Briefing I:

Trends in the Production and Consumption of Animal-Sourced Foods in Europe

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KEY INSIGHTS

- The consumption of meat and dairy in Europe is very high relative to health and environmental recommendations. It is projected to decrease slightly in the next decade, but not anywhere close to the level needed to respond to multiple environmental and health crises. Based on various coinciding analyses, we estimate that Europe's consumption of meat needs to be reduced by approximately 75 per cent by 2050, and of dairy products by 50-80 per cent.

- The production of meat and dairy is growing in Europe, though at a slower pace compared to other global regions. The highest density of livestock is found in parts of Belgium, the Netherlands and western Germany.

- The market for meat replacements almost doubled between 2018 and 2020. Organic consumption and production are also growing steadily, seeing relatively strong growth during the Covid-19 pandemic. Pulses form only a small part of the European diet and consumption has not increased over decades. The market share of "less and better" animal-sourced food (ASF) is far from levels that would put European countries on track to meet their commitments to the Paris Agreement on climate change and the Sustainable Development Goals.

- The Netherlands, Germany, Spain, Poland and France are major centres of ASF production. Imports of meat and dairy across Europe are small, while the European ASF export market is significant and growing. European industry sees expanding markets abroad as a major opportunity.

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Introduction

This briefing examines current trends in the production and consumption of animal-sourced foods (ASFs) in Europe. It aims to provide a snapshot of the current ASF landscape across the continent, while tracking trends for current production and consumption of "better" ASFs and alternatives.

Consumption

Tracking population dietary intake is a surprisingly complicated endeavour. Available estimates use different methodologies, and many rely on production data. This can be helpful in seeing historical trends, but it tends to overestimate individuals' actual consumption, as it does not consider food loss or waste beyond the farm gate. Other data sources rely on dietary intake surveys that measure actual consumption, but can suffer from imprecise reporting by subjects, while requiring that broader insights be extrapolated from samples of the population.

Meat

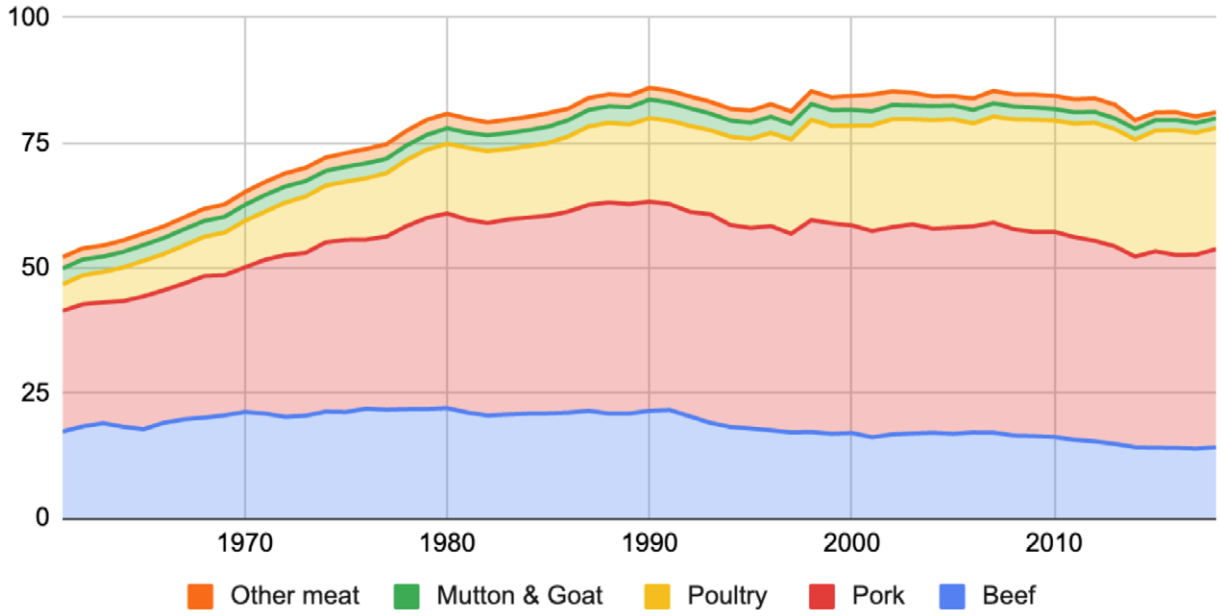
Global estimates of meat consumption are drawn from production data from the Food and Agriculture Organisation (FAO) using calculations to approximate actual dietary intake. Using this approach, the average person in the European Union (EU) consumed 81 kilograms (kg) of meat in 2013, up 56 per cent from 1961. Current EU consumption is more than double the global average, but some non-EU countries are much higher consumers, such as the United States (124kg per capita). Pork is the most commonly eaten meat in the EU, although its share of the diet has been declining steadily since 1990 (see Figure 1). Poultry has seen a large increase in production and consumption – a trend expected to continue. The (poultry) sector is estimated to account for 50 per cent of the additional meat that will be consumed in the EU in the next decade[1].

In forecasting consumption to 2030, the European Commission's agricultural outlook report estimates a decrease of 1.6 per cent in overall meat consumption in the EU. It cites several factors, including growing environmental and ethical concerns about ASF consumption, and an ageing population with lower protein needs[2]. Beef and pork consumption are expected to continue a downward trend over that period. These trends suggest Europe may be turning a corner, although the reductions are nowhere near the significant decrease in ASF production and consumption required in the region

to respond to the combined climate-health crisis. **Based on various coinciding analyses, we estimate that Europe's consumption of meat needs to be reduced by approximately 75 per cent by 2050, and of dairy by 50-80 per cent** (see Annex IX). These figures outline what Europe's equitable share of ASF consumption could look like, although they are likely to underestimate the consumption cuts required under a climate fair-share approach[3]. There are on the other hand more conservative estimations of the needed reduction.

Globally, meat consumption is expected to increase by 1kg per person between 2019 and 2030, reaching 35.7kg per capita. Population and economic growth in emerging economies are the key drivers [4].

Figure 1: "Domestic supply quantity" per person in the EU-28, 1961-2018 (kg/capita/year)



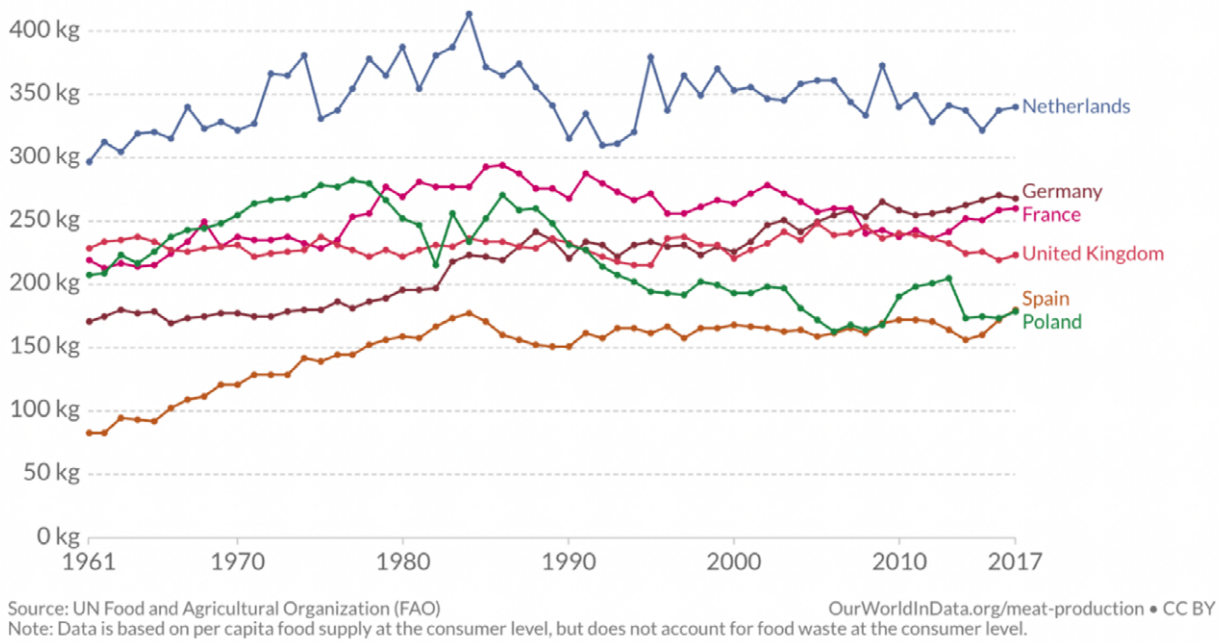
Data source: FAOstat [5]. "Domestic supply quantity per person" equals production + imports - exports + changes in stocks (decrease or increase) divided by total population. This figure is an approximation of meat consumption per person. NOTE: FAOStat has a different method for generating data from 1961-2013 than from 2014-2018. This might cause slightly different figures. EU-28 refers to the former European Union that included the UK.

The current consumption of meat, dairy and seafood varies greatly between European countries (see Annex IV), with the level of meat consumption differing noticeably between "old" and "new" EU member states. The amount of seafood consumed in Mediterranean and Scandinavian countries is clearly higher than in other countries. The consumption of dairy seems not to be related to specific regions.

Dairy

Per capita milk consumption in the EU rose 32 per cent from 1961 to 2013, to 236.41 kg annually. Finland leads all EU-27 countries, with 430.76 kg per capita (2013)[6]. An earlier analysis in 2003 of dietary records from EU countries found a great deal of variation in dairy consumption across countries. Spain and the Nordic countries reported a high consumption of milk, while the Netherlands reported greater "yoghurt and other fermented milk products", and France was home to the highest consumption of cheese. Germany, the UK and France were the largest consumers of butter[7].

