UNION ZUR FÖRDERUNG VON OEL- UND PROTEINPFLANZEN E.V.

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UFOP Report on Global Market Supply 2017/2018

European and world demand for biomass for the purpose of biofuel production in relation to supply in the food and feedstuff markets

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UFOP report on global market supply – there's enough for everyone!

For the revised version of our report on the supply situation in the international markets, I can conclude that global harvests are more than adequate for feeding the world population. This report confirms again: 'There's enough for everyone!'

And rightfully so! With this statement, the German world hunger aid agency 'Welthungerhilfe', acting as a representative of many aid organisations, promotes the solidarity necessary to eliminate hunger and malnutrition and to support the development of independent and sustainable strategies for local food production.

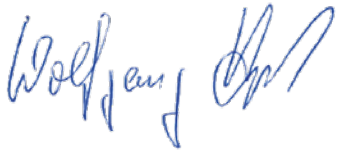
However, the sustainability of global agricultural production cannot be measured solely in terms of yield improvement, especially if leading agricultural export nations in South America and East Asia 'produce' this result at the expense of biodiversity and biotope conservation. The price pressure triggered by these quantities is felt worldwide by all farmers. The report reiterates the oversupply of the main agricultural commodities, in particular grains and vegetable oils. As a result, producer prices are under long-term pressure and are therefore not effective in terms of sustainable business development. Sustainability also means that adequate income can be earned to cover the cost of living, capital formation and investment costs.

In Germany, the producer price for bread wheat is around EUR 160 per metric ton. The energy value of this grain quantity is equivalent to about 400 litres of heating oil or about EUR 220 per metric ton, depending on the current price of heating oil. 'Burning' it would therefore make more economical sense than marketing it as bread wheat. I would like to point out that there is a generally undesirable development in producer prices, knowing that, of course, purchasing power must also be taken into account.

In the shopping carts of industrialised countries and large agricultural export nations, the share of agricultural raw materials for material and energy use is increasing. This development is also presented in the report in connection with the internationally binding goal of limiting global warming to a maximum of 2 degrees, or better yet 1.5 degrees, by 2050.

In my opinion, insufficient attention is directed towards the importance of biomass production or the opportunities associated with this commitment, especially for agriculture as a supplier of sustainably produced carbon sources. This was recently made clear again at the UN Climate Change Conference in Bonn, Germany (COP23).

With the specifications of legally enshrined criteria, the European biofuels policy leads the way, from the dated biomass origin (January 2008) to the proof of greenhouse gas reduction compared to fossil fuel (at least 60 % from 2018 on). There is room for improvement in social aspects, as the European Court of Auditors rightly criticised in its report. It is crucial that certified evidence is a precondition for market access to the European Union, but so far only for biofuel use. It is appropriate that demand has been raised for these criteria in order to create a 'framework' for fair global competition, regardless of the intended use of the raw material. In Germany, the entire rapeseed crop is recorded as sustainably certified. The rapeseed oil (canola oil) produced from it, as well as the non-GMO protein component, rapeseed meal, are sustainably certified. The environmental organisations should also do their part in exercising pressure in this regard. Because in the end, I think, the common interest is obvious.



» Wolfgang Vogel

Chairman of the UFOP Executive Board

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Editorial department, charts and descriptions:

Agricultural Market Information Company (AMI)
Department plant production
In Charge: Wienke von Schenck

www.ami-informiert.de

1 Feedstock supply

1.1 How much grain is produced on a global scale?

» 1.1.1 Global grain production

As a result of progress in plant breeding, expansions in overall area and improvement of agricultural production practices (fertiliser applications, pest and disease control, reduced losses at harvest and in storage), world grain production has continuously increased over the past decades.

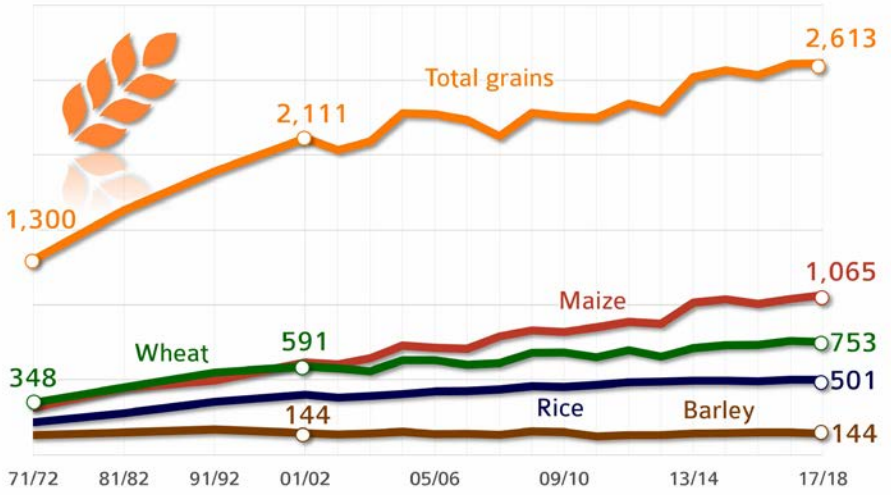
Since 1961/62, harvests of barley, oat, millet, maize, rice, rye and wheat have tripled. Bumper crops in many production regions have led to oversupply on the markets.

The number one grain is maize, reflecting its globally increasing importance in the feed sector. Like barley, maize is mainly used as livestock feed. By contrast, rice and wheat are predominantly used in human diets.

With the exception of barley, global output of the different grains is set to increase in 2017/18. As a result, total output will rise to the record level of 2.613 billion tonnes (2016/17 marketing year: 2.573 billion tonnes).

World grain production increases to 2.6 billion tonnes

Production of grains, total and by major crops, worldwide, 2017/18, estimated, in million tonnes



Total grains = maize, wheat, barley, rice, rye, oat, sorghum

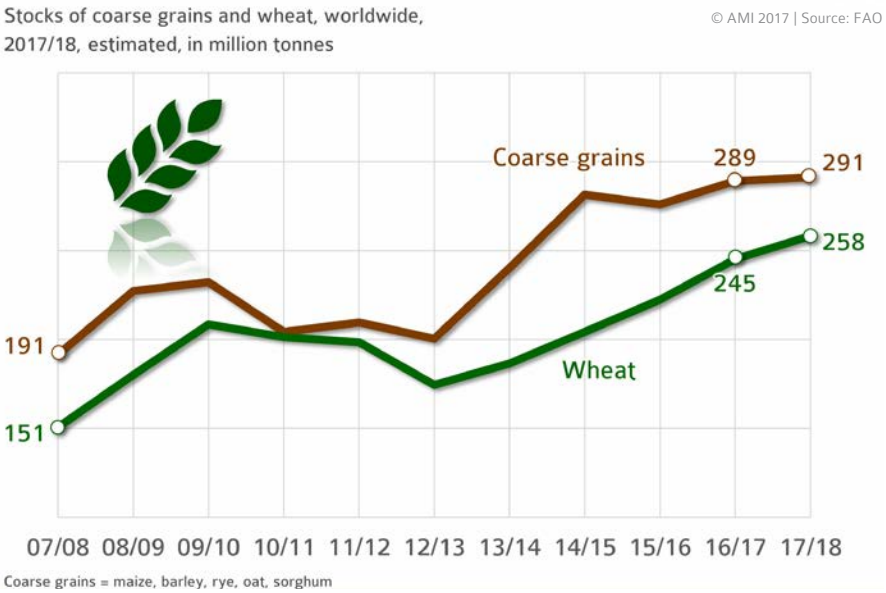
1.1 How much grain is produced on a global scale?

» 1.1.2 Global stocks of grains

Due to significant harvest increases in grain cultivation, world grain stocks have grown considerably. In most areas in several consecutive, production of wheat, maize and coarse grains has consistently exceeded consumption. Stocks that are left at the end of a marketing year are the ending stocks that, as beginning stocks, ensure supply at the beginning of the following marketing year.

Over the past five years, stocks of the different kinds of grain have increased by 50 per cent. Current wheat stocks are sufficient to supply the world with wheat for 128 days. Stocks of coarse grains would cover global demand for 79 days.

Global grain stocks increase to just under 550 million tonnes



1.1 How much grain is produced on a global scale?

» 1.1.3 Global grain supply

The ratio of supplies to consumption (also called the stock-to-use ratio) is a key figure in estimating supply and, consequently, potential price trends.

Large stocks indicate security of supply on the one hand, but they also put pressure on prices. In other words, the absolute level of global stocks of coarse grains shows, for example, that stocks at 291 million tonnes in 2017/18 were up just less than 2 million tonnes from a year earlier.

Supply and demand estimate based on the stock-to-use ratio

1.2 How much oilseed and vegetable oil is produced on a global scale?

» 1.2.1 Global oilseed production

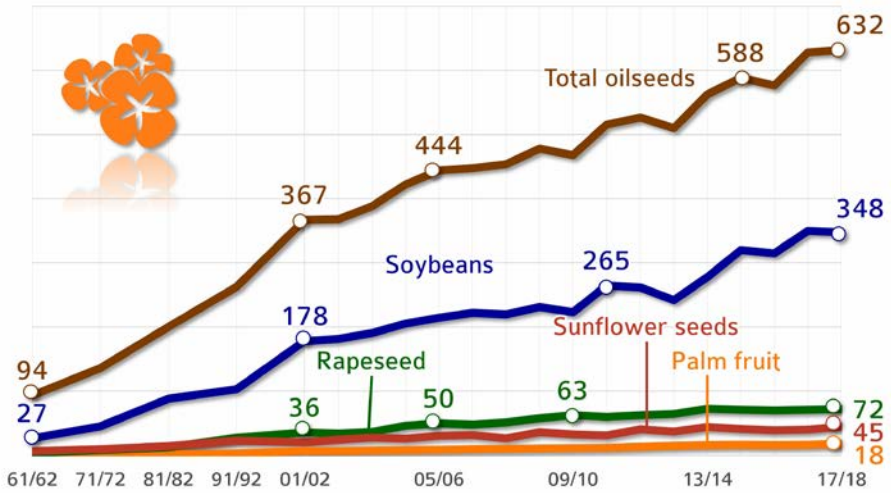
World oilseed production is projected to reach a new high at more than 632 million tonnes in 2017/18.

Global rise in demand for high-quality feed protein is a key driver of North and South American soybean production and the main reason for the expansion in cultivation area. On a global scale, soybean is the number one oilseed crop, accounting for more than 55 per cent of world oilseed production.

Oilseed crops differ in oil and protein content as well as fatty acid composition and protein quality, along with their climate and soil requirements. Consequently, these factors are the main determinants of pricing in oilseeds. This especially applies to protein quality because of the global deficit in protein. In this sense, soy is the most valuable source of protein in terms of quality. For this reason, rapeseed breeders are working intensively on improving the protein quality of rapeseed.

Soybeans are the world's no. 1 oilseed crop

Production of oilseed crops, total and by major oilseed crop, worldwide, 2017/18, estimated, in million tonnes



Total oilseeds = soybeans, rapeseed/canola, sunflower seeds, palm fruit, peanuts, coconut, cotton

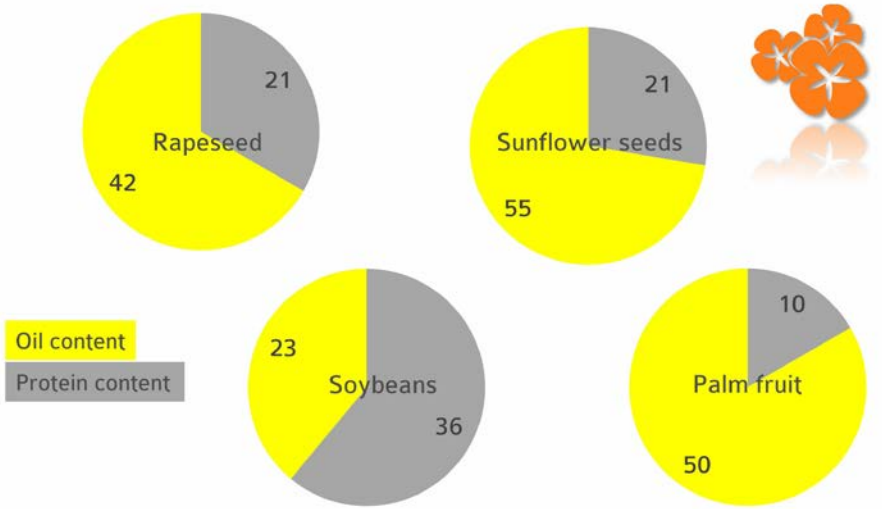
1.2 How much oilseed and vegetable oil is produced on a global scale?

