



Federal Ministry  
of Food  
and Agriculture

# Understanding Farming

Facts and figures about German farming

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***“Our farming sector is diverse. Like our society as a whole, it has developed and become more modern.”***



## Dear Readers,

More and more consumers want to know where their food comes from and how it is produced. That's good – because it shows that we are becoming more and more aware of the role nutrition plays in our health and well-being, and that we are taking a closer look at sustainability as well as animal welfare.

Only a few people still have a direct connection to agriculture and the producers of our food. Many have developed their idea of the farming profession from television shows, some from holidays on a farm or from children's books that display the romantic image of cows grazing on pasture and pumpkins growing in the farmer's garden. Is this idea realistic? This type of farming certainly exists. But it is not the only type. Like our society as a whole, our farming sector has developed and become more modern.

However, agriculture today is still largely influenced by family-run farms, some of which operate farm shops that sell regionally-grown meat and vegetables or organic products.

Agriculture has long since undergone a digital transformation. In the cowshed there are robots for milking, feeding and removing manure. GPS-controlled tractors drive on our fields, sensors on the machines can detect whether a plant needs fertiliser. Drones fly over fields of maize and

drop parasitic-wasp larvae to feed on pests. Digital innovation makes work easier, reduces pesticides, secures yields and increases animal welfare. This is already the case in the present and it will be the case in the future.

Our farming sector is diverse, our farmers are efficient.

With our brochure "Understanding Farming" I would like to introduce you to the producers of our food and the farming sector. Facts, trends, technology, background information – these will enable you to make up your own minds. and learn how our food, an existentially vital resource, is produced and how it reaches you. This is important. Because the future viability of our agri-food industry depends on it being accepted by society.

I am convinced that we need to work together if we are to conserve and promote a sustainable, competitive farming sector which is both accepted by society and economically viable.

Kind regards,

Yours,

**Julia Klöckner**  
Federal Minister of Food and Agriculture

# 1

# How important is farming to Germany?

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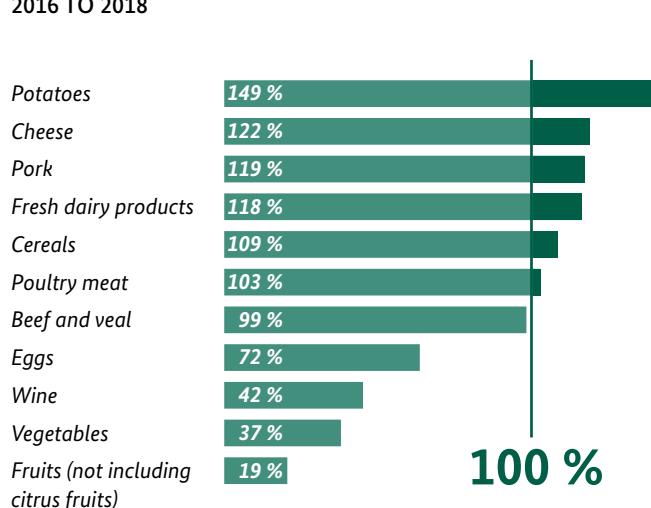
*Germany, the land of engineering ingenuity and industry, has at the same time always remained a country with a strong agricultural sector. Despite a high population density, half of the land in Germany is farmed. Almost a million people produce goods worth more than 50 billion Euros a year in approximately 275,400 agricultural enterprises. Farmers provide us with high-quality food. They also provide an important contribution to supplies of energy and raw materials. By tending the land, they help create and maintain the face of our countryside and are anchors of economic and social stability in rural areas.*



## Can Germany's farmers feed the country?

Potatoes from the Lüneburg Heath, milk from the Allgäu region, cereals from Germany's fertile plains, pork from the Münsterland area: Germany's farmers can provide a broad array of culinary delights. In mathematical terms, Germany produces around nine tenths of its demand for food from domestic production, although this is a theoretical model, given the division of labour in our globalised economy and consumer demand for diversity. In actual fact the situation differs greatly, depending on the product. In the case of milk and meat, we export more than we import – these exports are predominantly to other EU countries. With regard to fruit and vegetables, imports are higher than exports. Germany is the third largest importer of agricultural goods in the world – and also the third largest agricultural exporter. German agriculture exports about one third of its total production. Overall, though, Germany is a net importer, i.e. we import more than we export.

### AVERAGE RATE OF SELF-SUFFICIENCY IN GERMANY FOR SELECTED PRODUCTS FROM 2016 TO 2018

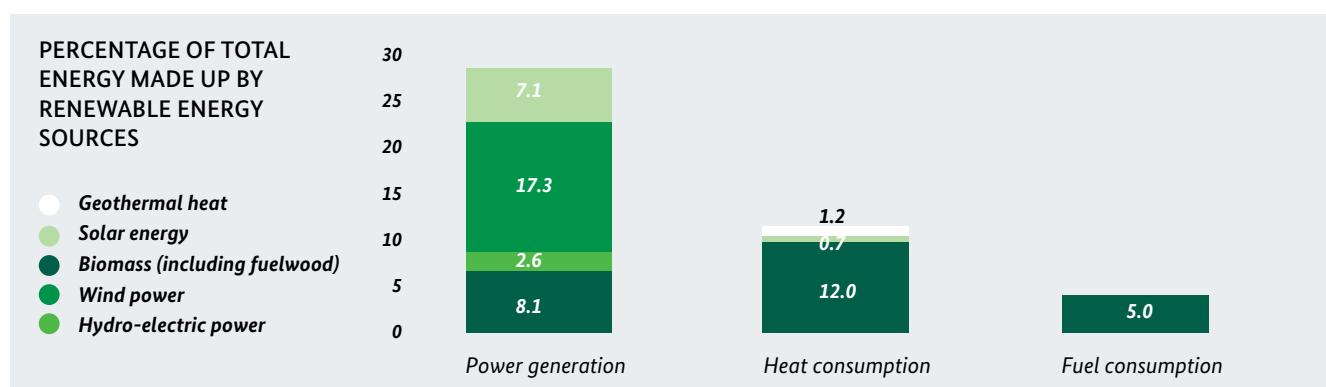


## How do farmers contribute towards protecting traditional cultivated landscapes?

Farmers farm and tend approximately half the land in Germany. Over centuries, their work has created the countryside as we know it: so-called “cultivated landscapes”. The combination of meadows, fields and forests that is typical for these landscapes is not static; it develops and changes, depending on the use to which the land is put. Many cultivated landscapes are now under threat: on the one hand the upkeep of these landscapes, which may be costly and labour-intensive, may no longer be worthwhile. On the other hand, agriculture also vies with other uses to which land can be put, such as new transport routes, settlements and commercial sites. Especially in the surroundings of densely populated areas, the demand for living space increases the pressure on valuable agricultural land. There is a downward trend of land take for residential and traffic purposes. However, from 2014 to 2016 the area converted still amounted to approximately 55 hectares per day. This is well above the Federal Government's objective of not claiming more than 30 ha per day for new residential and traffic areas by 2030.

## What is farming's contribution to energy supply?

Today, many farmers contribute to energy production in a variety of ways. They have expanded the scope of their activities in recent years. They provide land and roofs for building wind turbines or solar collection systems and above all they produce biomass: this includes energy plants such as rapeseed or maize, residual materials and by-products such as manure or straw – and of course timber as well. Biogas plants, biofuel plants and wood-fired power plants turn these into heat, electricity and fuels. Biomass is currently the most important renewable energy source in Germany, accounting for 7.5 percent of primary energy consumption in 2018. Bioenergy thus plays a major role in reducing greenhouse gases and consequently in assisting climate change mitigation. So-called cascade use is becoming increasingly important. This is a method of making multiple use of biomass. Timber, for example, is used firstly as a building material. If it is no longer required to fulfil this function, the material can then be used to generate electricity and heat.





## 2 What is farming like today?

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*Farming has changed greatly over recent decades. The number of farms and farm workers is decreasing. The quantities of goods produced on farms have, in contrast, risen dramatically. This apparent contradiction is explained by the fact that the farms that remain are becoming bigger and more efficient. Despite this development, the majority of German farms are family-run.*



## Why are there fewer and fewer farms?

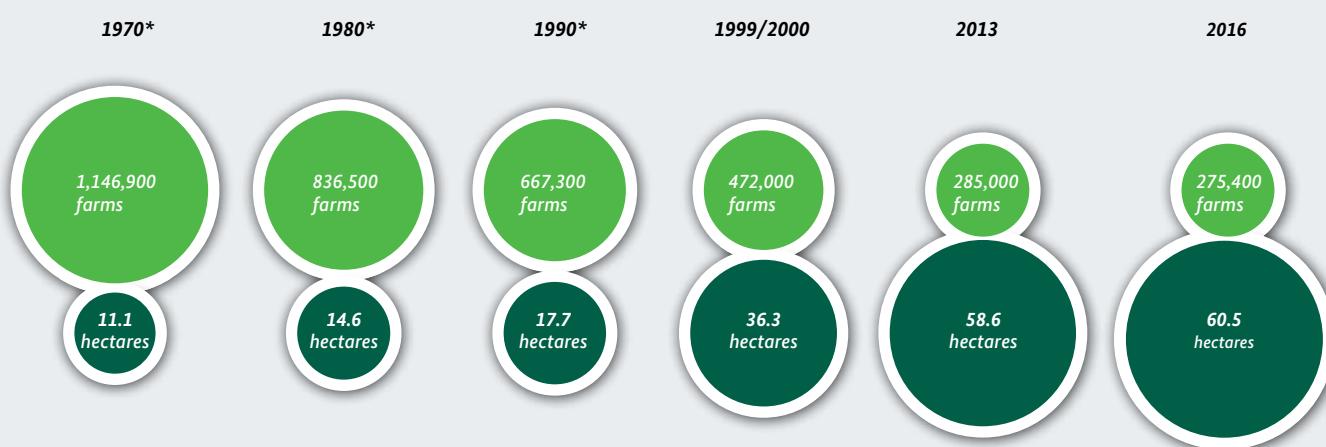
A glance at the past helps understand the structural change in agriculture: As recently as 1950, a lot of German farming was carried out by hand on small farms, although a few regions have always had larger holdings. Almost every fifth member of the working population worked in the farming sector. The situation changed with the arrival of tractors, combine harvesters and milking machines. Thanks to the technical advances, work on the farms now only needed a fraction of the earlier workforce. Farmers were able to farm more land and keep larger stocks of animals. The push towards modernisation also meant that agriculture became a capital-intensive business. For some farmers, it was not worthwhile investing in expensive farm machinery. For some, local constraints meant that they were unable to build larger sties or sheds or lease more land. Some did not know who would take over the farm when they retired. Others looked for better-paid work in other sectors. This resulted in growth, a process

that continues to this day. When, for any of a number of reasons, farmers believe their prospects are bleak, they may decide to give up their farms. Growth-orientated farms take over the land that becomes available and consequently expand their production base.

## Who is in charge of the farms?

Nine out of ten farms are managed by the proprietors themselves. Most of the land is leased (around 59 percent in 2016). The image of farmers working with their families to manage their farms does, therefore, correspond to the actual situation in almost 90 percent of farms. Cooperatives and private limited companies play a subordinate role in terms of absolute figures; they do, however, carry economic weight. The ten percent of farms run as partnerships, limited liability companies, cooperatives and private limited companies together work over a third of Germany's farmland. This percentage is far higher in the new Laender.

### EVER FEWER FARMS MANAGE EVER MORE LAND



- Number of farms
- Average size of farms

\* Old Laender

The figures are only comparable to a limited extent as the parameters have been altered several times.

## How many farmers still earn their living mainly from farming?

Almost half of farmers still earn their living mainly from farming. More than 50 percent of the individual farms – 52 percent in 2016 – are operated part-time, this means that the farm operators earned at least half of their income from activities other than farming. Full-time farmers now often try to generate an additional income from sources other than their main business of crop farming and livestock breeding: they market their own produce, such as vegetables, cheese and sausages, in farm shops, offer holidays on their farms, and generate renewable energy in their own biogas plants.

