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Agriculture and Food

Evaluation and Progress Report 2015

Biomass Energy Sustainability Ordinance
Biofuel Sustainability Ordinance

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Deichmanns Aue 29
53179 Bonn, Germany

Telephone: +49 228 99 6845 – 2550
Telefax: +49 228 6845 – 3040

E-Mail: nachhaltigkeit@ble.de
Internet: http://www.ble.de/Biomasse

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Preface

Dear Readers,

this is the sixth Evaluation and Progress Report presented by the Federal Office for Agriculture and Food (BLE) as the competent authority.

As of 2015, the greenhouse gas reduction quota has replaced the energetic blending requirement. For fuels brought into circulation in Germany, the parties obliged to provide proof had to prove emission savings of 3.5 % compared to their individual reference value. They fulfill the savings requirement largely by blending biofuels with fossil fuels.

Now that the greenhouse gas reduction quota has been in place for its first year, it has become obvious that all parties concerned strive to keep emission levels as low as possible across the entire value chain. Relevant data are presented in a separate section of this report. Higher emission saving levels entail a lower total of biofuels needed to fulfill the quota requirement. It also becomes obvious that, on average, retired fuels not intended for use in Germany generate higher emission levels.

In 2015, the European Court of Auditors checked the *EU System for the Certification of Sustainable Biofuels* used by the Commission and published the resulting Special Report 18/2016. Within the framework of this activity and to gather information, auditors of the European Court of Auditors also visited the BLE, among other authorities.

This Evaluation and Progress Report intends to inform both the interested public and experts on the development and progress of biofuels brought into circulation in Germany.

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

1. General Matters

1.1 Introduction

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

The control of European energy consumption and the increased **use of energy from renewable sources**, together with energy savings and increased energy efficiency, constitute important parts of the package of measures needed to reduce greenhouse gas emissions and **comply with the Kyoto Protocol to the United Nations Framework Convention on Climate Change**, and with further Community and international greenhouse gas emission reduction commitments beyond 2012.

The Directive aims, inter alia, at increasing the share of energy from renewable sources within the EU, and to reduce both the dependency on fossil electricity sources and greenhouse gas emissions.

At national level, each member state shall thus introduce measures and develop the appropriate instruments designed to achieve the goals set or national goals which go beyond those.

The use of energy from renewable sources in the **transport sector** is considered to be among the most efficient means for the Community to reduce its dependency on crude oil imports for the transport sector, where the problem of safe energy supplies is most acute, and to influence the fuel market[2].

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[1] The three primordial goals of the package: Reduction of greenhouse gas emissions by 20 % (as compared to levels in 1990), 20 % of EU energy from renewable sources, improve energy efficiency by 20 %

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

For biofuels and bioliquids the Renewable Energies Directive provides **sustainability criteria**:

- The reduction of greenhouse gas emissions achieved through the use of biofuels and bioliquids must amount to a minimum of 35 %,
- Biofuels and bioliquids may not be produced from raw materials obtained from high biodiversity areas,
- Biofuels and bioliquids may not be produced from raw materials obtained from high-carbon stock areas,
- Biofuels and bioliquids may not be produced from raw materials obtained from areas which were peatlands in January 2008, unless it is proved that the cultivation and harvest 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. via national systems,
2. via applying a voluntary scheme recognised by the Commission for that purpose,
   or
3. by fulfilling the rules of a bilateral or multilateral agreement between the European Union and third parties, which was recognised by the Commission for that purpose.

Up until the deadline of 31.12.2015, the European Commission published implementing decisions for the recognition of 18 voluntary systems within the scope of the Renewable Energies Directive. Since then, these voluntary systems have been operating alongside the certification systems recognised by the BLE (DE Systems) and to national systems of other Member States in the sustainable biomass production sector. In addition, the European Commission recognised a greenhouse gas calculation tool.

On 04.08.2010, the German government adopted the National Action Plan for renewable electricity. Also, on 28.09.2010, the German government published its energy concept for an environmentally friendly, reliable and affordable energy supply. Pursuant to Article 27(1) of the Renewable Energies Directive, and regarding the transposition into Member States‘ national law by 05.12.2010, Germany transposed the Directive by publishing both the Biomassestrom-Nachhaltigkeitsverordnung, BioSt-NachV [Biomass Energy Sustainability Ordinance, BioEnSusO], of 23.07.2009 and the Biokraftstoff-Nachhaltigkeits-Verordnung, Biokraft-NachV [Biofuel Sustainability Ordinance, Biofuel-SusO], of 30.09.2009 in the Federal Law Gazette. These sustainability ordinances implement the Renewable Energies Directive and represent 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 the Council of 9 September 2015 amending Directive 98/70/EC relating to 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 allowed less time to meet the sustainability criterion of minimum GHG savings, increased from an actual 35% to a future 50% (as of 2018) and to 60% for new plants (as of 2017)[3].

In Germany, on 1 January 2015, the energetic biofuel quota was replaced by the greenhouse gas reduction quota. Since then, parties obliged to provide proof must ensure that the greenhouse gas emissions of the fossil petrols and fossil diesel fuels, in addition to the greenhouse gas emissions from the biofuels they bring into circulation, are reduced by a defined percentage compared to their individually calculated reference value[4]. The reduction, compared to the reference value, amounted to 3.5 percent in 2015 and 2016; it shall amount to 4 percent between 2017 and 2019 and to 6 percent as of 2020.

As an accompanying measure to the introduction of the greenhouse gas reduction quota, the BLE drafts regular reports for the Commission and for both the voluntary and the national systems, on the proofs of sustainability with particularly low emission values entered in Nabisy. If the value indicated in the proof of sustainability falls short of the so-called typical value, or of a value comparable to that, by at least 10%, it appears as a ”particularly low emission value“ in that evaluation.

[3] Art. 17 (2) Directive 2009/28/EC

[4] The reference value compared to which the greenhouse gas reduction has to be achieved, is calculated by multiplying the base value (83,8 g CO2eq/MJ) by the energetic quantity of fossil petrol and fossil diesel fuel brought into circulation by the obliged party, plus the energetic quantity of biofuel brought into circulation by the obliged party. The greenhouse gas emissions of fossil petrols and fossil diesel fuels are calculated by multiplying the base value by the energetic quantity of fossil petrol and fossil diesel fuel brought 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 kilogram carbon dioxide equivalents per gigajoule by the energetic quantity of biofuel brought into circulation by the obliged party.

1.2 Summary of important results in 2015

- For 113,884 TJ of biofuels [124,582 TJ, i.e. minus 8.6% in the previous year] applications were filed for amounts to be counted towards the greenhouse gas reduction quota or for tax relief (amounting to the equivalent of 3,353 kilotonnes of biofuel). About 82% (93,669 TJ) thereof originate in the EU [compared to ca. 75% the year before].

- Source materials for all types of biofuel were mainly rapeseed (42.7%, [previous year: 42.1%]), waste and residue (19.5%, [previous year: 17.4%]), palm oil (10.5% [previous year: 14.4%]), maize (9.06% [previous year: 7.7%]) and wheat (8.3% [previous year: 5.6%]).

- With 73,878 TJ, biodiesel (FAME) made up the largest share of biofuels - almost 65%.

- Rapeseed was the most frequently used source material for 48,251 TJ (65.3% [previous year 69%]) of biodiesel produced.

- Maize, 10,313 TJ (33.2 % [previous year: 29.6 %]) and wheat, 9,395 TJ (30.3% [previous year: 27.8%]) were the most frequently used source materials used to produce bioethanol.

- In 2015, the use of palm oil in biofuels decreased by one third, as compared to the previous year (share in 2015: 10.5% (=11,908 TJ), in 2014: 14.4% (=17,922 TJ)

- The total savings of greenhouse gas emissions achieved by all (pure) biofuels amounted to over 70 % compared to fossil fuels. By using biofuels, roughly 6.7 million tonnes of CO_2 equivalent were thus avoided (compared to ca. 5.3 million the year before.)

- 32,994 TJ of bioliquids were registered for electricity generation and feed-in remuneration pursuant to the EEG. 87.8% [previous year: 89.5%] are thick liquor from the pulp industry, 12% [previous year: 10.1%] consist of vegetable oil.

- The total savings of greenhouse gas emissions achieved by all (pure) bioliquids amounted to almost 93 % compared to fossil fuels. By using bioliquids, about 2.8 million tonnes of CO_2 equivalent were thus avoided (compared to ca. 2.6 million the year before).

- 89,892 TJ of the biofuels and bioliquids whose data on sustainability were registered in Nabisy were retired to other states‘ accounts (ca. 52,644 TJ the year before). Compared to documents submitted in Germany, related proofs of sustainability showed emissions that were an average 10% higher.

- By the reporting date of 31.12.2015, 2 certification systems and 26 certification bodies had been permanently recognised by the BLE. By the end of 2015, the European Commission recognised a total of 19 voluntary systems.

- During the reporting year, BLE-recognised certification bodies certified 2,342 operations across the globe; 95% according to the prerequisites of the voluntary systems and 5% according to those of the DE systems.

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 Biokraft-NachV [Biofuel-SuSO] and/or Art. 74 BioSt-NachV [BioEN-SusO].

In Germany, along with the replacement of the energetic biofuel blending quota, the option to double-weight biofuels from certain wastes and residues was also eliminated. Consequently, this report does not offer any comparisons of double-weighting with previous years.

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 into *Nachhaltige Biomasse-System* (Nabisy), the public database, sustainability data regarding their supplies of biofuels and bioliquids, in case those data become relevant for the German market. Amounts entered but not used for energy generation in Germany are contained in Nabisy without, however, being attributed to Germany. The economic operator is responsible for their correct entry and accounting. The data entered are thus collected in an organised manner and are documented systematically.

The available information intend to provide the basis for optimisation processes conducted by decision-makers in politics and the economy.

The available data allowing, their analysis shall also help 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 various certification systems simultaneously and who acted as both producers and suppliers, were counted more than once. Therefore, a conclusion as to the number of operations participating in the measures is impossible.

Targets to be achieved with regard to evaluating measure effectiveness, such as:

- increasing the share of *renewable energies* where the supply of energy in Germany is concerned, in the fields of biofuels and electricity production from bioliquids,
- reducing greenhouse gas emissions by using of sustainable biomass instead, and
- developing more efficient procedures and source materials to produce energy from biomass

are considered and changes having occurred within respective calendar years are analysed within the scope of the BioEn-SusO [BioSt-NachV] and the Biofuel-SusO [Biokraft-NachV].

Areas to be analysed specifically include

- the effectiveness of the sustainability ordinances with regard to the objectives to be achieved by the German government

and

- potential improvements to be made in implementing the specifications stated in the Renewable Energies Directive.

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

Proofs of sustainability were considered for which applications were lodged for counting towards the biofuel quota obligation during the relevant quota year, or for tax relief, and also proofs which were registered for remuneration pursuant to the Renewable Energies Act. These are predominantly partial proofs of sustainability having resulted from multiple combinations and/or splittings along the supply chain through to the final recipient. These proofs were identified by means of the notations of use made by the main customs offices and/or the network operators.

The data were considered and evaluated in terms of fuel type, auantity, energy content, origin, source materials used and their origin, and finally with regard to emissions caused. Were graphical representations seemed inadequate to illustrate matters, tables were used instead.

In 2015, for the first time, source materials for biofuel types could directly be connected with the information on origins given in the proofs and partial proofs of sustainability. Thus, the weak point of the methodology used in previous years, which resulted from the initially optional indication of source material origins, has been eliminated.

Analyses primarily focus on both the current situation as of 31.12.2015 and the progress of the implemented measure over time (annually) in relation to the initial values, by way of statistical comparison.

In this context, BLE control measures and administrative procedures are also analysed, evaluated and improved.

Discrepancies in sum totals given 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 Energies Directive within the scope of the sustainability ordinances.

BLE responsibilities in the field of sustainable bioenergy include

- in the **biofuels sector** - **making data** that are required to count biofuels towards the biofuel quota or in connection with tax relief **available** to the biofuels quota body and the main customs offices,
- in the **bioelectricity sector** - **making data** that are required for remuneration and for the renewable raw materials (NawaRo) bonus for installation operators **available** to network operators,
- in the emissions trading sector - **making data available** to the German Emissions Trading Authority (DEHST),
- **administration of data** on the sustainability of biofuels and/or bioliquids through **the public web-based database Nabisy** and issuing of partial certificates of sustainability at the request of the economic operators,
- regular **evaluation of the sustainability ordinances a**nd the **compilation of an annual progress report** for the German government,
- regular compilation of **reports on particularly low emissions** of the proofs of sustainability for voluntary systems and national systems and to be notified to the EU Commission,
- **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 [BioSt-NachV] and/or art. 66 Biofuel-SusO [Biokraft-NachV], 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 certification bodies' audit work (witness audits),
- maintenance and further development of the BLE website, including information and documents in German and English,
- maintenance and further development of a continuous system to recognise certification systems and bodies and to monitor compliance with legal requirements,
- maintenance and further development of the public database Nabisy for the documentation of the origins of biofuels and of proofs of sustainability; general matters concerning the documentation and plausibility of information regarding the sustainability of biofuel supplies; exchange of data with other Member States' databases,
- maintenance and expansion of the information register pursuant to art. 66 Bio-En SusO [BioSt-NachV] and/or art. 60 Biofuel-SusO [Biokraft-NachV],
- 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,
- participation in various special events and trade fairs,
- cooperation with the implementing authorities of other Member States in the REFUREC (Renewable Fuels Regulators Club) to coordinate implementation, and as an observer in relevant working groups of CA-RES (Concerted Action-Renewable Energy Sources Directive),
- training of BLE Control Service staff employed as assessors in the field of sustainable biomass production.

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

The Renewable Energies Directive and its national implementation by means of the sustainability ordinances require compliance, by all economic operators and along the entire value chain, with the prerequisites for the sustainability of biomass and for the biofuels and bioliquids produced from them. It is the task of both the DE- and the voluntary systems or systems recognised by the European Commission, or of national systems in other Member States, to ensure and control this compliance.

Certification systems shall ensure, organisationally, that the requirements of the Renewable Energies Directive and of national legislation adopted for its implementation and for the production and supply of the required biomass are met. Their system documents contain further specifications regarding requirements to be fulfilled, proofs of compliance and the control of such proofs.

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

By 31.12.2015, the BLE received the following number of applications for the recognition of certification systems:

Table 1: Total number of applications submitted by certification systems

Total number of applications lodged by 31.12.2015	**4**
number of applications rejected	1
number of applications accepted	3
recognition withdrawn	1
currently recognised by the BLE ISCC System GmbH, Cologne REDcert GmbH, Bonn	**2**

Based on their applications, the BLE has granted recognition to the DE systems of the following states:

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

Pursuant to Article 41 of the BioEn-SusO and/or Biofuel-SusO, these voluntary systems are considered as recognised in Germany if and for as long as they are approved by the Commission of the European Communities. By 31.12.2015, the Commission of the European Communities had approved the following 18 voluntary schemes as well as one greenhouse gas calculation tool:

Table 2: Voluntary systems (EU systems)

Voluntary systems	Registered in	Recognised on
2BS Association	France	10.08.2011
Greenergy	United Kingdom	10.08.2011
Bonsucro	United Kingdom	10.08.2011
ISCC System GmbH	Germany	10.08.2011
Roundtable on Responsible Soy Association (RTRS)	Argentina	10.08.2011
Abengoa	Spain	10.08.2011
Roundtable on Sustainable Biomaterials (RSB)	Switzerland	10.08.2011
ENSUS UK	United Kingdom	14.05.2012
REDcert GmbH	Deutschland	15.08.2012
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
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 Energies Directive are met. They regulate the standards which further determine the requirements for proofs of their implementation and for the verification of such proofs.

In 2015, data of the national systems of Hungary, Slovenia and Austria were available in Nabisy. Operations based in the territory of Austria are required to enter their sustainability data in elNa, the Austrian database.

3.4 Economic Operators

In the field of sustainable bioenergy, all economic operators along the entire value chain principally operate according to the requirements of a certification system, a voluntary system or a national system of another Member State, while users (installation operators and parties obliged to provide proof) are exempted. They need to comply with additional national regulations in order to obtain remunerations pursuant to the Renewable Energies Act or to have quantities counted towards the biofuel quota.

The following economic operators are to be considered in particular:

Growers

are agricultural establishments which grow and harvest biomass.

First gathering points

are establishments and plants which, for the first time and for the purpose of trading it further (e.g. in agricultural trade), take on the biomass required to produce biofuels, from those holdings that grow and harvest such biomass.

Originators

Establishments or private households where waste and residue are generated.

Gatherers

are establishments and plants which, for the first time and for the purpose of trading them further, take on the biomass needed to produce biofuels, as biogenic waste and residue, from those holdings or private households that generate waste and residue.

Conversion operations

Two different groups are to be differentiated:

a) Establishments and plants which process biomass from sustainable production or from biogenic waste or residue and supply the semi-finished products to be processed at a further level for the purpose of biofuel or bio-liquid production (e.g. at oil mills, biogas plants, fat preparation plants or other plants whose processing stage fails to reach the quality level required for the final use of the product).
b) Establishments and plants which process the liquid or gaseous biomass up to the quality level required for final use (e.g. oil mills, esterification plants, eth-

anol plants, hydrogenatioin plants or biogas processing plants).

Establishments which require certification along the production and supply chain within the framework of the certification systems are called interfaces. In this context, first gathering points and gatherers are referred to as first interfaces while conversion operations which process the biomass up to the required quality level are referred to as final interfaces.

Supplier and/ or trader within the value chain

Suppliers are economic operators located between the first gathering point and the conversion operation or between the last interface and the distributor of biofuels and/ or the installation operator who supplies energy generated from biofuels. Where suppliers downstreram of the final interface are not subject to customs supervision they must be participants in a DE certification system or in a voluntary system approved by the EU.

Installation operator

Anyone who, irrespective of ownership, uses the installation to generate electricity from renewable energy.

Party obliged to provid proof

Parties obliged to provide proof are economic operators who, pursuant to Art. 37 a) Federal Immission Control Act shall, during a calendar year, reduce the greenhouse gas emissions of the total amount of biofuels they declared for taxation by a certain minimum share. To that effect, they may distribute sustainable biofuels. Anyone who applies for tax relief for biofuels pursuant to the Energy Tax Act is also considered as a party obliged to provide proof.

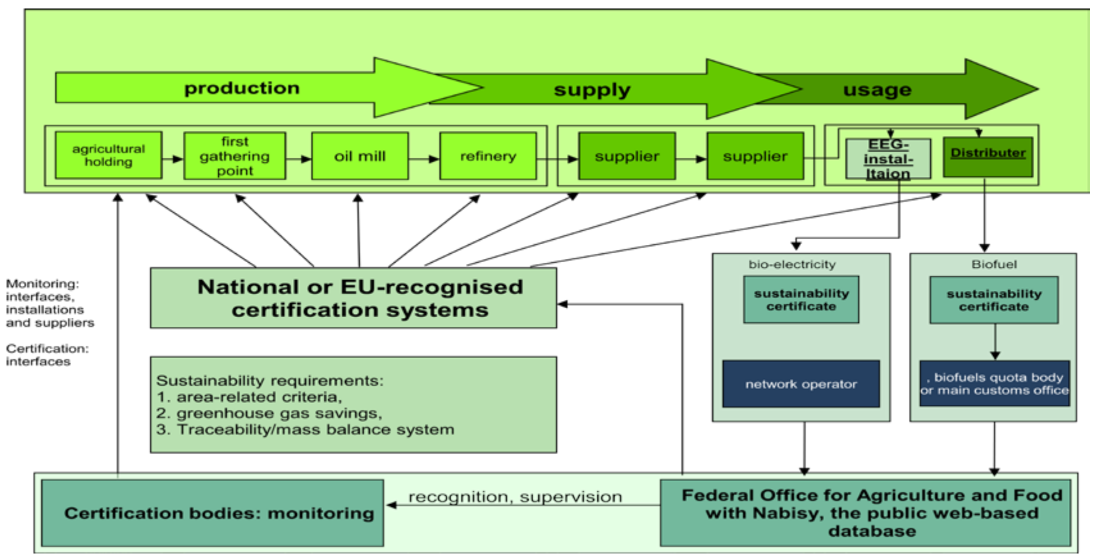


Figure 1: Control system

3.4.1 System participants having been notified to the BLE

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

The registraton of participants in BLE-recognised certification systems (DE-systems) is mandatory. Within the voluntary and the national systems only those participants are considered, who have been notified to the BLE because the biofuels or bioliquids they produce or trade are or could become relevant for the German market and they will need access to Nabisy in such cases. Most of the participants are now part of a voluntary system recognised by the EU.

By 31.12.2015, **3.723 participants** (3.757 in 2014) who produced or traded biofuels and/ or bioliquids were registered with the BLE along the value chain.

The overall figures result from all participants having been notified to the BLE. If a company acts in more than one role, e.g. as a producer of biofuel and a supplier downstream of the last interface and/or if it participates in several certification systems, this will entail multiple counting.

In 2015, again, DE systems had less participants while, at the same time, the number of participants in voluntary systems rises. The total number of participants slightly decreased.

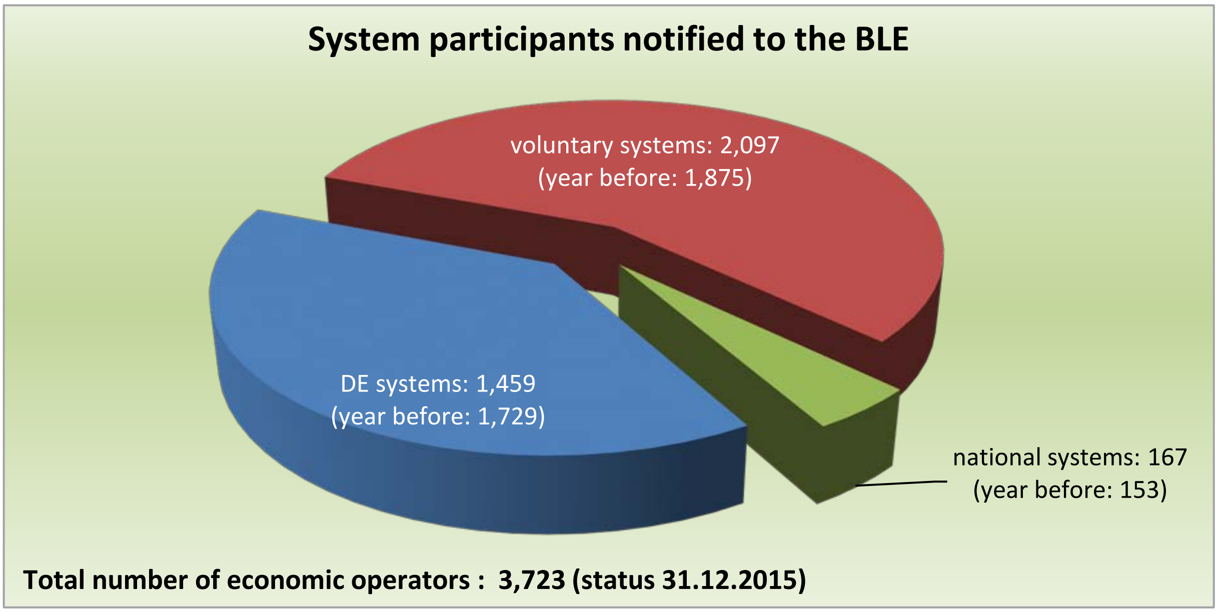


Diagram 1

3.4.2 Suppliers subject to supervision by German customs offices

Where suppliers downstream of the last interface are subject to customs supervision within the meaning of Art. 17 (3) Number 2 Biofuel SusO, they need not necessarily be part of a DE system or of a voluntary system recognised by the European Commission. To benefit from this exemption, the supplier's mass balance system must regularly be subjected to controls by the main customs offices for reasons of taxation pursuant to the Energy Tax Act or for the purpose of monitoring the biofuel quota obligation under the Federal Immission Control Act, and the suppliers must document having received and and forwarded the biofuels in the electronic database Nabisy, including the respective place and date as well as information stated on the proof of sustainability.

During the application process for access to Nabisy the BLE asks the main customs office responsible for the supplier's place of business to confirm that the applicant is indeed subject to customs supervision. Once this confirmation is provided the economic operator will obtain access to the database.

By 31.12.2015, **345 suppliers subject to customs supervision** were registered in Nabisy (376 the year before).

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 31.12.2015, a total of 167 participants (previous year: 153) in the national systems of **Austria**, **Hungary, Slovenia** and **Slovakia** were notified 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 9). It might rather be due to the fact that some Member States transposed Directive 2009/28/EC at a later date. Consequently, economic operators from other Member States who were interested at an early stage mostly 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 their compliance with the requirements laid down in the Renewable Energies Directive and in national legislation adopted for its implementation , as well as other requirements of the system used. Certificates certify that the specific requirements of the Renewable Energies 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 scope of sustainable biomass production. This applies irrespective of whether the certification bodies become active in connection with the certification systems recognised by the BLE or with voluntary schemes as the monitoring task of the BLE refers to all certification bodies located in Germany.

Pursuant to Art. 42 Nos. 1 and 2 as well as Art. 43 in connection with Art. 56 BioEnSusO and/or Biofuel SusO, the following number of applications for the recognition of certificatin bodies were lodged with the BLE by 31.12.2015:

Table 3: Applications for the recognition of certification bodies

Total number of applications	**50**
rejected	6
recognised	**44**
Recognition withdrawn or void due to inactivity of the certification body/ bodies	18
Number of certification bodies permanently recognised by 31.12.2015	**26**

During the application procedure certification bodies will first obtain a provisional recognition which will allow them to start certification activities. Only after the the certification body has undergone an office audit by the BLE control services can the provisional recognition be replaced by a permanent one.

Certification bodies currently recognised are listed here: http://www.ble.de/Biomasse.

