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Sustainable biofuels and bioliquids 2013

Sustainable biofuels

The sustainability criteria for biofuels aim to reduce greenhouse gas (GHG) emissions and ensure that no areas with high biological values have been damaged as a consequence of the production of renewable fuels. During the spring of 2014, the economic operators with a reporting obligation submitted their annual reports. The reports described the quantities of sustainable biofuels and bioliquids used in Sweden in 2013. Biofuels are used in the transport sector.

Emission reduction of 1.95 million tonnes

Biofuels used in 2013 include ethanol, FAME (fatty acid methyl ester), HVO (hydrogenated vegetable oil), biogas (gas and liquid form), ETBE (Ethyl tert-butyl ether) and DME (dimethyl ether). The biofuels that were used in the largest quantities were HVO, FAME and ethanol. The total quantity of sustainable biofuels is equivalent to almost 9.7 TWh, an increase by 30 per cent since 2012, when 7.3 TWh of biofuels were used.

In total, the biofuel use in Sweden implies emission reductions of 1.95 million tonnes of CO_2 equivalents compared to if corresponding amounts of fossil fuels were used, see table 1. The emissions from the cultivation of biomass often constitute a large proportion of the total emissions from biofuels from a lifecycle perspective.

The use of HVO increased considerably

During 2013, the amounts of HVO that were used in Sweden almost tripled compared to 2012, making HVO the most common biofuel. The amounts of FAME also increased, whereas the quantities of ethanol decreased. Most of the feedstock that was used for the production of biofuels was cultivated in Europe. However, some of the biofuels have their origin in South East Asia, Australia and Latin America. None of the feedstock that was used for the production of biofuels was cultivated in Africa.

Table 1 – Amounts of biofuels and the corresponding emission reductions.

Fuel category	Energy amount [GWh]			Emission reduction [TON CO_{2EQ}]		
	2011	2012	2013	2011	2012	2013
HVO	320	1 300	3 729	85 450	332 800	911 100
FAME	2 205	2 780	3 009	299 300	389 200	430 500
Ethanol	2 286	2 255	2 060	419 100	416 700	405 300
Biogas, gas form	728	917	834	139 700	210 700	192 900
Biogas, liquid form		14	36	0	2 383	6 260
ETBE	19	43	10	3 089	6 993	1 766
DME	>0	3	2	24	591	357
Total sum	**5 558**	**7 312**	**9 680**	**946 700**	**1 359 000**	**1 948 000**

Social and economic sustainability

33 per cent of the biofuel quantities also meet certain requirements for social and economic sustainability which are not included in the sustainability criteria of the Renewable Energy Directive. These quantities have been certified by one of the 19 certification schemes that have been approved by the EU Commission.

Increased use of wastes and residues

The amount of biofuels that are produced from wastes and residues have increased slightly since 2012. Almost one third of the biofuels on the Swedish market are now produced from wastes and residues. This amount consists almost exclusively of HVO and biogas. HVO is to a large extent produced from crude tall oil and slaughterhouse waste.

The biofuels that are produced from wastes and residues are double-counted towards the target of 10 per cent renewable energy in the transport sector 2020.

Large share of cereals as ethanol feedstock

For the ethanol used in Sweden during 2013, the average emission reduction varies between 53 and 96 per cent depending on feedstock. As in previous years, most ethanol comes from cereals, see figure 1. The feedstock base for ethanol has changed compared with the quantities reported for 2012. The use of sugarcane as a feedstock for ethanol has increased considerably, and is now larger than in 2011. The feedstock for one quarter of the ethanol originates in Sweden, see figure 2.

Figure 1 – Feedstock for ethanol

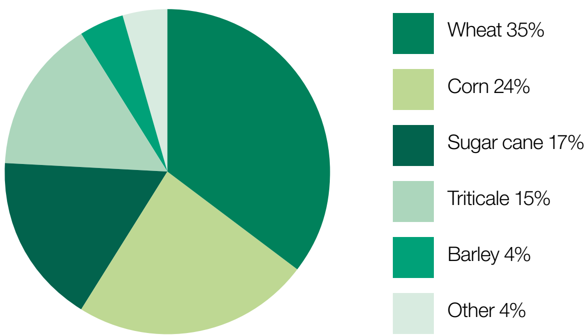
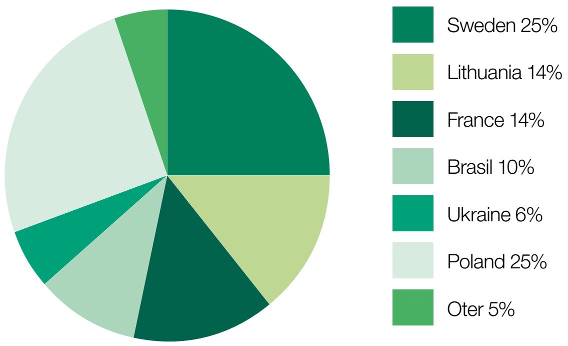