## How much do farmers earn?

Farm incomes fluctuate greatly. The prices that a farmer can charge for one litre of milk or a kilogramme of meat change from year to year, as do the prices for seed, fertiliser, feed and energy. As an average over the last five years (2013/2014 – 2017/2018), full-time farms generated an annual profit of approximately 54,200 Euros. Calculated in terms of each family member that works on the farms, this equates to an income of around a 32,000 Euros. But this income must be used to build up reserves for future investments or pay off farm debts as well as to cover living expenses and make provision for old age. Small farms and part-time farms have significantly less income: in the last five years, they generated an average of approximately 15,400 Euros per year and family worker. However, the income from farming at part-time farms accounts for significantly less than half of the farm owners' overall income. The financial assistance provided to farming by the European Union, the Federal Government and the Laender accounts for a significant amount of farmers' income.

### WHAT ADDITIONAL SOURCES OF INCOME DO FARMERS MAKE USE OF? (AS OF 2016)

<i>Number of farms that generate renewable energy:</i>	<b>34,600</b>
<i>Number of farms that engage in forestry management/wood processing:</i>	<b>23,200</b>
<i>Number of farms that work for other enterprises:</i>	<b>15,600</b>
<i>Number of farms other income combinations:</i>	<b>11,200</b>
<i>Number of farms that engage in direct marketing:</i>	<b>10,300</b>
<i>Number of farms offering horse-boarding services:</i>	<b>10,000</b>
<i>Number of farms offering tourism services:</i>	<b>6,000</b>

### SUPPORT FOR FARMERS IN THE FINANCIAL YEAR 2017/2018 (FULL-TIME FARMS)



→ Direct payments:  
**287 Euros per hectare**

→ Other payments (e.g. agri-environmental and climate programmes):  
**124 Euros per hectare**

→ Average:  
**34,391 Euros per farm**

## How and why are farmers supported by the state?

Farmers provide a variety of services for society which are not remunerated by market earnings for their products. The government therefore supports the farming sector financially. Governmental aid has several aims: On the one hand, it is intended to acknowledge the diverse services that farming provides for society, and to ensure that these services are maintained. Farmers bear a great responsibility to ensure the preservation of cultivated landscapes and supply the population with high-quality foods. They shape the social fabric in villages and create income and job opportunities in rural areas. On the other hand, the purpose of state aid is to compensate for the fact that European farmers have to meet far higher standards than their colleagues in other parts of the world, especially in the fields of environmental, animal and consumer protection. These higher standards raise the cost of production in many cases and may be a competitive disadvantage in a globalised market. Support seeks to offset this disadvantage and ensures high product safety and high quality. State aid also helps to stabilise farmers' income. The funds made available via the Common Agricultural Policy support both farmers and rural areas. A total annual funding of around 6.2 billion Euros in Community resources will be available for agricultural support in Germany from 2014 to 2020. The main budget item in the support funds is direct payments. Expressed simply, all farmers receive a standard amount for each hectare they farm – irrespective of what or how much they produce. 30 percent of direct-payment funds are, under the so-called greening scheme, tied to farmers' compliance with specific climate- and environmentally-friendly farming methods that even go beyond the existing standards (so-called cross-compliance standards) that are in place today. Small and medium-sized farms are provided with additional aid for the first few hectares. Additional aid is also available for young farmers. In addition to this, farmers can receive aid from



## A FUTURE FOR GREEN TRADES

*Nowadays agriculture is more than just driving tractors or milking cows. Modern farming offers diverse and varied activities in and with nature. The farmers' main task is to produce safe and high-quality food. In addition, they contribute to vital rural areas with a broad range of services. In all production processes and operational structures, modern agriculture places high demands on the professional qualifications of the technical and managerial staff in the holdings. Hardly any occupation requires a greater variety of skills than farming. Today farmers face far greater demands in many areas. Farmers wishing to manage a farm successfully must be proficient in more than just production methods; they must know about business management including world markets, understand, observe and apply a wide range of regulations and support guidelines, be able to master modern technologies and digital applications, know about animal-welfare oriented husbandry and low-impact soil cultivation, have a talent for marketing and much more besides. The fact that new technical and economic challenges continually arise provides for a demanding and responsible professional field. Nine out of ten full-time farms are run by senior managers who have attended an institute of agriculture, attained their "master" qualification or studied agricultural science or similar courses. In the last decade, the number of students enrolled in agricultural science has risen by more than 50%. During the 2017/2018 winter term, 17,436 young people studied agricultural science. Over 40 percent of those in charge of large farms that are run as limited liability companies, cooperatives or private limited companies have a university degree.*

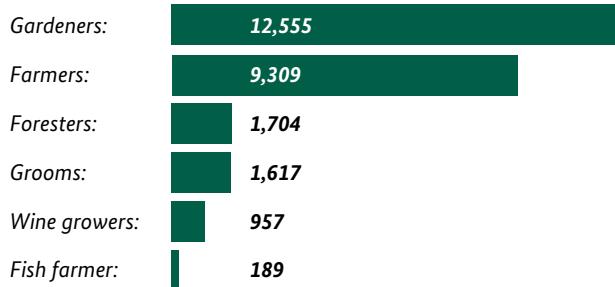
the Federal Government and the Laender if they participate in support schemes under the so-called second pillar of the Common Agricultural Policy. This aid includes, for instance, investment grants, support for organic farmers and payments for agri-environment and climate measures. There is also compensation for farmers who farm land in naturally disadvantaged areas.

## Who works in the farming sector?

Most farms are run by families. The most important workers on farms are usually the owners and their family members. Of the approximately 940,000 people employed in the farming sector, family members working on farms make up the largest group, totalling around 449,100. In addition to this group, there are 204,600 employees and 286,300 seasonal workers who work at certain times, for instance during the harvests. The farming sector remains a male domain: 64 percent of workers are male. The gender ratio is even greater at managerial level: fewer than ten percent of all farms are run by women.

In 2017, a total of 32,900 young people trained for jobs in the so-called "green sector": They trained to be farmers, horticulturists, forest managers, dairy technologists or were trainees in other agricultural occupations. For more information, please go to <https://www.bildungs-serveragrar.de/>

### TRAINEES IN "GREEN TRADES" IN 2017, INCLUDING:



# 3 What work do farmers do?

*In the cow shed, the cows themselves decide when they want to be milked by the milking robot, in the fields sensors calculate how much fertiliser is needed where, and the tractor no longer needs a driver – thanks to GPS it finds its own way: This may sound like pie in the sky, but for some innovative farms it is already reality. Technical advances have made much of the work in the farming sector a lot easier, resulting in huge leaps in productivity. But in many areas the advances that some see as a cause to celebrate are criticised by others as the “industrialisation of farming”. Critics complain about the impact of unwanted side-effects on the environment, on animals and on people and call for a return to “traditional farming”.*



## What working methods do farmers use?

Following the Second World War, a farmer was able to feed 10 people. Nowadays a farmer can feed 139 people. This has been made possible by means of the continual development of production methods. Modern machines and stalls, progress in breeding plants and animals, and plant protection and mineral fertilisers have revolutionised farming. All this leads to farmers today gaining far more stable and greater yields than they used to. The innovations of the past few decades have not only made farmers' work easier and increased production. They have also improved the quality of the products.

## Which opportunities come along with digital technologies in the farming sector?

The introduction of digital technologies is changing the way we work, communicate and consume; in a nutshell, it's changing our whole lives. The farming industry is a prime example of this; automated work processes on fields and farms have long since arrived. Information technology and electronics have shaped everyday farming practice for many years. Precision farming techniques have been used in everyday life in agriculture for more than two decades.

The farming sector and agricultural technology are therefore at the forefront of the digital revolution. Autonomous driving is often already a reality in agriculture. As part of their daily working routine, farmers use milking systems and equipment with sensors that can analyse milk components or the physical condition of the cows and provide the farmer with the information straight away. Stable robots keep stables clean day and night and satellites inform farmers about soil moisture content and crop conditions. Sensors on tractors can for instance determine how much fertiliser should be applied, adapting the dosage precisely to the needs of the respective plants and consequently making it possible to avoid excessive use. This is also beneficial for the environment.

Digital technologies provide many opportunities for the farming industry and its upstream and downstream sectors. For instance, farmers can produce their food more sustainably and transparently. Physically demanding

or monotonous work can be carried out or made easier by modern digital technologies. Digital solutions enable the farming sector to use limited resources such as water and soil more carefully and efficiently. Digital technologies in livestock husbandry help to improve the living conditions of animals, for example by means of improved feeding, or to detect early on if an animal is sick. Health controls of animals can then be improved. This benefits animal welfare.

Despite all the opportunities offered by digitisation, there are still challenges: to be able to apply digital technologies universally, rural regions require high-performance and secure infrastructure. A wide variety of processes can be linked and stakeholders can be put in contact with each other by means of a wide range of information. But also the issues of interface compatibility between different manufacturers of agricultural machinery and IT providers, data sovereignty and data security are important for both small and large holdings. The Federal Ministry of Food and Agriculture will continue to support the farming sector in the digital transformation process. The objective is to help shape the framework for digital farming in such a way that the farming industry, the environment and consumers can benefit equally from the new opportunities and the potential risks can be reduced.

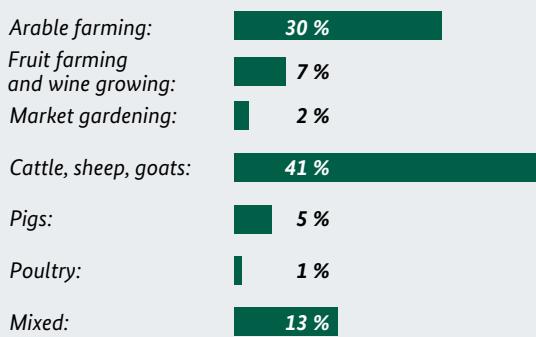


## What does specialisation in farming mean?

In the past, farms were quite diversified. As a farm also catered to the farm family's own requirements, it was usual to keep a lot of different kinds of animals and to grow a broad range of arable crops. Reasons related to work processes also encouraged this diversity. Until tractors established themselves, horses provided most of the pulling power – as recently as 1950, there were 1.2 million horses working on German farms. Large quantities of feed had to be grown for the draught animals. Today, 87 percent of farms have specialised in one area of production; for instance, they may concentrate on arable farming or focus on keeping one particular species of animal. With regard to animal husbandry, most farmers specialise. Pig fatteners, for example, buy the young animals (piglets) from specialised breeding farms, dairy farmers sell their male calves to other farms for fattening. The high degree of specialisation and division of labour enables, on the one hand, work to be made far more economic and efficient. On the other hand, this may also have negative side-effects, for example more animals being transported, biodiversity being reduced, or farms becoming more susceptible to fluctuations in prices on specific markets.



**WHAT HAVE FARMS SPECIALISED IN?  
(AS OF: 2016)**



## To what extent is farming dominated by large farms?

Even if there remain many smaller farms among the 275,400 in Germany, the average farm size continues to rise. More than half of agriculturally-used land is now farmed by around a tenth of the farms – each of these has at least 100 hectares of land.

The 1,500 largest farms, with at least 1,000 hectares of land, together farm an area that is larger than the Land of Mecklenburg-Western Pomerania – around 2.5 million hectares. This development is very advanced in animal husbandry. Together, the 2,800 largest of the 40,300 German pig farmers have over eleven million pigs in their sties – more than a third of the total stock. The production of eggs and fattening chickens is highly specialised and uses large units. Almost all fattening chickens originate from farms that keep more than 10,000 animals. With regard to laying hens, at the beginning of 2016 the 200 largest farms kept 55 percent of the total stock. Each of them had at least 50,000 hens.

## What conclusions about the farm's working methods can be drawn from its size?

The public debate often makes the size of the farm the decisive criterion. According to this view, large farms stand for “industrial farming”, small farms for “traditional farming” which is more concerned for the environment and animal welfare. There is no scientific evidence for making this link. In the new Laender, in particular, some farms are showing that more than 1,000 hectares of land and large animal stocks can be managed according to the most stringent standards of environmental conservation and animal welfare. The animals on a small farm are not necessarily happier. It is easier for more profitable farms to make investments, including investments which make farming more environmentally sound or improve animal welfare. The size of farms is therefore not the decisive factor regarding the quality of products and the environmental compatibility and welfare orientation of the production methods. The vital factor is to a large extent the ability and the commitment of the farm management. The management must, for example, coordinate the fertiliser application with the needs of the plants and the nutrient content of the soil, closely observe the animals and react correctly if they exhibit unusual behaviour.