Across the globe, BLE assessors and auditors accompany the certification audits of the certification bodies where respective states have the BLE permission to carry out these so-called Witness Audits on their territory. Audits concern controls pursuant to the prerequisites of both the DE systems and the voluntary systems. In 2015, the BLE accompanied 146 certification audits carried out by the certification bodies. 78 of these audits were carried out in Germany while the remaining 68 of them took place across the globe, in countries both within and outside of the European Union.

Table 4: 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
LKS Landwirtschaftliche Kommunikations- und Servicegesellschaft mbH, Germany	21.04.2011
TÜV Thüringen e. V., Germany	21.04.2011
TÜV Nord Cert GmbH, Germany	25.09.2011
proTerra GmbH, Germany	27.09.2011
Intertek Certification GmbH, Germany	13.02.2013
ELUcert GmbH, Germany	17.04.2013
SC@PE international ltd., Germany	05.06.2014
BSI Group Deutschland GmbH, Germany	13.11.2014
DIN CERTCO Gesellschaft für Konformitäts-bewertung mbH, Germany	04.02.2015
SicZert Zertifizierungen GmbH, Germany	26.03.2015

4.1 Global certifications under DE system requirements

In Germany, the transposition of Directive 2009/28/EC into national law provides for a compulsory certification of the so-called **interfaces**, certain economic operators along the supply chain for the production of biofuels or bioliquids. These interfaces include the first gathering points/gatherers as well as all conversion operations. In addition, assessments of conformity and random controls required by law 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.

The number of DE certifications carried out continues to decline sharply. While in 2014 about 60 % less certifications were carried out in comparison to the previous year, the decline in 2015 amounts to 65 % as compared to 2014.

As a resultat, in 2015 only 121 certifications according to DE prerequisites were carried out. Two of these certificates were withdrawn by the certification body before their expiration.

It can be assumed that the remaining 121 system participants certified are mostly companies that operate on the German market exclusively and therefor do not necessarily need a certification accordign to the prerequisites of a voluntary system.

Table 5: Number of DE certifications

Number of operations certified and recertified under DE requirements	in 2013	in 2014	in 2015
total	857	341	121
in Germany	479	160	91
within the EU, excluding Germany	340	161	29
in third countries	38	20	1

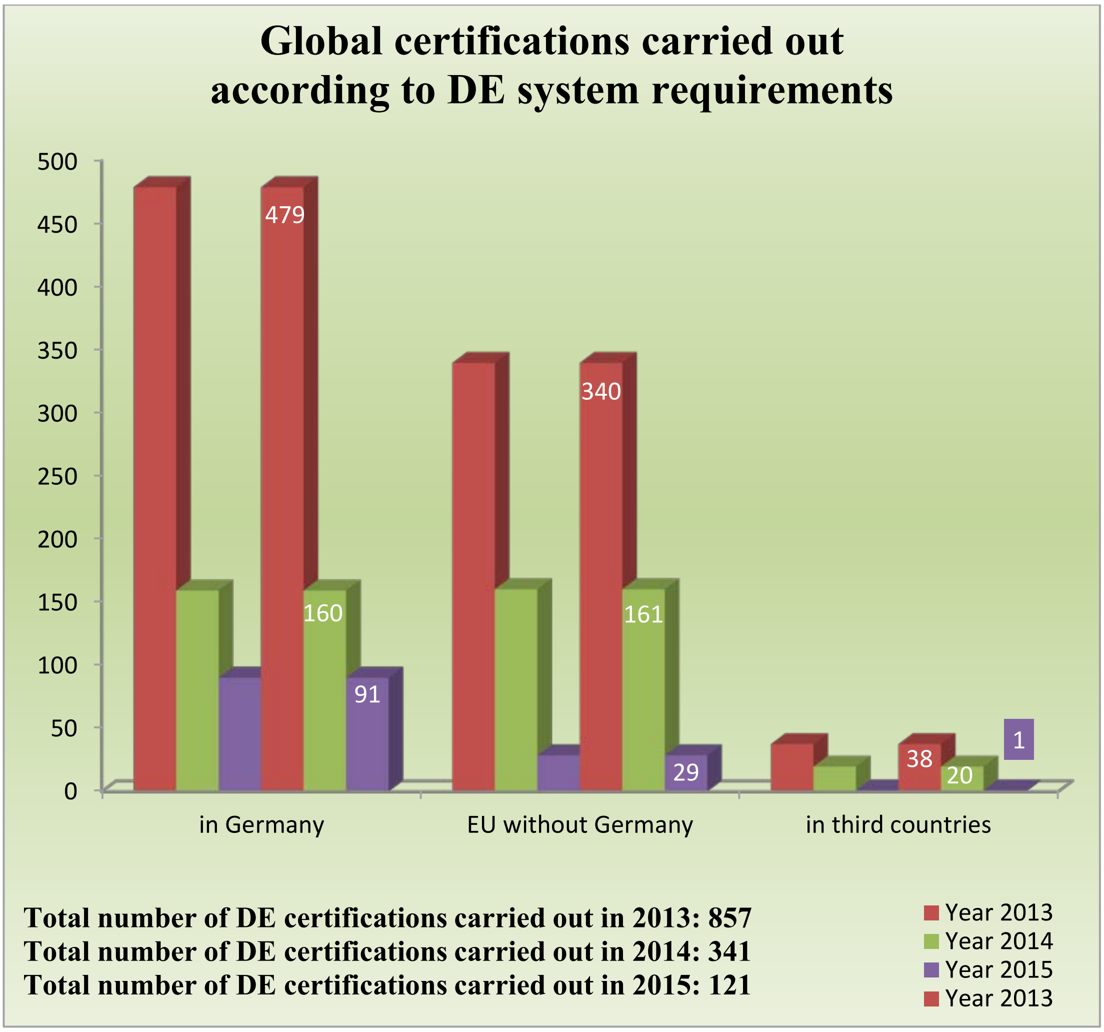


Diagram 2

4.2 Certifications under voluntary system requirements

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

Wherever these certification bodies carry out certifications according to the requirements of voluntary systems and where the certification decision is taken in Germany, they are also subject to BLE supervision. Therefore, these certificates are to be transmitted to the BLE as well. During the reporting year, **2.342** certifications and recertifications of operations according to voluntary system requirements were notified to the BLE.

5. The government 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, where these consignments 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. Certificates of sustainability or partial certificates of sustainability contain the data regarding compliance with the sustainability criteria entered into Nabisy and are to be handed on along the supply chain.

In the reporting year, 1,539 accounts were used by economic operators. Only 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 biomass for the generation of electricity.

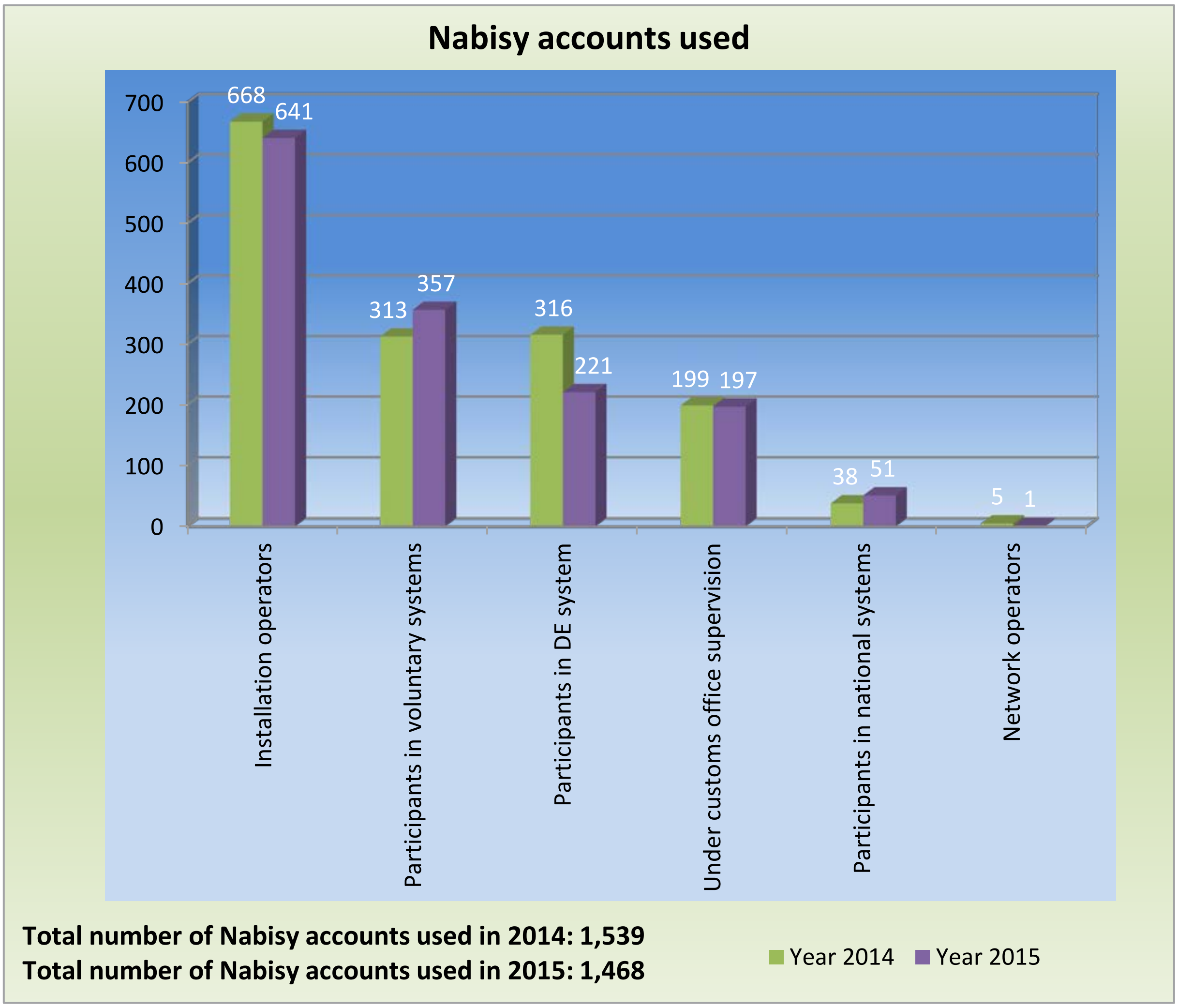


Diagram 3

Depending on their function, economic operators with an account in Nabisy can create proofs of sustainability (final interfaces), can transfer, split or combine proofs of sustainability and partial proofs of sustainability (suppliers/ installation operators) and can indicate uses (network operators). Economic operators may apply to the BLE for a needs-based number of accesses to their accounts.

Since the reporting year 2015, installation operators subject to compulsory emissions trading and aircraft operators may prove their compliance with the sustainability requirements to the German Emissionshandelsstelle, DEHSt (German Emissions Trading Body) via the Nabisy database. To date, twelve accesses were granted for these operators.

The overview below shows the number of accesses established by 31.12.2015.

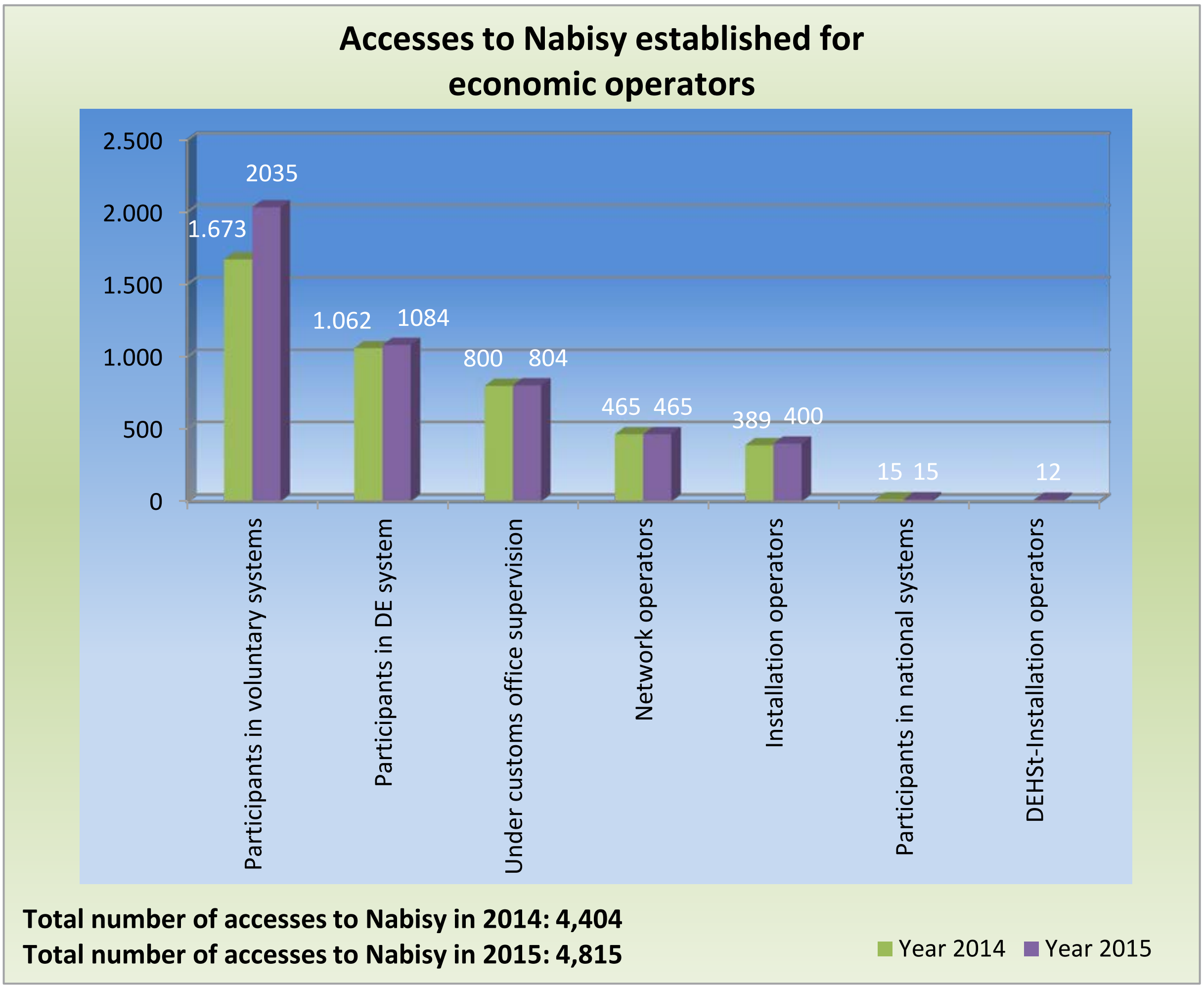


Diagram 4

5.2 Proofs

Only producers of consignments of biofuel or bioliquids may issue a proof of sustainability. They are the so-called **final interface**. By issuing the certificate in Nabisy, they ensure that the consignment can be used on the German market. If a party downstream of the supply chain, e.g. a supplier, decides that the goods are to be used outside Germany, they shall retire the respective proof to the retirement account of the state where

The presentation of proofs of sustainability or partial proofs of sustainability to the customs authority is a prerequisite for biofuels to be counted towards the distributor's obligation to reduce greenhouse gas emissions. Installation operators can only claim remuneration for electricity produced from biomass and fed into the grid pursuant to the Renewable Energy Sources Act and, where applicable, the renewable resources bonus if they provide proofs of sustainability or partial proofs of sustainability.

Partial proofs of sustainability are issued by those certified economic operators who process the liquid or gaseous biomass up to the quality level required for the use as biofuel or 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. This report therefore generally refers to the economic operator who issues the proof of sustainability.

A proof of sustainability identifies a certain quantity of biofuel or bioliquid as being sustainable. Where biofuels ands/or bioliquids are traded on to the party obliged to provide proof or to the installation operator in the supply chain, the respective quantities shall be split or combined as required.

To document this accordingly, a proof of sustainability needs to be split a proof of sustainability or to combine it with other proofs of sustainability. In that process, but also by simply transferring a proof to the customer, **partial proof of sustainability** are generated.

Nabisy processes proofs of sustainability (*basic proofs* to be issued by producers only) and partial proofs of sustainability (*subsequent proofs* which are generated by any kind of action carried out by suppliers: transferring, splitting, combining).

In 2015 producers around the globe entered **16,943** proofs of sustainability into Nabisy.

Table 6: Proofs of sustainability issued

Producer location	Number of producers	Number of proofs of sustainability issued
Germany	151	9,561
European Union	93	7,215
Third countries	31	167
Total	**275**	**16,943**

Samples of a proof of sustainability (basic proof) and a partial proof of sustainability (subsequent proof) are shown below.

Proof of Sustainability

For bioliquids pursuant to Arts. 15 et seqq. of the Biomass electricity sustainability ordinance (Biomassestrom-Nachhaltigkeitsverordnung (BioSt-NachV)), or for biofuels pursuant to Arts. 15 et seqq. of the biofuels sustainability ordinance (Biokraftstoff-Nachhaltigkeitsverordnung (Biokraft-NachV))

Number of the proof of sustainability:

Note of delivery:

Interface:	Recipient:	Certification system:

1. General information on biomass / biofuels:

Type, potential parts:

Country of cultivation / Country of origin*:

Quantity (t oder m^3):

Energy content (MJ):

The bioliquids / biofuels have been produced from residues or by-products, with by-products not arising from agriculture, forestry, fisheries or aquaculture. ☐ yes ☐ no

Advice: If Yes has been indicated, no further particulars are required for 2.

2. Sustainable production of biomass and / or sustainable production of biofuels pursuant to Arts. 4 – 7 BioSt-NachV/Biokraft-NachV:

The biomass complies with the requirements pursuant to Arts. 4 – 7 BioSt-NachV / Biokraft-NachV. ☐ yes ☐ no

3. Greenhouse gas savings pursuant to Art. 8 BioSt-NachV / Biokraft-NachV:

☐ The greenhouse gas emissions savings potential has been complied with as follows:

- Greenhouse gas emissions (g CO_2eq/MJ):

Comparator for fossil fuels (g CO_2eq/MJ):

- Compliance with the savings potential when used

☐ for electricity generation ☐ as fuels

☐ for combined electricity / heat generation ☐ for heat generation

- Compliance with the greenhouse gas savings when used in the following countries (e.g. Germany, EU):

Calculation of the greenhouse gas savings has been carried out wholly or partially on the basis of standard values according to Annex 2 BioSt-NachV / Biokraft-NachV. ☐ yes ☐ no

☐ The biomass originates from an exemption granted interface pursuant to Art. 8 para. 2 BioSt-NachV and Art. 8 para. 2 Biokraft-NachV respectively.

The proof of sustainability is valid without signature. The interface is responsible for accuracy of the proof. Identification of the proof takes place by means of ist non-recurring number.

Place and Date of issuance:

Delivery / shipment based on a mass balance system pursuant to Art. 17 BioSt-NachV / Biokraft-NachV:**

☐ Delivery / shipment has been documented in a mass balance system.

☐ Documentation has been carried out according to the requirements of the following certification system:

☐ Documentation is carried out pursuant to Art. 17 para. 3 Biokraft-NachV.

☐ Documentation has been carried out by means of the following electronic database:

☐ Documentation has been carried out in the following different way:

Last supplier (name, address):

* **Advice**: In the case ~~where~~ The proof of sustainability contains materials ~~are included~~ from multiple countries of cultivation

Partial Proof of Sustainability

For bioliquids pursuant to Arts. 15 et seqq. of the Biomass electricity sustainability ordinance (Biomassestrom-Nachhaltigkeitsverordnung (BioSt-NachV)), or for biofuels pursuant to Arts. 15 et seqq. of the biofuels sustainability ordinance (Biokraftstoff-Nachhaltigkeitsverordnung (Biokraft-NachV))

Number of the partial proof of sustainability: DE-B-BLE-BM-39-213-10000057-NTNw-10001595

Number of the proof divided into partial proofs: DE-B-BLE-BM-39-213-10000057-NTNw-10001593

Supplier: BLE

Interface:	Recipient:	Certification system:
DE-B-BLE-BM-39-SSt-00000057	Lieferant / trader 54, M[illegible]stadt, DE-B-BLE-BM[illegible]-00000054	Nabisy-Test-System, null, DE-B-BLE-BM-39

1. General information on biomass / biofuels:

Type, potential parts: 100.00% Pflanzenöl

Country of cultivation / Country of origin*: AT

Quantity (t/kWh/m3): 25 m³

Energy content (MJ): 850,000

The bioliquids / biofuels have been produced from residues or by-products, with by-products not arising from agriculture, forestry, fisheries or aquaculture. ☐ yes ☒ no

2. Sustainable production of biomass and/or sustainable production of biofuels pursuant to Arts. 4-7 BioSt-NachV/ Biokraft-NachV:

The biomass complies with the requirements pursuant to Arts. 4-7 BioSt-NachV/ Biokraft-NachV. ☒ yes ☐ no

3. Greenhouse gas savings pursuant to Art. 8 BioSt-NachV/ Biokraft-NachV:

☒ The greenhouse gas emissions savings potential has been complied with as follows:

- Greenhouse gas emissions (g CO2eq/MJ): **36.0** Comparator for fossil fuels (g CO2eq/MJ): 77.0
- Compliance with the savings potential when used: ☒ for electricity generation ☒ as fuels ☒ for combined electricity/heat generation ☒ for heat generation
- Compliance with the greenhouse gas savings when used in the following countries/regions (e.g. Germany; EU): Weltweit

☐ The biomass originates from an exemption granted interface pursuant to Art. 8 para. 2 BioSt-NachV and Art.8 par. 2 Biokraft-NachV respectively.

The proof of sustainability is valid without signature. The interface is responsible for accuracy of the proof. Identification of the proof takes place by means of its non-recurring number.

Place and date of issuance: Bonn, 03.07.2014

Delivery/shipment based on a mass balance system pursuant to Art. 17 BioSt-NachV/ Biokraft-NachV**:

☒ Delivery/shipment has been documented in a mass balance system.

- ☒ Documentation has been carried out by means of the database of the BLE:
- ☐ Documentation has been carried out according to the requirements of the following certification system:
- ☐ Documentation is carried out pursuant to Art. 17 para. 3 Biokraft-NachV.
- ☐ Documentation has been carried out by means of the following electronic database:

Last supplier (name, address): Ölk, Fulda

6. Biofuels

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

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

Please note that the information given only concerns the quantities applied for and respective energy contents. The available data allow no statements as to whether all of the quantities and energy contents presented here were actually granted tax relief or were counted towards the quota obligation.

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

Diagram 5 gives an overview of the amounts for which applications were submitted towards the biofuel quota obligation for 2013, 2014 and 2015 in comparison. The share(s) of quantities subject to a proof of double-weighting are indicated for 2013 and 2014.

In 2015, due to the switch from the energetic quota to the greenhouse gas reduction quota, the option of double-weighting has been suspended. Yet, at minus 8,6% in the quota year 2015, the amount of biofuels has cleary declined in comparison to the year before. This situation might, among other things, be attributed to the fact that the GHG reduction of 3.5% required in 2015 and in 2016 through the distribution of biofuels with the highest possible reduction potential can be achieved by a smaller amount of biofuel.

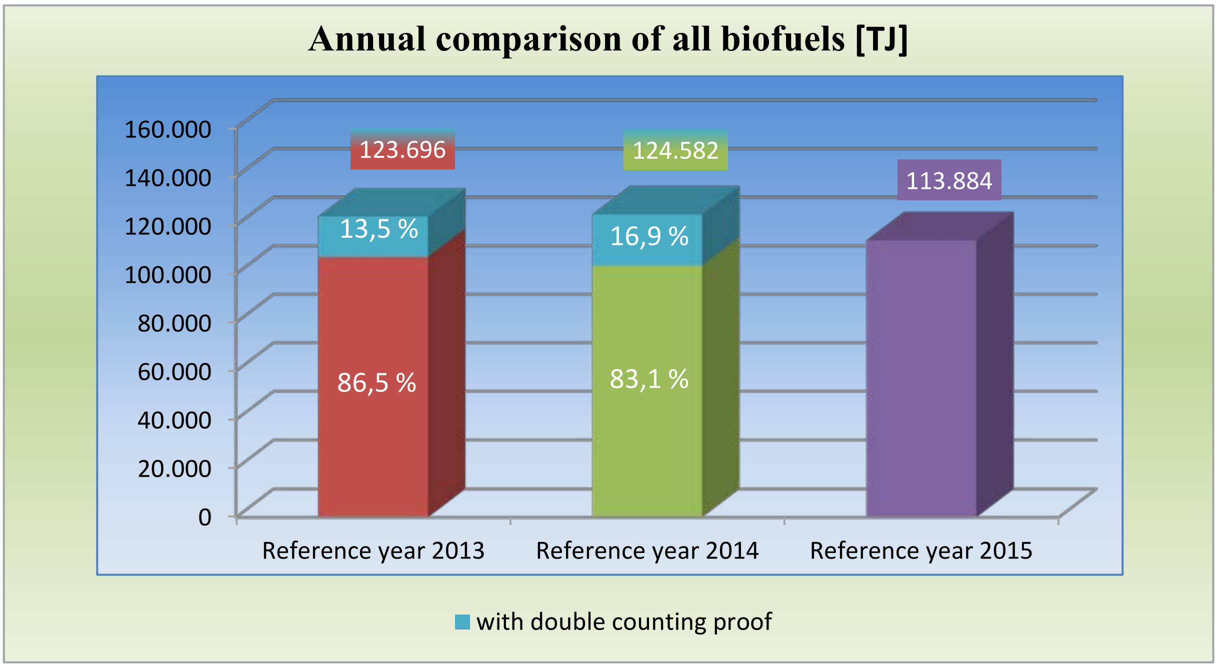


Diagram 5

Although, during the reporting year, double-weighting of biofuels produced from wastes and residues was no longer possible, this has not affected these source materials' sales prospects. In 2015, the share of wastes and residues, known to bear high GHG savings potential, has risen by 2.1 percentage points as compared to the previous year.

