is that the suppliers' mass balance system is regularly subjected to controls carried out by the main customs offices for reasons of taxation pursuant to the Energy Tax Act or for the monitoring of the biofuel quota obligation under the Federal Immission Control Act, and that suppliers document the receipt and forwarding of biofuels in the electronic Nabisy database including place and date as well as the information on the sustainability certificate.

In the application process for Nabisy access, the BLE asks the main customs office responsible for the suppliers place of business to confirm that the applicant is actually under customs office supervision. Once this confirmation is provided, the economic operator is given access to the database.

By 31.12.2016, 345 suppliers under supervision of the customs office were registered with Nabisy (previous year: 376).

3.4.3 Participants in national systems of other Member States

Some of the participants registered in Nabisy are part of national systems of other Member States. By 31.12.2016, a total of 173 participants (previous year: 167) in national systems of **Austria**, **Hungary, Slovenia** and **Slovakia** had been reported to the BLE. The relatively small number of reports does not mean that biofuels, bioliquids or their source materials from these Member States are of limited relevance for the German market (see chapter 6.1, Diagram 12). Rather, it is due to the fact that some Member States transposed Directive 2009/28/EC at a later date. For that reason, interested economic operators from other Member States usually joined the DE Systems or the voluntary systems recognised by the European Commission.

4. Certification bodies

Certification bodies are independent natural or legal persons who issue certificates to economic operators along the supply chain and who monitor all operations along the supply chain with regard to fulfilment of the requirements laid down in the Renewable Energy Directive and in national legislation adopted for its implementation as well as other requirements of the used system. Certificates certify that the specific requirements of the Renewable Energy Directive for the production of sustainable biofuels or bioliquids are met. In Germany, the BLE is responsible for the recognition and supervision of certification bodies within the context of sustainable biomass production. This applies irrespective of whether the certification bodies become active in connection with DE Systems or with voluntary systems, since the monitoring task of the BLE refers to all certification bodies located in Germany.

Pursuant to Art. 42 Nos. 1 and 2 and Art. 43 in connection with Art. 56 BioEn SusO and/or Biofuel SusO, the following number of applications for the recognition of certification bodies were lodged with the BLE by 31.12.2016:

Table 3: Number of applications for recognition as certification body

Total number of applications (as of 31.12.2016)	**51**
rejected	6
permanently recognised	**44**[8]
recognition withdrawn or void due to inactivity of the certification body	19
Number of certification bodies permanently recognised by 31.12.2016	**25**

In connection with the recognition procedure, certification bodies receive a provisional recognition at first which allows them to take up their certification activities. Only after the certification body has undergone an office audit by the BLE control services can the provisional recognition be replaced by a permanent one.

The current list of recognised certification bodies can be viewed at http://www.ble.de/Biomasse at any time.

BLE auditors monitor certification audits of certification bodies (so-called witness audits) all over the world, provided that the countries concerned have permitted the BLE to carry out witness audits on their territory. The audits concern both the requirements of the DE Systems and the voluntary systems. In 2016, the BLE monitored 163 (previous year: 146) certification audits carried out by the certification bodies. 96 of these audits were carried out in Germany, the remaining 67 audits took place all over the world in countries both within and outside of the European Union.

[8] By 31.12.2016, one additional certification body was provisionally recognised

Table 4: Permanently recognised certification bodies

Recognised certification bodies	Permanently recognised on
SGS Germany GmbH, Germany	23.08.2010
DQS CFS GmbH, Germany	23.08.2010
TÜV SÜD GmbH, Germany	23.08.2010
GUT Certifizierungsgesellschaft mbH, Germany	23.08.2010
Global-Creative-Energy GmbH, Germany	30.08.2010
Peterson Control Union Deutschland GmbH, Germany	30.08.2010
Agrizert Zertifizierungs GmbH, Germany	29.09.2010
IFTA AG, Germany	01.12.2010
DEKRA Certification GmbH, Germany	01.12.2010
ABCERT AG, Germany	09.12.2010
LACON GmbH, Germany	15.12.2010
ÖHMI Euro Cert GmbH, Germany	20.12.2010
QAL Umweltgutachter GmbH, Germany	20.12.2010
Agro Vet GmbH, Austria	21.12.2010
ASG cert GmbH, Germany	14.03.2011
Bureau Veritas Certification Germany GmbH, Germany	14.03.2011
TÜV Thüringen e. V., Germany	21.04.2011
TÜV Nord Cert GmbH, Germany	23.09.2011
proTerra GmbH, Germany	27.09.2011
Intertek Certification GmbH	13.02.2013
ELUcert GmbH, Germany	17.04.2013
SC@PE international Ltd.	05.06.2014
BSI Group Deutschland GmbH	13.11.2014
DIN CERTCO Gesellschaft für Konformitäts-bewertung mbH	04.02.2015
SicZert Zertifizierungen GmbH	26.03.2015

4.1 Global certifications under DE System requirements

In Germany, the transposition of Directive 2009/28/EC into national law stipulates an obligation for certain economic operators along the supply chain for the production of biofuels or bioliquids, the so-called **interfaces**, to be certified. The interfaces include the first gathering points/gatherers as well as all conversion operations. In addition, assessments of conformity are carried out along the production and supply chain.

The certification bodies acting according to the requirements of the certification systems recognised by the BLE (REDcert-DE and ISCC-DE) mainly carried out certifications in Germany and within the European Union.

In 2016, 99 DE certifications were carried out. In the previous year, certifications still amounted to 121.

It can be assumed that the 99 system participants certified are mostly companies that operate exclusively on the German market and therefore do not necessarily need a certification according to the requirements of a voluntary system. However, there were also some operations overseas that were provided with a certificate issued according to DE System requirements.

Table 5: Number of DE certifications

Number of operations certified and recertified under DE requirements	in 2014	in 2015	in 2016
total	341	121	99
in Germany	160	91	76
within the EU, excluding Germany	161	29	19
in third countries	20	1	4

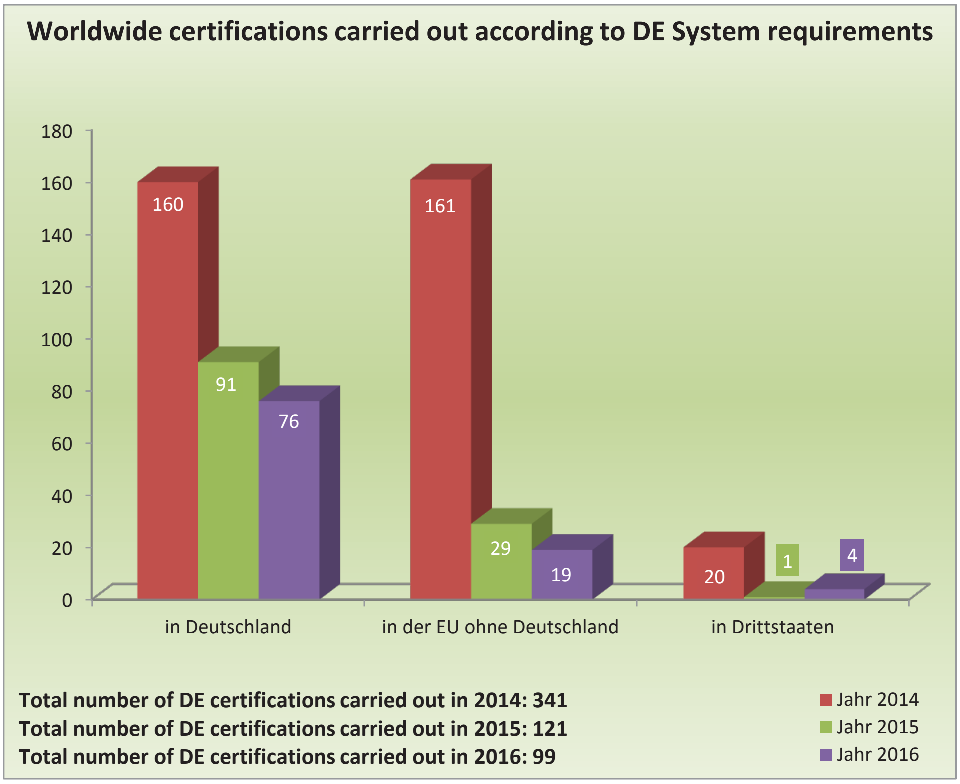


Diagram 3: Global certifications carried out according to DE system requirements

4.2 Certifications under the requirementsof the voluntary systems

The BLE is responsible for the recognition and supervision of certification bodies based in or operating a branch in Germany and making their certification decisions there.

This applies irrespective of the kind of system used (DE or voluntary) the requirements of which the certified company has committed itself to comply with. The certification bodies submit all certificates to the BLE. In the reporting year, **2,448** (previous year: 2,342) certifications and re-certifications for operations certified according to the requirements of voluntary systems were reported to the BLE.

5. Public database Nabisy and sustainability certificates

5.1 Sustainable biomass system ("Nabisy")

According to Commission Decision 2011/13/EU of 12th January 2011, economic operators have to submit certain kinds of information on the sustainability of every consignment of biofuels and bioliquids to the Member States if they can become relevant for the respective market.

In Germany, this is done electronically. The economic operators must enter this information into the web-based public database **Nabisy** for every supply of biofuels or bioliquids. Sustainability certificates or partial sustainability certificates contain the data entered into Nabisy on the fulfilment of the sustainability criteria and are to be handed on along the supply chain.

In the reporting year, 1,859 (previous year: 1,468) accounts were in use. Only accounts of operators from the final interface were involved as this is where the Nabisy system commences. The largest share is accounted for by plant operators using liquid sustainable biomass for the generation of electricity.

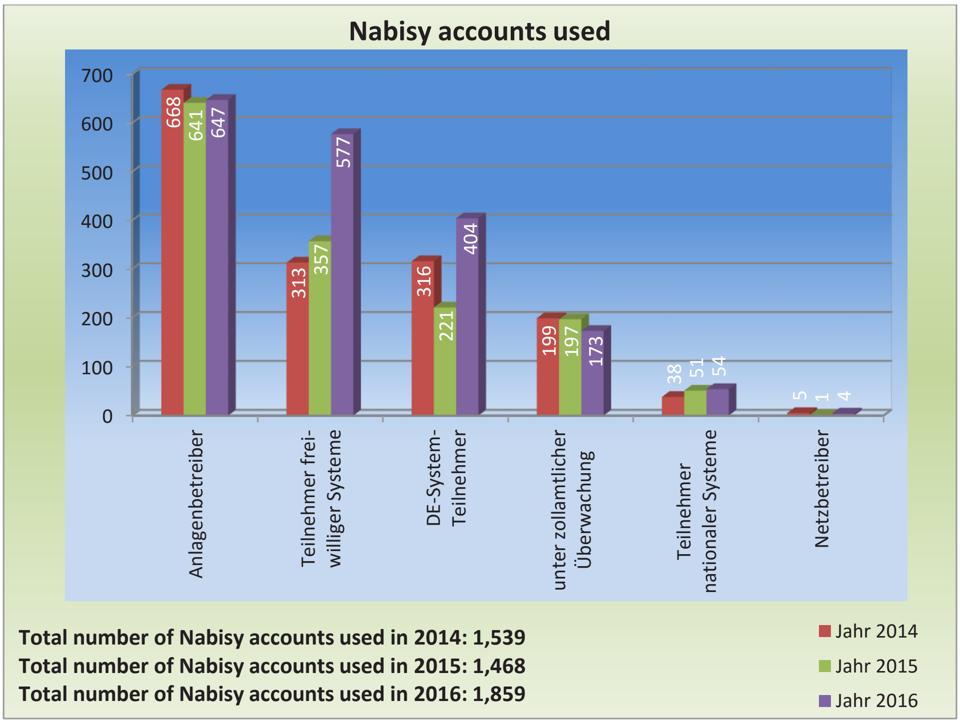


Diagram 4: Nabisy accounts used

Economic operators with an account in Nabisy can, depending on their function, create sustainability certificates (final interfaces), rewrite, share and summarise sustainability certificates and partial sustainability certificates (suppliers/plant operators) and apply notations of use (network operators). Economic operators have the option to apply at the BLE for a needs-based number of accesses to their account.

Through the Act for the introduction of tenders for electricity from renewable energies and for further changes to the renewable energies law from 13.10.2016 (Federal Law Gazette I, p. 2258), the Biomass Electricity Sustainability Ordinance became applicable to any liquid biomass remunerated by the EEG as of 01.01.2017. Installation operators who necessarily require **start-up, ignition or auxiliary firing** for the operation of their installation and use liquid biomass for this purpose require a sustainability certificate as of 01.01.2017. In November and December 2016, the BLE provided, upon request, access for more than 600 biogas plants concerned.

The largest increase in new Nabisy registrations was recorded in the area of installation operators. These accesses were predominantly created for biogas plants.

The following overview shows the total number of accesses as of 31.12.2016.

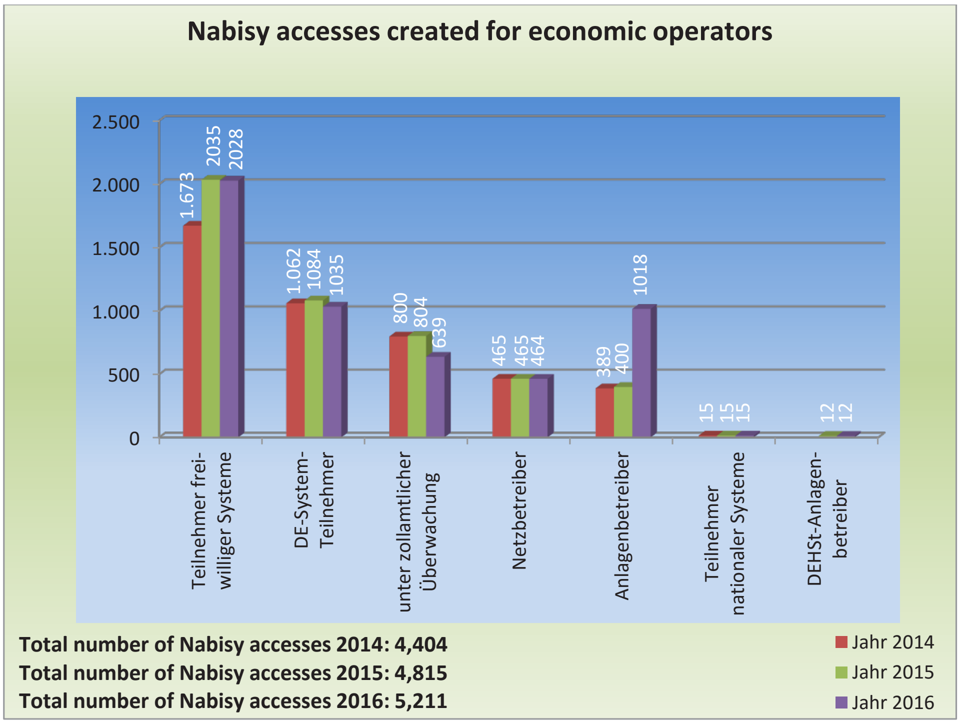


Diagram 5: Nabisy accesses created for economic operators

5.2 Certificates

Only producers of a consignment of biofuel or bioliquids can issue a **sustainability certificate**. They are a so-called "**final interface**". By issuing the certificate in Nabisy, they ensure that the consignment can be used on the German market. If a down-stream part of the supply chain, e.g. a supplier, decides that the goods are to be used outside of Germany, they will have to retire the respective certificate to the retirement account of the state in which the use takes place.

Presenting sustainability certificates or partial sustainability certificates to the customs authority is a prerequisite for counting biofuels towards the greenhouse gas reduction obligation of the distributor. Installation operators are entitled to remuneration for electricity generated from biomass and fed into the grid pursuant to the Renewable Energy Sources Act and the renewable resources bonus (if applicable) only if they produce a sustainability certificate or partial sustainability certificate.

Sustainability certificates are issued by certified economic operators who upgrade the liquid or gaseous biomass to the quality class required for the use as biofuel, or by those who produce biofuels from the biomass used (**issuing bodies**). While the sustainability ordinances refer to such economic operators as the final interface, the voluntary systems do not use this term. Thus, this report generally refers to the economic operator issuing the sustainability certificate.

A sustainability certificate identifies a certain quantity of biofuel or bioliquids as being sustainable. Where biofuels and/or bioliquids are traded along the supply chain to the party under obligation to deliver proof or the installation operator, the respective quantities are split or combined as required.

In order to document this accordingly, it is necessary to split a sustainability certificate or to combine it with other certificates. By doing so, but also by transferring the certificate to the suppliers account of a customer, **partial sustainability certificates are generated.**

Thus, Nabisy processes sustainability certificates (“basic certificates”, which can only be issued by producers) and partial sustainability certificates (“subsequent certificates”, which are generated by any kind of action of a supplier: transferring, splitting, combining).

In 2016, suppliers all over the world entered a total of **16,872** sustainability certificates (previous year: 16,943) into Nabisy.

Table 6: Sustainability certificates issued

Producer location	Number of producers	Number of sustainability certificates issued
Germany	122	9,572
European Union	93	6,726
Third countries	31	574
Total	**246**	**16,872**

Samples of a sustainability certificate (basic certificate) and a partial sustainability certificate (subsequent certificate) are pictured below.

NACHHALTIGKEITSNACHWEIS

für flüssige Biomasse nach §§ 15 ff. Biomassestrom-Nachhaltigkeitsverordnung (BioSt-NachV) oder für Biokraftstoffe nach §§ 15 ff. Biokraftstoff-Nachhaltigkeitsverordnung (Biokraft-NachV)

Nummer des Nachweises: EU-BM-14-150-87654321-12345678

Schnittstelle:	Empfänger:	Zertifizierungssystem:
EU-BM-14-SSt-00000004	Lieferant / trader EU 5, Musterstadt, EU-BM-14-Lfr-10000005	Nabisy Test Voluntary Scheme, null, EU-BM-14

1. Allgemeine Angaben zur Biomasse / zum Biokraftstoff:

Art: 100,00% FAME Anbauland / Entstehungsland*: DE

Menge (t/kWh/m3): 56,402 m³ Energiegehalt (MJ): 1.861.266

Die flüssige Biomasse / der Biokraftstoff ist aus Abfall oder aus Reststoffen hergestellt worden, und die Reststoffe stammen nicht aus der Land-, Forst- oder Fischwirtschaft oder aus Aquakulturen. ☐ ja ☒ nein

2. Nachhaltiger Anbau der Biomasse bzw. nachhaltige Herstellung des Biokraftstoffs nach den §§ 4 – 7 BioSt-NachV / Biokraft-NachV:

Die Biomasse erfüllt die Anforderungen nach den §§ 4 – 7 BioSt-NachV / Biokraft-NachV ☒ ja ☐ nein

3. Treibhausgas-Minderungspotenzial nach § 8 BioSt-NachV / Biokraft-NachV:

☒ Das Treibhausgas-Minderungspotenzial ist wie folgt

- Treibhausgasemissionen (g CO2eq/MJ): **24,4** Vergleichswert für Fossilbrennstoffe (g CO2eq/MJ): 83,8
- Erfüllung des Minderungspotenzials bei einem Einsatz ☒ zur Stromerzeugung ☒ als Kraftstoff ☒ in Kraft-Wärme-Kopplung ☒ zur Wärmeerzeugung
- Erfüllung des Minderungspotenzials bei einem Einsatz in folgenden Ländern/Regionen (z.B. Deutschland, EU): Weltweit

Der Nachhaltigkeits-Teilnachweis wurde elektronisch erstellt und ist ohne Unterschrift gültig. Die Identifizierung des Teilnachweises erfolgt über seine einmalig vergebene Nummer.

Ort und Datum der Ausstellung: Bonn, 27.09.2017

Lieferung auf Grund eines Massenbilanzsystems nach § 17 BioSt-NachV / Biokraft-NachV:**

☒ Die Lieferung ist in einem Massenbilanzsystem dokumentiert worden.

☐ Die Dokumentation erfolgt über die Web-Anwendung der BLE

☒ Die Dokumentation erfolgte nach den Anforderungen des folgenden Zertifizierungssystems: Nabisy Test Voluntary Scheme

☐ Die Dokumentation erfolgt nach § 17 Abs. 3 Biokraft-NachV.

☐ Die Dokumentation erfolgte in der folgenden elektronischen Datenbank:

Letzter Lieferant (Name, Adresse):

*** Hinweis:** Im Falle, dass Rohstoffe aus mehreren Anbau- oder Entstehungsländern in dem Nachhaltigkeitsnachweis enthalten sind, werden nur die zwei Staaten mit den größten Mengenanteilen angezeigt.

**** Hinweis:** auszufüllen vom letzten Lieferanten

Vordruck der Bundesanstalt für Landwirtschaft und Ernährung

Diagram 6: Sustainability certificate

NACHHALTIGKEITS-TEILNACHWEIS

für flüssige Biomasse nach §§ 15 ff. Biomassestrom-Nachhaltigkeitsverordnung (BioSt-NachV) oder für Biokraftstoffe nach §§ 15 ff. Biokraftstoff-Nachhaltigkeitsverordnung (Biokraft-NachV)

Nummer des Teilnachweises: EU-BM-14-Lfr-10000006-999-12345678-NTNw-10006523

Nummer des Basis-Nachweises: EU-BM-14-150-87654321-12345678

Aussteller: BLE

Schnittstelle:	Empfänger:	Zertifizierungssystem:
EU-BM-14-SSt-00000004	Lieferant / trader EU 6, Musterstadt, EU-BM-14-Lfr-10000006	Nabisy Test Voluntary Scheme, null, EU-BM-14

1. Allgemeine Angaben zur Biomasse / zum Biokraftstoff:

Art: 100,00% FAME

Anbauland / Entstehungsland*: DE

Menge (t/kWh/m3): 56,402 m³

Energiegehalt (MJ): 1.861.266

Die flüssige Biomasse / der Biokraftstoff ist aus Abfall oder aus Reststoffen hergestellt worden, und die Reststoffe stammen nicht aus der Land-, Forst- oder Fischwirtschaft oder aus Aquakulturen. ☐ ja ☒ nein

2. Nachhaltiger Anbau der Biomasse bzw. nachhaltige Herstellung des Biokraftstoffs nach den §§ 4 – 7 BioSt-NachV / Biokraft-NachV:

Die Biomasse erfüllt die Anforderungen nach den §§ 4 – 7 BioSt-NachV / Biokraft-NachV ☒ ja ☐ nein

3. Treibhausgas-Minderungspotenzial nach § 8 BioSt-NachV / Biokraft-NachV:

☒ Das Treibhausgas-Minderungspotenzial ist wie folgt

- Treibhausgasemissionen (g CO2eq/MJ): **24,4**

Vergleichswert für Fossilbrennstoffe (g CO2eq/MJ): 83,8

- Erfüllung des Minderungspotenzials bei einem Einsatz

☒ zur Stromerzeugung ☒ als Kraftstoff
☒ in Kraft-Wärme-Kopplung ☒ zur Wärmeerzeugung

- Erfüllung des Minderungspotenzials bei einem Einsatz in folgenden Ländern/Regionen (z.B. Deutschland, EU): Weltweit

Der Nachhaltigkeits-Teilnachweis wurde elektronisch erstellt und ist ohne Unterschrift gültig. Die Identifizierung des Teilnachweises erfolgt über seine einmalig vergebene Nummer.