## What regulations must farms comply with?

No farmers are allowed to do just as they wish on their farms. The legislative requirements within the EU are rigorous, when gauged by international standards. They require all farmers to comply with standards regarding environmental conservation, animal welfare, occupational health and safety, and consumer protection. These include hygiene regulations, provisions of animal feed legislation and medicinal drug legislation, stipulations on the use of plant protection products, and minimum standards for animal keeping.

Research, support and legal provisions have in recent years brought about great progress and corrected many unwelcome developments. For instance, since 2006, a ban on the use of antibiotics as growth promoters has been in place throughout the EU. Antibiotic veterinary drugs may only be used upon prescription by a vet for the treatment of sick animals. Keeping chickens in cages – so-called laying batteries – has been banned in Germany since 2010, and throughout the EU since the beginning of 2012. In addition to this, farmers are required to work in accordance with “good agricultural practice”, to which reference is made in many laws. It is taken to refer to a body of regulations that are based on scientifically robust findings and that have proved in practice to be appropriate for increasing animal welfare and improving environmental conservation. A large number of farmers take part voluntarily in so-called agri-environmental and climate programmes.

## What animal welfare requirements are there in livestock husbandry?

The legislator has laid down a large number of requirements regarding livestock husbandry which are aimed at animals being kept in compliance with their needs and the needs of their species. In the case of pig husbandry, for example, there are stipulations on the minimum amount of space an animal must have to move around in, what light and temperature conditions must be complied with in animal housing, what kind of flooring is permitted, how the feeding and watering equipment must be installed and what conditions must be met for certain medical procedures, such as castration. These minimum standards required by law are compulsory for all farmers. The Animal Welfare Act also requires farmers to conduct their own controls. Animal welfare indicators are intended to identify and eliminate weaknesses at farms.

In summer 2015, the BMEL and the poultry industry concluded the “Agreement on improving animal welfare, in particular on discontinuing beak-trimming in the

## A HISTORICAL COMPARISON OF HARVEST YIELDS AND LIVESTOCK PERFORMANCE



### **Harvest yield for 1 hectare of wheat**

1950*:	2,580 kg
1980*:	4,890 kg
<b>Average 2016–18:</b>	<b>7,387 kg</b>



### **Harvest yield for 1 hectare of potatoes**

1950*:	24,490 kg
1980*:	25,940 kg
<b>Average 2016–18:</b>	<b>42,197 kg</b>



### **Milk yield per cow and year**

1950*:	2,480 kg
1980*:	4,538 kg
<b>2018:</b>	<b>8,059 kg</b>



### **Egg yield per hen and year**

1950*:	120 eggs
1980*:	242 eggs
<b>2018:</b>	<b>298 eggs</b>

\* Old Laender

husbandry of laying hens and fattening turkeys”. Since August 2016, there has been a ban on beak-trimming in chicks intended for laying hen husbandry in Germany. As of January 2017, it is not permitted to keep any hens with trimmed beaks in laying hen holdings in Germany. Since summer 2018, eggs originating in Germany have therefore been produced exclusively by laying hens with intact beaks.

Whether a farmer provides his animals with conditions that go beyond the minimum animal welfare requirements and are particularly animal-friendly is not easily recognisable for consumers when they buy food of animal origin. For this reason, the BMEL is currently working intensively on the introduction of a three-tiered state animal welfare label, which can be used to label foodstuffs from particularly animal-friendly husbandry systems and identify them quickly and reliably when they are purchased. The requirements to be met by the livestock industry will increase with each step of the animal welfare label. Consumers can obtain information about the current status of the planned state animal welfare label and other food labelling with special reference to animal welfare on the BMEL internet portal at [www.tierwohl-staerken.de](http://www.tierwohl-staerken.de).

# Organic Farming

Organic farming is a particularly resource-conserving and environmentally friendly type of farming based on the principle of sustainability. The main idea behind organic production is that of farming in harmony with nature. Organic farming contributes to preserving ecosystems and biodiversity, protecting the soil, keeping water clean and minimising climate change. Germany is Europe's largest market for organically produced food.

## How do organic farmers work?

Organic farming, along with conventional farming, is an important pillar of Germany's agricultural and food industries. Organic farming is considered an important key technology, which – next to environmental benefits – offers great innovative potential for the entire sector. The farming methods used by organic farmers are particularly resource-conserving and ecologically compatible. These farmers are guided by the principle of sustainability. The main idea behind organic production is that of farming in harmony with nature. Organic farmers keep interference with natural processes to a minimum. Animal feed must also come from organic production.

Organic farmers are not permitted to use any easily-soluble mineral fertilisers. To keep soil fertile, they mostly use manure or slurry for fertilisation, or regularly plant crops such as beans, peas or clover which improve the nutrient content of soil. It is not permitted to use synthetically produced chemical pesticides in organic farming. Mechanical systems (e.g. hoeing machines, harrows) or arable techniques (crop rotation) are used to keep plants healthy and reduce unwanted grasses or weeds. On organic farms, livestock are kept in conditions that are as in line with animal welfare requirements as possible. They have more space than animals on conventional farms. They are usually able to have outdoor runs and the opportunity to behave naturally, for example by scratching the ground, pecking or wallowing.

Organic farmers have lower yields than their colleagues in conventional farming. Yields for crops such as wheat or potatoes, for example, are approximately 50 percent lower, the milk yield from cows amounts to 90 percent of yields at conventional farms. On the other hand, organic farmers are able to charge higher prices for their products. Additional State funds offset the lower income that organic farmers nevertheless have in comparison with conventional farmers. The payments for organic farming amount on average to 216 Euros per hectare (2017/18). Vegetables, meat and processed products from organic farming are very popular with consumers. The aim is for domestic organic farmers to meet even more of the rapid growth in demand for organic products. The Federal Government aims to increase organic farming to 20 percent by 2030.



The Federal Ministry of Food and Agriculture has therefore developed the Strategy for the Future of Organic Farming. This Strategy is to be used as a guideline to significantly improve the development opportunities for organic farming and food management and thus also the participation of domestic agriculture in market opportunities.



Germany's organic production  
label



EU organic farming logo

It is planned to reach the 20 percent target by implementing 24 measures along five pivotal lines of action:

1. designing a viable and coherent legislative framework;
2. facilitating access to organic farming;
3. fully utilizing the demand potential and expanding it further;
4. improving the productivity of organic farming systems, and
5. rewarding environmental services adequately.

The strategy highlights the “levers” which policy-makers can use to support organic farming on its way to achieving the 20 percent target. It is crucial for developing a sustainable and eco-friendly agricultural sector.

## How many organic farmers are there?

In 2018 there were around 31,700 farms (approximately 12 percent of all farms) which worked according to the organic farming regulations. Together they farm 9.1 percent of the agriculturally-used land – more than 1.5 million hectares. Around 6 percent of hens and one percent of pigs are kept organically in Germany. Organic products now account for approximately 5.3 percent of the total turnover in the food sector.

## How reliable is the labelling of organic foods?

“Bio” and “Öko” are terms that are protected under German law and may only be used if the respective products comply with precisely specified regulations. These regulations are defined in the EU Organic Farming Regulation. Prepacked produce from organic production which meets all stipulations is labelled with the European Union’s organic logo. In addition to the code number of the organic control body, the label must also include the origin of the ingredients if the EU organic farming logo is used. The composition of the code number for a control body approved in Germany is as follows:

*DE-ÖKO-000. “DE” stands for Germany and “000” is the three-digit code of the control body.*

Products from Germany also often bear the national organic label. There are also a series of other organic logos from growers’ associations or commercial brands. Farmers who belong to such a growers’ association must, in addition to the regulations contained in the EU Organic Farming Regulation, also comply with the regulations of their association which often go beyond national requirements. Currently, more than 5,400 companies use the national state organic label on more than 80,000 products.

# 4

## What do farmers produce?

### SELECTED PRODUCTION OUTPUTS IN GERMANY IN 2018

Milk:	33.1 million t	Sugar beet:	28.6 million t
Beef and veal:	1.1 million t	Potatoes:	10.5 million t
Pork:	5.4 million t	Rape:	4.2 million t
Poultry meat:	1.6 million t	Vegetables:	3.5 million t
Eggs:	14.7 billion eggs	Fruit:	1.1 million t
Silage maize:	89.7 million t	Wine:	899 million l
Cereals:	43 million t	Hops:	42,040 t

*For crop products, the mean value amongst the figures for the period 2016 to 2018 was used.*

*Germany's farming sector is one of the four largest producers in the European Union. This success is based mainly on animal husbandry: no other country in Europe produces as much milk or pork. To provide nourishment for Germany's livestock, which totals over 200 million animals, feed is grown on around 60 percent of agriculturally used land, for instance maize or wheat. These and other crops also play an important role in the generation of renewable energy. Besides animal products, the main produce for human consumption is bread cereals, potatoes, sugar beet, fruit and vegetables.*

*The main growing and production areas are those that are favourable due to geological, climatic or infrastructural conditions. These maps show what products predominate in which areas of Germany.*





 **CATTLE (DAIRY COWS AND FATTENING COWS)**  
from 1 cow per hectare of farmland



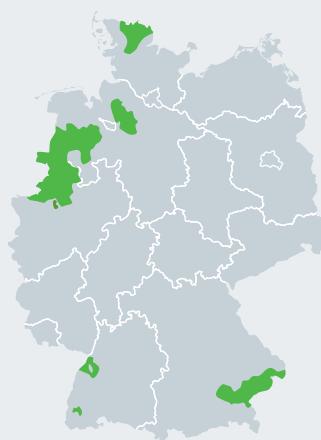
 **PIGS**  
from 2 pigs per hectare of farmland



 **HENS**  
from 1 million hens per district



 **CEREALS**  
from 70 percent of arable land



 **MAIZE**  
from 30 percent of farmland



 **POTATOES**  
from 10 percent of arable land



 **FRUIT (TREE FRUIT, BUSH FRUIT, STRAWBERRIES)**  
from 750 hectares under fruit per district



 **FIELD VEGETABLES**  
from 750 hectares under field vegetables per district



 **WINE & HOPS**  
all important areas in Germany

## KEY FIGURES FOR GERMANY

Stocks:

**approx. 11.8 million**  
of which  
**4.1 million dairy cows**

Farms with cattle farming:  
**approx. 121,000**

Animals slaughtered annually:  
**3.5 million**

Annual production:  
**1.1 million tonnes of beef and veal,**  
**33 million litres of milk**  
of which from organic production:  
**Beef and veal approx. 5 percent**  
**Milk: approx. 3.4 percent**



## Cattle

From an economic point of view, they are the most important food producers in the German farming sector: approximately half of all farmers keep cattle in order to produce milk, meat or both. While the number of cattle farmers is decreasing, herd sizes are increasing: over two thirds of the cattle live in farms which keep at least 100 animals.

### How important is cattle farming?

Germany is the largest milk producer in the EU and, after France, the second-largest producer of beef and veal. German farmers earn approximately 25 percent of their production value from milk and meat provided by their cattle – from 2016–2018, the average production value amounted to 14 billion Euros. More than two-thirds of this, amounting to over ten billion Euros, was accounted for by milk: about half of this milk is processed in domestic dairies to milk for drinking, butter, yoghurt, cheese and other dairy products. Almost half of these dairy products are exported; of these exports, 84 percent are to countries in the EU. China, Switzerland the US and South Korea are important third-country markets. At the same time, Germany also imports many dairy products; these imports are also mainly from the EU countries.

### How are cattle kept?

Cattle are mainly kept in loose housing sheds in which they can move around relatively freely. These sheds vary considerably. They range from narrow sheds with floors made completely of concrete slats (usually cattle fattening farms) to generously-sized cubicle houses in which every dairy cow has a resting place with litter (for example straw). Some farms, in particular smaller farms, also use tethering: the animals are tethered in rows and can only stand up or lie down. This method is used for about

every fifth cow in Germany. Irrespective of the type of husbandry used, slightly more than every third cow can graze regularly in the summer, on average for half a year. Grazing makes an important contribution to the tending of grassland.