Figure 2: Per capita milk consumption in selected EU countries (1961-2017)8



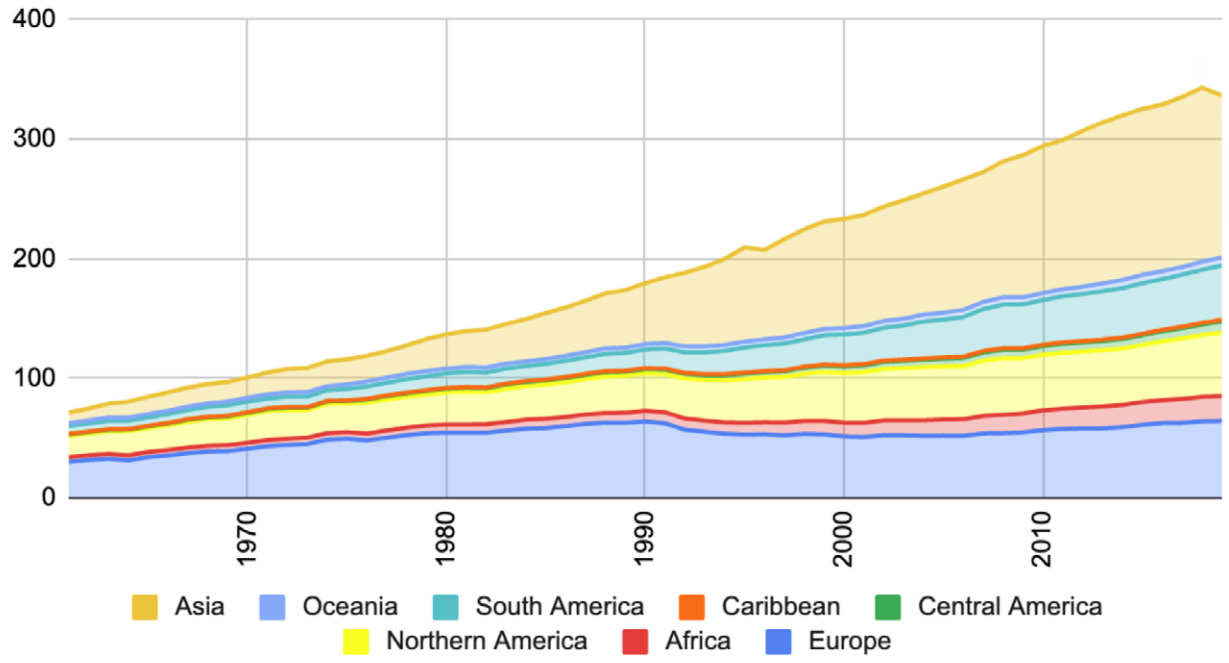
Egg and fish

Egg consumption in the EU has increased since the 1960s, but not as markedly as meat or dairy. FAO data shows a 14 per cent increase from 1961-2013, from 10.54kg annually per capita to 12.04kg[9]. Over the same period, EU consumers ate 54 per cent more fish (22.47kg per capita in 2013), slightly higher than North America (21.61kg per capita), and the global average (18.98kg per capita). The Portuguese are the leading European fish consumers at 56.84kg per capita in 2017[10].

Production

Compared to other regions in the world, the European production of meat is increasing at a slower pace. Europe's share of global meat production is also decreasing. In 1961, 42 per cent of the world's global meat production took place in Europe. By 2019, that share had dropped to 19 per cent.

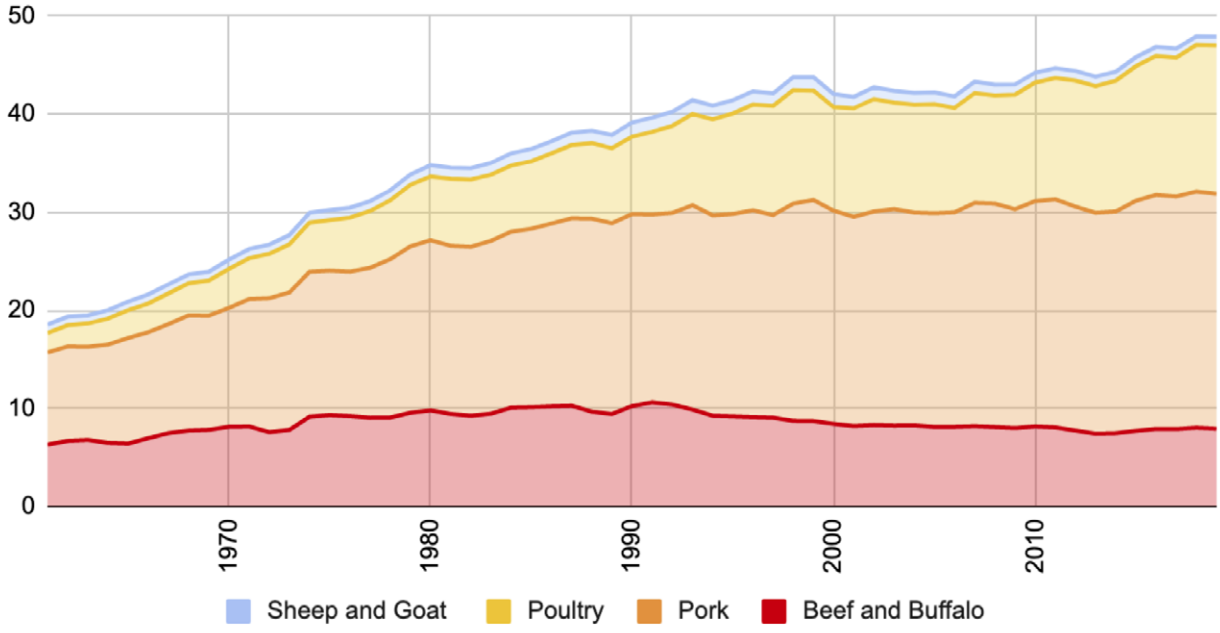
Figure 3: Global total meat production, in megatonnes (1961-2019)



Data source: FAOstat[11]

Within the EU, pork is by far the most common type of meat produced, reaching 23.95 megatonnes (Mt) in 2019[12]**.** Chicken (15.16Mt in 2019) is replacing beef (7.92Mt) over the last two decades as the second-most produced type of meat. Experts have linked this to an increased awareness of the health impacts of red meat. The production of sheep and goat meat in Europe is relatively low, at 0.89Mt in 2019.

Figure 4: Meat production in the EU-28, in megatonnes (1961-2019)



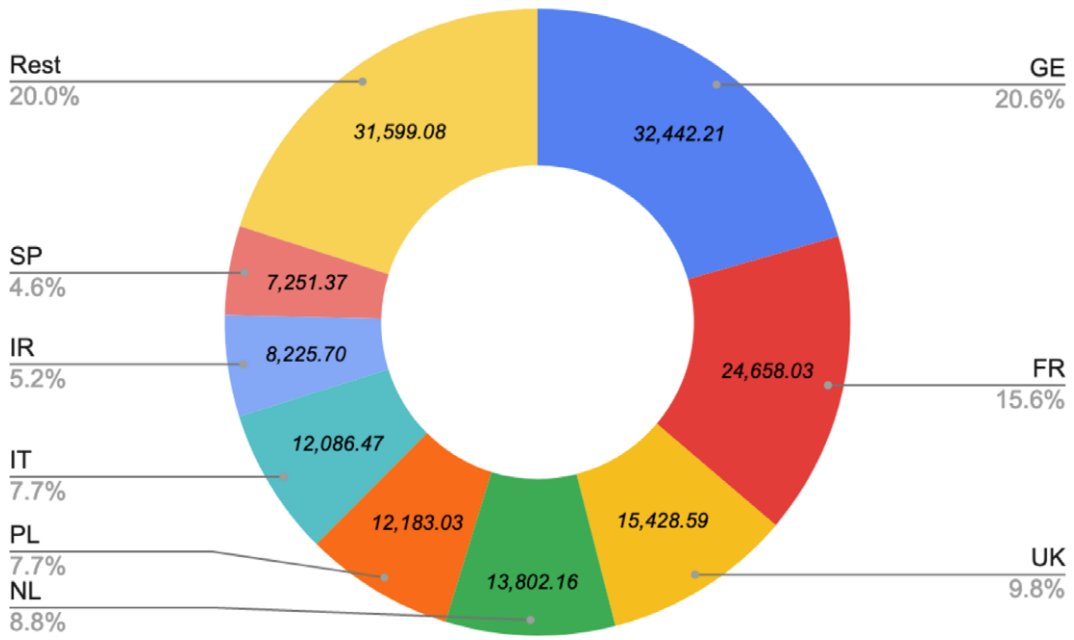
Data source: FAOstat[13]

In 2019, the total livestock population of the EU-27 countries consisted of 143 million pigs, 77 million heads of cattle and 74 million sheep and goats[14]. The majority of these animals are geographically concentrated in just a few countries. Germany, France, the Netherlands, Poland, Spain and the UK are the biggest European livestock producers (see Annex II). Half the EU's beef was produced in three countries: France (20.8 per cent), Germany (17.9 per cent) and Italy (11.7 per cent). Germany and Spain are Europe's two leading pork-producing countries.

Three quarters of sheep production comes from Spain (24.8 per cent), Romania (16.6 per cent), Greece (13.5 per cent), France (11.4 per cent) and Italy (11.2 per cent). The EU produced 13.3 million tonnes of poultry meat in 2019 – the highest on record. In 2019, the EU's main poultry-producing countries were Poland, Spain, France, Germany and Italy[15].

The production of milk in the EU has increased rapidly in recent years (see Annex III), particularly since 2015. In that year, the EU's quota designed to cap dairy production was lifted. Although this measure did not lead to the growth of dairy production all over Europe, total production increased[16]. The production of milk is more equally spread across European regions compared to meat. However, Germany, France, the UK and the Netherlands are hotspots of dairy production (see Figure 5).

Figure 5: Raw milk obtained by EU dairies 2019 (x 1000 tonnes)



Data source: Eurostat[17]

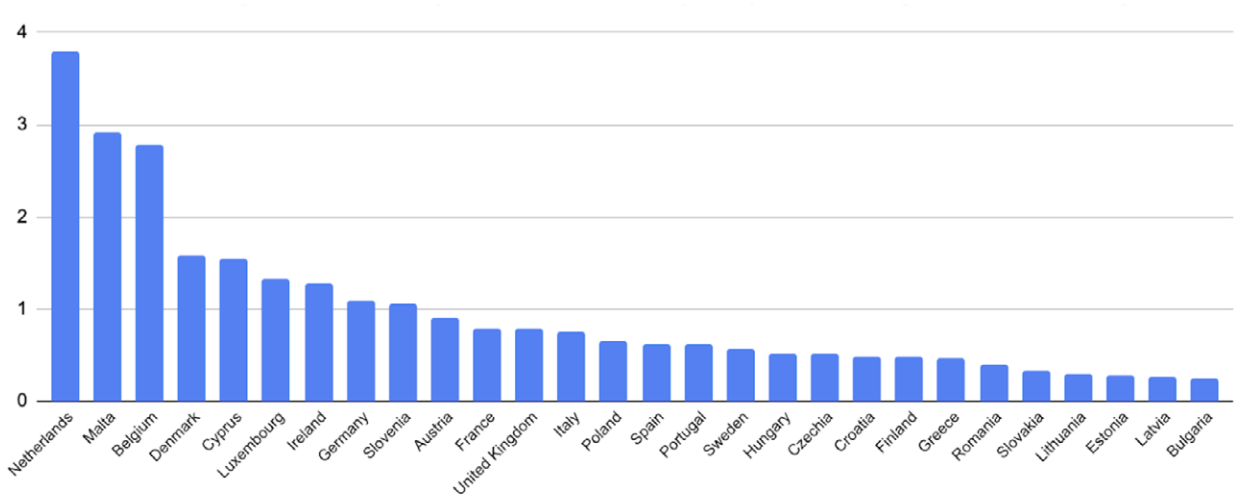
Livestock production is an important feature of European farms. **Approximately one-third of EU farm operations specialise in livestock production** (17 per cent ruminants, such as beef, lamb and goat, 5 per cent non-ruminants, and 12 per cent with mixed types of animals), while 10 per cent of holdings are mixed farms with both livestock and crops. In recent decades, the EU cattle population has decreased by 5 million due to the intensification of milk production and the removal of milk production quotas in 2015. This has helped reduce methane emissions, but some research shows it has also led to significant losses of carbon from the soils[18].