Ort und Datum der Ausstellung: Bonn, 27.09.2017

Lieferung auf Grund eines Massenbilanzsystems nach § 17 BioSt-NachV / Biokraft-NachV:**

☒ Die Lieferung ist in einem Massenbilanzsystem dokumentiert worden.

☒ Die Dokumentation erfolgt über die elektronischen Datenbank der BLE

☐ Die Dokumentation erfolgte nach den Anforderungen des folgenden Zertifizierungssystems:

☐ Die Dokumentation erfolgt nach § 17 Abs. 3 Biokraft-NachV.

☐ Die Dokumentation erfolgte in der folgenden elektronischen Datenbank:

Letzter Lieferant (Name, Adresse): Lieferant / trader EU 5, Musterstadt

*** Hinweis:** Im Falle, dass Rohstoffe aus mehreren Anbau- oder Entstehungsländern in dem Nachhaltigkeitsnachweis enthalten sind, werden nur die zwei Staaten mit den größten Mengenanteilen angezeigt.

**** Hinweis:** auszufüllen vom letzten Lieferanten

Vordruck der Bundesanstalt für Landwirtschaft und Ernährung

Diagram 7: Partial sustainability certificate

6. Biofuels

The following illustrates the energetic quantities (TJ) of biofuels distributed in Germany for which applications for
- counting towards the greenhouse gas reduction quota or
- a tax relief were lodged.

Data are based on the certificates with notations of the Federal Revenue Administration deposited in Nabisy.

Please note that the information given only concerns the quantities applied for as well as the respective energy contents. On the basis of the available data, no statements can be made as to whether tax relief is actually granted for all the amounts and energy contents presented here or whether they are counted towards the quota obligation.

The data regarding the quota obligation and tax relief were presented together.

Diagram 8 gives an overview of the quantities for which applications were submitted towards the biofuel quota obligation for 2014, 2015 and 2016 in comparison. For 2014, the shares of quantities with double-weighting certificates are presented as well.

Replacement of the energetic quota by the greenhouse gas reduction quota in 2015 cancelled the option of double-weighting. While the quantity of biofuels significantly declined by 8.6 % in the quota year of 2015 compared to the previous year, it remained almost unchanged in 2016.

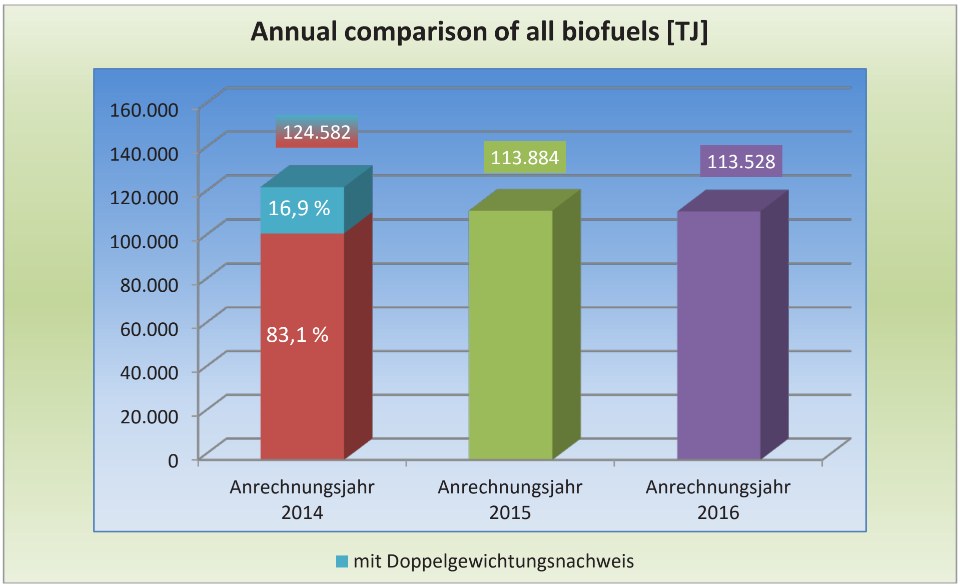


Diagram 8: Annual comparison of all biofuels

In previous years, the share of biofuels produced from waste and residues had already been on a continuous increase. In 2016, this share reached a new record high of 30.1 %. Thus, almost 54 % more waste and residues came into use compared to 2015.

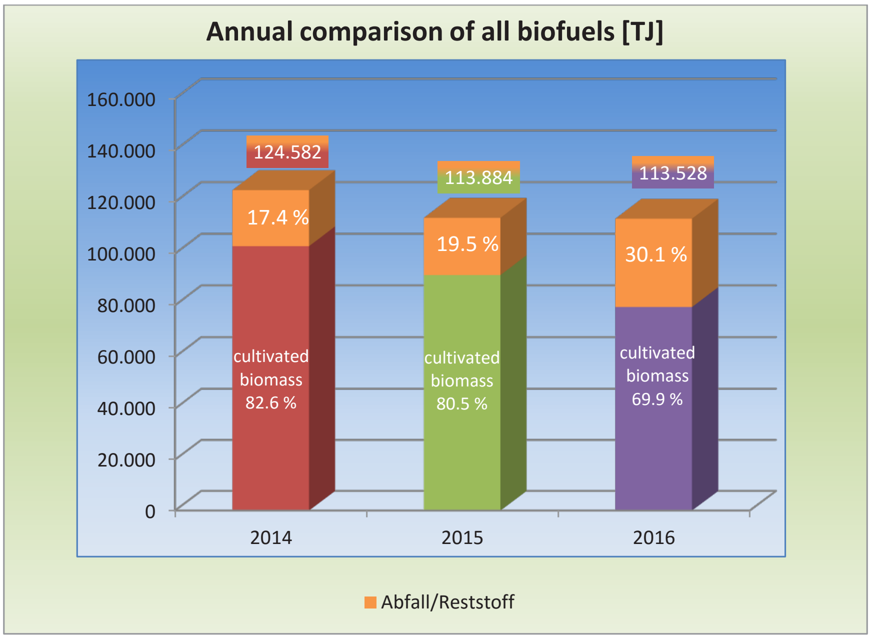


Diagram 9: Annual comparison of all biofuels (including waste/residues)

6.1 Origin of the source materials

The decline in the quantity of biofuels the source materials of which originate in Europe was more distinct than in the previous year. While the quantity declined by 1.5 % in 2015, the decline amounted to 12.9 % in the reporting year.

The quantities of biofuels produced from source materials originating in Asia increased by 56.9 % in contrast to the European quantities. This can mainly be attributed to the different allocation of quantities to the German greenhouse gas reduction quota and the forwarding to other countries. As palm oil has lower average emissions than rapeseed (see Diagram 41), obviously these quantities of palm oil were predominantly used in Germany to fulfil the quota. The rapeseed quantity with the higher emission values counted in the previous year was booked to other countries' accounts rather (see Diagrams 51, 52, and 53).

Quantities the source materials of which originated in North, Central and South America have increased significantly, yet, overall, still play an insignificant role (see Diagrams 19, 20, and 21).

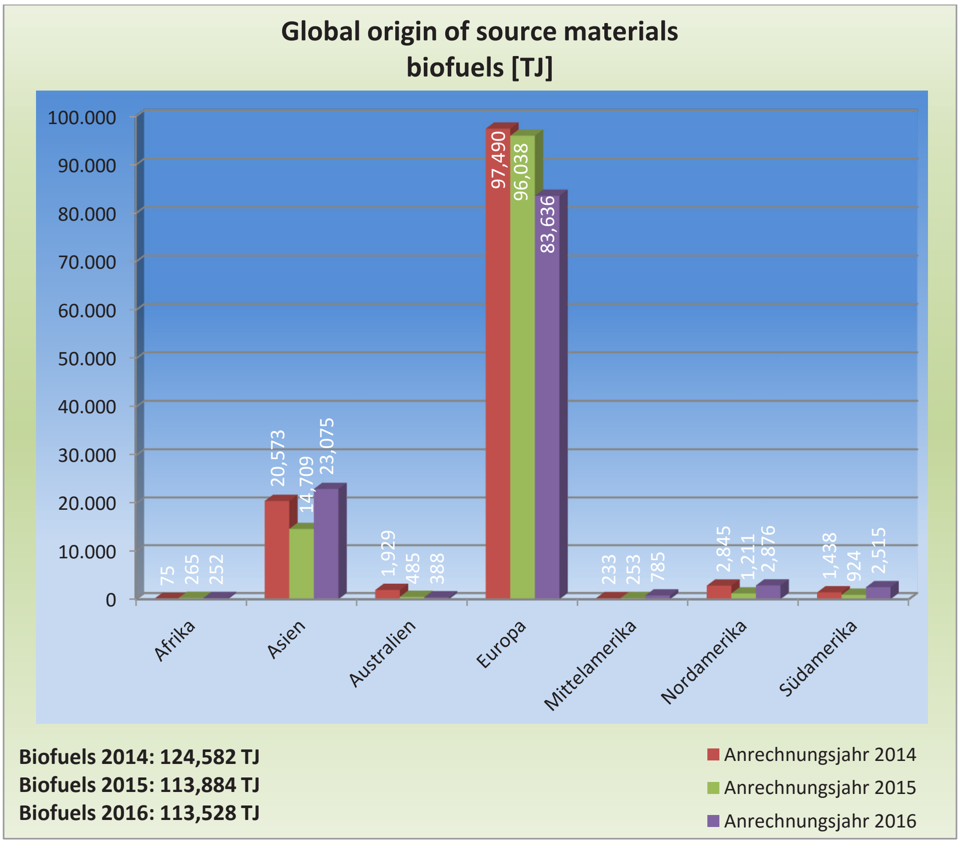


Diagram 10: Global origin of source materials

The share of biofuels originating in Germany declined significantly in the reporting year by 25.5 % compared to the previous year. The quantities originating in European third countries declined by 34.3 %.

The quantities originating in other Member States of the European Union, on the other hand, increased slightly.

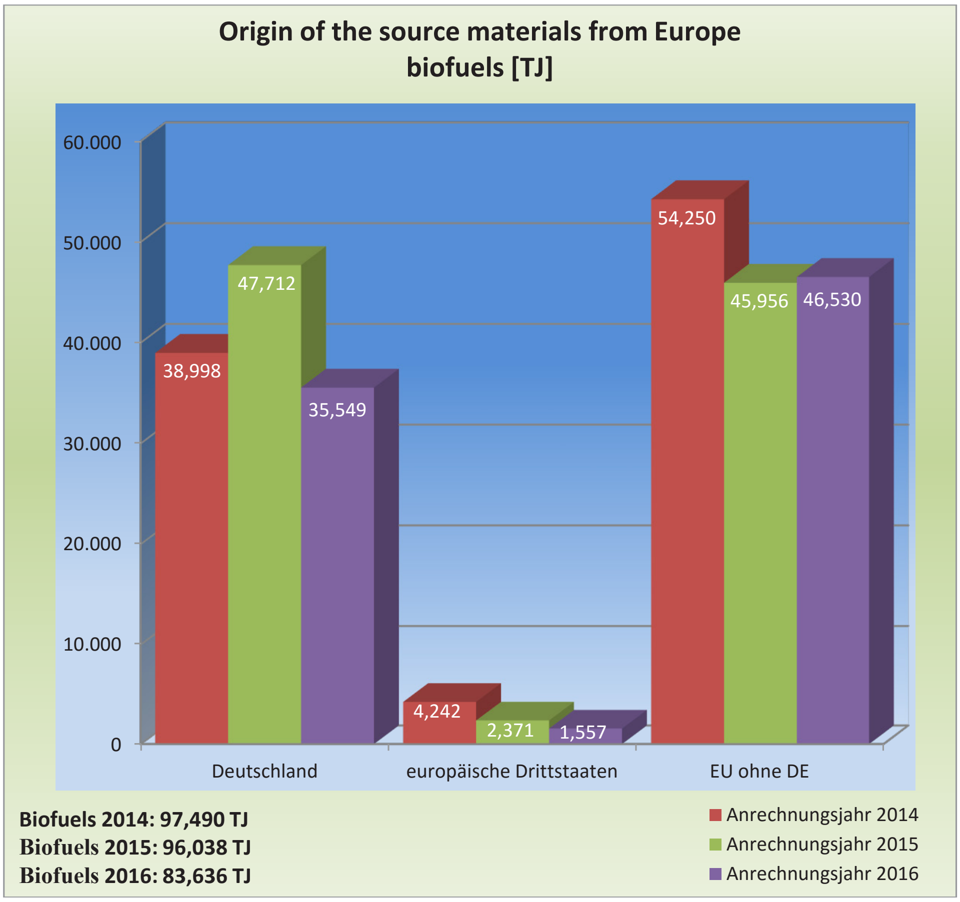


Diagram 11: Origin of the source materials from Europe

Among biofuels the source materials of which originated in Member States of the European Union, the share of biofuels originating in Germany was 43.3 %. That is 7.6 percentage points less than in the previous year.

The quantity shares of Hungary (9.1 %) and Poland (7.6 %) came in second and third place behind Germany. France was relegated from second to fourth place with a share of 7.4 % (previous year: 8.3 %). It was followed by the Netherlands 6.3 %, the Czech Republic 5.6 %, Belgium 4.3 %, Sweden 4.2 %, Austria 3.4 %, Bulgaria 2.5 % and the United Kingdom 1.5 %.

The remaining quantity (4.7 %) originated in a total of fifteen countries the shares of which were below 1,000 TJ, respectively.

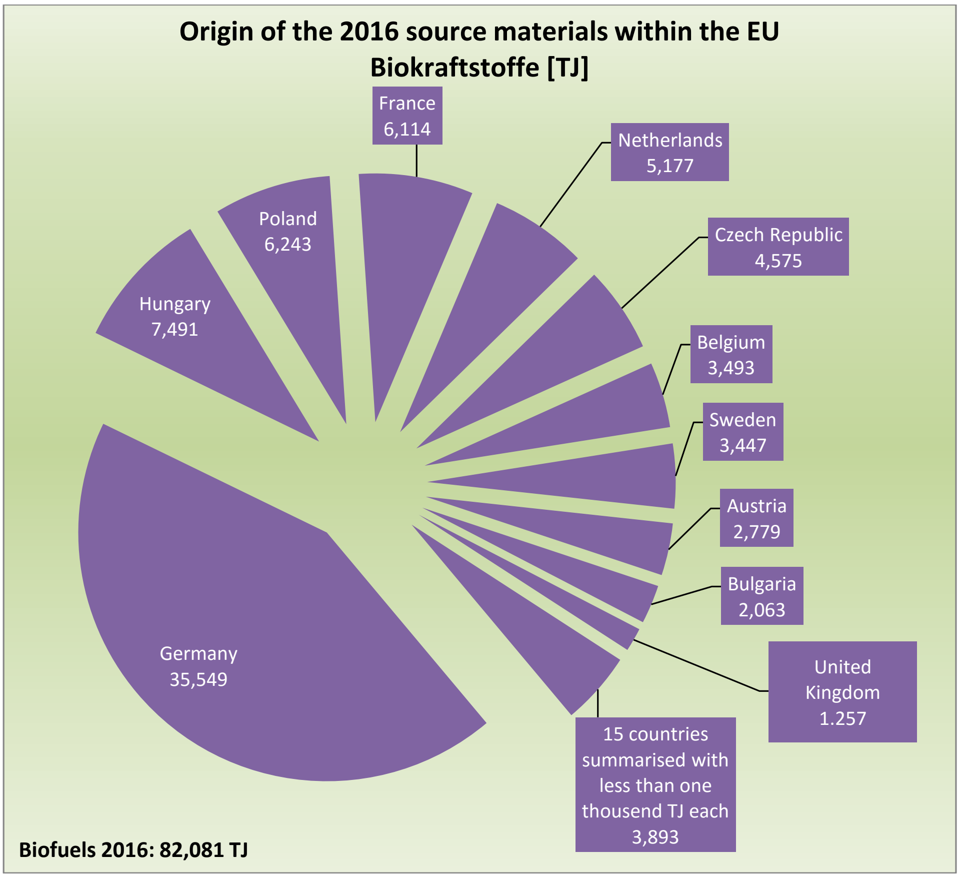


Diagram 12: Origin of the 2016 source materials within the EU

The shares of the fifteen countries summarised here are as follows:

Spain	994	Slovakia	791	Denmark	670	Romania	630
Ireland	175	Latvia	175	Lithuania	135	Finland	110
Croatia	75	Italy	61	Greece	44	Luxembour g	19
Slovenia	12	Cyprus	2	Portugal	0.1		

Source materials from European third countries originated mainly in Ukraine (88.5 %).

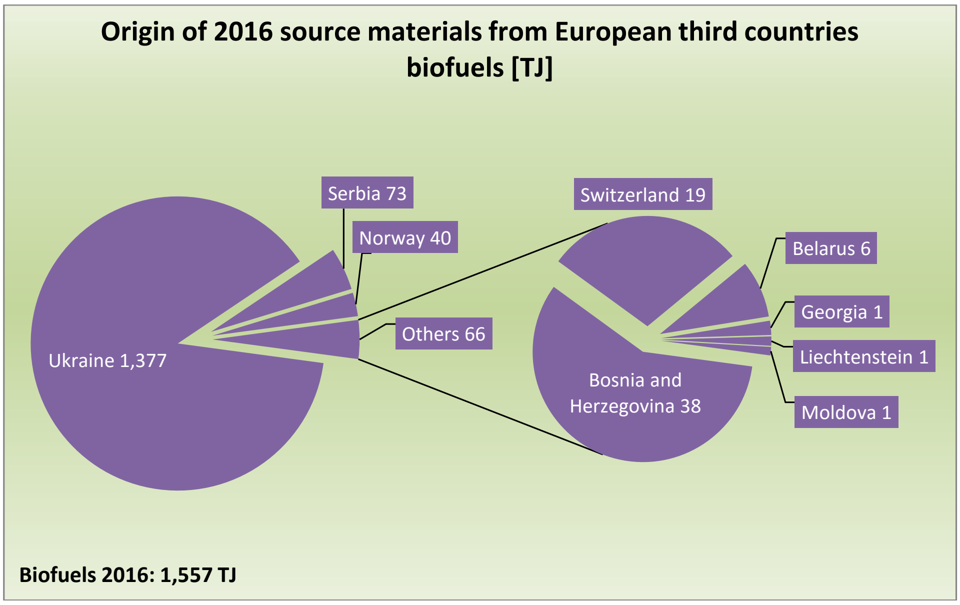


Diagram 13: Origin of 2016 source materials from European third countries

6.2 Source materials according to their origin and type

Source materials from **Africa** were exclusively waste and residues in 2016 and increased by 31.9 % compared to the previous year. They originated primarily in South Africa, Tunisia and Egypt. Sugar cane was no longer used. The total quantity of biofuels introduced to the market in Germany and made of African source materials is therefore declining.

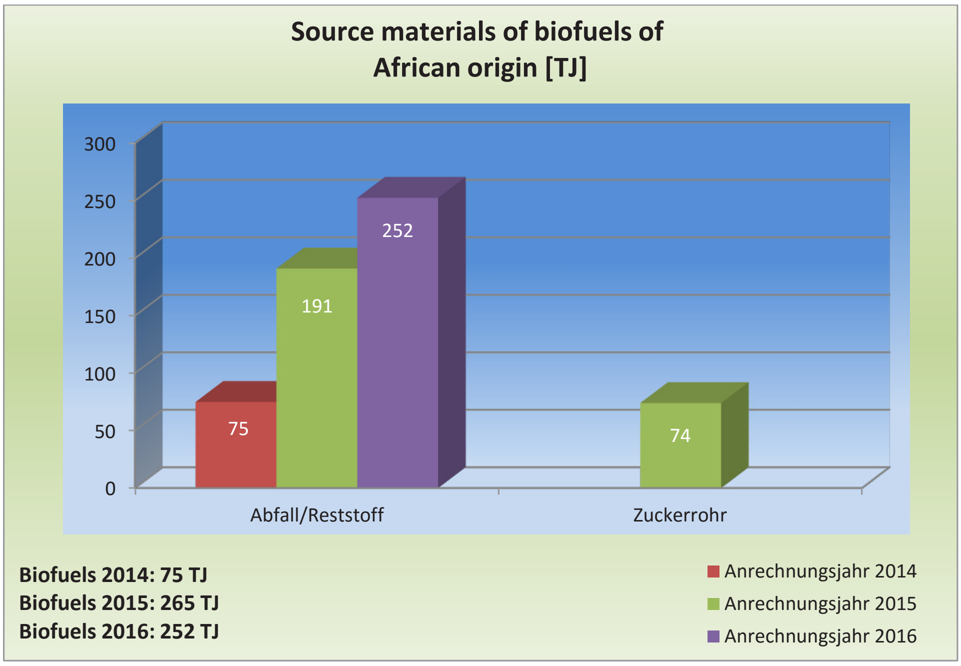


Diagram 14: Source materials of biofuels of African origin

After biofuels the source materials of which originated in **Asia** had recorded a sharp decline in the previous year they showed an increase in quantity of 56.9 % in 2016.

This was particularly due to the share of palm oil (plus 38 %). However, the quantities of waste and residues have far more than doubled (plus 141 %), as well.

As in the previous year, palm oil had its origin exclusively in Indonesia (93 %) and Malaysia (7 %).

The waste and residues originated primarily in Indonesia and the People's Republic of China.

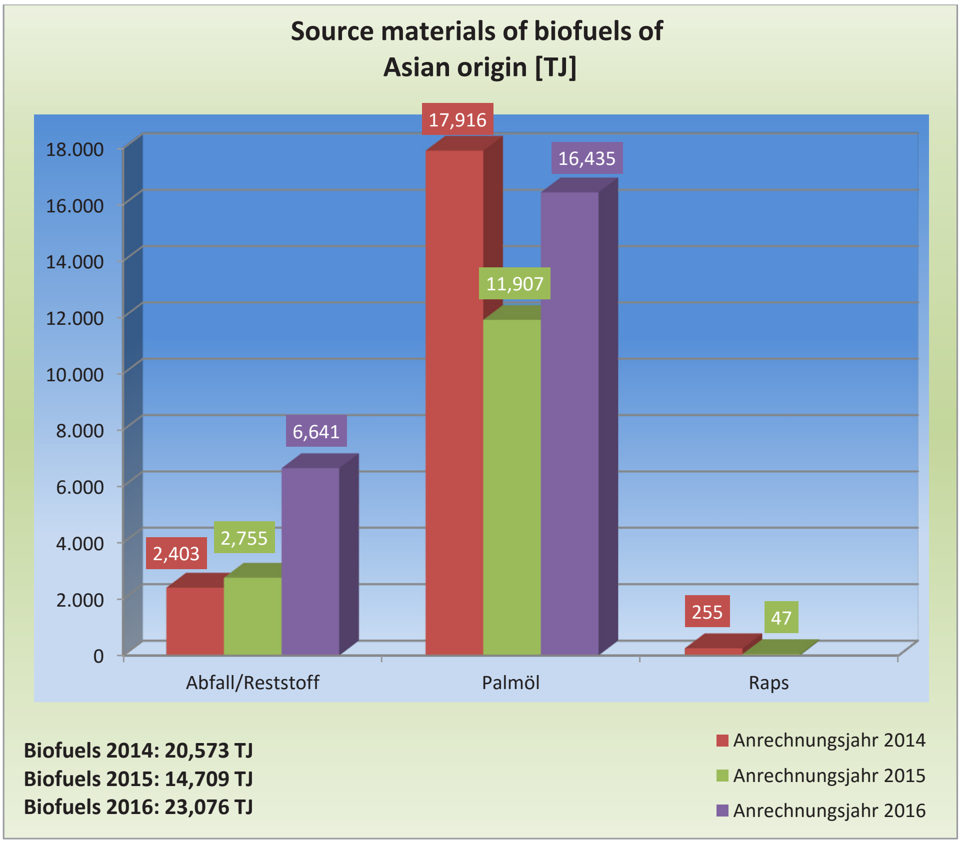


Diagram 15: Source materials of biofuels of Asian origin

Biofuels the source materials of which originated in **Australia** continue to be of minor importance. While the quantities of waste and residues increased by 30.8 %, the rapeseed share decreased by 23.9 %.