### What is a cow's life like?

For dairy cows to supply milk, they need to have given birth to a calf. Female calves are usually kept to serve as the next generation in the dairy herd, male calves are usually fattened. Female animals are usually inseminated for the first time at about 18 to 24 months; this is almost always artificial insemination. The main reasons for artificial insemination are breeding considerations and the prevention of animal disease transmission. Calves are born after just over nine months. The calf is reared initially in a calf pen or in a calf igloo with an outdoor run. From the eighth week at the latest, it lives in a group with other young cattle. Fattening cattle reach their slaughter weight after one-and-a-half to two years. Dairy cows are usually slaughtered after four-and-a-half years. Suckler-cow husbandry, where the suckler cow and her calf remain together, is regarded as the type of beef-cattle husbandry most in line with animal-welfare requirements. These cows are not milked. In suckler cow husbandry, the cattle spend as much time as possible in pasture.

## FACTS AND FIGURES ABOUT CATTLE

Percentage of farms with up to 49 cows in 2016:

**47.7 %**

Percentage of total cattle kept on these farms:

**10.1 %**

Percentage of farms which in 2016 kept 200 cows or more::

**12.7 %**

Percentage of total cattle kept on these farms:

**49.4 %**

Average per-capita consumption of beef and veal in 2018:

**9.7 kg**

Amount of milk contained in the annual per capita consumption of milk and dairy products:

**340 kg**

Daily feed requirement for a dairy cow that gives 40 litres of milk:

**50–60 kg**

of which high-energy feed:

**12 kg**

Daily water requirement of this cow:

**85 l**

Average slaughter weight of a fattening bullock in 1960\*:

**268 kg**

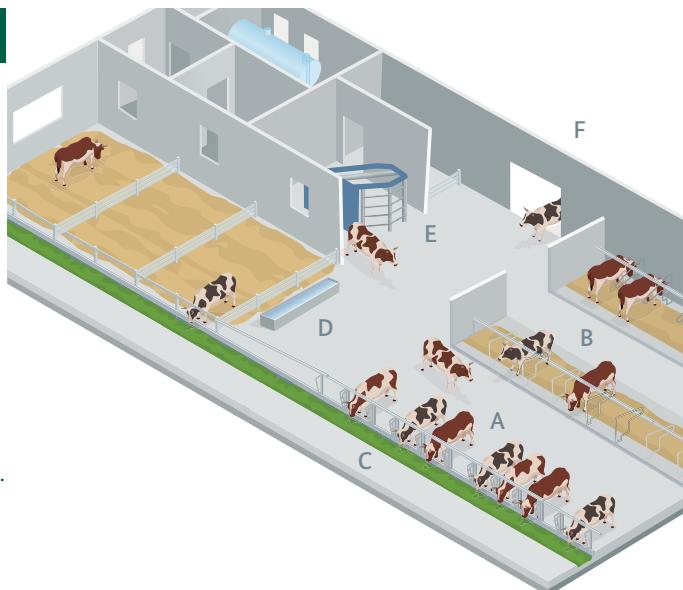
in 1990\*:

**355 kg**

in 2018:

**396 kg**

\* Old Laender



## What does a modern cowshed look like?

### Loafing areas (A)

Cattle are herd animals. Passageways in the sheds provide them with freedom of movement. The floors are usually perforated to allow excrement to be pushed through as the cattle move around. In most cases, the floor is solid. Excrements are regularly removed with a scraper. In some cases, floors are perforated so that excrements can be pushed through the slats.

### Cubicle loose box (B), feeding places (C) and drinking point (D)

Cattle spend much of their time feeding, resting and ruminating. Sheds offer freely accessible feeding places, drinking points and cubicles cushioned with litter such as straw. As cattle, being ruminants, require feed rations with a certain minimum fibre content, grass and maize silage are important elements of their basic feed. Nowadays, in most cases a Total Mixed Ration (TMR) is used to feed concentrated feedingstuffs, where the concentrate is pre-mixed with basic feed. Milking robots can also offer concentrates as bait feed.

### Robot milking system (E)

In modern housing the animals are often milked by a milking robot. The animals can choose when and how often they want to go to the milking parlour. Farmers are also no longer bound to fixed milking times and are more flexible in their work.

### Outside area (F)

In some cases, animals also have the option of going outside – for example to an outdoor run or to pasture land. This offers the animals the best means of satisfying their species-specific exercise requirements.

## DEBATE: ANIMAL TRANSPORTS

*Animals must not suffer unnecessarily during transport. EU law clearly stipulates how animals must be fed during transport in trucks. There are clear rules regarding the frequency and duration of resting periods for the animals. The organisers and transportation companies are responsible for compliance with these rules.*

*Under Community law, it is impossible at national level to prohibit the transport of animals if the destination is outside the EU. Transnational transport of animals can therefore only be limited by EU-wide provisions on animal welfare. The Federal Ministry of Food and Agriculture has called upon the European Commission to address the problematic issue of practices that are contrary to animal welfare in livestock transportation to third countries, and to act immediately. Care must be taken to ensure that animals are fed sufficiently during transport in line with European animal welfare standards and that resting periods are complied with. Animal welfare must not end at borders.*

## KEY FIGURES FOR GERMANY

**Stocks:**  
approx. 26 million

**Farms with pig husbandry**  
approx. 40,000

**Animals slaughtered annually**  
57 million

**Annual production**  
approx. 5.4 million tonnes of meat,  
of which from organic production:  
less than 0.6 percent



## Pigs

Pigs were domesticated at least 9,000 years ago, making them one of mankind's oldest farm animals. Today, pigs are the most important source of meat in Germany and a mainstay of the domestic farming sector. Pig husbandry has changed rapidly over recent decades: the sector is increasingly becoming dominated by highly-specialised farms with large numbers of animals.

### How important is pig farming?

Germany is the largest producer of pork in Europe and, after China and the USA, the third largest producer in the world. The German farming industry's average production value in the pig sector between 2016 and 2018 amounted to approximately 6.8 billion Euros. The structure of pig production has changed over the last 50 years. From 2007 to 2016 alone, the number of pig farmers sank by approximately 50 percent, while the number of animals rose slightly.

### How are pigs kept?

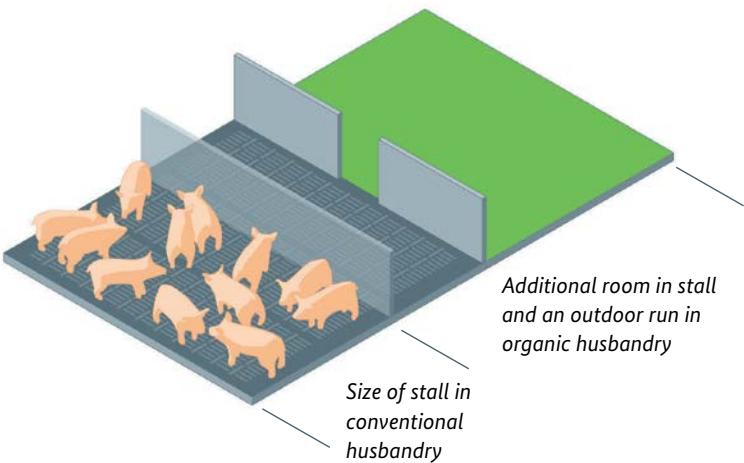
Modern pig farming aims to make production hygienic, efficient and cost-effective while achieving high animal performance and high quality. Farmers must comply with legal regulations which require husbandry to be animal-

welfare orientated and environmentally sound; this includes, for example, the provision of manipulable material, stall ventilation and slurry storage. Most farms concentrate on specific production steps, for instance piglet production or fattening. However, there are an increasing number of farms which carry out all production phases themselves. Computer-controlled feeding systems are now standard, as are special stalls for every stage of husbandry.

Pigs are usually kept on perforated flooring. This is usually a slatted floor made of concrete or sometimes of synthetic material which allows urine to run out and excrement to be pushed through the slats as the pigs move around. This keeps stalls clean. Litter, such as straw, is seldom used. Free-range production is not very widespread (less than one percent) as there is a higher risk of disease and the husbandry conditions are more costly and work-intensive.

### How much room do pigs have in their sties?

Pig husbandry must comply with a large number of regulations. These regulations describe in detail what features and fittings pig sties must have. They relate in particular to the flooring and to how much space each animal needs. For instance, a fattening pig weighing between 50 and 110 kilos must have at least 0.75 square metres' space at its disposal. In organic husbandry, a fattening pig has at least 1.3 square metres' space and also an outdoor run measuring at least one square metre.



## What is a pig's life like?

### Reproduction and gestation

Breeding sows are inseminated at least twice a year. Insemination takes place in a service area. The sows are kept in so-called crates (A) during insemination and for up to four weeks afterwards in order to increase breeding success. After this period, breeding sows live in groups (D). Gestation lasts for about 115 days.

### Farrowing and nursery

About one week before the expected farrowing date, the sow is taken to the farrowing pen (B). The average litter size is twelve piglets. Protective baskets for the piglets are intended to prevent the sow from accidentally crushing her offspring. The sow suckles her piglets for three to four weeks; she then returns to the service area.

### Rearing (until the twelfth week)

From an age of three to four weeks, the piglets are reared in groups in a special piglet house, a so-called flatdeck (C). At the end of this rearing phase, the pigs are moved to a fattening house.

## DEBATE: TAIL DOCKING

*Tail biting is a prevalent problem on pig holdings.*

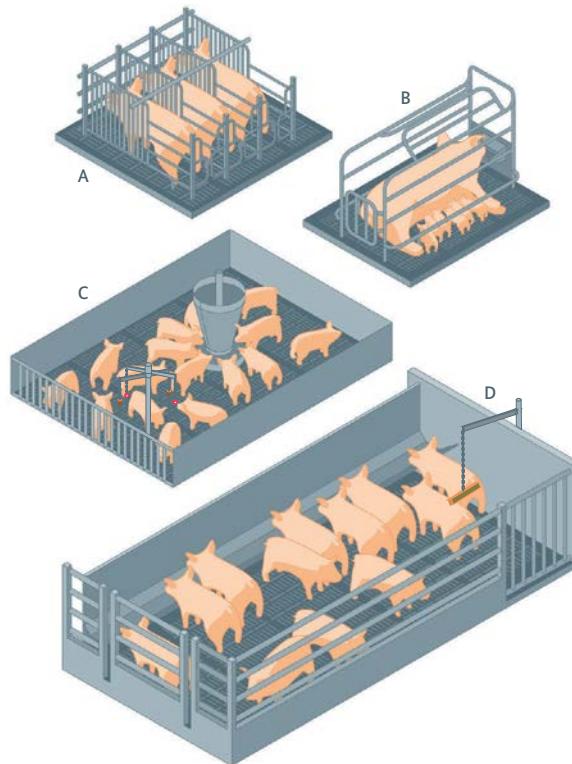
*There are different and multi-faceted reasons for the occurrence of tail biting. Among other reasons, stocking density, stable climate, animal nutrition or the occupational material may play a role. Tail docking, which is currently practised throughout the EU except in Finland and Sweden, can reduce the risk of tail biting.*

*However, docking piglets' tails is only permitted in exceptional cases under European and German law. In particular, farmers need to take preventive operational measures to minimise the risk of tail biting by other means, for instance by adjusting the stocking density or by offering more occupational material to the animals.*

*The BMEL supports different research projects in this area. Among other things, the model and demonstration projects on animal welfare support both extension services and investments in agricultural holdings in order to reduce the risk of tail biting and ultimately make it possible to renounce tail docking.*

*In various audits the European Commission objected to the practice of tail-docking in the member states with a high number of pig farms, including Germany, and considered it non-compliant with European legislation. For this reason, in 2018 the federal states took the lead in developing an action plan, which aims to prospectively eliminate tail docking in Germany.*

*Currently, there are consultations with other member states going on in order to coordinate the planned activities in terms of time and content.*



### Fattening (until ready for slaughter)

Fattening pigs are usually kept in separate pens (D) in groups of from twelve to 45 animals. The animals are usually fed on cereals and high-protein feed such as soy grist. They reach their slaughter weight at an age of about six months.

