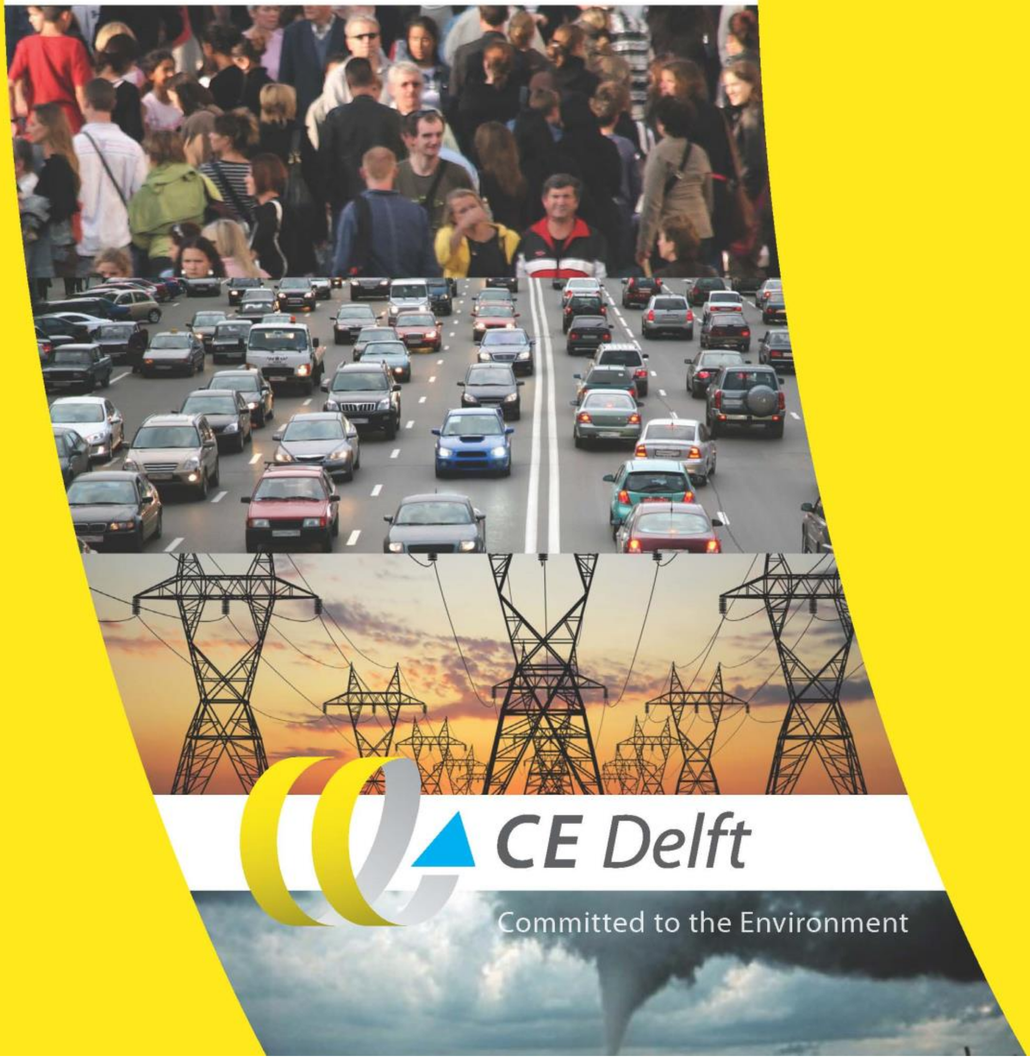
Biofuels on the Dutch market

Update: data for 2013



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Summary

Introduction

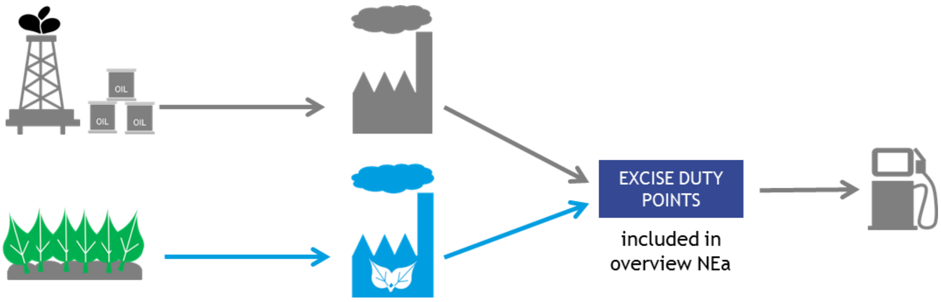
Under the Dutch biofuels obligation, fuel suppliers are required to include a minimum share of biofuels in their overall sales of road transport fuels: 5.0% in 2013. They also have to submit an annual report detailing the biofuels they sell on the Dutch market. The Dutch Emissions Authority (NEa) then publishes a selection of the results. As there is a large variation in greenhouse gas (GHG) emissions pf different biofuels, the actual GHG emission savings achieved by the biofuels obligation then depend significantly on the biofuels mix that the fuel suppliers choose to supply to meet the requirements of the obligation.

In earlier years, CE Delft analysed the NEa data for 2011 and 2012, and presented a ranking of fuel suppliers based on the average greenhouse gas (GHG) emissions of the biofuels that they had supplied to the Dutch market in these years. To continue to monitor the developments, ActionAid, Greenpeace, IUCN NL, Milieudefensie, Natuur & Milieu and Wereld Natuur Fonds commissioned CE Delft to provide an update of the ranking based on the NEa report of 2013 data.

In addition, these data were to be put in the broader context of the European biofuels market, and the overall biofuels production in the Netherlands, based on publically available information.

A (simplified) schematic of the fuel supply chain, provided in Figure 1, illustrates the different points of analysis in this report: the ranking is based on data reported at excise duty point level, whereas the additional analysis looks at biofuels production, further upstream in this chain.

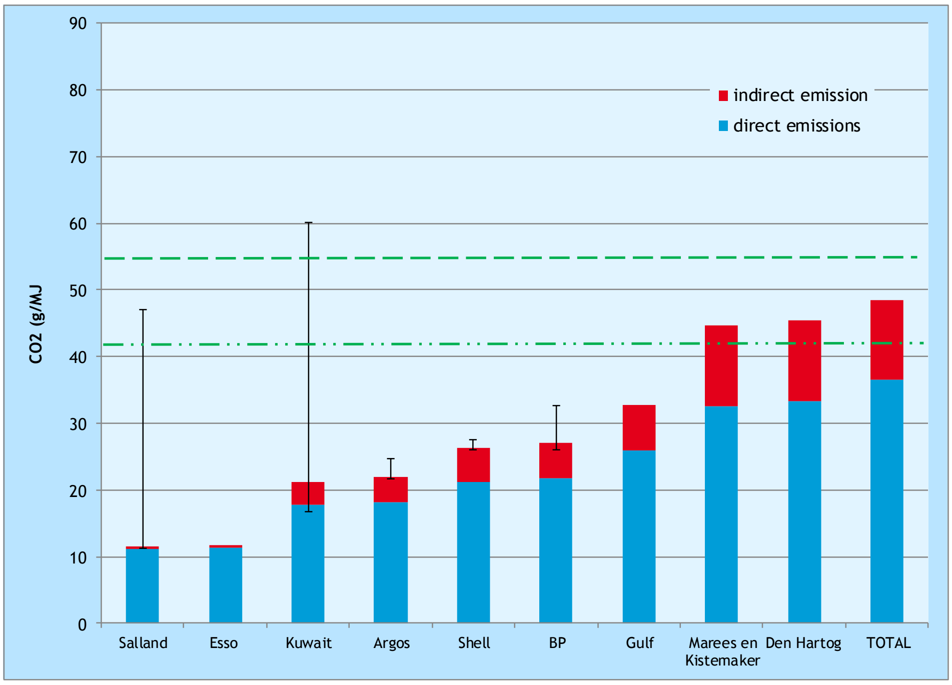
Figure 1 **A schematic of the fuel supply chain**



The new ranking of fuel suppliers

Figure 2 presents the update of the ranking of fuel suppliers and includes both direct emissions and emissions related to indirect land use change (ILUC).

Figure 2 **Ranking of fuel suppliers based on total GHG emissions of the seven biofuels mostly used in 2013**



* The green dotted lines represent a 35 and 50% reduction of GHG emissions compared to the fossil fuel reference (83.8 gCO_2/MJ). The black lines indicate uncertainty in the data, due to the reporting methodology of NEa (see text below).

This year the biofuels brought on the market by Salland have the lowest average GHG emission factor, directly followed by Esso. The emission factor of Salland (and Kuwait) is, however, uncertain due to the reporting methodology of the NEa: only the top 7 feedstocks for biofuels are reported, the rest is included in an 'other feedstock' category[1]. The position of Salland in this graph is solely based on the feedstock that was specified (about 65% of their sales), the black line indicates the uncertainty in the emission factor for their total biofuels sales[2]. Esso moved from the highest average GHG intensity of the ranking in 2011 to almost the lowest GHG intensity of the ranking today. Kuwait, with the highest average GHG intensity in 2012, also seems to have significantly improved as result of their shift from rapeseed and sugar beet to less carbon intensive feedstocks, but their data are relatively uncertain. Compared to last year, the average GHG intensity of the biofuels from Den Hartog and TOTAL remain relatively high.

Overall improvement of GHG performance

Most fuel suppliers reduced the average GHG emission factor of their biofuels. This is due to changes in feedstock used for the biofuels production: this has been the first year with no biodiesel from food crops in the list of the seven feedstocks mostly used, a shift that reduces both the direct and indirect emissions. Some new waste and residues like wheat straw have appeared on the top 7 list of feedstocks.

1 Note that the contributions bioCNG and renewable electricity are not included in these data, only the biofuels blended into gasoline and diesel.

2 In the best case, the 'other feedstock' contains low-emission waste and residues and their overall emission factor remains low, in the worst case, the 'other feedstock' is a vegetable oil with high risk of ILUC emissions such as palm oil.

Contrary to biodiesel, bioethanol production still relies heavily on agricultural crops as feedstock. This can be explained by the status of the production technology: converting used cooking oil and animal fat to biodiesel is a mature technology, whereas the production capacity of bioethanol from waste and residues is still very limited as the technology is still in the R&D phase.

Biofuel production in the Netherlands: mainly for export

Besides the fuel suppliers bringing biofuels on the Dutch market, the Dutch biofuel sector also consists of biofuel producers. In 2013, about 1,375 kton of biodiesel was produced in the Netherlands, and 414 kton of ethanol (compared to a consumption of 220 kton and 194 kton, respectively). The producers are not obliged to report on the mix of feedstocks they use for their production process, so this market lacks transparency.

Although it is expected that the majority of biofuels produced in the Netherlands meet the sustainability criteria of the RED[3], these biofuels are likely to have a poorer average GHG performance compared to the biofuels brought on the Dutch market by the fuel suppliers: the biofuels mix in other EU countries typically contains much higher shares of land-based feedstocks, and most of the production capacity in the Netherlands is based on food crops. However, this can not be quantified due to the limited data available.

Biofuels from waste and residues

The incentive of double counting in the biofuels obligation in the Netherlands may create a number of risks related to fraud and price impacts on other industries that use these feedstocks, as it drives up prices for both UCO and UCO-based FAME. Nevertheless, UCO prices remain below prices for virgin oil, and concrete cases of fraud have so far not been identified. Because the Netherlands do not have sufficient waste and residues such as UCO to fulfil demand, these feedstocks are also imported.

Key recommendations

- It is recommended to provide full disclosure of the feedstocks used and country of origin for all biofuels supplied to the Dutch market by the fuel suppliers, at company level. This will reduce the uncertainties in this analysis and enable the assessment of the average GHG emission factors (including ILUC) for all fuel suppliers.
- To assess the actual GHG savings that the various fuel suppliers achieve with the biofuels they blend, information on the volumes of biofuel imported and consumed need to be provided, on company level.
- The national legislation and definition of which biofuels are double counted should be harmonised in the EU. This improves the effectiveness of the policy, inter alia because it prevents trade and transport of waste and residues between Member States.
- It is recommended that this level of transparency and annual reporting is rolled out throughout the EU, to maximise the positive effect of transparency and enable European monitoring and reporting on this level.
- It is furthermore recommended to also increase transparency of biofuel production and trade, to get insight into whether the biofuels produced and traded in the Netherlands meet sustainability criteria, and to enable monitoring of the feedstocks used, the countries of origin and overall GHG emission factors of the biofuels produced in the Netherlands.