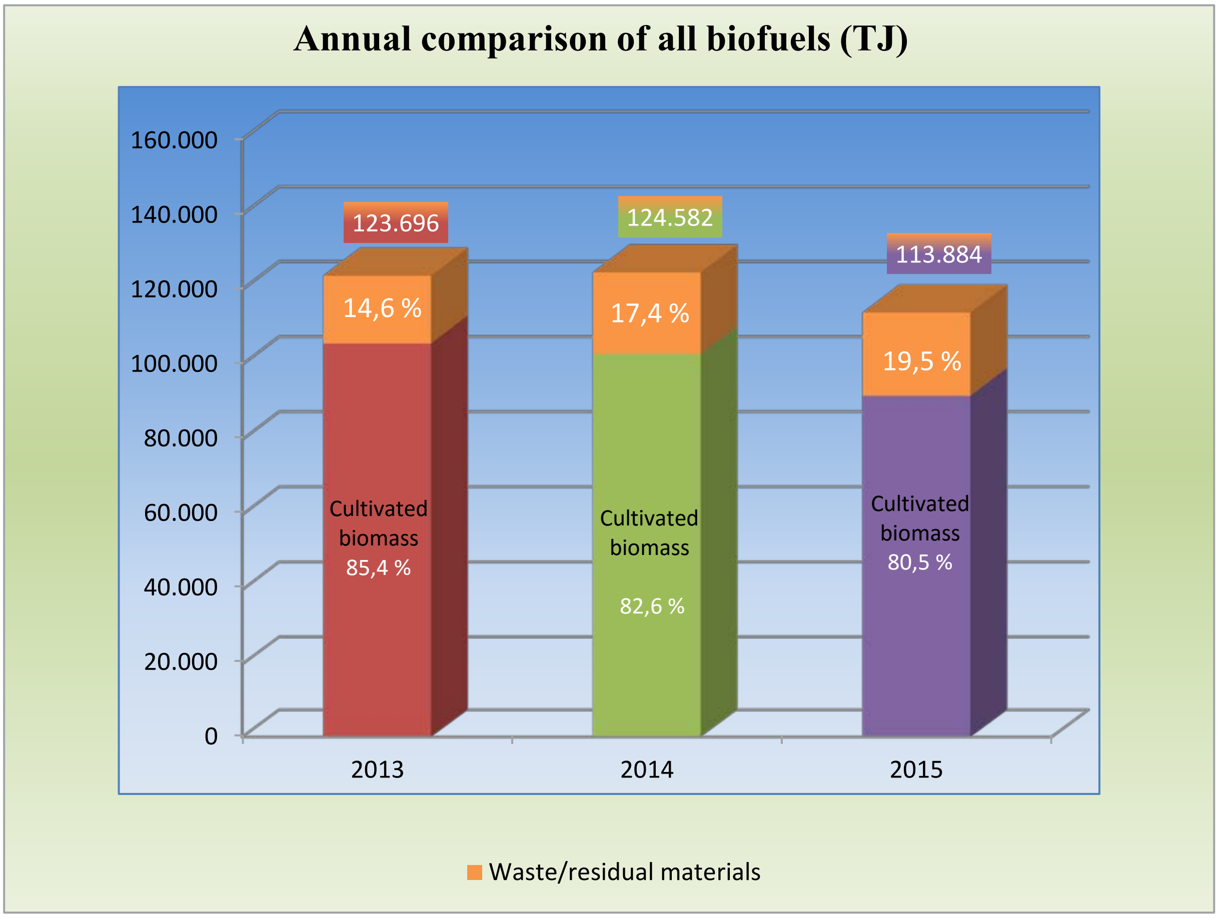


Diagram 6

6.1 Origin of the source materials

For the first time during the reporting year it was possible to evaluate the biofuel amounts by directly linking raw materials and their origins.

Biofuels with source materials originating in Europe continued to make up the largest share of the total amount by far. Compared to the decline of the the total amount (-8,6 %) they only declined by 1.5 %.

By contrast, the quantity of biofuels produced from source materials originating in Asia declined sharply, by 28.5 %. This decrease concerns mainly hydrotreated vegetable oil (see diagram 22).

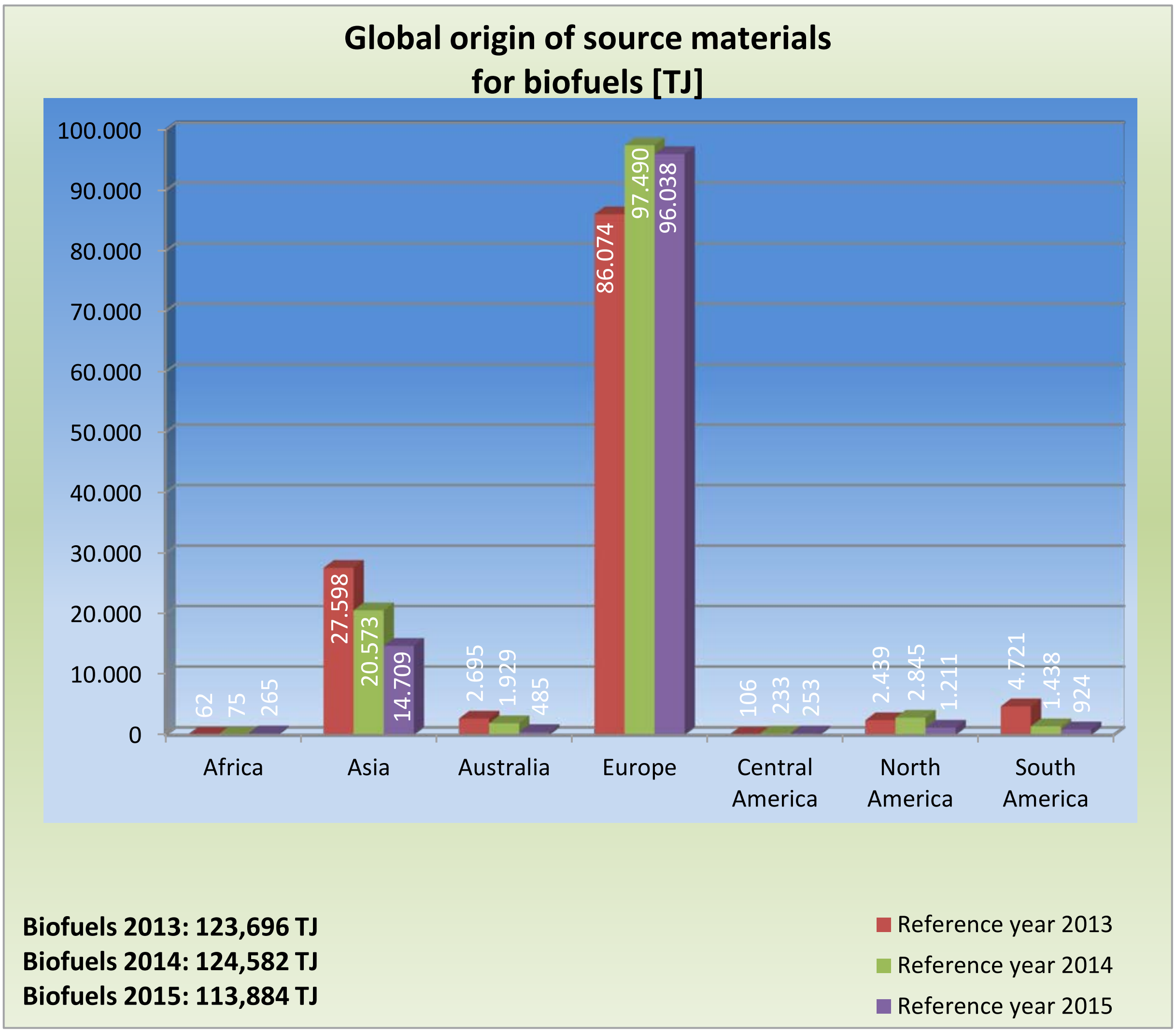


Diagram 7

The share of biofuels produced from source materials originating in Germany rose by 22.3% as compared to the previous year, while the share from other EU Member States fell by 15.3 %.

This has led to the fact that the share originating in Germany exceeds that from the rest of the European Union.

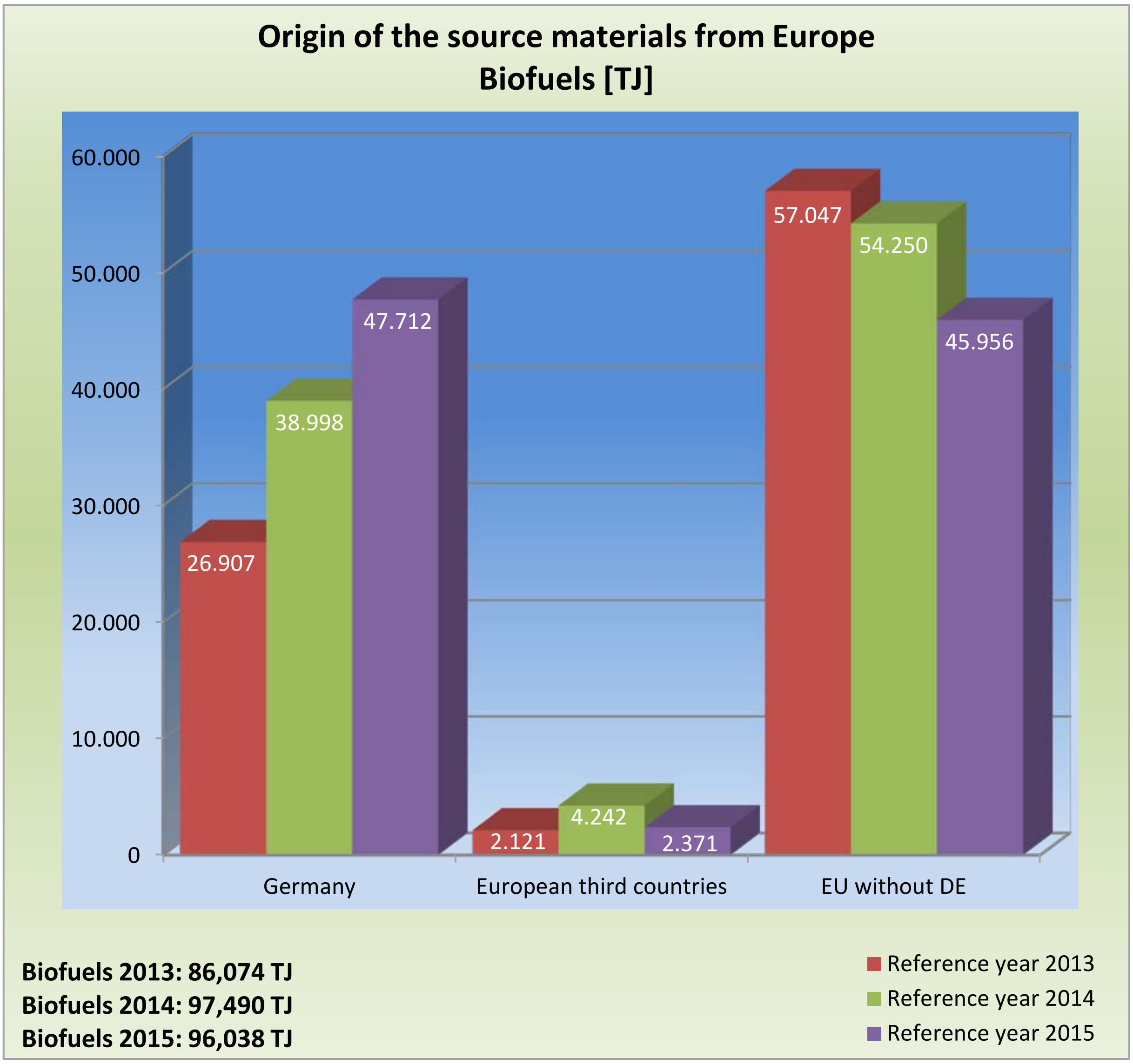


Diagram 8

For biofuels whose source materials originate from EU Member States, the share of finished products produced from raw materials originating in Germany amounts to 50.9 %, followed by France (8.3 %), the Czech Republic (8.0 %), Poland (7.6 %) and Hungary (6.2 %).

The remaining quantity (18.9 %) originated in a total of twenty-two countries whose shares amounted to less than 5,000 TJ each.

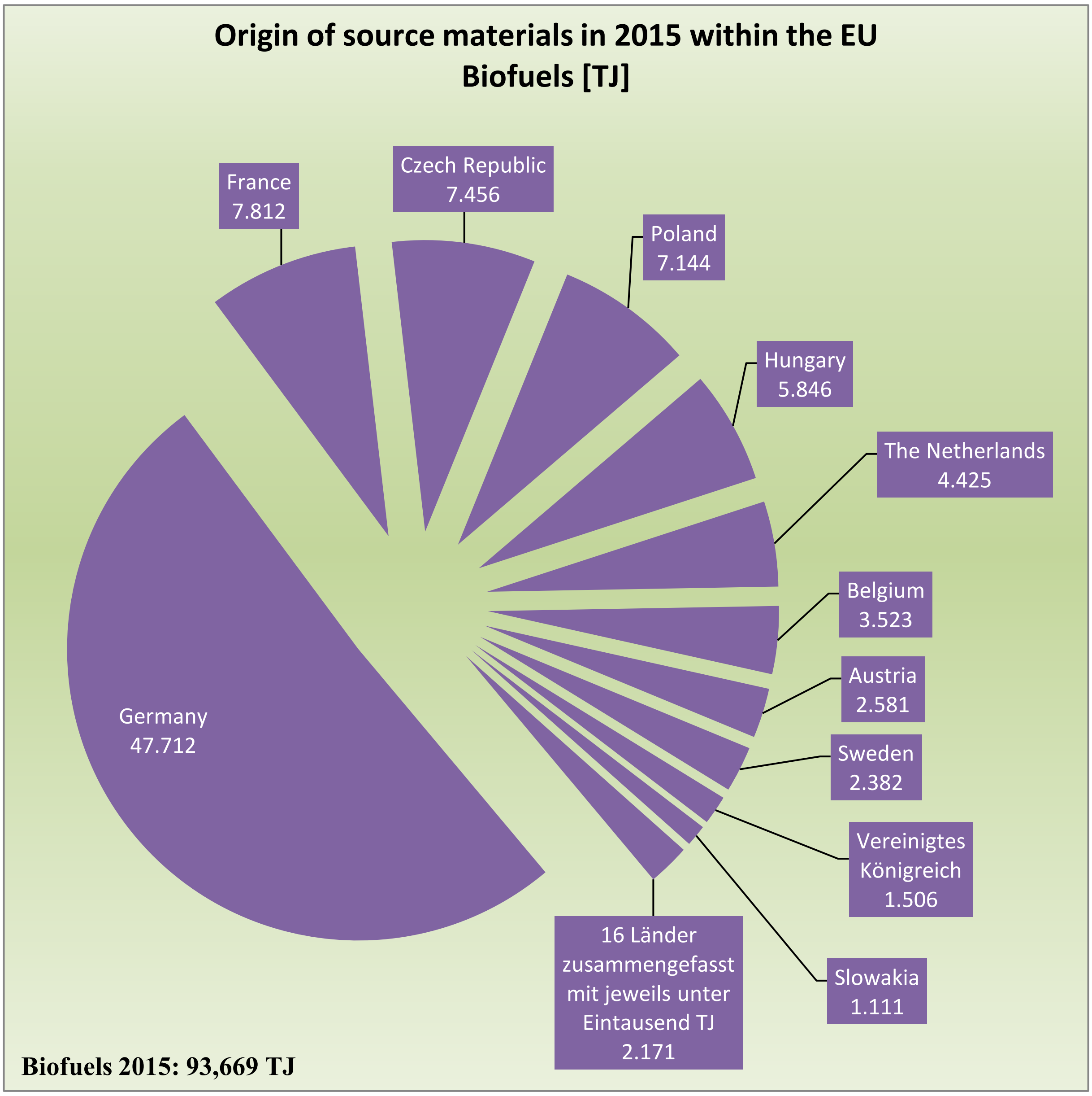


Diagram 9

The shares of the sixteen countries combined here amount to the following:

Spain	722	Rumania	515	Bulgaria	367	Latvia	158
Denmark	127	Lithuania	106	Italy	52	Luxembourg	47
Ireland	29	Finland	27	European Union	7	Portugal	5
Slovenia	5	Cyprus	2	Greece	1	Estonia	1

Source materials from European third countries originate mostly in Ukraine (93.2 %).

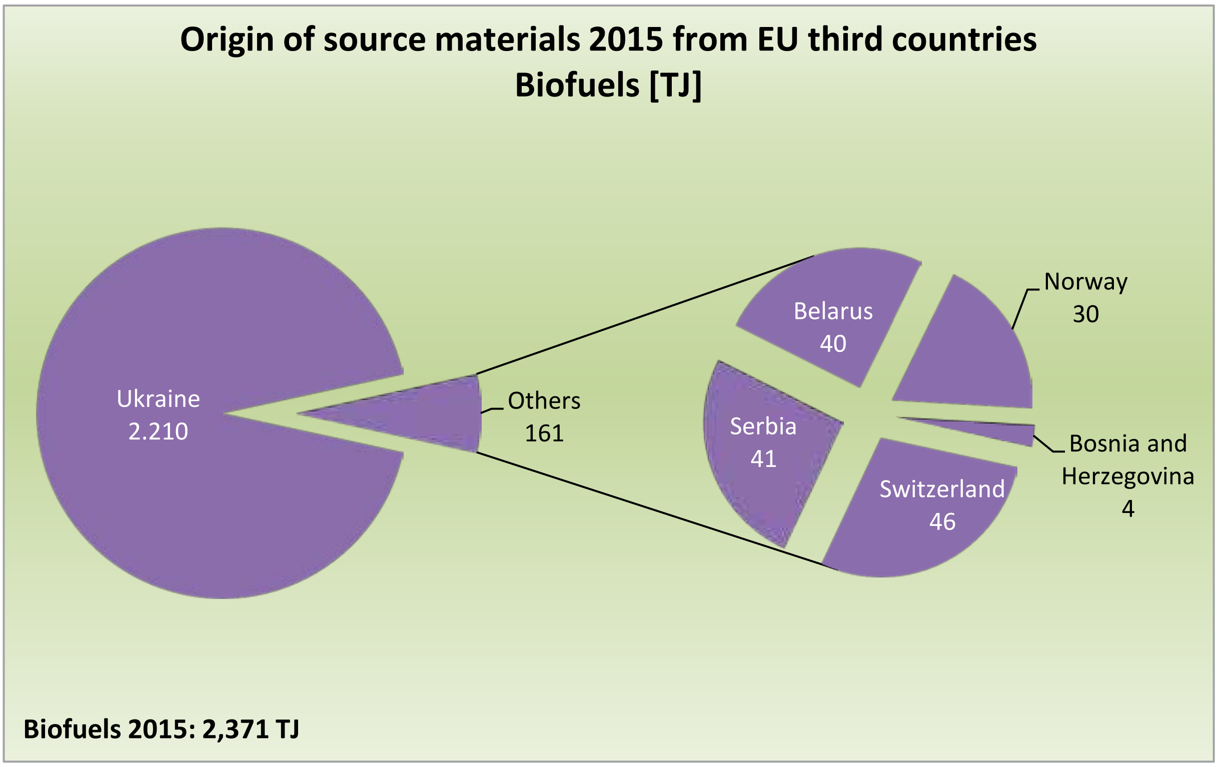


Diagram 10

6.2 Source materials according to origin and type

Source materials from **Africa** were mainly waste and residue. In comparison to 2013 the quantity has more than quadrupled. The largest share of these wastes and residues (63.2 %) originated in the Republic of South Africa and consisted exclusively of bio-diesel from used cooking oils of vegetable origin.

Biofuels from sugar cane originating in Africa were registered to be counted towards the greenhouse gas reduction quota for the first time. The sugar cane was grown in the West African Republic of Sierra Leone.

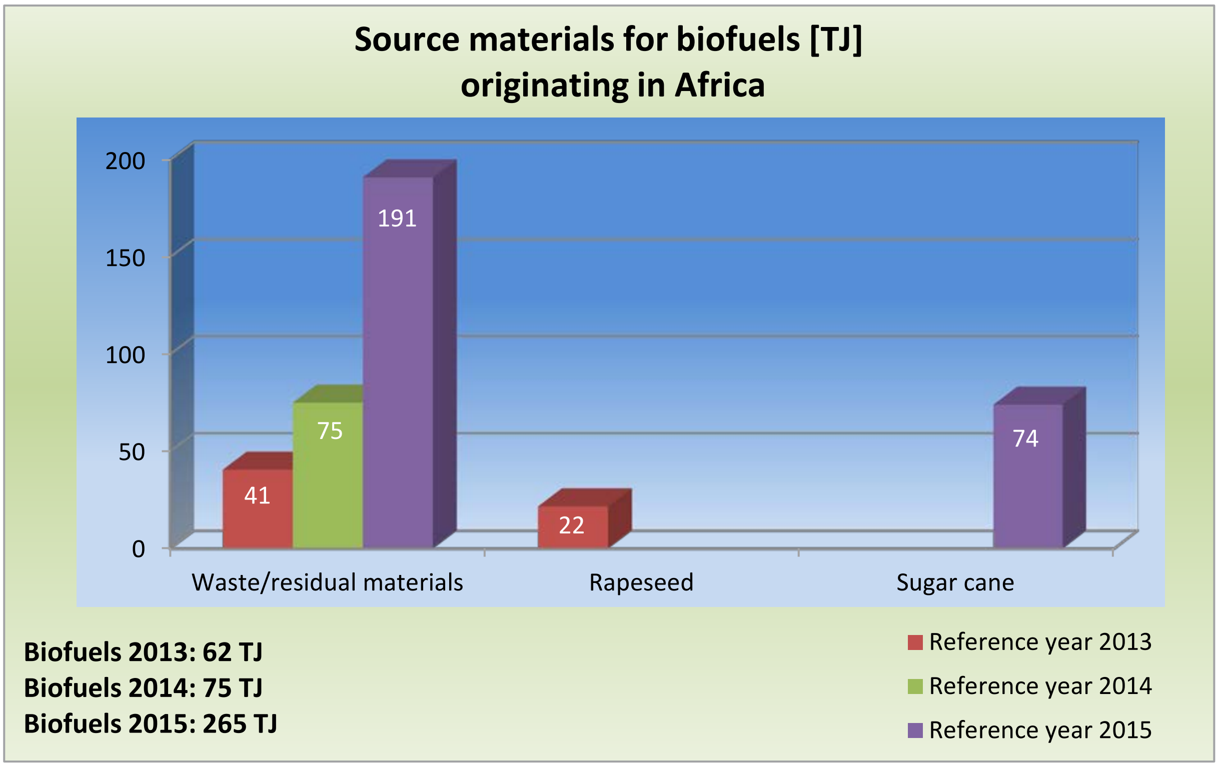


Diagram 11

In 2015, the decline in biofuels whose source materials originate in **Asia** has continued from last year. While the share of wastes and residues increased slightly, that of palm oil fell by 33.5 %.

45.6 % of wastes and residues originated in Malaysia and consist mainly of used cooking oils and fats of vegetable origin.

Palm oil originated in Indonesia (69 %) and in Malaysia (31 %).

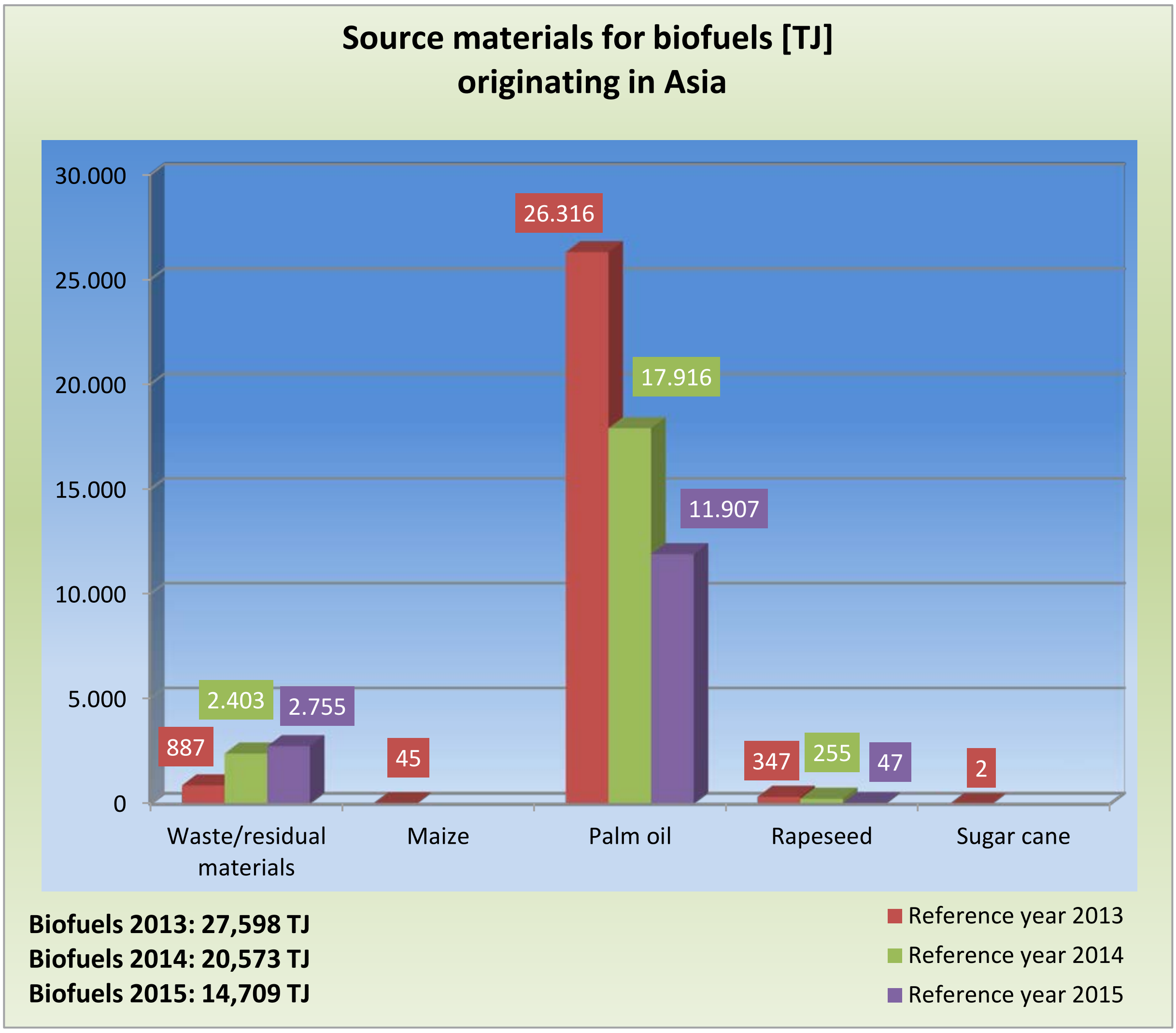


Diagram 12

The amount of biofuels whose source materials originated in **Australia** fell to less than a quarter of last year's quantity.