## FACTS AND FIGURES ABOUT PIGS

Percentage of farms with fewer than 100 pigs 2016:

**42.7 %**

Percentage of total number of pigs kept on these farms:

**1.1 %**

Percentage of farms which in 2016 kept 1,000 pigs or more:

**23.5 %**

Percentage of total number of pigs kept on these farms:

**75.3 %**

Daily feed requirement for 1 kg increase in fattening pigs in 1967\*:

**3.7 kg**

in 1985\*:

**3.2 kg**

in 2013:

**2.5 kg**

Average per-capita consumption of meat per week in Germany in 2018:

**about 1.2 kg**

of which pork:

**about 0.7 kg**

Average slaughter weight of a fattening pig in 1900:

**100 kg**

Age when reaching this weight in 1900\*:

**11 months**

Average slaughter weight of a fattening pig in 2018:

**95 kg**

Age when reaching this weight:

**6 months**

\* Old Laender

## KEY FIGURES FOR GERMANY

**Stocks:**  
approx. 174 million

**Farms with poultry husbandry**  
approx. 49,100

**Animals slaughtered annually**  
709 million

**Annual production**  
approximately 1.6 million tonnes  
of meat,  
approximately 14.7 billion eggs  
of which from organic production:  
**Poultry meat:** about 1.4 percent  
**Eggs:** about 11.5 percent



## Poultry

Domestic poultry have provided mankind with meat and eggs for more than 4,000 years. Domestic chickens are the most common farm animals in Germany. There are many other poultry species; apart from turkeys, however, these play a niche role. While egg consumption has stayed relatively stable, the population's demand for poultry-meat in Germany has been rising for decades. This demand is largely met by a few hundred specialised farms with very large poultry stocks.

### How important is poultry farming?

Germany is a net exporter of poultry meat. With regard to eggs, domestic production meets around two-thirds of domestic consumption. Eggs and poultry meat account for approximately six percent of the agricultural production value; the average value between 2016 and 2018 amounted to 3.5 billion Euros, of which meat accounted for almost 70 percent.

### What type of poultry is kept?

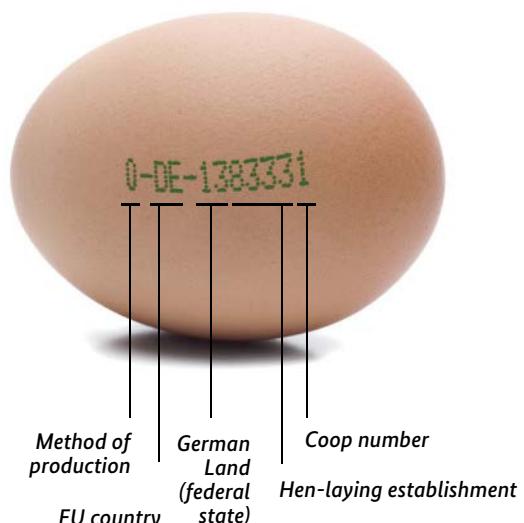
The domestic chicken is by far the most common poultry species on German poultry farms. Turkey has gained in importance; stock figures have more than doubled since the early 1990s. Duck farming is in third place, while goose fattening plays a niche role. Other poultry species, such as guinea fowl, quail or pheasants are only kept in small numbers.

#### Stock figures for selected species of poultry

<b>Domestic chickens:</b>	159 million
of which laying hens:	52 million
<b>Turkeys:</b>	12.3 million
<b>Ducks:</b>	2.2 million
<b>Geese:</b>	0.3 million

### What does the code on the egg mean?

As of 2004, every egg produced in the EU must be marked with a code. The first number stands for the type of husbandry (0 means organic production, 1 means free-range production, 2 means floor housing, 3 means cage rearing), the following letters stand for the EU country and that follow this number stands for the respective farm. For an egg originating in Germany it is possible to tell from these numbers what Land, farm and stall the egg was laid in.



## FACTS AND FIGURES ABOUT POULTRY

Number of farms which kept 50,000 fattening chickens or more in 2016:  
**around 660**

These farms as a percentage of all farms with fattening chickens:  
**19 %**

The fattening chickens kept on these farms as a percentage of the overall stock:  
**79.4 %**

Number of farms which kept 50,000 laying hens or more in 2016:  
**around 210**

These farms as a percentage of all farms with laying hens:  
**0.5 %**

The laying hens kept on these farms as a percentage of the overall stock:  
**54.7 %**

Average fattening period for a fattening chicken in 1961\*:  
**60 days**

Average slaughter weight attained after this period:  
**1.0 kg**

Average fattening period for a fattening chicken in 2017:  
**28 days**

Average slaughter weight attained after this period:  
**1.5 kg**

Average per capita consumption of poultry meat in Germany in 1985\*:  
**5.6 kg**

Average per capita consumption of poultry meat in Germany in 2018:  
**13.2 kg**

\* Old Laender

## DEBATE: ALTERNATIVES TO THE CULLING OF MALE CHICKS

*Every year in Germany alone, about 48 million male chicks are killed shortly after hatching. Since other breeds of fowl are more suitable for the production of meat, the brothers of the laying hens are in most cases not reared but killed. But how can the killing of chicks – which is to be rejected on animal welfare and ethical grounds, but which is legally controversial – be avoided? The Federal Ministry of Food and Agriculture is searching for alternatives and supporting corresponding research projects. Experts are currently discussing three main alternatives: In the search for alternatives, one approach that is being supported is in-ovo sex determination. This approach is based on being able to determine the sex of an animal at an early stage in the egg (Latin “in ovo”). Only the female animals are then hatched. Another approach is the breeding of chickens which are used both as laying hens and as fattening chickens – so-called dual-purpose chickens. Besides that, the “Bruderhahn initiative” is currently making a name for itself. This is not a special breed. The lower profit made from the meat of these animals is compensated in this model by selling the eggs for a higher price.*

## How is poultry kept?

### Laying hens

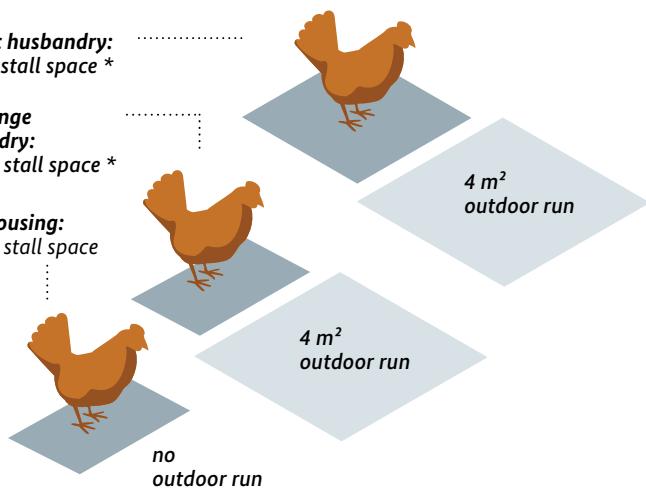
Floor housing is now the most common form of husbandry (62 percent). The birds usually live in tens of thousands in hall-like sheds. They can scratch, peck and dust-bathe in a litter of straw or wood shavings. In free-range systems, the hens also have an open-air run. 18 percent of laying hens are kept like this. Another 9 percent are kept in so-called small-group housing systems. The birds live in groups in aviaries; around 11 percent is accounted for by animals in organic husbandry.

The last step to dispense with small-group housing systems was agreed on in April 2016. Existing farms have been granted a phase-out deadline of until the end of 2025. Only in special cases of hardship can the deadline be extended until 2028 at the latest.

Nowadays, almost all the laying hens used are specially bred for high egg yields. They can lay over 300 eggs a year, but this yield decreases after one year. The birds are therefore slaughtered at approximately one-and-a-half years of age and replaced by young hens.

### Fattening poultry

The fattening-poultry sector, especially for fattening chickens and fattening turkeys, is dominated by floor housing and large stocks. The animals are kept on litter to help regulate the temperature and store humidity. Special strains are used for fattening purposes: these strains are distinguished by high weight increases and a good feed conversion ratio. Fattening chickens weigh around 40 grams on the day they are born but reach their slaughter weight between five and nine weeks later. According to animal-protection regulations, a certain maximum permissible “stock density” must not be exceeded in chicken fattening. In practice, this means that one square metre of flooring is usually shared by between 16 and 23 birds. The fattening of turkeys requires more time. Hens attain their slaughter weight of around ten kilos after around 16 weeks; cocks are usually fattened to around 20 kilos within 22 weeks. There are rules on maximum stocking density in turkey farms in the “National reference figures for a voluntary agreement on keeping fattening turkeys”.



\* per laying hen

## KEY FIGURES FOR GERMANY (INCL: GRAIN MAIZE)

Cereal-growing farms:  
approx. 174,800

Area under crops:  
approx. 6.1 million hectares

Total annual production:  
approx. 43 million tonnes, of which

Wheat:  
approx. 23.1 million tonnes

Barley:  
approx. 10.4 million tonnes

Rye:  
approx. 2.7 million tonnes

Oats:  
approx. 0.6 million tonnes

Area of land under organic farming:  
approx. 4 percent



## Cereals

**It was not until mankind began to sow seed and engage in arable farming that populations moved from being hunters and gatherers to being sedentary. Today, cereals – and in particular wheat – are the most important plant products in the German farming sector. Cereals serve as food, feed and, to a minor degree, as renewable raw materials.**

### How important is cereal farming?

Cereals are grown on over a third of agriculturally used land in Germany. More than every ninth Euro earned by German farmers comes from cereal crop production; in 2015 to 2017, the production value amounted to around 6.5 billion Euros. Following their French colleagues, German farmers are the second-largest cereal producers in Europe.

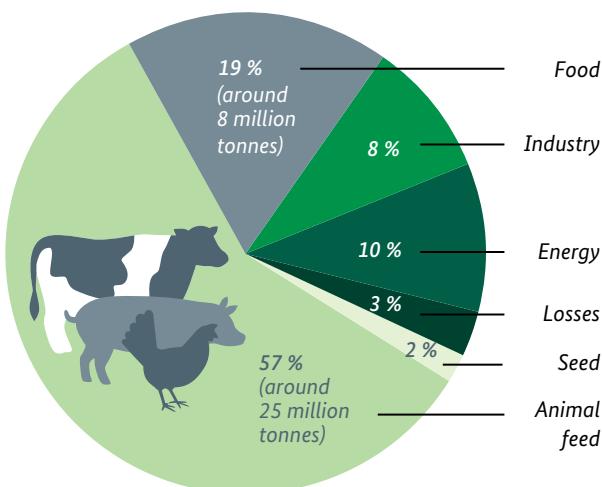
### What is grown?

Wheat is by far the most commonly grown cereal in Germany. One of the main positive features of wheat is its extremely good yield. Barley is in second place; this is used mainly as animal feed, but also as brewer's barley for making beer. Rye traditionally also plays an important

role in Germany, the land of bread. In general, the quantity of oats grown has been declining for decades. There has been a slight renaissance, in particular in organic farming, for some almost forgotten cereals, such as spelt and "einkorn" which is often described as "stone-age wheat" and is one of mankind's oldest crops.

### What are cereals used for in Germany?

Contrary to popular belief, cereals are not grown mainly for making our bread. Almost 60 percent of the cereals used in Germany end up in the feeding troughs of the farm animals to help produce meat, milk and eggs. Just under a fifth is grown for human consumption. Cereals are also used, albeit to a far lesser degree, as renewable raw materials for energy generation and for industry. For example, alcohol is also produced from cereals and the malt is used to brew beer. The diagram below shows the average quantities for the years 2015 to 2017/18.



