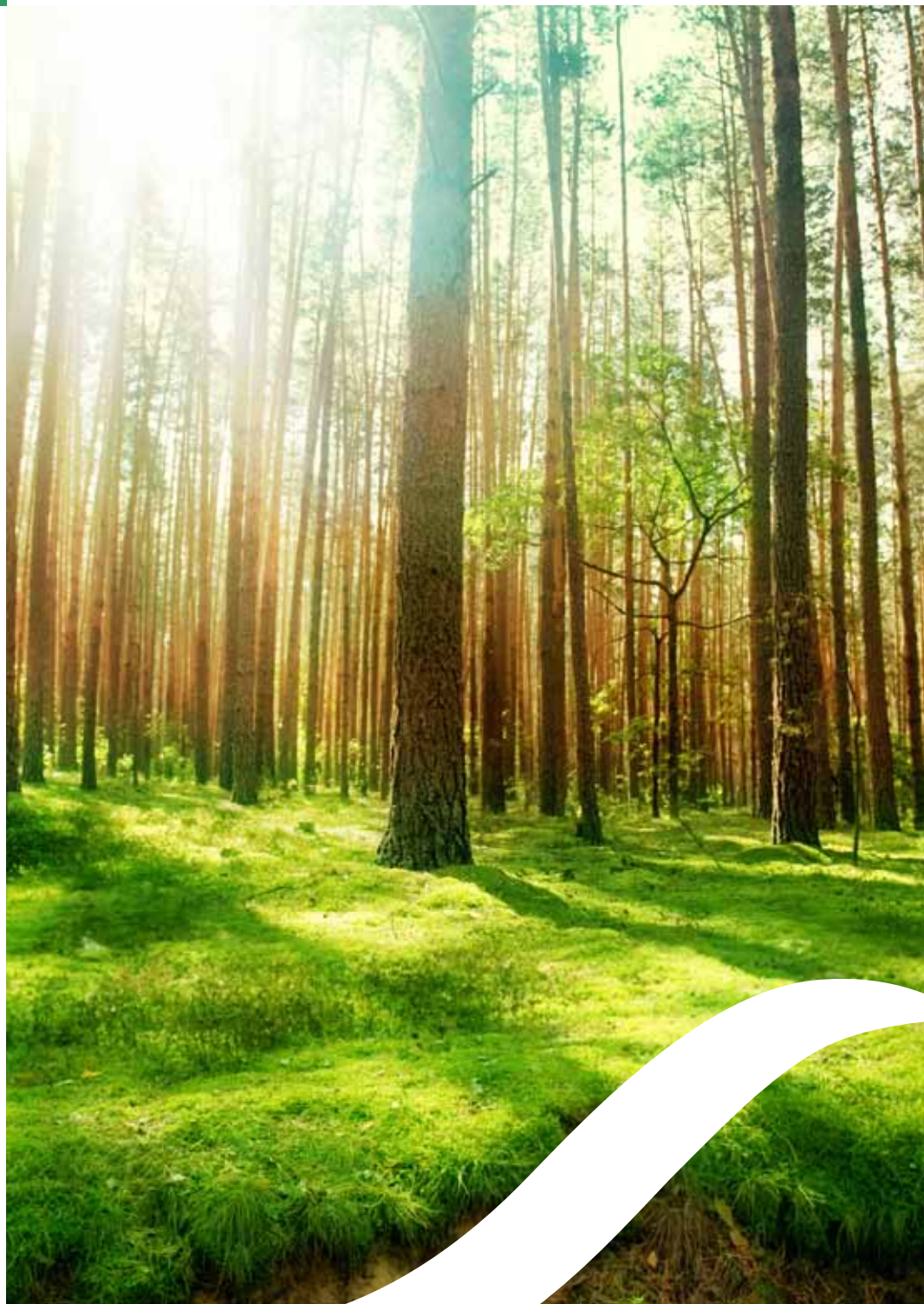



# **Sustainable biofuels 2011**





*The sustainability criteria for biofuels and bioliquids aim to reduce greenhouse gas (GHG) emissions and ensure that no areas with high biological values have been damaged as a consequence of the renewable fuels production. During the spring of 2012, economic operators with a reporting obligation concerning biofuels and bioliquids in Sweden submitted their annual reports for the first time. The reports described the quantities of sustainable biofuels and bioliquids used in Sweden in 2011.*

#### **Emission reduction of 940 000 tonnes**

Biofuels used in 2011 include ethanol, FAME (fatty acid methyl ester), biogas, HVO (hydrogenated vegetable oil), ETBE (Ethyl tert-butyl ether) and DME (dimethyl ether). The total amount of sustainable biofuels is equivalent to 5.5 TWh. None of the feedstock that was used for the production of biofuels was cultivated in Africa or Oceania, almost none in Asia and very little in Latin America

other than in Brazil, in order to supply the Swedish biofuel market. Most of the feedstock was cultivated in Europe.

The current requirement on emission reductions is set at 35 per cent compared to a fossil comparator; however, half of the reported biofuels in Sweden already fulfil the 50 per cent reduction requirement that comes into force in 2017.