Quantities of biofuels produced from rapeseed fell by 76 % in 2015, while th shares produced from waste and residue rose to more than twice the amounts of the year before. Quantities produced from palm oil were used for the first time, whose small amounts in relation to the total quantity are insignificant, however. Biodiesel produced from soy was not distributed this year.

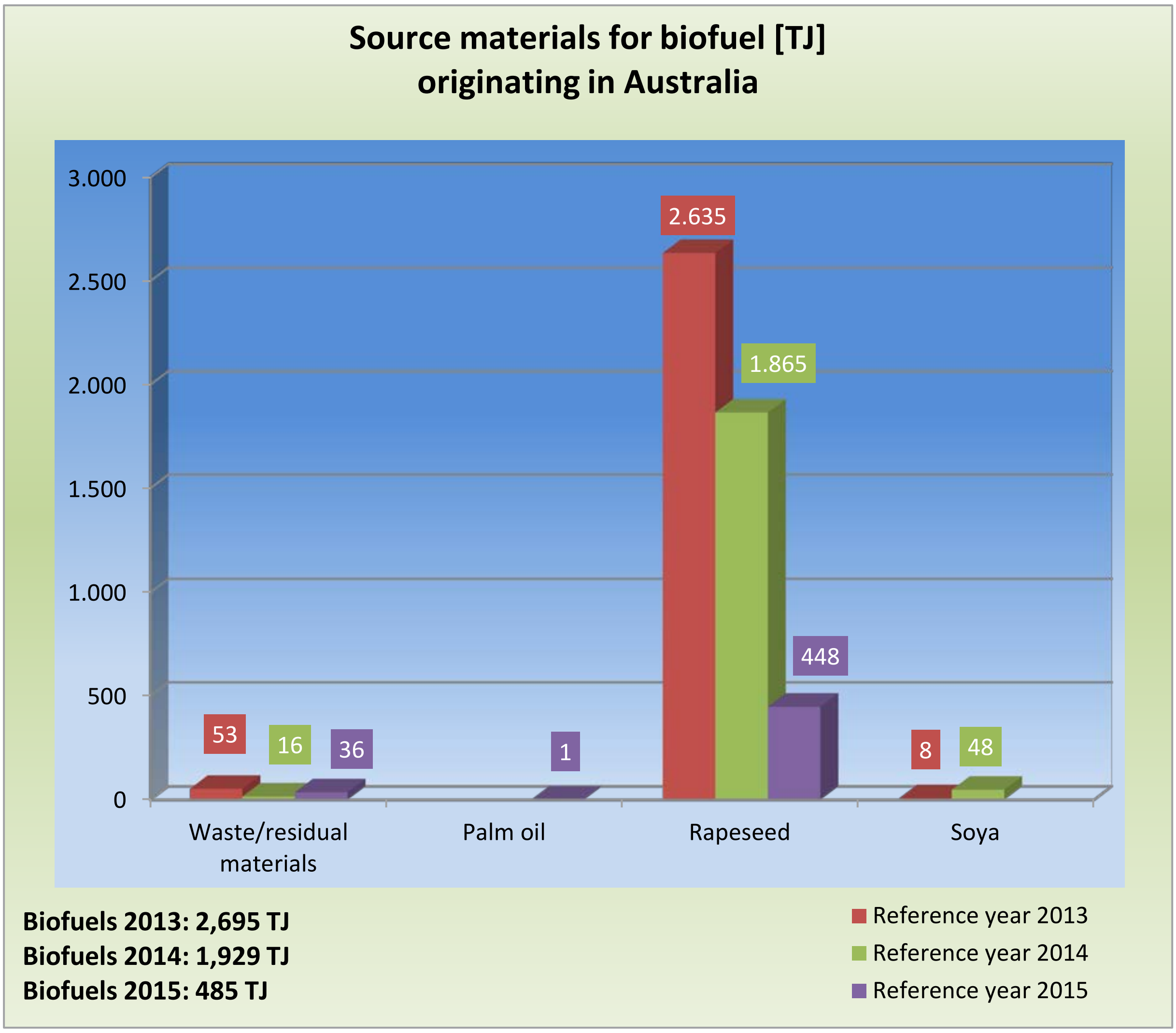


Diagram 13

Despite a decrease of about 4.3 %, rapeseed made up the largest share of all source materials originating in **Europe**. About two thirds of this share were grown in Germany. About 11 % originated in the Czech Republic, 9 % in France and about 7 % in Poland. The share produced from wastes and residues almost stagnated in comparison to the year before. Here, too, the biggest share originated in Germany (39 %), followed by the Netherlands (25 %). In 2015, wheat only increased slightly. The share of sugarbeet declined by 40 %, while that of corn rose by almost 22 %.

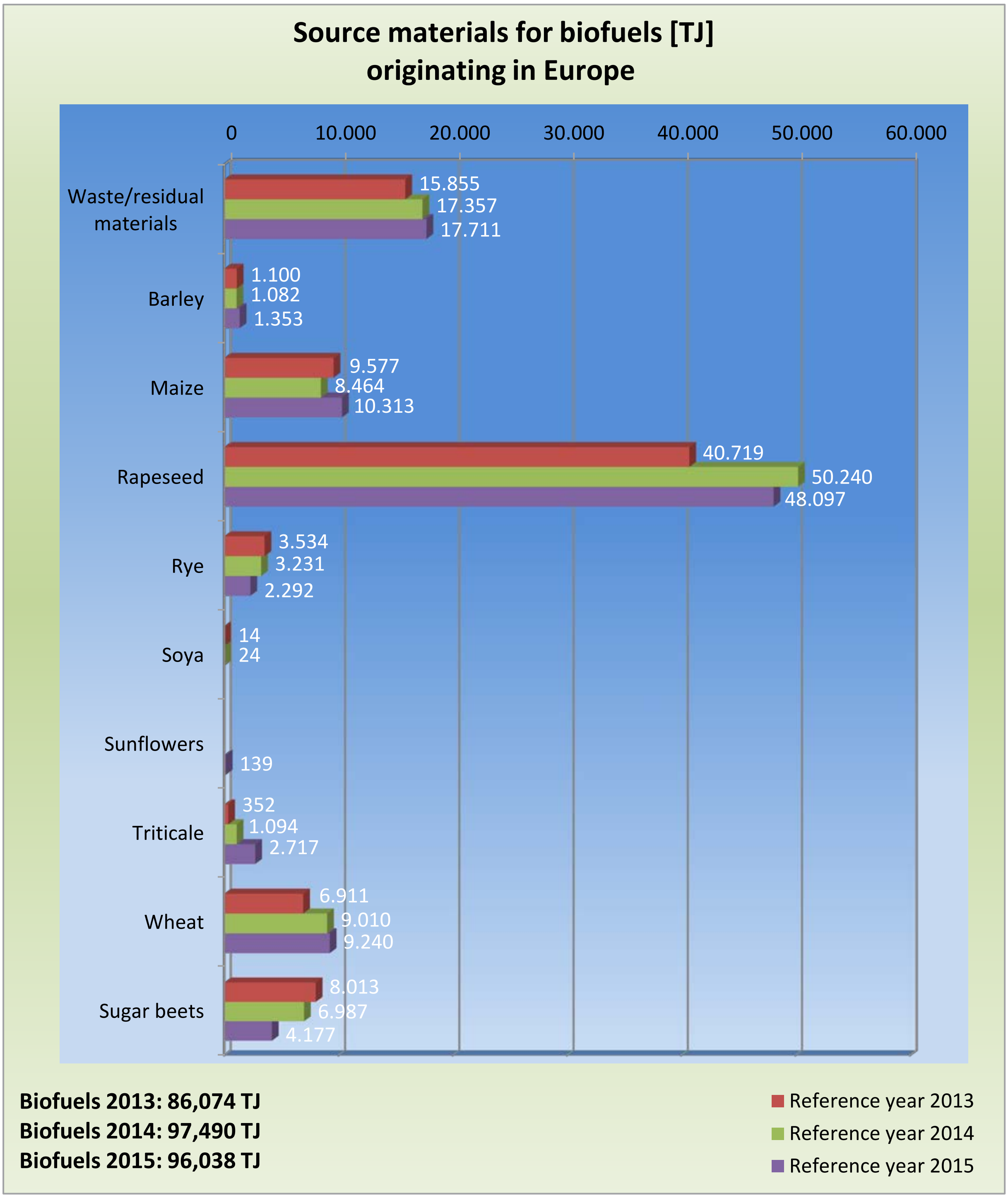


Diagram 14

Source materials for the production of biofuels **Central America** represented the smallest share, with regard to the overall amount. In 2015, sugarcane was the only source material used for the production of bioethanol. Guatemala is the biggest producing country with a share of 86.6 %. The remaining quantity originated in Costa Rica (10.4 %) and Nicaragua (3.0 %).

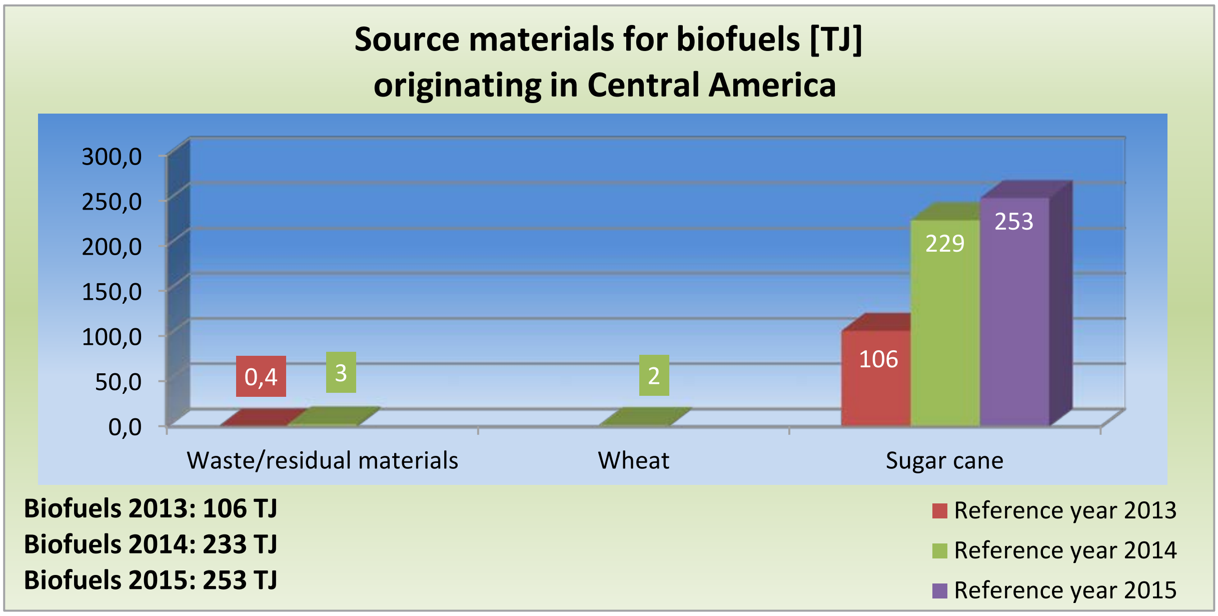


Diagram 15

The total volume of source materials originating in **North America** continued to decline. As the share of corn steadily decreased, no quantity accounted for biofuel production in 2015. Also, soy has become irrelevant in the reporting year. Only biofuels from wastes and residues were used, albeit at a reduced rate of 27.8 %. The most significant quantities originated in the USA.

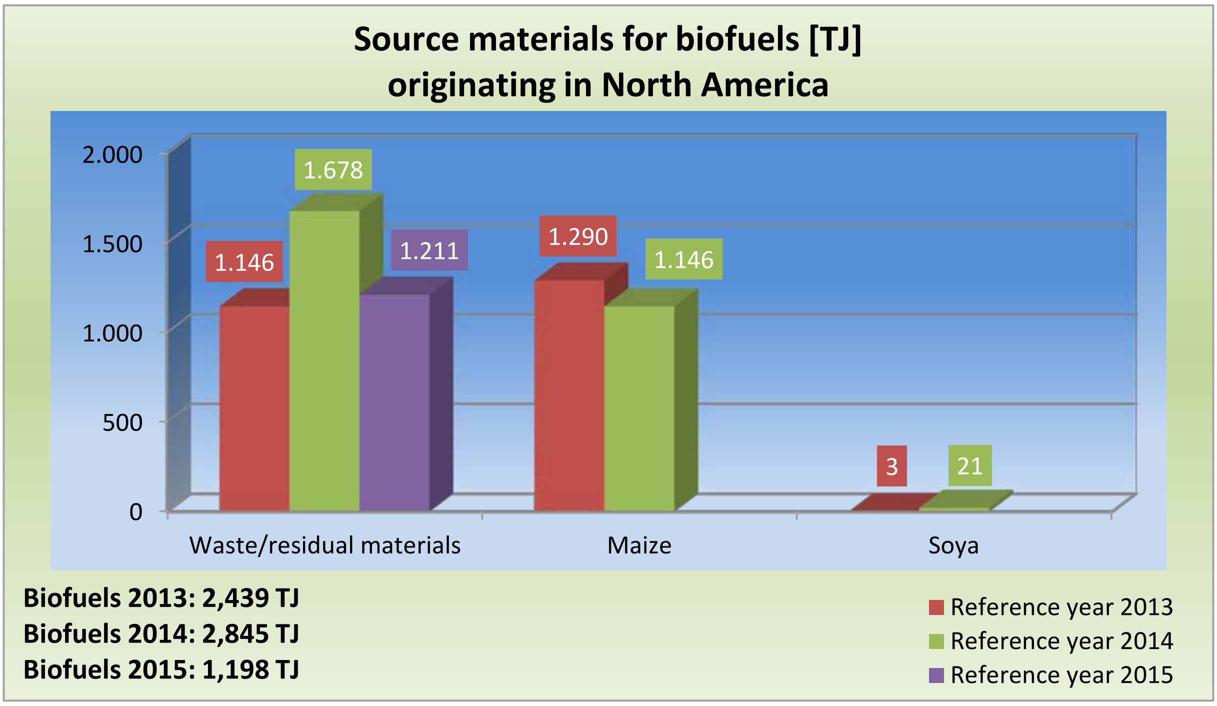


Diagram 16

In 2015, there was a sharp decline in quantities of biofuels produced from source materials originating in **South America**.
All types of biomass cultivated experienced significant reductions. The small share palm oil used to account for, disappeared completely. Significant reductions appeared were soy (77.5 %) and rapeseed (98.5 %) were concerned as source materials. The share of sugarcane (18.9 %) fell less sharply. Even though wheat had not been registered for two consecutive years prior to the reporting year, a small quantityof biofuels produced from wheat could be registered in 2015.

By contrast, the quantity produced from waste and residue rose sharply by 67.2 %.

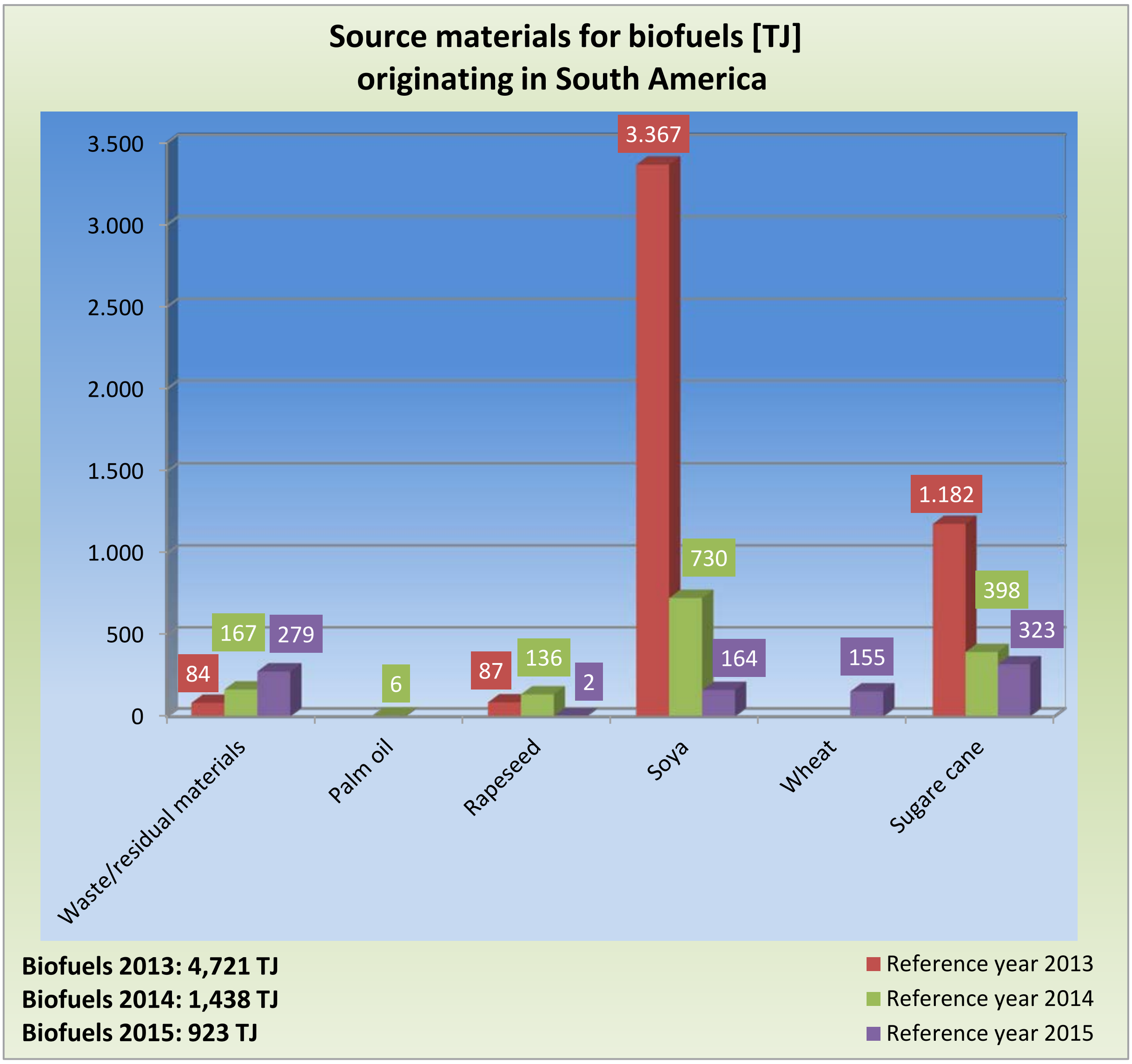


Diagram 17

6.3 Types of Biofuel

Among the biofuels registered for being counted towards the biofuel quota or for tax relief, FAME held the largest share by far, followed by bioethanol and HVO at a considerable distance. The share of other types of biofuel amounts to less than one percent. UCO, as pure fuel however, is irrelevant as a source material for the production of biodiesel.

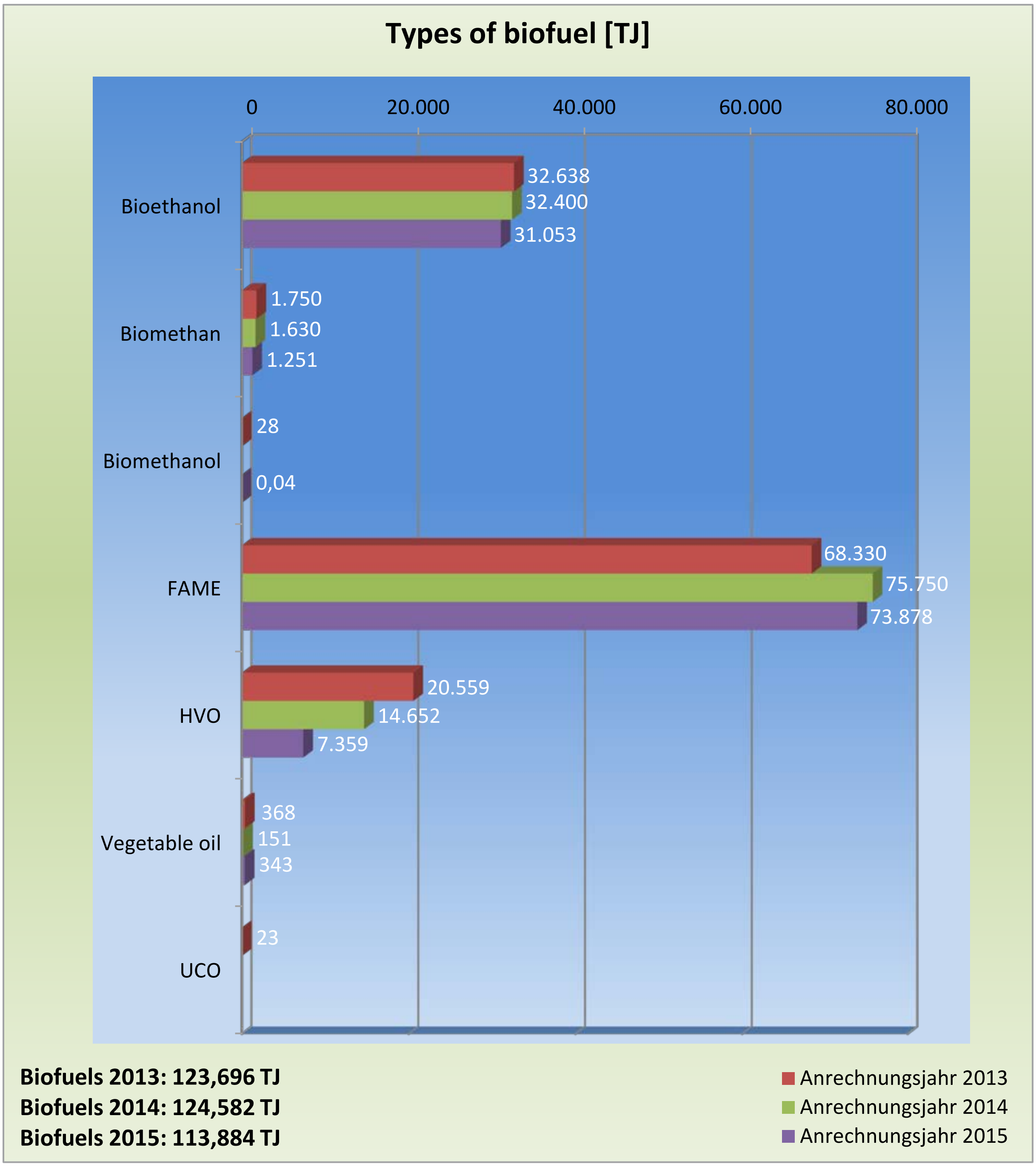
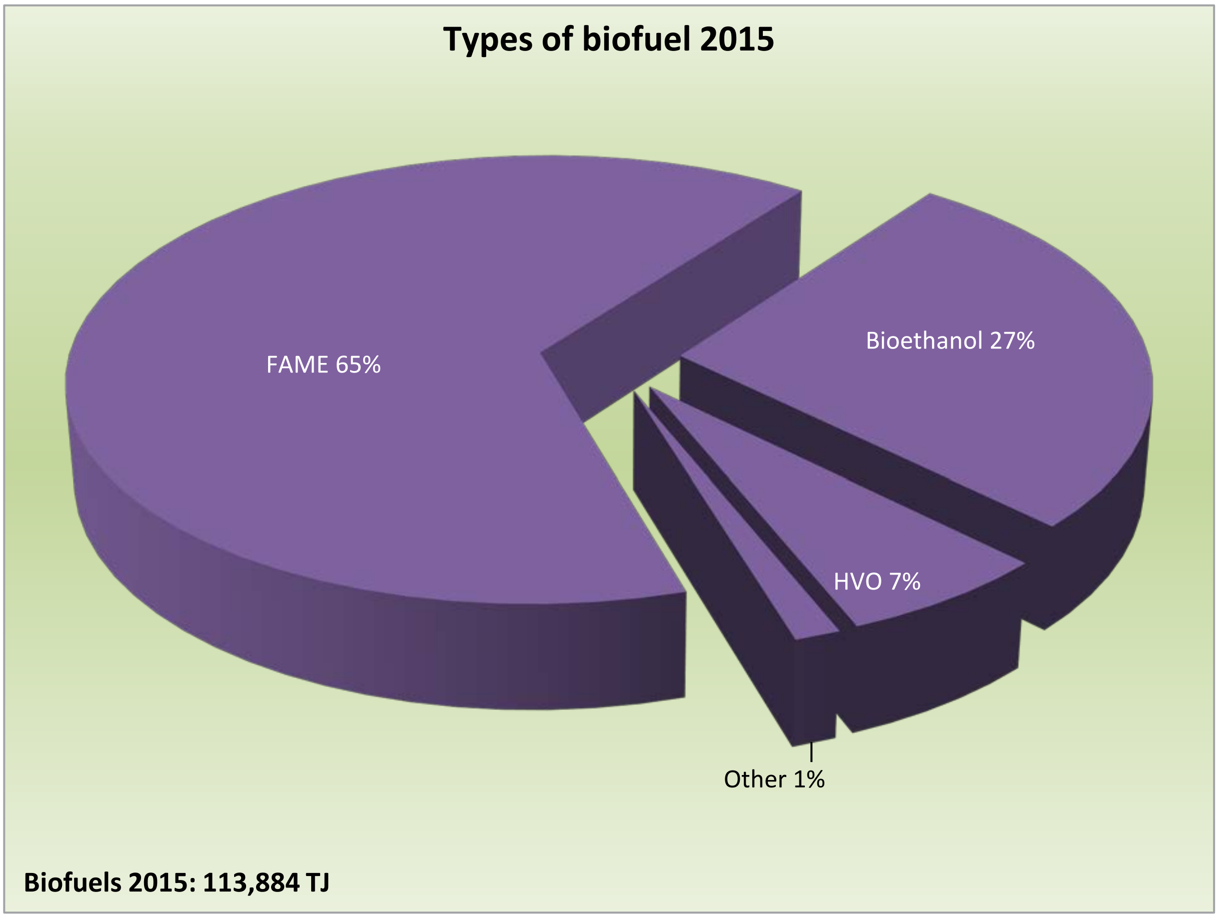


Diagram 18

The following diagram shows the percentages of biofuel types in 2015. Biomethane, biomethanol and vegetable oils are combined under “Others“.