Livestock density

The density of livestock is an important indicator for the environmental, animal welfare and health-related impacts of animal production. These include stench, particulate matter, zoonoses and the deposition of ammonia. Livestock density is usually measured in livestock units[19] (LSU) per hectare of utilised agricultural area (UAA)[20].

Livestock density in Europe varies enormously from country to country. The Netherlands tops the list in 2016 with 3.8 LSU per hectare of UAA in 2016, while Bulgaria had a density of 0.24. The EU average density in 2016 was 0.98 LSU.

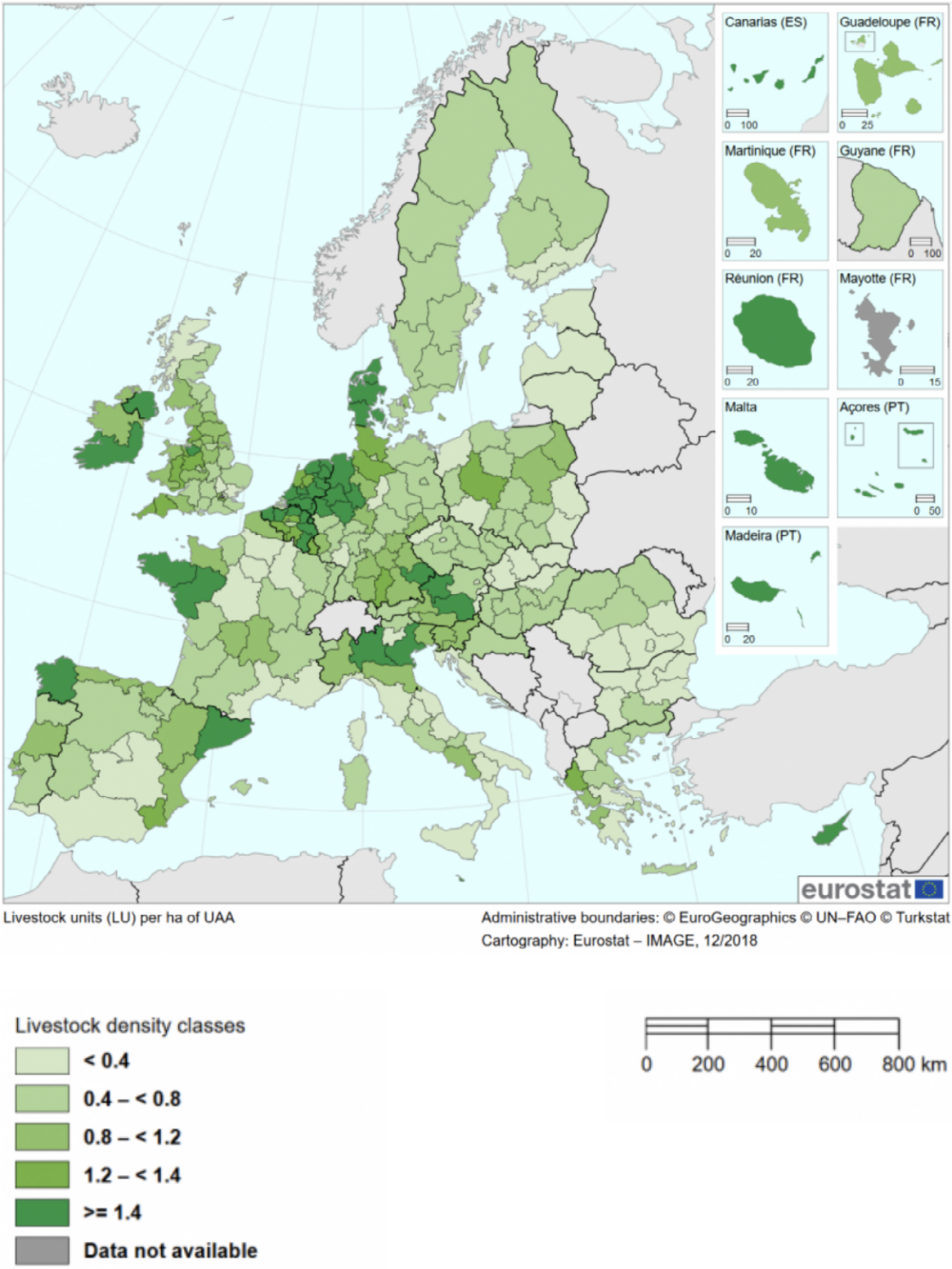
Figure 6: Livestock density (units per hectare of agricultural land) in the EU-28 (2016)



Data source: Eurostat[21]

When looking at specific regions, the differences are even more striking, with some of the strongest European concentrations of livestock occurring in the southern Netherlands, northern Belgium and western Germany. The density of livestock across Europe increased between 2013 and 2016, the most recent years for which statistics are available[22]. There are no other comparable regional clusters of livestock industry in the EU. Other regions have a relatively high density of a specific species of livestock, such as pigs in northern Italy (see Figure 7). Unsurprisingly, the lowest densities of livestock are in capital cities or tourist regions.

Figure 7: Livestock density in European regions (livestock units per hectare). Eurostat[23]

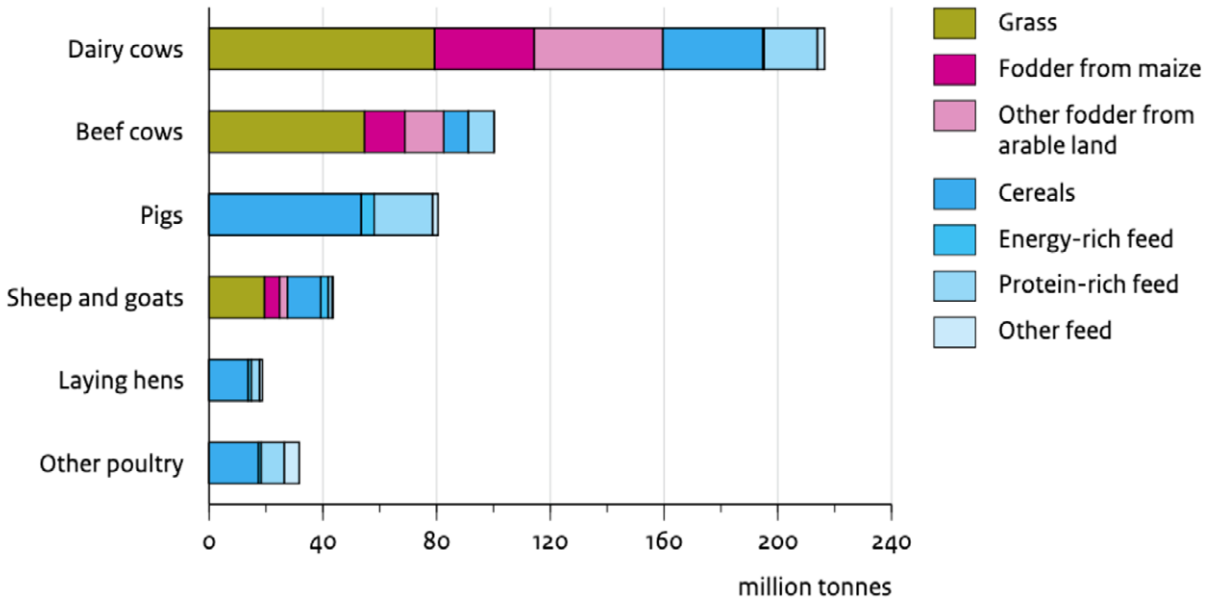


Feeding Europe's livestock

Traditionally, cows and other ruminants ate grass, and pigs and poultry consumed the leftovers of food production and consumption. However, in recent decades, the diets of farm animals have shifted towards more protein-rich feed - this promotes growth of meat and production of milk. Today, 57 per cent of global cereals are grown to feed livestock[24]. Europe's livestock have become dependent on imported feed from other regions of the world. Figure 8 gives an overview of which types of feed are used for different livestock.

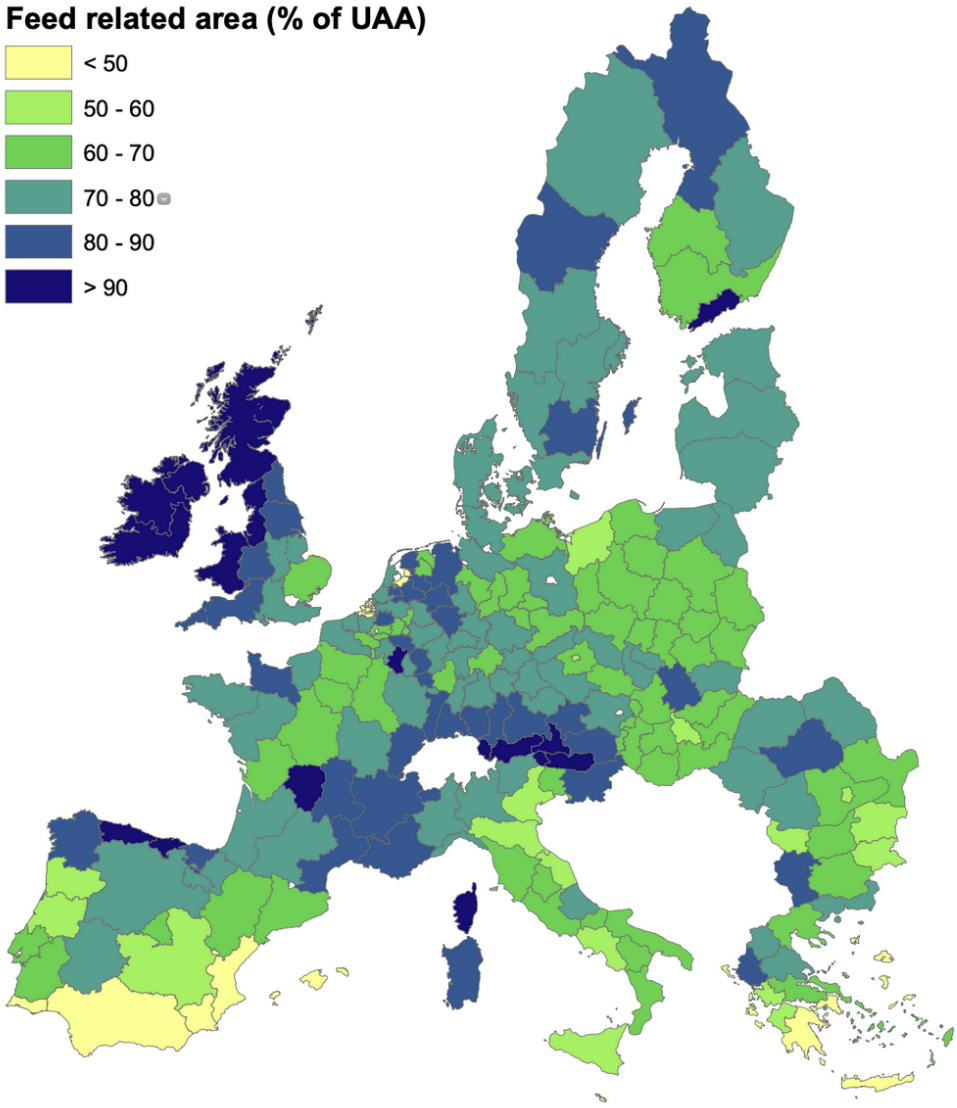
Producing animal protein by feeding animals plant-based proteins and nutrients is markedly inefficient. The feed conversion of 100 calories of grain would, on average, yield 12 calories of chicken meat, 10 calories of pork and 3 calories of beef[25]. The production of feed ingredients such as soy, palm kernels and palm oil is associated with deforestation and ecosystem destruction in Latin America and Southeast Asia[26]. Less well known is the extent of land used across Europe for feeding livestock. The map in Figure 9 shows the percentage of farmland used to feed farm animals. In the majority of European regions, more than 60 per cent of agricultural land is used to feed livestock – an area that could instead be used for growing food for human consumption, biomass or other purposes.