[3] Most biofuels export is to other EU countries where the RED requirements have also been implemented. However, exact data are lacking.

1 Introduction

In 2012 the Dutch NGO Natuur & Milieu, together with three European environmental NGOs, commissioned the study 'Biofuels on the Dutch market – Ranking oil companies in the Netherlands' (CE Delft, 2013). In this study CE Delft analysed the biofuel data per supplier as published by the Dutch Emissions Authority (NEa), resulting in a ranking of fuel suppliers based on the average greenhouse gas (GHG) emissions of their biofuel blends in 2011 (NEa, 2012). In February 2014, CE Delft updated this ranking based on the data over 2012 (CE Delft, 2014).

Mid December 2014, the NEa published the data over 2013 (NEa, 2014a). Therefore, ActionAid, Greenpeace, IUCN NL, Milieudefensie, Natuur & Milieu and Wereld Natuur Fonds requested an update of the ranking in order to assess the developments in the biofuel mix and the related GHG impacts until 2013. In addition, the NGOs requested an overview of the industry as a whole, i.e. of biofuel production in the Netherlands. The biofuel industry in the Netherlands not only supplies the fuel suppliers blending biofuels in the diesel and petrol mix in the Netherlands, but also exports significant volumes.

The main aim of this report is therefore twofold:
- to provide an update of the previous 'Biofuels on the Dutch market' reports;
- to provide insight in the large difference between the type of biofuel feedstocks consumed in the Netherlands and other European countries and to put the role of the Dutch biofuel industry and its exporting role in perspective.

As the biofuels market is very much policy driven, Box 1 contains a summary of the main policy context, both on EU level and on the national policy level in the Netherlands.

Box 1 - Summary of main policy context

RED and FQD
Since 2009, two European Directives, the Renewable Energy Directive (RED) and the Fuel Quality Directive (FQD), affect renewable energy use in the transport sector. The RED sets a 10% target for the share of renewable energy in the transport sector for the year 2020.
The FQD obliges fuel suppliers to reduce the average GHG intensity of the fuels sold on the market with 6% by 2020 compared to the baseline 2020 (EC, 2009a; EC, 2009b). The two targets will be mostly fulfilled with the use of biofuels due to a lack of alternatives to 'green' the transport sector. These directives contain sustainability criteria for the biofuels, and there has been quite some debate on implementation of indirect land use change, both are briefly explained in the following.

Sustainability criteria and minimum GHG emission reductions
A number of environmental sustainability criteria are laid down for biofuels, both in the RED and FQD. Neither Directive includes binding social criteria. There are sustainability criteria related to the protection of areas with high carbon stocks and biodiversity, and the following minimum GHG emission reduction criteria are defined:
- 2010: 35% reduction
- from 2017 onwards: 50% reduction
- from 2018 onwards: 60% reduction (only for new installations)

Indirect land use change (ILUC) and indirect emissions
The GHG emission reduction requirements of both Directives only cover the direct emissions, not the indirect emissions as result of indirect land use change (ILUC). The consumption of land based biofuels (biofuels from food and energy crops, such as sugar beet, rapeseed, corn and maize), may cause indirect land use change effects: cultivating these commodities requires land, so that an increasing demand of these biofuels will lead to expansion of the global agricultural area. In case of direct land use change, this effect can be directly attributed to specific biofuel batches, for example in case a palm oil plantation is started on land that used to be forest or grass land the year before. However, these effects can also be indirect, when the biofuel feedstock is produced on existing fields or from plantations that have been in place for many years. The land conversion will then be somewhere else, perhaps even in a different region, country or continent. Because of the high GHG emissions associated with this indirect land use change different policy options were being studied and debated in the past years, including a cap on land based biofuels and ILUC-factors to add as malus factor to the direct emission factor.
On April 28, 2015, the European Parliament and the Council reached a final decision on this issue, deciding, inter alia, to set a cap on biofuels from crops grown on agricultural land of 7% (energy consumption in transport), with the option for Member States to set a lower cap, to require fuel suppliers and the European Commission to report ILUC-related emissions, and to require Member States to decide on national targets for advanced biofuels. This new regulation would thus allow to carry out a motion that was adopted in the Dutch Parliament in December 2014, to limit the share of biofuels from crops to 5% (Kamerstuk 32813, nr. 97). Member States must enact this legislation by 2017[4].

Land based biofuels versus biofuels from waste and residues
An alternative to the use of land based biofuels are biofuels produced from waste and residues, like used cooking oil (UCO) and animal fat. Biofuels from waste and residues do not cause indirect emissions and on average result in relatively high emission savings. However, incentives for waste and residues might result in shifts of feedstock use which will also cause ILUC and indirect emissions: for example, while UCO is increasingly being used for biofuels, the use of UCO for soap, etc. might be replaced by less sustainable palm oil. The resulting effect may then be similar to the indirect effect of using land based feedstock. Therefore, for optimal use of waste and residues, these potential impacts as well as the principles of cascading use should also be taken into account and monitored.

Double counting
To provide an incentive for the use of biofuels from waste and residues (rather than from food crops) the RED includes a double counting provision for these biofuels, enabling these biofuels to count double towards the 10% renewable energy for transport target. Besides providing an incentive for biofuels from waste and residues, double counting also results in less absolute volumes of biofuels and thus in less replacement of fossil fuels.

Biofuels obligation in the Netherlands: blending quota
The RED and FQD have been implemented by the introduction of a blending obligation for fuel suppliers: they need to bring a certain share of biofuels on the Dutch market. In the table below the annual targets and the increase of these targets over time are depicted.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total obligation	4%	4.25%	4.5%	5.0%	5.5%	6,25%	7%	7,75%	8,5%	9,25%	10%

Except from subtargets for the share in the petrol and diesel mix (in 2013 3.5% for both diesel and petrol), fuel suppliers are free to choose the type of biofuel and the feedstocks used as long as the sustainability criteria of the RED and FQD are met. Due to this free choice there

4 http://www.europarl.europa.eu/news/en/news-room/content/20150424IPR45730/html/Parliament-supports-shift-towards-advanced-biofuels

can be significant differences between fuels suppliers in the type of biofuels they use, and the average GHG performance of their biofuels.
As explained above, the ILUC proposal has only very recently been decided on, and will be implemented in the Dutch policy in the coming years.

1.1 Outline of this report

The first part of this report, Chapter 2, contains the update of the ranking. It starts with an overview of the fuel suppliers included in the ranking and an overview of the feedstocks used by these fuel suppliers, and their origin. Based on these overviews the update of the ranking is presented in Section 2.4. To assess the potential impacts of uncertainties in the data, this first part ends with a sensitivity analysis in Section 2.5.

The second part of this report, Chapter 3, focuses on the biofuel production developments in the Netherlands. Overall production, import and export is described in Section 3.1. Section 3.2 zooms in on the feedstock used for biofuel production, which can then be compared with the feedstock used for the biofuels consumed in the Netherlands. In Section 3.3, an overview of Dutch biofuel production facilities is presented. Section 3.4 then describes the case of used cooking oil (UCO), which is an important feedstock from waste and residues on the Dutch market, in more detail.

The report ends with a chapter on conclusions and recommendations.

2 Biofuels brought on the market in 2013

2.1 Fuel suppliers included in the ranking

As described in Box 1, fuel suppliers are obliged to blend a certain share of biofuels with the fuels that they bring on the Dutch market. In order to prove compliance with the legislation, each fuel supplier has to annually submit a report to the Dutch government. The ranking in this study is based on the overview of the information submitted by the fuel suppliers, as published by the Dutch Emissions Authority (NEa, 2014a).

Due to changing market activities, the group of fuel suppliers which physically blended biofuels for the Dutch market in 2013 slightly differs from the group of 2012:
- North Sea Group Netherlands B.V. changed its name to Argos Supply Trading B.V.
- Smeets & Geelen B.V. are now included in the ranking as Lukoil Netherlands B.V.
- Catom Distribution B.V. has not been active in blending biofuels for the Dutch market in 2013 and therefore is no longer included.
- Marees en Kistemaker B.V. is new on the list as result of its activities on the blending market in 2013.
- Allesco and Lukoil both reported 100% of their biofuels in the category 'other feedstocks', which means their biofuel mixes do not include any of the seven feedstocks mostly used. For this reason, both companies could not be included in this year's ranking.

The relevant fuels suppliers of 2013 are thus:
- Salland;
- Esso;
- Kuwait;
- Argos;
- Shell;
- BP;
- Gulf;
- Marees en Kistemaker;
- Den Hartog;
- TOTAL.

2.2 Type of feedstocks used and shift in feedstocks

The average GHG emission factor of the biofuels that each fuel supplier brings on the market largely depends on the type of feedstocks used for the production of biofuels and their relative shares in the mix. Like last year, the estimate of this average GHG emission factor and the resulting ranking could only be based on the seven biofuel feedstocks used mostly, due to the limitations of the reporting methodology of the NEa. These seven feedstocks are: animal fat, UCO, corn, sugarcane, wheat, sugar beet and wheat straw. This year rapeseed and tallow are no longer part of the seven feedstocks mostly used. This implies that 2013 has been the first year without biodiesel from food crops in the top seven of the feedstocks mostly used.

The disappearance of tallow is the consequence of changes in the categories used by NEa: 'other animal fat' and 'tallow' are merged into 'animal fat'. The use of sugarcane and wheat straw has increased to such an extent that these feedstocks are now part of the top 7. An overview of the development of the feedstock categories used since this type of reporting was started is provided in Table 1.

Note that the NEa report only includes shares of different types of feedstock in the overall biofuels sales of a fuel supplier, absolute volumes are lacking. Therefore, only emission factors can be provided, not the actual emission savings that each fuel supplier achieved due to the biofuels blended.

Table 1 Seven feedstocks mostly used in 2011-2013

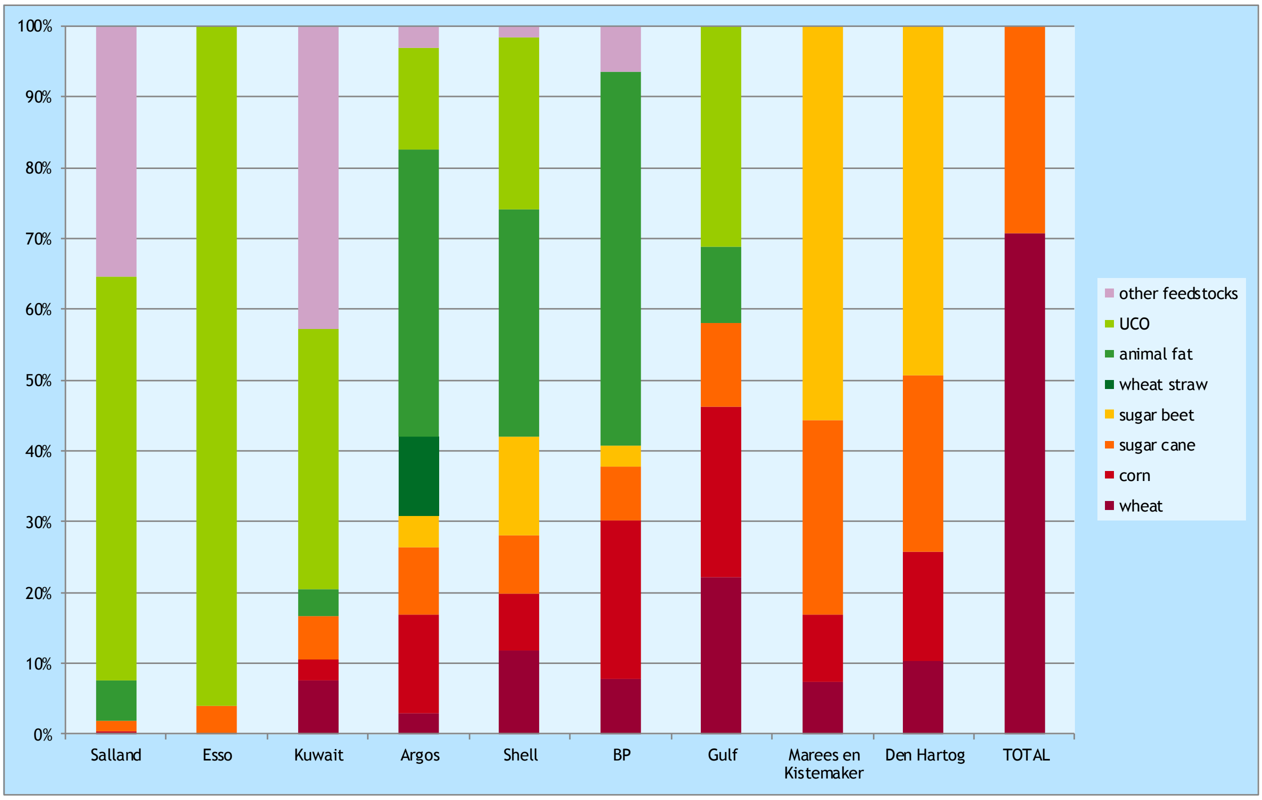
	2011	2012	2013
Animal fat	x	x	x
Glycerine	x		
Rapeseed	x	x	
Corn	x	x	x
Tallow	x	x	
Wheat	x	x	x
UCO	x	x	x
Sugar beet		x	x
Wheat straw			x
Sugar cane			x
Other feedstocks	Palm oil, soy, sugarcane, sugar beet	Other animal fat, glycerine, palm oil, sugar cane, wheat straw	Glycerine, municipal waste, waste from starch production, palm oil, rapeseed, fatty acids, soy and triticale

In Figure 3, the feedstock use per fuel supplier is depicted. It clearly shows the large variation in feedstock use: while some fuel suppliers have fulfilled their obligation with biofuels from waste and residues, other fuel suppliers have solely used food crops. This is to a large extent related to the type of biofuel: production of biodiesel from waste and residues such as used cooking oil is technologically mature, whereas ethanol production from waste and residues is still in the R&D phase, and production capacities are still very limited[5].