### How are cereals grown?

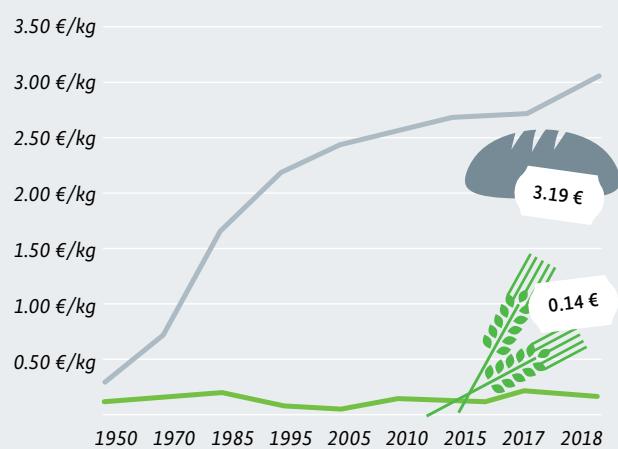
Cereals are grown as winter and summer cereals. Typical summer cereal varieties, such as oats and brewing barley, are sown from February onwards and harvested from July. Winter cereals are also harvested from July but are sown the previous autumn. Winter cereal varieties play a more important role as they produce far higher yields. They are usually sown between mid-September and early November. Intercrops are increasingly being planted in autumn and spring. Intercrops that are sown in autumn to provide root penetration of the

soil, improve the soil structure and bind the nutrients in the soil are often used as cattle feed or left in the ground over winter to prevent soil erosion. In spring, the farmer takes soil samples and has the nutrient content of the soil checked in a laboratory. Based on the soil analysis and the requirements of the crops sown on the respective sites, targeted fertilising is carried out between February and June. To protect the cereals against disease and pests, the farmers work according to the general principles of integrated plant protection. Combine harvesters are used during the harvest from July to separate the cereal grain from the straw. The straw that is amassed is either cut and worked into the soil to be processed into humus, worked into the soil or pressed uncut into bails and used as litter in stalls.

## DEBATE: FERTILISATION

*Plants need nutrients to live and grow, in particular nitrogen, phosphorus and potassium. Soil does not have unlimited resources of these nutrients and the nutrients it does have are not necessarily present in the ratio that plants need for optimal growth. Plants extract nutrients from the soil. If the necessary nutrients are not replaced, the soils become leached and lose their fertility. Farmers use targeted fertilisation to compensate for this. Fertilisation in line with good professional practice provides plants with the necessary nutrients and maintains and promotes soil fertility. If too much nitrogen is applied during fertilisation, the plants may not be able to absorb it completely. Nitrate leaching, particularly in sandy soils, is often detected in areas that have a high concentration of livestock or that feature intensive vegetable farming. To meet these problems and achieve good groundwater quality everywhere, fertilisation is subject to a large number of legal requirements. The Fertiliser Application Ordinance of 2017 specifies the requirements for good professional practice in fertilisation and regulates how the risks associated with fertilisation – such as nutrient losses – can be reduced. In this way, German fertiliser law has been adapted to international environmental goals for water, climate and biodiversity protection. Farmers are, in particular, obliged to draw up fertilisation plans, in which they compare the anticipated nutrient requirements for the expected harvest yield with the nutrients still available in the soil. This has for some time now been carried out with the help of EDP programmes. But even the most careful calculations are not always able, during fertilisation, to accurately predict the exact quantities of nutrients that the plants will actually use, as this depends on the weather and other environmental factors over which farmers have no influence. In order to implement the ECJ ruling issued in 2018, the European Commission deems that further water protection measures must be taken. For this reason, work is currently underway on an amendment to the Fertiliser Application Ordinance. To preserve and improve soil fertility and biodiversity as a whole in future, the Federal Ministry of Food and Agriculture is currently working on a strategy for arable farming. It focuses on plant and soil health, crop robustness, stress tolerance and climate and resource efficiency. The spread of digital technologies also plays a key role in this process.*

## PRICE DEVELOPMENT OF RYE AND RYE BREAD



## What influence does the use of cereals have on the price of bread?

Is bread becoming more expensive because the quantities of cereals used as animal feed and renewable raw materials are increasing? The fact is that cereals as a raw material account for only a fraction (significantly less than ten percent) of the manufacturing costs for a loaf of bread. Energy, trade and tax account for two thirds, and wage costs for almost thirty percent. While the price for a kilogramme of bread has risen more than fivefold over the past fifty years, the price for cereals has remained at about the same level during this period.

## FACTS AND FIGURES ABOUT CEREALS

Number of farms which in 2018 grew winter wheat on 500 hectares or more:

**around 450**

These farms as a percentage of all farms growing winter wheat:

**0.37 %**

The area of land under wheat on these farms as a percentage of the total area under winter wheat:

**11.9 %**

Amount of time an average German had to work for a kilogramme of bread in 1970:

**16 minutes**

in 2018:

**12 minutes**

Global wheat harvest in 2017/2018:

**762 million t**

Wheat harvest in the EU in 2016/2017:

**151 million t**

Annual per-capita consumption of bread in Germany in 1900:

**140 kg**

in 2015/2016:

**80.0 kg**

Number of types of bread produced in Germany:

**around 300**

Number of types of small baked goods produced in Germany:

**around 1,200**

## KEY FIGURES FOR GERMANY

### Farms:

**Fruit (tree fruit and berry fruit, nuts)**

**approximately 12,100**

**Vegetables approx. 6,200**

**Potatoes approx. 27,300**

### Annual production:

**Fruit around 1.1 million tonnes**

**Vegetables around 3.4 million tonnes**

**Potatoes around 10.6 million tonnes**

### Area under crops:

**Fruit around 64,200 hectares**

**Vegetables around 127,600 hectares**

**Potatoes around 252,200 hectares**

**of which farmed organically:**

**Fruit around 19 percent**

**Vegetables around 12 percent**

**Potatoes around 4 percent**



# Fruit, vegetables, potatoes

Fruit and vegetable growing achieves high value added on relatively little land. This sector of agricultural output helps provide rural populations with fresh, regional food. Most commercial fruit farming in Germany takes place in a few regions, usually with favourable climatic conditions. Many regions are proud of their unique regional specialities. The percentage of organically farmed land is well above average for fruit and vegetables.

## How important is fruit, vegetable and potato farming?

The fruit and vegetables cultivated in this country are not sufficient to supply the German population. The domestic farming sector meets about a third of Germany's demand for vegetables and about a fifth of Germany's demand for fruit. What's missing has to be imported. It is only with regard to potatoes that production in Germany traditionally exceeds consumption, with part of the harvest being exported, i.e. sold abroad.

Fruit and vegetable growing is labour-intensive. The tending and especially the harvest of many fruit and vegetable crops requires a lot of manual work. Nevertheless, fruit and vegetable growing can be a profitable business for farmers. Vegetables have a particularly high yield: they are farmed on only 0.7 percent of agricultural land but account for five percent of agricultural production value.

## What is grown?

In Germany, fruit is mostly grown in climatically favoured areas, for example in the region around Lake Constance or in the region called "Altes Land". Apples dominate fruit cultivation. Apples account for three quarters of the total fruit harvest in Germany. The second most important fruit crop is strawberries. Plums, cherries and pears are grown less frequently. Vegetable farming is very diverse: the crops grown are not limited to asparagus, onions, cabbages, carrots and lettuces, but include also spinach, peas and beans. In terms of quantity, carrots, onions, white cabbages and lettuces account for the largest share of German

vegetable production. Together, they account for more than half of the locally grown vegetables.

## How is fruit grown?

Commercial fruit farming has little in common with growing fruit in your garden. Modern apple farmers do not move from tree to tree with a big ladder. Other than a small market niche for fruit from tall scattered fruit-trees, it is low-stem orchards that dominate tree-fruit farming. The height to which trees in these orchards can grow is so limited that all the fruit can be picked by hand without a ladder. So-called moving tunnels are gaining importance in strawberry farming. These are mobile greenhouses about five to ten metres wide and around 2.50 metres high. When grown in the tunnel, the first strawberries can be harvested up to one month earlier than outdoors. With regard to berry fruits, soil-free growing is becoming more important. The plants are grown in greenhouses and placed in nutrient solutions or sand rather than in soil. The advantage is that the nutrient input can be gauged more precisely than when using soil. The plants are usually also less prone to disease when grown in a soil-free system.

## How are vegetables grown?

A distinction is drawn in vegetable growing between field vegetable farming, market gardening and greenhouse farming. Notable features of growing vegetables in fields (for example carrots, onions and peas) include the high degree of mechanisation. In most cases, the cultivated areas are only used once a year for the cultivation of field vegetables and there is crop rotation with other agricul-

## FACTS AND FIGURES ABOUT FRUIT, VEGETABLES AND POTATOES

Annual per capita consumption of fresh fruit (including citrus fruit) in Germany in 1950\*:

**48.0 kg**

in 1980\*:

**112.2 kg**

in 2016/2017:

**94 kg**

Annual per capita consumption of vegetables in Germany in 1950\*:

**49.9 kg**

in 1980\*:

**64.2 kg**

in 2016/2017:

**99.6 kg**

Growth in area of land under strawberries in Germany between 2000 and 2018:

**44 %**

Growth in the strawberry harvest yield in Germany between 2000 and 2018:

**36 %**

Growth in area of land under asparagus in Germany between 2000 and 2018:

**102 %**

Growth in the asparagus harvest yield in Germany between 2000 und 2018:

**162 %**

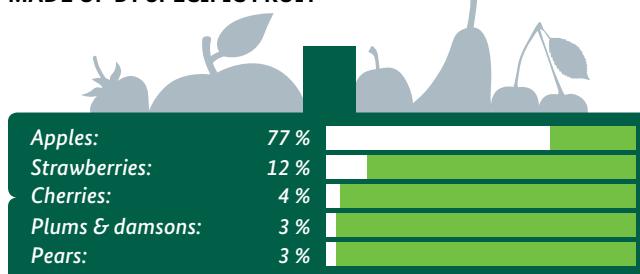
\* Old Laender

tural crops (e.g. cereals). Market gardening often uses the fields intensively, with several crop rotations per year (for example, lettuce, cauliflower, Chinese cabbage).

Vegetables for planting are usually pre-cultivated in greenhouses. Attempts are made, with both vegetables for planting and early-harvest sown vegetables, to bring the harvest date forward by using different coverings (plastic film, fibre mats). Greenhouse farming results in particularly high yields, with soil often being replaced by other substrates. Greenhouse farming is used for only about 1 percent of the land under vegetables in Germany.

### PERCENTAGE OF OVERALL FRUIT HARVEST

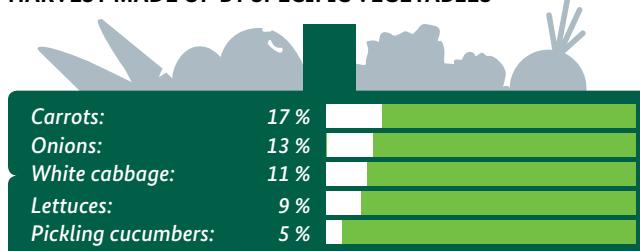
#### MADE UP BY SPECIFIC FRUIT



## DEBATE: BIODIVERSITY

*More than practically any other economic sector, the farming industry depends on an intact environment and a rich insect fauna in order to guarantee sufficient pollination, among other things. The declining biodiversity in Germany and across the globe is a huge challenge. The Federal Ministry of Food and Agriculture therefore advocates improved measures to protect biodiversity and structural diversity in landscapes. With the financial support of the Federal Government, the Laender already offer holdings a wide range of measures for greater protection of nature and the environment. In this way, farmers can receive subsidies for establishing flowery areas, riparian zones, the extensive cultivation of grassland and the maintenance of hedges, tree rows and woodlots. The creation and upkeep of orchard meadows is also eligible for financial support. The same applies to nature conservation agreements. Based on these agreements, targeted measures are implemented on agricultural land that is of value for nature conservation purposes. The Federal Government intends to combat insect mortality to the fullest extent. With the "Action Programme for Insect Protection", which was adopted in September 2019, the Federal Government is striving to improve the living conditions for insects. The Federal Ministry of Food and Agriculture is also currently working on extending the existing systems for the assessment of biological diversity. The resulting data will allow a more reliable assessment of the causes of the decline in species, including in insects. Based on this assessment, existing protective measures will be improved and, if necessary, further action will be taken.*

### PERCENTAGE OF OVERALL VEGETABLE HARVEST MADE UP BY SPECIFIC VEGETABLES



## Are genetically modified fruit and vegetables grown in the EU?

Tomatoes, cucumbers and bananas on supermarket shelves are currently free from genetic engineering. Only one genetically modified plant – “MON810” maize – is authorised to be grown in the EU. “MON810” is banned from being commercially grown in Germany. The import of genetically modified food and feed to the EU is also strictly regulated and only permitted with a corresponding authorisation. Products from genetically modified plants that are imported to the European Union include feed and cotton products. Read more about this on page 33.