In the reporting year, no biofuels made from Australian palm oil came into use anymore.

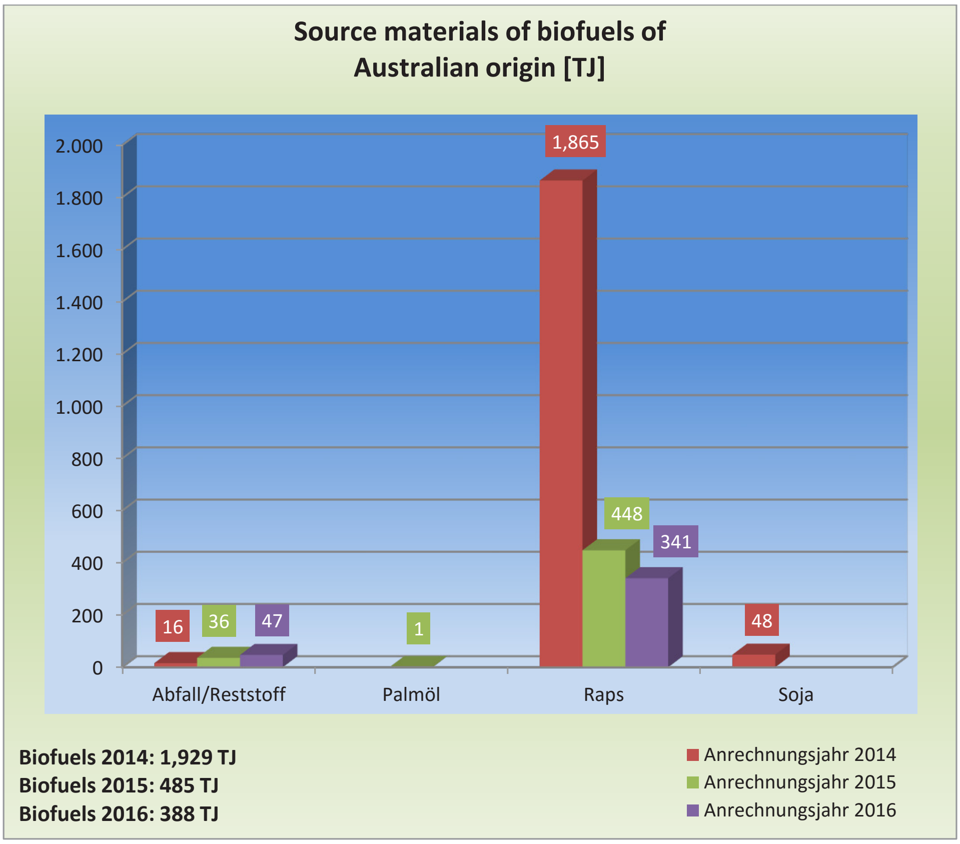


Diagram 16: Source materials of biofuels of Australian origin

Despite its significant decline, rapeseed remained the most important source material originating in **Europe** for the German biofuel market. 66 % of this share were grown in Germany. 11.1 % came from France and 6.3 % from the Czech Republic. The share of waste and residues increased further (plus 34.9 %). As in the previous year, the largest shares came from Germany and the Netherlands. The wheat share achieved only a small increase in 2016. The share of sugar beet again declined noticeably (minus 47.9 %) and originated predominantly in Germany. Maize remained an important source material, nevertheless its share decreased by 3.2 %.

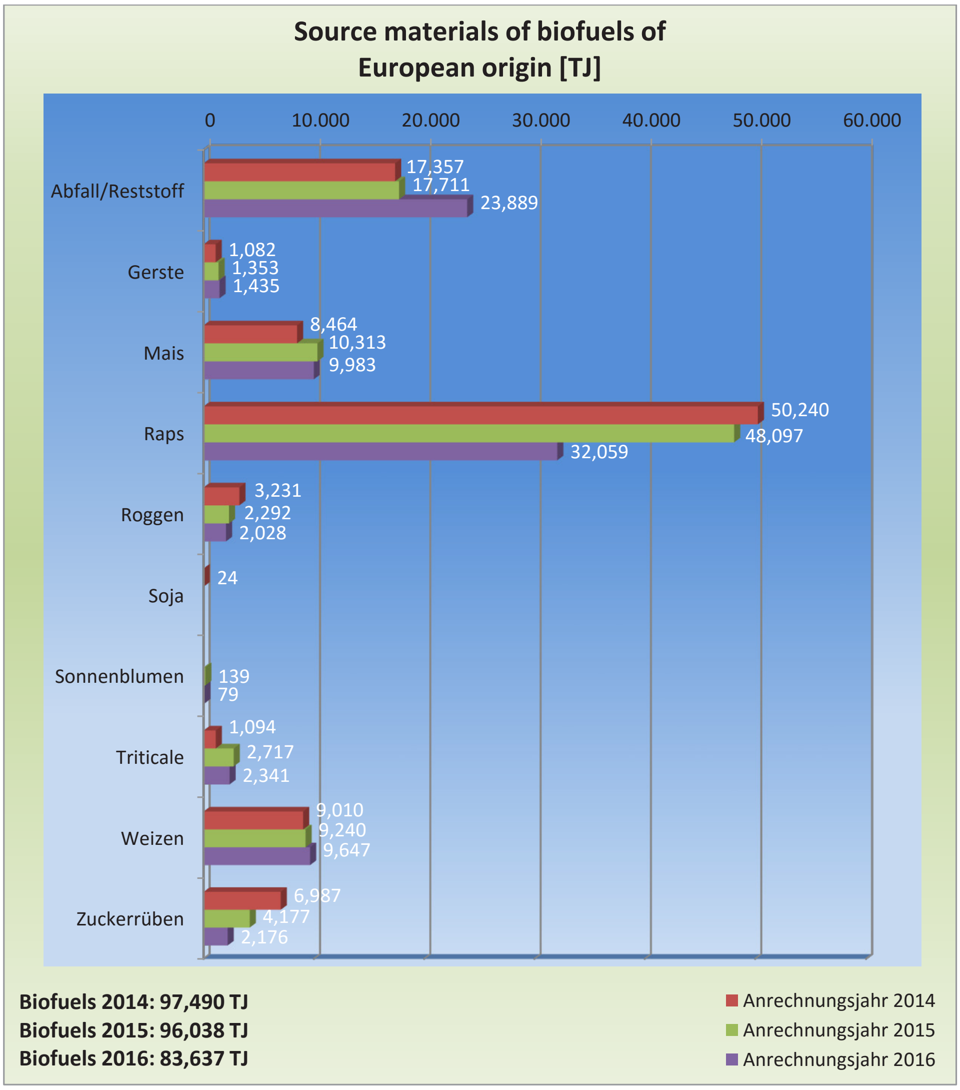


Diagram 17: Source materials of biofuels of European origin

Rapeseed was by far the most important source material of German origin, followed by waste and residues and grains.

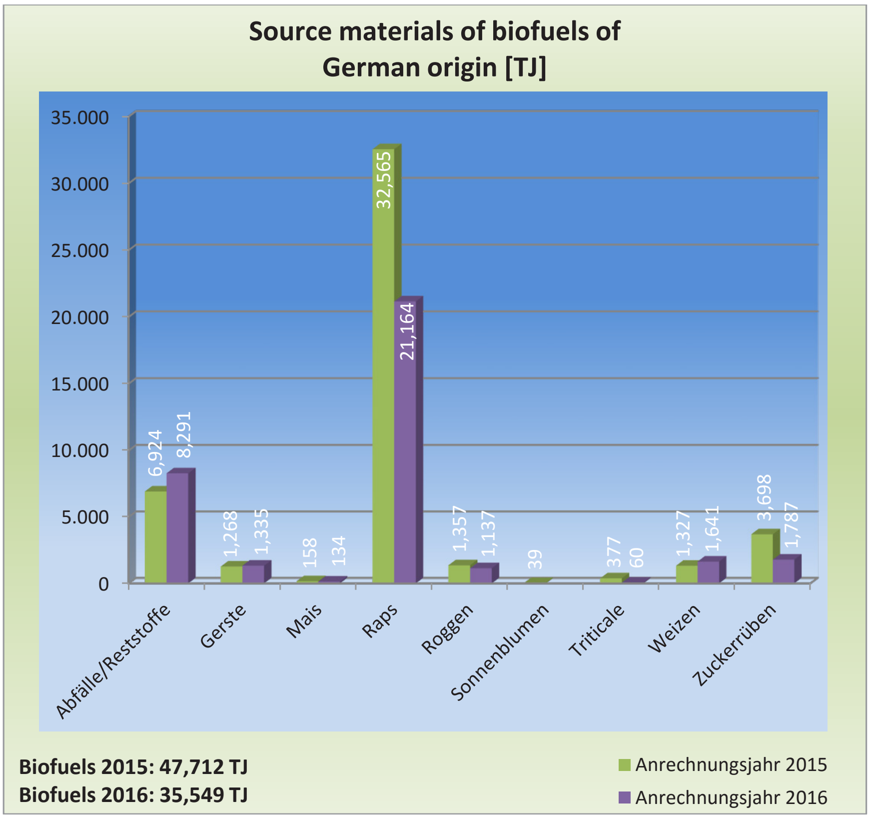


Diagram 18: Source materials of biofuels of German origin

Biofuels the source materials of which originated in **Central America** were predominantly made of sugar cane in the reporting year. The majority of the sugar cane originated in Guatemala and Costa Rica. Palm oil from the Central American state of Honduras came into use for the first time. Besides, a small amount of waste and residues was used. Overall, the amount of biofuels made of source materials from Central America has more than tripled.

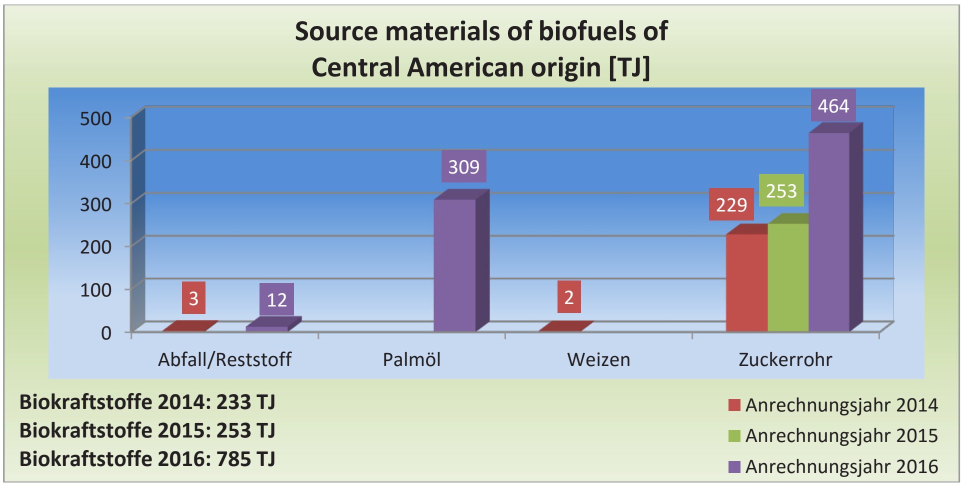


Diagram 19: Source materials of biofuels of Central American origin

In the reporting year, the total quantity of source materials originating in **North America** was similar to the quantity of two years earlier. What is striking is the increase in the quantity of waste and residues (plus 137.5 %). The majority came from the United States. In addition, a small amount of rapeseed came into use. As in the previous year, maize and soy had become irrelevant.

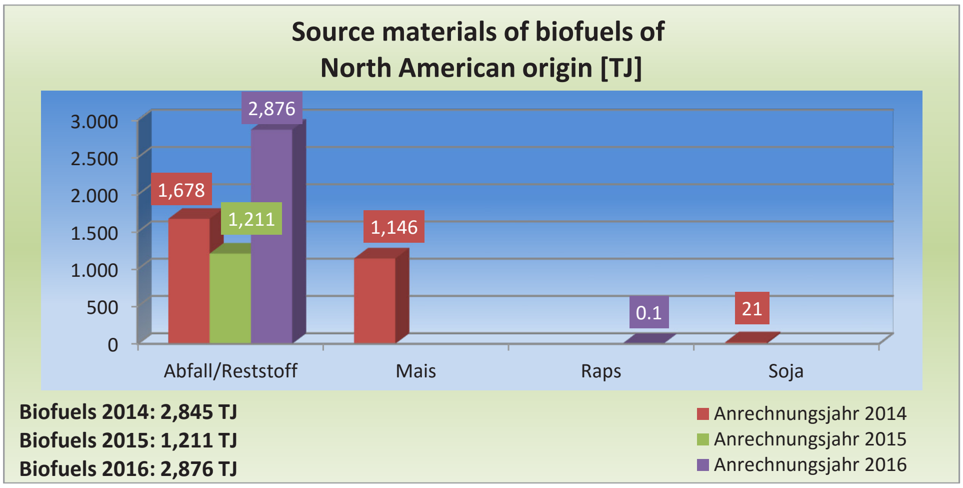


Diagram 20: Source materials of biofuels of North American origin

Biofuels with source materials originating in **South America** increased by 172.5 % in 2016.

The main reason for this was the sixfold increase of the sugar cane use, which, similarly to the situation with palm oil and rapeseed, will be attributable to significantly lower emission levels. The sugar cane quantities came from Peru (83.2 %), Brazil (15.4 %) and Bolivia (1.4 %).

The share of waste and residues was increased by 67.4 %, compared to the previous year. More than half of the waste and residues originated in Argentina.

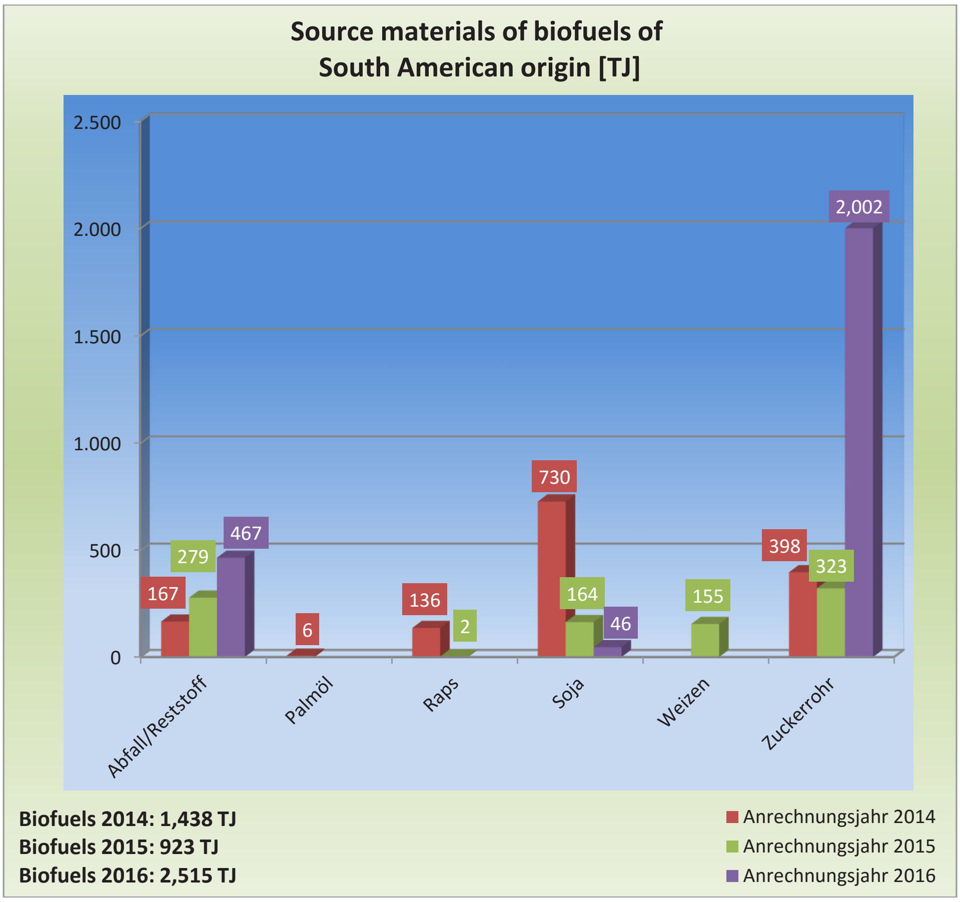
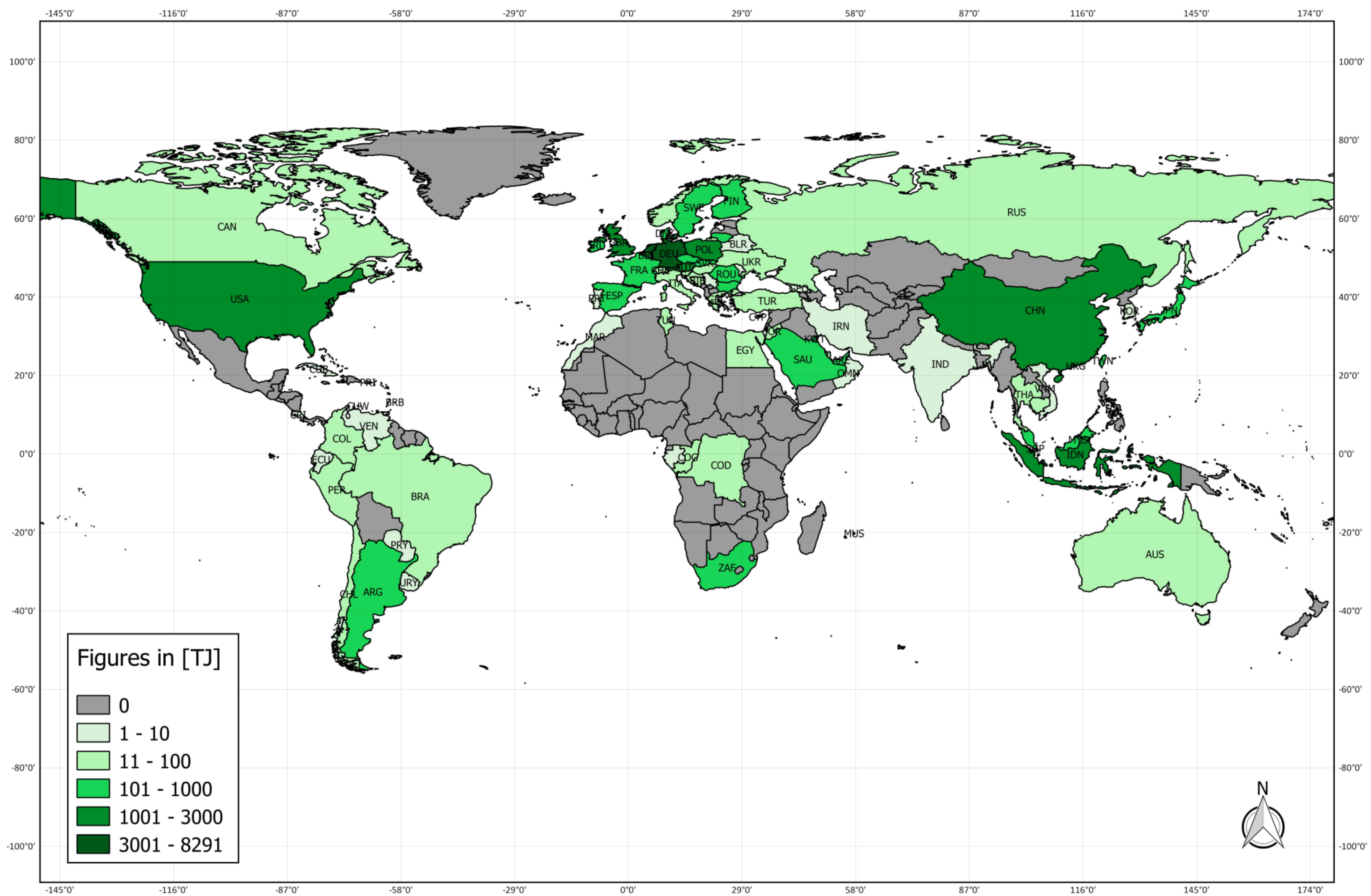