Figure 2 – Country of origin for ethanol feedstock



High emission reductions of HVO

Previous years, HVO has mainly been based on tall oil. During 2013 the quantities of HVO from slaughterhouse wastes increased distinctly, see figure 3. Also, the amount of HVO based on Indonesian and Malaysian palm oil increased and equal 19 per cent, all of which is certified under ISCC EU.

The average emission reduction from palm oil HVO is 51 per cent. The rest of the HVO has average emission reductions between 87 and 89 per cent, depending on feedstock. Sweden is still the main country of origin, see figure 4.

Increased amounts of FAME from outside of Europe

The FAME used in Sweden during 2013 has been produced from rapeseed with an average emission reduction of 43 per cent. Europe is still the dominant area of origin for the feedstock but Australia has increased and was reported as origin for one fifth of the FAME.

Biogas is produced from wastes and residues

Biogas intended for transport is subject to the sustainability criteria. The biogas is produced from a variety of feedstock which in most cases is waste or residues. The biogas produced from manure yields the best emissions reduction, more than 80 per cent, while cultivated biomass gives lower emission reductions. For example, maize has an average emission reduction of 48 per cent.

Figure 3 – Feedstock for HVO

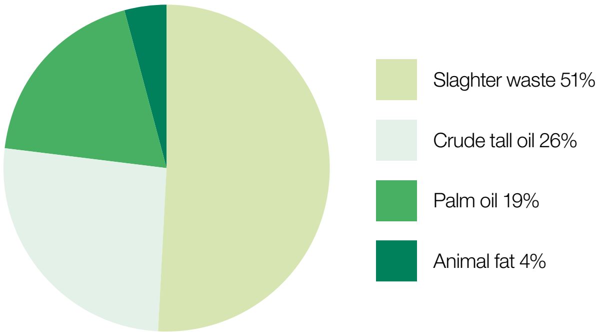


Figure 4 – Country of origin for HVO

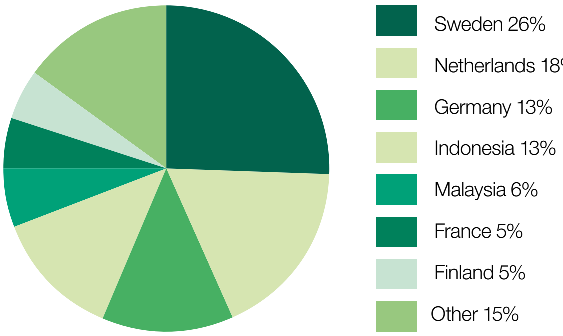


Figure 5 – Country of origin for FAME feedstock

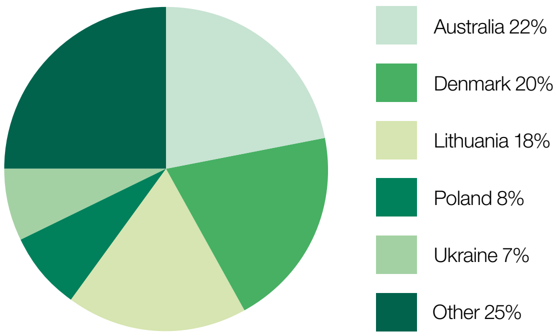
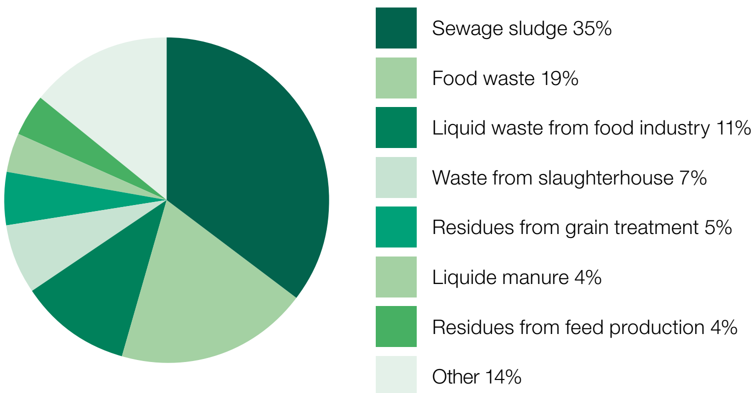