» 1.2.1 Global oilseed production

↳ 1.2.1.1 Composition of oilseed crops

Sunflowers have the highest oil content

Proportion of pure protein and oil in different oilseed crops, in per cent



1.2 How much oilseed and vegetable oil is produced on a global scale?

» 1.2.2 Global vegetable oil production

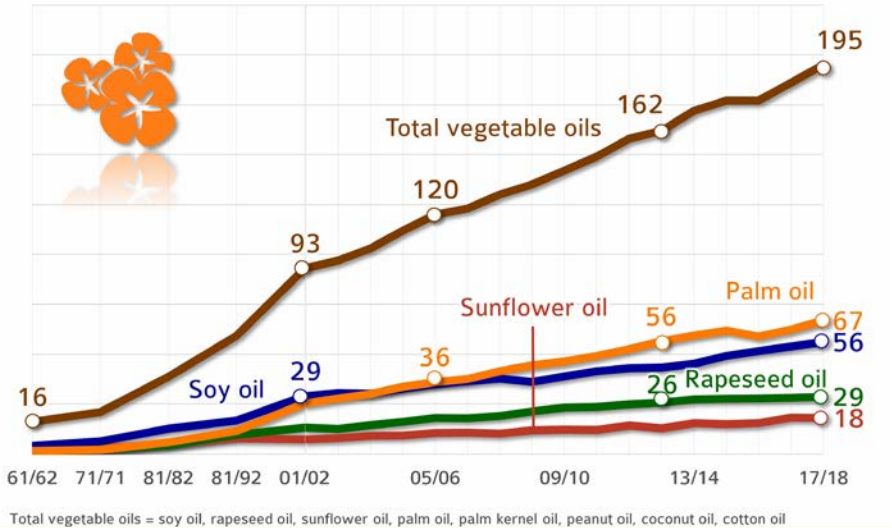
Vegetable oil production has seen a rapid rise over the past decades. Production of vegetable oil from the eight key oil-yielding crops will amount to approximately 195 million tonnes in the 2017/18 marketing year. This was just over twice the amount at the turn of the millennium.

Palm and soybean oil together are the most important vegetable oils, accounting for just less than 63 per cent of global output. Rapeseed oil occupied third place, accounting for almost 15 per cent, followed by sunflower oil, which accounted for just over 9 per cent of world output.

Vegetable oils are not only used in human diets, but also as a feedstock for transport fuel production and other industrial purposes, such as soaps, surfactants for use in detergent production, operating supplies such as lubricating and hydraulic oils, abherents for industrial uses or base substance for cosmetic products.

Palm oil strengthens its top position

Production of vegetable oils, total and by major oilseed crop, worldwide, 2017/18, estimated, in million tonnes



Total vegetable oils = soy oil, rapeseed oil, sunflower oil, palm oil, palm kernel oil, peanut oil, coconut oil, cotton oil

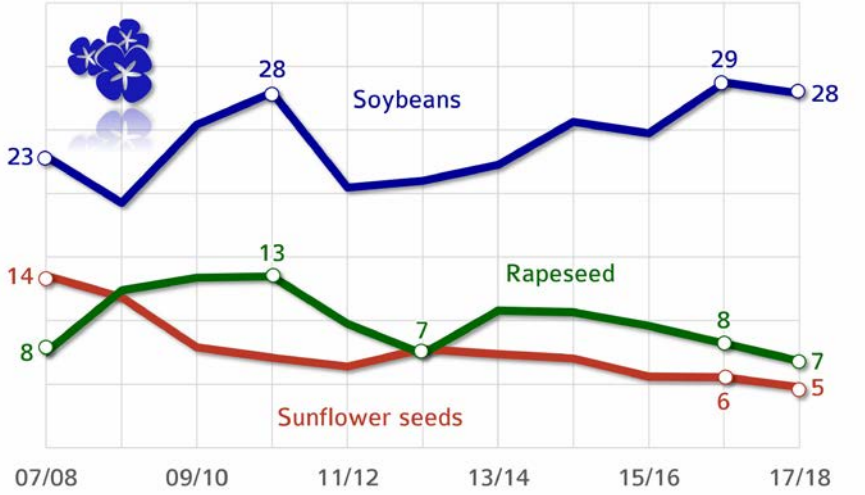
1.2 How much oilseed and vegetable oil is produced on a global scale?

» 1.2.3 Global oilseed supply

Contrary to grain, the stock-to-use ratio of the key oilseed crops has been on the decline for years now. Although production of oilseeds, especially soybeans, has grown continuously, the supply and demand balance is relatively tight, because demand is also rising sharply. The reason is the steady increase in demand for soy protein for use in animal feed, especially in China. The economy of this highly populated country, and consequently spending power, are growing, and, with that, demand for meat and also for oilseed meal used in animal feeds. Although this development is at the cost of oilseed stocks, price dynamics are more intense than they are in the case of wheat, which has benefits for German and EU-28 rapeseed production. On the other hand, the fact that – unlike rapeseed – large amounts of soybeans are harvested in both the northern and the southern hemisphere has a stabilising effect on prices. Consequently, the prevailing conditions at the time of sowing and harvest prospects are the main determinants of the volume of contracts concluded in the commodities futures markets and what these agree. This is why these markets are also frequently called weather markets.

Tight supply of rapeseed and sunflower seed

Stock-to-use ratio of soybeans, rapeseed and sunflowers, worldwide, 2017/18, estimated, in per cent



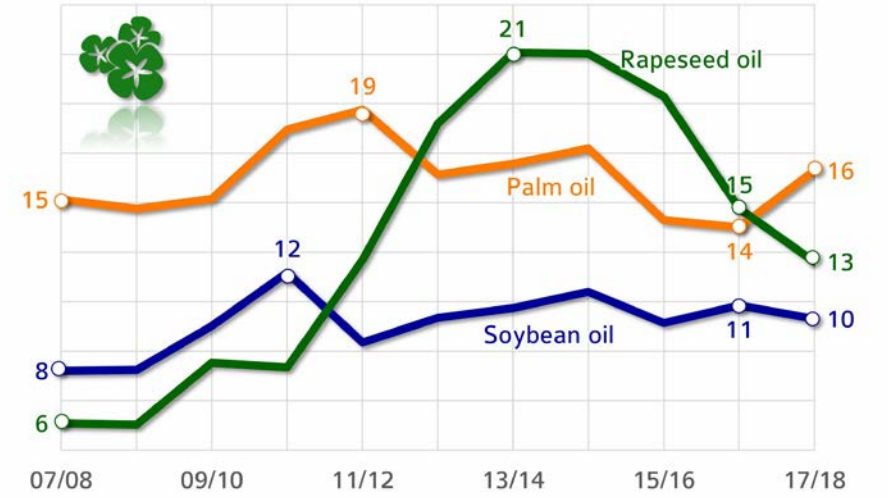
1.2 How much oilseed and vegetable oil is produced on a global scale?

» 1.2.3 Global oilseed supply

↳ 1.2.3.1 Global vegetable oil supply

Rapeseed oil supply declines sharply

Stock-to-use ratio of rapeseed oil, palm oil and soybean oil, worldwide, 2017/18, estimated, in per cent



1.3 How much oilseed and grain (including rice) does each continent produce?

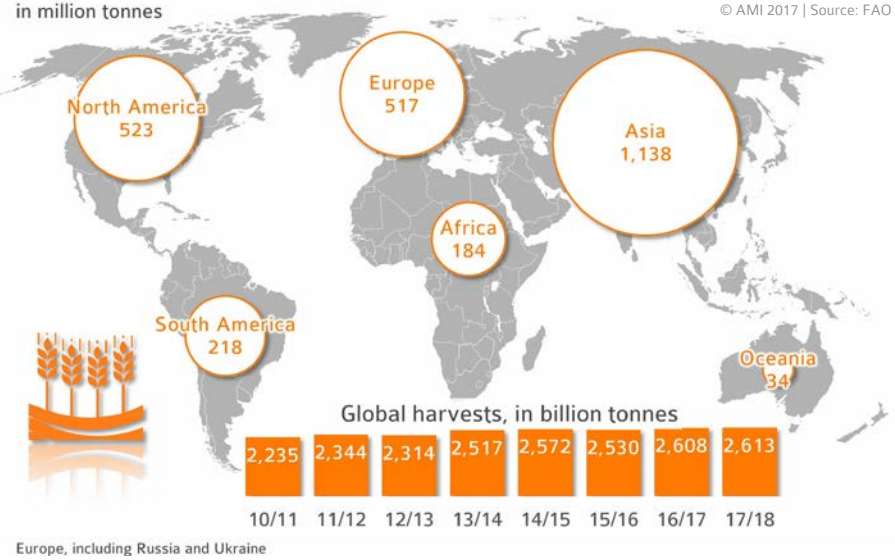
» 1.3.1 Production of grain

World production of grain (including rice) is set to be at the highest level ever in 2017/18. The Food and Agriculture Organization FAO forecast is for 2.6 billion tonnes. The majority, around 44 per cent, is produced in Asia. The main reason is that Asia is the home of rice production.

China is the main country of origin for grain and rice. North America holds second position, headed by the US with more than 429 million tonnes. Whereas marketing grain globally is vital for the economy of countries like the US or Canada, China hardly offers any of its grain on the world market, as the country produces most of its agricultural feedstock to cover domestic demand.

World grain production hits record

Harvests of grains (including rice) by continent, 2017/18, estimated, in million tonnes



Europe, including Russia and Ukraine

1.3 How much oilseed and grain (including rice) does each continent produce?

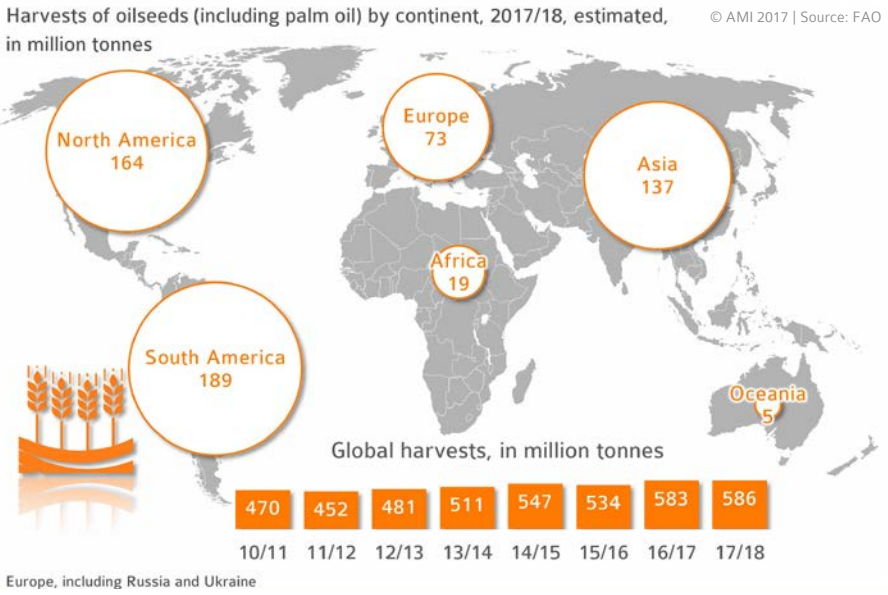
» 1.3.2 Production of oilseeds

Production of oilseeds continues to grow. The Food and Agriculture Organization FAO estimates oilseed output to touch 586 million tonnes in 2017/18. This is virtually a 50 per cent rise over ten years ago. Globally, the most important areas growing oilseeds and palm oil are more evenly distributed. The difference is not so much in output as in crops grown.

Whereas soybean is the most important oilseed crop in South America and the US, rapeseed prevails in Canada and the EU-28.

Asian countries such as China and India produce large amounts of both rapeseed and soybeans. On the other hand, oil palm is the primary oilseed crop in countries such as Malaysia and Indonesia.