Diagram 21: Source materials of biofuels of South American origin



Countries of origin waste/residual materials

Scale: 1:130.000.000 Reference: Data basis made with Natural Earth, 2017

Diagram 22: World map with countries of origin – waste and residues

Diagram 23: Map of Europe with countries of origin – rapeseed

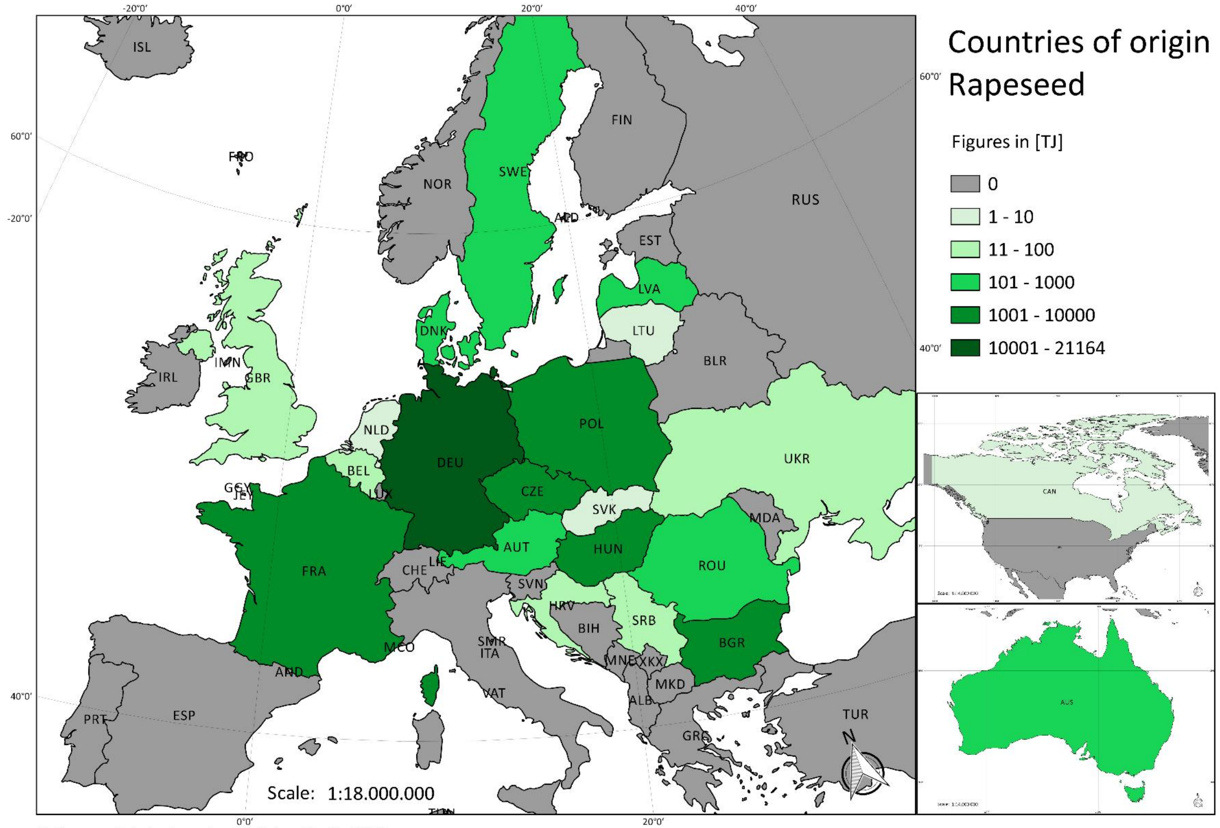
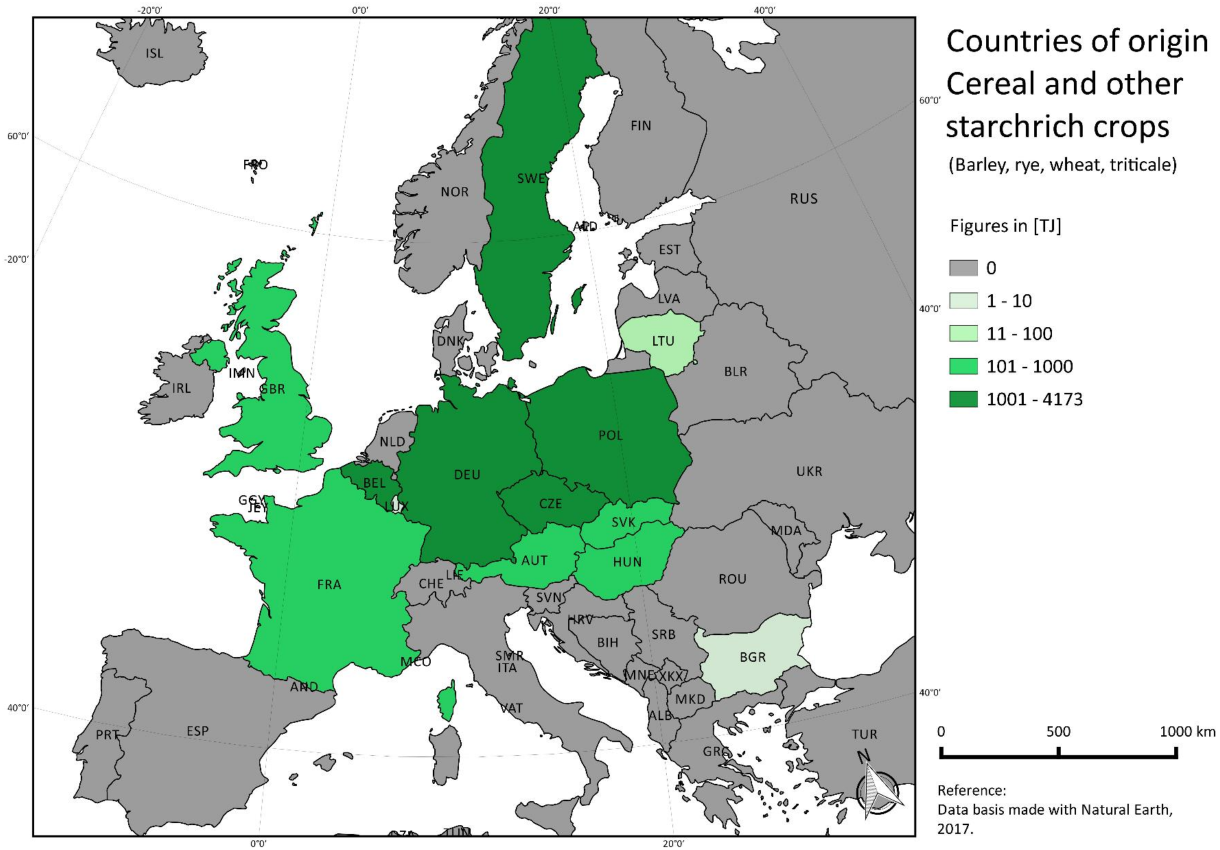


Diagram 24: Map of Europe with countries of origin – cereals



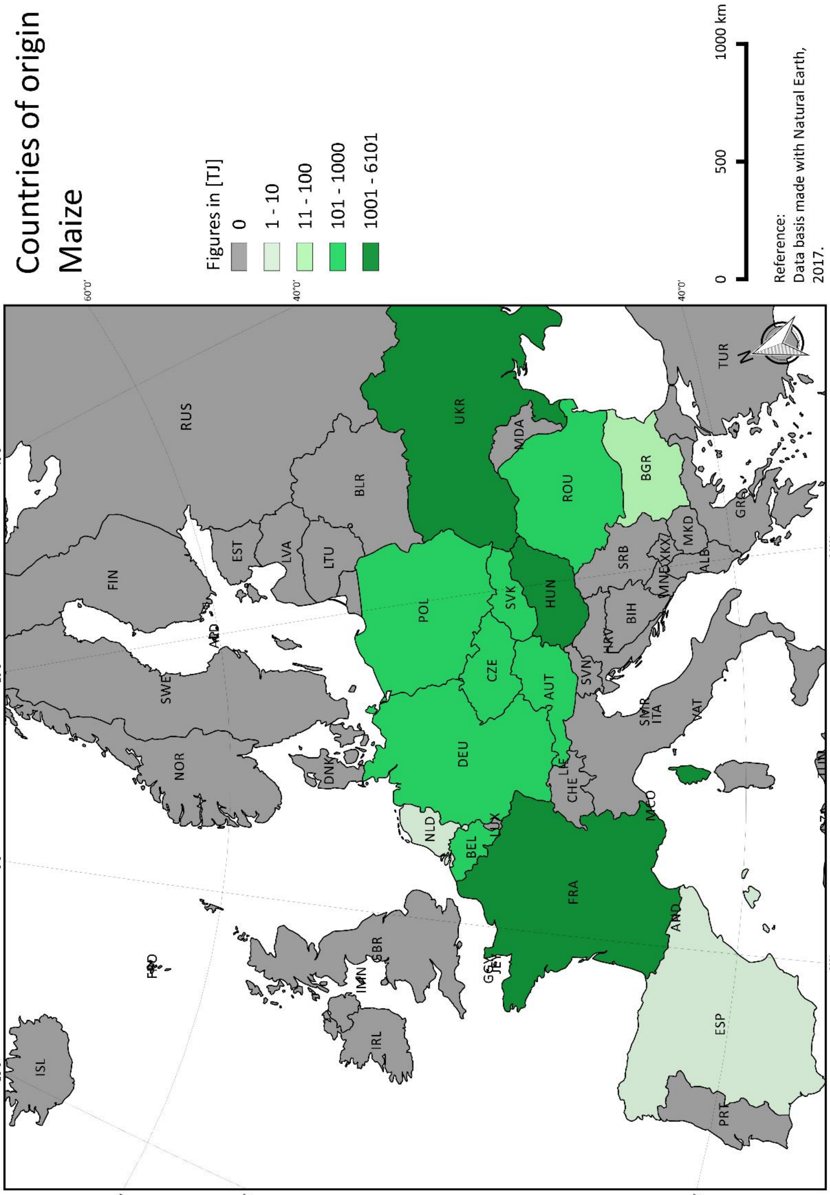


Diagram 25: Map of Europe with countries of origin – maize

6.3 Biofuel types

So far, FAME has had the visibly largest share of all biofuels submitted for counting in all the years. While the quantities of bioethanol (minus 2.8 %) and HVO (minus 2.2 %) showed minor reductions, the quantity of FAME increased slightly (plus 0.9 %).

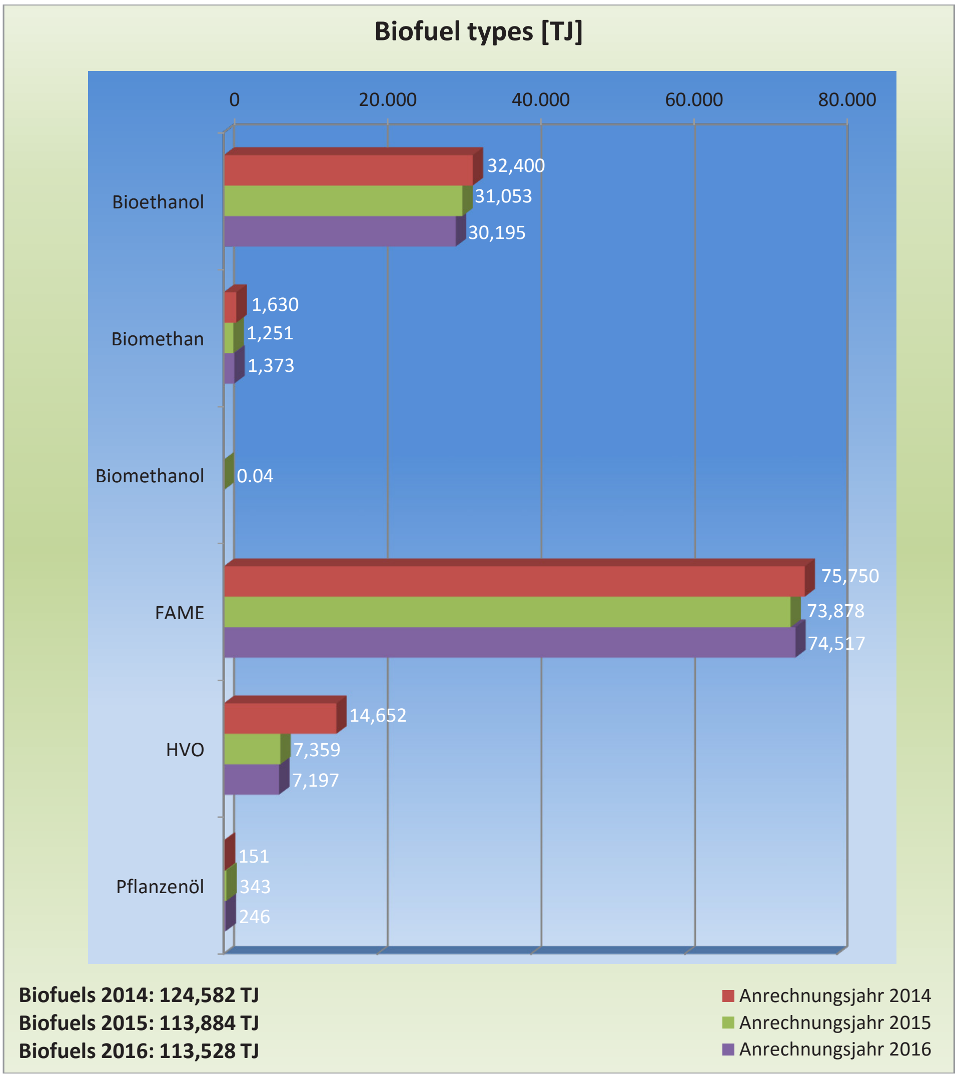


Diagram 26: Biofuel types

The following diagram illustrates the distribution of the biofuel types in 2016.

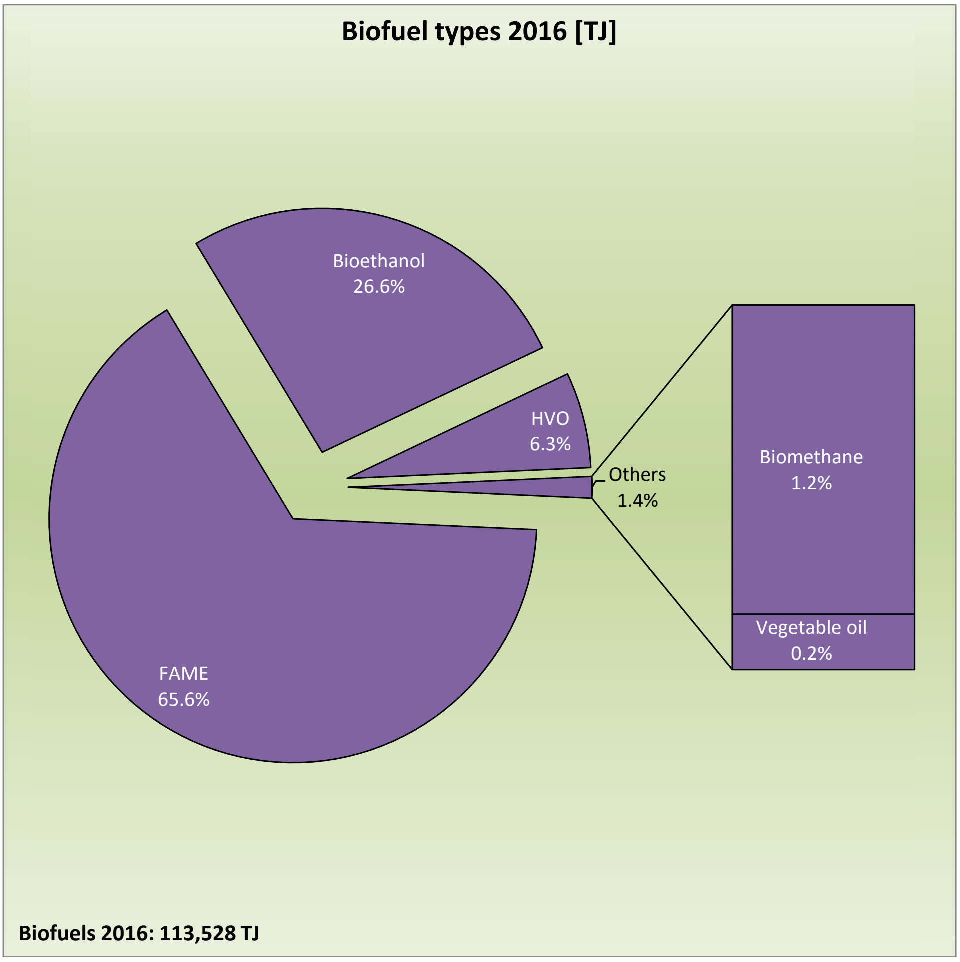


Diagram 27: Biofuel types in 2016

Maze remains the most important source material for the production of bioethanol, followed by wheat. The share of sugar cane increased significantly while the sugar beet share decreased equivalently. In the consequence, sugar beet no longer accounted for the third largest but only the fifth largest share. The amount of triticale exceeded the amount of sugar beet for the first time in the reporting year. While rye recorded a slight decline, the amounts of barley and wheat increased slightly.

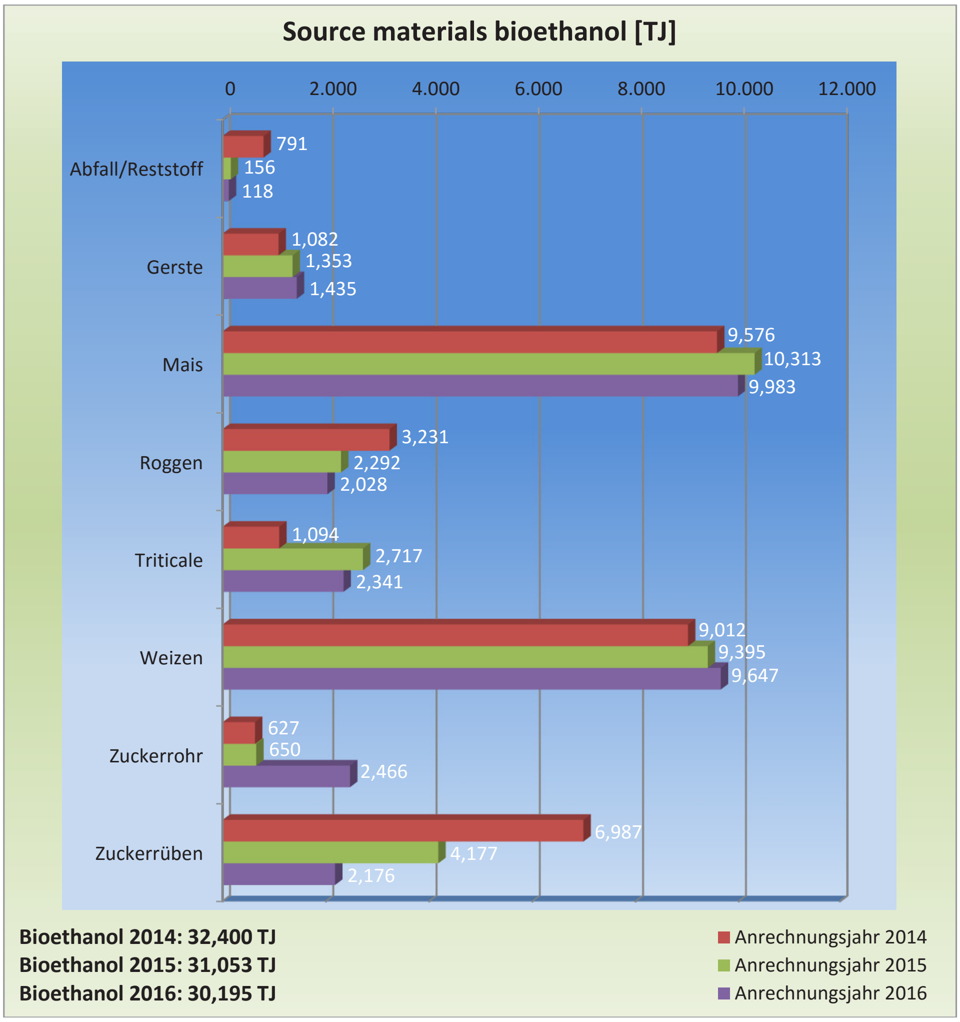


Diagram 28: Source materials of bioethanol

Despite a significant decline in the reporting year, sugar beet remained the most important source material for the bioethanol production. Wheat, barley and rye had a similarly high importance.

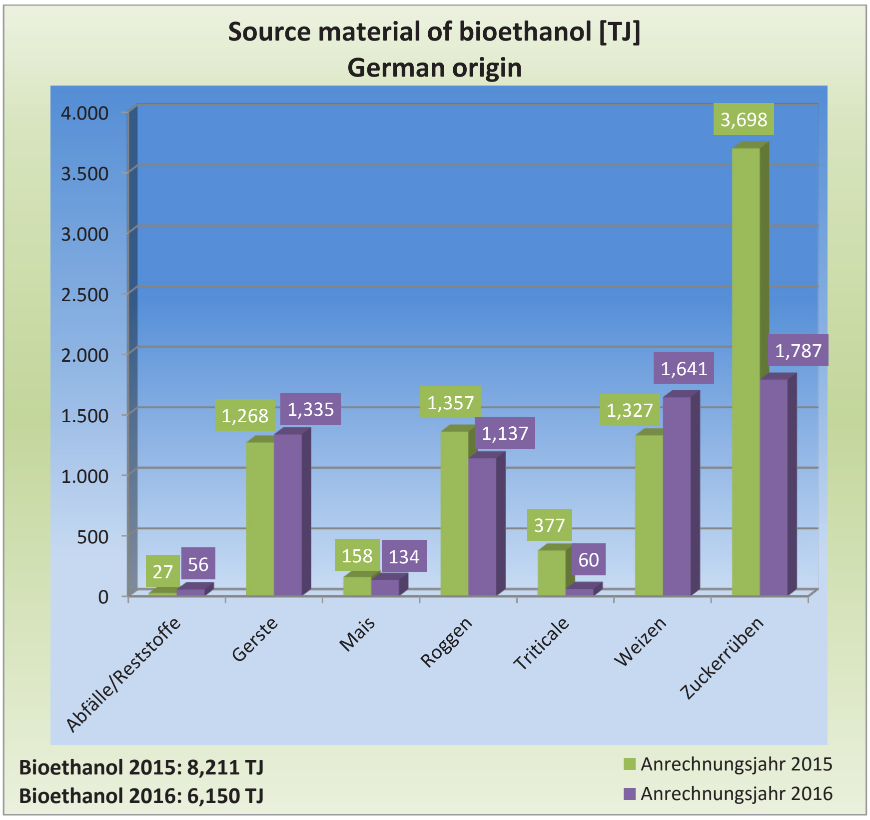


Diagram 29: Source materials of bioethanol, German origin

For the first time since the 2010 reporting year, the source material with the highest share in FAME (biodiesel) is no longer rapeseed, but waste and residues, with an increase of 57.8 % in the reporting year. Overall, 33.4 % less rapeseed came into use. The share of palm oil in the FAME production has more than doubled compared with the previous year's value.

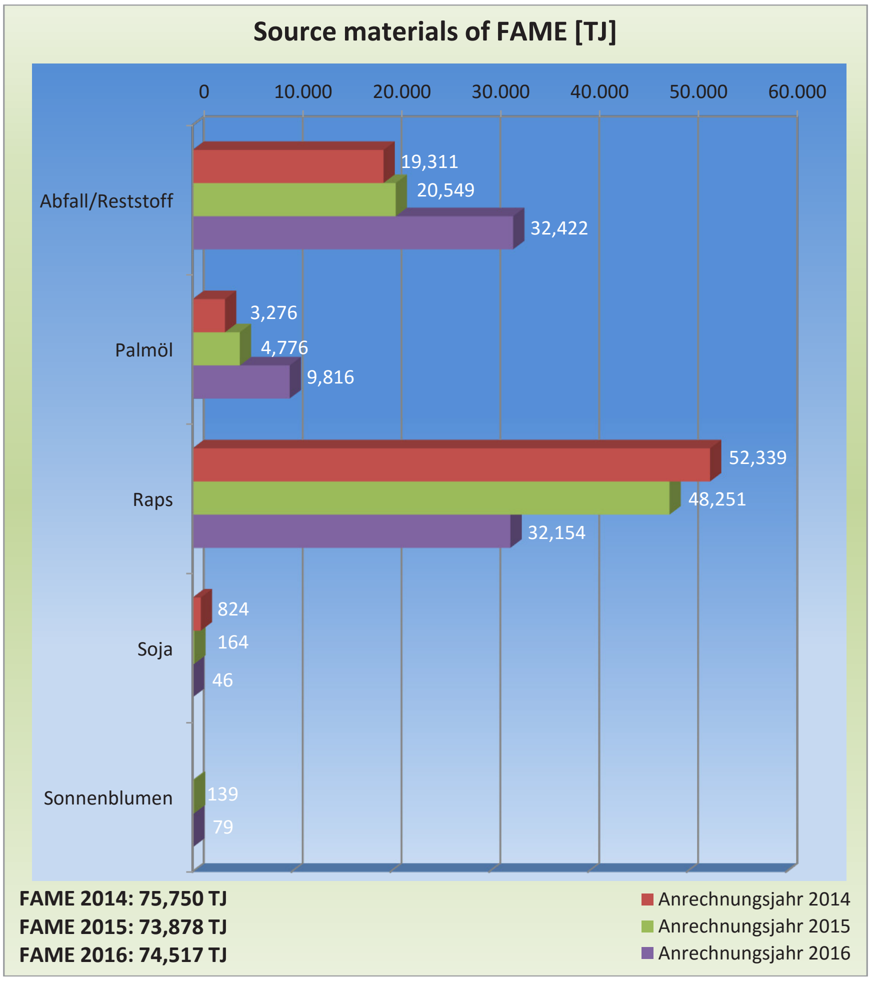


Diagram 30: Source materials of FAME

Rapeseed was the most important source material for the production of biodiesel. About one quarter of the FAME quantity was produced from waste and residues generated in Germany.