The figure shows the actual shares of the blended biofuels volumes, without taking into account double counting.

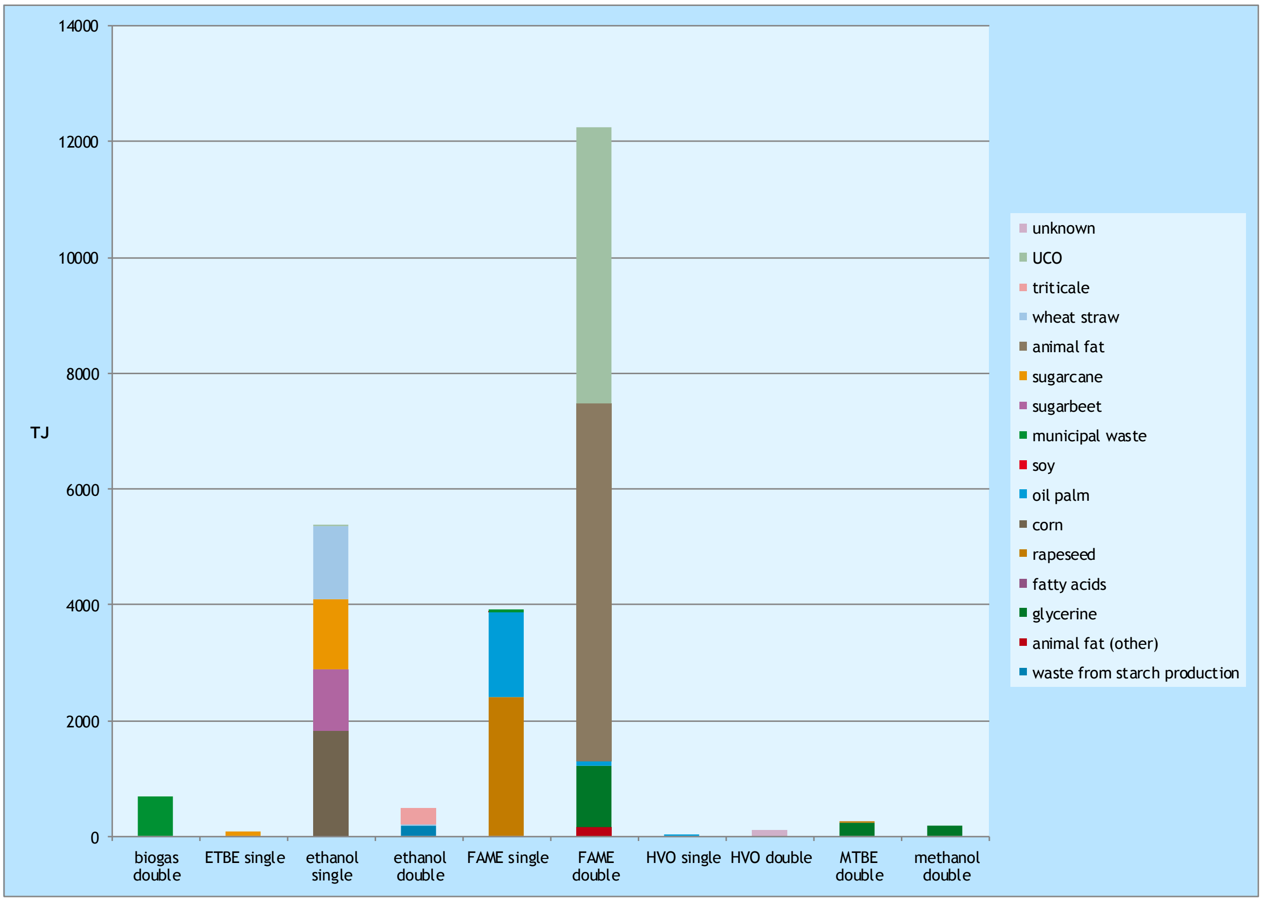
5 Note that biodiesel can be blended with diesel, ethanol with petrol.

Figure 3 Overview of feedstocks used per fuel supplier based on NEa, 2014a



To put these data into context, the absolute volumes of the various biofuels-feedstock combinations consumed in the Netherlands in 2013 are given in Figure 4 (in TJ, source: NEa, 2014b). This graph clearly shows the large market share of FAME from waste and residues (FAME double counting), followed by ethanol from food crops (ethanol single counting) and FAME from food crops. Biogas, not included in the ranking as the company data in (NEA, 2014a) are limited to diesel and gasoline biofuels only, represent about 3% of total biofuels consumption.

Figure 4 Overview of feedstocks used per type of biofuel in TJ, based on (NEa, 2014b)



As indicated before the GHG performance of the biofuels brought on the market are mainly determined by the feedstock used. Table 2 lists the seven feedstock types including their direct and indirect GHG emission factors as used in the calculations of the ranking. The indirect GHG emission factors are based on the ILUC-factors as proposed in the ILUC-proposal of the European Commission of October 2012.

Table 2 GHG emission factors for the direct and indirect emissions per feedstock

Group	Feedstocks	Direct GHG emissions ($gCO_2eq./MJ$)	Indirect GHG emissions ($gCO_2eq./MJ$)
Bioethanol from cereals and other starch rich crops (food crops)	Corn	38.5	12
	Wheat	41.1	
Bioethanol from sugars (food crops)	Sugar beet	34.1	13
	Sugar cane	25.4	
Biodiesel from waste and residues	Animal fat	10.7	0
	UCO	10.7	
	Wheat straw	11.4	

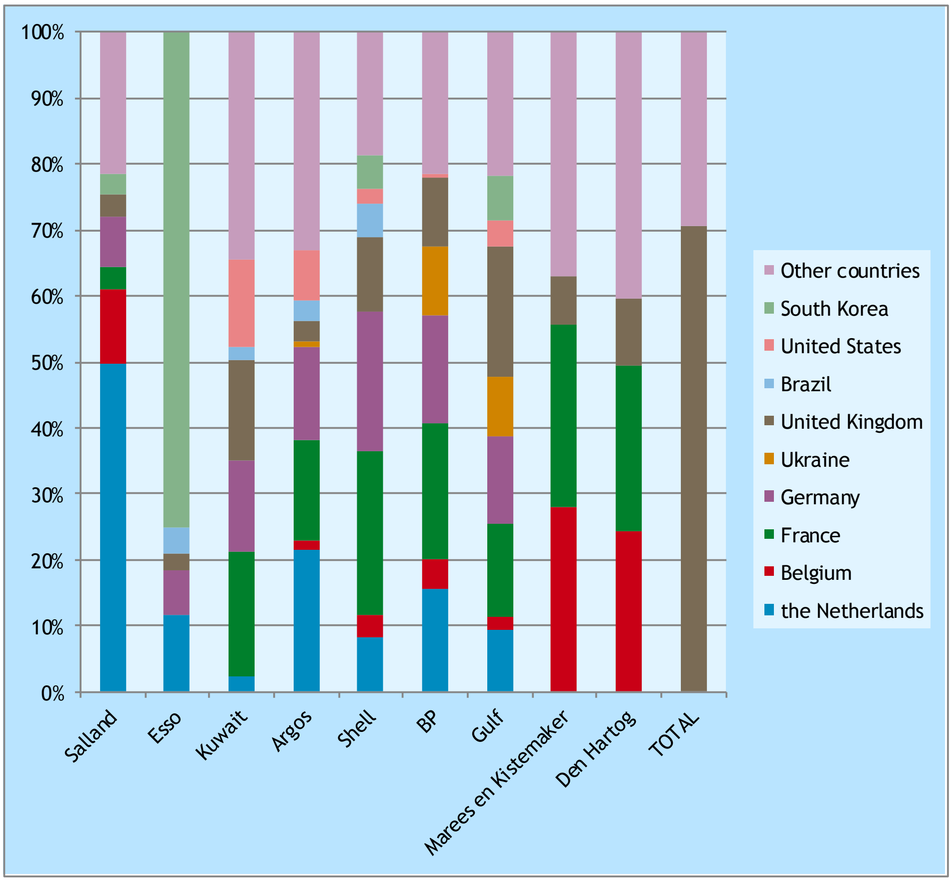
Source: EC, 2012a (ILUC proposal).

2.3 Origin of the feedstocks

Overall, waste and residues (UCO, animal fats) are the main feedstock for the biofuels sold in the Netherlands in 2013 (about 51%). Less than one fifth of these feedstocks are produced in the Netherlands: 18.7% of UCO, 19.7% of the tallow and none of the other animal fats. The remaining share of tallow and the total share of other animal fats are imported mainly from countries in Western-Europe (Germany and the United Kingdom). Other feedstocks strongly rely on imports from outside the EU: sugar cane is imported from South America, a substantial share of the corn from North America, the origin of the imported UCO is highly international dispersed.

The origin of the feedstocks per fuel supplier are shown in Figure 5. Salland stands out in these figures, as it is the only fuel supplier with 50% of its feedstock originating from the Netherlands.

Figure 5 **Origin of feedstocks per fuel supplier**

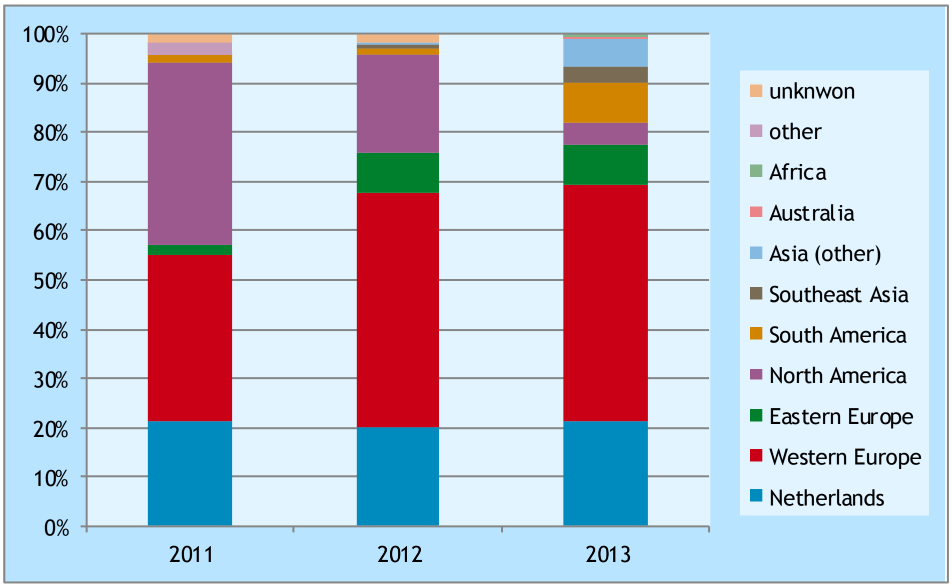


Source: NEa, 2014a.