Diagram 19



As in previous years, maize, wheat and sugarbeet were again the main source materials for the production of bioethanol. While the shares of maize and wheat increased slightly, that of sugarbeet decreased sharply by 40.2 %. Compared to last year, the share of sugarcane slightly rose. With the exception of rye, the share of which decreased by 29.1 %, the remaining types of cereal saw an increase, with that of Triticale being especially significant at a massive increase of 148.3 %.

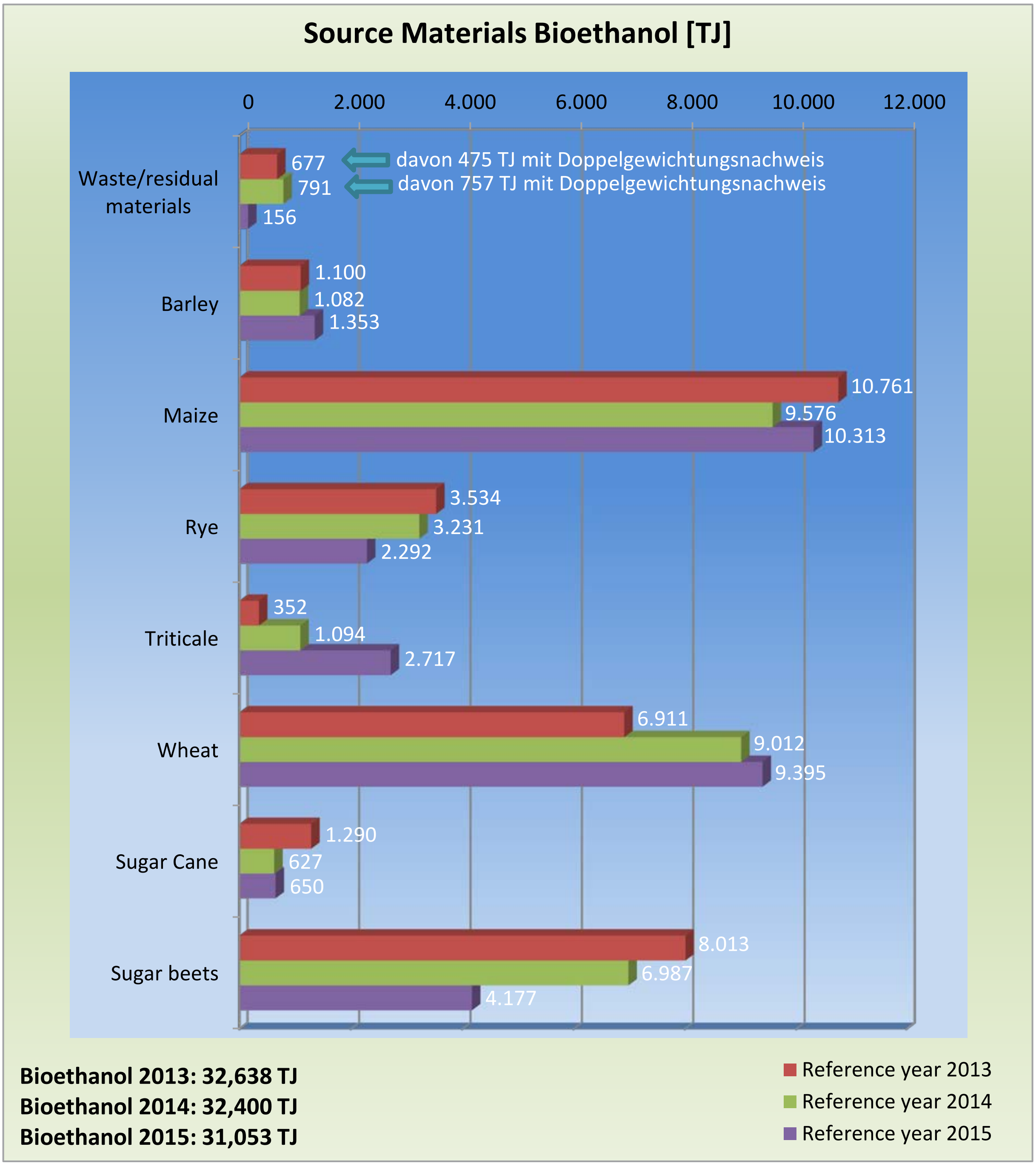


Diagram 20

FAME (biodiesel) was mainly produced frome rapeseed, like before, although its share decreased by 7.8 %. About two thirds of the rapeseed used were grown in Germany. Onlyl 1.4 % originated in countries outside the European Union. The share of wastes and residues rose again. Also, more palm oil was used to produce FAME than the year before.

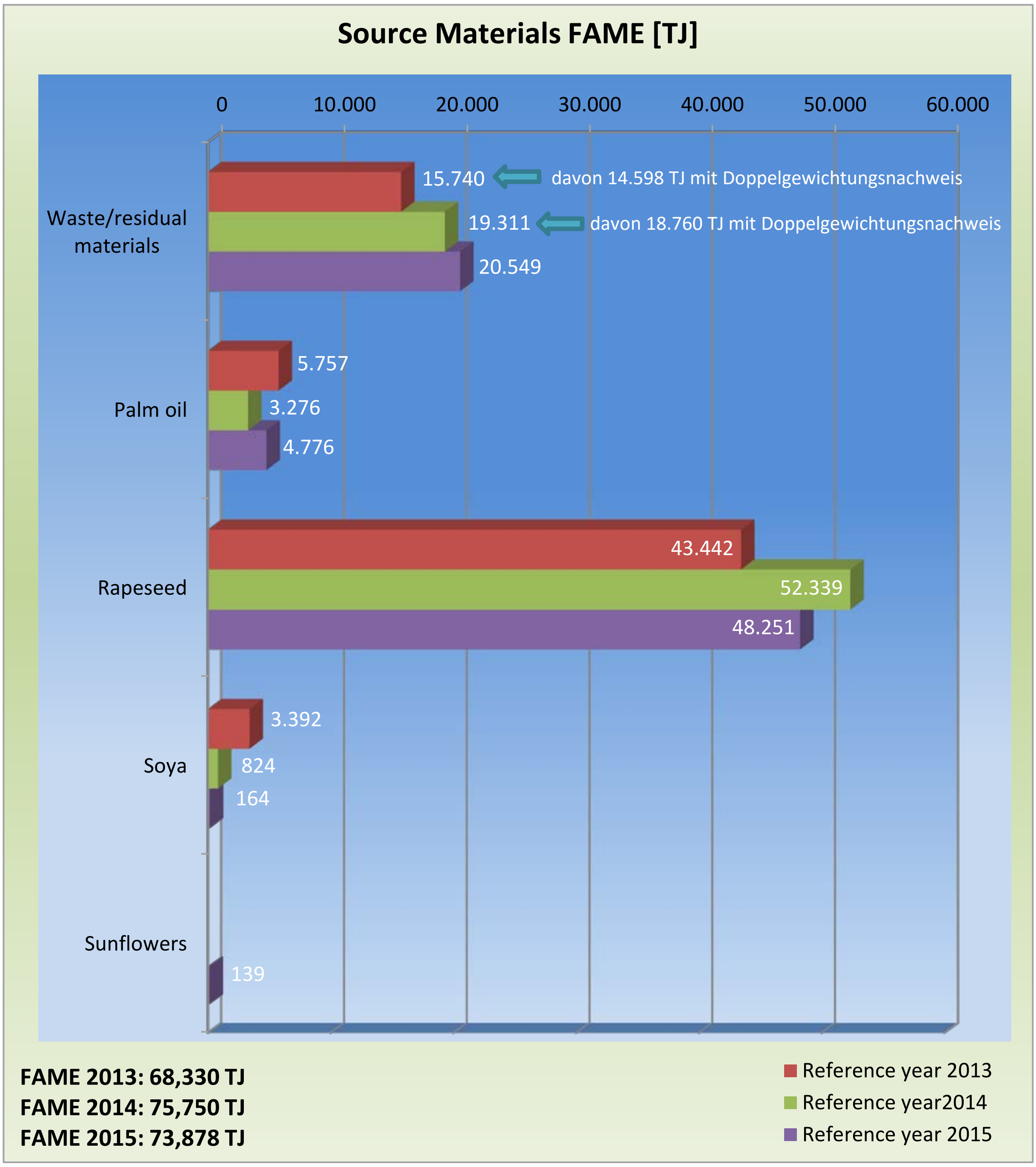


Diagram 21

Hydrogenated vegetable oils (HVO) are produced mainly from palm oil. This year, the quantity produced amounted to about half that of last year. The amount of wastes and residues increased significantly and originated mostly in the United Kindgom (57.7 %).

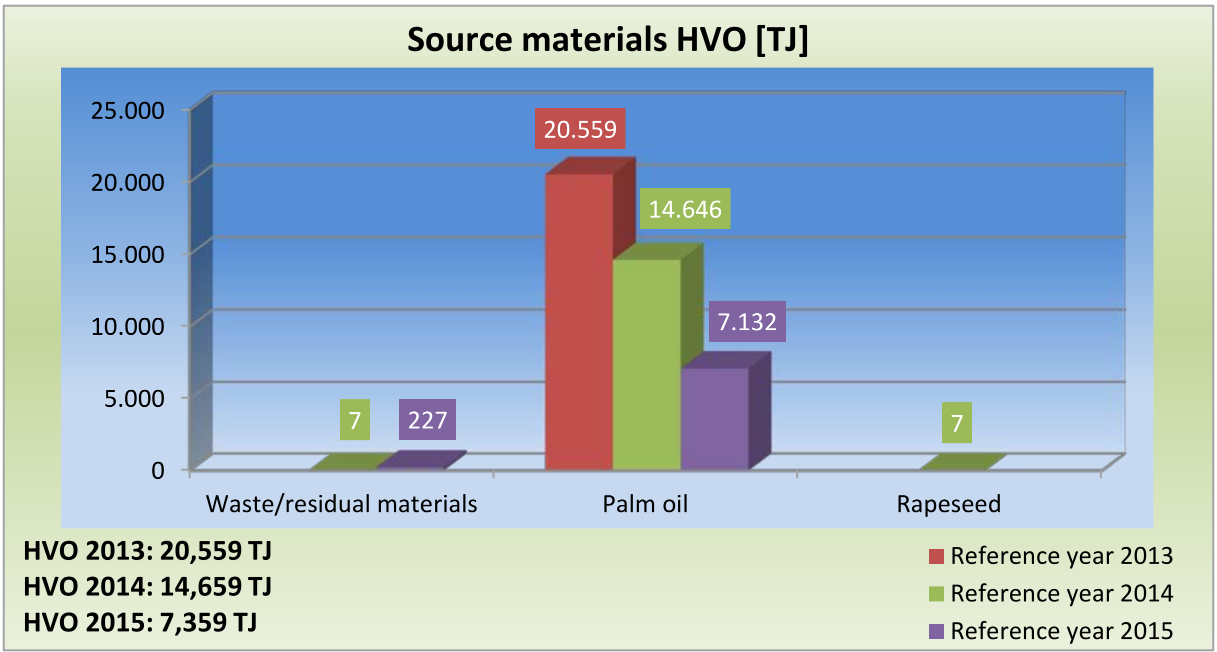


Diagram 22

In the reporting year, biomethane, as biofuel, was exclusively produced from wastes and residues, the major share of which originated in Germany. A very small amount only was generated in Hungary as the country of origin.

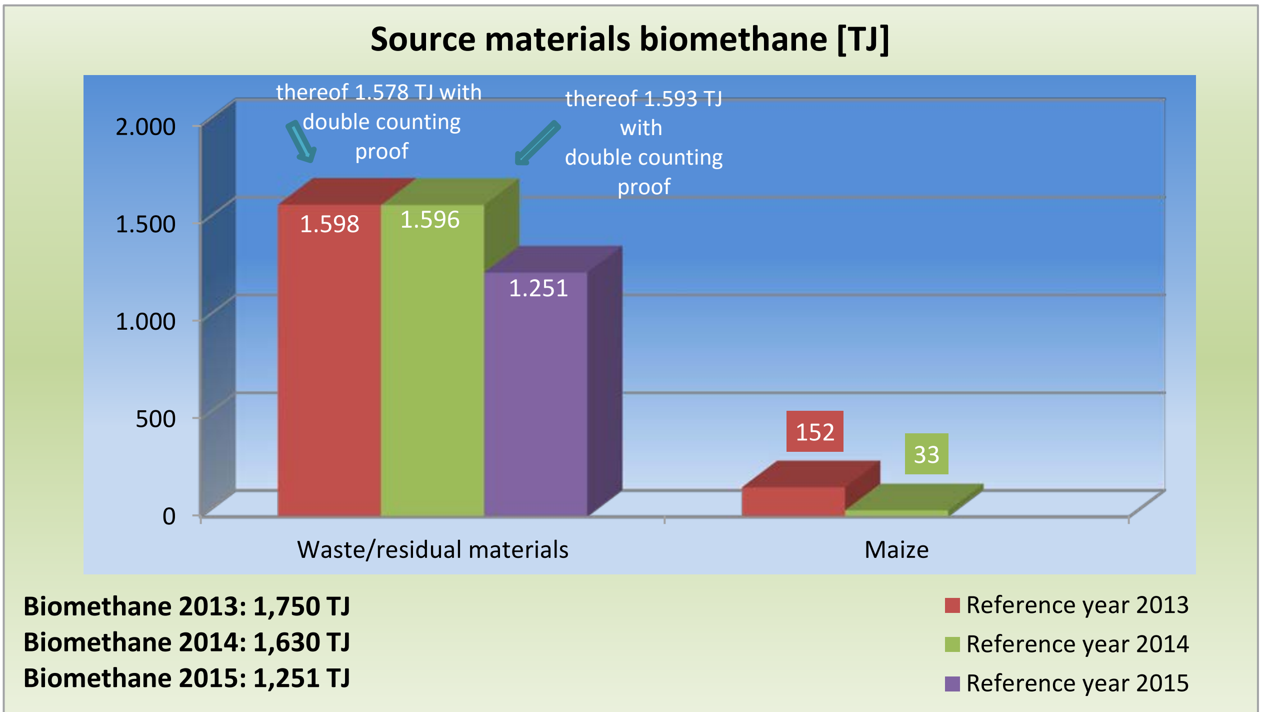


Diagram 23

Vegetable oil as biofuel contributes a share of 0.3 % to the total volume and thus the second lowest share following biomethanol (0.3 ‰). Since 2014 rapeseed was used exclusively as source material. The registered quantity has more than double again during the reporting year.

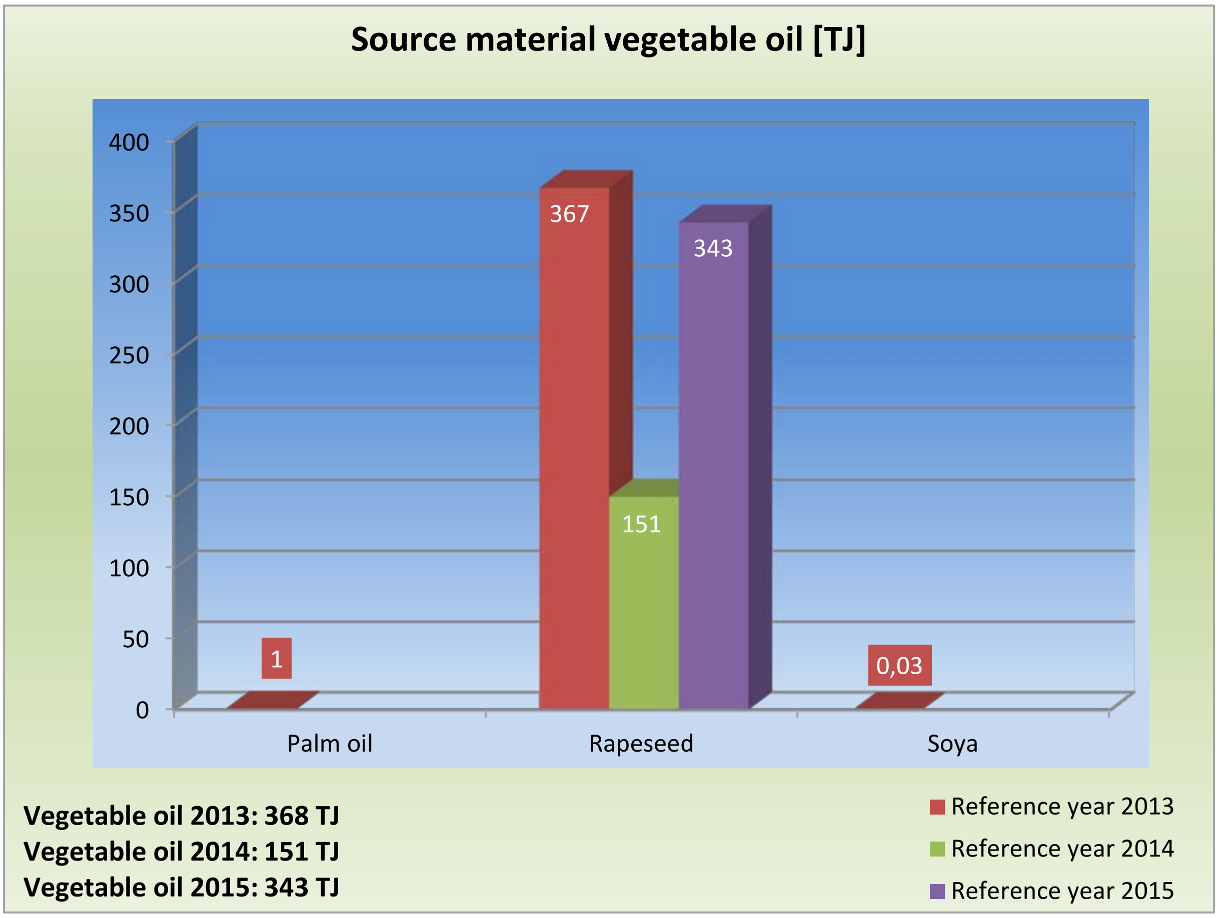


Diagram 24

6.4 Greenhouse gas emissions and savings

The **Reduction of greenhouse gas emissions** is one of the aims to be achieved by the Renewable Energies Directive. Data regarding emissions must be stated on the proofs of sustainability, pursuant to Articles 18 of both the BioEn SusO [BioSt-NachV] and/ or the Biofuel SusO [Biokraft-NachV] for each product. Only so-called old installations were, until 30.03.2013, not required to prove any greenhouse gas reduction. Since the switch to the greenhouse gas quota as of 2015, GHG emissions must necessarily be stated on the proofs of sustainability. As of that date, eventually remaining proofs of sustainability from old installations will no longer be countable towards the greenhouse gas quota. Reference values emission calculations were based on in 2013 and 2014 are listed in Table 7.

Table 7: Reference values for the calculation of biofuel emissions

	total [TJ]	Indications re. emissions [TJ]	No indications re. emissions [TJ]	No indications re. emissions [%]
Allocation Year 2013	123,696	120,128	3,568	2.88%
Allocation Year 2014	124,582	124,553	29	0.02%
Allocation Year 2015	113,884	113,884	0	0.00%

The emission calculation includes the total amount of emissions generated during the entire production process for the final product and concerning the greenhouse gases stated in the Renewable Energies Directive, namely carbon dioxide (CO_2), laughing gas (N_2O) and methane (CH_4), expressed in CO_2 equivalent per unit of energy.

The following diagrams show the biofuel emissions for which an application for counting towards the biofuel quota or for tax relief was lodged.

For the calculation of the emission savings, the total amount of emissions generated during the entire biofuel production process were compared with the reference value of **83,8 g CO_{2eq}/MJ** for fossil fuel.

It should be noted that the emission savings presented here are based on the comparison of **pure biofuels** and **pure fossil fuels**. A biofuel is considered sustainable at a proven savings value of 35% (50% as of 01.01.2018) compared to fossil fuel.
The total savings in case of blended fuels in Germany would be calculated on the basis of the sum total of emissions from biogenic and fossil fuels.

The diagram below illustrates the amount of emissions that would have been generated if, instead of a quantity of biofuels, fossil fuels had been used exclusively. **I.e. the use of biofuels saved ca. 6,700,000 tonnes of CO_2 equivalents.**

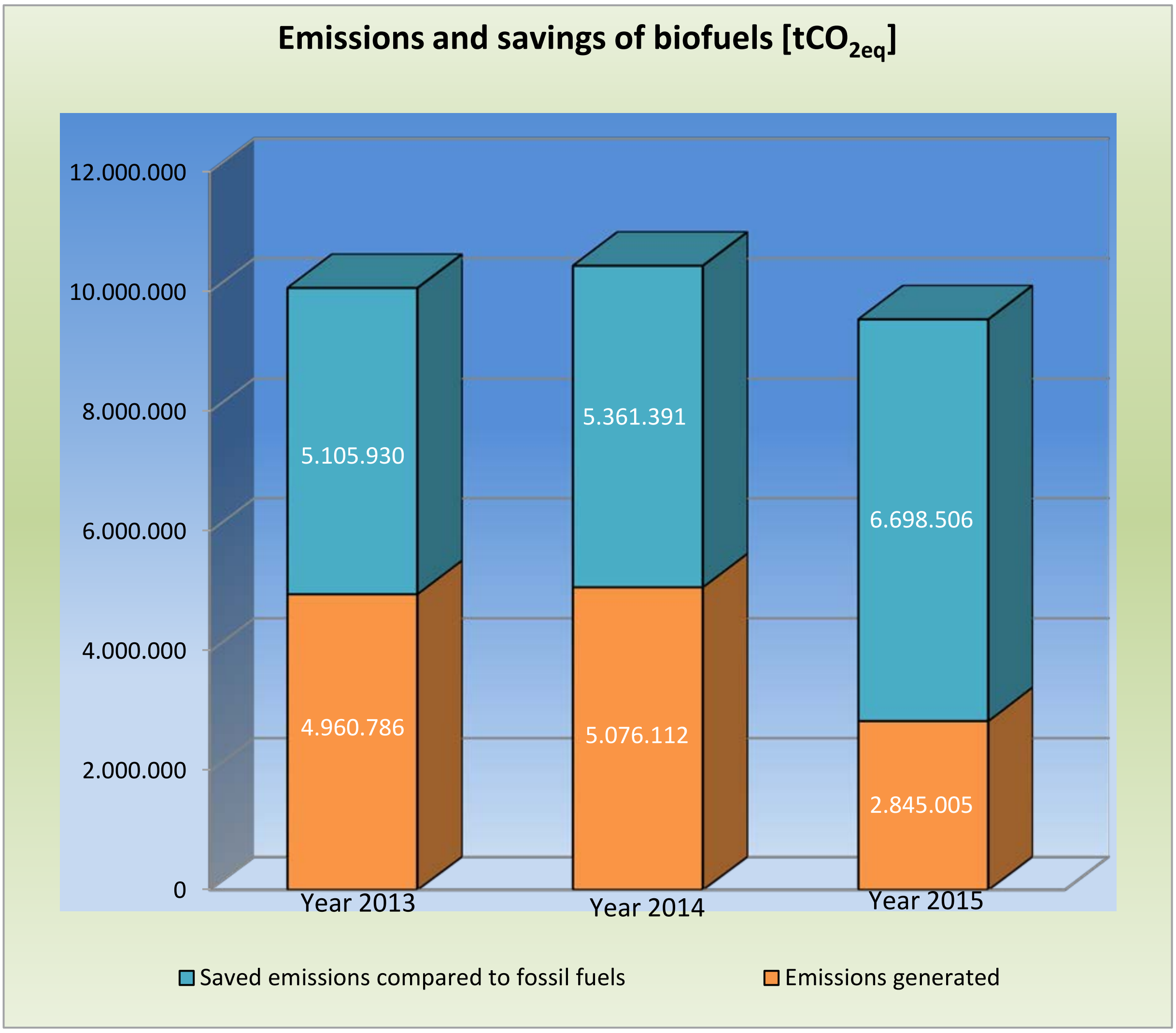


Diagram 25

In 2015, an average of 24.98 tonnes of CO_{2eq} were generated per terajoule of biofuel, i.e. 38.7 % less than the year before.