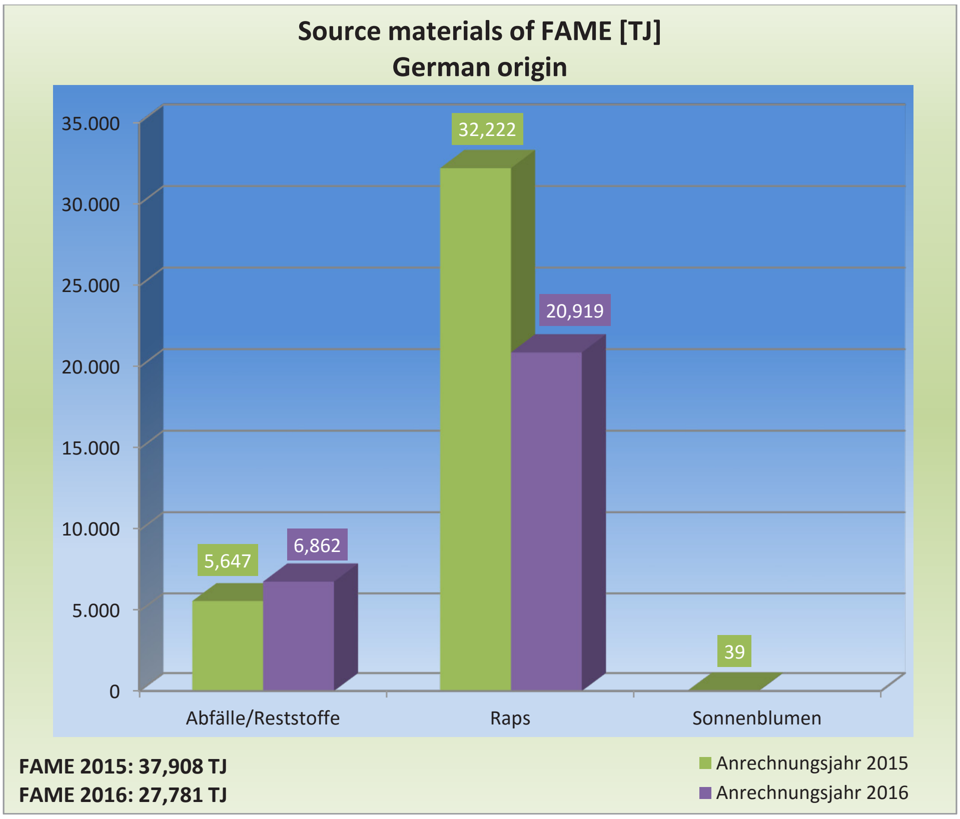


Diagram 31: Source materials of FAME, German origin

Hydrated vegetable oils (HVO) were predominantly produced from palm oil. Compared to the previous year, the quantity produced has decreased slightly, while the share of waste and residues used has increased.

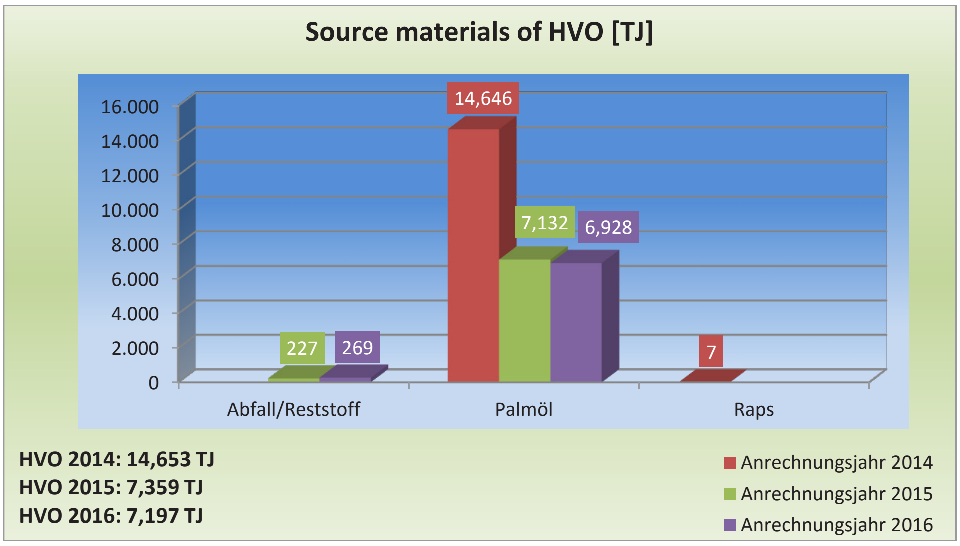


Diagram 32: Source materials of HVO

Both in the reporting year and in 2015, biomethane as fuel was exclusively made from waste and residues. Almost 86 % of this quantity were waste that arose from the alcohol distillation of fruit and/or distillers' dried grains and/or potato stillage. The source materials originated exclusively in Germany.

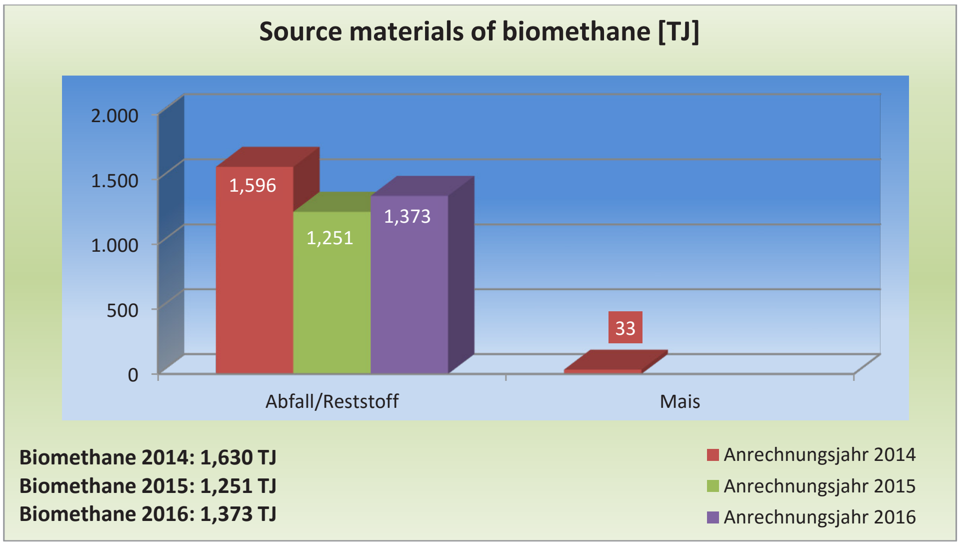


Diagram 33: Source materials of biomethane

As in the previous year, vegetable oil as biofuel came in last place, in terms of quantity, in the reporting year. Vegetable oil used in the fuel sector consists exclusively of rapeseed as source material, which was grown almost exclusively in Germany. The submitted quantity is lower in the reporting year than in 2015 (minus 28.4 %).

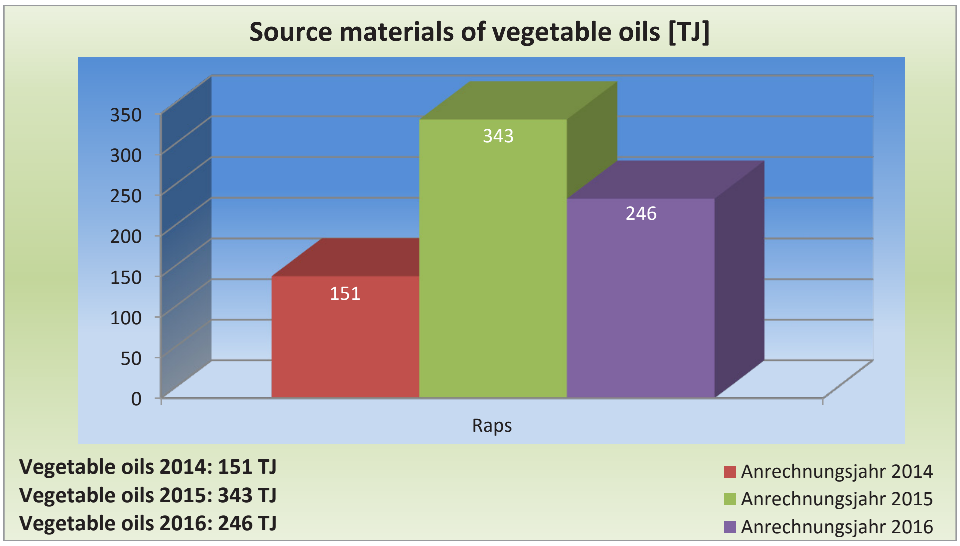


Diagram 34: Source materials of vegetable oil

6.4 Greenhouse gas emissions and savings

The **reduction of greenhouse gas emissions** is one of the targets of the Renewable Energy Directive. Sustainability certificates must contain details on the emissions of the product, pursuant to Art. 18 BioEn SusO and/or Biofuel SusO. Until 30.03.2013, so-called older installations were exempted from the obligation to prove greenhouse gas reductions. With the change to the greenhouse gas reduction quota in 2015 it became obligatory to disclose greenhouse gas emissions in the sustainability certificates. Any sustainability certificates from older installations can no longer be counted towards the greenhouse gas reduction quota from this point in time. The reference values underlying the 2014 and 2015 emission calculation can be seen in Table 7.

Table 7: Reference values for the emission calculation of biofuels

	Total [TJ]	with emission details [TJ]	without emission details [TJ]	without emission details [%]
Reference year 2014	124,582	124,553	29	0.02
Reference year 2015	113,884	113,884	0	0.00
Reference year 2016	113,528	113,528	0	0.00

In the emission calculation, all the emissions arising during the manufacturing process for the final product are taken into account. They include the following greenhouse gases as stated in the Renewable Energy Directive: carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4), expressed as CO_2 equivalent per unit of energy.

The following diagrams show emissions of those biofuels for which applications were submitted to be counted towards the biofuel quota or to be considered for tax relief.

For the calculation of the emission savings, the amount of emissions generated during the entire production process of the biofuel was compared to the reference value for fossil fuel of **83,8 g CO_{2eq}/MJ** in accordance with the Renewable Energy Directive.

The emission savings shown as follows are based on the comparison of **pure biofuels**and **pure fossil fuels**. For biofuel to be counted as sustainable, it currently has to achieve proven savings of 35 % (50 % from 01.01.2018) compared to fossil fuel. In order to calculate the total savings in blended fuels in Germany, the sum total of emissions from biogenic and fossil fuels would have to be taken as a basis.

The following diagram shows the amount of emissions that would have been generated if, instead of the quantity of biofuel, only fossil fuels had been used. **Thus, thanks to the use of biofuels, 7.3 million tonnes of CO_2 equivalent were saved.**

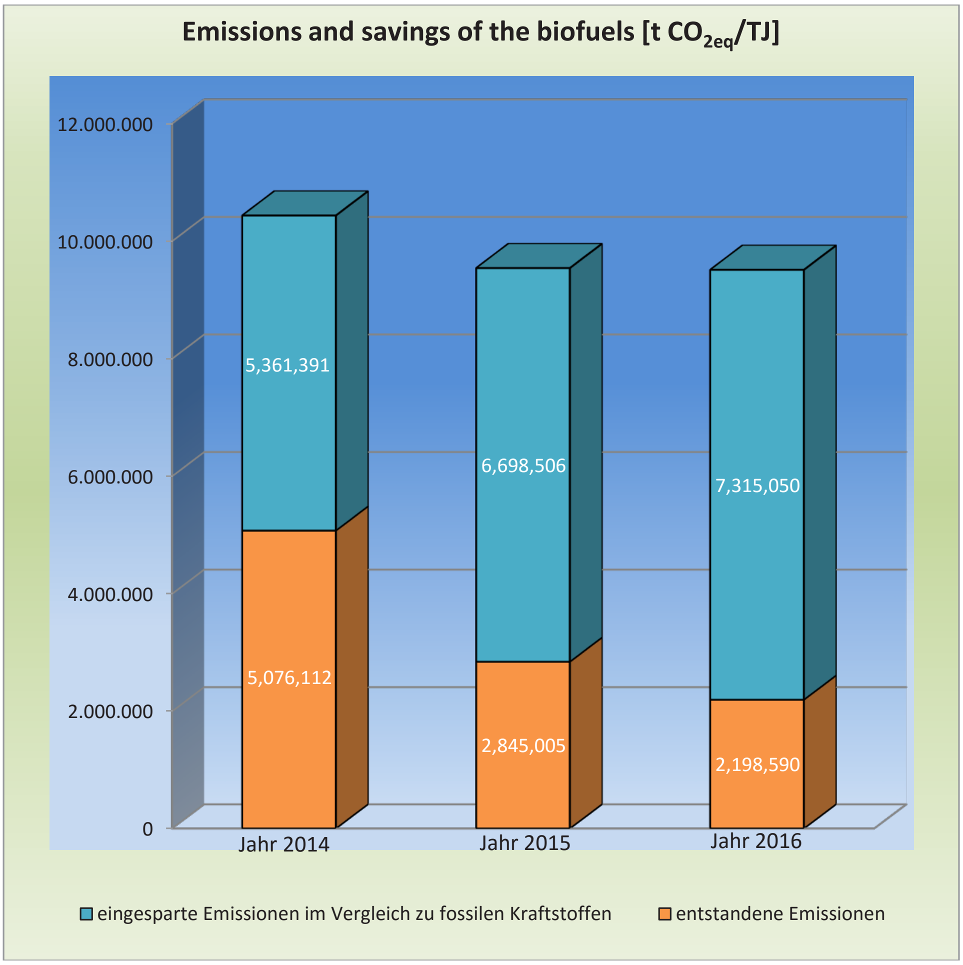


Diagram 35: Emissions and savings of biofuels

On average, less and less CO_{2eq} is emitted per Terajoule biofuel brought onto the market. In 2016, the amount was 19.37tonnes of CO_{2eq}/TJ, i.e. 22.5 % less than in the previous year. That means that, since the introduction of the greenhouse gas reduction quota, average emissions have been halved.

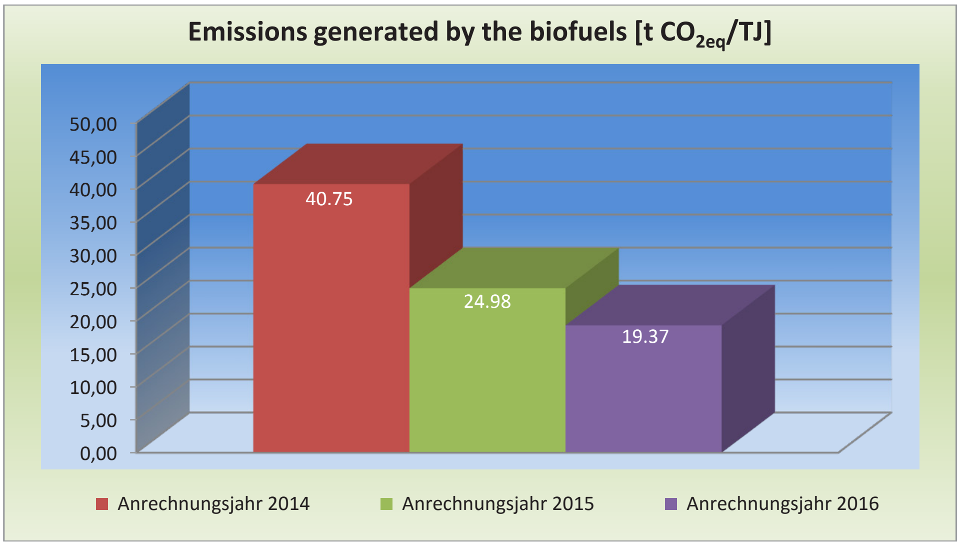


Diagram 36: Emissions of biofuels

The average total emission savings of all biofuels could once more be improved.

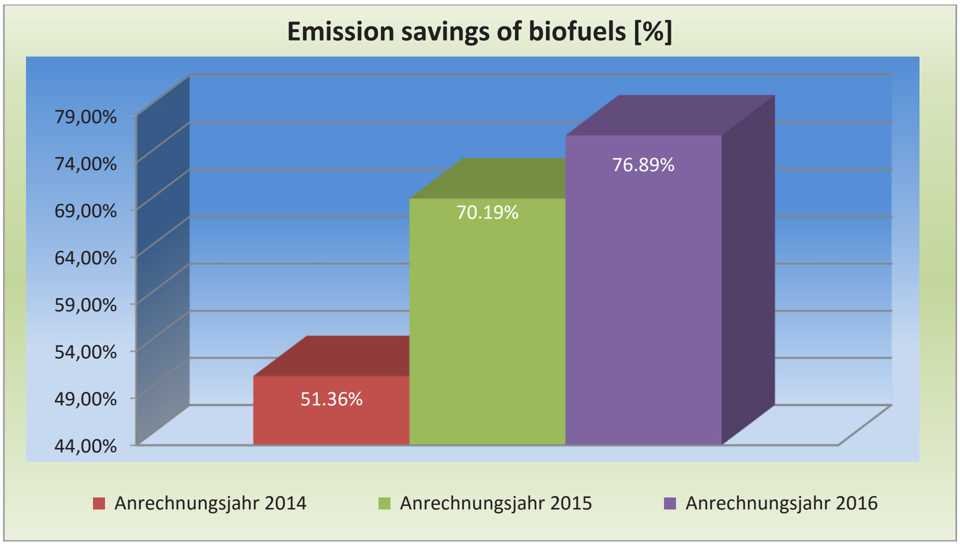


Diagram 37: Emission savings of biofuels

Average emissions have decreased for all types of biofuels. The lowest and therefore best value was again reached by biomethane, which was produced exclusively from wastes and residues. The highest average emission was recorded for vegetable oils. They were invariably produced from rapeseed. For FAME and bioethanol, a significant improvement amounting to 27.5 % and 16.1 %, respectively, could be achieved.

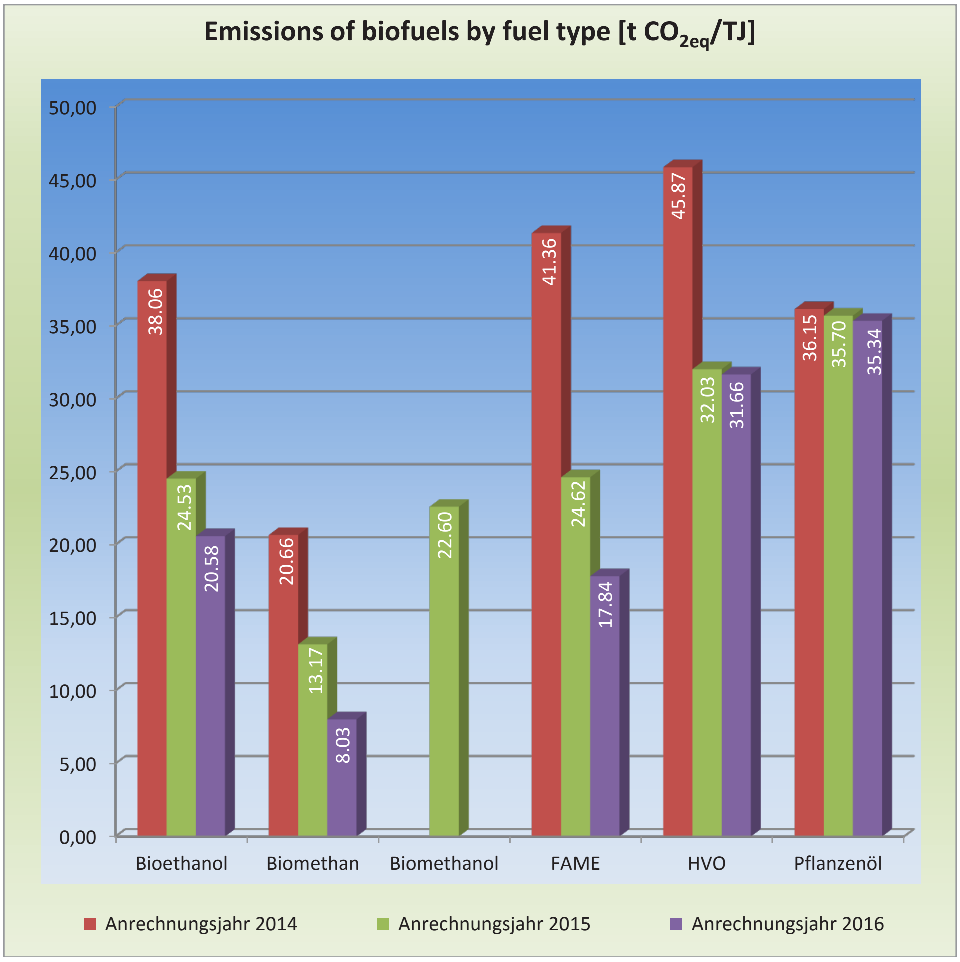


Diagram 38: Emissions of biofuels by fuel type

FAME, biomethane and bioethanol have again achieved better average greenhouse gas savings.

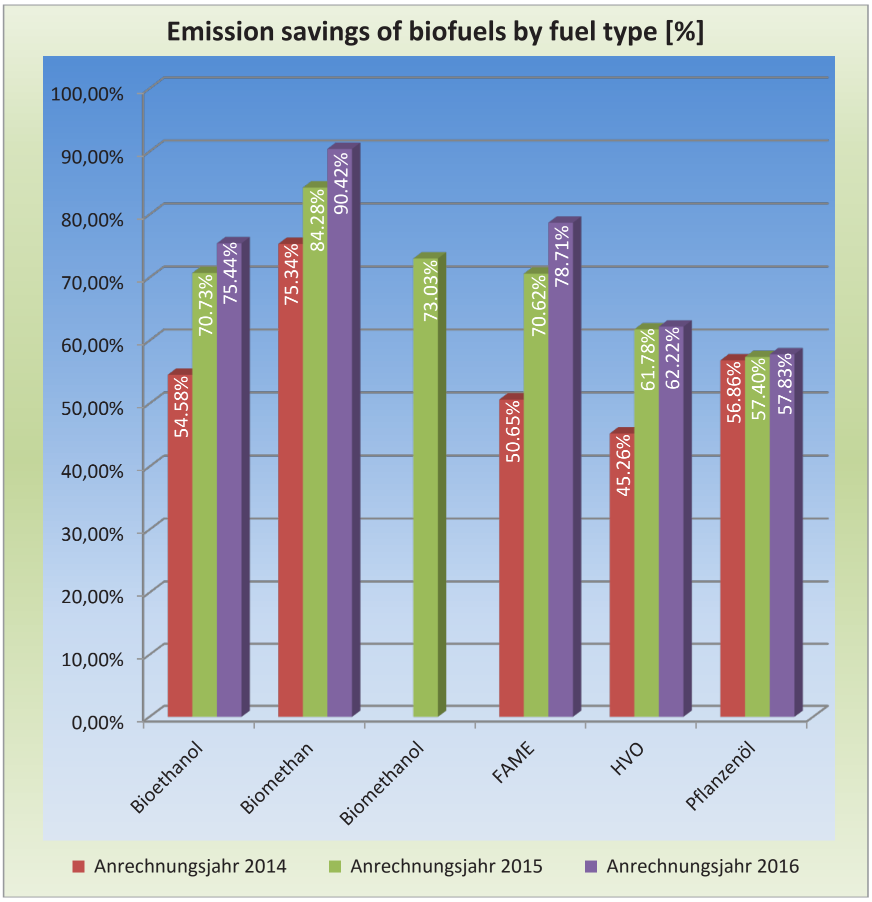


Diagram 39: Emission savings of biofuels by fuel type

The biofuel type bioethanol was produced from eight different source materials. Six of these eight source materials achieved a percentage greenhouse gas reduction of more than 70 % in the reporting year, compared to the fossil reference value of 83.8 g CO_{2eq}/MJ. Only bioethanol made of rye and sugar beet were slightly below this value.