The origin of the feedstocks for the last three years is shown in Figure 6. In the period 2011-2013 the use of feedstocks from the Netherlands was stable at about 20%. The import from Western Europe and Eastern Europe together increased from about 35 to 50%, while the (relative) import from North America decreased from about 45% in 2011 to not more than 5% in 2013. This decrease can partly be attributed to the substantially lower import of corn and animal fat from the USA during this period, caused by price and import tariff fluctuations.

If we take a closer look at the origin of waste and residues, the import from animal fat from Germany increased in 2013. This can be explained by the fact that Germany itself does not allow animal fat to be double counted. Exporting it to countries where double counting is allowed then becomes an attractive option (ePure, 2013). While UCO mainly came from the Netherlands in 2011 (67% of all UCO), the origin of UCO became more dispersed in 2013, where only 19% still came from the Netherlands. Note that these shares are relative: in absolute terms the growth in demand for UCO has probably been fulfilled with import from abroad, while the absolute volumes in the Netherlands probably kept stable. In Figure 6 the origin per feedstock type in 2013 is depicted[6].

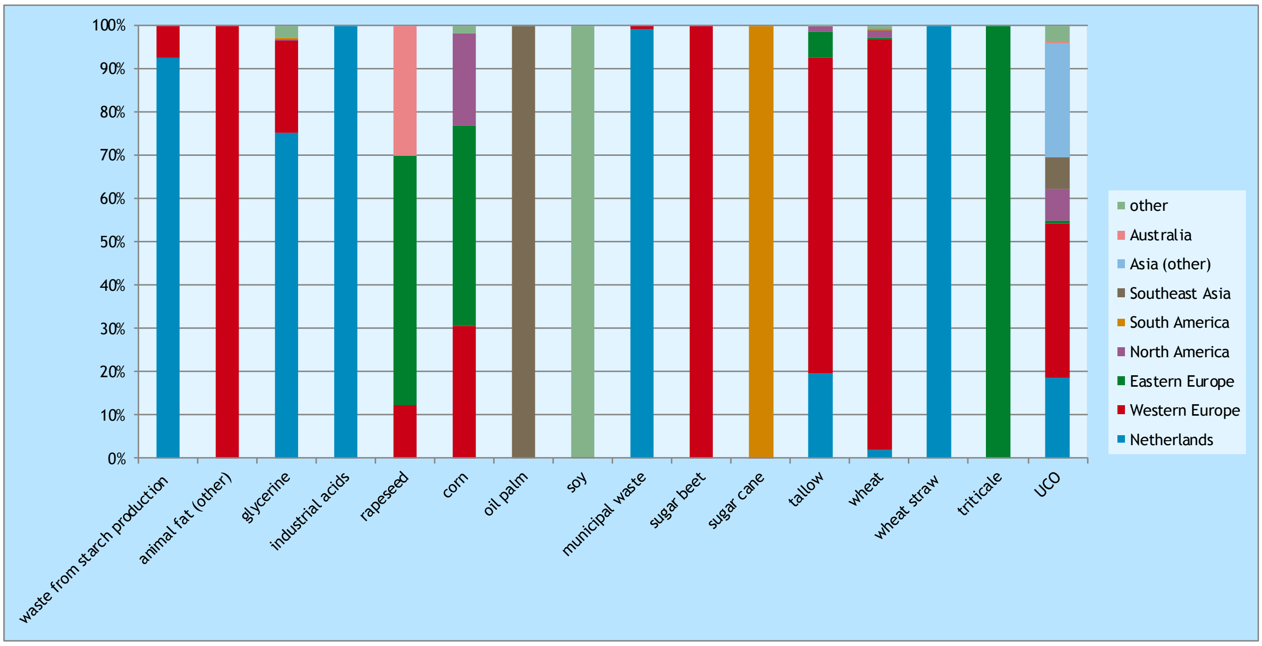
Figure 6 **Origin of the seven feedstocks mostly used in the period 2011-2013**



Source: NEa, 2014a.

6 Note that in these graphs, the category 'other' is a category used by NEa for 26 countries with an overall contribution of <1%. These countries are: Argentina, Bulgaria, China, Costa Rica, Denmark, Egypt, Greece, Hong Kong, India, Iran, Lithuania, Luxembourg, Morocco, Portugal, Saudi-Arabia, Serbia, Slovenia, Slovakia, Taiwan, Trinidad & Tobago, Czech Republic, Tunisia, Turkey, United Arab Emirates, Sweden and South Africa.

Figure 7 Origin of feedstocks used for biofuels brought on the Dutch market in 2013



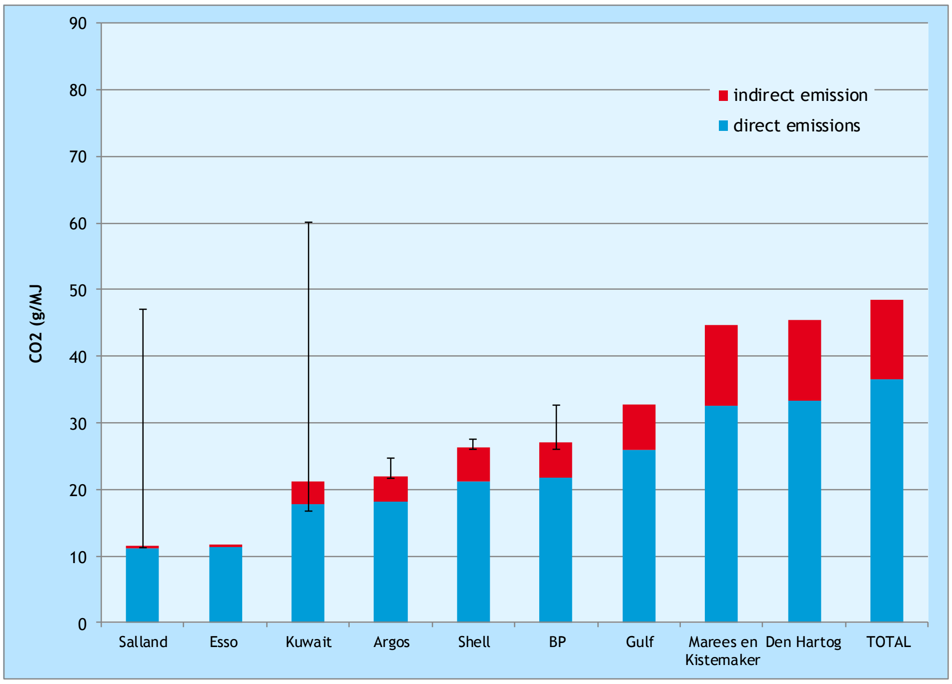
Source: NEa, 2014a.

2.4 Ranking based on average GHG emission

Combining the data on the relative shares of feedstocks per fuel supplier with the direct and indirect emission factors as listed in Table 2, the average biofuel emission factor of each fuel supplier can be calculated. The results of these calculations were then used to rank the fuel suppliers.

Figure 8 presents the new ranking of fuel suppliers, based on the biofuels they supplied to the Dutch transport fuel market in 2013 as reported in (NEa, 2014a).

Figure 8 **Ranking of fuel suppliers based on total GHG emissions of the seven biofuels mostly used in 2013**



* The dotted green lines represent a 35 and 50% reduction of GHG emissions compared to the fossil fuel reference (83.8 gCO_2/MJ). From 2010 onwards, a minimum of 35% savings is required, from 2017 onwards, this increases to 50% (RED requirements).

The ranking of 2013 differs from the ranking of 2012 in terms of fuel suppliers included, the order of the ranking and the height of the average emissions factors.

Order of the ranking

This year, like in 2011, the biofuels brought on the market by Salland have the lowest average GHG emission factor, directly followed by Esso. Both companies have hardly any indirect emissions. Note that Salland has a relatively high share of 'other feedstocks' (35.4%), which could not be taken into account in this ranking as the CO_2 emissions of this category are unknown[7]. Depending on the GHG performance of these 'other feedstocks' the ranking could have led to a different outcome. Esso does not have any feedstocks in the category 'other feedstocks': their biofuels were only made from UCO (96.1%) and sugarcane (3.9%). Due to changes in feedstock use in the past few years, Esso moved from the highest average GHG intensity of the ranking (in 2011) to having almost the lowest GHG intensity of the ranking today.

Kuwait, having the highest average GHG intensity of the ranking in 2012, also significantly improved as result of their shift from rapeseed and sugar beet to less carbon intensive feedstocks.

Compared to last year, Den Hartog and TOTAL remain to have the highest average GHG intensities of the ranking. The positions of Shell and Argos somewhat worsened in the ranking, mainly as result of better performance of other companies.

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7 Note that Salland is a relatively small fuel supplier, and this share of their feedstock is likely to be very small compared to the overall biofuels sales in the Netherlands.

All companies managed to realise an average 50% reduction in direct emissions compared to the fossil fuel reference as a result of feedstock shifts. When also taking into account indirect emissions, only the three fuel suppliers with the highest average GHG intensity (Marees en Kistemaker, Den Hartog and TOTAL) exceed the 50% reduction limit: their emission reduction is then reduced to around 45%. They use feedstock that have a high risk of causing indirect land use change GHG emissions.

Uncertainty as result of the category 'other feedstocks'

As in previous versions of this ranking, a sensitivity analysis was performed to estimate what the impact could be if the share of other feedstocks would consist of the best or worst performing biofuel. The results are indicated in Figure 8, where the range between the worst and best case is visualised by black error bars. The ends of these represent the best and worst case and the length of the error bars is determined by the share of 'other feedstocks'.
See Section 2.5 for more detail on methodology used for the sensitivity analysis.

As can be seen in Figure 8 the positions of Salland and Kuwait are highly uncertain, because of their shares of 'other feedstocks'. In case these shares will be palm oil, they both will end as the fuel suppliers with the highest average GHG intensity of the ranking, as biodiesel from palm oil has a relatively high average emission factor. With respect to the other suppliers, the impact of the worst case only makes them shift one position. It could be questioned, however, to what extent the worst case would be realistic, because most of the feedstocks in the category 'other feedstocks' consist of waste and residues. If the share of 'other feedstocks' from all fuel suppliers is assumed to be waste or residues, with emission factors close to that of animal fat and UCO, the ranking remains the same.

Box 2 - The impact of double counting biofuels on the overall fuel mix and GHG emissions

It is important to realise that the data used for the ranking in this report only looks at the biofuels component in the fuel mix. In that respect, it should also be noted that a higher share of biofuels from waste and residues will actually reduce the biofuels content in the fuels, compared to meeting the blending obligation with single counting biofuels.

Due to this double counting, the impact of using higher shares of biofuels from waste and residues on overall GHG emissions is not straightforward: one the one hand it will result in the use of biofuels with relatively high GHG emission savings and low risk of indirect land use change, but on the other hand, it also reduces the absolute volume of biofuels sold and thus increases the share of fossil fuels in total transport fuels sales.

This effect can be illustrated with the following (hypothetical) example, where the GHG savings of using double counting biofuels are compared with singe counting biofuels.
Assuming that:
- fossil fuels have an average GHG emission factor of 85 g CO_2 per MJ (or ktoe) of fuel;
- the double counting biofuels have an average emission factor of 11 g CO_2/MJ, achieving 88% GHG savings compared to fossil fuels;
- the single counting biofuels are on average 60 g CO_2/MJ, and thus achieve about 33% savings (incl. ILUC emissions).

If the 10% is then met with the single counting biofuels, the average GHG intensity of the transport fuels would be 82.5 g CO_2/MJ, a 2.9% saving of overall emissions.
If it is met with double counting biofuels, 5% of these biofuels would be sufficient to meet the transport target. The average GHG intensity of the transport fuel would then be 81.3 CO_2/MJ, a 4.4% saving.
The net effect depends strongly on the actual emission factors of the various fuels.