Oilseed harvests growing steadily

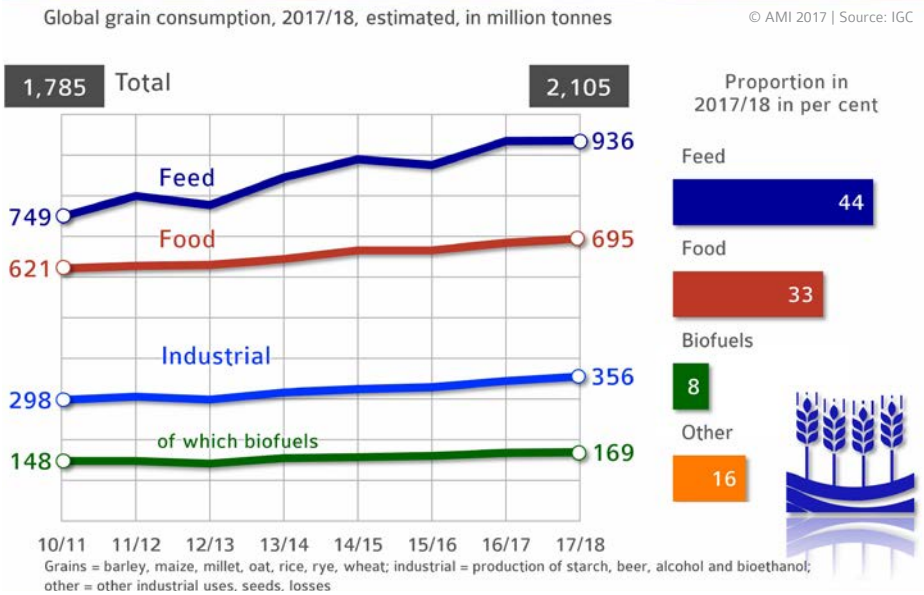


1.4 What products are made from grain?

» 1.4.1 Global use of grains

Global production of grains in the 2017/18 marketing year amounts to an estimated 2.1 billion tonnes. The produce is intended for human consumption, but also used as a livestock feed and feedstock in bioethanol production. At 44 per cent, the largest part of the grain harvests goes into feeding troughs, trending upward. By contrast, demand for grain for use in transport fuel production increases only slightly, remaining at around 8 per cent for several years, the International Grain Council (IGC) reports. This means that there is enough grain to meet the growing demand for food, feedstuff and industrial uses. In the US, bioethanol is mostly made from maize. The process generates Dried Distillers Grains with Solubles (DDGS), which is used as a protein feed. One tonne of wheat that is processed into bioethanol produces on average 295 kg of DDGS with a moisture content of 10 per cent. One tonne of maize yields 309 kg of DDGS. Increasing grain prices lead to a decrease in processing to biofuels, followed by savings in feed. The high added-value potential in the food markets ensures that grain mostly goes into the production of food when grain prices are high. The biofuels market serves as a "supply buffer" that ensures grain is constantly available for human consumption and feed.

Grain is mainly used for feed production



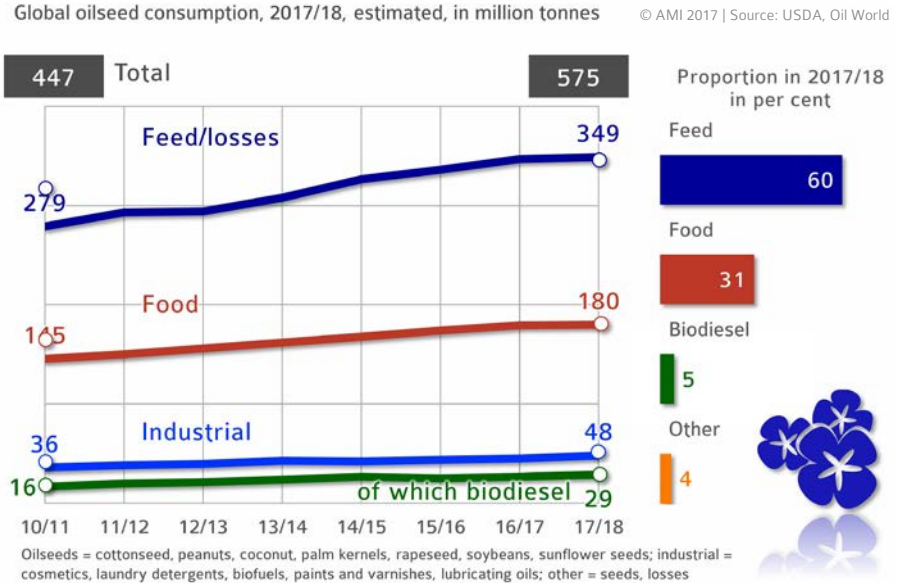
1.5 What products are made from oilseeds?

» 1.5.1 Global use of oilseeds

Oilseeds grown worldwide are pressed to make vegetable oils, generating extraction meal and oilseed cake as joint products of pressing. Vegetable oil can be gained by various chemical and physical methods. Before being pressed, the feedstock is heated to increase oil yield. The meal that remains after pressing is used as a protein feed, because it has a high protein content.

Consequently, the largest part of the oilseeds – around 60 per cent – goes into feeding troughs and the smaller proportion – around 31 per cent – is used as feed oil. Soybean meal is the number one feed in terms of quantity, with global output amounting to 105 million tonnes. It is followed by rapeseed, which has a share of around 12 million tonnes in global protein supply. Farmers in the EU-28 only produce GM-free rapeseed. Consequently, rapeseed is by far the most important GM-free source of protein for animal feeding. The amount of sunflower meal produced is ten times less than that of soybean meal. Production of sunflower oil is much more important. Any meal produced is also used as animal feed.

Most oilseeds also destined for animal feed

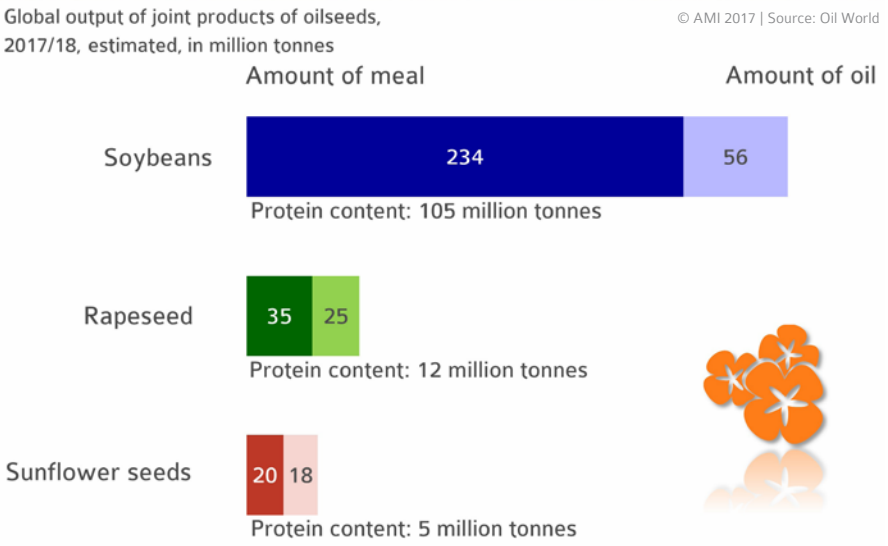


1.5 What products are made from oilseeds?

» 1.5.1 Global use of oilseeds

↳ 1.5.1.1 Global production of oils and meals

Practical dual use of oilseeds



2 Production of biofuels

2.1 Which countries promote biofuels?

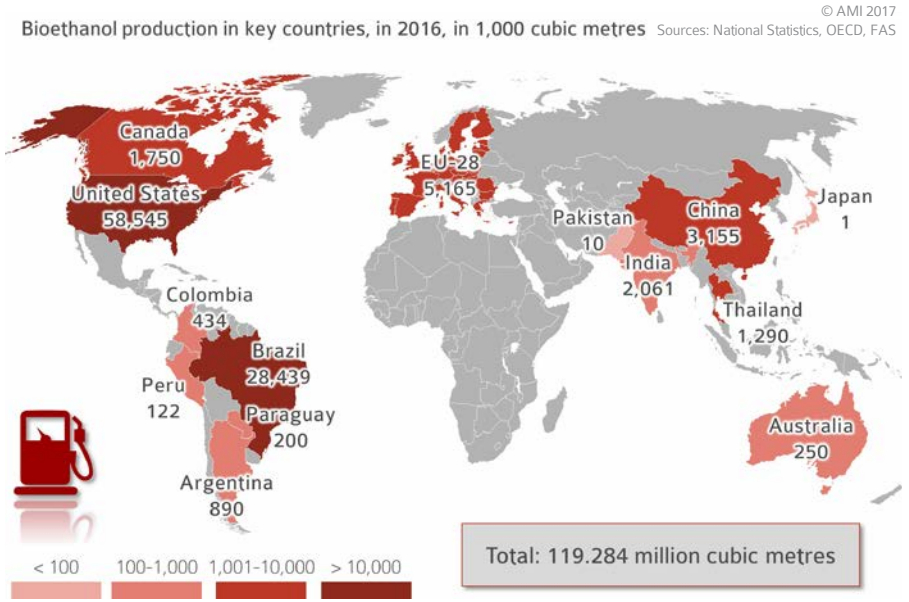
» 2.1.1 Global output of bioethanol

More than 119.3 million m^3 of bioethanol were produced globally in 2016. The aim is to save fossil energy sources and cut down on greenhouse gas emissions. The single most important feedstock source for bioethanol production is maize. The US is by far the most important producer of bioethanol with an output of 58.5 million m^3 in 2016, of which 98 per cent was based on maize and 2 per cent on other kinds of biomass. The reason for the large volume of US production is, among others, the Renewable Fuel Standard (RFS). In force since 2005 and enhanced and extended in 2007, the standard requires transport fuels that are sold in the US to contain a specific, annually increasing percentage of renewable transport fuels.

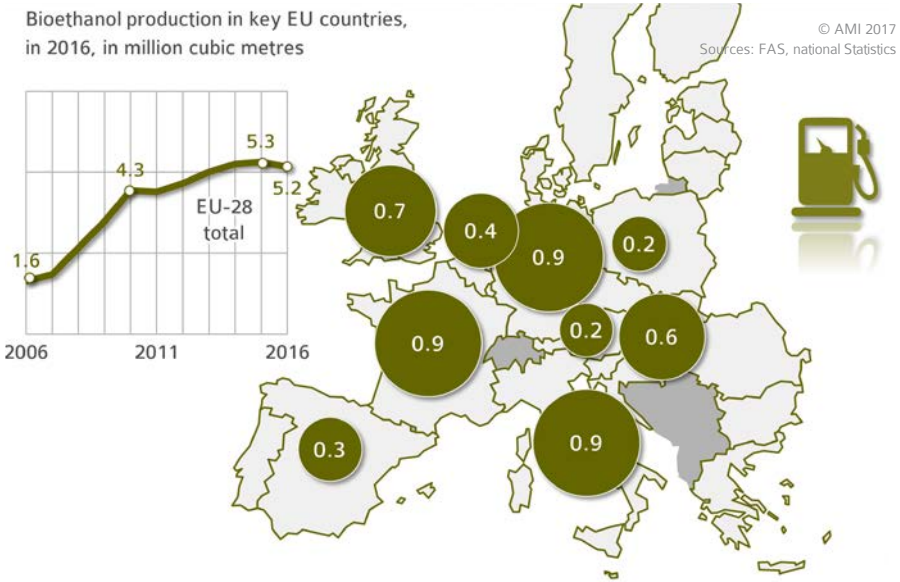
The second largest bioethanol-producing country is Brazil with an output of 28.4 million m^3. South America and also Australia process sugar cane to make bioethanol. Brazil adopted its National Alcohol Programme in response to the oil crisis in the seventies with the intention of reducing the country's dependence on fossil-energy imports.

In the EU-28, the Directive on the Promotion of the Use of Biofuels or other Renewable Fuels for Transport (28/30/EG) and the Energy Tax Directive (30/96/EG) created the framework conditions for European biodiesel and bioethanol production in 2003. In 2016, the EU-28 produced more than 5 million m^3 of bioethanol from grain and sugar beet.