Figure 6 – Feedstock for the sustainable biogas



1 International Sustainability and Carbon Certification

Sustainable bioliquids

The sustainability criteria for bioliquids aim to reduce greenhouse gas (GHG) emissions and to ensure that no areas with high biological values have been damaged as a consequence of the renewable fuels production. During spring 2014 the economic operators with a reporting obligation submitted their annual reports. The reports described the quantities of sustainable biofuels and bioliquids used in Sweden in 2013. Bioliquids are deployed for heating purposes in industry and heat as well as to some extent for electricity generation in combined heat and power plants and industry.

Bioliquids from industrial residues and waste oils

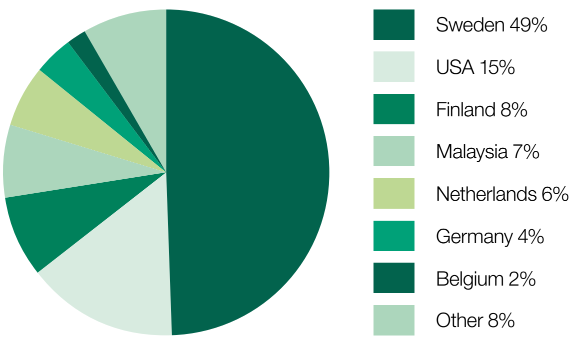
Feedstock for bioliquids consists primarily of industrial residues and waste oils with the largest share coming from the forest industry in the form of tall oil pitch, tall oil and methanol. Another common residue is a so-called MFA (mixed fatty acid) that can occur in several different types of plants.

Less feedstock originated in the Netherlands

The feedstock's country of origin is normally the country where the cultivation of biomass occurred. Meanwhile, for wastes and residues origin means the country where the material is arising, for example, from an industrial process.

In 2013, half of the bioliquids used in Sweden also had their feedstock origin in Sweden, see figure 7. Previous years, the Netherlands have been reported as country of origin for relatively large amounts of bioliquids. The reason is probably that traceability hasn't been fully implemented in some companies' control systems. As a result of the supervision of the Swedish Energy Agency, the amounts that are reported with Netherlands as origin have decreased.

Figure 7 - Country of origin for bioliquids



Emission reduction of 1.2 million tonnes

The emission reduction for bioliquids is generally high, in some cases close to or at 100 per cent. This is due to the fact that the calculation of emission reduction for residues and wastes starts from the point where the material occurs. In many cases this implies that only the transport of the bioliquid is included in the calculation of lifecycle emissions. For methanol and tall oil the residue occurs in the same plant where it is later used. In these cases there is no transport and therefore the emission reduction achieved can be as high as 100 per cent.
The average emission reductions for MFA and tall oil pitch are 95 and 97 per cent respectively. The total emission reduction is 1.2 million tonnes of CO_2 equivalents for the bioliquids.

Table 2 – Amounts of bioliquids and the corresponding emission reductions.

Liquid biofuel (rest products and waste)	Energy amount [GWh]	Energy amount [%]	Emission reduction [TON CO_{2EQ}]
Bioliquid			
Tall oil pitch	2 425	53	652 712
MFA (Mixed Fatty Acid)	1 269	28	332 790
Tall oil	413	9,0	113 311
Other	110	2,4	29 221
FAME			
Rape seed oil	16	0,3	2 406
Other	1	0,0	268
Methanol			
Raw methanol	344	7,5	94 954
Total Sum	**4 580**	**100**	**1 226 000**

A sustainable energy system benefits society
The Swedish Energy Agency works for a sustainable energy system, combining ecological sustainability, competitiveness and security of supply.

For a more efficient use, the Agency supports the development and dissemination of knowledge targeted at households, industry, and the public sector.

The Agency finances research for new and renewable energy technologies, smart grids, and vehicles and transport fuels of the future. The Agency supports commercialisation and growth of energy related cleantech.

With the aim of attaining energy and climate objectives, the Agency participates in international collaboration and manages instruments such as the EU Emission Trading System and the Electricity Certificate System. The Agency also provides energy system analysis, energy forecasts and official energy statistics.

Swedish Energy Agency

Swedish Energy Agency, Box 310, SE-631 04 Eskilstuna
Telephone +46 16-544 20 00, Fax +46 16-544 20 99
E-mail registrator@energimyndigheten.se
www.swedishenergyagency.se

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