Relation to the type of feedstock

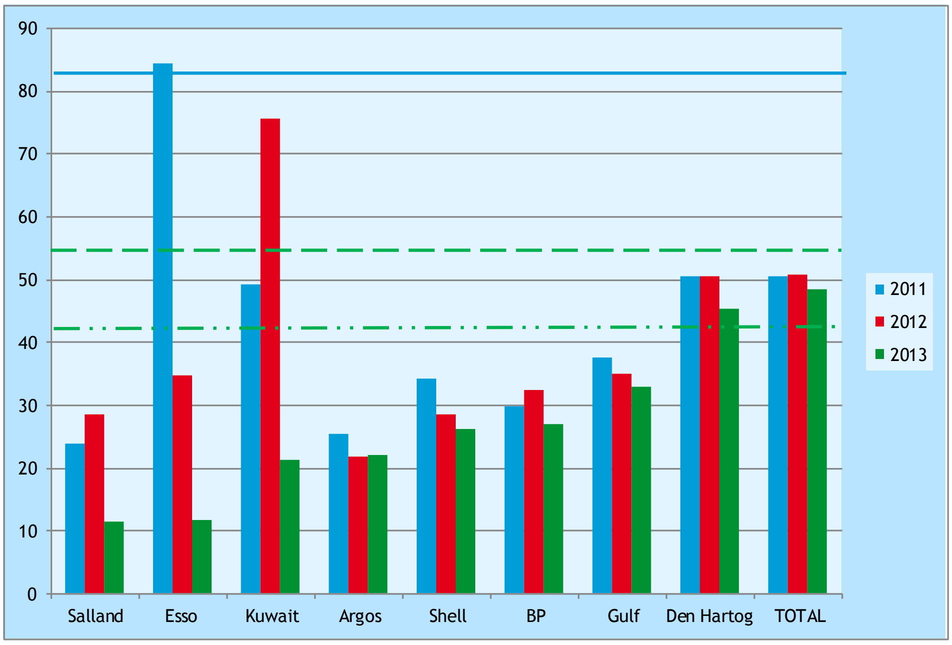
The fuel suppliers with the highest average GHG intensity in the ranking did not blend any biofuels from waste and residues, only bioethanol from food crops, while the suppliers with the lowest average GHG intensity to a large extent rely on biodiesel produced from UCO and animal fat. As explained above, this is mainly due to technology: ethanol production from waste and residues is still in R&D phase and production capacity is limited (and costs are high), whereas biodiesel production from waste oils and fats is mature and operational on a large scale. As the biofuels obligation for 2013 included subtargets of 3.5% for both petrol and diesel, a certain minimum level of ethanol supply in the Dutch fuel mix was required.

Again note that the share of ‘other feedstocks’ creates an uncertainty in this ranking. Especially the position of Salland and Kuwait is uncertain due to their high share of ‘other feedstocks’.

Difference in average GHG intensity compared to earlier years

As can be seen in Figure 9, almost all companies that have been part of all three rankings of the past years seem to have decreased the GHG intensity of their biofuels between 2012 and 2013. In other words: all companies, except Argos, have improved the GHG performance of their biofuels over the last year. Argos already had relatively low GHG intensity in 2011, their performance improved further in 2012 and then remained the same in 2013.

Figure 9 **Developments in the average GHG emission factors of the fuel suppliers included in all three years (including direct and indirect emissions) (in gCO_2/MJ)**



* The green dotted lines represent the minimum GHG requirements of the RED, the blue line the fossil fuel GHG emission factor – direct emissions only. In order to count towards the target biofuels should at least reduce 35% GHG emissions. From 1 January 2017 biofuels this minimum reduction will be 50% (based on NEa, 2014a).

Between 2011 and 2013 some fuel suppliers have reached higher reductions (Esso) compared to other fuel suppliers (TOTAL, Den Hartog, Gulf, etc.)

In general the fuel suppliers with the lowest average GHG intensity have managed to realise higher reductions compared to 2011.

2.5 Sensitivity analysis

2013 is the first year without a feedstock category 'unknown', which implies all data gaps were resolved (in 2011, 4.6% of feedstocks were 'unknown). The category 'other feedstocks' includes the feedstocks that have only been used in small amounts. This years these feedstocks include waste from starch production, glycerine, industrial acids, rapeseed, oilpalm, soy, municipal waste and triticale. Although the shares of these feedstocks are known, the reporting requirements as laid down in Dutch legislation prescribes that the feedstocks not belonging to one of the seven feedstocks mostly used are reported as 'other feedstocks'.

In 2013 the category 'other feedstocks' contained 7.2% of all feedstocks, which is higher compared to 2012 (5.4%) and 2011 (2.0%). A reason for this could be diversification resulting in more types of different feedstocks and therefore less coverage by the seven feedstocks mostly used.
There are five fuel suppliers with a share of 'other feedstocks'. Their shares are presented in Table 3. Fuel suppliers not listed here do not have a share of 'other feedstocks'.

Table 3 Share of 'other feedstocks' per fuel supplier

	Share of 'other feedstocks'
Kuwait	42.8%
Salland	35.4%
BP	6.5%
Argos	3.0%
Shell	1.5%

Looking at the feedstocks in the category 'other feedstocks' we use the following values for the best and worst case for the sensitivity analysis:

Table 4 Emission factors assumed for best case and worst case calculations

	Feedstock assumed	Direct GHG emission factor used (gCO_2/MJ)	Indirect GHG emission factor used ($gCO_2eq./MJ$)
Worst case	Palm oil biodiesel	57	55
Best case	Waste vegetable oil/ animal fat biodiesel	10.7	0

3 Biofuel production in the Netherlands

Where the previous chapter assessed biofuels sales on the Dutch fuels market, this chapter looks at the broader picture of biofuels production in the Netherlands.

This chapter starts with a description of overall biofuels production, import and export, in Section 3.1. Section 3.2 will zoom in on the feedstock used for biofuel production, and compares this with the feedstock used for the biofuels brought on the market, as shown in the previous section. In Section 3.3, an overview of Dutch biofuel production facilities is presented and finally, Section 3.4 includes a case description of used cooking oil (UCO), as important feedstock from waste and residues on the Dutch market.

Data availability

When assessing the biofuels production sector, it has to be noted that much less data are publically available, compared to what is available on biofuels supply to consumers. There are several reasons why the data on biofuel production is limited. First of all, there is no obligation for biofuels producers to report on the origin and type of feedstock they use to the authorities, as is the case for the fuel supplier when supplying in the Netherlands. Biofuel producers do not publish detailed information on feedstock use voluntarily, these data are typically confidential. Secondly, trade statistics on the various types of feedstock for biofuels do not distinguish between end use.
For example, import data on palm oil do not provide information on which part goes to the food sector, and which is used as feedstock for biofuels production plants. Nevertheless, the Dutch Central Bureau of Statistics (CBS) gathers data and reports on the overall production capacity, production volume and import volume in the Netherlands, and some additional relevant data on this sector can be found in public literature.

3.1 Overall production, import and export

According to Ecofys (2011) the Netherlands is the country with the largest biofuel distribution sector in Europe. Several reasons can be identified to explain the significant role of the Netherlands in biofuel trade:
- the hub function of the ports of Rotterdam and Amsterdam and the (transport) connection with biofuel plants along the Rhine river;
- the large fossil fuel refining capacities in these port areas;
- the long-established oilseed handling and crushing sector (e.g. ADM, Bunge, Cargill) which have installed biodiesel facilities next to their vegetable oil mills.

Section 2.3 showed that only about 20% of the feedstock for the Dutch biofuels originates from the Netherlands. Likewise, it can be said that only a small part of the biofuels produced in the Netherlands is actually used in the Netherlands. As depicted in Table 5 the production volume of bioethanol is around twice as high as actual consumption. For biodiesel the production volume is seven times higher compared to the consumption of biodiesel in the Netherlands. This clearly confirms the role of the Netherlands as significant market player in biodiesel trade.

In Table 5 the differences between production volume and production capacity reflect the current overcapacity in the European biofuels market.
For bioethanol the overcapacity is limited, but only around 70% of the biodiesel production capacity was in use in 2013. There are several reasons for this overcapacity: first of all, most production capacity has been installed at the time the market expectations were estimated to be far more positive than the market demand turned out in practice. This lower demand for biofuels has been the result of increasing concerns on the sustainability of biofuels, especially on biofuels from land based biofuels (leading to the recent decision on ILUC, as briefly explained in the introduction of this report) and, to some extent, of the economic crisis. According to (Ecofys, 2013), which assessed the sustainability of biofuels for the European Commission, the capacity in use as share of total installed capacity has dropped from 64% in 2007 to only 42% in 2010. Since then, this has not improved: in 2013, only 43% of the EU's biodiesel production capacity and 44% of bioethanol capacity was actually used (Eurostat data). A final decision on the ILUC proposal was been reached in the European Parliament on 28 April 2015[8] Nevertheless, the development of biofuels production and demand remains uncertain: it will depend on how the EU Member States will implement the ILUC decision in national policies, and on the post-2020 biofuels ambitions and policies of both the EU and its Member States.

Table 5 also shows that the Dutch export and production volume of biodiesel grew by a small amount between 2012 and 2013, while the consumption and the production capacity in the Netherlands decreased. For bioethanol this comparison cannot be made because the figures of 2012 were not available.

Table 5 **Import, export and production of biofuels in the Netherlands (in kton)**

Units: kton	Bioethanol, etc.		Biodiesel	
	2012	2013	2012	2013
Production capacity	Confidential	503	2,051	2,014
Production volume	Confidential	414	1,177	1,375
Net import pure biofuels	Confidential	-215	-849	-989
Net import blended biofuels	54	-9	-35	-54
Net export pure biofuels	Confidential	215	849	989
Net export blended biofuels	-54	9	35	54
Consumption pure biofuels	Nihil	Nihil	Unknown	Unknown
Consumption blended biofuels	193	194	238	220

Source: CBS (2014) Table 'Biobrandstoffen voor het wegverkeer; aanbod, verbruik en bijmenging'.

Note that the shares of bioethanol and biodiesel produced in the Netherlands are generally in line with the European consumption data: in the Netherlands, biodiesel production volumes were 3.3 times as high as bioethanol production, where biodiesel consumption is the EU is 3.8 times as high as bioethanol consumption.

8 See http://www.europarl.europa.eu/news/en/news-room/content/20150424IPR45730/html/Parliament-supports-shift-towards-advanced-biofuels, the final text of the decision will be published on this website.

3.2 Feedstock used for the Dutch production of biofuels

Differences between Member States

Biofuels that are exported to and used in other EU Member States also have to comply with the sustainability criteria defined in the Renewable Energy Directive. However, as the previous chapter showed that there is a large variation in the GHG performance of RED compliant biofuels. Member States have implemented the RED differently, mainly resulting in different (or no) incentives for double counting biofuels, leading to different preferred feedstocks being used in the various Member States.

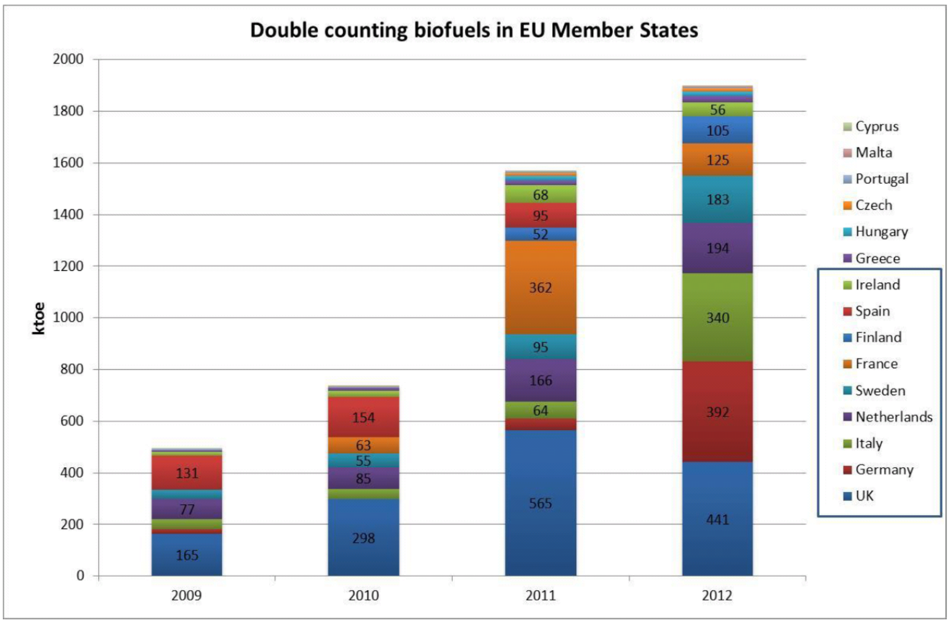
The different incentives and policies are also the reason that in 2012, only four Member States, namely the Netherlands, Italy, Germany and the UK, are responsible for 70% of the biofuels from waste and residues consumed in the EU, as shown in Figure 10 (based on final energy consumption, i.e. without double counting). Taking into account that the fuel market in the Netherlands is relatively small[9], this implies that the other Member States rely to a much larger extent on the consumption of single counting, land based biofuels.
The overall use of biofuels from waste and residues was still limited to 1.4% of all EU compliant biofuels in 2010. In that specific year biodiesel was mainly been produced from rapeseed (56%), soybean (13%) and palm oil (9%), while wheat (30%), maize (23%) and sugar beet (30%) were the main feedstocks for the production of ethanol (Ecofys, 2013). Since only very few EU countries, including the Netherlands had double counting implemented in 2010, the waste and residues were partly sourced from (neighbouring) countries without double counting.