Most bioethanol produced in America



France, Italy and Germany in the lead in the EU-28

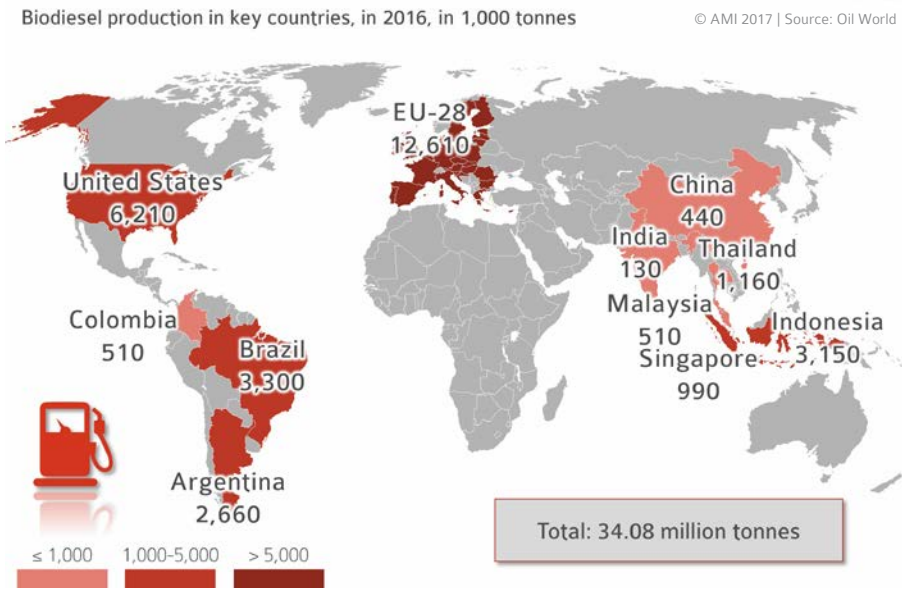


The term "biodiesel" is used in the statistics to refer to biodiesel (FAME = fatty acid methyl ester), hydrogenated vegetable oil (HVO) and biofuels made from vegetable oils in petroleum refineries. In 2016, world biodiesel production amounted to just over 34 million tonnes.

By far the most important biodiesel producer is the European Union, which accounts for almost 37 per cent of global output. The EU's key feedstock is rapeseed. On the American continent, biodiesel production is based on soybeans. The most important American biodiesel producers are the US, Brazil and Argentina.

Southeast Asia is gaining more and more importance in the biodiesel market. In the key palm oil producing countries Indonesia and Malaysia, biodiesel production is on a steady increase, driven by structural glut and the associated pressure on prices in the vegetable oil markets.

EU-28 is top of the list of biodiesel producers

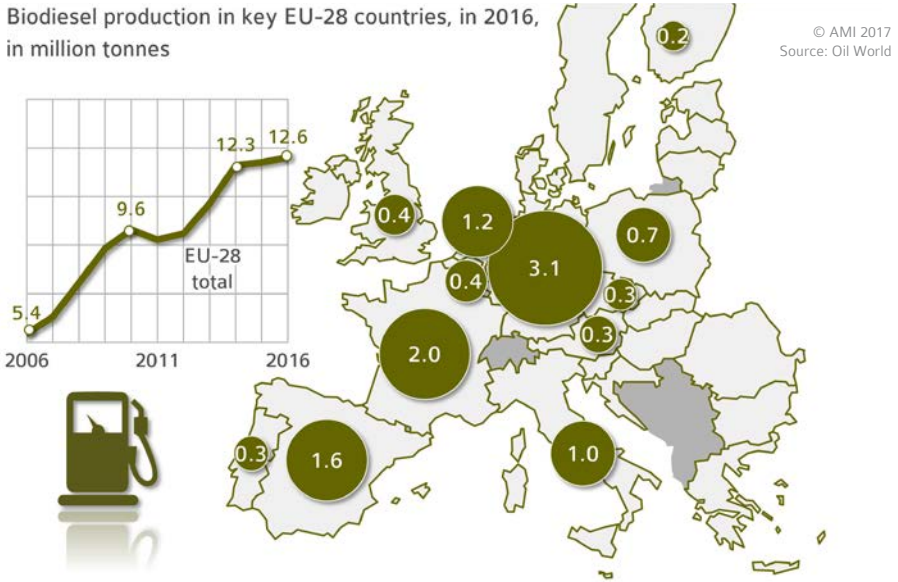


2.1 Which countries promote biofuels?

» 2.1.2 Global output of biodiesel

↳ 2.1.2.1 Key EU-28 biodiesel producers

Germany leads the way in biodiesel production



2.2 What feedstocks are used in world biofuels production?

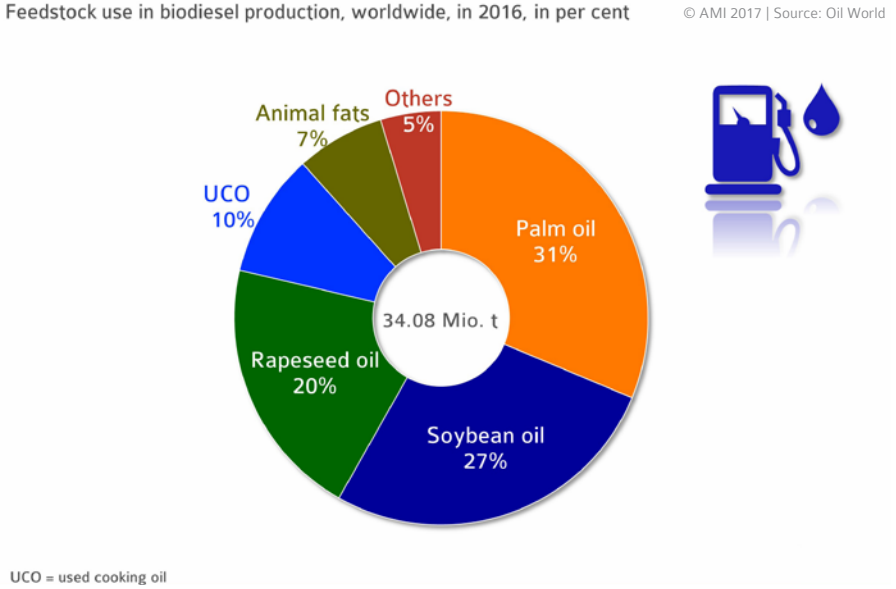
» 2.2.1 Global resource bases for biodiesel

Vegetable oils are the key feedstock in biodiesel production. The use of waste vegetable oils (WVO) or waste animal fats plays an increasingly important role, but it is still of secondary significance on a global scale. The potential of this feedstock source is naturally limited, especially because the EU has imposed strict waste regulations (cascading use). In order to avoid fraud, these requirements are also part of certification. By far the most important feedstocks in biodiesel production are palm oil (31 per cent), soybean oil (27 per cent) and rapeseed oil (20 per cent). The most important vegetable oils used to make biodiesel are palm oil in East Asia, soybean oil in North and South America and rapeseed oil in Europe. Today, the specific shares vegetable oils have in global output reflect their market impact.

Enhanced production methods for hydrogenated vegetable oils and the 37th Bundesimmissionsschutzverordnung (German Federal Immission Protection Ordinance), which permits vegetable oils to be co-processed in petroleum refineries, contribute to making vegetable oils replaceable by palm oil, the world's lowest-priced feedstock.

The debate about banning the use of palm oil has intensified, because in Indonesia the applicable sustainability standards have failed to stop the country's primeval forests from being cleared.

Biodiesel is mainly made from vegetable oils



2.3 What feedstocks are used in European biodiesel fuel production?

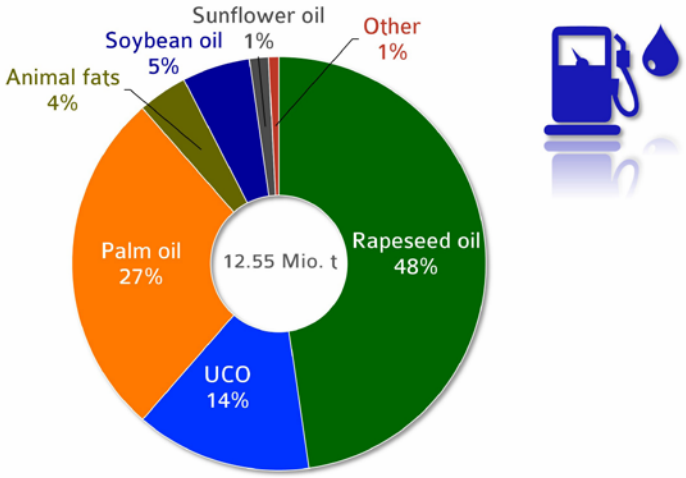
» 2.3.1 Resource bases for biodiesel in the EU-28

Biodiesel can be made from any vegetable oil or animal oil or fat. However, the key aspects are availability and price. Accounting for 48 per cent, rapeseed oil is the single most important feedstock source in EU-28 biodiesel production. This fact underlines the importance the biodiesel market has for the continuation of rapeseed cultivation in the Community.

However, imports from overseas are also used, depending on price. More specifically, palm oil from Southeast Asia has a 27 per cent share in EU biodiesel production. The use of used cooking oil has risen substantially, accounting for 14 per cent of total raw material used. This is a result of EU-28 promotion policies. In the EU, with the exception of Germany, biofuels from waste and residues count double towards national quota obligations (in terms of energy) in order to increase the binding percentage of renewable energy used in the transport sector to 10 per cent by 2020.

Rapeseed oil is Europe's no. 1 biodiesel feedstock

Feedstock use in biodiesel production in the EU-28, in 2016, in per cent



UCO = used cooking oil

2.4 What feedstocks are used in the production of biodiesel used in Germany?

» 2.4.1 Feedstocks of biofuels, consumed in Germany

In Germany in 2016, just less than 2.15 million tonnes of biodiesel and 7,000 tonnes of pure vegetable oil were used as a blending component in diesel fuel. Since the 3.5 per cent cap (rising to 4.0 per cent from 2017 to 2019, and to 6.0 per cent from 2020) on greenhouse gas emission replaced the renewable energy quota in 2015, the mineral oil groups bound by the regulations have changed their purchasing strategy to comply with the requirement in the most cost-efficient and greenhouse gas-efficient manner.

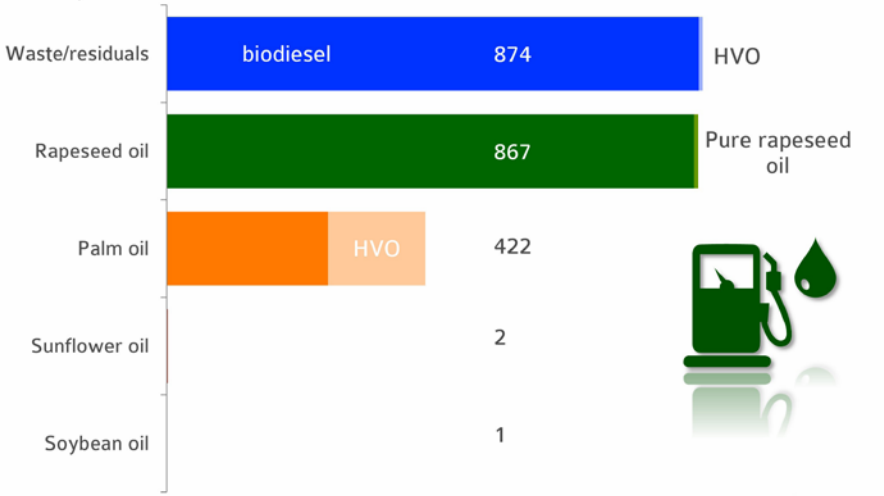
Feedstocks and suppliers of biofuels compete for the most cost-effective greenhouse gas efficiency. The resulting shift to biofuels from used cooking oils became apparent in 2016. For the first time, the share of biodiesel from used cooking oils exceeded that of rapeseed oil-based biodiesel.

The reason is the advantage cooking oil has when calculating greenhouse gas emission, as these feedstocks are accounted for at a „zero" CO_2 greenhouse gas value. The transition to the cap on greenhouse gas emission has led to higher feedstock efficiency, i.e. manufacturers require less feedstock to meet the obligation.

Conversely, based on a higher obligation to reduce greenhouse-gas emissions, biofuels could boost the transport sector's contribution to protecting the climate even today. The German biofuels industry is therefore calling for a widening of the obligation to reduce greenhouse gas emissions.