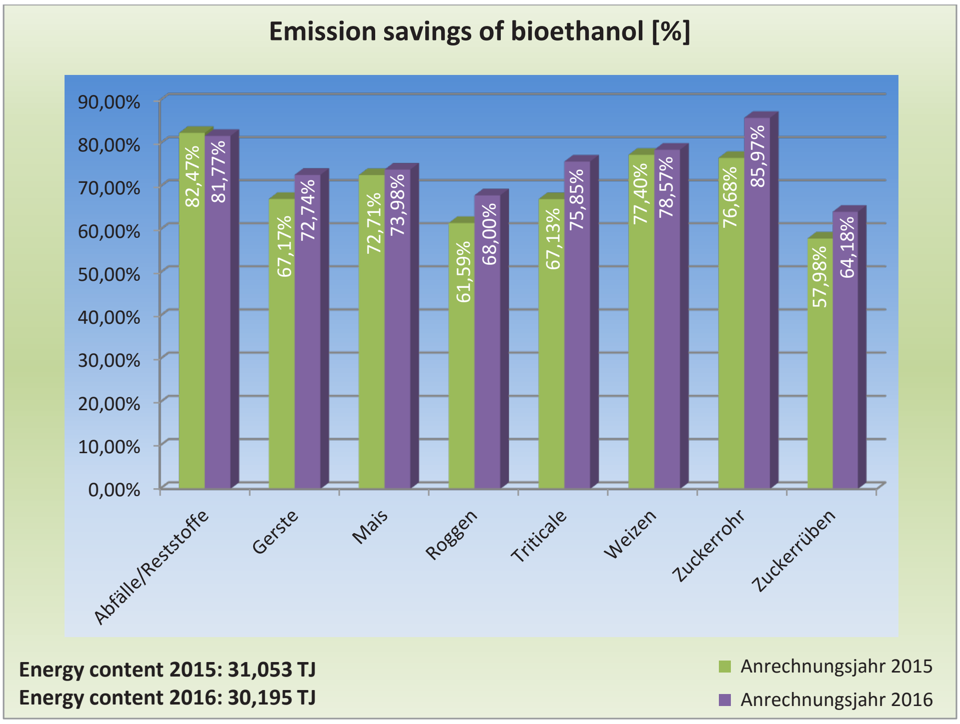


Diagram 40: Emission savings of bioethanol

Biodiesel/FAME was produced from five different source materials. Behind waste and residues, sunflowers came in second place in terms of greenhouse gas reduction, followed by palm oil, rapeseed and soya.

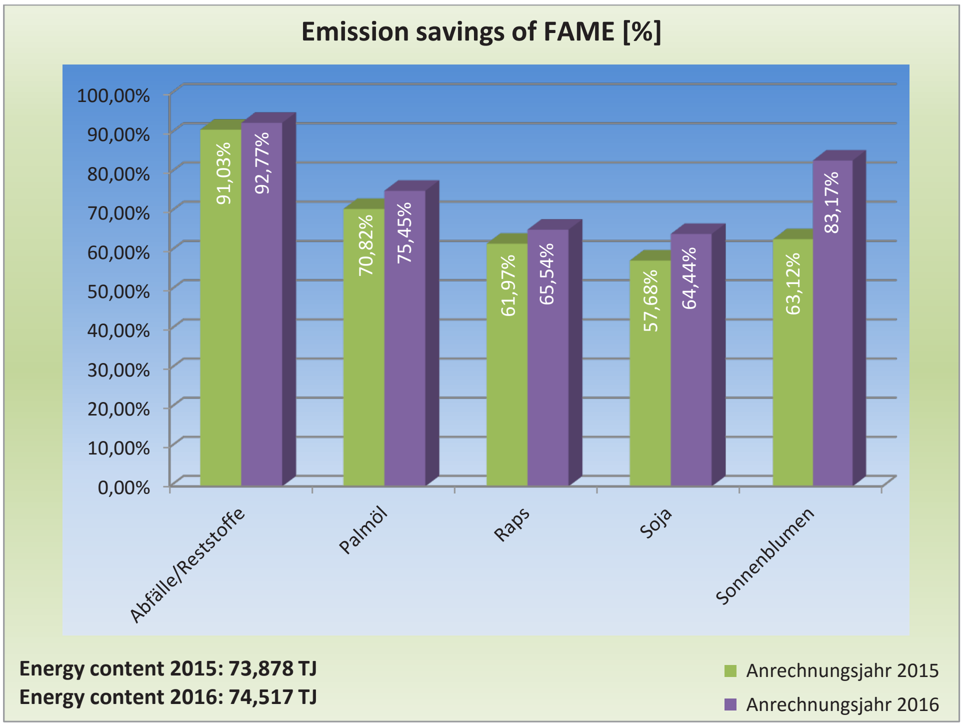


Diagram 41: Emission savings of FAME

6.5 Emission savings of various biofuel types according to greenhouse gas reduction levels

This section contains **tabular presentations of the emission savings** of the four biofuel types bioethanol, FAME, vegetable oil and biomethane. These are broken down according to source material and percentage energy share within the respective GHG savings level (Tables 8, 10, 12, and 13).

Tables 9 and 10 show the energy shares of the most important source materials according to GHG savings level and growing region.

Table 8: Emission savings of bioethanol according to source material and GHG savings level – shares in %

GHG savings compared to 83.8 g CO_{2eq}/MJ [%]	Waste/ residues		Barley		Maize		Rye		Triticale		Wheat		Sugar cane		Sugar beet		Total	
	in 2015 156 TJ	in 2016 791 TJ	in 2015 1,353 TJ	in 2016 1,435 TJ	in 2015 10,313 TJ	in 2016 9,983 TJ	in 2015 2,292 TJ	in 2016 2,028 TJ	in 2015 2,717 TJ	in 2016 2,341 TJ	in 2015 9,395 TJ	in 2016 9,647 TJ	in 2015 650 TJ	in 2016 2,466 TJ	in 2015 4,177 TJ	in 2016 2,176 TJ	in 2015 31,053 TJ	in 2016 30,195 TJ
>35-40	1.02	4.88					4.44	3.15	1.08	0.90	0.20	0.01					0.49	0.30
>40-45						0.11	0.08		0.07		0.01				0.07		0.03	0.04
>45-50			0.46		0.65		0.10		0.46		0.51				0.83		0.55	
>50-55			23.82		3.40	0.11	0.04				1.18	0.01			46.92	27.57	8.84	2.03
>55-60			0.64		1.00	0.36	1.82		1.47		1.13	0.01	1.43		1.13	8.42	1.15	0.73
>60-65			0.36		29.49	17.33	88.75	16.17	26.48	0.96	13.70	2.17			48.44	33.00	29.33	9.96
>65-70			50.01	1.67	16.48	31.33	3.42	13.54	61.36	12.76	26.10	39.02			0.10	4.26	21.18	25.11
>70-75	36.99	47.19	18.57	91.35	10.43	21.96	1.37	65.89		66.25	4.18	3.29	58.34	16.37	2.51	13.10	7.39	24.68
>75-80	10.77	14.27			9.78	7.72		1.24		6.48	18.74	19.58	16.06	6.49			9.31	9.98
>80-85	34.25				7.43	3.42					1.38		1.29	9.68		0.07	3.09	1.93
>85-90					8.22	3.26					7.61	4.94		5.09		6.08	5.03	3.51
>90-95					9.98	7.01				2.87	5.25	15.37	22.89	62.37		7.50	5.38	13.08
>95-100			2.01	0.35	3.14	7.39			4.45	5.71	18.10	13.60					7.00	7.25
>100-105	16.97	33.66	4.13	6.64					4.64	4.08	1.92	2.01					1.25	1.41
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 9: Emission savings of bioethanol according to source material, origin and GHG savings level – shares in %

GHG savings compared to 83.8 g CO_{2eq}/MJ [%]	Maize								Wheat							
	Germany		EU		Third countries		Bioethanol from maize, total		Germany		EU		Third countries		Bioethanol from wheat, total	
	in 2015 158 TJ	in 2016 134 TJ	in 2015 8,108 TJ	in 2016 8,600 TJ	in 2015 2,046 TJ	in 2016 1,249 TJ	in 2015 10,313 TJ	in 2016 9,983 TJ	in 2015 1,327 TJ	in 2016 1,641 TJ	in 2015 7,913 TJ	in 2016 8,006 TJ	in 2015 155 TJ	in 2016 0 TJ	in 2015 9,395 TJ	in 2016 9,647 TJ
>35-40									0.12	0.07	0.21				0.20	0.01
>40-45			0.01			0.87		0.11			0.01				0.01	
>45-50	0.25		0.82				0.65		0.27		0.56				0.51	
>50-55	2.40		3.50	0.01	3.12	0.81	3.40	0.11	0.79		1.26	0.01			1.18	0.01
>55-60	2.75		1.17	0.11	0.19	2.14	1.00	0.36	1.90	0.01	1.02	0.01			1.13	0.01
>60-65	12.16		37.24	19.90	0.10	1.50	29.49	17.33	31.08	0.14	11.05	2.58			13.70	2.17
>65-70	66.48	99.81	17.71	32.97	7.72	12.73	16.48	31.33	63.74	99.67	20.30	26.58			26.10	39.02
>70-75	8.87		10.49	24.59	10.34	6.21	10.43	21.96	0.33		4.91	3.96			4.18	3.29
>75-80			7.42	8.08	19.87	6.04	9.78	7.72			22.25	23.59			18.74	19.58
>80-85			7.12	3.92	9.25	0.35	7.43	3.42			1.64				1.38	
>85-90	5.01		3.11	1.32	28.68	16.97	8.22	3.26		0.12	9.04	5.92			7.61	4.94
>90-95	2.07		8.10	4.08	18.02	27.92	9.98	7.01	1.77		3.97	18.52	100.00		5.25	15.37
>95-100		0.19	3.31	5.03	2.71	24.46	3.14	7.39			21.49	16.39			18.10	13.60
>100-105											2.27	2.42			1.92	2.01
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**0.00**	**100.00**	**100.00**

Table 10: Emission savings of FAME according to source material and GHG savings level – shares in %

GHG savings compared to 83.8 g CO_{2eq}/MJ [%]	Waste/residues		Palm oil		Rapeseed		Soya		Sunflower		Total	
	in 2015 20,549 TJ	in 2016 32,422 TJ	in 2015 4,776 TJ	in 2016 9,816 TJ	in 2015 48,251 TJ	in 2016 32,154 TJ	in 2015 164 TJ	in 2016 46 TJ	in 2015 139 TJ	in 2016 79 TJ	in 2015 73,878 TJ	in 2016 74,517 TJ
>35-40			0.12		2.58	1.16	13.57	0.82			1.72	0.50
>40-45			0.51		0.10						0.10	
>45-50			0.94		0.16	0.31					0.17	0.14
>50-55			3.49	0.02	1.88	0.34	8.94	10.05		0.01	1.47	0.16
>55-60			5.87	0.17	15.41	2.79					10.44	1.23
>60-65			12.75	0.93	62.72	38.93	77.48	41.64	81.64		42.11	16.95
>65-70			10.18	2.38	14.39	48.16		47.49	18.36		10.09	21.13
>70-75	0.01		26.35	50.69	0.18	5.78					1.82	9.17
>75-80	1.41	0.48	37.35	35.99	1.81	1.05					3.99	5.40
>80-85	4.58	2.11	2.42	9.81	0.10	1.01				99.99	1.49	2.75
>85-90	30.73	7.67	0.02		0.59	0.26					8.93	3.45
>90-95	55.78	84.08			0.09	0.18					15.57	36.66
>95-100	7.49	5.66									2.08	2.46
>100-105												
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 11: Emission savings of FAME according to source material, origin and GHG savings level – shares in %

GHG savings compared to 83.8 g CO_{2eq}/MJ [%]	Waste/residues								Rapeseed							
	Germany		EU		Third countries		FAME from waste/residues, total		Germany		EU		Third countries		FAME from rapeseed, total	
	in 2015 5,647 TJ	in 2016 6,862 TJ	in 2015 10,378 TJ	in 2016 15,406 TJ	in 2015 4,524 TJ	in 2016 10,154 TJ	in 2015 20,549 TJ	in 2016 32,422 TJ	in 2015 32,222 TJ	in 2016 20,919 TJ	in 2015 15,358 TJ	in 2016 10,732 TJ	in 2015 670 TJ	in 2016 504 TJ	in 2015 48,250 TJ	in 2016 32,154 TJ
>35-40		0.01							1.91	1.67	3.68	0.22	9.75	0.26	2.58	1.16
>40-45									0.03		0.19		1.35		0.10	
>45-50									0.10	0.34	0.30	0.28			0.16	0.31
>50-55									0.97	0.32	3.42	0.33	10.62	1.35	1.88	0.34
>55-60									15.79	2.95	12.18	2.10	71.17	10.97	15.41	2.79
>60-65	0.02								68.45	40.79	53.32	33.91	2.49	68.91	62.72	38.93
>65-70									11.07	51.54	21.92	43.79	1.53	1.08	14.39	48.16
>70-75	0.03						0.01		0.13	0.05	0.29	16.95		6.06	0.18	5.78
>75-80	2.30	1.24	1.43	0.34	0.25	0.16	1.41	0.48	0.97	1.04	3.59	0.58	1.24	11.37	1.81	1.05
>80-85	3.90	2.88	6.41	2.38	1.21	1.18	4.58	2.11	0.04	0.78	0.21	1.51			0.10	1.01
>85-90	31.32	10.81	22.28	7.71	49.37	5.50	30.73	7.67	0.45	0.24	0.81	0.31	1.85		0.59	0.26
>90-95	38.55	67.64	68.80	85.74	47.42	92.67	55.78	84.08	0.09	0.27	0.09	0.03			0.09	0.18
>95-100	23.88	17.42	1.08	3.83	1.76	0.49	7.49	5.66								
>100-105																
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 12: Emission savings of vegetable oil according to source material and GHG savings level – shares in %

GHG savings compared to 83.8 g CO_{2eq}/MJ [%]	Rapeseed	
	in 2015 (343 TJ)	in 2016 (246 TJ)
>35-40	0.31	0.33
>40-45		
>45-50		
>50-55		
>55-60	96.04	92.50
>60-65	0.96	1.60
>65-70	0.49	1.41
>70-75	2.20	4.17
>75-80		
>80-85		
>85-90		
>90-95		
>95-100		
>100-105		
Total	**100.00**	**100.00**

Table 13: Emission savings of biomethane according to source material and GHG savings level – shares in %

GHG savings compared to 83.8 g CO_{2eq}/MJ [%]	Waste/residues	
	in 2015 (1,251 TJ)	in 2016 (1,373 TJ)
>35-40		
>40-45		
>45-50		
>50-55		
>55-60		
>60-65		
>65-70		
>70-75	11.82	6.69
>75-80	0.68	0.55
>80-85	5.83	3.43
>85-90	81.68	33.59
>90-95		13.68
>95-100		42.07
>100-105		
Total	**100.00**	**100.00**

7. Bioliquids

The total quantity of bioliquids registered for electricity production and feed-in pursuant to the EEG decreased by 3 % in the reporting year.

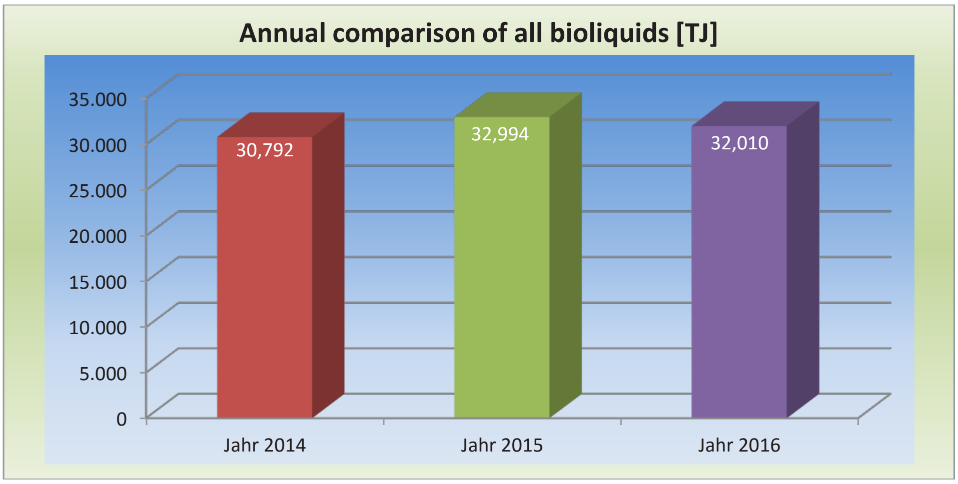


Diagram 42: Annual comparison of all biofuels

7.1 Bioliquid types

The most important biofuel type, thick liquor from the pulp industry, showed a slight decline (minus 2.8 %), as did the vegetable oils (minus 3.9 %).

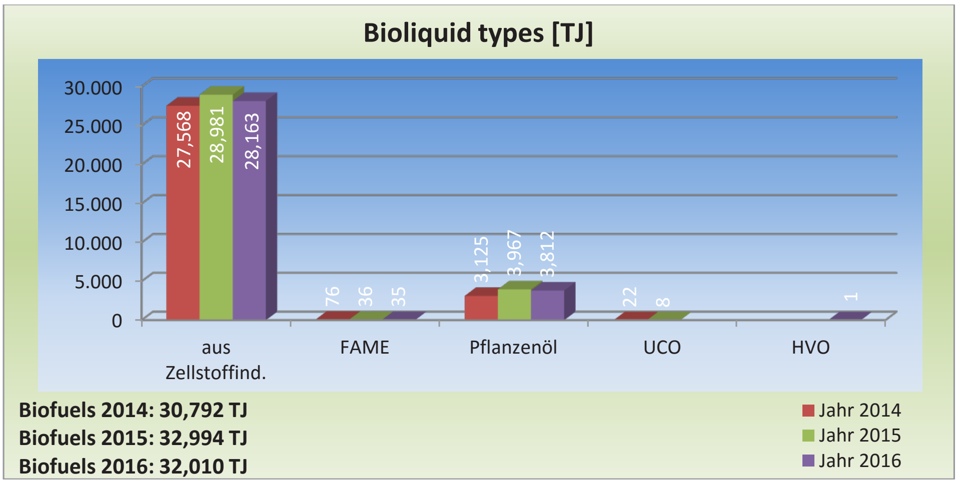


Diagram 43: Bioliquid types

7.2 Source materials and origin of the vegetable oils used as bioliquids

The share of palm oil in the bioliquids sector rose by 5.3 % in the reference year. The quantity of rapeseed used decreased by 35.4 % and came predominantly from Germany.

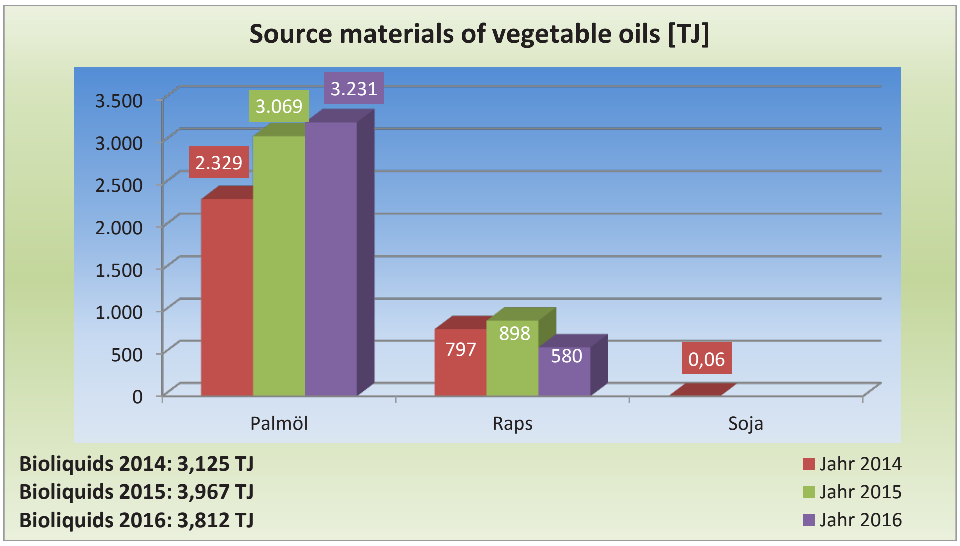


Diagram 44: Source materials of vegetable oils

The palm oil used originated in Malaysia (80 %), Indonesia (16.7 %) and Honduras (3.3 %).

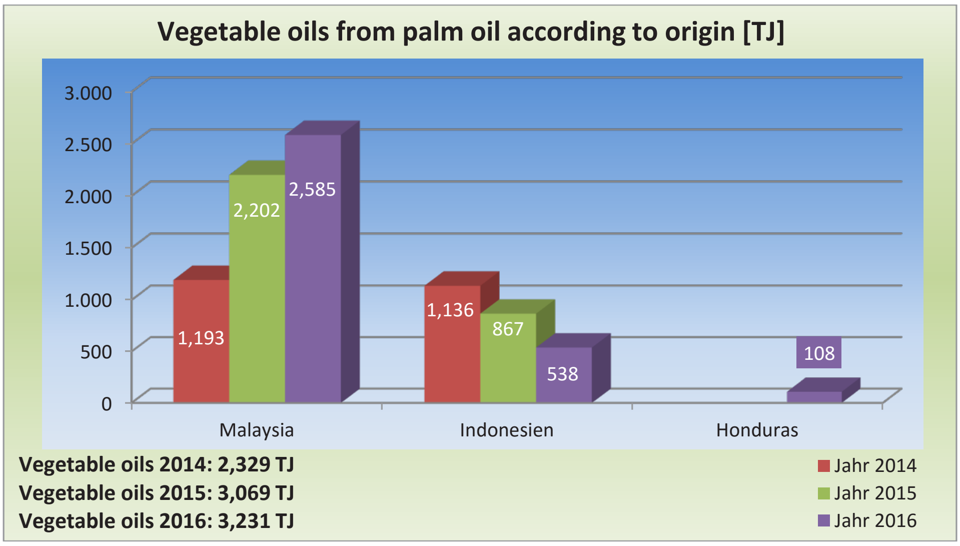


Diagram 45: Vegetable oils from palm oil according to origin

7.3 Greenhouse gas emissions and savings

For the calculation of the emission savings, the total emissions generated during the production of the bioliquid were compared with the reference value for fossil fuels for electricity generation of **91 g CO_{2eq}/MJ**.