Since 2010, an increasing number of Member States has implemented the doubling counting incentive in their policies, and the consumption of double counting biofuels increased significantly, as shown in Figure 10. In 2012, these 1,900 ktoe double counting biofuels comprised almost 15% of overall EU biofuels consumption. The 9 countries in the blue box represent the Member States with substantial markets in 2012.

These data suggest that the biofuels produced in the Netherlands for export will be based much more on land-based feedstock than those produced from the Dutch market. However, as these data do not distinguish between origin of the biofuel or feedstock, it is not known to what extent these biofuel volumes were produced in the Netherlands.

[9] The Dutch biofuels consumption only accounts for about 2.5% of the EU biofuels consumption, whilst Germany and Italy, for example, have a share of 20 and 10% respectively (Eurostat data).

Figure 10 Double counting biofuels in EU Member States



Source: Pelkmans et al.,2014.

Biofuels exported to outside the EU will be subject to the national legislation of those specific countries, but this was not further analysed within the scope of this project. Similar to the EU, the incentives provided in these countries determine the type of feedstocks used in these areas.

Overall import of feedstocks

The relatively high share of biofuels from food and energy crops in Dutch biofuel production in the Netherlands is confirmed by the data in Figure 11 and Figure 12 (source: NL Agency, 2014), which provide a qualitative overview of the import and export of biofuels and their feedstocks, as published by the NL Agency for both biodiesel and bioethanol in 2013.

Biodiesel

Although the quantities can not directly be related to the different flows, the figures show that biodiesel was mainly produced from palm oil, and most of this biodiesel was exported. This is in line with the results of the ranking where palm oil does not belong to the seven feedstocks mostly used (in 2013).

While the use of single counting biofuels by fuel suppliers operating in the Dutch market has decreased in the last few years, according to (Netherlands Enterprise Agency, 2014) the import of palm oil increased sharply from 2011 to 2012 as result of the growth of the palm-based biofuel production. This palm oil mainly originated from Indonesia and Malaysia. The palm oil processed for energy purposes in 2012 was about 10 times higher compared to the processed palm oil in 2011 (NL Agency, 2014).

As Figure 11 shows, industry that uses vegetable oils strongly depend on import of feedstocks: the raw material production in the Netherlands itself only consists of some small flows of waste and residues (0.29 MT).
These data confirm what was seen in the previous paragraph: biodiesel production in the Netherlands does not only heavily rely on import, but also far more biofuels (a total of 1.58 MT) are exported than consumed in the Netherlands itself (0.26 MT), which only equals 14% of all biofuels produced.

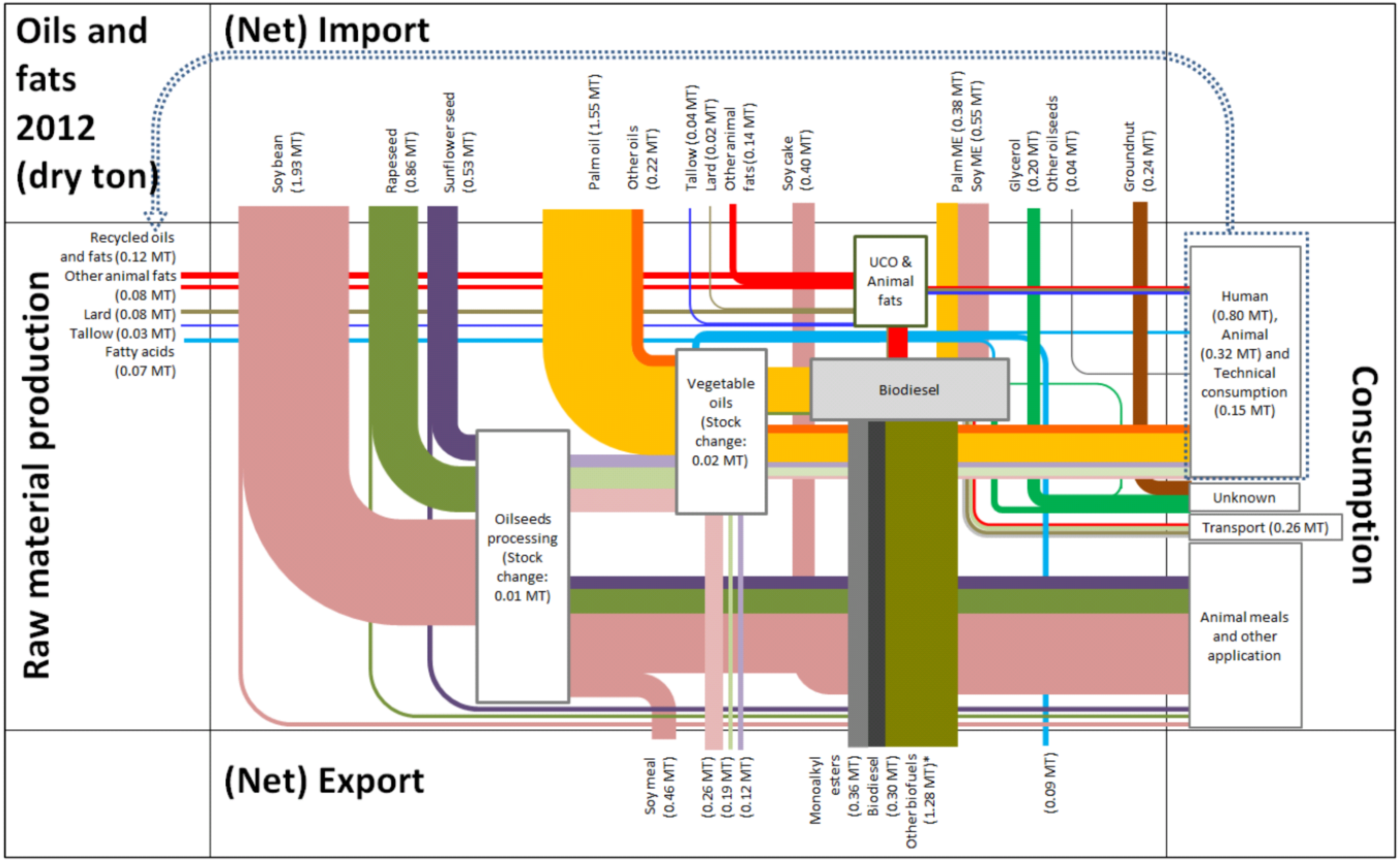
This dominating export is only valid for biodiesel: other applications of imported vegetable oils are more for consumption within the Netherlands.

Bioethanol

According to Figure 12, the production of bioethanol does not rely on import and export to the extent biodiesel production does: bioethanol production is also based on national raw material production of wheat and maize. The green maize production in the Netherlands (3.78 MT) is even slightly higher than the amount of imported corn (3.43 MT). Because soybean is mainly a source of proteins rather than an oil crop, this flow, mainly supplied by Brazil and the US, is mainly used for animal feeds in the Netherlands, rather than for biofuel production.

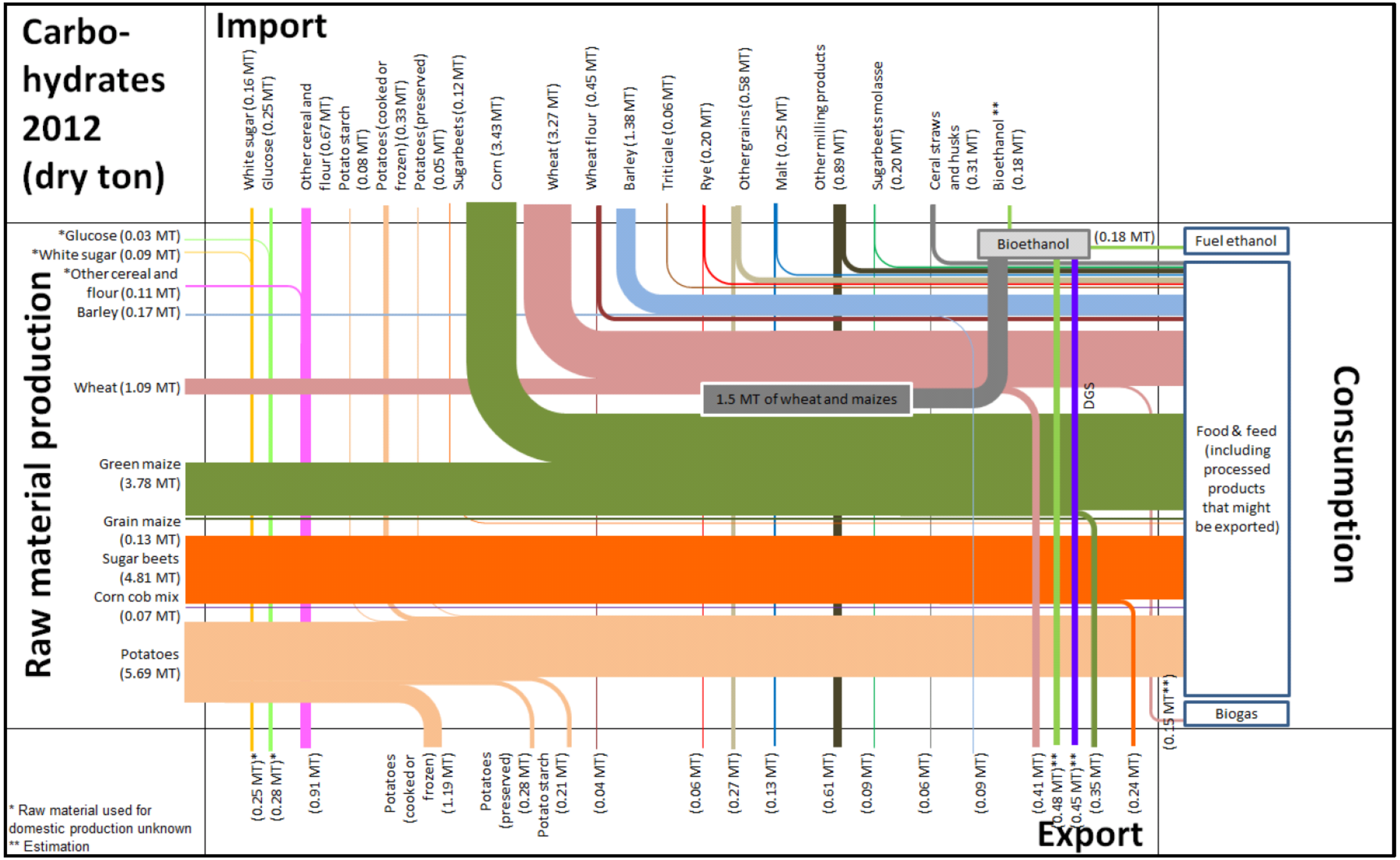
Around 0.48 MT of bioethanol is exported to other countries compared to 0.18 MT designated to biofuel consumption in the Netherlands itself and implies around 27% is consumed nationally.

Figure 11 Mass balance for oils and fats flows in the Netherlands in 2012 (dry content)



Source: NL Agency, 2014

Figure 12 Mass balance for carbohydrates flows in the Netherlands in 2012 (dry content)



Source: NL Agency, 2014

3.3 Market scan of Dutch production facilities

Approach
This section provides the results of a market quick-scan of the Dutch biofuel production companies. Two earlier reports on biofuel producers in 2011 (Peters, 2013) and 2008 (Bersch, 2008) were taken as a starting point and updated to the current situation where possible. New companies were added based on their registration in the GAVE databases from NL Agency (2014) and the databases of the main certification systems of biofuel producers (ISCC and NTA8080).