FUEL CATEGORY	ENERGY AMOUNT [GWH]	SUSTAINABLE QUANTITY [M³]	EMISSION REDUCTION [TON CO <sub>2EQ</sub> ]
Etanol	2 274	388 423	416 887
FAME	2 183	237 320	296 348
Biogas in gas form	724	74 526 328	138 812
HVO	320	34 902	85 351
ETBE	19	2 830	3 089
DME*	>0	>0	
<b>Verified sustainable</b>	<b>5 520</b>		<b>940 487</b>
<b>Non-verified sustainable**</b>	<b>540</b>		
<b>Total sum</b>	<b>6 061</b>		

\* Cannot be disclosed due to confidentiality.

\*\* This non-verified sustainable amount is the sum of all fuel categories.

Non-verified sustainable can imply for example feedstock bought before the legislation came into force.

## Feedstock and emissions reduction

The most common biofuels are ethanol and FAME. The emissions from the cultivation of biomass often constitute a large proportion of the total emissions from biofuels from a lifecycle perspective.

Depending on the feedstock, the average emission reduction from ethanol varies between 50 and 80 per cent. The ethanol delivered in 2011 was derived from eleven different types of feedstock, one third of which originated in Sweden. Europe is the main area of origin for the remaining part.

Nearly all the sustainable FAME used in Sweden has been produced from rapeseed with an emission reduction of 38 per cent. Europe is the dominant area of origin for the feedstock as well.

HVO is mainly based on tall oil, which is a residue from the forest industry. The average emission reduction is 88 per cent.

Only 8 per cent of biofuels, besides biogas, have been produced from residues, then mainly from the forest industry. These are, for example, brown liquor, black liquor and crude tall oil used to produce ethanol, DME and HVO respectively; as well as vegetable and animal waste oil and molasses from sugar beet, that have been used to produce FAME and ethanol respectively.

Biogas intended for transport is subject to the sustainability criteria. Swedish feedstock contributed to 89 per cent of the biogas for transport in 2011. 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. Cultivated biomass such as barley, rye, corn and ley crops give the lowest emission reduction, 40-60 per cent.

Approximately 25 per cent of biofuel quantities also meet certain requirements for social and economic sustainability by having been certified under one of the EU-Commission's eight approved voluntary certification schemes.

Figure 1 - Feedstock for ethanol

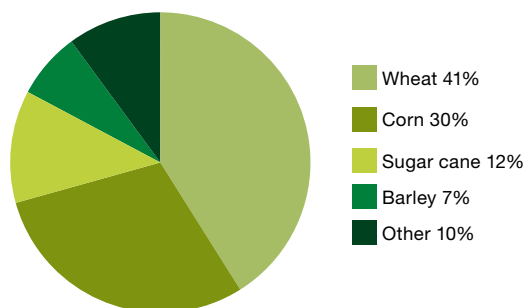


Figure 2 - Country of origin for ethanol feedstock

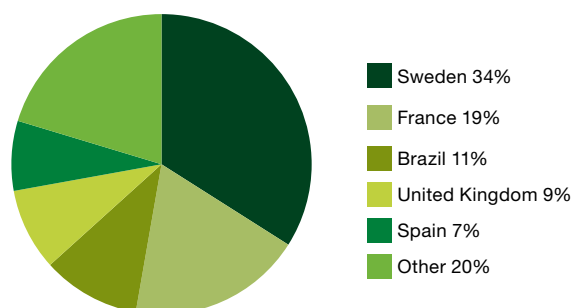


Figure 3 - Country of origin for FAME feedstock

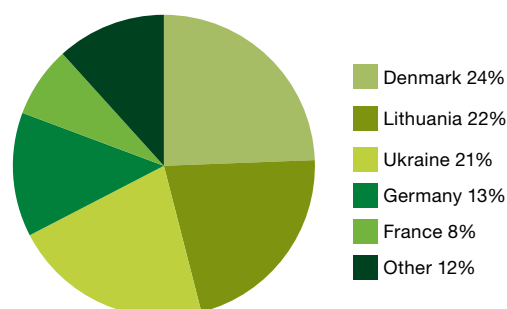
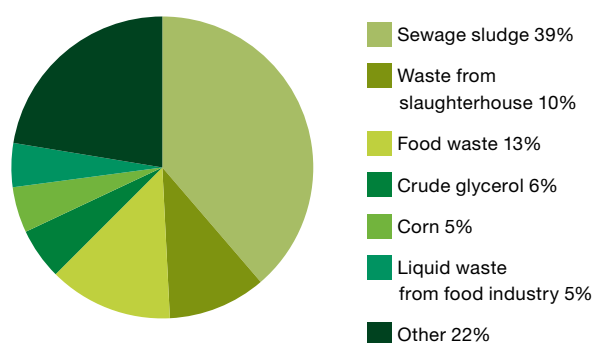


Figure 4 - Feedstock for the sustainable biogas





### **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 energy 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.



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