German biodiesel half based on used cooking oil

Feedstocks of biodiesel. HVO and vegetable oils counted towards quota obligations in Germany in 2016, in 1,000 tonnes



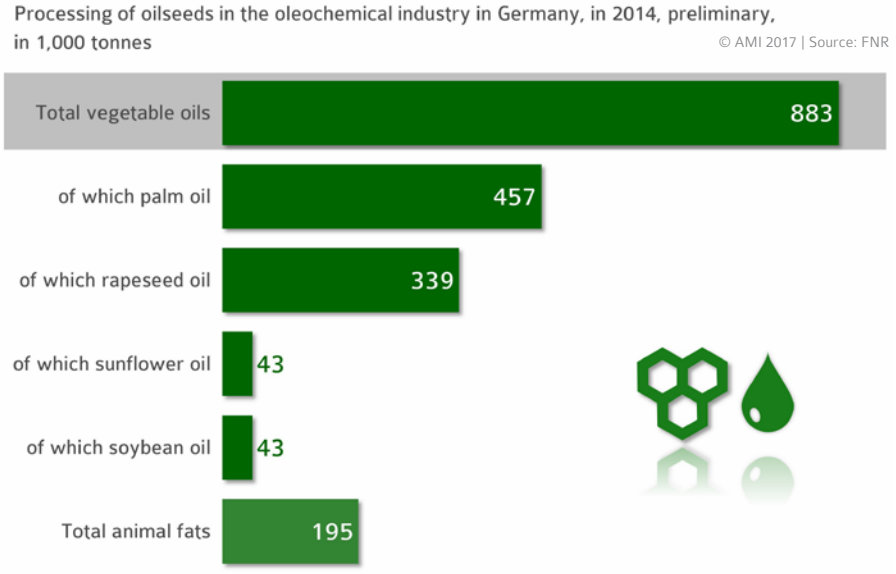
HVO = hydrogenated vegetable oil

2.5 What feedstocks are used in German oleochemistry?

» 2.5.1 Raw material used in German oleochemistry

The chemical industry uses vegetable oils to make skin creams, soaps and biodegradable laundry detergents, and also as ingredients in cosmetics, paints, varnishes, lubricants and textile fabrics. The German chemical industry processed a total of 883,000 million tonnes of vegetable oils in 2014. This was 16 per cent of total feedstock use. Demand for raw material continues to be centred on fossil feedstocks. Among vegetable oils, palm oil accounts for the largest share of 457,000 tonnes, followed by rapeseed oil at just less than 340,000 tonnes. Sunflower and soybean oils are also used in the chemical industry. The use of animal fats for chemical and technical purposes has seen a slight decline for several years now. It should be noted that in the case of material use, statistical returns on feedstock use are comparatively inaccurate, whereas in the case of biofuels documentation is strictly regulated by law. These statutory regulations for use in Germany or the EU include evidence of conformity with specific sustainability criteria. Irrespective of feedstock origin (including that of palm oil), feedstocks must be certified. There are no analogous legal regulations for the material use of renewables.

Palm and rapeseed oil are top of the list

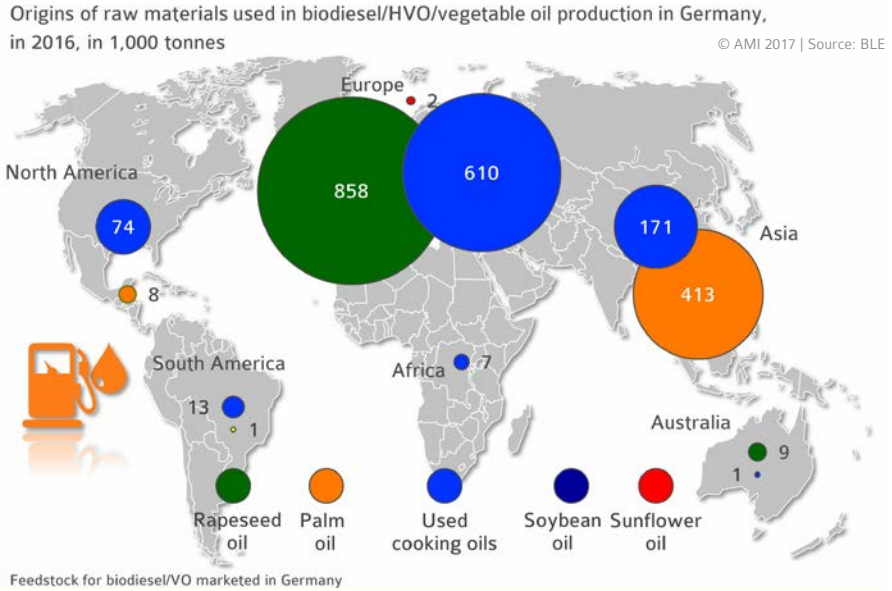


2.6 Where do the feedstocks for biodiesel at German petrol stations come from?

» 2.6.1 Origins of feedstocks for biodiesel used in Germany

Most of the sustained biomass in Germany is used to produce biofuels and recorded systematically. However, the unique traceability system exclusively centres on biofuels marketed as transport fuels. These biofuels can then be counted towards the quota of greenhouse gas emission reduction. Exports are excluded, but analogous evidence of conformity must be provided, if they are to be counted towards renewable quota obligations in any other EU country. The diagram below only shows the part of feedstock origins used in biodiesel imported to Germany or processed for such use in Germany. In 2016, a total of 2.17 million tonnes of feedstocks were used to produce the biodiesel/HVO/vegetable oil that was placed on the market. About 65 per cent of the rapeseed oil used alone came from rapeseed grown in Germany. The amount of biodiesel from waste oils (used cooking fats, used deep-frying oil, etc.) exceeded the amount of rapeseed oil-based biodiesel for the first time in 2016. This was due to the low-priced imports from Indonesia and China. Imports from North America more than doubled from 2015 to 2016. Palm oil imports, first and foremost from Indonesia and Malaysia, accounted for around 19 per cent of the feedstock mix. Soybean oil from South America and sunflower oil from Europe only played a secondary role.

Two thirds of feedstock sourced in Europe



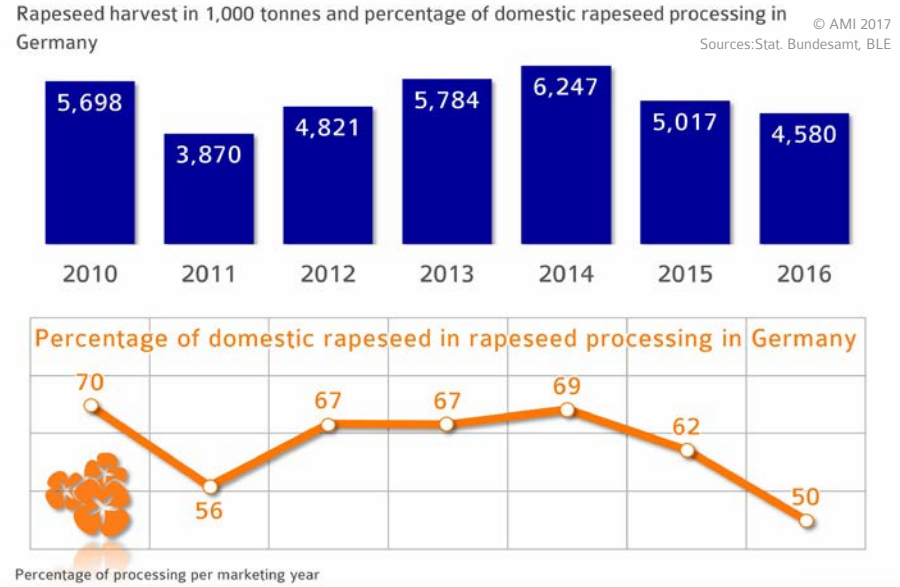
3 Food security

3.1 Is there sufficient rapeseed in Germany?

» 3.1.1 German rapeseed production and level of self-sufficiency

The level of self-sufficiency in rapeseed is strongly dependent on domestic rapeseed harvest and consumption. One of the world's largest oilseed-processing countries, Germany needs imported oilseeds in addition to oilseeds from its domestic crop. Most of these imports are rapeseed. In 2016, Germany processed 13.2 million tonnes of oilseeds, of which just over 70 per cent (approximately 9.4 million tonnes) was rapeseed. About 50 per cent of this demand was covered with rapeseed from domestic production. The remainder came from other countries, mainly the EU-28. This rapeseed yielded 4.1 million tonnes of rapeseed oil, more than needed for the production of food, transport fuels and for uses in the oleochemical industry. About 1.2 million tonnes of rapeseed oil went to the German food industry, another 1.2 million tonnes to the engineering sector. More than 930,000 million tonnes (net) of rapeseed oil were exported.

Never enough



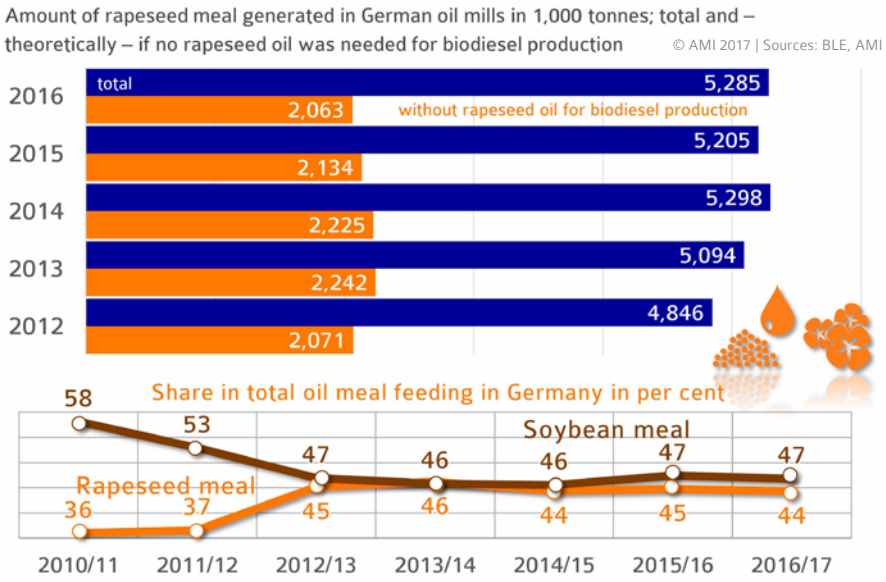
3.1 Is there sufficient rapeseed in Germany?

» 3.1.1 German rapeseed production and level of self-sufficiency

↳ 3.1.1.1 Output of rapeseed meal with and without biodiesel fuel production

The feed market is one of the main beneficiaries of biodiesel production, because most (approximately 60 per cent) rapeseed meal is generated as a by-product of rapeseed oil production. In 2016, Germany processed 9.4 million tonnes of rapeseed (of which 44 per cent came from abroad) to approximately 4.1 million tonnes of rapeseed oil and 5.3 million tonnes of rapeseed meal. Rapeseed meal is GMO-free (not produced from genetically modified organisms) and is therefore mainly used in dairy cow feeding, where it can fully replace soybean meal. This means that dairy products can be labelled "without GM". Above all, rapeseed meal reduces Germany's dependence on imports of GMO soy or GMO soybean meal. About 40 per cent of the 4.1 million tonnes of rapeseed oil is used for human or animal consumption and 60 per cent for technical applications or producing energy. If future demand for rapeseed oil were to shrink because biodiesel is no longer promoted as a contribution towards decarbonising the transport sector, rapeseed meal production would come down 60 per cent (in terms of quantity), whereas soybean imports would go up analogously. In purely arithmetic terms, the reduction of rapeseed meal would have amounted to all of 3 million tonnes (approximately) over the past three years. To offset the gap left by rapeseed, soybean meal imports would have had to increase by 2.5 million tonnes annually – which would have required an additional soybean production area of approximately 1 million hectares. Consequently, the situation would reverse the trend of promoting domestic GM-free protein sources. It has only been since 2013 that rapeseed meal accounts for half of the meal fed to animals in Germany.