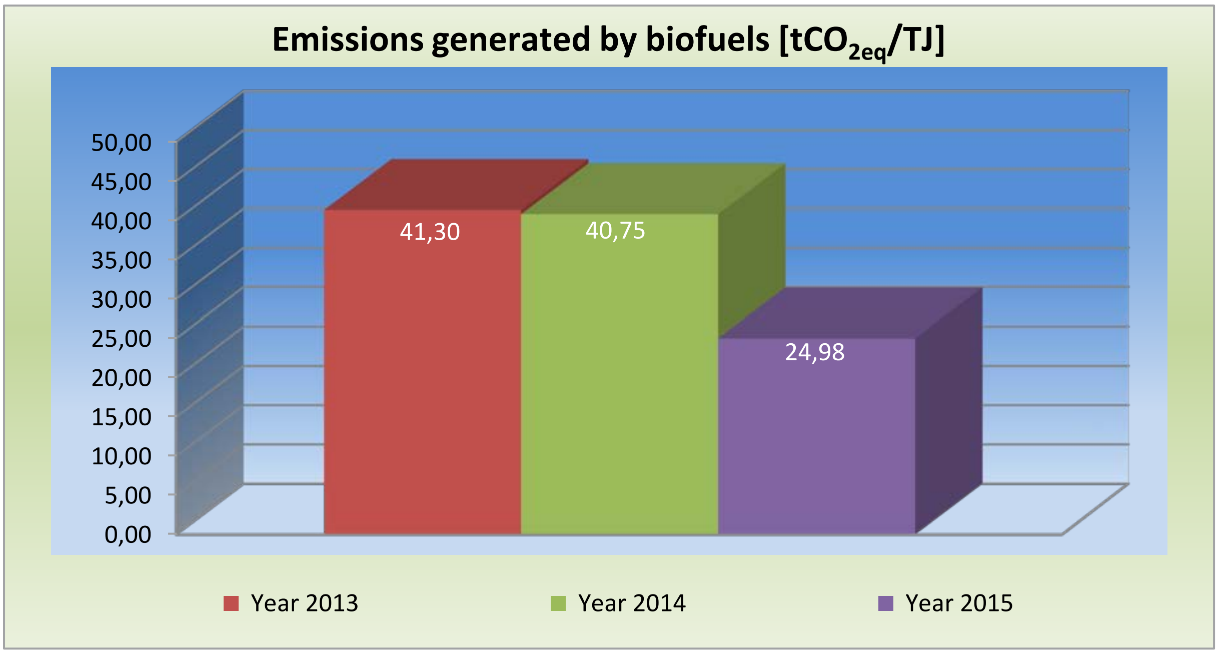


Diagram 26

While total emission savings in previous years could only be improved in small increments, a significant upward trend was notable in 2015. Better savings results might have been achieved last year already. Yet, in view of the greenhouse gas reduction quota having been introduced by 01.01.2015, distributors probably decided to count biofuels with relatively low savings potentials towards the quota year of 2014.

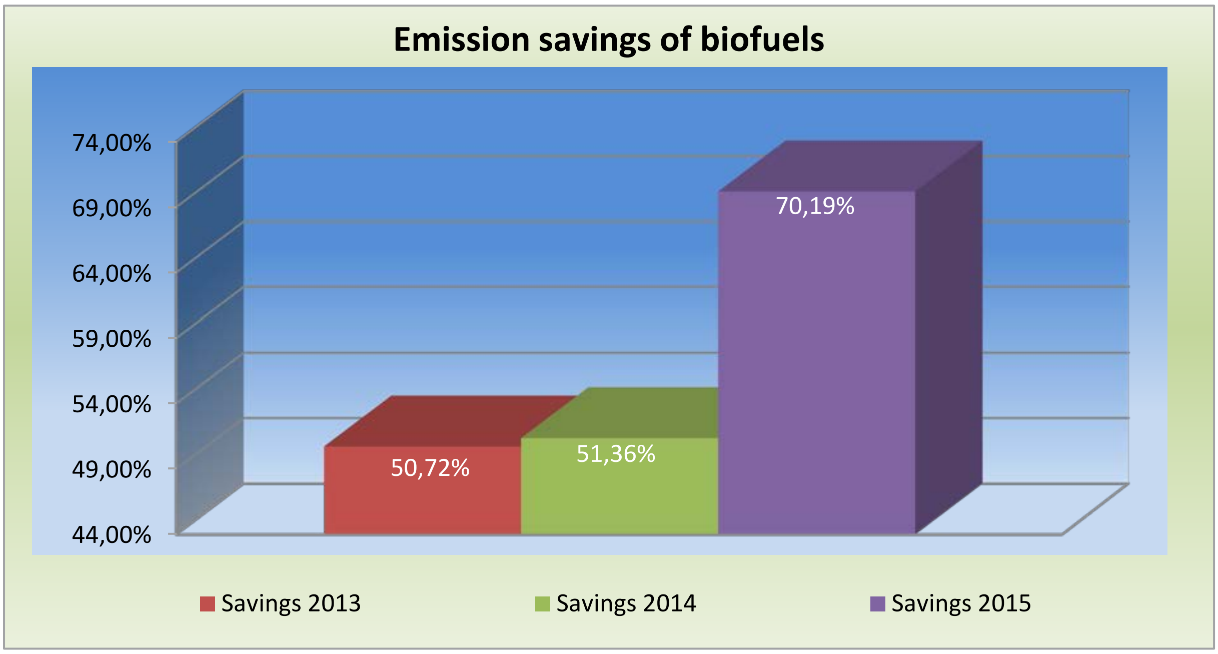


Diagram 27

In the reporting year of 2015, vegetable oils generated the largest average amount of emissions. However, the quantity of vegetable oils applied for in 2015 amounted to just 0.3 % of the total quantity of biofuels. Biomethane generated the lowest average amount of emissions, albeit at a small share of 1.1 % in the total quantity only.

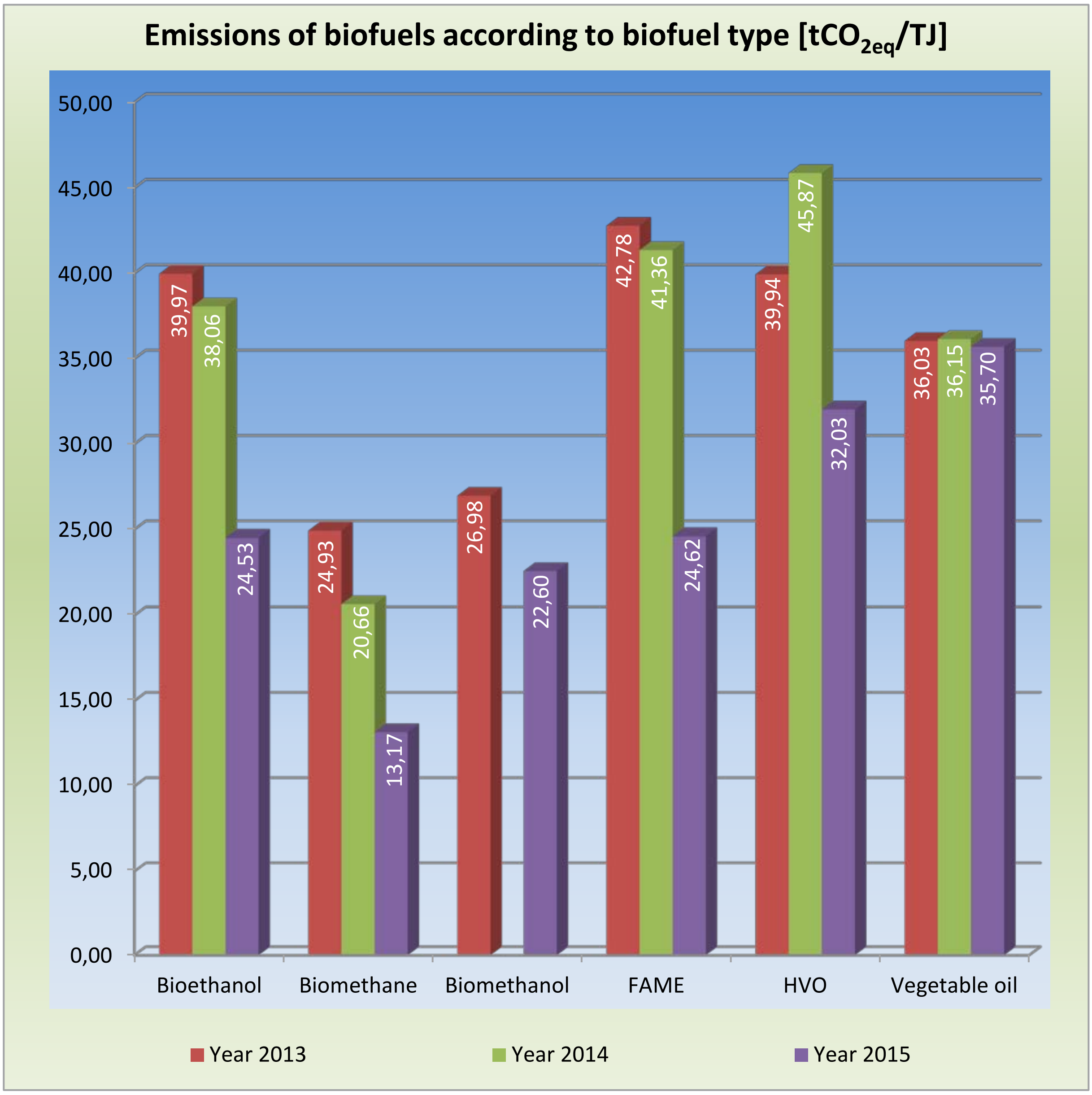


Diagram 28

Individual types of biofuel were able to achieve a significant improvement of their average greenhouse gas performance.
In contrast, greenhouse gas savings of vegetable oils improved only slightly. After savings of hydrogenated vegetable oils (HVO) decreased from 2013 to 2014, they were able to improve significantly in 2015.

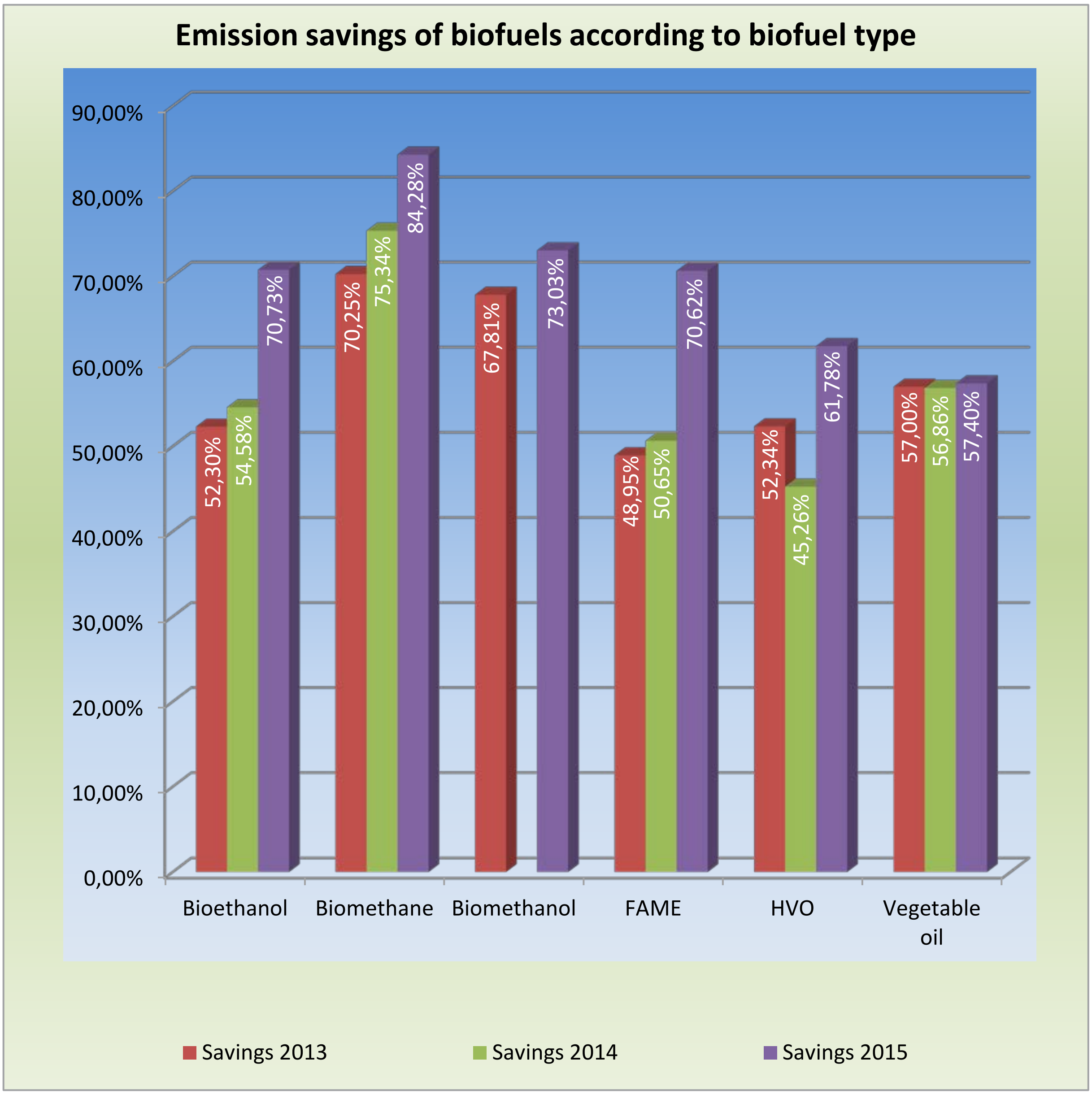


Diagram 29

In the reporting year, one half of the source materials for bioethanol was able to achieve savings of above 70 %, or even above 80 %. These were waste/ residue, wheat, sugarcane and maize. Emission savings of the other half were lower but still amounted to well over 50 %.

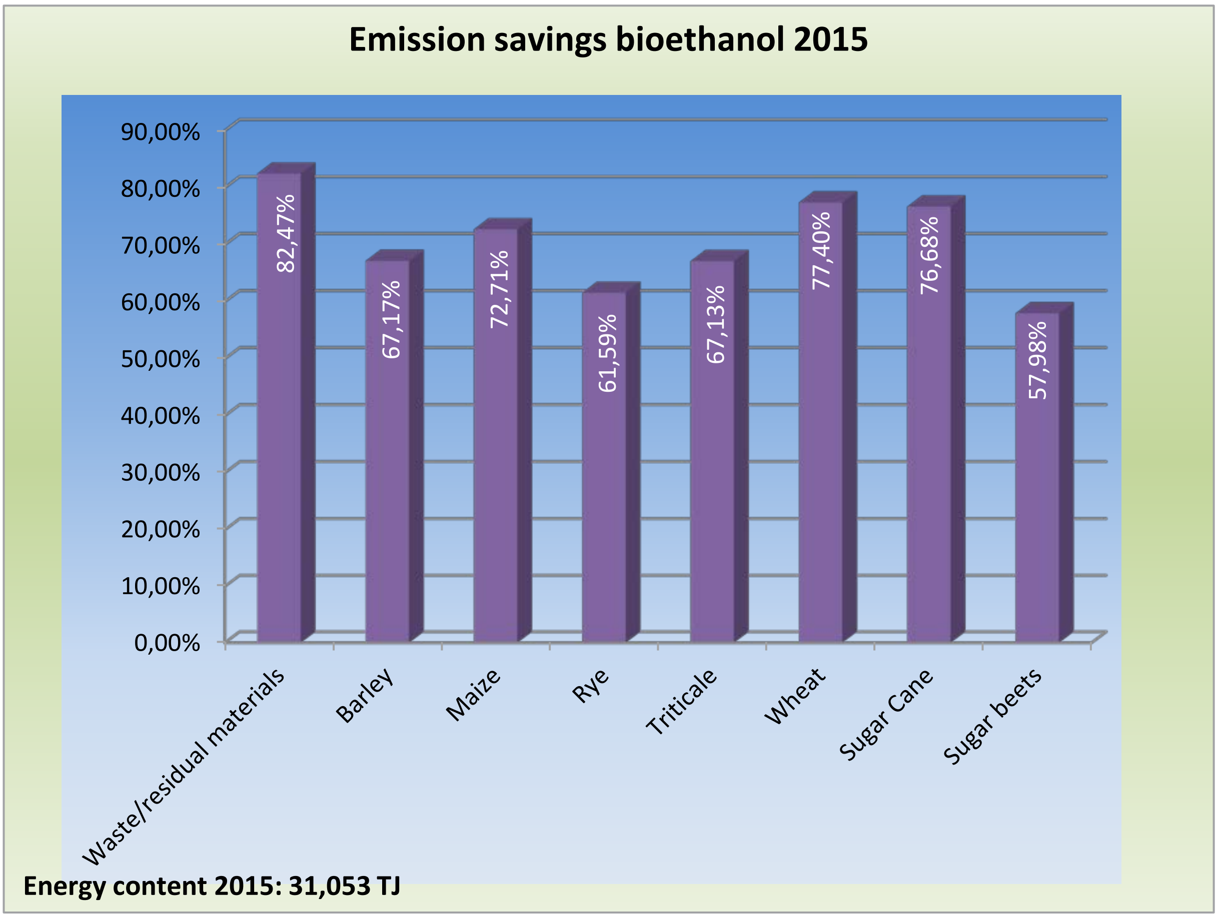


Diagram 30

FAME from waste and residual materials even achieved an average savings value of over 91 %. Palm oil as source material achieved the second best value, followed by sunflowers, rapeseed and soy.

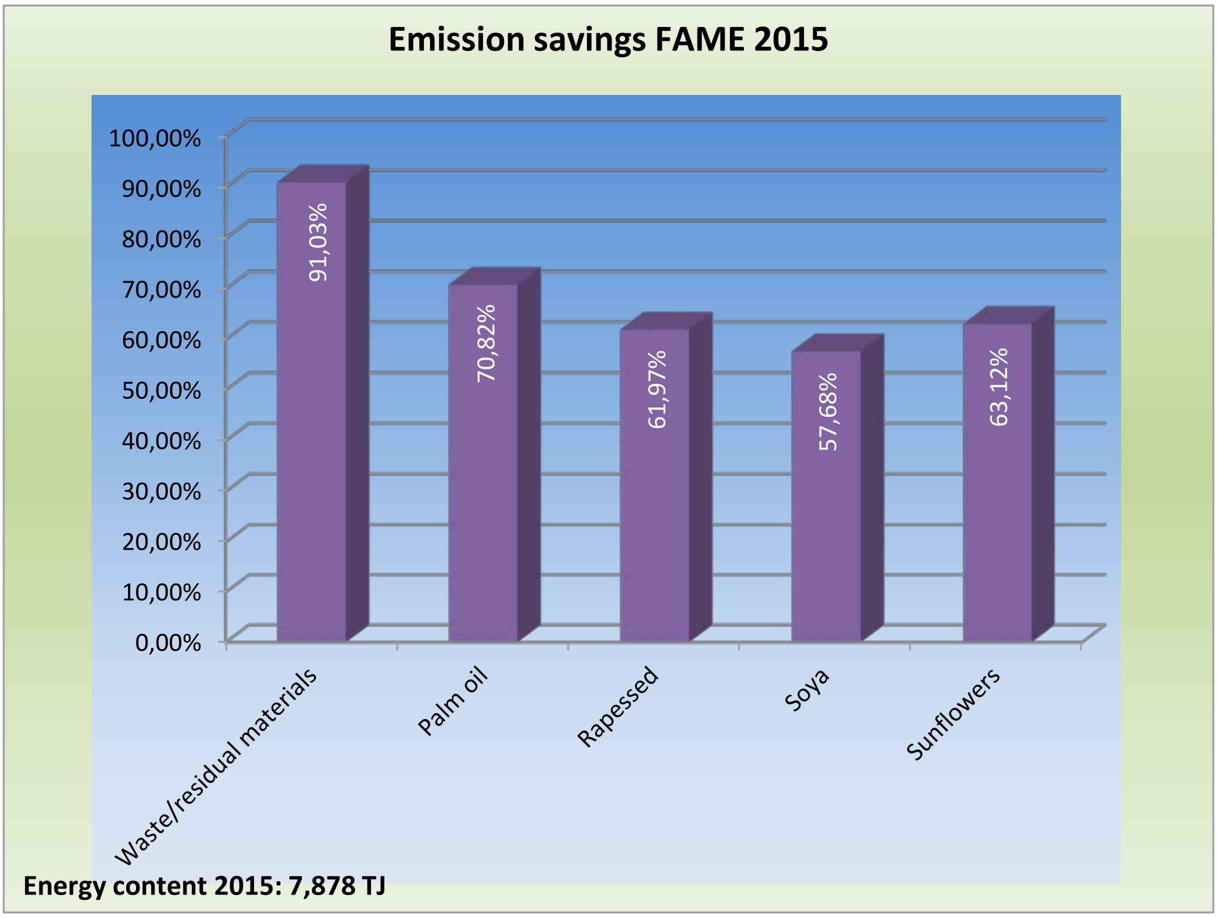


Diagram 31

The following section 6.5 shows the efforts made by the value chain to improve emission savings of FAME, bioethanol, vegetable oil and biomethane. It contains **tables to illustrate emission savings** of individual biofuels, broken down by their (main) source materials with quantities and shares expressed in percent and, where applicable, by their origin(s) and in increments of 5% starting from a minimum 35%.

6.5 Emission savings of individual types of biofuel according to GHG reduction levels

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

GHG savings compared to 83.8 gCO_{2eq}/MJ [%]	Waste/ Residue (156 TJ)	Barley (1,353 TJ)	Maize (10,313 TJ)	Rye (2,292 TJ)	Triticale (2,717 TJ)	Wheat (9,395 TJ)	Sugarcane (650 TJ)	Sugarbeet (4,177 TJ)	Bioethanol total (31,053 TJ)
>35-40	1.02			4.44	1.08	0.20			0.49
>40-45				0.08	0.07	0.01		0.07	0.03
>45-50		0.46	0.65	0.10	0.46	0.51		0.83	0.55
>50-55		23.82	3.40	0.04		1.18		46.92	8.84
>55-60		0.64	1.00	1.82	1.47	1.13	1.43	1.13	1.15
>60-65		0.36	29.49	88.75	26.48	13.70		48.44	29.33
>65-70		50.01	16.48	3.42	61.36	26.10		0.10	21.18
>70-75	36.99	18.57	10.43	1.37		4.18	58.34	2.51	7.39
>75-80	10.77		9.78			18.74	16.06		9.31
>80-85	34.25		7.43			1.38	1.29		3.09
>85-90			8.22			7.61			5.03
>90-95			9.98			5.25	22.89		5.38
>95	16.97	6.14	3.14		9.08	20.01			8.25
Sum total	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

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

GHG savings compared to 83.8 gCO_{2eq}/MJ [%]	Maize				Wheat			
	Germany (158 TJ)	EU (8,108 TJ)	Third Countries (2,046 TJ)	Bioethanol from Maize total (10,313 TJ)	Germany (1,327 TJ)	European Union w/o Germany (7,913)	Third Countries (155 TJ)	Bioethanol from Wheat total (9,395 TJ)
>35-40					0.12	0.21		0.20
>40-45		0.01				0.01		0.01
>45-50	0.25	0.82		0.65	0.27	0.56		0.51
>50-55	2.40	3.50	3.12	3.40	0.79	1.26		1.18
>55-60	2.75	1.17	0.19	1.00	1.90	1.02		1.13
>60-65	12.16	37.24	0.10	29.49	31.08	11.05		13.70
>65-70	66.48	17.71	7.72	16.48	63.74	20.30		26.10
>70-75	8.87	10.49	10.34	10.43	0.33	4.91		4.18
>75-80		7.42	19.87	9.78		22.25		18.74
>80-85		7.12	9.25	7.43		1.64		1.38
>85-90	5.01	3.11	28.68	8.22		9.04		7.61
>90-95	2.07	8.10	18.02	9.98	1.77	3.97	100.00	5.25
>95		3.31	2.71	3.14		23.76		20.01
Sum total	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

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

GHG savings compared to 83.8 gCO_{2eq}/MJ [%]	Waste/ Residue (20,549 TJ)	Palm Oil (4,776 TJ)	Rapeseed (48,251 TJ)	Soy (164 TJ)	Sunflowers (139 TJ)	FAME total (73,878 TJ)
>35-40		0.12	2.58	13.57		1.72
>40-45		0.51	0.10			0.10
>45-50		0.94	0.16			0.17
>50-55		3.49	1.88	8.94		1.47
>55-60		5.87	15.41			10.44
>60-65		12.75	62.72	77.48	81.64	42.11
>65-70		10.18	14.39		18.36	10.09
>70-75	0.01	26.35	0.18			1.82
>75-80	1.41	37.35	1.81			3.99
>80-85	4.58	2.42	0.10			1.49
>85-90	30.73	0.02	0.59			8.93
>90-95	55.78		0.09			15.57
>95	7.49					2.08
Sum total	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

Table 11: Emissionseinsparung FAME nach Ausgangsstoff, Herkunft und THG-Minderungsstufe – Anteile in %

GHG savings compared to 83.8 gCO_{2eq}/MJ [%]	Waste/Residue				Rapeseed			
	Germany (5,647 TJ)	European Union w/o Germany (10,378 TJ)	Third Countries (4,524 TJ)	FAME from Waste and Residue total (20,549 TJ)	Germany (32,222 TJ)	European Union w/o Germany (15,358 TJ)	Third Countries (670 TJ)	FAME from Rapeseed total (48,250 TJ)
>35-40					1.91	3.68	9.75	2.58
>40-45					0.03	0.19	1.35	0.10
>45-50					0.10	0.30		0.16
>50-55					0.97	3.42	10.62	1.88
>55-60					15.79	12.18	71.17	15.41
>60-65	0.02				68.45	53.32	2.49	62.72
>65-70					11.07	21.92	1.53	14.39
>70-75	0.03			0.01	0.13	0.29		0.18
>75-80	2.30	1.43	0.25	1.41	0.97	3.59	1.24	1.81
>80-85	3.90	6.41	1.21	4.58	0.04	0.21		0.10
>85-90	31.32	22.28	49.37	30.73	0.45	0.81	1.85	0.59
>90-95	38.55	68.80	47.42	55.78	0.09	0.09		0.09
>95	23.88	1.08	1.76	7.49				
Sum total	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

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

GHG savings compared to 83.8 gCO_{2eq}/MJ [%]	Rapeseed [343 TJ]
>35-40	0.31
>55-60	96.04
>60-65	0.96
>65-70	0.49
>70-75	2.20
Sum total	**100 %**

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

GHG savings compared to 83.8 gCO_{2eq}/MJ [%]	Waste/ Residue [1,251 TJ]
>70-75	11.82
>75-80	0.68
>80-85	5.83
>85-90	81.68
Sum total	**100 %**

7. Bioliquids

The total amount of bioliquids registered for electricity production and feed-in pursuant to the Renewable Energies Act cotinued to increase during the reference years.