The reference values underlying the emission calculation can be seen in Table 14.

Table 14: Reference values for the emission calculation of bioliquids

	Total [TJ]	with emission details [TJ]	without emission details [TJ]	without emission details [%]
2014	30,792	30,791	1	0.003
in 2015	32,994	32,994	0	0
in 2016	32,020	32,020	0	0

Due to the large share of thick liquor from the pulp industry with very low emissions, total savings in the area of bioliquids are traditionally very high. Overall, emissions have been reduced once more in the reporting year, which is partly due to the fact that the amount of thick liquor used to generate electricity was decreased.

The emission savings shown as follows are based on the comparison of **pure bioliquids** and **pure fossil fuels**. For bioliquids to be counted as sustainable, they currently have to achieve proven savings of 35 % (50 % from 01.01.2018) compared to fossil fuels.

Through the use of bioliquids for electricity generation approximately 2.7 million tonnes of CO_2 equivalent have been saved. If fossil fuels had been used for electricity generation instead of biofuels, over 2.9 million tonnes of CO_2 equivalent would have been generated, taking the fossil reference value of 91 g CO_{2eq}/MJ as a basis.

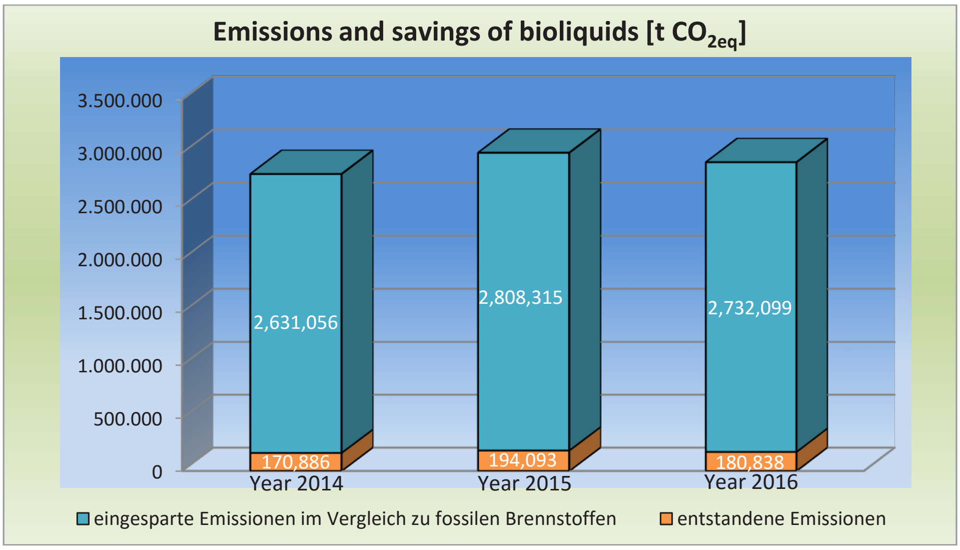


Diagram 46: Emissions and savings of bioliquids

The amount of CO_{2eq} generated decreased by 4 % compared to the previous year.

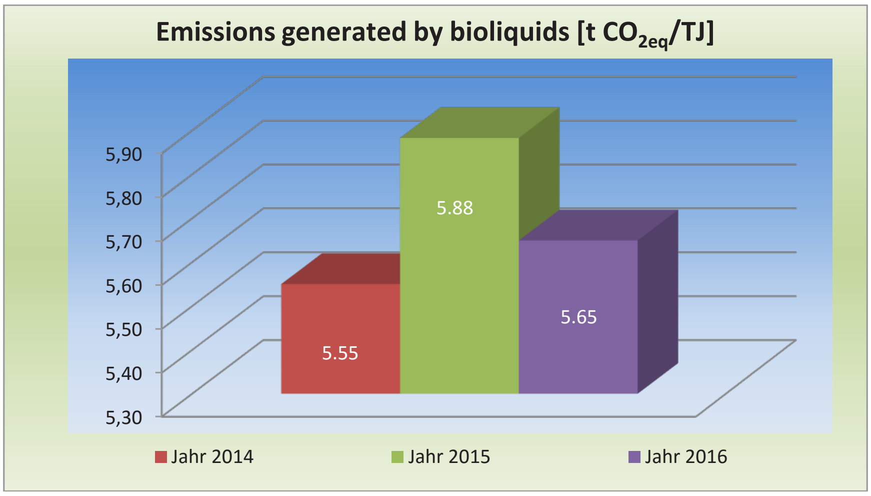


Diagram 47: Emissions generated by bioliquids

As a result, higher greenhouse gas savings were achieved.

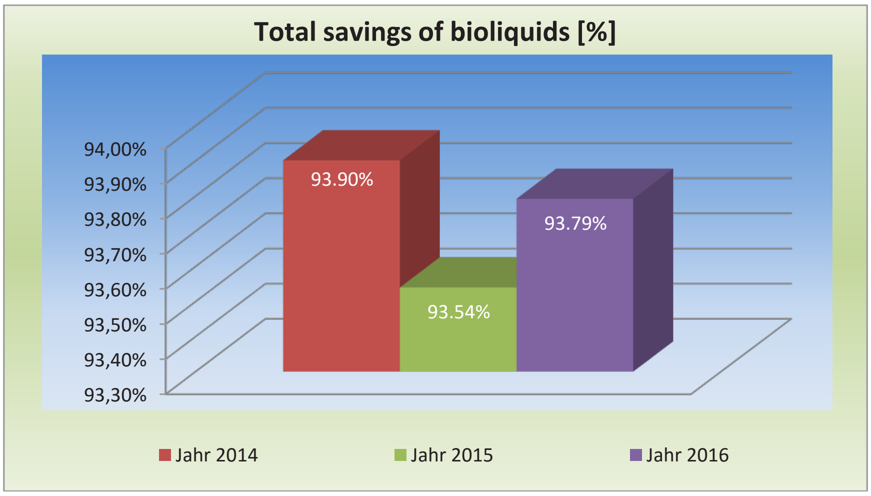


Diagram 48: Total emission savings of the bioliquids

Emissions of the bioliquid types FAME and vegetable oil could be reduced. Regarding emissions generated by bioliquids from the pulp industry (thick liquor), an increase of 9 % was recorded. UCO as bioliquid was no longer in use in the reporting year. A new addition was a small amount of HVO (see Diagram 43).

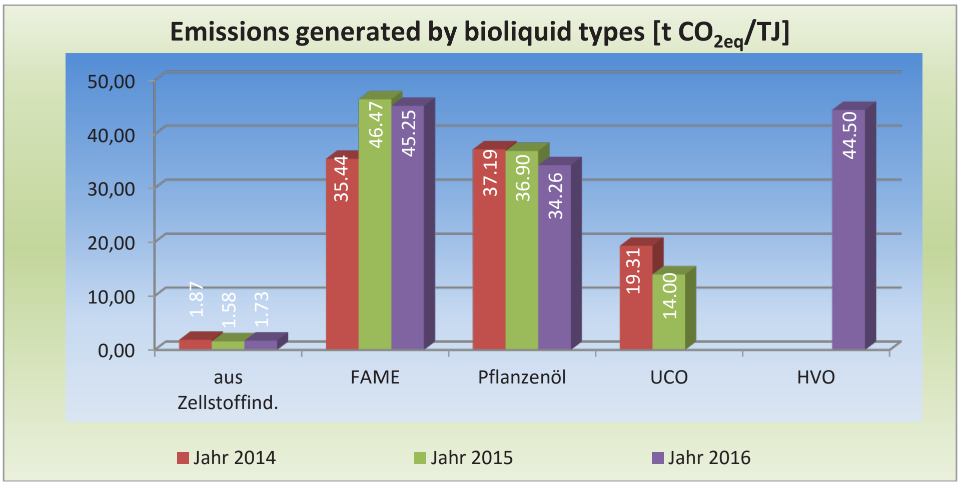


Diagram 49: Emissions generated by bioliquid types

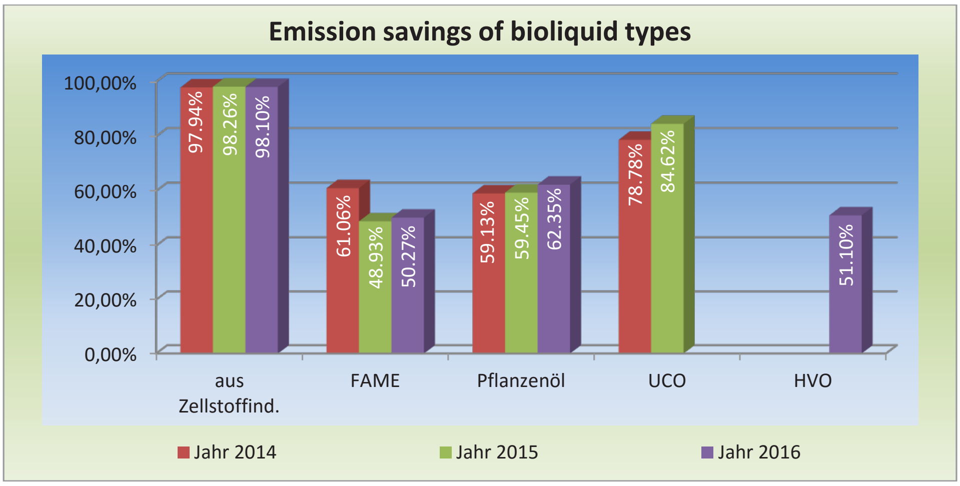


Diagram 50: Emission savings of bioliquid types

8. Retirement accounts

For the economic operators to be able to comply with mass accounting requirements, retirement accounts for various purposes have been set up in Nabisy. They include:

- **country accounts**, in cases where the products leave Germany and the recipient is not registered in Nabisy,

- **retirement accounts for other purposes,** e.g. for use for further conversion, or other technical purposes,

- underfunding on the balance sheet date, in cases where, at the end of a mass balance period, existing certificates are not corresponded by physically existing sustainable goods.

8.1 Retirements to accounts of other Member States and third countries

Biofuels and bioliquids which are registered in the Nabisy database and exported to other countries need to be retired to the Nabisy account of the respective country by the economic operators. In the reporting year, **53,100 TJ** (previous year: 89,892 TJ) of biofuels and bioliquids were transferred to accounts of countries within and outside of the European Union in this way.

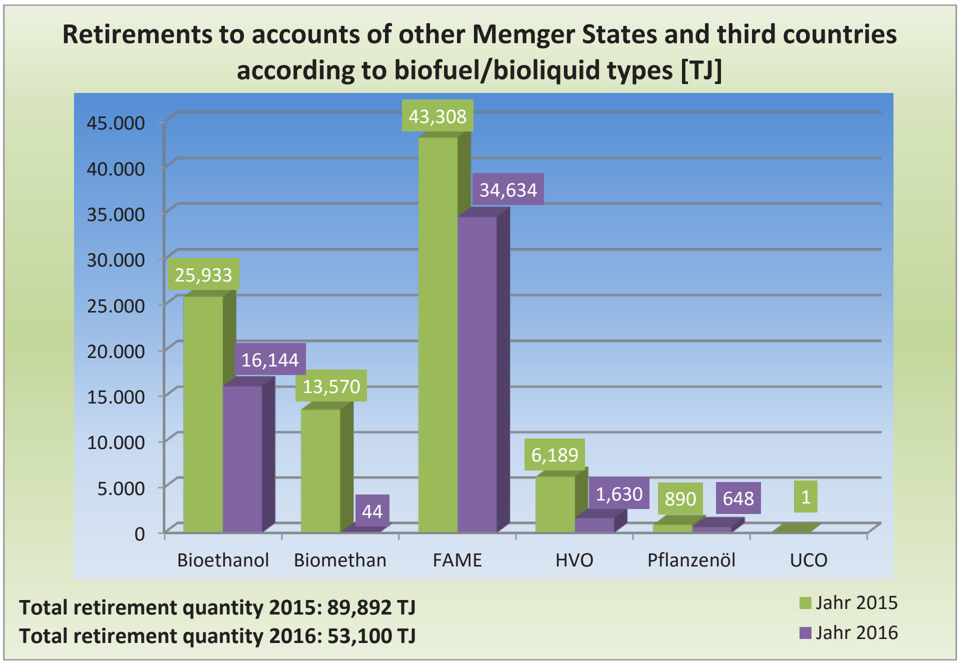


Diagram 51: Retirements to accounts of other Member States and third countries according to biofuel/bioliquid types

The following diagram shows only those country accounts that had more than 1,000 TJ booked to them during at least one reference year. A complete overview of the retired amounts can be found Table 15 on page 79.

The largest quantities of the biofuels and bioliquids retired were booked to the accounts of France (20.2 %), the Netherlands (18.7 %) and Austria (16.6 %). A conspicuous development took place on the Swedish account. While in the previous year, the largest quantity share was booked to this account, the quantity dropped by more than 94 % in the reporting year.

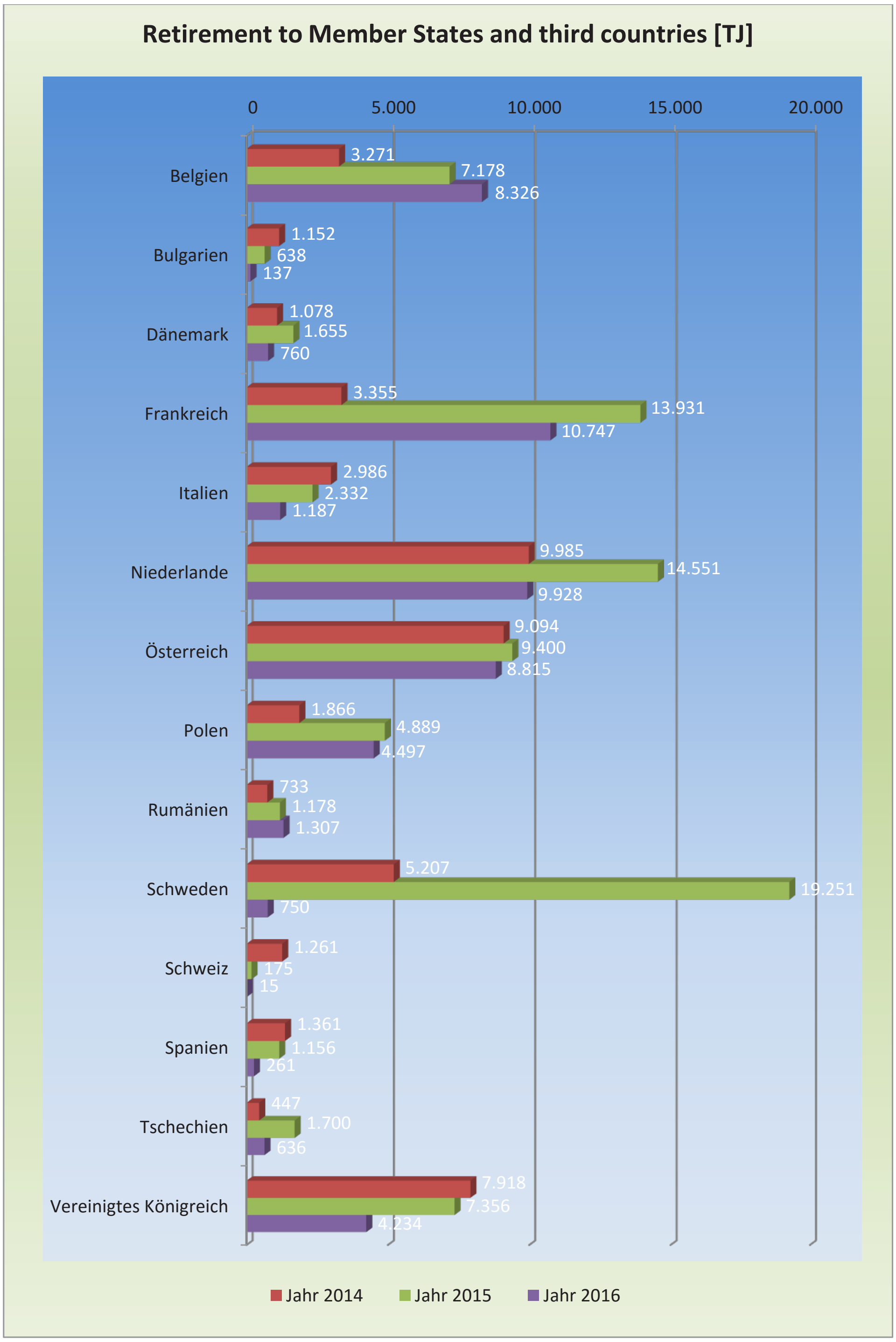


Diagram 52: Retirement to Member States and third countries

Table 15: Retirement of biofuels or bioliquids in Member States and third countries [TJ]

	Waste/ residues	Barley	Camelin a oil	Maize	Palm oil	Rapesee d	Rye	Soya	Sunflow er	Triticale	Wheat	Sugar cane	Sugar beet	Total
Belgium	118			215	776	6,795		291		21	85	3	22	**8,326**
Bulgaria				130			2			4			1	**137**
Denmark	27			127		113					50		443	**760**
Finland											0		126	**126**
France	447	2		933	1,532	6,389	93	297	119		298	28	610	**10,747**
Greece						1								**1**
Ireland		1									69		13	**83**
Italy				162		961					0		65	**1,187**
Croatia				3							4			**7**
Luxembourg	29	22		21	18	257	4	2		0	6			**358**
W — Malta	19													**19**
Netherlands	2,220	25	0	2,148	160	2,070	96	176		109	1,726	602	596	**9,928**
Norway				257		190					16	49	35	**547**
Austria	99	33		221	817	6,889	201	69	35	93	138	9	210	**8,815**
Poland	0	29		318		3,660	128	57		30	43		232	**4,497**
Portugal											71		12	**83**
Romania				275		319				23	679		12	**1,307**
Sweden	10			524		128	23			23	0	41		**750**
Switzerland		0		7			2			3	2	0	2	**15**
Slovakia				2	0	1	2		0	4	0		2	**11**
Slovenia				4		121		2		24	80			**230**
Spain				46	74	142								**261**
Czech Republic	1	3		187	3	365	8		0	0	21	0	47	**636**
Hungary				15		6	0						7	**28**
United Kingdom	2,561	5		712	0	1	31			4	522	233	166	**4,234**
Cyprus				3			1			3			1	**8**
Total	**5,531**	**120**	**0**	**6,311**	**3,379**	**28,407**	**590**	**893**	**155**	**340**	**3,808**	**964**	**2,603**	**53,100**

8.2 Comparison of the quota counting and retirement to the country accounts

As expected and as in the previous year, the quantities retired to the country accounts showed lower emission savings than the quantities counted towards the German greenhouse gas reduction quota. Apart from the vegetable oils, all biofuel types counted towards the quota had significantly higher savings. As a reference value for the calculation of the emission savings of the retired quantities, the value for the biofuel sector, 83,8 g CO_{2eq}/MJ, was used.

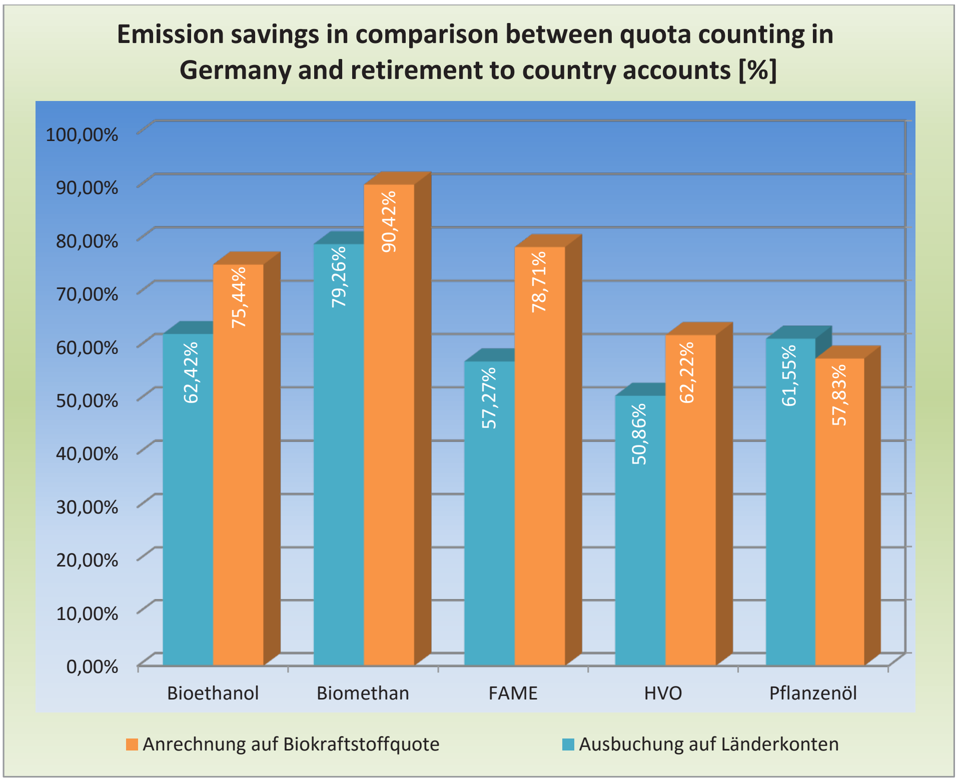


Diagram 53: Emission savings in comparison

When considering **palm oil and rapeseed** as source materials by means of the data available in Nabisy with regard to the quota counting (Chapter 6), remuneration pursuant to the Renewable Energy Sources Act (Chapter 7) and retirement (Chapter 8) it becomes obvious that significant shifts have occurred here. The increase in palm oil quantities in the quota section in the amount of 4,836 TJ is corresponded by a reduction in the retirement section in the amount of 6,128 TJ. The quantity of palm oil used for energy generation in the field of the Renewable Energy Sources Act was almost constant, as was the entire certified quantity used in Nabisy. The reduction in the total rapeseed quantity in the amount of approximately 17,394 TJ, on the other hand, corresponds roughly with the reduction in the quota section (16,194 TJ).