Rapeseed meal is scarce without rapeseed oil for biodiesel production

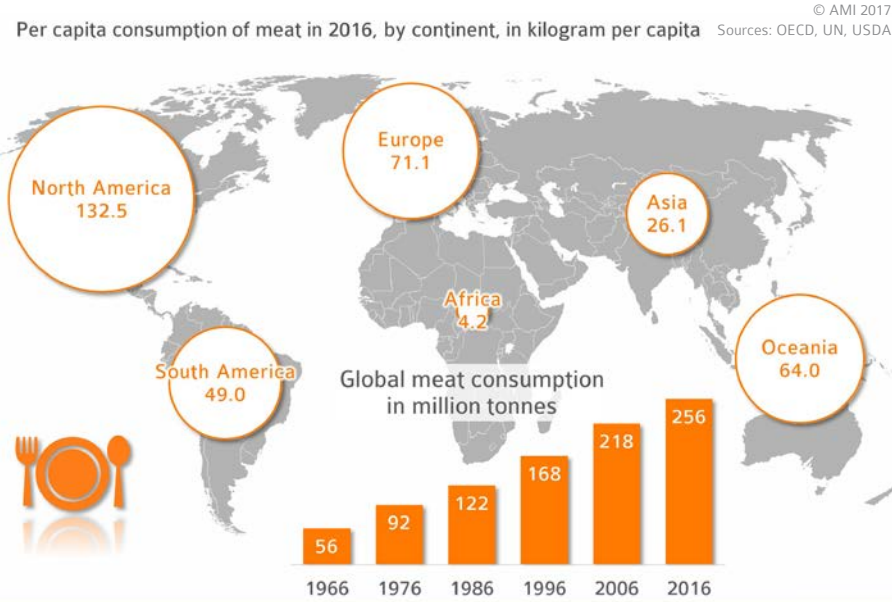


3.2 Why is demand for oilseeds increasing?

» 3.2.1 Global consumption of meat by continent

World meat consumption tripled to more than 256 million tonnes over the past 50 years. On the one hand, the world's population has grown. On the other hand, consumers' preferences have changed. Especially consumers in emerging markets such as China and Brazil eat significantly more meat than they did ten years ago. Whereas meat consumption in developed countries has stagnated, eating animal protein is seen as a sign of economic progress in developing and threshold countries. In China in particular, a significant segment of the population with higher purchasing power has emerged. Livestock feed is primarily based on oilseeds, especially soybeans and rapeseed, along with grains. Both soybeans and rapeseed are used to make feed meal. Most soybeans grown worldwide are raised from GM (genetically manipulated) seed. So is rapeseed produced in Canada. Because of the global surge in meat consumption, demand for feed protein from oilseeds is set to rise further in future.

Meat consumption increases worldwide



3.2 Why is demand for oilseeds increasing?

» 3.2.2 Quota requirements to promote biofuels

On a global scale, the largest driving force promoting biofuels are statutory blending requirements. The motivation of the various countries differs greatly. Whereas US and Brazilian interests focus on security of supply and reduction of imports, the EU-28 places great importance on climate protection and an increase in the overall proportion of renewable energy generated. Independently, the purpose in Asian countries like Malaysia, Indonesia and China, but also in Argentina and Brazil, is different again. In these countries, the main objective is to reduce vegetable oil surplus in an effort to stabilise market prices. National mandates of volumetric or energy-related proportions in fossil diesel fuel range from one to 30 per cent.

The cap on greenhouse gas emission that was imposed in Germany in 2015 is unique in the world. Distributors (i.e. the petroleum companies) must provide evidence of compliance. Globally, bioethanol plays the most important role in the majority of countries that have quota requirements. The reason is, again, oversupply in the grain and sugar markets. The biofuel funding policy's aim is not only to contribute to protecting the climate and natural resources, but also to reduce pressure on the market and, consequently, stabilise prices for farmers.

Based on the Paris climate protection agreement, we can expect the major exporters of agricultural produce to continue to pursue their previous biofuels policies in the national action plans for decarbonising the transport sector they are required to provide by 2020.

Blending quotas drive up usage of biofuels

Quotas for ethanol and biodiesel by country, in 2016, in per cent

Source: Global Renewable Fuels Alliance

E=ethanol, B=biodiesel
Germany: 2017: 4 % GHG avoidance; 2020: 6 % GHG avoidance
EU-28: 10 % biofuels in transport by 2020
Norway: E= 4 %, B= 7 %
Canada: E=5 %, B=2 %
USA: E+B= 7 % by 2022
Peru: E= 7.8 %, B= 2 % (planned 5 %)
Costa Rica: E= 7 %, B= 20 %
Jamaica: E= 10 %
Panama: E= 2 % (planned 10 %)
Colombia: E= 8 % (planned 10 %)
Brazil: E= 25 %, B= 5 %
Paraguay: E= 24 %, B= 1 %
Argentina: E= 5 %, B= 10 %
Mexico: E= 2 % in Guadalajara

E=ethanol, B=biodiesel
South Africa: E= 10 %, B= 5 %
Mosambique: E= 10 %
Angola: E= 10 %
Malawi: E= 10 %
Zimbabwe: E= 10 %
India: E= 5 % (planned E+B 20 %)
Indonesia: E= 3 %, B= 10 % (planned E= 20 %, B= 30 % by 2025)
China: E= 10 % in 9 provinces, (gepl. E+B 10 %)
Philippines: E= 10 %, B= 5 % 2020: E= 20 %, B= 10 %
Malaysia: B= 5 % (planned 15 %)
South Korea: B= 2,5 %
Thailand: B= 5 %
Australia: E= 4 %, B= 2 % in New South Wales

3.3 What is the amount of grain/vegetable oil per person?

» 3.3.1 Per capita supply of grain and vegetable oil

Over the past 40 years, the per capita supply of grain and vegetable oil increased steadily to currently 338 kg of grain and 26 kg of vegetable oil despite the huge growth in world population. Adding the global 2017/18 per capita supply of grain and vegetable oil, consumption could, in theory, touch a record of 364 kg per capita. However, part of the output is also used in feed production, for transport fuel blends (based on statutory quotas) or other industrial purposes.

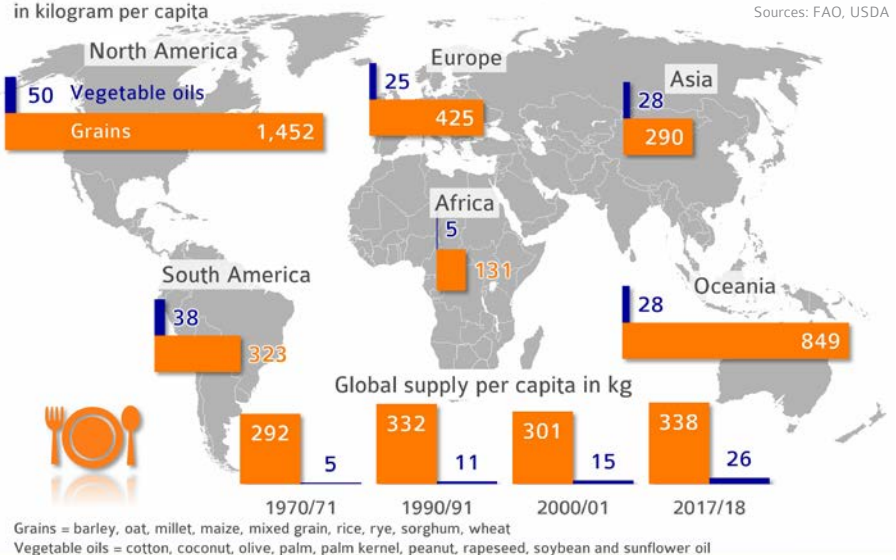
In purely arithmetic terms, food supply is sufficient to feed the world's population. However, the chart highlights the considerable differences between oversupplied and undersupplied countries. The difference in availability of agricultural feedstocks is primarily a result of distribution issues rather than competing fuel and feed uses. Moreover, there are substantial differences in purchasing power in the different countries. The chart takes into account both the cost of living and inflation in the relevant countries. However, what we need is a comparison between specific shopping baskets and habits of consumption (e.g. cassava, millet in Africa) that would allow us to draw conclusions on per capita purchasing power.

The currency to evaluate purchasing power is the international dollar, which has the same purchasing power as the US dollar. The World Bank put the per-capita purchasing power in Germany in 2016 at around 48,730 international dollars. In contrast, the purchasing power for the Central African Republic was stated to be only 700 international dollars. This means that the existing funds are insufficient for people to buy the amounts of food they need in countries with low purchasing power, although supply of agricultural products is adequate. Whereas people in industrial nations spend less than 25 per cent of their income on food, the population in the poorest countries of the world spends up to 80 per cent.

Growing population has more to eat

Supply of grain and vegetable oils, in 2016/17, estimated by continent, in kilogram per capita

Sources: FAO, USDA



Grains = barley, oat, millet, maize, mixed grain, rice, rye, sorghum, wheat
Vegetable oils = cotton, coconut, olive, palm, palm kernel, peanut, rapeseed, soybean and sunflower oil

3.4 Is there enough food?

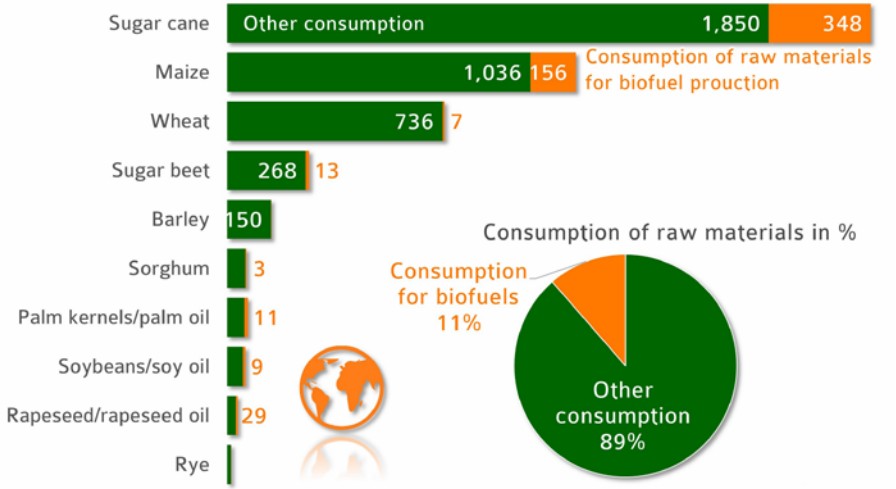
» 3.4.1 Use of feedstocks in biofuels production

In terms of global production, the share of agricultural feedstocks in biofuels production is small, not least because the processing of grain and maize to make bioethanol also yields considerable amounts of protein feed, such as rapeseed and soybean meal or Dried Distillers Grains with Solubles (DDGS). On a global scale, the key challenge is to reduce the protein deficit to combat malnutrition. The share of agricultural feedstocks in biofuels production is only 11 per cent of global total use. Demand for sugar cane and maize as feedstocks for use in bioethanol production by far outstrips that for vegetable oil feedstocks for use in biodiesel production. The share of wheat and sugar beet is relatively small. Conversely, this confirms the structural surplus, particularly of carbon hydrates, that exists in the countries where these crops are grown.

Vegetable oils only have a small share in global biofuel production

Shares in total consumption of raw materials for biofuel production, worldwide, in 2016, in million tonnes

Sources: OECD, USDA, Oil World, IGC



3.5 Why do people starve?

» 3.5.1 The issue of distribution

People in many parts of the world starve or are malnourished although in terms of figures there is adequate supply of the most important staple foods. The reasons for the shortage of foodstuff are multiple and complex: climate change, drought, unjust distribution, wars and forced migration as well as a lack of democratic structures. All these factors prevent economies from booming, farmers from farming in a cost-efficient manner and countries from establishing democratic structures without maladministration or corruption. It is a striking fact that in past famines, it was almost always a combination of war and economic hardship with natural disasters like dry spells that led to humanitarian emergencies. Countries having no structures for a functioning social system run a much higher risk of famine and malnutrition. Where an appropriate framework is in place, it can be used as a base on which to intensify locally adapted cultivation systems in a sustained manner and, by so doing, create the foundation for supply with food that is equally sustained.