Figure 8: Feed use per livestock sector in the EU-27 (2005)



Source: Westhoek et al, 2011. Note: These calculations are not recent. Increasing the efficiency of feed conversion has been a major focus for animal breeders and the feed industry in recent decades. However, as the livestock industry has also increased productivity, these figures are still a useful indication of feed use for the EU livestock sector.

Figure 9: Land area utilised for animal feed production in the EU-27



Source: Lesschen et al, 2011 [27]

Export and import of European meat and dairy

While the domestic European market for meat is stable in the short-term and predicted to shrink in the medium-term, exports of European meat to countries outside the EU are growing. **The EU livestock industry currently profits from growing global demand for meat** [28]. The largest exporter of meat in the EU is the Netherlands, followed by Spain, Germany and Poland.

The table below displays export and import quantities of European ASFs in 2020. Most noteworthy are the levels of exported pork, particularly to China. This is the result of a pandemic of African swine fever in Chinese pig populations, which has

forced the country to import pork[29]. While European imports of beef and poultry are considerable, imports of pork are relatively small. Large quantities of beef are imported from Latin America, and have been linked to intensive deforestation and ecosystem destruction[30].

European dairy imports and exports are much lower than those of meat. Exports have grown by about 2 per cent per year in the last decade, but expectations are that this growth will stabilise as other regions increase their domestic supply [31].

Table 1: Export and import of ASFs from EU to non-EU countries 2020 (Thousand tonnes)

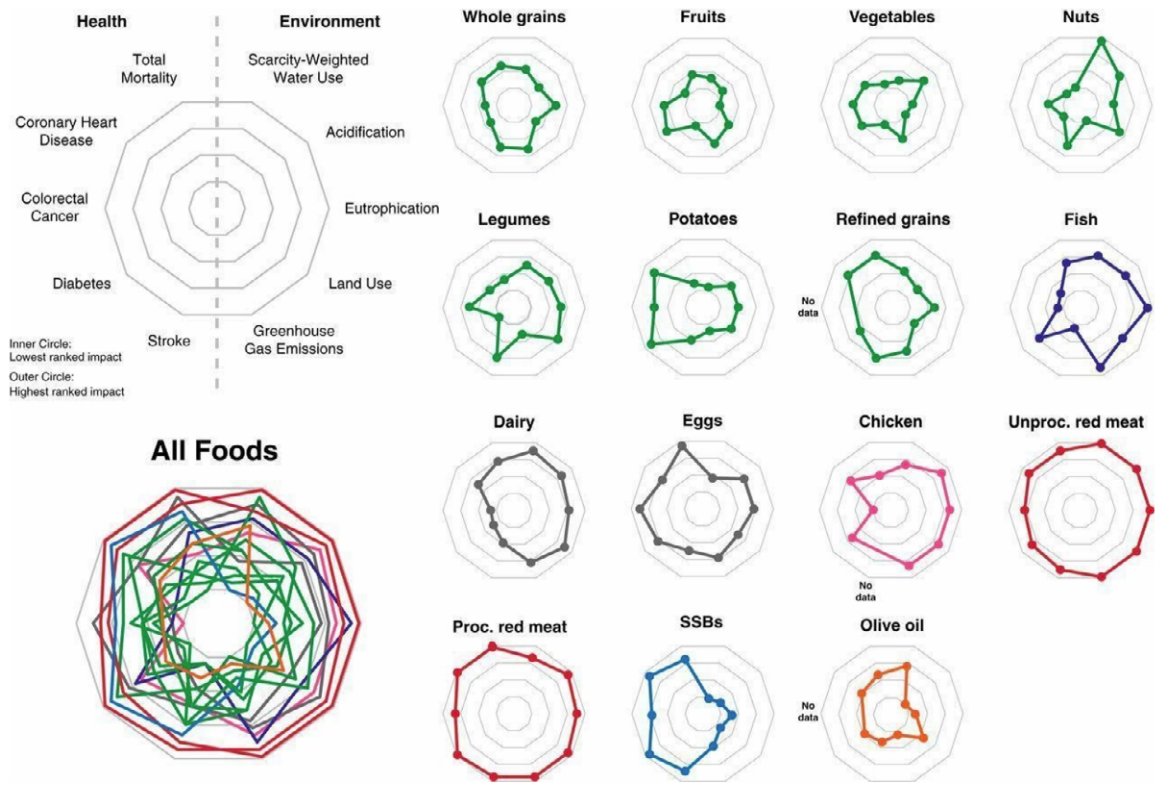
	Total production	**Export**	**Top 5 countries importing from EU** (% total export)	**Import**	**Top 5 countries exporting to EU** (% total import)
Beef	6,819.17	1,158.43 (17% of production)	UK 39.2% Hong Kong 4.9% Israel 4.9% Ghana 4.1% Philippines 3.4%	372.90 (5.5% of production)	UK 35% Brazil 22.6% Argentina 15.7% Uruguay 13.6% US 4.4%
Poultry	13,552.79	2,517.31 (18.6% of production)	UK 28.5% Ghana 11.7% Ukraine 7.7% Congo 5.3% Philippines 4.2%	803.84 (5.9% of production)	UK 32.7% Brazil 30.8% Thailand 19.3% Ukraine 12.5% China 2.5%
Pork	22,819.85	6,374.28 (27,9% of production)	China 47.8% UK 12% Philippines 5.7% Japan 5.6% South Korea 3.6%	214.42 (0.9% of production)	UK 70.8% Switzerland 13% Norway 3.8% Serbia 3.7% China 2.4%
Dairy	192,520.50	6,418.21 (3,3% of production)	China 18.3% UK 20.5% US 3% Saudi Arabia 3% Japan 3%	1,302.49 (0.7% of production)	UK 86.8% Switzerland 7.9%

Data source: European Commission[32]. Note: Meat weight is in tonnes of carcass weight. Meat statistics include all types of meat – fresh, frozen and living animals. Dairy statistics include fresh milk and all other dairy products. Annex VII offers a series of tables reviewing the production, import, export and domestic supply of meat and dairy of the Netherlands, Poland, Germany, France, the UK and Spain. Data updated in oct 2021.

Tracking "better" animal-sourced foods or plant-based alternatives

Estimates of environmental and social impacts of food vary. Despite the significant environmental, social and other impacts associated with ASFs, not all sources are equal. Ruminants have much higher environmental impacts compared to other meats[33]. Fish and dairy consumption have been shown to have health-protective effects in some cases,[34,35] yet some analyses link these foods to higher environmental harm than pork, poultry or eggs[36]. Being able to choose "better" meat and dairy can play an important role in reducing the overall impact of people's dietary choices. Poore and Nemecek (2018) showed that **there is a wide range of environmental impacts within food categories, making the choice of "better" foods an important step in mitigating the impacts of climate change.** For example, there is a 50-fold difference in land use values and an 18-fold difference in greenhouse gas emissions between the highest- and lowest-impact beef production systems[37]. However, combining evidence on health and environmental impacts for different foods is a complex task. Clark et al. (2020) created "radar plots" for food groups that incorporate five health and five environmental impacts. The left side of each radar plot shows health outcomes and the right shows environmental impacts. The closer the plots are to the centre, the better the outcome. The analysis shows a frequent, but not universal, overlap between foods with lower environmental impact and increased health benefits.

Figure 10: Combined health and environmental outcomes for different food groups[38]



Definitions of "better"

Several organisations and institutions have promoted the goal of eating "less and better" meat and dairy. While no universally accepted definition exists, the UK's Eating Better alliance views "less" as a 50 per cent reduction in average per capita meat and dairy consumption, while "better" is defined as meat and dairy production in "healthy ecosystems, favouring more natural diets from sustainable sources, in well-managed farms that deliver high standards of animal welfare"[39].

Numerous assurance schemes, certifications and labels have emerged over the years to help producers address ASF concerns, distinguish their products in the marketplace and support consumers in choosing better products. The online Ecolabel Index references 73 environmental impact labels used in Europe. **None of these labels encompasses all principles of better meat and dairy, but EU organic certification may come the closest.**

Labelling and signposting "better foods"

Environmental impact labelling that provides tailored scores for food products could be a valuable part of an overall strategy to shift consumer purchasing, although civil society actors have expressed concerns that labelling could pass responsibility down to already overwhelmed consumers.

A 2021 systematic review of 76 ecolabelling interventions found that ecolabels, across a broad range of formats and content types (including organic labels), are effective at promoting the selection, purchase and consumption of food products[40]. Recent University of Oxford tests of several ecolabel concepts showing customised eco-scores on a virtual supermarket site found a significant reduction in the overall environmental impact of study participants' shopping baskets[41]. Businesses in Europe are beginning to explore a rollout of eco-scores this year. A group of food tech businesses in France, led by the ECO2 Initiative, have created an eco-score system that gives products a mark out of 100 and displays it on a traffic-light coloured A-E scoring scale[42]. The Colruyt Group in Belgium and Lidl in Germany are testing this in their stores in 2021. Several French delivery apps and food scanning apps have already implemented the eco-score system. A similar system will be launched in the UK later in 2021. The plan is coordinated by Foundation Earth, a non-profit organisation backed by the UK government, Nestlé and British brands such Marks & Spencer, Sainsbury's, Co-op and Costa Coffee. Products will be graded into tiers marked A to G and colour-coded, with green labels signifying the lowest environmental impact products and red signalling the highest[43].