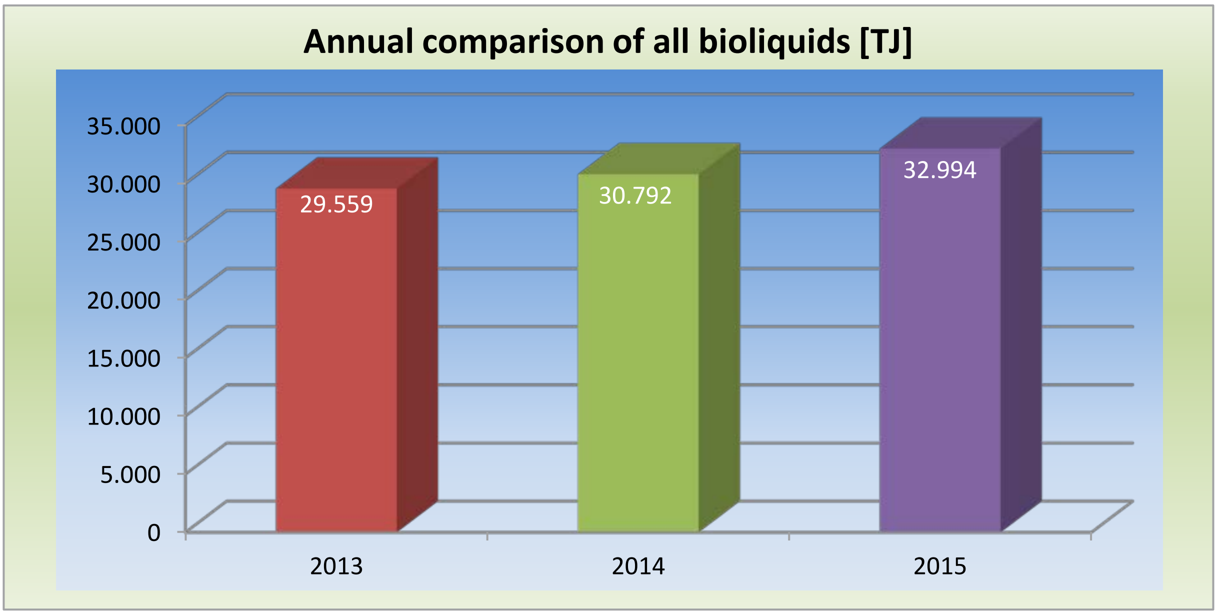


Diagram 32

7.1 Types of Bioliquid

Every year, the most important type of bioliquid by far was bioliquid from the pulp industry (thick liquor). The amount of vegetable oil used rose by almost 27 %.

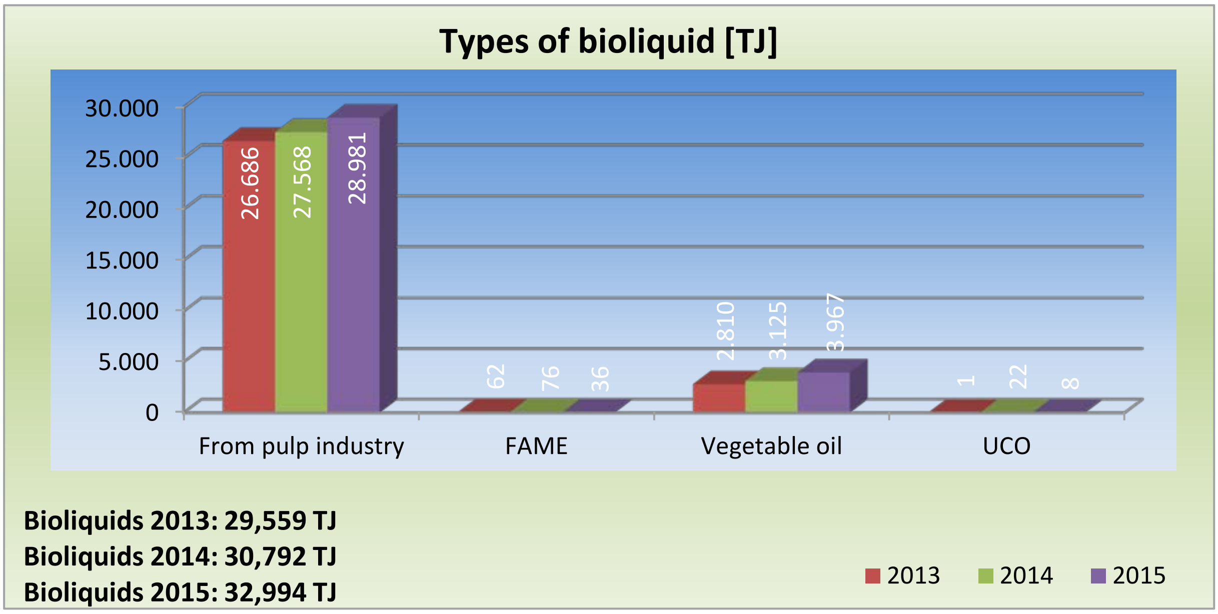


Diagram 33

7.2 Source materials and origins of vegetable oils used as bioliquids

Contrary to the decreasing use of palm oil for fuels, its use in the field of bioliquids increased by 24 %. Soybeans were no longer used.

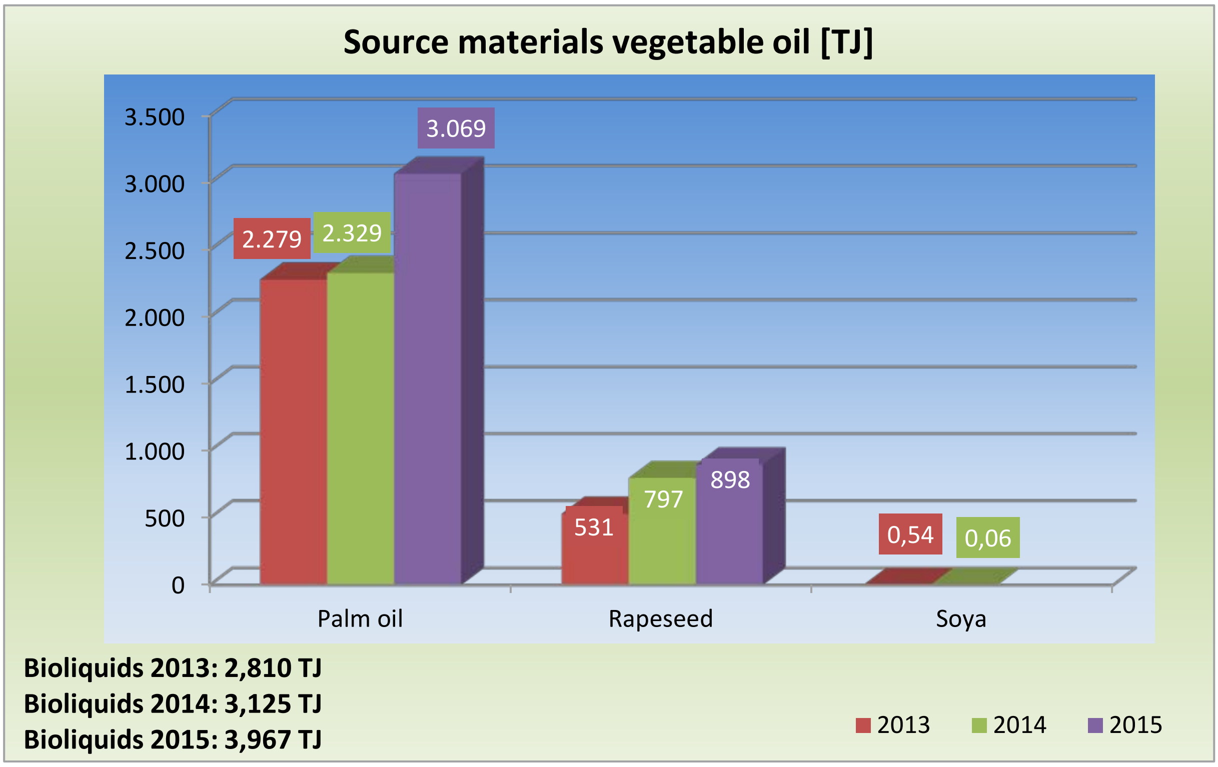


Diagram 34

In the field of vegetable oils, the share of palm oil originating in Malaysia increased by almost 85 %.

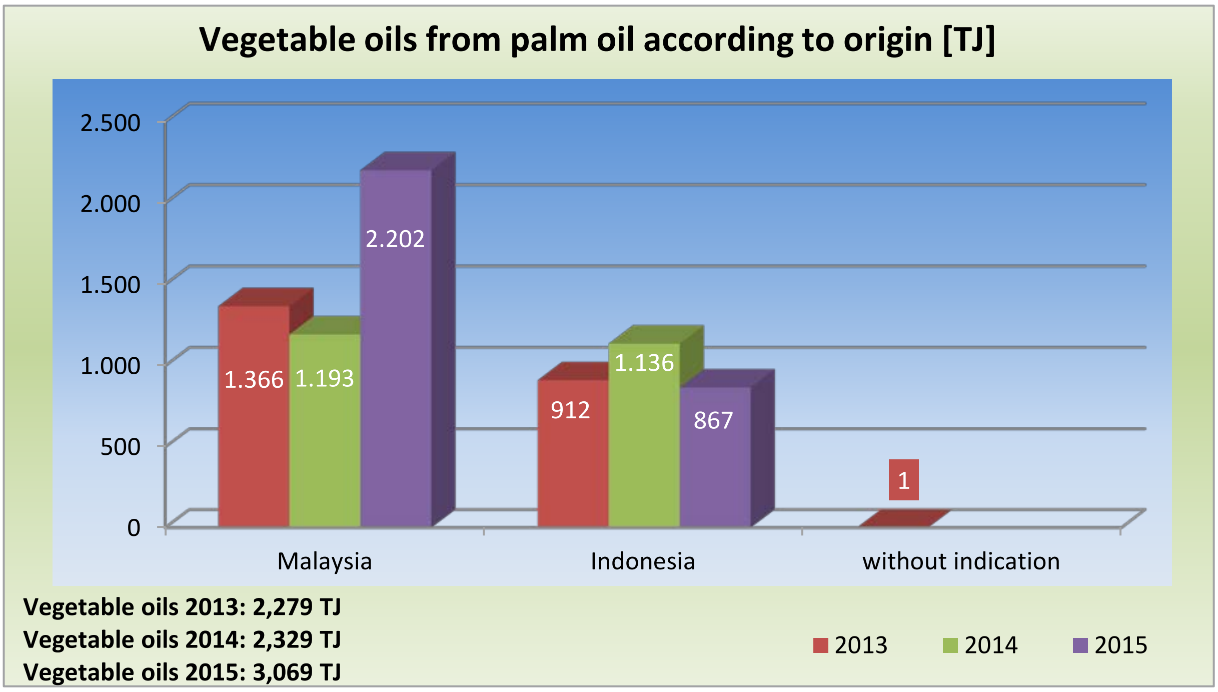


Diagram 35

7.3 Emissions and savings

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

The reference values emission calculations were based on are listed in Table 14.

Table 14: Reference values used to calculate emissions of bioliquids

	total [TJ]	including data re. emissions [TJ]	no data re. emissions [TJ]	no data re. emissions [%]
Jahr 2013	29,559	29,440	119	0.40
Jahr 2014	30,792	30,791	1	0.003
Jahr 2015	32,994	32,994	0	0

Due to the large share of thick liquor from the pulp industry, with very very low emission rates, the total savings in the area of bioliquids are quite high. In sum, however, more emissions were generated as the amount of source materials used did increase.

The use of bioliquids for electricity/energy productin allowed savings of ca. 2,800,000 tonnes of CO_2 equivalents.

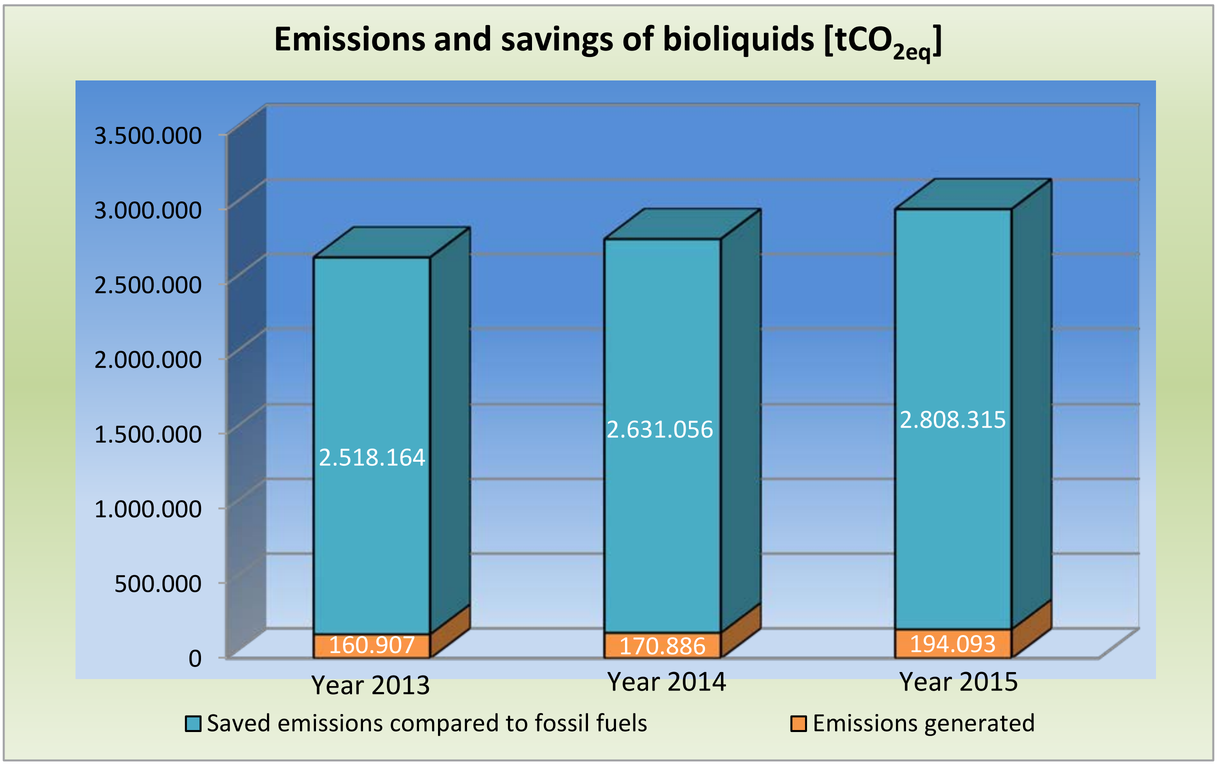


Diagram 36

Compared to last year, the generated amount of CO_{2eq} per TJ increased by 6 %.

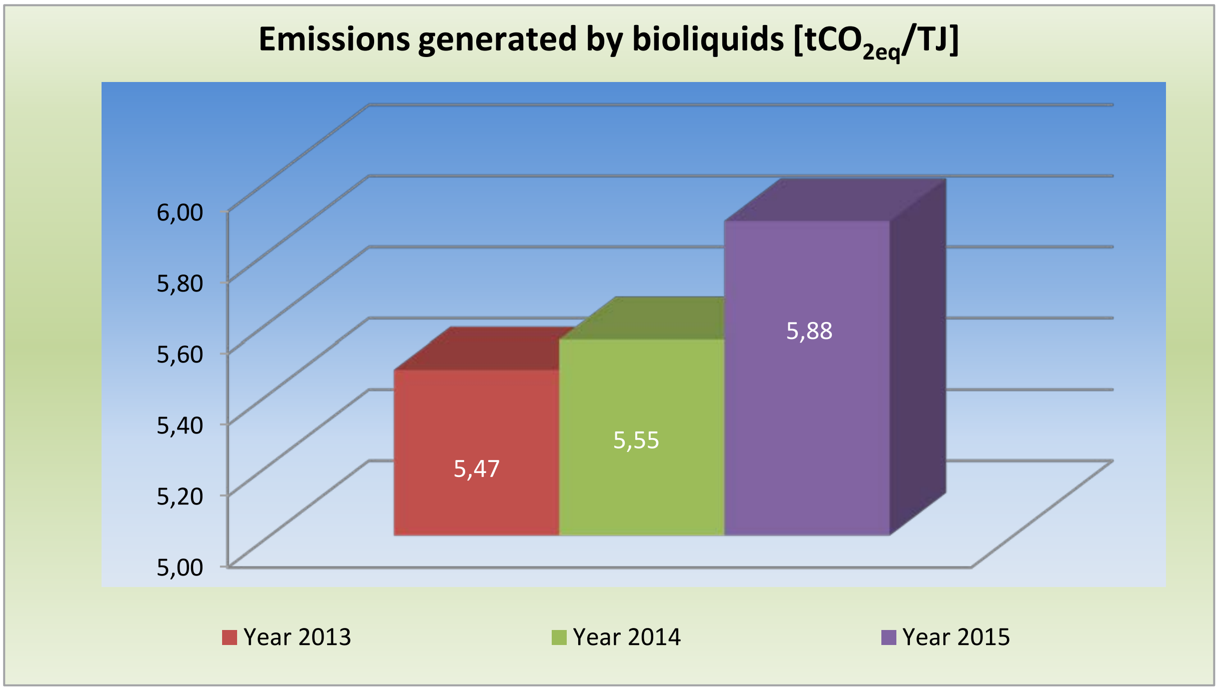


Diagram 37

Consequently, emission savings decreased.

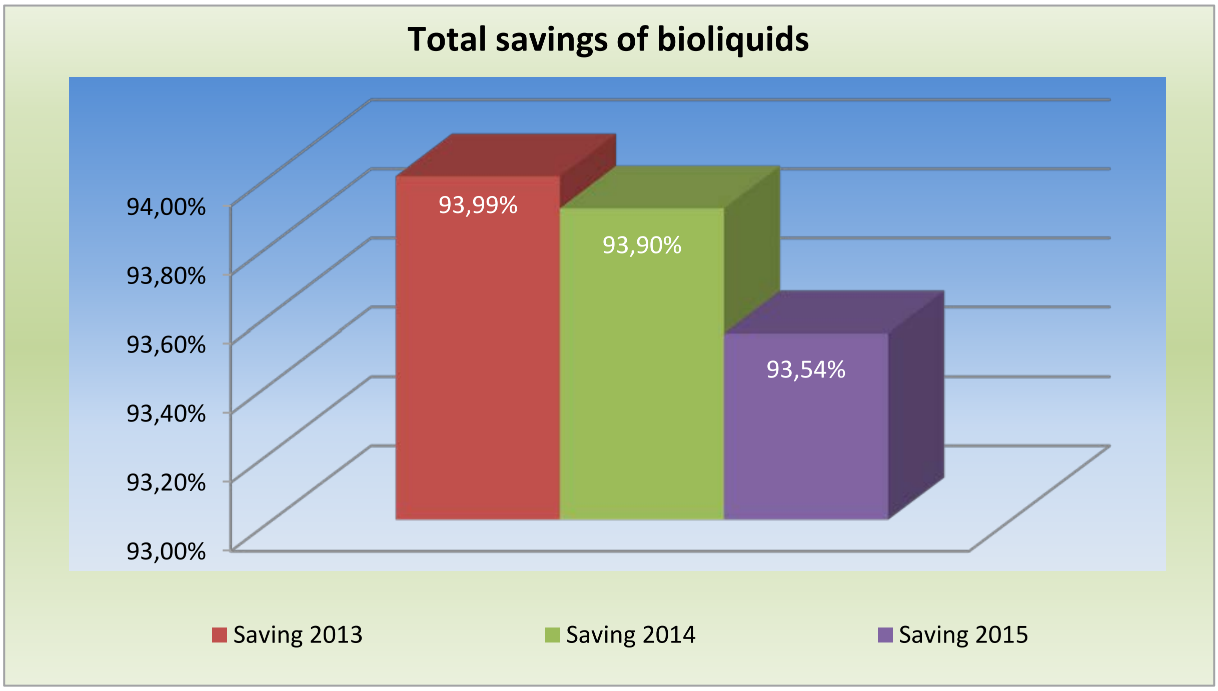


Diagram 38

Again, in the reporting year, bioliquids from the pulp industry as well as vegetable oils and UCO showed an improvement. Only FAME's greenhouse gas performance worsened.

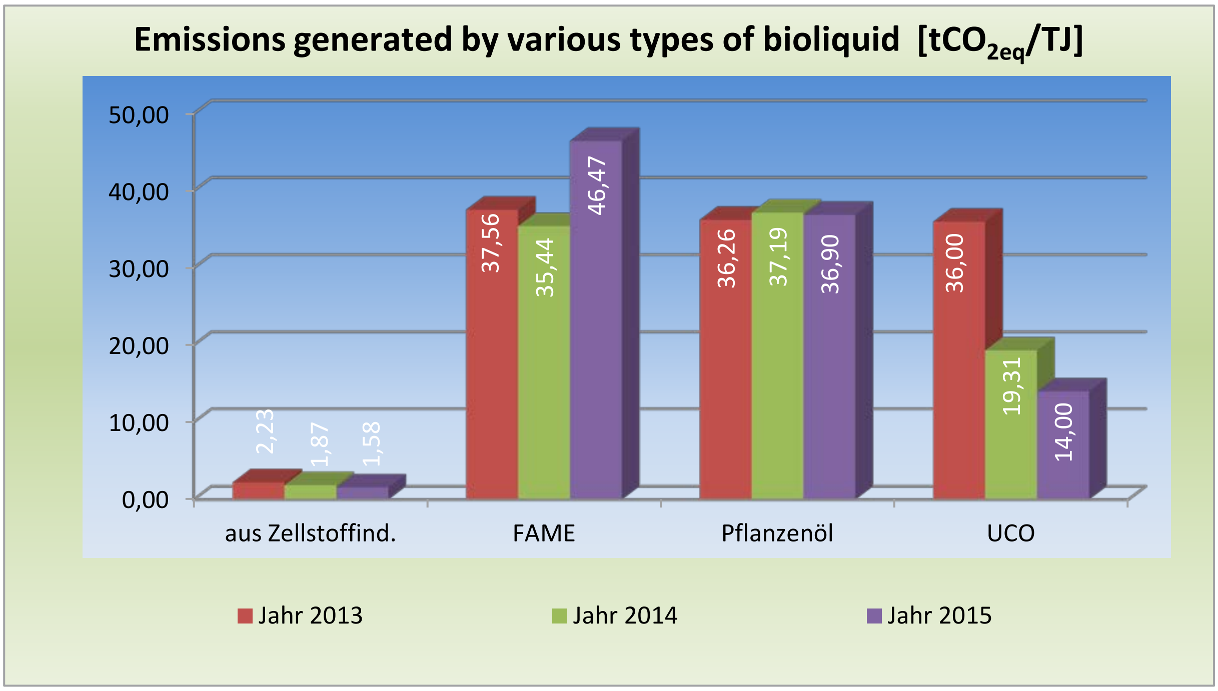


Diagram 39

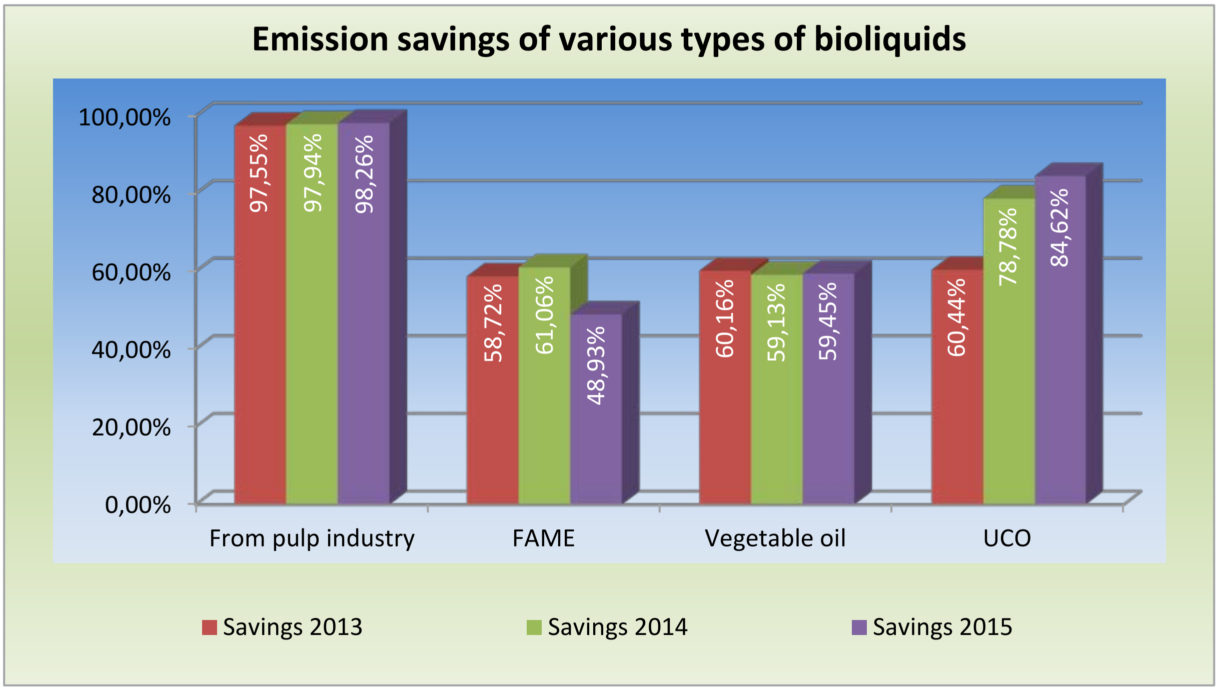


Diagram 40

8. Retirement accounts

Biofuels and bioliquids which are registered in the Nabisy database and will be exported to other countries must be retired to the respective state's account, in Nabisy and by the economic operators. This way, **89,892 terajoules** of biofuel and bioliquids were transferred to accounts of states within and outside of the European Union during the reporting year. Last year's quantity amounted to 52,644 TJ. Almost hlaf of this quantity consisted of FAME. The largest shares thereof went to France, Austria and Belgium.