Distribution issue just one of multiple reasons

Largest producers of wheat, rye, millet, rice und edible oils in 2016/17, in million tonnes, and 2016 per capita income in international dollars

Sources: World Bank, USDA

Country	Food production	Per capita income	Country	Food production	Per capita income
World	1,531	16,101	Japan	10	42,870
China	306	15,500	Ethiopia	8	1,730
India	220	6,490	Uzbekistan	8	6,640
EU-28	174	37,574	Mali	5	2,040
USA	94	58,030	Republik of Korea	4	35,790
Russia	82	22,540	Burkina Faso	3	1,680
Indonesia	76	11,220	Uruguay	2	21,090
Canada	36	43,420	Bolivia	1	7,090
Bangladesh	36	3,790	Jordan	0.1	8,980
Australia	36	45,970	Namibia	0.01	10,550
Ukraine	34	8,190	Singapore	<0.01	85,050
Pakistan	34	5,580	Qatar	<0.001	124,740

Gross national income (GNI) per capita at purchasing power parity

3.5 Why do people starve?

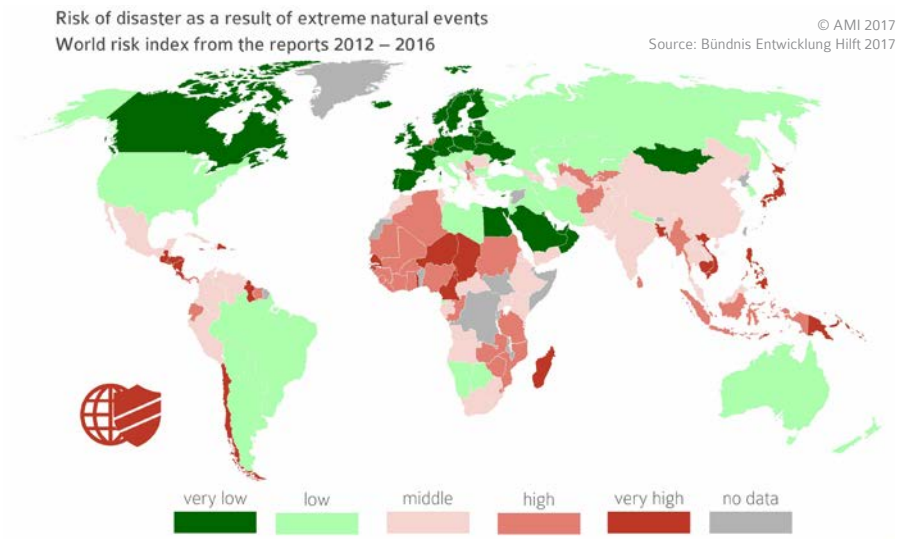
» 3.5.2 Risk of exposure to extreme natural events or famine

Food supply is not only confined by gradual desertification and devastation of agricultural land. Natural disasters also pose a threat to people and animals. Although man does not trigger extreme natural events directly, man's interference with nature massively increases the risk potential. The destruction of natural shore protection structures, such as mangrove forests or coral riffs, increases the risk of flood waves and flooding, whereas clearing primeval forests worsens soil erosion and accelerates climate change. "Weather extremes" are noticeably on the rise.

The risk index shown in the chart is not based solely on the probability of the occurrence of natural hazards and their severity, but also takes people's living conditions into account. The index is calculated from the risk hazard of natural disasters combined with so-called vulnerability, which is assessed by looking at susceptibility, ability to deal with events and adaptation.

The following considerations apply to all countries as a matter of principle: a nation that has sufficient means and functioning state and civil structures, employs an adaptive strategy to combat recurrent natural events and is willing to invest in the adaptation to changing overall conditions such as weather and climate extremes, will be hit less hard by extreme natural events. These countries have therefore the responsibility to help poorer countries by substantially raising their contributions to what is called the adaptation fund. This challenge was one of the key issues discussed at the UN's Climate Conference (COP23) that was held in Bonn in November 2017.

Wealthy countries are less vulnerable to natural disasters



3.5 Why do people starve?

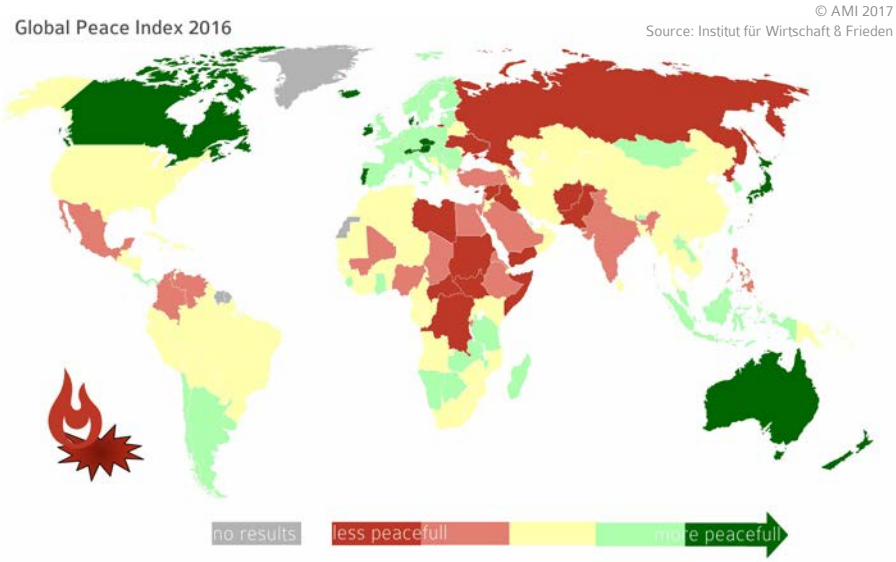
» 3.5.3 Violence is common in many countries

Along with climate change and natural disasters, wars, forced migration and the lack of democratic structures are the main factors stoking hunger in the world. On top of this, international terrorism has become an increasing risk to people's lives and safety. The more people are involved in producing food, the more serious the setbacks in food production caused by political crises or conflicts. It is sadly true that to this day more money is spent on maintaining and spreading violence than peace.

The Institute for Economics and Peace has compiled the Peace Index since 1996 to provide a basis for evaluating the situation in specific countries. The current report indicates that the world became somewhat more peaceful from 2015 to 2016, but the trend over the past ten years has been clearly towards war and violent extremism. Although the militarisation of the countries has declined, terrorism has surged many times over.

The Peace Index is established on the basis of measurable indicators of a country's internal and external conflicts, its neighbourly relations, the number of terrorist activities, the number of violent felonies and homicides, as well as arms imports and spending on peacekeeping. These factors result in a ranking list of 163 analysed countries with Iceland at the top and Syria at the bottom.

Iceland is the most peaceful country in the world since the last 10 years



4 Use of land

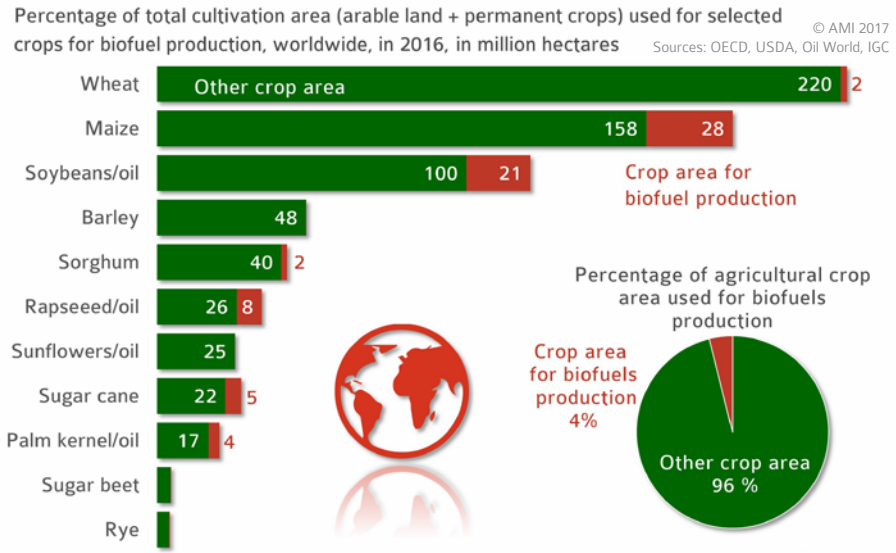
4.1 Does growing energy crops create a lack of land for food crops?

» 4.1.1 Shares of land used for global biofuels production

Crop plants are grown on more than 1.7 billion hectares worldwide. At 4 per cent, the land used for biofuels production only accounts for a fraction of this.

Moreover, the countries that grow the crops for, and produce biofuels, are also the biggest agricultural exporters of the feedstocks in question. In other words, in regions such as e.g. South America, biofuels production does not act as a "driving force" in agriculture. Rather, the steady global rise in demand for protein feed, especially soybean meal, and consequently the changes in price determine hectarage and its expansion. Since the percentage of soybean oil in soybeans is only 20 per cent, it only accounts for a small proportion of the producer price compared to the percentage and price of soybean meal.

Biofuels only take up a small part of the crop area



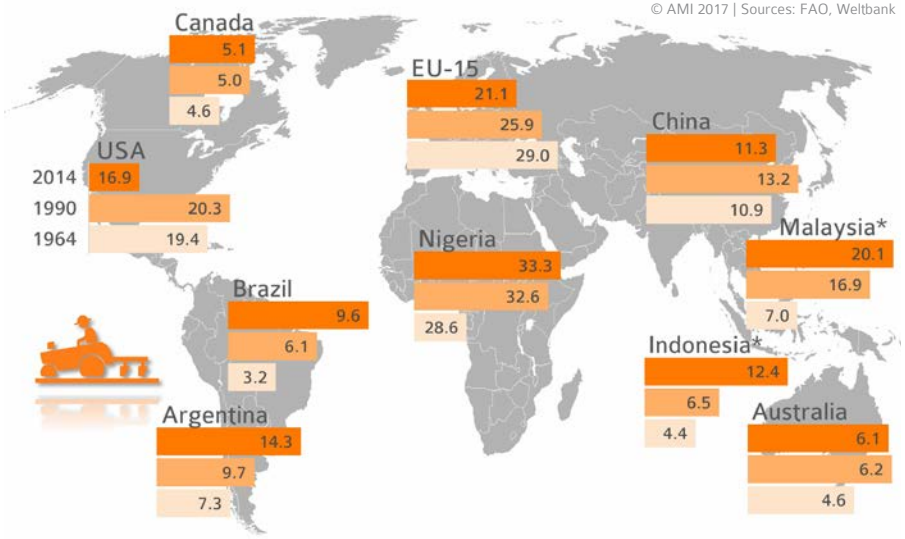
4.1 Does growing energy crops create a lack of land for food crops?

» 4.1.2 Development of agricultural land

The primary purpose of agriculture has always been to feed people. The continuous growth in population and changes in eating habits due to higher incomes call for sustained intensification and increases in agricultural production. Between 1960 and 2014, the production of grain and rice more than doubled from 1.3 billion tonnes to 2.6 billion tonnes, and in that time output of vegetable oils increased twelve-fold. In the southern hemisphere, this growth is first and foremost based on an increase in agricultural land, along with technical progress in production methods (seed, fertilizers, crop protection, agricultural engineering). In the northern hemisphere, on the other hand, agricultural land is decreasing. In the north, increases in productivity primarily result from research and innovation by universities and companies. This progress is achieved as a result of farmers' high level of qualification, good professional support and prompt implementation in agricultural practice. Considering the fact that the conversion of primeval forest and other land required to protect the environment and climate encounters strong public and political resistance, there is a need to create sustainability requirements that are binding on all growing areas. Based on these requirements, biomass production must be certified to allow it to be traced back to its origin. In the southern hemisphere, the implementation of social standards and the issues of land acquisition and ownership are paramount for sustained biomass production. A stop must be put to illegal clearings of primeval forest or changes in land use for new palm oil plantations or soybean cultivation. In its Renewable Energy Directive (2009/28/EC and iLUC Regulation 2015/1513/EG), the biofuels policy of the European Union requires sustainability certification from the earliest stage of biomass crop cultivation onwards. There are growing calls to develop these system requirements further – irrespective of final use – in order to create a "level playing field" for global fair competition without any environmental or social dumping.

Arable land and palm oil plantations are still growing in the southern hemispere

Percentage of arable land in total land area, in 1964, 1990 and 2014



* = in Indonesia and Malaysia, development of plantation area; EU-15 without Belgium and Luxembourg

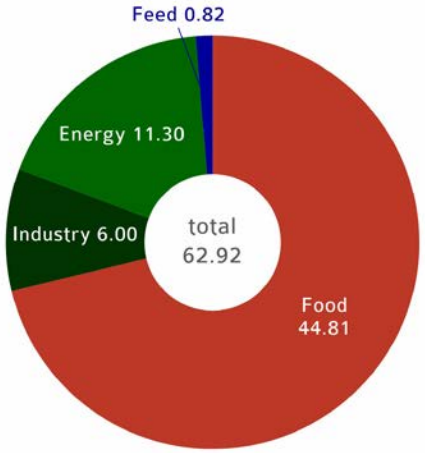
4.2 Is there a limit to the use of palm oil?