Improved animal welfare is not only good for animal health and food quality, but reduces the need for antibiotic use and helps preserve biodiversity. In its 2020 "Farm to Fork Strategy", the EU Commission committed to revising animal welfare legislation, including on animal transport and slaughter, to align it with the latest scientific evidence, and to improve enforcement[44]. There are around a dozen animal welfare labels in use on food products in Europe today, all of which are voluntary initiatives. In December 2020, EU agricultural ministers announced plans to develop a voluntary EU-wide animal welfare label, although it is not yet clear whether this would be a front-of-pack label or displayed elsewhere[45].

Growth in "better" – the example of organic foods

From 2010 to 2019, the market for organic products in general more than doubled. In 2019, the EU organic market increased by another 8 per cent, reaching €45 billion in sales. The EU's Farm to Fork Strategy sets out a goal of 25 per cent of farmland being used for organic farming by 2030[46]. France's Agriculture Biologique is the national logo for organic products, and perhaps the best-known on the continent. The country is the EU's second largest organic market (after Germany). In 2018, 71 per cent of French consumers reported buying organic foods at least once a month, compared with 37 per cent in 2003[47]. In 2019, growth figures were 13.4 per cent in France and 9.7 per cent in Germany. Other countries have lower growth rates.

Data is currently incomplete, but indications already show that the organic market grew even more in 2020[48]. The Covid-19 pandemic has changed where consumers purchase their food (for example, away from work canteens for those working from home), the prominence of health in public discourse, and how consumers decide which food they buy. For part of the public, this resulted in more organic food in their diet, according to the researchers and analysts of "The world of organic agriculture" report[49].

In terms of organic sales, Danish and Swiss people spend the most – €344 and €338 yearly per person respectively – followed by the French (€174), the Germans (€144) and the Dutch (€71). In 2019, the average expenditure per capita on organic products in the EU rose to €84. Consumers in Central and Eastern European countries spend relatively little on organic produce. The 2019 market share of organic sales in relation to all food retail sales was highest in Denmark (12.1 per cent – the highest organic market share in the world), followed by Switzerland (10.4 per cent) and Austria (9.3 per cent)[50].

Sales of specific organic products differ significantly (see Annex V). In many countries, eggs are a real organic success story, reaching market value shares in the total retail market of almost 30 per cent in Denmark and France. Fresh milk is another animal-based product with relatively high market shares, reaching more than 21 per cent in Austria. Organic meat, especially chicken, has a relatively

low market share. This low penetration is partially explained by the high price of organic meat in comparison to conventional meat. In addition, many consumers who buy organic products tend to follow a lower-meat diet already[51].

The production of organic output follows consumption patterns in its growth. Although statistics are often incomplete or incomparable, estimates suggest the growth rate of organic livestock is considerable. The growth of European livestock between 2010 and 2019 was between 80 and 110 per cent (see Annex VI). The biggest growth in organic livestock was in poultry, due to the increasing demand for eggs. Numbers of pigs, sheep and cattle also grew considerably. Germany, France and Austria have the highest number of organic cattle, while Germany, France, Denmark and the Netherlands have the highest number of organic pigs. Organic dairy production has almost doubled since 2007. In 2019, 3.4 per cent of the EU's milk was produced by organically managed cows[52]. Yet the share of organic livestock is very low in comparison to its conventional counterpart. Reasons include the insufficient availability of organic local and imported feed, high investment costs for barns and pens in comparison to conventional husbandry systems, and high consumer prices.

Organic standards are protected under the EU Organic Regulations. However, many labels and phrases used on packaging to promote "better" food products, such as "grass-fed" or "outdoor-bred" meat, are less regulated and can mean different things. Beef marketed as "grass-fed" can come from cows raised on grass for 51-100 per cent of their lives, indoors or outdoors. Supporting consumers to make healthier, more sustainable and socially just food choices is a complex task, which can be made more confusing by the wide range of product labels on the market.

Organic food generally comes with a price premium which can hinder its uptake, but may also increase its perceived quality and benefits among consumers. Market research in 2016 found organic items priced at 89 per cent higher than non-organic equivalents in UK supermarkets[53]. Experiments in lab and real consumer settings suggest that many people are willing to pay a premium for "better" foods, especially meat. A 2020 University of Oxford meta-analysis found that consumers were willing to pay a premium of US$3.79 per kilo for foods with any of a variety of sustainability labels. Study participants were more likely to pay a premium for sustainably labelled meat and dairy compared to seafood, nuts, vegetables or fruits. The appeal was also higher for foods labelled organic[54].

Growth in “less” – the example of plant-based products

Along with organic products, another proxy which can help us understand possibilities in the transition away from ASFs is meat replacement products. While there have been questions raised around the nutritional quality of plant-based meat substitutes, they represent a promising strategy in transitioning to less and better ASFs.

Proveg recently published the results of an analysis of retailers’ sales data collected by Nielsen. The data included sales of meat replacements in Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Poland, Romania, Spain and the UK. The analysis compares yearly sales of plant-based meat, milk, yoghurt and ice cream from 2018 to 2020, documenting an average growth in the sales value of these products by a staggering 49 per cent. The research distinguishes between discounters and high-end supermarkets; in discounters, the growth of sales is often higher[55].

Other market analysts observe a trend of market growth for plant-based meat replacements. A scenario study by the Boston Consulting Group and Blue Horizon estimates that if this continues, alternative proteins will have captured 11 per cent of the global protein market by 2035[56]. In the most progressive scenario, 2025 will be the year “peak meat” is reached in the United States and the EU. However, this scenario depends on continued technological developments and the adoption of stronger policies to encourage the transition to plant-based foods.

Big players in the agro-food industry are investing in plant-based technologies and ensuring their access to this growing market. Food manufacturer Unilever has published ambitious plans to grow its sales of vegan and vegetarian foods. Meat processing giant JBS recently acquired plant-based meat brand Vivera, while Burger King is promoting its first fully plant-based fast-food restaurant[57].

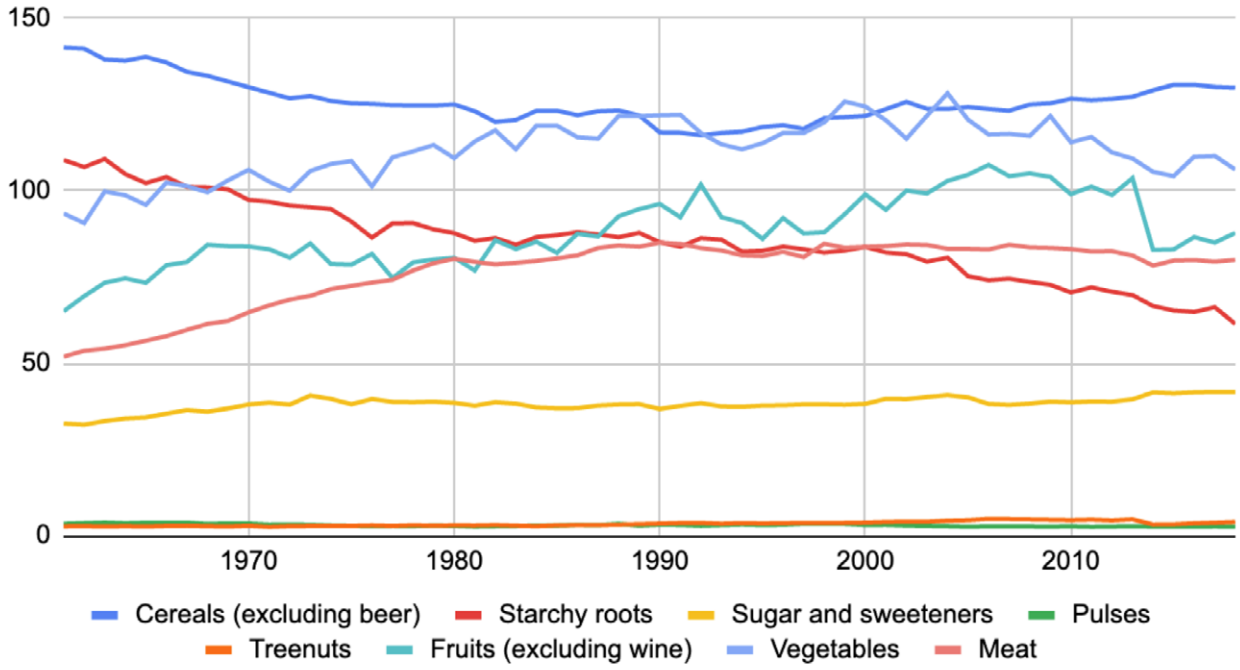
Although plant-based meat and other food products may seem like booming business, their relative market share in comparison to meat and dairy is still small. A publication by ING Research concludes that “even at the current growth rate, it would take until the mid-2050s before sales of ‘plant-based meat and dairy’ could surpass sales of meat and dairy”[58]. The potential of meat alternatives to replace or significantly substitute for meat remains unclear, as sales of both meat replacements and of meat itself are concurrently increasing in some countries. Some interviewed experts even suggest that meat replacement products are consumed in addition to meat.

Pulses - healthy and sustainable, but unpopular

Legumes (soybeans, peanuts, fresh beans and pulses such as beans, peas and lentils) are plant-based alternatives to meat that are high protein, high fibre, low fat and nutrient rich. They have been consumed for decades if not centuries and, more recently, employed by manufacturers in meat substitutes[59]. Increased production and consumption of beans, pulses and other leguminous crops in place of meat would significantly improve diets. It would also improve the sustainability of farming practices, as leguminous crops are nitrogen fixing and can therefore replace chemical fertilisers. Meat from ruminants requires 20 times more land and generates 20 times more greenhouse gas emissions per gram of protein than pulses.

However, despite their health and environmental benefits, consumption of pulses in the average European diet is relatively low compared to other food categories and other countries. Pulse consumption declined from roughly 3.65kg per person per year in the 1960s to 2.67kg after 2010. This is illustrated by Food Balance Sheet data from the FAO, represented in Figure 11.