Since the aforementioned reports, a lot has changed in the Dutch biofuel market. Some companies went bankrupt or projects were not realized (e.g. Vesta Biofuels, Noord Ned. Oliemolen, BioDSL and Biofueling), some made a restart with a new owner (Dutch Biodiesel, Rosendaal Energy/Goes on Green), some are or were some time on hold due to a difficult economic market (Dutch Biodiesel Pernis, Maatschap Bosma, CleanerG, Vesta Biofuels), others could not be traced back or identified as Dutch producers anymore (e.g. Dekro, Harvest, J&S Bio Energy, OPEK, Pentagreen, Wheb Biofuels). Most of these companies produced biofuels from food crops. Some companies have switched between food crops and waste and residues as feedstock, for example Sun Oil.

The next two paragraphs give an overview of the companies that could be traced and are still in the Dutch market. Production capacities are tabulated, but the actual production volumes are not known. Except for Neste Oil, none of the companies were transparent on their website about the origin of their feedstocks.

Since most of the feedstocks are imported and also a lot of biofuel is exported, many companies are located at harbors.

Diesel replacers
From a few companies it is known that they cooperate with local feedstock producers that use at least some local feeedstock: Coöperatie Carnola, Biodiesel Amsterdam, Biodiesel Kampen and Ecoson. The palm oil of OIO/Loders Crocklaan and Wilmar/KOG is likely to come from Asia (Indonesia and Malaysia), since these are the countries of origin for palm, as reported by the NEa (NEa, 2014a), although this can not be stated with certainty.

Table 6 Biodiesel production overview

Company & location	Type biodiesel	Capacity (kton)	Feedstock	Certification	Since
Land based feedstocks (food crops)					
ADM, Rotterdam	FAME	3,000 *	Rapeseed, canola, soybean (oilseeds)	ISCC EU, DE, Plus	≤ 2009
Biopetrol Industries, Rotterdam	?	400	Rapeseed, canola, soybean, palm, sunflower, free fatty acids	ISCC EU, Plus	2008
CleanerG, Zwijndrecht	FAME *	200	Rapeseed, soybean, palm	Unknown	> 2011
Coöperatie Carnola, Limburg	PPO	2,5 **	Rapeseed	Unknown	2006
Ecopark, Harlingen	PPO	32 (only small % for	Rapeseed	Unknown	2007

Company & location	Type biodiesel	Capacity (kton)	Feedstock	Certification	Since
		fuels) ***			
OIO/Loders Crocklaan	Palm oil	10,000 *	Palm	ISCC EU	≤ 2009
Wilmar/KOG	Palm oil *	500 *	Palm	ISCC EU	
Waste and residues based feedstock					
Biodiesel Amsterdam, Amsterdam	FAME (UCE)	110	UCO (Benelux), Animal fat cat.1	ISCC EU, DE	2010
Biodiesel Kampen, Kampen	UCE		UCO (local), Animal fat cat.1	ISCC EU, DE	N/A
Eco Fuels, Eemshaven	UCOME	50	UCO	ISCC DE	2007
Ecoson (VION), Son	FAME *	5	Animal fat cat. 1,2,3	ISCC EU; NTA8080	≤ 2011
SunOil, Emmen	FAME *	70	UCO(, animal fats)	ISCC EU, DE	≤ 2011
SES International, Moerdijk	?	NA	UCO, vegetable oils, fats	Unknown	> 2007
Multifeedstock					
Electrawinds Greenfuel, Sluiskil	FAME *	250	Multifeedstock; vegetable oils, UCO, animal fat	Unknown	≤ 2011
Neste Oil, Rotterdam	HVO	800	Multifeedstock; vegetable oils, UCO, rape, canola, animal (fat) waste residues, palm oil, stearine	ISCC EU, DE, Plus	>2011

(*) Ecofys (2013); "Oilseed crushers operate both for food and biofuel markets. Crushers often have biodiesel capacity integrated with their crushing facilities. In the EU on average 38% of vegetable oil resulting from the crushing ends up in biodiesel, while non-oil components resulting from crushing end up as animal feed".
(**) Bersch (2008).
(***) NL Agency (2015)

Petrol replacers

The Dutch bioethanol production is dominated by two large international companies, Abengoa and LyondellBasell. Only a relatively small number of facilities use waste and residues based feedstock for bioethanol production. This is in line with the general state of the art of current technologies, which offer more options for the conversion of waste and residues into diesel replacers and less options for ethanol replacers.

Table 7 Bioethanol production overview

Company & location	Type bioethanol	Capacity (kton)	Feedstock	Certification	Since
Land based feedstocks (food crops)					
Abengoa, Rotterdam	bioethanol	480	corn, wheat	ISCC EU, DE; RBSA	≤ 2011
LyondellBasell, Rotterdam	Bio-ETBE	600 **	unknown	ISCC EU	2008
Waste and residues based feedstock					
Cargill, Bergen op Zoom/Sas van Gent	?	32	Palm oil, starch slurry	ISCC EU	≤ 2011
SABIC, Geleen	ETBE/MTBE	Unknown	?	unknown	unknown

(*) Ecofys (2013); "Oilseed crushers operate both for food and biofuel markets. Crushers often have biodiesel capacity integrated with their crushing facilities. In the EU on average 38% of vegetable oil resulting from the crushing ends up in biodiesel, while non-oil components resulting from crushing end up as animal feed".
(**) Bersch (2008).

Other biofuels

A few companies produce other biofuels: bio-LNG, biomethanol and biobased jet fuel. Biomethanol can be used to replace petrol, like bioethanol. These are all produced from waste and residues.

Table 8 Other biofuels

Company & location	Type biofuel	Capacity (kton)	Feedstock	Certification	Since
Waste and residues based feedstock					
Bioethanol Rotterdam, Rotterdam	Bio-LNG	Unknown	Biomass waste	Unknown	Unknown
BioMCN, Farmsum	Biomethanol	200	Crude glycerine	ISCC EU	≤ 2011

3.4 The case of UCO

In Section 3.2, it was concluded that the Netherlands is likely to be the EU country with the highest share of biofuels from waste, and a significant share of these are produced from used cooking oil (UCO). Various studies have been published on the potential of waste and residues such as UCO, and on the market impacts of the differences in incentives provided across the EU.
For these reasons, this chapter ends with a short case description of the market impacts of UCO.

Availability of UCO in the Netherlands

Figure 11 already showed the flows of waste and residues, which were relatively limited compared to other types of oils and fats. According to a position paper of the KNAW (2015) the Netherlands have almost reached the potential of the consumption of UCO from the Netherlands. This statement was explained by the following calculation:

- In 2012, 1.1% of the energy for transport consisted of biofuels from waste and residues. This accounted for 3.9 days of driving per year, of which 2.6 days were produced from animals fats and tallow and 1.3 day of UCO.
- 1.3 day driving on UCO in the Netherlands equals 41,000 tons of UCO.
- The potential of UCO to collect from the hotel and catering industry is estimated to be 44,000 tons of UCO and 10,000 from individuals.
  This equals 54,000 tons in total on an annual basis (KNAW, 2015).
  This is in line with Pelkmans et al. (2014), who also mentions a potential of 60,000 tons annually.

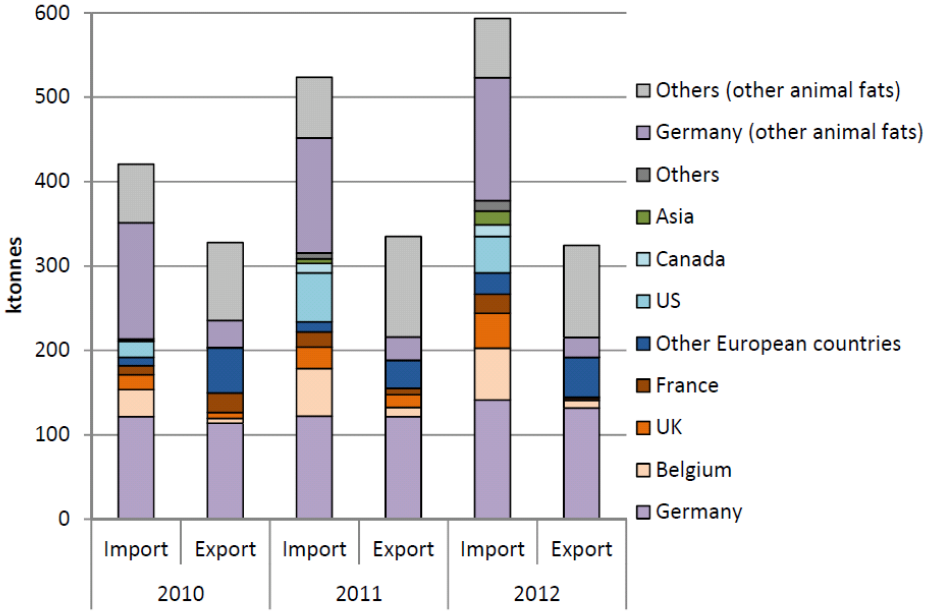
Because it is unknown to what extent the full potential of the UCO collection can be achieved, and 100% may be unlikely, it can be concluded that the Netherlands already have quite a good UCO collection system in place, and approaches the maximum that may be achievable. Especially when considering that UCO has other potential applications as well, and when applying the cascading principle some of these other applications may be preferred to using it in the transport sector. Any further growth of UCO on the Dutch biofuel market will therefore come from imported UCO of other waste and residues.

Import and export of UCO

In the Netherlands the trade data in UCO and animal fats show a net import volume, see Figure 13. The feedstocks are imported mainly from Germany and other Western European countries, but also from countries such as Canada and the US. In the period 2010-2012 imports increased, while the export volumes remained more or less have been stable, indicating a growing consumption of

UCO on the national fuel market, which is in line with the shift in feedstock use by the fuel suppliers included in the ranking. The Netherlands are seen to export UCO and animal fats mainly to Germany and other European countries.

Figure 13 **Trade balance of (used) oils and fat mixtures and other animal fats for the Netherlands**



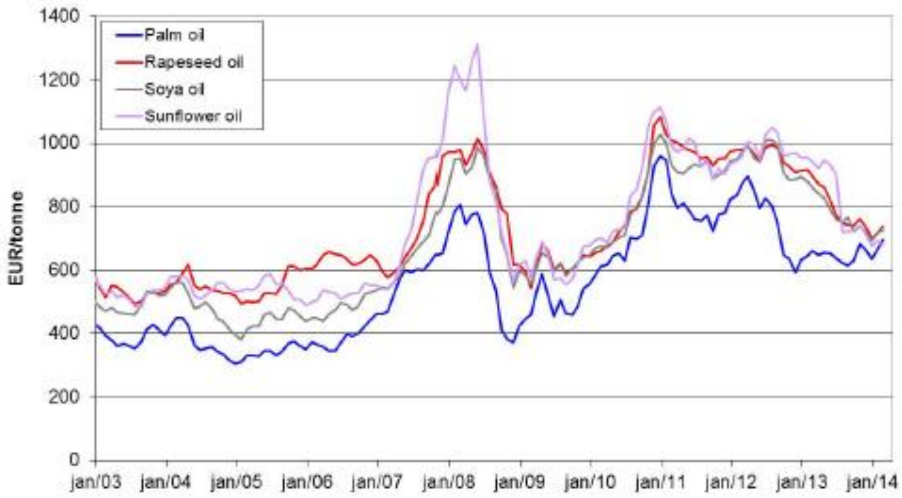
Source: Pelkmans et al. (2014).

UCO price developments

The high market demand for UCO in the Netherlands, mainly caused by policy incentives (the double counting in the biofuels obligation), in combination with the lack of sufficient UCO at the national level, results in several risks.
The various literature sources (Pelkmans, 2014)(Arup URS Consortium, 2014) (Ecofys, 2013) mention price increases, possible fraud and the fact that the current biofuels from waste and residues do not provide any incentive for investments in more advanced biofuels. The economic added value of double counting biofuels is difficult to predict and forecast and does not result in sufficient investment security to invest in more advanced biofuels (Arup URS Consortium, 2014). According to the same source a higher share of UCO in the fuel mix is only possible by imports from Asia, which is, like Indonesia, at the same time also a big supplier of virgin palm oil. UCO cannot chemically be distinguished from virgin oil, so that monitoring and verification has to depend on adequate processes for tracking and certification.