## KEY FIGURES FOR GERMANY

*Holdings:*  
approx. 16,100

*Production in 2016:  
wine and must:*  
approx. 899 million litres

*Area under cultivation:  
vines: approx. 103,000 hectares,  
of which farmed organically:  
approx. 9 percent*



# Wine

German viticulture looks back over a tradition lasting more than 2,000 years, a tradition that was founded by the Romans. This tradition is characterised by a high level of know-how and experience that has been passed down over centuries. The German wine-growing sector has had a particular influence on the landscape, resulting in vineyards in romantic river valleys, on steep hillsides and sunny slopes. German wine – above all Riesling – is a popular product across the globe. The growing of vines is concentrated in a few regions with favourable climates. Germany has 13 main wine-growing regions, located predominantly along the banks of the river Rhine and its tributaries.

### How important is wine growing?

German wine growers have high levels of productivity. On around three percent of the area under vines in the EU, they produce approximately six percent of the total quantity of European wine. German wine growers achieve a production value of over 1.5 billion Euros. At 1.1 billion Euros, the value of German wine production corresponds to that of Spain, the world's largest wine-growing country, despite the fact that, with almost one million hectares, Spain has almost ten times as much area under vines as Germany.

Wine is also the basis for sparkling wine. It is refined into sparkling wine by alcoholic fermentation – typically in tank or bottle fermentation. Germany is one of the largest and most traditional sparkling wine producers.

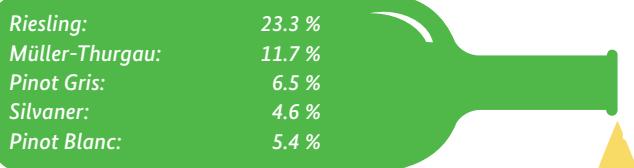
### How is wine grown?

It is not just the variety of grape that influences the taste of a wine; it is also the environment in which the grapes are grown – a complex interplay of location, soil conditions, climate and the work of the wine grower. The sheltered Mosel valley with its heat-storing slate hills, for instance, offers optimum conditions for the world-renowned Riesling. Steep hills are more difficult to manage but are very attractive features of the landscape. Growing wine on these hills is very work-intensive: after being pruned in the winter, the vine shoots are bound in order to create an even leaf canopy pointing in the optimal direction. In summer, growers remove superfluous shoots, some of the leaves and – depending on the quality they are striving for – some of the grapes.

In autumn, wine growers must always weigh up different factors in deciding when to harvest: a longer ripening period increases the sugar content and aromas, but also increases the risk of damage due to decay or rain. Harvesting by hand facilitates selective harvesting, but is also far more expensive than mechanical harvesting.

**PERCENTAGE OF THE TOTAL WINE-GROWING AREA IN GERMANY MADE UP BY THE MOST COMMON VARIETIES OF GRAPES**

**WHITE WINE**



**RED WINE**



**DEBATE:  
VITICULTURE IN A TIME  
OF RADICAL CHANGES**

*Climate change does not spare the wine-growing industry. Late frosts, hot spells, extreme droughts and torrential rainfall – the increasing frequency of extreme weather conditions puts the sensitive grapes at risk. Extreme weather can cause great damage to winegrowers within a short period of time.*

*Over the last decades, the average temperature in German wine-growing areas has already increased by about one degree Celsius. This has a positive effect as it results in earlier ripening and higher must weights. On the other hand, however, late frosts, thunderstorms and damaging events such as hail or rot following rainfall during the harvest season are becoming increasingly common.*

*With higher temperatures becoming more frequent, the growing areas for thermophile wine varieties are expanding. But the growing of grape varieties that produce the best wines in moderately warm weather conditions, such as Riesling, will shift further north.*

*The higher temperatures and humidity are also conducive to the spread of fungal pathogens like real and false mildew. In order to meet these challenges, resistant grape varieties are being bred. Germany plays a leading role in the breeding of fungus-resistant grape varieties in respect of which the use of pesticides can be reduced. Grapevine breeding is part of the BMEL's departmental research and is carried out at the Julius Kühn Institute (JKI) for Grapevine Breeding in Siebeldingen.*

**WINE IN FIGURES**

Exports of wine from Germany abroad in 2018:

**483 million litres**

of which to the Netherlands:

**20 %**

Imports of wine to Germany in 2018:

**1,543 million litres**

of which from Italy:

**35 %**

Per capita consumption of wine in Germany in 1950\*:

**5 litres**

in 2018:

**24 litres**

Per capita consumption of wine in the Czech Republic in 2015:

**19 litres**

Per capita consumption of wine in France in 2015:

**41 litres**

\* Old Laender

## KEY FIGURES FOR GERMANY

*Holdings:*  
approx. 1,100

*Area under cultivation:*  
*hops: approx. 20,100 hectares,*  
*of which farmed organically:*  
*approx. 1 percent*

*on average in the years 2016 to 2018:*  
*approx. 9.5 billion litres*



## Hops

Hops, an important raw material for beer, have been cultivated in Germany for about 1,200 years. There are few areas where hops are grown, but their importance is considerable. Hallertau, the largest German hop-growing area, alone accounts for around a third of global production. The inflorescences used for beer brewing are called umbels by the hop industry, but only the umbels of the female plants are used. The high content of tannins and bitter substances in hops gives beer its characteristic aroma and the desired bitterness. The hops constituents also have a preservative and foam-stabilising effect.

### How important is hops growing?

German hops planters are at the top of their profession worldwide: more than one third of the global harvest comes from Germany – no other country produces more. German hops growers achieved an average production value of over 211 million Euros from 2016 to 2018. 98 percent of the hops is used for beer brewing. It is an essential ingredient because it not only gives the beer its taste but also makes artificial preservatives superfluous.

### How are hops grown?

Hops are mainly grown between the 35<sup>th</sup> and the 55<sup>th</sup> degree of latitude as it is only in this region that day length is at the optimum. The hop-growing regions of the USA, central Europe and China are in this region in the northern hemisphere, and those of South Africa, Australia and New Zealand are in this region in the southern hemisphere. 83.3 percent of the German hop-growing areas are in the Hallertau region in Bavaria. Hop fields can be recognised by their typical wirework trellises, which are up to seven metres high and must carry a weight of 40 tonnes, and even up to 100 tonnes per hectare in wet conditions. Technological advancements in recent decades have greatly modernised hop growing. The average hop holding has a hop-growing area of just over 18 hectares. It used to take 120 pickers about four weeks to harvest an area this size. With modern harvesting machinery, five workers can do the work in less than three weeks.

### Why is there a German purity law?

“We especially wish that from now on in all our cities, towns, markets and in the countryside, no other ingredients besides barley, hops and water should be used in any beer.” With these words, in 1516 the Bavarian Estates issued the oldest food legislation in the world that remains in force today: the German purity law. It has consequently ensured the quality of German beer for more than 500 years. This law was issued due to the bizarre mixtures of various herbs that brewers were using at the time to flavour and preserve the beer.

The purity law regulates not only what may be added to beer, but above all what must not be used for brewing. In contrast to breweries abroad, German breweries that produce beer according to the purity law and declare it as such are still not allowed to use any aromas, dyes, stabilisers, enzymes, emulsifiers or preservatives. While European additive legislation permits a long list of additives, brewing according to the purity law remains restricted to the use of the four natural ingredients water, malt, hops and yeast – and is therefore much more complex and demanding than in most foreign breweries.

## What is the importance of beer brewing?

Today, in Germany, over 1,500 breweries brew more than 6,500 beers, but the possible combinations are far from exhausted. The brewers have around 250 different hop varieties and more than 40 different types of malt at their disposal. In addition, there are almost 200 different yeast strains. The choice of water also has an effect on the aroma of the beer, as does, not least, the specificities of the brewing process. Taking all variants into account, there are more than a million different ways of brewing beer according to the purity law.

The strong increase of breweries in recent years is due to the trend coming from the USA to establish small and micro breweries for so-called craft beers. Craft beers are brewed by hand, have strong hoppy and fruity notes, and some of them mature in wooden barrels. These beers, which are characterised by regionality and creativity, are usually only produced in smaller quantities by hand and are often served locally in breweries and bars. Although the market share of craft beers has so far reached no more than one percent of the total beer volume produced, the boom in these beers documents the growing interest of consumers in the brewing trade and the diversity of beer.

## DEBATE: PESTICIDE RESIDUES

*Many consumers are worried about pesticide residues in their food: almost 50 percent are concerned about residues. Farmers use plant protection products in order to protect crops from diseases and pests: they prevent yield losses and can help to improve the quality of the produce. Fungicides, by way of one example, can prevent the occurrence of mycotoxins that are detrimental to the health of both humans and animals. Before a plant protection product can be used it must undergo a strict authorisation procedure. Conditions and directions for use are issued, as are waiting periods between the last use and the harvest. Food controls include tests on whether food and feed comply with the maximum permissible residue levels for pesticide substances. Each year, around 20,000 samples are taken from a wide variety of foods and tested for up to 800 different active substances. On average, one to two percent of these samples give cause for complaint because the maximum residue levels have been exceeded. Only a small fraction of these samples are problematic from a health point of view.*



With a total volume of 93 million hectolitres in 2018, Germany is the fifth largest beer producer in the world and the largest in Europe. Of this, 16 million hectolitres were exported. German beer is particularly popular with the Italians, Chinese, Dutch and French.

### BEER IN FIGURES

Per capita consumption of beer in Germany in 1950\*

**36 litres**

in 2017:

**101 litres**

Per capita consumption of beer in the Czech Republic in 2017:

**138 litres**

Per capita consumption of beer in France in 2017:

**33 litres**

Number of breweries in Germany in 1950\*

**2,662**

im Jahr 2017:

**1,500**

\* Old Laender

## KEY FIGURES FOR GERMANY

Farms specialising in forage growing:  
approx. 114,000

Average yield of feed, based on the feed value of barley:  
approx. 83 million tonnes

Area under fodder crops:  
approx. 10 million hectares  
of which farmed organically:  
approx. 9 percent (estimated)



## Forage crops

The importance of the role played by animal husbandry for German farming can be seen for instance by the scope of forage production: Just under 60 percent of agriculturally- used land – meadows, pastures and some arable land – is devoted to growing plants which end up in the stomachs of the more than 200 million farm animals in order to produce meat, milk and eggs. Despite the extent of this production, forage growing in Germany cannot meet the actual demand: feed, particularly high-protein feed, also needs to be imported.

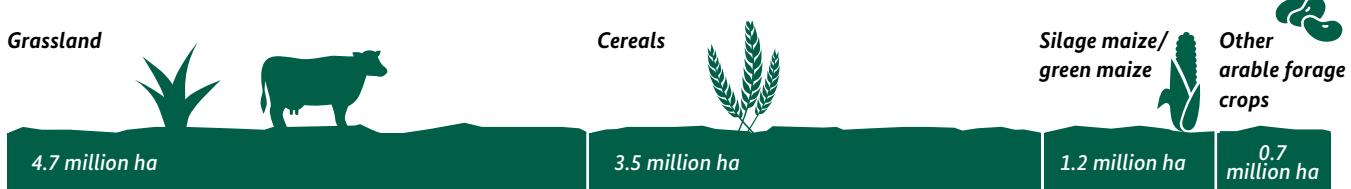
### How important is forage growing?

Forage growing supplies most of the coarse fodder necessary to feed the cattle, such as silage from grass and maize. There are two basic types: arable forage production and grassland husbandry. Arable forage production usually uses forage crops as the first season crop which remains in the arable land for almost the entire vegetation period (for example maize, cereals). Grassland husbandry includes meadows that are mown to obtain feed, and pastures where animals graze. Forage growing accounts for a total of 60 percent of agriculturally used land, of which almost half is grassland. From 2015 to 2017, farmers achieved an average production value of around five billion Euros from the production of feed plants (without cereals and grain maize); this equates to nine percent of the production value of agriculture as a whole. Feed is the basis for animal products such as milk, meat and eggs.