Figure 11: Food supply quantity EU-28, kg/capita/year (1961-2018)

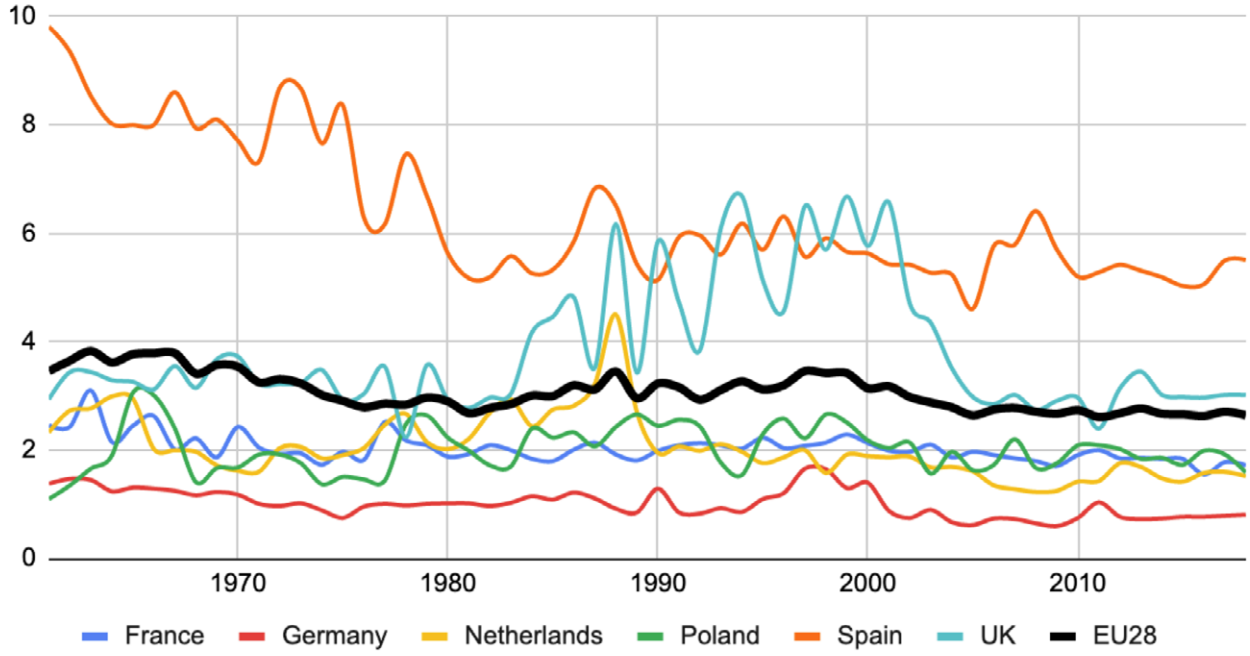


Data source: FAOstat Food Balance Sheets[60]. Note: FAOStat has a different method for generating data from 1961-2013 than from 2014-2018.

In comparison to other regions of the world, Europeans consume a relatively low amount of pulses. In 2013, they consumed 2.6kg per capita, while the global average was 7.2kg per person, and the figure in Africa and the Americas reached 11.8 and 9.2kg respectively[61].

There are big differences in the consumption of pulses between European countries, as shown in Annex VIII. In Mediterranean countries, pulse consumption is relatively high, particularly compared to low levels in northern and Central Europe[62]. However, the volume of pulses consumed in Mediterranean countries is decreasing, as across the rest of the EU. Figure 12 shows the consumption of pulses in France, the UK, the Netherlands, Germany, Poland and Spain. The reduction of legume consumption in Spain is striking. Further analysis of the consumption of pulses in the UK would be interesting for the goals of the Healthy Food Healthy Planet project: the popularity of these healthy and sustainable foods in the 1990s.

Figure 12: Food supply, quantity of pulses in the EU-28, kg/capita/year (1961-2018)



Data source: FAOstat Food Balance Sheets. Note: FAOStat has a different method for generating data from 1961-2013 than from 2014-2018.

Annex I:

Slaughtered animals in slaughterhouses EU-28 2019 (x1,000 animals)

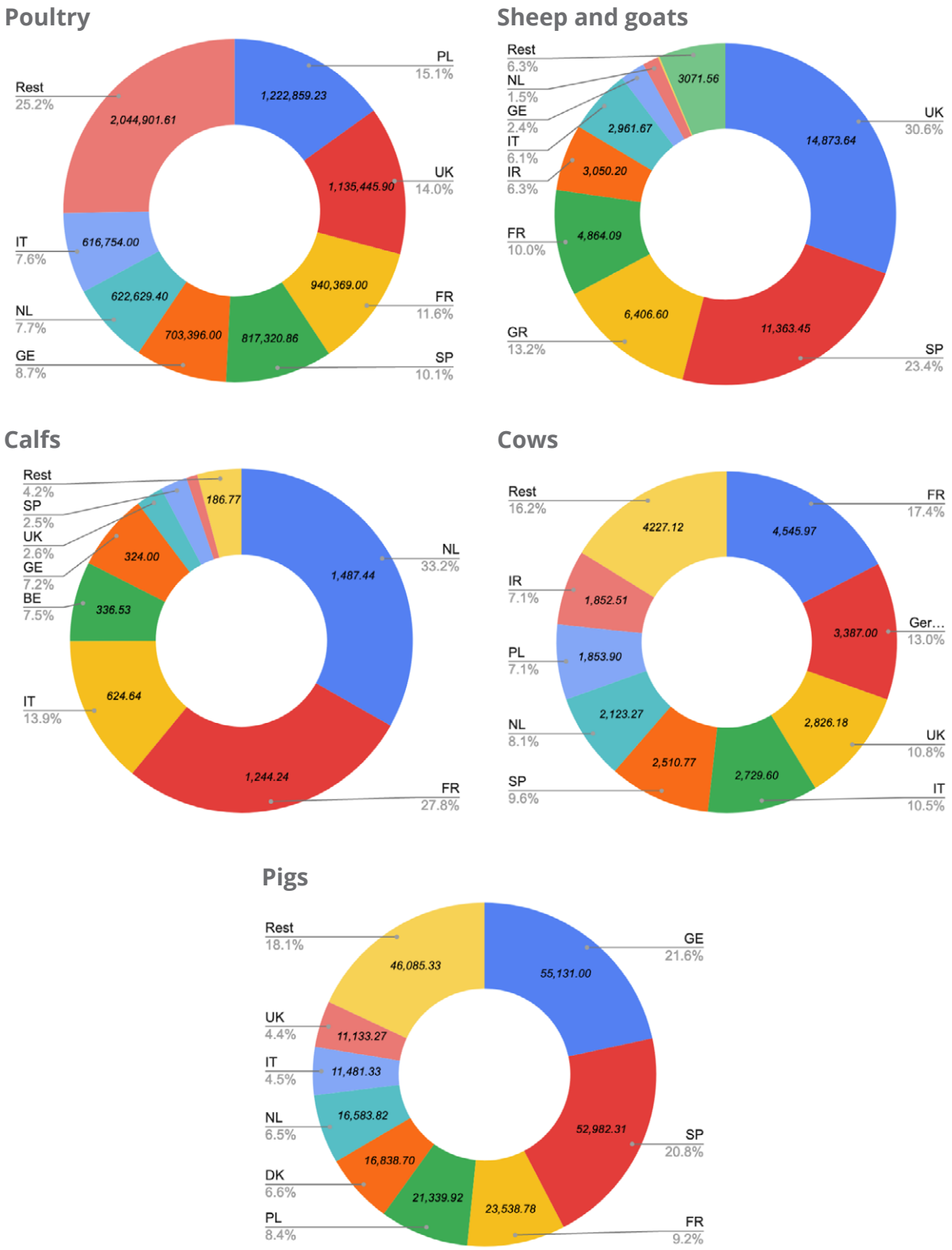


Figure 13. *Data source: Eurostat*[63]

Annex II:

Production of meat types by EU-27 country (2019)[64]

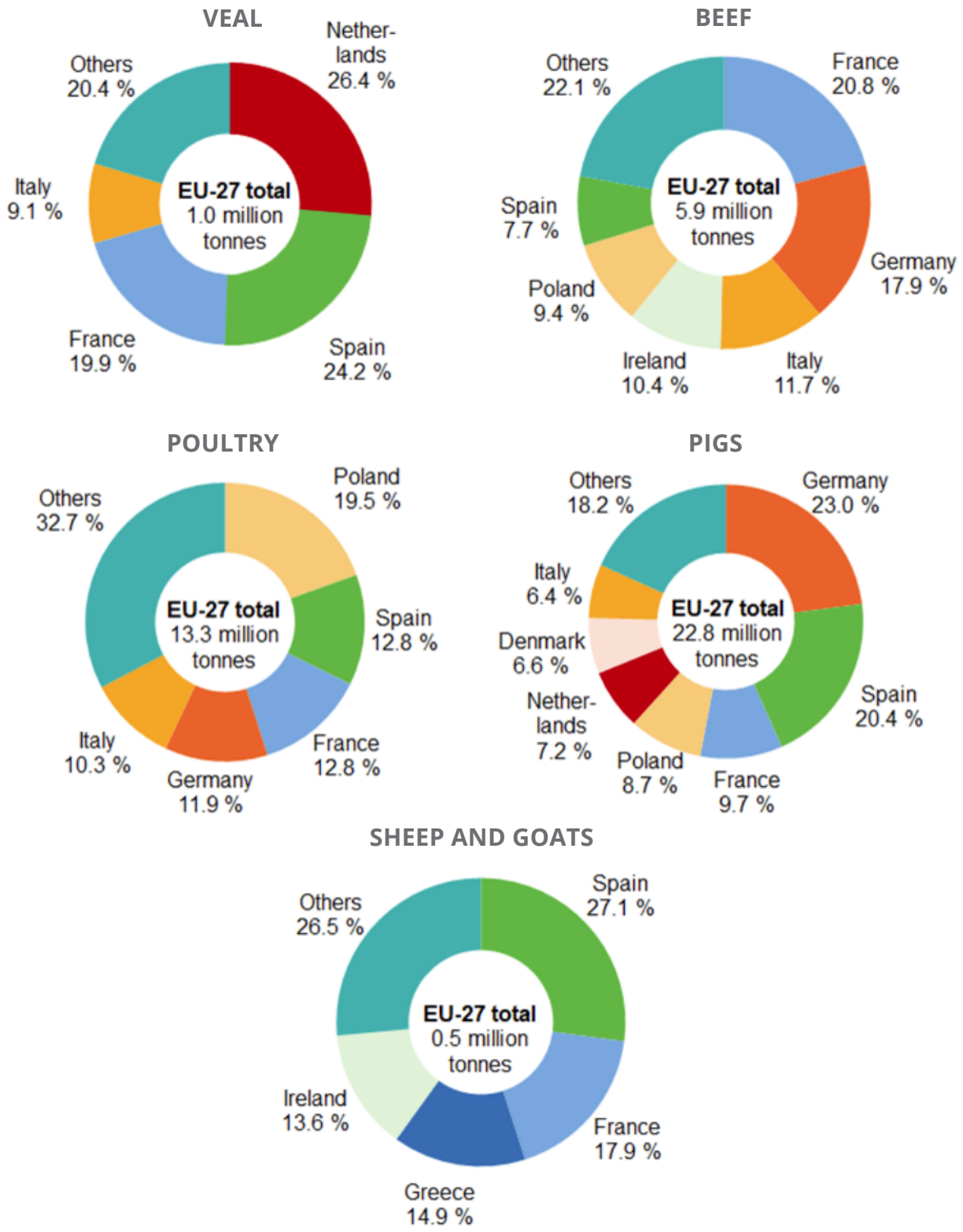


Figure 14. *Data source: Eurostat, taken from Peyraud and Macleod, 2020.*

Annex III:

Production of milk, by EU-28 country 1961-2019 (Mton)

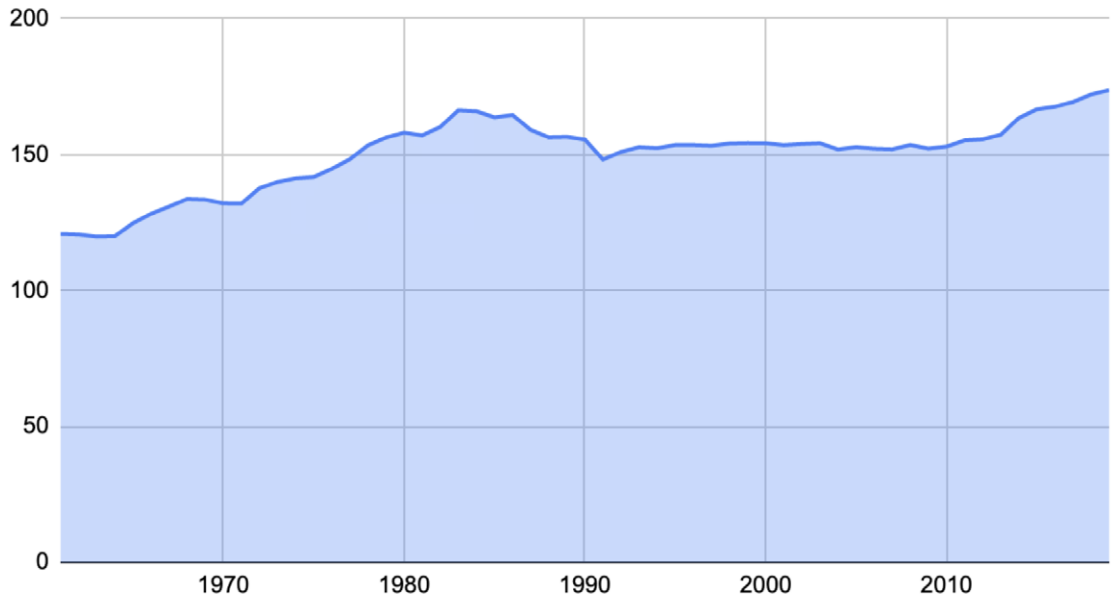


Figure 15. *Data source: FAOstat*[65]

Annex IV:

Supply quantities of meat, dairy and seafood EU-28 2018

Meat supply quantity EU28 2018 (Kg/capita/year)

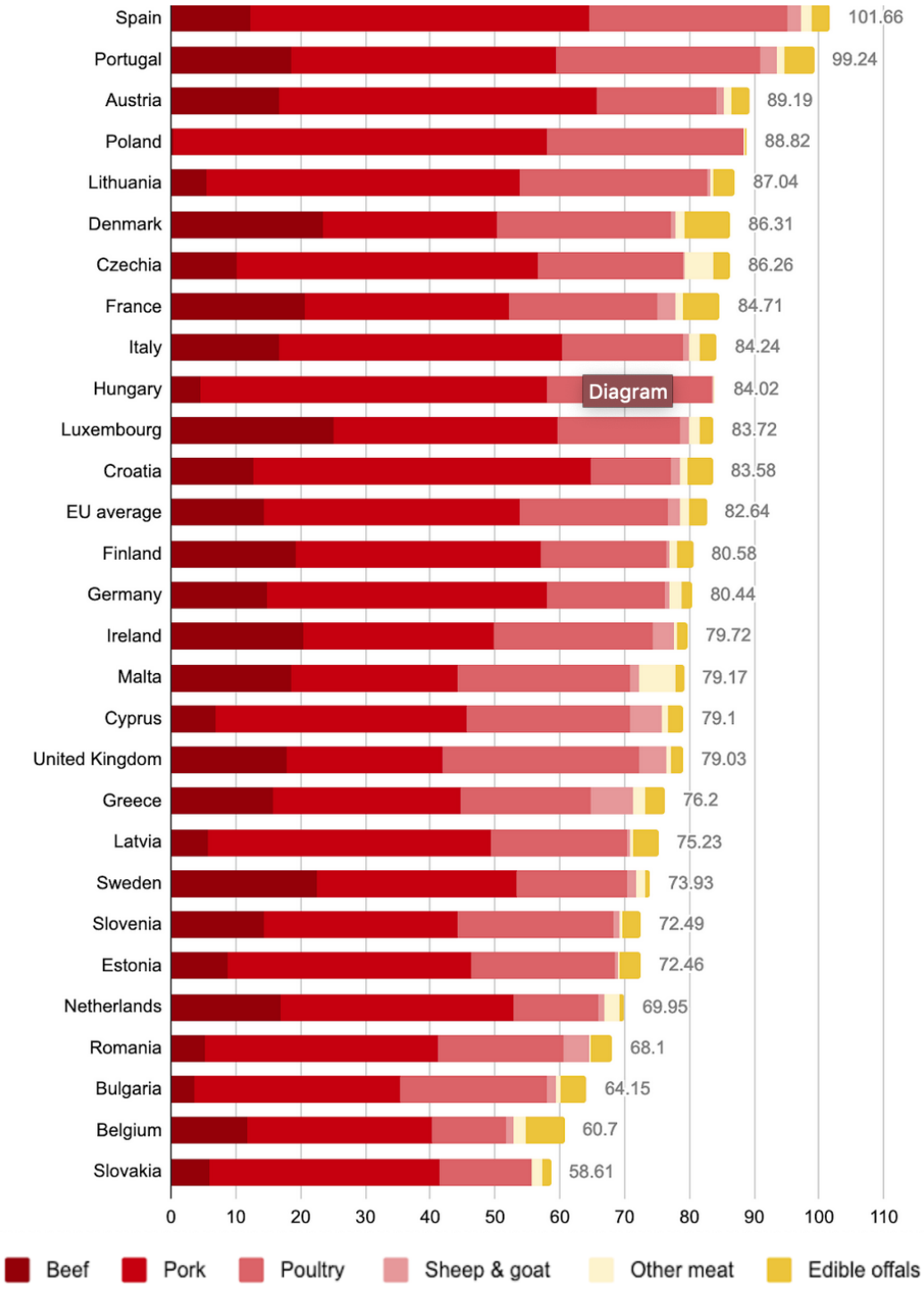


Figure 16: *Data source NOTE: FAOStat[66]. Note: The "food supply quantity" is a calculation of the available food for consumption (production + import - export - waste - other uses, divided by the number of inhabitants of a country). The supply refers to the parts of the animals after slaughter that are technically edible, also known as "dressed carcass weight" or just "carcass weight". The supply figures include waste (such as bones) before reaching retail, as well as food that goes unsold or uneaten.*

Dairy supply quantity EU28 2018 (Kg/capita/year)

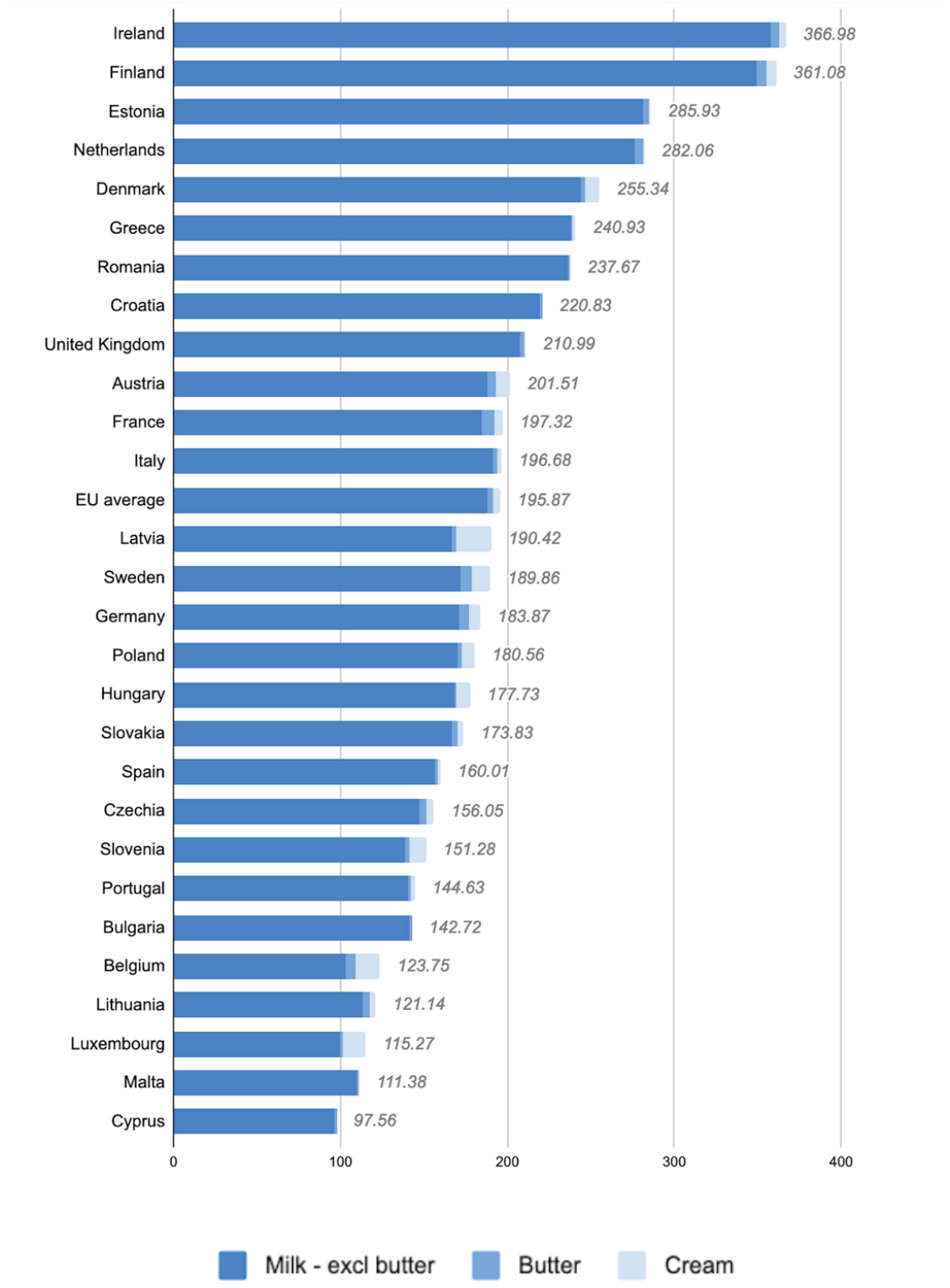


Figure 17: *Data source: FAOStat[67]. Note: The "food supply quantity" is a calculation of the available food for consumption (production + import - export - waste - other uses, divided by the number of inhabitants of a country). The supply of "milk" includes cheese, yoghurt and other dairy products.*