Note that UCO prices strongly depend on certification, quality and volume. Certified UCO has a higher market value (Pelkmans et al., 2014). According to this same source, the prices of UCO ranged from € 300-€ 500 per tonne in February 2014 and has been quite stable in the period before. Pelkmans et al. also refer to prices reported by Greenea (a broker in Europe specialised in waste-based feedstock and biodiesel). Greenea reported much higher prices ranging from € 500 to nearly € 800 per tonne. However, Pelkmans et al. (2014) state that as result of the declining prices of UCOME (processed UCO) the prices of UCO are still lower compared to the virgin oil prices presented in Figure 14.

Figure 14 **Evolution of vegetable oil prices, delivered in the Netherlands (based on FAOSTAT, 2014)**



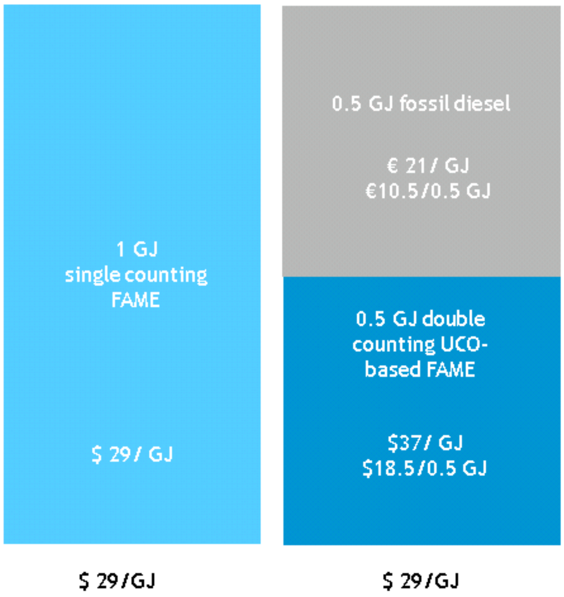
Although the above mentioned figures do not indicate the attractiveness of fraud, Arup URS Consortium (2014) states that based on data for the UK market, labelling new Indonesian palm oil as UCO increases the price by 5-20%. The authors also state that the value of double counting fuel is in principle two times the price premium of conventional biofuel over conventional fuels. This statement is illustrated by the following price indications taken from Platts (2013):

Table 9 **Premium prices to fossil diesel (Platts, 2013) in (Arup URS Consortium, 2014)**

	Dollar/GJ	Premium to fossil diesel (Dollar/GJ)
Fossil diesel	21	-
Vegetable oil FAME	29	8
UCO FAME	37	16

According to the authors this example shows that the UCO FAME has reached its maximum price premium over FAME produced from vegetable oil due to double price premium of $ 16/GJ compared to the $ 8/GJ. This is based on the assumption that blenders only need half the volume to comply with blending obligations in case of double counting biofuels. However, because the transport demand itself does not reduce by 50% the fossil diesel should also be taken into account in case of biofuels from waste and residues. This is illustrated in Figure 5.

Figure 15 Price structure for single and double counting biofuels from a fuel supplier perspective



As depicted in this figure, the compliance cost associated with 1 GJ of biodiesel (FAME, in this case) are equal for both single counting FAME and UCO based FAME in case the price premium of the double counting FAME is twice as high as the price premium for FAME. If the prices of UCO-based FAME would be higher than the $ 37/GJ it would cost a fuel supplier more to fulfil its blending obligation. Solely from an economic perspective, the fuel supplier will then prefer the single-courting FAME over the double-counting FAME. In practice, fuel suppliers might be willing to pay a higher price for UCO-based FAME if other considerations than economic consideration are taken into account, as discussed in the previous chapter, for example if a fuel supplier would rather not sell single counting FAME due to the sustainability concerns and ILUC impacts associated with the feedstock.

Using the cost example in the figure above, UCO-based FAME could deliver up to 27% ($ 37 compared to $ 29) more profit compared to FAME produced from virgin oils, which indicates it may be attractive to simply convert virgin oil into UCO before selling it on the market. To what extent it is indeed an attractive option depends on the actual cost of the various fuels and oils, but also on the cost associated with the conversion of the oils to FAME and the administrative burdens of certification processes.

(Pelkmans et al., 2014) addressed the potential issue that these price differentials might lead to fraud, but could not find conclusive evidence for this. The study does conclude, however, that some inconsistencies can be identified in the markets in previous years, and a uniform mechanism at EU-level is needed for tracing and verification, to reduce unclarities.

4 Conclusions and recommendations

4.1 Conclusions

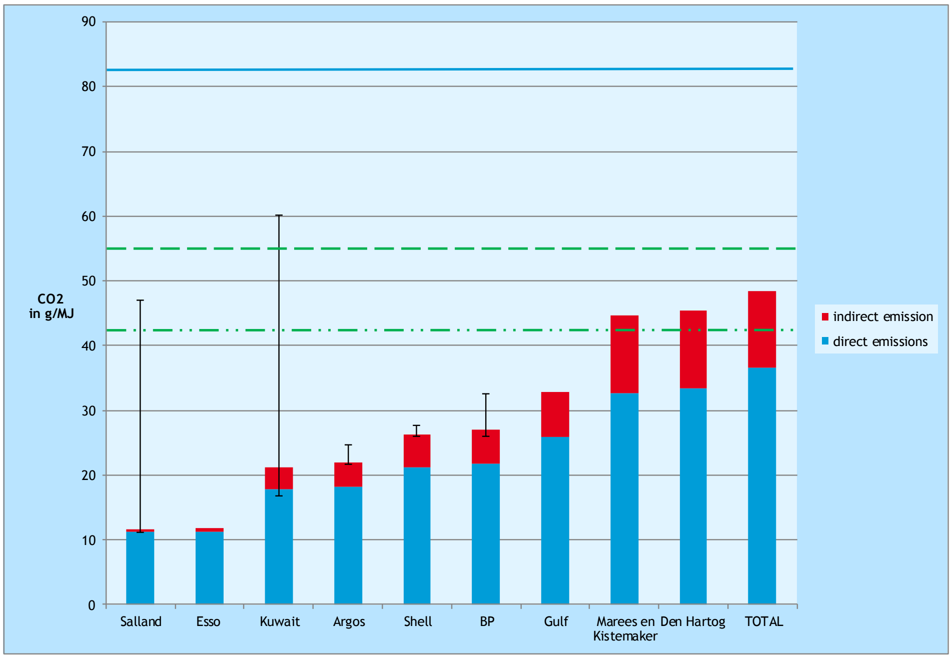
The new ranking of fuel suppliers

Based on the data for 2013, the following conclusions can be drawn for biofuels consumed in the Netherlands:

- **Overall improvements in GHG performance:** Compared to 2011 and 2012, the large majority of the fuel suppliers reduced their average GHG emission factor and thus improved the GHG performance of their biofuels. The only exception is Argos, who already had a relatively good performance in 2011 and 2012, and now also in 2013.
- **The ranking:** The biofuels that Salland and Esso sold to the Dutch market had the lowest average GHG emissions, achieving average GHG savings of about 85%. Marees en Kistemaker, Den Hartog and TOTAL had the highest average emissions, about 50% of that of the fossil fuels they replace. Part of this is due to the different types of biofuels they blend and the associated production technology and capacity: the low emissions are typically achieved by using used cooking oil and animal fat for biodiesel production, whereas production capacity of bioethanol (a petrol replacement) from waste and residues is still very limited.
- **Changes compared to last year:** Some companies shifted in the ranking, not because the average GHG intensity of their biofuels worsened, but because other companies managed to improve the GHG intensity of their biofuels even more. Due to changes in feedstock use in the last years, Esso moved from the highest average GHG intensity of the ranking (in 2011) to almost the lowest average GHG intensity of the ranking today.
- **Uncertainties:** The GHG performance of the biofuels brought on the market by some of the fuel suppliers is still uncertain due to a lack of transparency concerning the category ‘other feedstocks’. Compared to the previous years, the category ‘unknown’ has dropped to 0%. Also, volumes of the claimed biofuels are not reported on individual company-level, making it impossible to rank the biofuel suppliers on a more absolute scale.
- **A declining role for biodiesel from food crops:** this has been the first year with no biodiesel from food crops in the list of the seven feedstocks mostly used. It is clear the fuel suppliers are shifting away from virgin oils as feedstock for biofuels, as far as the Dutch market is concerned.
- **Origin of the feedstocks:** compared to previous years the share of feedstocks from within the EU is still increasing.
- **Role of biofuels from waste and residues:** the role of biofuels from waste and residues is still increasing. Some new double counting feedstocks like wheat straw have appeared on the list of the seven feedstocks mostly used.

The overall results of the ranking are shown in Figure 16.

Figure 16 Ranking of fuel suppliers based on total GHG emissions of the seven biofuels mostly used in 2013



* The dotted green lines represent a 35 and 50% reduction of GHG emissions compared to the fossil fuel reference (83.8 gCO_2/MJ, blue line). From 2010 onwards, a minimum of 35% savings is required, from 2017 onwards, this increases to 50% (RED requirements).

Biofuel production in the Netherlands

Besides the fuel suppliers bringing biofuels on the Dutch market, the Dutch biofuel sector also consist of biofuel producers. These are not obliged to report on the mix of feedstocks they use used for their production process, so this market is much less transparent.

In 2013, about 1,375 kton of biodiesel was produced in the Netherlands, and 414 ktoe of ethanol (compared to a consumption of 220 kton and 194 kton, respectively). Overall, the Netherlands is a large importer and exporter of biofuels. Many production facilities were planned and realized before the sustainability concerns related to ILUC started to dominate biofuel policy, and these still use a large share of land based feedstocks. Because of a delay of a policy decision on ILUC and due to current lack of a long term policy framework for biofuels after 2020 only a few biofuel production facilities have been realised in the period after 2011. These few new facilities mainly focused on the conversion of waste and residues, while the food-crop oriented facilities, are still operational, albeit not on full capacity.

The role of land-based biofuels in the Dutch biofuel trade

Although the role of land based biofuels to meet the blending obligation is still declining, Dutch biofuel producers still contribute to the consumption of land based biofuels: they have a significant role in biofuel trade, and produce for other European countries that still have much higher shares of biofuels from land-based feedstocks in their mix. For example, the volumes of palm oil in biofuel import and export have increased in the period up to 2012, despite a declining demand for the Dutch market.

The biofuels produced in the Netherlands are likely to have a poorer average GHG performance compared to the biofuels brought on the market by the fuel suppliers, because of their higher share of land-based feedstock and the associated ILUC emissions. However, this performance can not be quantified.

Biofuels from waste and residues

The incentive of double counting in the biofuels obligation in the Netherlands creates a number of risks related to fraud and price impacts on other applications. Because the Netherlands do not have sufficient waste and residues such as UCO to fulfil demand, these feedstocks are also imported. Whether this indeed leads to fraud or other undesired impacts is, however, unknown.

4.2 Recommendations

A number or recommendations can be provided that can further increase transparency of the origin and environmental impacts of the biofuels that are consumed in the Netherlands, for each fuel supplier.

– There is still a data gap due to the methodology of the NEa reports, where only the data on the top 7 feedstocks (animal fat, UCO, corn, sugarcane, wheat, sugar beet and wheat straw) are provided. This results in relatively large uncertainties for some of the fuel suppliers, as they use ‘other types of feedstock’ that are not in this top 7. It is therefore recommended to provide full disclosure of the range of feedstocks used, also to enable the assessment of the average GHG savings that these suppliers achieve.
– It is currently only possible to estimate average GHG emission factors of the biofuels of the various fuel suppliers. To assess the actual GHG savings that they achieve with the biofuels they blend, information on the volumes of biofuel (feedstocks) imported and consumed need to be provided, on company level.
– The national legislation and definition of which biofuels are double counted should be harmonised in the EU. Different policies encourage trade and transport of waste and residues between Member States, as they are double counted in one country but not in another (see, for example, the UCO trade from Germany to the Netherlands).
– Transparency helps to incentivise fuel suppliers to supply biofuels that exceeds the minimum criteria set in the RED. Whilst this effect can not be quantified, it is recommended to roll out this transparency and annual reporting throughout the EU, to maximise the effect and enable European monitoring and reporting on this level.
– It is furthermore recommended to also increase transparency of biofuel production and trade, to get insight into whether the biofuels produced and traded in the Netherlands meet sustainability criteria, and to enable monitoring of the feedstocks used, the countries of origin and overall GHG emission factors of the biofuels produced in the Netherlands.

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