### Can the European farming sector feed its own farm animals?

Farmers meet a large percentage of their animals' need for carbohydrates via grass, maize and cereals. Another important component of farm animal feed is protein; however, the EU does not produce enough protein plants. 26 percent of the protein contained in animal feed in Germany must therefore be imported – mostly as soya from Brazil, Argentina and the USA. The natural production conditions in these countries result in lower production costs; soya exports to Europe are therefore part of international trade based on a division of labour. Rape-seed meal, which is produced when oilseeds are processed, has also become an important source of protein. In 2016, around 4 million tonnes of rape-seed meal were fed to animals as a GM-free protein feed ingredient.

SHARE OF DIFFERENT FORAGE CROPS  
IN THE HARVEST AREA (2016)



## FACTS AND FIGURES ABOUT FORAGE CROPS

Global harvest volume of soybeans in 2017/2018:

**341 million t**

Area under legumes in Germany in 1950\*:

**91,119 ha**

in 1980\*:

**11,284 ha**

in 2018:

**191,000 ha**

\* Old Laender

Harvest volume of protein forage crops in Germany on average in the years 2016 to 2018:

**526,000 t**

Soy imports to Germany in 2016:

**5.7 million t**

to the EU:

**40.5 million t**

to China:

**95.5 million t**

## DEBATE: GENETICAL ENGINEERING

*Genetically modified food and feed may only be marketed in the EU if it has been approved by the European Commission following an in-depth safety assessment. Food and feed are also subject to certain traceability and labelling obligations. If food or feed contains more than 0.9 percent genetically modified ingredients authorised in the EU, it must be labelled accordingly. Genetically modified ingredients not authorised in the EU may not be present in food or, in principle, in feed. Foods from, or derived from, animals fed on genetically modified feed, such as meat, milk or eggs, do not require labelling. This also applies to the many foodstuffs containing enzymes, vitamins, flavourings, sweeteners or flavour enhancers that have been produced with the help of genetically modified micro-organisms, provided that they no longer contain these micro-organisms. Foodstuffs labelled "GM-free" are subject to special requirements with regard to the GM-free status, with minor exceptions. Products of animal origin that have this label originate from animals that have not been fed with feed labelled "genetically modified" for a period of time stipulated by law. Also, no genetically modified feed additives may be used. However, there are no restrictions on the use of feed additives such as enzymes or vitamins produced with the help of genetically modified micro-organisms, provided that these are no longer present in the product. Veterinary medicinal products manufactured by genetic engineering or containing genetically modified organisms may also be used. Apart from this, genetically modified ingredients of 0.1 percent are tolerated in principle for all foodstuffs labelled "GM-free".*

To further increase protein-crop production in Germany, the Federal Government is supporting demonstration and research projects. These are intended to facilitate the growing of domestic, protein-rich pulses – so-called legumes – such as peas and broad beans and to make these more competitive. In Germany, around 191,000 hectares of arable land are used for growing grain legumes, and 284,000 hectares of arable land for small-seed forage legumes.

## How are German farm animals fed?

German farm animals eat approx. 83 million tonnes of feed per year. 54 percent of this total is accounted for by green and dried feed (hay) and silages from grass and maize, 24 percent by compound feed (enriched with supplements such as vitamins, minerals and trace elements) and 22 percent by cereal grown on-farm and purchases of additional feed. Many animal feeds are produced as by-products of the food industry, for example in flour mills, oil mills, sugar factories, dairies or breweries, and are marketed as feed material.

## What is done to preserve grassland?

Meadows and pastures are of major importance – economically, ecologically and culturally. They supply farm animals, particularly cattle, with feed and are consequently a pillar of the dairy industry. They are a hotbed of biodiversity, providing a habitat for over 850 species that typically thrive in grassland. And their colour and shape are distinguishing features of our farm landscapes. Grassland is put to very different uses, ranging from farmed grassland, which is grazed and mown frequently, to biotopes and nature conservation areas which are subject to considerable restrictions on how they are used. The percentage of grassland in Germany has declined in the past over a long period. Meadows and pastures have also been making way for settlements and traffic or were in the past converted into forests or arable land. To combat or at least slow this trend, some EU funding to farmers is linked to the maintenance of so-called "permanent grassland" – a term referring to meadows and pastures that have not been used for other purposes for at least five years. This has also stopped the decline in permanent grassland in recent years.



## KEY FIGURES FOR GERMANY

*Area under cultivation:*  
**Fuel crops**  
**approx. 2.2 million hectares**

*Industrial crops*  
**approx. 270,000 hectares**



## Renewable resources

**Before people discovered oil, coal and natural gas, they had to use plant and animal materials to meet their needs. Timber, cotton and flax, wool and animal hides are still used today. Other important fuel and industrial crops today include rapeseed, maize, wheat, sugar-beet and even potatoes. Renewable resources provide an answer to what is going to happen after our oil resources have run out.**

### How important are renewable resources?

The use of renewable resources contributes to the conservation of fossil resources and can reduce the emission of gases that are harmful to the climate. They also create jobs and added value in rural areas. Renewable resources are used for energy or non-energy purposes. Making greater use of these products is an important element of the German Bioeconomy Strategy. The terms bioeconomy, bio-based economy and Green Economy describe a forward-looking form of economic activity that largely dispenses with fossil fuels and that employs modern methods to make use of biological and sustainable resources. Agricultural and forestry holdings are an important element of the bioeconomy and the most important suppliers of raw materials. If the bioeconomy continues to gather speed, this could lead to further growth trends for renewable raw materials, in particular regarding material recovery in timber construction, biobased synthetics and in biotechnology.

Among the renewable energy resources, bioenergy continues to play an important role: in 2018, 14 percent of the primary energy used in Germany originated from renewable energy resources. Of this, bioenergy alone supplied around 54 percent. Almost 87 percent of the renewable energy used in the heat sector came from biomass, and almost 88 percent in the transport sector. It contributed to almost 25 percent of regenerative power generation. According to forecasts, bioenergy from domestic sources alone would have sustainable potential to provide 26 percent of our primary energy in 2050.

### What is manufactured from renewable resources?

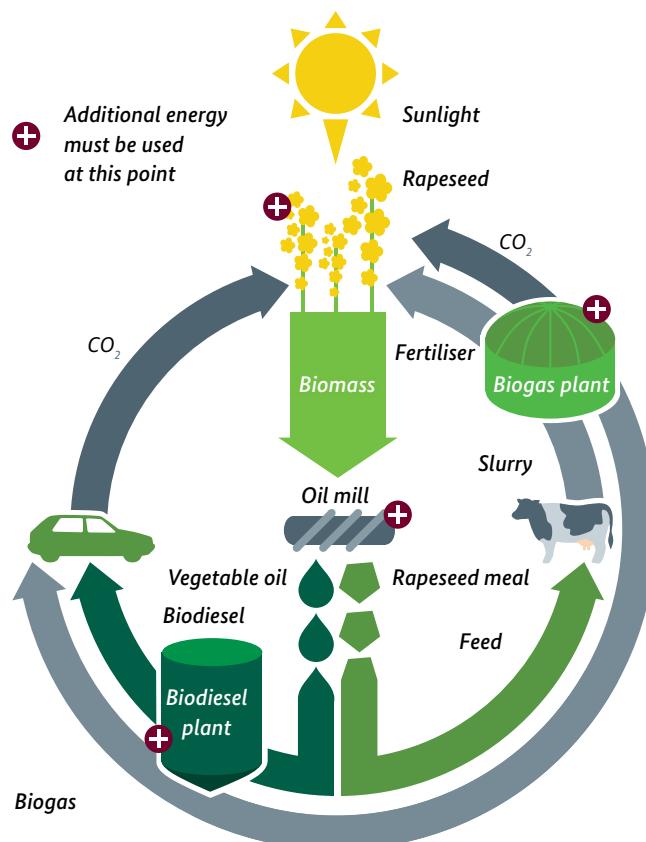
Timber is probably the most important and versatile renewable resource: It plays a central role as a building material and in manufacturing chemical pulp and paper. It is the most important renewable supplier of heat, and it can be used to generate electricity and heat at the same time in heat and power cogeneration plants. In modern biorefineries – currently still being piloted – isolated timber elements are used to make a range of products, for example adhesives, resins and synthetics. Other, classic uses for timber, such as for building furniture, music instruments and much else besides, are well known. Plant oils and fats are also assuming an important role. They are used to manufacture bio-based lubricants, paints and varnishes, detergent substances (tensides) and bioethanol. Starch from maize, wheat and potatoes, on the other hand, is used as an ingredient in bio-based synthetics, adhesives and in ethanol that can be utilised as a replacement for petrol. Sugar from sugar beets is used by the chemical industry to make antibiotics and vitamins. Fibre plants, such as flax and hemp, are used to make insulating materials, natural fibre reinforced plastics and textiles. On a small scale, farmers in Germany also grow medicinal plants; the active substances from these plants are used in teas, traditional medicines or as food supplements. Energy crops such as maize, cereals, beets and grass, and the residual materials slurry and manure, are the raw materials for biogas installations that generate electricity and heat. And straw – by no means insignificant in terms of quantity – can also be used for biogas production and heating purposes.

## How are crops used to make energy?

Rapeseed can be used as an example to show how the use of energy crops is virtually a closed cycle. The central element is the oil mill which is used to obtain plant oil from the rapeseed on the one hand and rape-seed meal on the other. One side of the cycle consists in the plant oil being processed into biodiesel in the biodiesel plant; this diesel can then be used as fuel in cars, lorries and ships. During its growth period, rape absorbs CO<sub>2</sub> from the air. The other side of the cycle consists in the rape-seed meal generated in the oil mill being used as protein-rich feed in livestock farming. The slurry that is produced can in turn be used for energy purposes in biogas plants; methane from biogas plants is also suitable for use as a fuel for gas-powered vehicles. Fermentation residues from the biogas plants can then finally serve as fertiliser for growing new energy crops. Growing plants and operating oil mills, biodiesel plants and biogas plants do, however, need additional external processing energy. But this can, of course, be renewable energy.

## DEBATE: WILL PEOPLE STARVE BECAUSE WE ARE IMPORTING BIOMASS?

*Farming and forestry have always supplied raw materials as well as food for people and feed for livestock. The growing demand for agricultural raw materials for the non-food sector is both an opportunity and a challenge. This "bio-based industry" is opening up new sources of income for agriculture and forestry and conserves fossile resources. The production of raw materials can create jobs in agriculture, provide family smallholdings with income and provide developing countries with foreign currency. This is an important contribution to poverty eradication and to supporting economic growth and prosperity. Given the limited availability of land, the cultivation of renewable raw materials is however also a challenge: people in developing and threshold countries often spend more than 50 percent of their income on food. Price hikes for staple foods hit them. Food prices throughout the world are determined by a large number of factors. The demand for bioenergy is only one of these factors. Others include poor harvests caused by the weather, activities on financial markets and political crises. However, only a fraction of the global harvests are used for renewable raw materials. The import of sustainably produced biomass cannot, therefore, be made accountable for the global hunger crises. It is clear that food security must always be the top priority in the development of strategies, concepts and programmes on bioeconomy: this is and remains farming's most important task.*



## FACTS AND FIGURES ABOUT RENEWABLE RESOURCES

Percentage of farmland on which maize is grown for the production of biogas:

**5.2 %**

Percentage of farmland on which rapeseed is grown for the production of biodiesel:

**3.4 %**

Compared to five years ago, the area on which maize is cultivated for biogas production has declined by:

**11,000 ha**

Consumption of biofuels in Germany in 2018:

**3.5 million t**

Percentage of biodiesel from rape marketed in Germany in 2016:

**35 %**

Percentage of biodiesel from waste and residual materials marketed in Germany in 2017:

**39 %**

Percentage of biodiesel from palm oil marketed in Germany in 2017:

**23 %**

Annual CO<sub>2</sub> emissions in Germany in 2016:

**907 million t**

Quantity of CO<sub>2</sub> emissions saved in Germany through the use of biofuels in 2017:

**7.7 million t**

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