» 4.2.1 Global use of palm oil

Oil palm is the single most important oleaginous fruit crop in Southeast Asia. A significant number is also grown in Colombia and Nigeria. Palm oil is the most important vegetable oil in the world, with annual production exceeding 60 million tonnes. Like other vegetable oils, it is ideal for a wide range of uses – in the food, chemical and biofuels industries. Global 2017/18 consumption of palm oil is estimated at 63 million tonnes, most of which is edible oils used in Southeast Asia. Food uses account for 71 per cent, energy uses for 18 per cent (e.g. biodiesel) and oleochemical uses for 10 per cent of overall consumption. World palm oil production continues to increase due to expansion in area (by clearing primeval forest legally and illegally), replantings and the use of new hybrid varieties with a high yield potential. EU legislation requires palm oil for biodiesel fuel production to be certified as sustainable in compliance with a system accredited by the EU Commission if the oil is intended to be used for biofuels production in the European Union or for biodiesel (palm oil methyl ester) exports to the EU. Palm oil consumption is likely to increase in the years to come, probably mostly for food uses. Besides the power sector, industries are poised to use more and more palm oil that is certified as sustainable. In the EU-28 today, the percentage of certified palm oil for energy-related uses is one hundred per cent.

Palm oil is the most important foodstuff

Shares of various uses of palm oil, worldwide, in 2017/18, estimated, in million tonnes

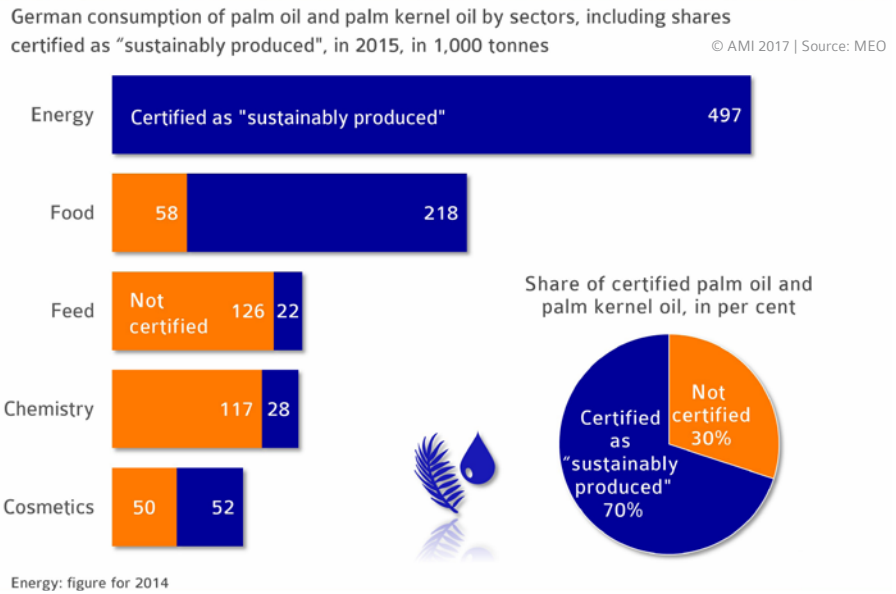


4.2 Is there a limit to the use of palm oil?

» 4.2.2 Certified palm and palm kernel oil in Germany

European law requires evidence of compliance with sustainability requirements as set out in the Renewable Energy Directive (2009/28/EC or its amended version 2015/1513/EC) for biofuels to count towards fulfilment of quota obligations or in the case of claiming tax benefits. These requirements have been incorporated in the criteria of the certification systems that are licensed by the EU Commission. As a result, in terms of sustainability requirements, EU law is implemented globally in biomass production. Consequently, it is only in biofuels use in the EU that one hundred per cent of feedstock production for e.g. rapeseed oil and all other cultivated biomass feedstocks are certified as sustainable. There is no other sector in agriculture – with the exception of organic farming – where this is the case. The certification systems have to be continuously developed, as re-approval is required every five years. Other areas of use, such as use of palm oil in the food and chemical industries, rely on voluntary systems. In these contexts, there is still considerable need for improvement of the requirements compared to the rules applying to biofuels certification, especially in relation to preventing illegal clearances of primeval forests.

Shares of palm oil from sustainable production in Germany



5 Development of prices

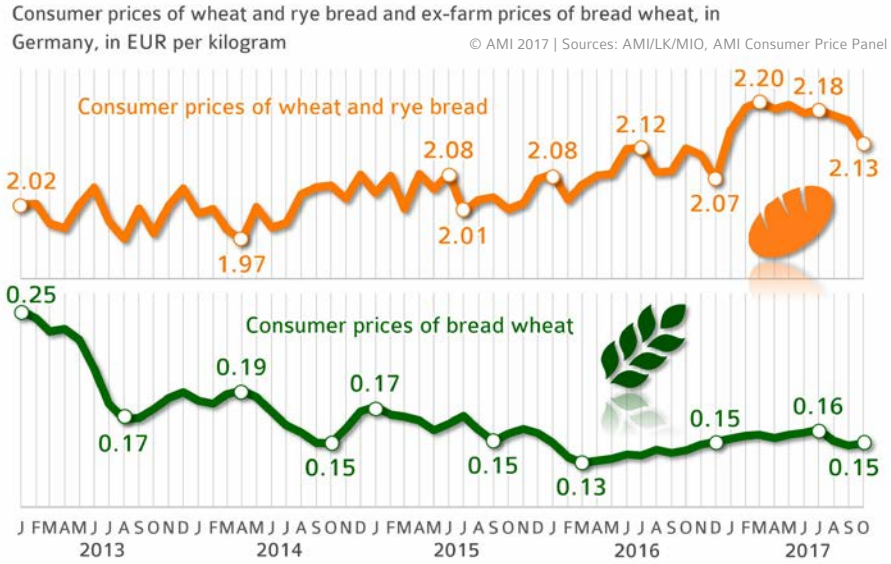
5.1 Do biofuels push food prices up?

» 5.1.1 Comparison of prices of bread and grain

Wheat is used both for food and bioethanol production, with use in transport fuel production gaining more and more importance. In this context, many people argue that this situation causes a shortage and drives prices of feedstocks for food production. Although prices for wheat and rye bread increased till March 2017, the expansion of biofuel production had little to do with the increase. This point is supported by the slight firming of prices on the production side which, from the perspective of farmers, remain too low. This factor alone shows clearly that there is no scarcity in feedstock supplies. In fact, continuing surpluses are the main factor accounting for pressure on wheat prices. This has been clearly the case since August 2017 when wheat-rye bread prices started to follow the weaker prices of soft wheat. The main reason for consumer price increases of soft wheat-based products, e.g. wheat-rye bread, has been rising costs for labour, rents, energy etc. The explanation is that raw material only accounts for approximately 15 cents of the costs in a one-kilo loaf of wheat-rye bread.

The case that the production of biofuels reduces the availability of feedstock for food and drives prices upwards is not only made in industrial countries. The point is also made as an argument against the use of renewables in developing countries. However, the real causes of price increases in these countries are primarily found in government interventions in the markets, high freight costs, poor infrastructure and inadequate market access.

Bread price versus grain price



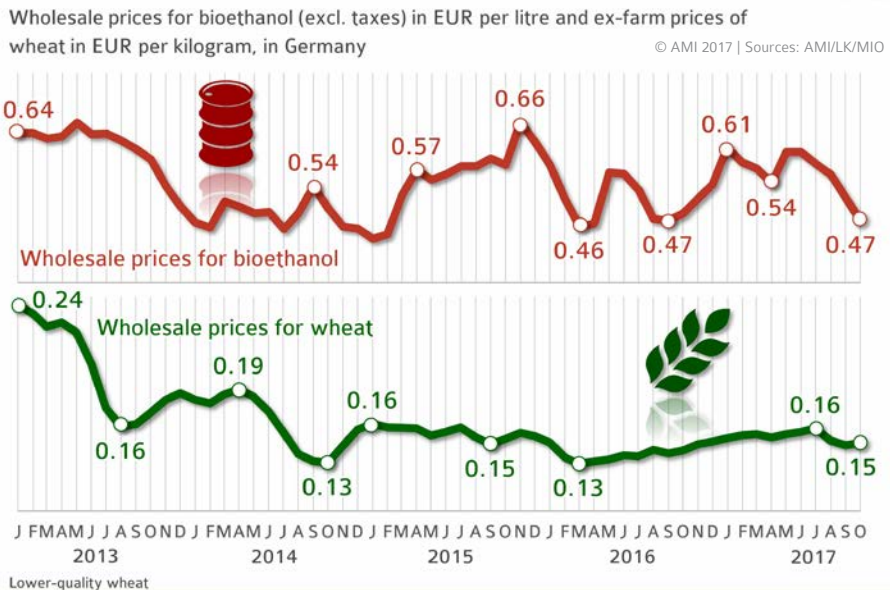
5.1 Do biofuels push food prices up?

» 5.1.2 Comparison of prices of bioethanol and grain

Issues surrounding global nutrition continue to be at the centre of intense discussion, especially since prices for agricultural feedstock and staple foods exploded globally in 2007 and 2008 and prices became volatile as a result. Ongoing famine, hunger and poverty situations have been closely associated with the way prices for agricultural feedstock have developed in the global market. More specifically, biofuels are often cited as the explanation for the price situation.

According to FAO, suppliers have "responded" with intensification and yield increases. Bumper crops have since led to global oversupply and consequently to ever higher levels of stocks. As the charts show, the increase in demand for agricultural feedstocks for use in biofuels production only has a minor inflationary impact on prices. In fact, the effect is quite the opposite, – demand for biofuels stabilises feedstock costs also for farmers in developing countries.

Biofuel demand has little impact on prices

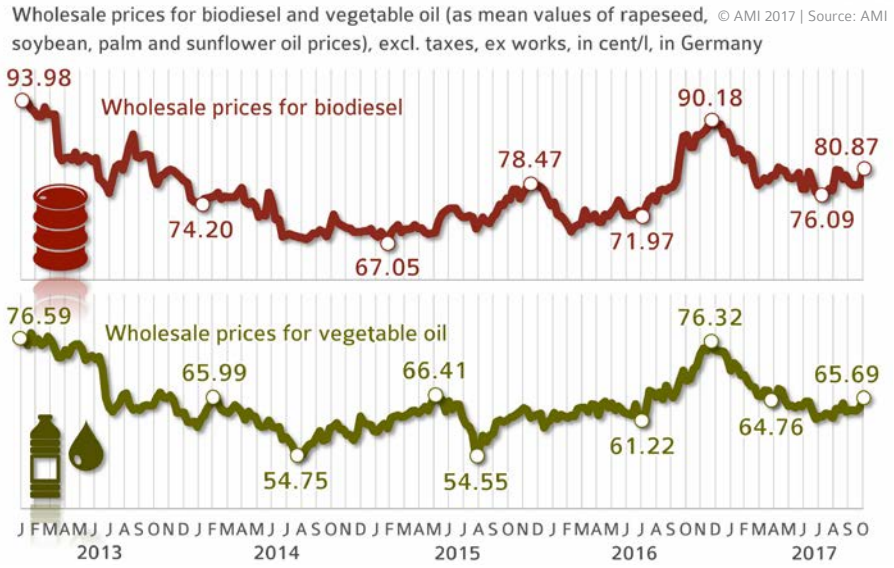


5.1 Do biofuels push food prices up?

» 5.1.2 Comparison of prices of bioethanol and grain

↳ 5.1.2.1 Comparison of prices of biodiesel and vegetable oil

Biofuel demand has little impact on prices



Sources

AMI Consumer Price Panel	Weekly survey of consumer prices in Germany, AMI GmbH, Bonn	www.ami-informiert.de/ami-maerkte/maerkte/ami-maerkte-verbraucher/meldungen.html
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BLE	Bundesanstalt für Landwirtschaft und Ernährung, Federal Office for Agriculture and Food, Bonn	www.ble.de
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IEP	Institut for Economies & Peace, Sydney	visionofhumanity.org/indexes/global-peace-index/
IGC	International Grain Council, London	www.igc.int/en/markets/marketinfo-sd.aspx
MEO	Meo Carbon Solutions GmbH, Cologne	www.meo-carbon.com
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