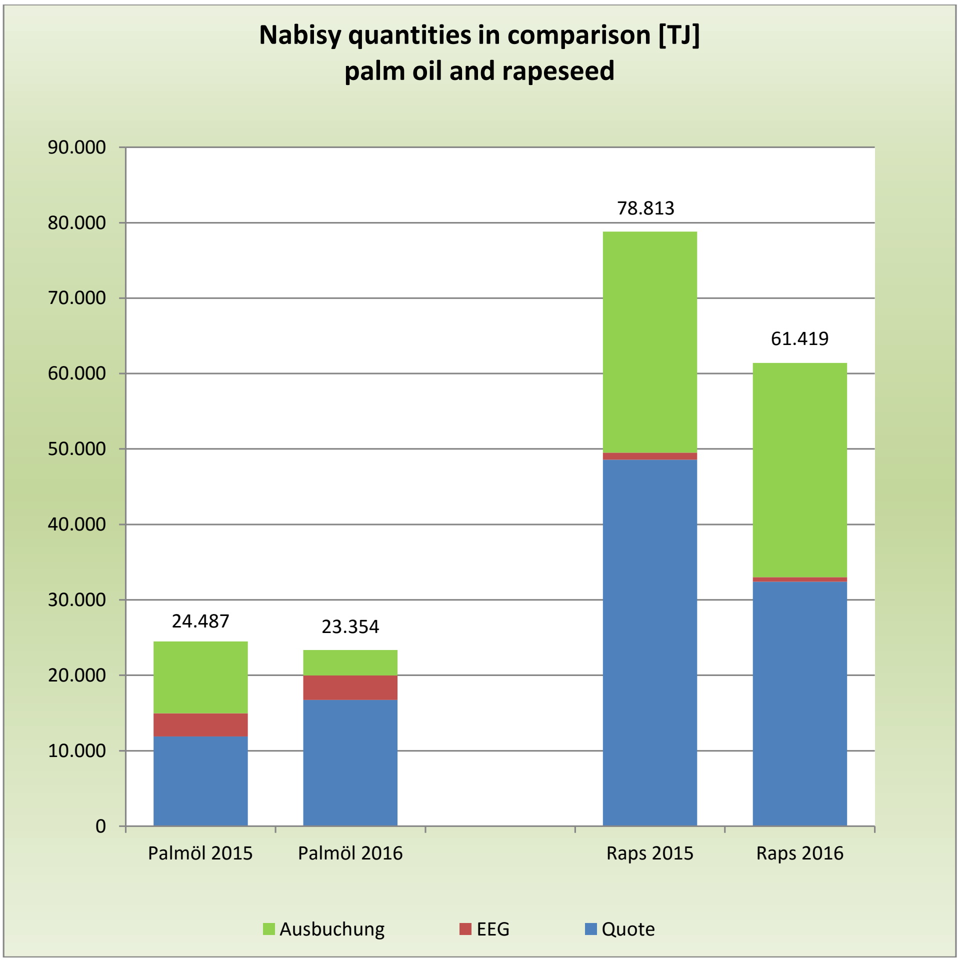


Diagram 54: Nabisy quantities in comparison – palm oil and rapeseed

The source material **sugar cane** showed a similar situation as palm oil, although, in this case, the total quantity increased. Significant decreases were recorded for **sugar beet**, which predominantly originated in Germany, although they have much lower savings potentials than palm oil and sugar cane, for example.

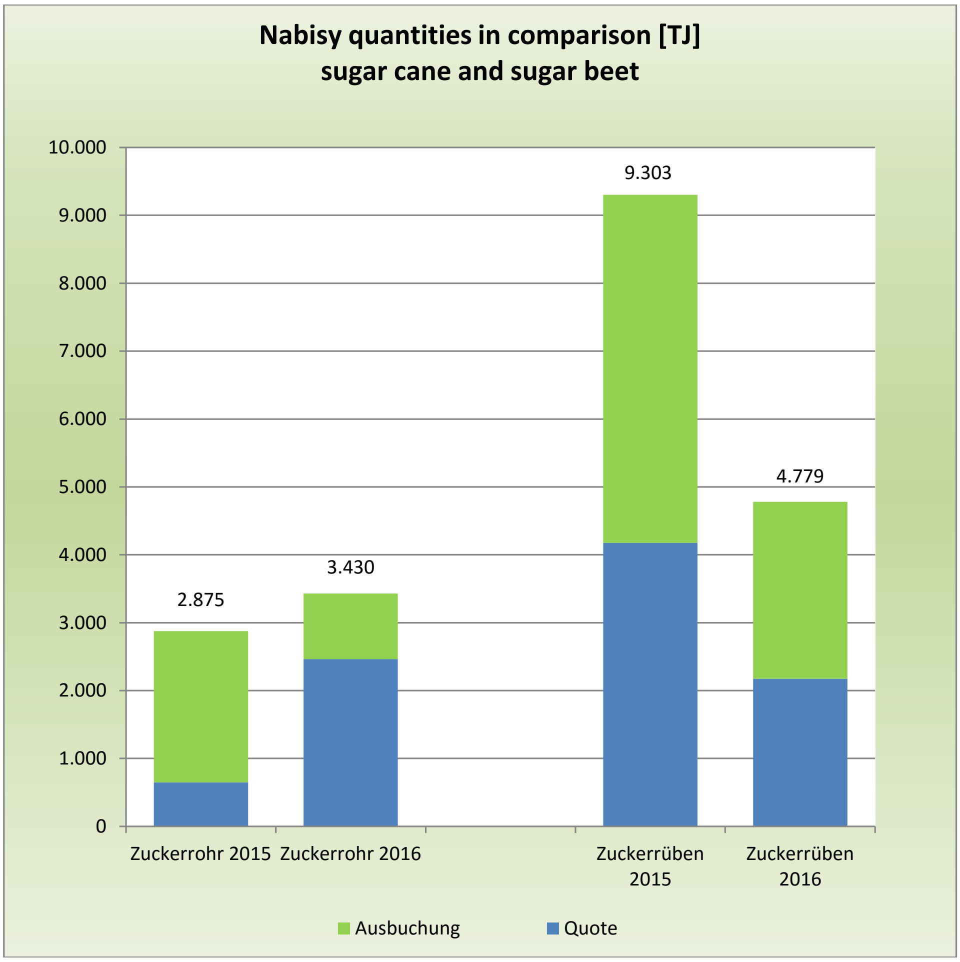


Diagram 55: Nabisy quantities in comparison – sugar cane and sugar beet

8.3 Retirements to other accounts

Apart from the retirement to country accounts, the electronic Nabisy database provides other retirement options for certified quantities which were also not used or will not be used for energy purposes in Germany. The following diagram shows the developments for three of these other accounts.

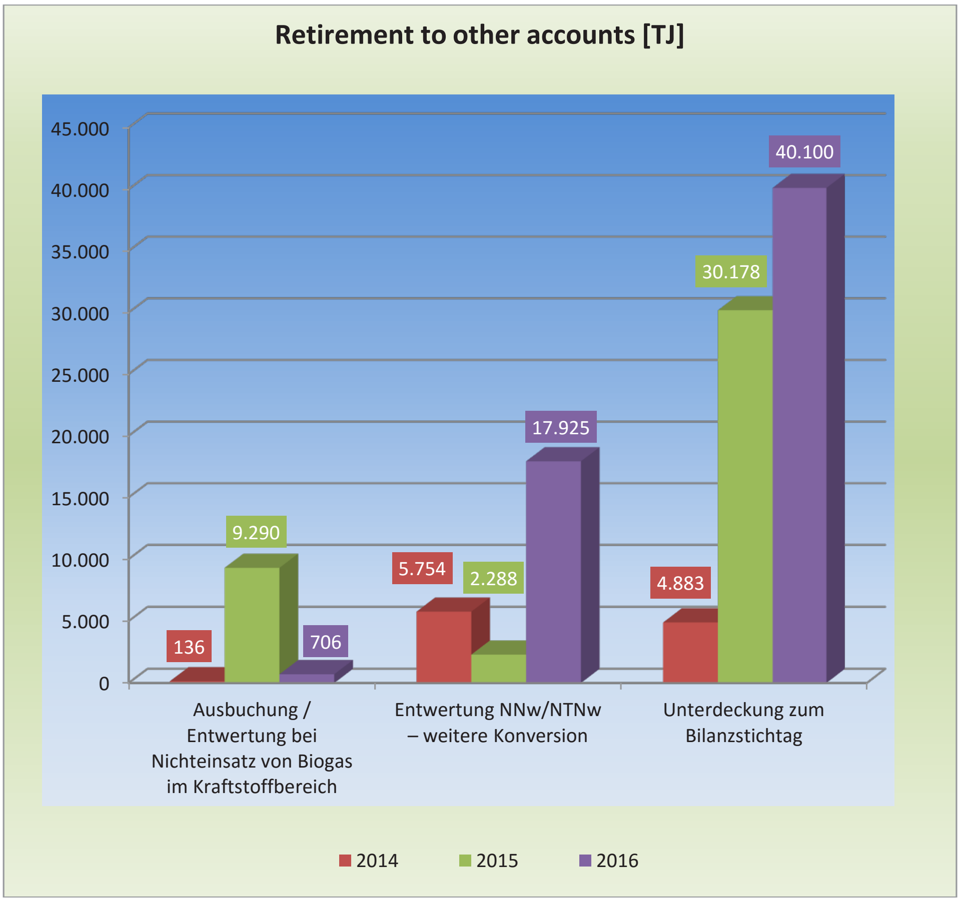


Diagram 56: Retirement to other accounts

9. Outlook

Parties under the obligation to provide proof who put fuels into circulation in Germany must save at least 3.5 % of greenhouse gas emissions compared to their individual reference value. This has been stipulated since 2015 by the greenhouse gas reduction quota introduced in Germany as the only EU Member State so far. This quota is going to increase to 4 % from 2017 and to 6 % from 2020.

This report shows that, in the second year of applying the greenhouse gas reduction quota, most biofuel types put into circulation in Germany again achieved significantly greater average greenhouse gas savings than the year before. This applies to FAME, bioethanol and biomethane.

The market asks for emission abatement costs that are as low as possible, which, in Germany, means biofuels with particularly high greenhouse gas savings. If other Member States align their quota systems towards higher emission reduction levels in the coming years, market shifts will have to be expected.

The second year of the German greenhouse gas reduction quota once again shows that quantities of goods that are not put to use in Germany and are thus retired to the accounts of other Member States achieve lower emission savings.

From 2018, biofuels will only be considered as sustainable when they achieve savings of at least 50 % compared to the fossil reference value. By then, at the latest, the Europe-wide demand for lower-emission biofuels should rise.

Through the 37th BImSchV, biofuels that were produced together with fossil fuels will become countable towards the quota in Germany in the future. Therefore, verifiable regulations for this process are required on the part of the systems, so that the biogenic share of the jointly refined product that is considered as sustainable can be clearly identified; it is only for this share that the sustainability certificate can be issued.

It remains to be seen what effect the reduced import duties on biofuels from Argentina and Indonesia will have on the use of vegetable oils certified as sustainable in the German biofuels sector in the coming years.

10. Background data

Table 16: Biofuels in TJ - source materials[1]

Fuel type/ quota year / Source material	Bioethanol Diagram 28, p. 52			Biomethane Diagram 33, p. 56			Bio-methanol[2]	FAME Diagram 30, p. 54			HVO Diagram 32, p. 56			Vegetable oil Diagram 34, p. 57		
	2014	2015	2016	2014	2015	2016	2015	2014	2015	2016	2014	2015	2016	2014	2015	2016
Waste/residues	791	156	118	1,596	1,251	1,373	0.04	19,311	20,549	32,422		227	269			
Barley	1,082	1,353	1,435													
Maize	9,576	10,313	9,983	33												
Palm oil								3,276	4,776	9,816	14,646	7,132	6,928			
Rapeseed								52,339	48,251	32,154	7			151	343	246
Rye	3,231	2,292	2,028													
Soya								824	164	46						
Sunflower									139	79						
Triticale	1,094	2,717	2,341													
Wheat	9,012	9,395	9,647													
Sugar cane	627	650	2,466													
Sugar beet	6,987	4,177	2,176													
Total Diagram 26, p. 50	**32,400**	**31,053**	**30,195**	**1,630**	**1,251**	**1,373**	**0.04**	**75,750**	**73,878**	**74,517**	**14,652**	**7,359**	**7,197**	**151**	**343**	**246**

[1] Discrepancies in the sum totals are due to rounding
[2] no data available for 2014 and 2016

Table 17: Biofuels in kt - source materials [1,2]

Fuel type/ quota year / source material	Bioethanol			Biomethane			Bio-methanol[3]	FAME			HVO			Vegetable oil		
	2014	2015	2016	2014	2015	2016	2015	2014	2015	2016	2014	2015	2016	2014	2015	2016
Waste/residues	30	6	4	32	25	27	0.002	517	550	868		5	6			
Barley	41	51	54													
Maize	362	390	377	1												
Palm oil								88	128	263	336	164	159			
Rapeseed								1,400	1,291	860	0.2			4	9	7
Rye	122	87	77													
Soya								22	4	1						
Sunflower									4	2						
Triticale	41	103	88													
Wheat	341	355	365													
Sugar cane	24	25	93													
Sugar beet	264	158	82													
Total	**1,224**	**1,173**	**1,141**	**33**	**25**	**27**	**0.002**	**2,027**	**1,977**	**1,994**	**336**	**169**	**165**	**4**	**9**	**7**

[1] Discrepancies in the sum totals are due to rounding
[2] The conversion into tonnage was made on the basis of the quantities indicated in the certificates
[3] no data available for 2014 and 2016

Table 18: Biofuels in TJ - source materials and their origin[1]

Region/ Quota Year	Africa Diagram 14, p. 39			Asia Diagram 15, p. 40			Australia Diagram 16, p. 41			Europe Diagram 17, p. 42			Central America Diagram 19, p. 44			North America Diagram 20, p. 44			South America Diagram 21, p. 45		
Source material	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**
Waste/residues	75	191	252	2,403	2,755	6,641	16	36	47	17,357	17,711	23,888	3		12	1,678	1,211	2,876	167	279	467
Barley										1,082	1,353	1,435									
Maize										8,464	10,313	9,983				1,146					
Palm oil				17,916	11,907	16,435		1							309				6		
Rapeseed				255	47		1,865	448	341	50,240	48,097	32,059						0.1	136	2	
Rye										3,231	2,292	2,028									
Soya							48			24						21			730	164	46
Sunflower											139	79									
Triticale										1,094	2,717	2,341									
Wheat										9,010	9,240	9,647	2							155	
Sugar cane		74											229	253	464				398	323	2,002
Sugar beet										6,987	4,177	2,176									
Total Diagram 10, p. 35	**75**	**265**	**252**	**20,574**	**14,709**	**23,075**	**1,929**	**485**	**388**	**97,489**	**96,038**	**83,636**	**234**	**253**	**785**	**2,845**	**1,211**	**2,876**	**1,437**	**924**	**2,515**

[1] Discrepancies in the sum totals are due to rounding

Table 19: Biofuels in kt - source materials and their origin[1,2]

Region/ Quota Year — source material	Africa			Asia			Australia			Europe			Central America			North America			South America		
	2014	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**	**2014**	**2015**	**2016**
Waste/residues	2	5	7	64	73	177	0.4	1	1	463	466	631	0.1		0.3	45	32	77	4	8	13
Barley										41	51	54									
Maize										319	390	377				43					
Palm oil				423	291	413		0.03							8				0.1		
Rapeseed				7	1		50	12	9	1,344	1,287	858						0.003	4	0.1	
Rye										122	87	77									
Soya							1			1						1			20	4	1
Sunflower											4	2									
Triticale										41	103	88									
Wheat										340	349	365	0.1							6	
Sugar cane		3											9	10	18				15	12	76
Sugar beet										264	158	82									
Total	**2**	**8**	**7**	**494**	**366**	**590**	**51**	**13**	**10**	**2,935**	**2,894**	**2,534**	**9**	**10**	**26**	**89**	**32**	**77**	**43**	**30**	**90**

[1] Discrepancies in the sum totals are due to rounding
[2] The conversion into tonnage was made on the basis of the quantities indicated in the certificates

Table 20: Sum total of biofuels according to source material[1]

Source material	in 2014 [TJ]	in 2015 [TJ]	in 2016 [TJ]	in 2014 [kt]	in 2015 [kt]	in 2016 [kt]
Waste/residues	21,698	22,183	34,183	579	586	906
Barley	1,082	1,353	1,435	41	51	54
Maize	9,610	10,313	9,983	363	390	377
Palm oil	17,922	11,908	16,744	424	291	422
Rapeseed	52,496	48,594	32,400	1,405	1,300	867
Rye	3,231	2,292	2,028	122	87	77
Soya	824	164	46	22	4	1
Sunflower		139	79		4	2
Triticale	1,094	2,717	2,341	41	103	88
Wheat	9,012	9,395	9,647	341	355	365
Sugar cane	627	650	2,466	24	25	93
Sugar beet	6,987	4,177	2,176	264	158	82
Total	**124,582**	**113,884**	**113,528**	**3,624**	**3,353**	**3,334**

[1] Discrepancies in the sum totals are due to rounding

Table 21: Emissions and emission savings of biofuels[1,2]

Biofuel type	Emissions in 2014 [t CO_{2eq}/TJ]	Emissions in 2015 [t CO_{2eq}/TJ]	Emissions in 2016 [t CO_{2eq}/TJ]	Savings 2014 [%]	Savings 2015 [%]	Savings 2016 [%]
	Diagram 38, p. 61 and Diagram 36, p. 60			Diagram 39, p. 62 and Diagram 37, p. 60		
Bioethanol	38.06	24.53	20.58	54.58	70.73	75.44
Biomethane	20.66	13.17	8.03	75.34	84.28	90.42
Biomethanol		22.60			73.03	
FAME	41.36	24.62	17.84	50.65	70.62	78.71
HVO	45.87	32.03	31.66	45.26	61.78	62.22
Vegetable oil	36.15	35.70	35.34	56.86	57.40	57.83
weighted average of all biofuels	**40.75**	**24.98**	**19.37**	**51.36**	**70.19**	**79.89**

Table 22: Emissions and emission savings of bioliquids[1,3]

Bioliquid type	Emissions in 2014 [t CO_{2eq}/TJ]	Emissions in 2015 [t CO_{2eq}/TJ]	Emissions in 2016 [t CO_{2eq}/TJ]	Savings 2014 [%]	Savings 2015 [%]	Savings 2016 [%]
	Diagram 49, p. 75 and Diagram 47, p. 74			Diagram 50, p. 75 and Diagram 48, p. 74		
From the pulp industry	1.87	1.58	1.73	97.94	98.26	98.10
FAME	35.44	46.47	45.25	61.06	48.93	50.27
HVO			44.50			51.10
Vegetable oil	37.19	36.90	34.26	59.13	59.45	62.35
UCO	19.31	14.00		78.78	84.62	

[1] Discrepancies in the sum totals are due to rounding
[2] Savings compared to the fossil fuel reference value of 83.8 g of CO_{2eq}/MJ
[3] Savings compared to the reference value for fuels for electricity generation of 91 g of CO_{2eq}/MJ

weighted average of all bioliquids	5.55	5.88	5.65	93.90	93.54	93.79

Table 23: Bioliquid types [TJ][1]

Diagram 43, p. 70

Bioliquid type	2014	2015	2016
From the pulp industry	27,568	28,981	28,163
FAME	76	36	35
HVO			1
Vegetable oil	3,125	3,967	3,812
UCO	22	8	
Overall result Diagram 42, p. 70	**30,792**	**32,994**	**32,010**

Table 24: Bioliquid vegetable oil in TJ - source materials[1]

Diagram 44, p. 71

Source material	2014	2015	2016
Palm oil	2,329	3,069	3,231
Rapeseed	797	898	580
Soya	0.06		
Total	**3,125**	**3,967**	**3,812**

Table 25: Vegetable oils from palm oil according to origin (bioliquids) [TJ][1]

Diagram 45, p. 71

Origin	2014	2015	2016
Malaysia	1,193	2,202	2,585
Indonesia	1,136	867	538
Honduras			108
Overall result	**2,329**	**3,069**	**3,231**

[1] Discrepancies in the sum totals are due to rounding

Table 26: Biofuels the source materials of which originate in Germany [TJ][1]

Fuel type/ quota year — source material	Bioethanol Diagram 29, p. 53		Biomethane		FAME Diagram 30, p. 54		Vegetable oil		Total Diagram 18, p. 43	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Waste/residues	27	56	1,250	1,373	5,647	6,862			**6,924**	**8,291**
Barley	1,268	1,335							**1,268**	**1,335**
Maize	158	134							**158**	**134**
Rapeseed					32,222	20,919	343	246	**32,565**	**21,164**
Rye	1,357	1,137							**1,357**	**1,137**
Sunflower					39				**39**	
Triticale	377	60							**377**	**60**
Wheat	1,327	1,641							**1,327**	**1,641**
Sugar beet	3,698	1,787							**3,698**	**1,787**
Total	**8,211**	**6,150**	**1,250**	**1,373**	**37,908**	**27,781**	**343**	**246**	**47,712**	**35,549**

[1] Discrepancies in the sum totals are due to rounding

11. Conversion tables, abbreviations and definitions

Conversion of energy units

Energy unit	Megajoule [MJ]	Kilowatt hour [kWh]	Terajoule [TJ]	Petajoule [PJ]
1 megajoule [MJ]	1	0.28	0.000001	0.000000001
1 kilowatt hour [kWh]	3.60	1	0.0000036	0.0000000036
1 terajoule [TJ]	1,000,000	280,000	1	0.001
1 petajoule [PJ]	1,000,000,000	280,000,000	1,000	1

Density

Biofuel type	Tonne per cubic metre [t/m³]	Megajoule per kilogramme [MJ/t]
Bioliquids from the pulp industry	1.32	7,000
Bioethanol	0.79	27,000
Biomethane	0.00072	50,000
Biomethanol	0.80	20,000
FAME	0.883	37,000
HVO	0.78	44,000
Vegetable oil	0.92	37,000
UCO	0.92	37,000

Abbreviations and definitions

Abbreviations	Meaning
36th BImSchV	36th Ordinance for the implementation of the Federal Immission Control Act (Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes)
BHKW	Combined heat and power plant
Biofuel SusO	Biofuel Sustainability Ordinance (Biokraftstoff-Nachhaltigkeitsverordnung)
BioEn SusO	Biomass Electricity Sustainability Ordinance (Biomassestrom-Nachhaltigkeitsverordnung)
DE system	Certification system according to Art. 33 Nos. 1 and 2 BioEn SusO and/or Biofuel SusO recognised by the BLE
EEG	Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz)
EU system	Voluntary system according to Art. 32 No. 3 BioEn SusO and/or Biofuel SusO
FAME	Fatty acid methyl ester (biodiesel)
HVO	Hydrogenated Vegetable Oils
GHG	Greenhouse Gas
Terms	Meaning
Bioliquids from the pulp industry	Bioliquids from the pulp industry are energy- and lignin-rich by-products of the cellulose production in the paper industry.
Bioethanol	Bioethanol (ethyl alcohol) is derived from renewable raw materials by distillation after alcoholic fermentation or comparable biochemical methods.
Biomethane	Biogas is a methane-rich gas from the fermentation of biomass.
Biomethanol	Like BTL fuel, methanol can be produced via synthesis gas from a wide range of biomass types. In addition, methanol can also be produced through the conversion of crude glycerol.
FAME	Fatty acid methyl ester (FAME), which is generated during the chemical conversion of fats and oils with methanol, is referred to as biodiesel.
HVO	Hydrogenated vegetable oil (HVO) is vegetable oil which is converted to hydrocarbon chains through a chemical reaction with hydrogen in a hydrogenation plant.
Vegetable oil	Vegetable oil fuel can be produced from rapeseed or other oil plants; in contrast to biodiesel, no chemical conversion takes place.
UCO	UCO are used cooking fats and oils. They can be used as clean fuels or as a component of FAME.
Blending	Adding of biofuels, among other things, to fossil fuels (e.g. 7% max. for diesel)