Diagram 41

The following diagram shows that the emission savings potential of quantities retired to state accounts was inferior to that of quantities which were counted towards the German GHG reduction quota. Average emissions of the former are 10% higher. The value of 83,8 g CO_{2eq}/MJ for biofuels was used as a benchmark to calculate the emission savings of quantities that were retired.

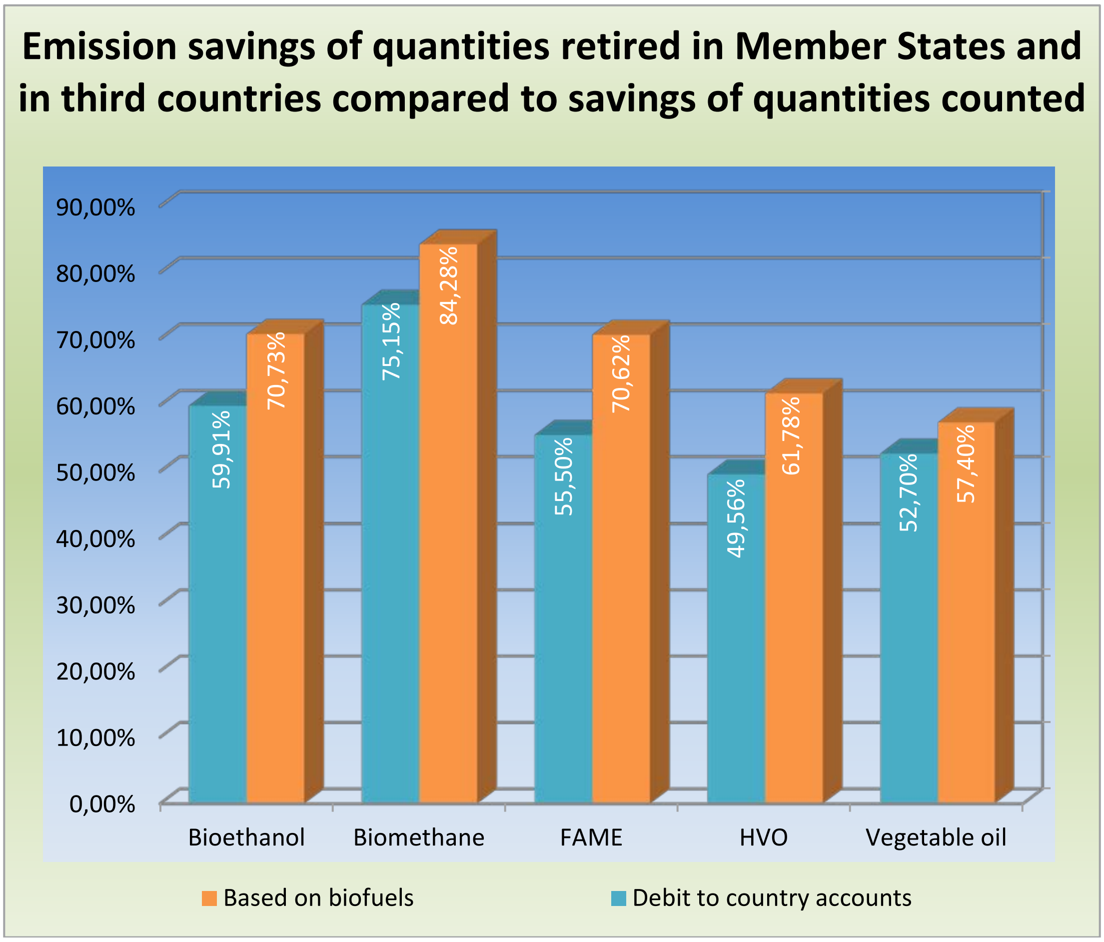


Diagram 42

The largest share of retired biofuels and bioliquids went to Sweden's account (21.4%) and has almost quadrupled, compared to last year. Large shares also went to the Netherlands (16.2 %) and to France (15.5%).

The following diagram only shows country accounts which quantities of over 1,000 TJ were retired to in at least one reference year. Table 15 on page 70 gives a complete overview of retired quantities.

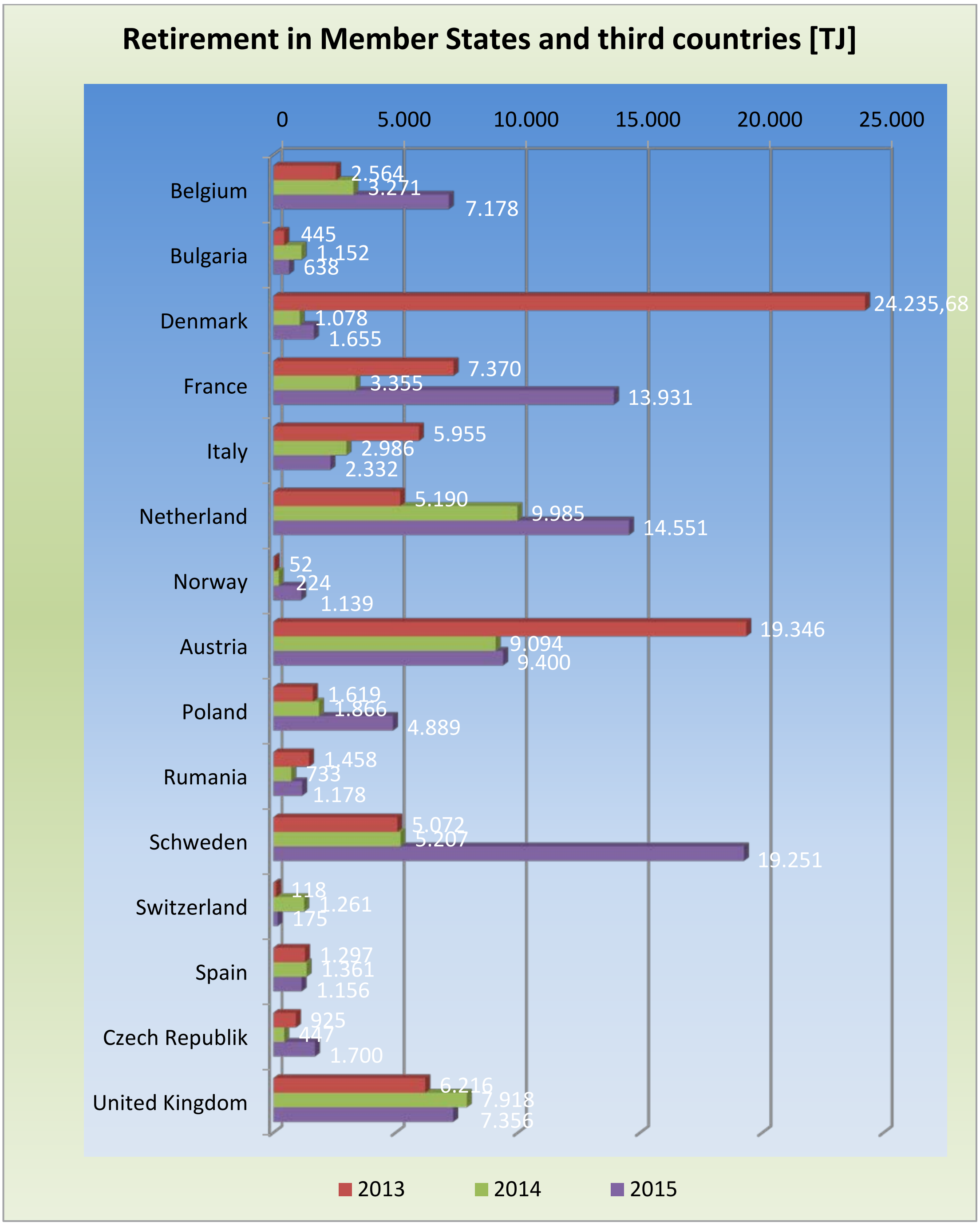

Retirement in Member States and third countries [TJ]
0
5.000
10.000
15.000
20.000
25.000
Belgium
2.564
3.271
7.178
Bulgaria
445
1.152
638
Denmark
24.235,68
1.078
1.655
France
7.370
3.355
13.931
Italy
5.955
2.986
2.332
Netherland
5.190
9.985
14.551
Norway
52
224
1.139
Austria
19.346
9.094
9.400
Poland
1.619
1.866
4.889
Rumania
1.458
733
1.178
Schweden
5.072
5.207
19.251
Switzerland
118
1.261
175
Spain
1.297
1.361
1.156
Czech Republik
925
447
1.700
United Kingdom
6.216
7.918
7.356
2013
2014
2015

Diagram 43

Table 15: Retirement in Member States and in Third Countries [TJ]

Retirement Account	Waste/ Residue	Barley	Maize	Palm Oil	Rape Seed	Rye	Soy	Sun-flowers	Triticale	Wheat	Sugar-cane	Sugar-beet	Total
Belgium	470		26	964	5,446		175			69		28	**7,178**
Bulgaria	37		92		493					11		5	**638**
Denmark			496		477					220	163	300	**1,655**
Finland			152						50	138			**341**
France	1,087	2	817	2,590	6,899		1,286			728		522	**13,931**
Ireland	37		164							76	28	10	**315**
Italy	483		62	6	1,636					71		74	**2,332**
Croatia			3						1	3			**6**
Latvia			1			1						2	**4**
Lithuania			5			2				1		4	**12**
Luxembourg	241	2	10	272	131	2	1			7		9	**675**
Netherlands	3,435	26	4,690	848	661	74	7		21	1,853	1,199	1,737	**14,551**
Norway			242		813					30	28	27	**1,139**
Austria	78	15	350	1,380	6,982	115	92	46	90	113		139	**9,400**
Poland		32	450		2,371	354	83		249	626	12	711	**4,889**
Portugal			50							165		169	**384**
Rumania			729		190					258			**1,178**
Sweden	13,672		925	3,170	214	13				332	307	618	**19,251**
Switzerland	15	21	28		37	3				60	3	9	**175**
Slovakia					23							1	**24**
Slovenia			153		485				17	81			**736**
Spain	1			131	496		264			144		120	**1,156**
Czech Republic			27		1,347	93	175	1	4	6		46	**1,700**
Hungary	570		223		7							29	**830**
United Kingdom	3,472		1,480	145	597	1	202			426	486	547	**7,356**
Cyprus	3		9			5			2	2		19	**38**
Total	**23,599**	**98**	**11,181**	**9,507**	**29,305**	**662**	**2,284**	**47**	**435**	**5,421**	**2,225**	**5,126**	**89,892**

Apart from the option to retire quantities to country accounts, the electronic database Nabisy offers additional options for quantities subject to proof, which are or were not used to produce energy/ electricity in Germany. The following diagram shows the development of these three additional accounts.

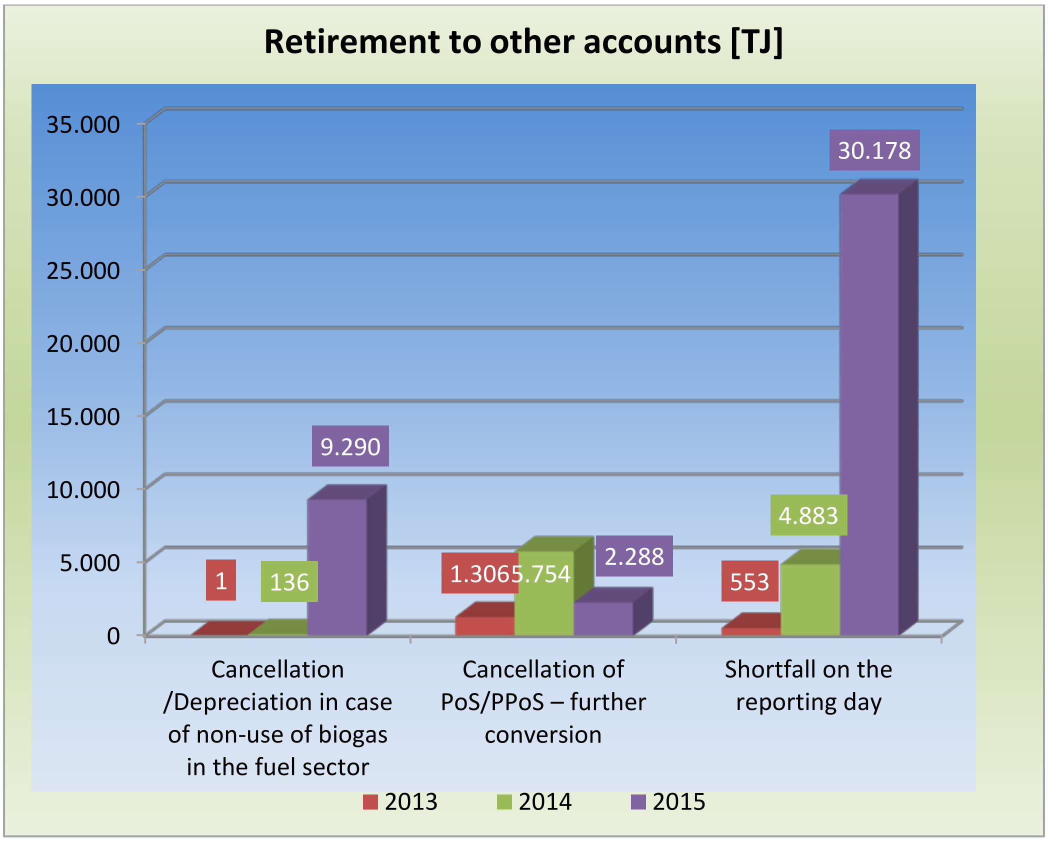


Diagram 44

9. Outlook

Parties obliged to provide proof who have brought fuels into circulation in Germany as of 01.01.2015, must save at least 3.5% of greenhouse gas emissions compared to their individual reference value.

As expected, the greenhouse gas reduction quota recently introduced in Germany encourages all parties involved to keep emissions as low as possible along the entire value chain. Because on the German market there is a high demand for emission prevention to cost as little as possible and for economically viable biofuels with high levels of greenhouse gas emission savings.

This, in turn, leads to a significant increase in individual greenhouse gas calculations and away from default values, especially at production level. It increases the necessary effort for certification bodies which verify the individual greenhouse gas balances. Only verifications adapted to each individual greenhouse gas calculation can justify the fact that the market trusts in the correctness of the certified emission values indicated. This also requires detailed verification requirements within the systems to make sure that certificates are uniform.

Germany's first year with the greenhouse gas reduction quota also shows that product quantities which were retired to accounts of other Member States – and were thus not used in Germany – regularly achieve lower emission savings levels.

As of 2018, biofuels shall only be considered sustainable if they achieve savings of at least 50% compared to the fossil reference value. By then, if not earlier, the demand for these sustainable biofuels will rise across Europe.

Already in 2017, biofuels from new installations will only be considered as sustainable, if they save at least 60% of emissions, compared to the fossil reference value. In order to implement this rule the BLE shall, in the future, ask system participants for the date of an installation's becoming operational.

In the field of biofuels it remains to be seen whether the negative trend regarding the use of palm oil that was certified as sustainable will continue in the years ahead.

). Background data

ble 16: Biofuels in TJ - Source Materials[1]

Fuel Type/ Quota Year / urce Material	Bioethanol Diagram 20 p. 43			Biomethane Diagram 23 p. 45			Bio-methanol[2]		FAME Diagram 21 p. 44			HVO Diagram 22 p. 45			Vegetable Oil Diagram 24 p. 46			UCO[3]
	2013	2014	2015	2013	2014	2015	2013	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013
aste/Residue	677	791	156	1,598	1,596	1,251	28	0.04	15,740	19.311	20,549			227				23
rley	1,100	1,082	1,353															
aize	10,761	9,576	10,313	152	33													
lm Oil									5,757	3,276	4,776	20,559	14,646	7,132	1			
peseed									43,442	52,339	48,251		7		367	151	343	
e	3,534	3,231	2,292															
y									3,392	824	164				0.03			
nflowers											139							
iticale	352	1,094	2,717															
heat	6,911	9,012	9,395															
garcane	1,290	627	650															
garbeet	8,013	6,987	4,177															
tal Diagram 18, p. 41	**32,638**	**32,400**	**31,053**	**1,750**	**1,630**	**1,251**	**28**	**0.04**	**68,330**	**75,750**	**73,878**	**20,559**	**14,659**	**7,359**	**368**	**151**	**343**	**23**

)ifferences in sum totals are due to rounding.
o data in 2014

le 17: Biofuels in kt - Source Materials [1,2]

Fuel Type/ Quota Year / urce Material	Bioethanol			Biomethane			Bio-methanol[3]		FAME			HVO			Vegetable Oil			UCO[4]
	2013	2014	2015	2013	2014	2015	2013	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013
te/Residue	26	30	6	32	32	25	1	0.002	421	517	550			5				1
ey	42	41	51															
ze	407	362	390	3	1													
ı Oil									154	88	128	472	336	164	0.02			
eseed									1,162	1,400	1,291		0.2		10	4	9	
	134	122	87															
									91	22	4				0.001			
lowers											4							
cale	13	41	103															
ıat	261	341	355															
ırcane	49	24	25															
ırbeet	303	264	158															
l	**1,233**	**1,224**	**1,173**	**35**	**33**	**25**	**1**	**0**	**1,828**	**2,027**	**1,977**	**472**	**336**	**169**	**10**	**4**	**9**	**1**

ferences in sum totals are due to rounding.
nversions into tonnage were based on quantities indicated in the proofs.
data in 2014
data in 2014 and 2015

e 18: Biofuels in TJ – Source Materials and their Origins[1]

Region/ Quota Year / Material	Africa Diagram 11 p. 35			Asia Diagram 12 p. 36			Australia Diagram 13 p. 37			Europe Diagram 14 p. 38			Central America Diagram 15 p. 39			North America Diagram 16 p. 39			South America Diagram 17 p. 40		
	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015
/Residue	41	75	191	887	2,403	2,755	53	16	36	15,855	17,357	17,711	0.4	3		1,146	1,678	1,211	84	167	279
										1,100	1,082	1,353									
				45						9,577	8,464	10,313				1,290	1,146				
)il				26,316	17,916	11,907			1											6	
eed	22			347	255	47	2,635	1,865	448	40,719	50,240	48,097							87	136	2
										3,534	3,231	2,292									
							8	48		14	24					3	21		3,367	730	164
wers												139									
e										352	1,094	2,717									
										6,911	9,010	9,240		2							155
ane			74	2									106	229	253				1,182	398	323
eet										8,013	6,987	4,177									
gram 7, p. 31	**62**	**75**	**265**	**27,598**	**20,573**	**14,709**	**2,695**	**1,929**	**485**	**86,074**	**97,490**	**96,038**	**106**	**233**	**253**	**2,439**	**2,845**	**1,211**	**4,721**	**1,438**	**924**

erences in sum totals are due to rounding.

le 19: Biofuels in kt – Source Materials and their Origins[1,2]

Region/ Quote Year	Africa			Asia			Australia			Europe			Central America			North America			South America		
e Material	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015	2013	2014	2015
e/Residue	1	2	5	24	64	73	1	0.4	1	422	463	466	0,01	0.1		30	45	32	2	4	8
y										42	41	51									
e				2						359	319	390				48	43				
Oil				626	423	291			0,03											0.1	
seed	1			9	7	1	71	50	12	1,090	1,344	1,287							2	4	0.1
										134	122	87									
							0.2	1		0.4	1					0.1	1		90	20	4
owers												4									
ale										13	41	103									
t										261	340	349		0.1							6
cane			3	0.1									4	9	10				45	15	12
beet										303	264	158									
	2	**2**	**8**	**660**	**494**	**366**	**72**	**52**	**13**	**2,624**	**2,936**	**2,894**	**4**	**9**	**10**	**79**	**89**	**32**	**139**	**43**	**30**

ferences in sum totals are due to rounding.
nversions into tonnage were based on quantities indicated in the proofs.

20: Sum total of Biofuels per Source Material[1]

e Material	Year 2013 [TJ]	Year 2014 [TJ]	Year 2015 [TJ]	Year 2013 [kt]	Year 2014 [kt]	Year 2015 [kt]
/Residue	17,859	21,698	22,183	475	579	586
/	1,100	1,082	1,353	42	41	51
:	10,882	9,610	10,313	409	363	390
Oil	24,805	17,922	11,908	591	424	291
seed	43,559	52,496	48,594	1,166	1,405	1,300
	3,534	3,231	2,292	134	122	87
	3,321	824	164	89	22	4
owers			139			4
le	353	1,094	2,717	13	41	103
t	6,945	9,012	9,395	262	341	355
cane	1,290	627	650	49	24	25
beet	7,977	6,987	4,177	301	264	158
	121,624	**124,582**	**113,884**	**3,530**	**3,624**	**3,353**

rences in sum totals are due to rounding.

le 21: Biofuel Emissions and Emission Savings[1,2]

fuel Type	Emissions 2013 [t CO_{2eq}/TJ]	Emissions 2014 [t CO_{2eq}/TJ]	Emissions 2015 [t CO_{2eq}/TJ]	Savings 2013 [%]	Savings 2014 [%]	Savings 2015 [%]
	Diagram 28, p. 50 and Diagram 26, p. 49			Diagram 29, p. 51 and Diagram 27, p. 49		
ethanol	39.97	38.06	24.53	52.30	54.58	70.73
methane	24.93	20.66	13.17	70.25	75.34	84.28
methanol	26.98		22.60	67.81		73.03
ME	42.78	41.36	24.62	48.95	50.65	70.62
Ɔ	39.94	45.87	32.03	52.34	45.26	61.78
etable Oil	36.03	36.15	35.70	57.00	56.86	57.40
Ɔ						
ighted average of all fuels	**41.30**	**40.75**	**24.98**	**50.72**	**51.36**	**70.19**

le 22: Emissions and Emission Savings of Bioliquids[1,3]

liquid Type	Emissions 2013 [t CO_{2eq}/TJ]	Emissions 2014 [t CO_{2eq}/TJ]	Emissions 2015 [t CO_{2eq}/TJ]	Savings 2013 [%]	Savings 2014 [%]	Savings 2015 [%]
	Diagram 39, p. 63 and Diagram 37, p. 62			Diagram 40, p. 63 and Diagram 38, p. 62		
n the pulp industry	2.23	1.87	1.58	97.55	97.94	98.26
ME	37.56	35.44	46.47	58.72	61.06	48.93
etable Oil	36.26	37.19	36.90	60.16	59.13	59.45
Ɔ	36.00	19.31	14.00	60.44	78.78	84.62
ighted average of all liquids	**5.47**	**5.55**	**5.88**	**93.99**	**93.90**	**93.54**

ferences in sum totals are due to rounding.
ings compared to 83.8 g CO_{2eq}/MJ as the reference value for fossil fuel
ings compared to 91 g CO_{2eq}/MJ as the reference value for fossil bioliquids for power generation

Table 23: Types of Bioliquid [TJ][1]

Diagram 33, p. 59

Bioliquid type	2013	2014	2015
from the pulp industry	26,686	27,568	28,981
FAME	62	76	36
Vegetable Oil	2,810	3,125	3,967
UCO	1	22	8
Total Diagram 32, p. 59	**29,559**	**30,792**	**32,994**

Table 24: Bioliquid Vegetable Oil TJ – Source Materials[1]

Diagram 34, p. 60

Source Material	2013	2014	2015
Palm Oil	2,279	2,329	3,069
Rapeseed	531	797	898
Soy	1	0.06	
Total	**2,810**	**3,125**	**3,967**

Table 25: Vegetable Oils from Palm Oil according to Origin (Bioliquid) [TJ][1]

Diagram 35, p. 60

Origin	2013	2014	2015
Malaysia	1.366	1.193	2.202
Indonesia	912	1.136	867
no indication	1		
Total	**2.279**	**2.329**	**3.069**

[1] Differences in 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 Kilogram [MJ/t]
Bioliquid 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

Abbreviation	**Meaning**
36. BImSchV	36th Ordinance for the implementation of the Federal Immission Control Act (Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes)
BHKW	Combined heat and power plant
Biokraft-NachV	Biofuel Sustainability Ordinance (Biokraftstoff-Nachhaltigkeitsverordnung, Biokraft-NachV)
BioSt-NachV	Biomass Electricity Sustainability Ordinance (Biomassestrom-Nachhaltigkeitsverordnung, BioSt-NachV)
DE-System	Certification system recognised by the BLE pursuant to Art. 33 Nos. 1 and 2 BioSt-NachV and/or Biokraft-NachV
EEG	Erneuerbare-Energien-Gesetz [Renewable Energies Act]
EU-System	Voluntary System pursuant to Art. 32 No. 3 BioSt-NachV and/or Biokraft-NachV
FAME	Fatty Acid Methyl Ester (Biodiesel)
HVO	Hydrogenated Vegetable Oils (Hydrierte Pflanzenöle)
Terms	Meaning
Bioliquids from the pulp industry	Energy- and lignin-rich by-products of cellulose production in the paper industry
Bioethanol (Ethyl alcohol)	is derived from renewable raw materials by distillation after alcoholic fermentation or by comparable biochemical methods
Biomethane	Biogas results from biomass fermentation as a methane-rich gas.
Biomethanol	Like BTL fuel, methanol can be produced via synthesis gas and from a wide range of biomass types. It can also be produced by converting crude glycerin.
FAME	Fatty acid methyl ester, called biodiesel, is generated during the chemical conversion of fats and oils by means of methanol.
HVO	Hydrogenated vegetable oil is converted to hydrocarbon chains by means of a chemical reaction with hydrogen in a hydrogenation plant.
Vegetable Oil	Vegetable oil fuel can be produced from oilseed rape or from other oil plants while, in contrast, to biodiesel no chemical conversion takes place.
UCO	Used cooking oils or fats can be used as pure fuels or as components of FAME.