Seafood supply quantity EU28 2018 (Kg/capita/year)

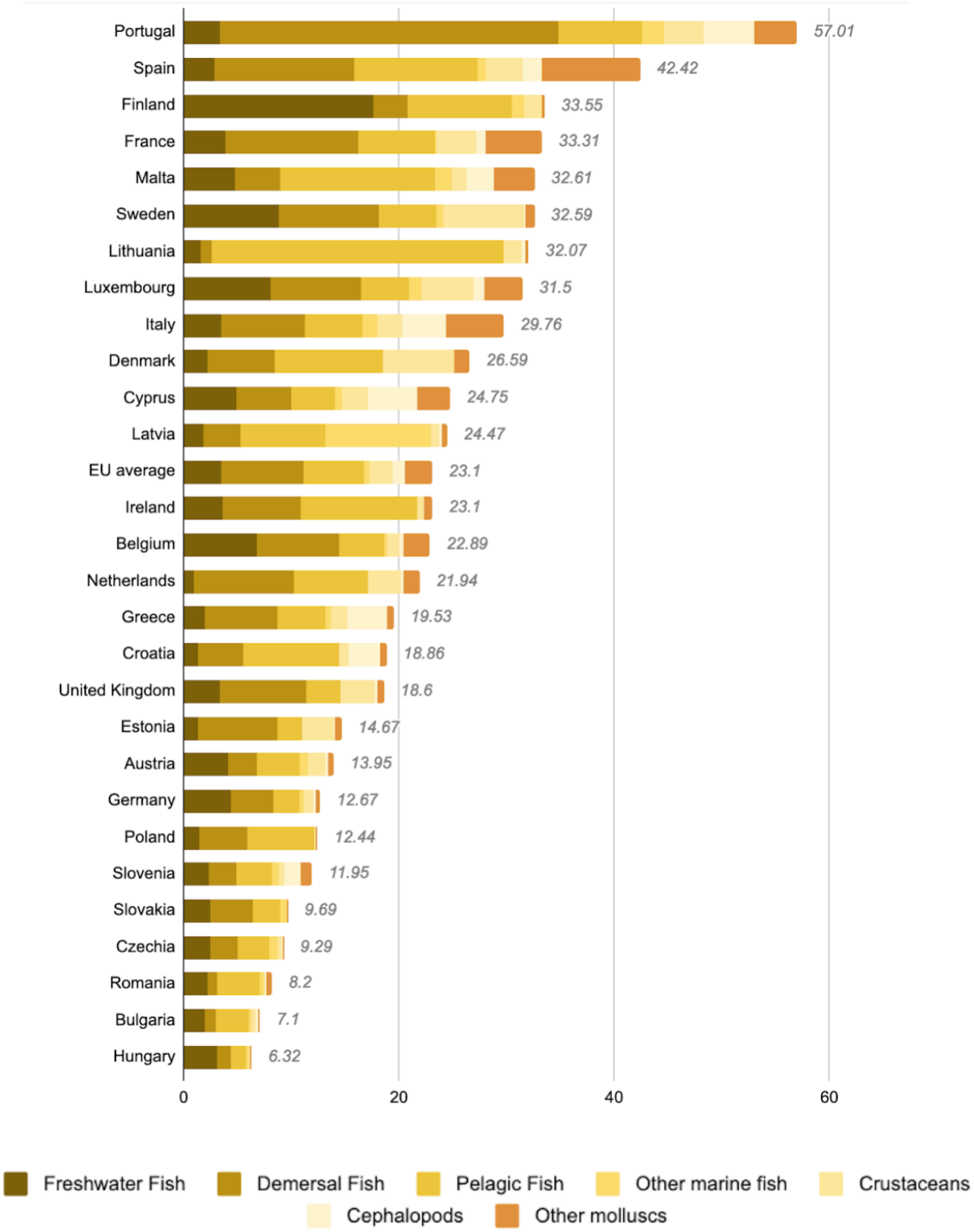


Figure 18: *Data source: FAOStat[68]. Note: The "food supply quantity" is a calculation of the available food for consumption (production + import - export - waste - other uses, divided by the number of inhabitants of a country).*

Annex V:

Organic shares for retail sales values (euros) for selected products

	Baby food	Bevergaes	Bread & bakery products	Eggs	Fish & fish products	Fresh vegetables	Fruit	Vegetables & fruit	Meat & meat productos	Milk & daily products	Butter	Cheese	Milk	Yoghurt
Austria				22.1		16	11	13.6	3.8	12.4	11.2	10.3	21.8	23.7
Belgium (2018)			4.5	18.2	0.6						4.7		3.3	10.1
Czech Republic (2018)		0.4	0.4					1.3	0.2	1.4				
Denmark		14.4 juice		29.6					8.0 beef		16.8	6.8	32.3	
Finland	23			18		4.5	7.5						4.5	
France	26.9	5.5	5.3	37.2	3.1	7.6	8.8	8.2	3.2	5.8	7.4	2.6	15.7	9.1
Germany			7.4	20.6		9.8	7.5		2.9	8.5	4.5	4.7	12.4	8.2
Italy	4.8	3	4.0	19.8		4.7	6.6	7.7	2.9	3.6	2.8	1.0	8.1	6.1
Netherlands (2018)			2.6	15.9	1.3			5.8	4.7	5.6				
Norway (2018)	33.1	0.5	2.1	9.5	1.5	4.2	2.2		0.5	2.1	3.1	0.7	4.4	0.7
Spain (2017)				2.9	0.6	3.3	1.7		1.2	1.1				
Sweden (2017)		5.6	3.5		12.9	12.2	18.4		2.9	10.4				
Switzerland		4.0	26.1	28.7		23.1	17.5	20.3	6.2	11.0		7.6	24.9	
UK	55.4		0.3	8.8	1.1	4.3	2.8	0.5	1.5	3.5		1.1	5.5	7.8

Note: Due to classifications and nomenclatures differing from country to country, it is not possible to supply data for all product groups, even if data for individual products may be available. Not all countries have data on the market shares of organic products.

Figure 19: *Source: FIBL and IFOAM, 2021*[69]

Annex VI:

Organic livestock in Europe and the EU 2010-2019

	Europe				European Union	
	Animals [head]	Organic share of total [%]	Change 2018-2019 [%]	Change 2010-2019 [%]	Animals [head]	Organic share of total [%]
Bovine animals	5'079'962	4.0%	4.1%	80.9%	4'852'303	6.0%
Sheep	5'413'520	3.5%	-9.7%	55.3%	5'214'634	5.3%
Pigs*	1'586'702	0.9%	13.7%	109.6%	1'544'573	1.1%
Poultry**	62'317'071	2.5%	8.0%	110.0%	59'666'753	4.2%

Source: FiBL survey 2021 based on Eurostat and national data sources.

Notes: Data for the calculation of organic shares are based on Eurostat and FAOSTAT. The numbers for the organic shares of all livestock are based on FAOSTAT data. FAOSTAT only provides totals for bovine animals, sheep, pigs, and poultry, without further specifications. Please note that growth rates from 2010-2019 were similar for Europe and the European Union and are not included in the table.

** Please note there is no consistent reporting in the official statistics, no clear distinction is made between the number of animals slaughtered, the places or average numbers of stock. Therefore, the data should be treated with caution. I According to the Agricultural Market Information Company AM1, the average stock of fattening pigs was 621'000 in Europe, and 584'000 in the European Union.*

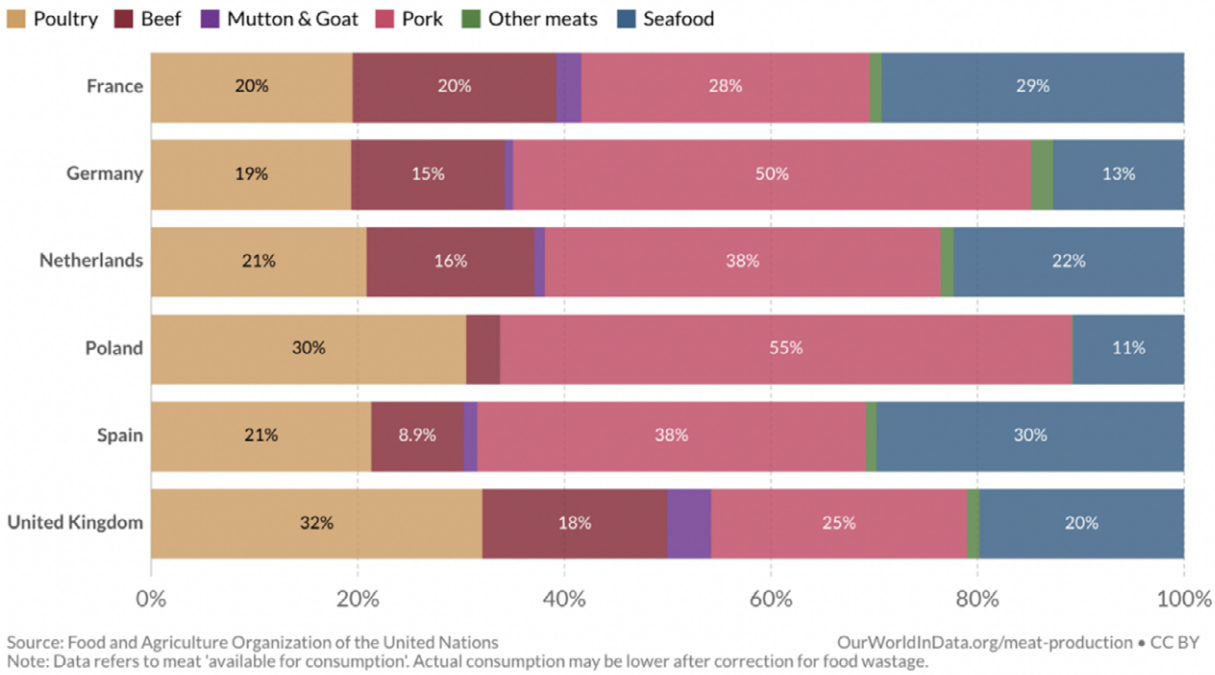
*** Also for poultry, there is no consistent reporting. According to the Agricultural Market Information Company (AMI), broilers' average stock was IS. I million Europe and 14.6 million in the European Union. The average stock of laying hens was 27.3 million in Europe and 25.4 million in the European Union.*

Figure 20: *Source: FIBL and IFOAM, 2021*[70]

Annex VII:
Country-level profiles

There is no one European diet, although to a great extent it has been homogenised. Across the continent there is still significant regional and local variation in what people eat. Figure 21 reviews the percentage of meat in the diets of the six countries of interest for this report. For example, poultry is more common in the UK, while the Spanish and French consume much higher levels of fish and seafood compared to others.

Figure 21: Per capita meat consumption by type, in selected European countries (2017)

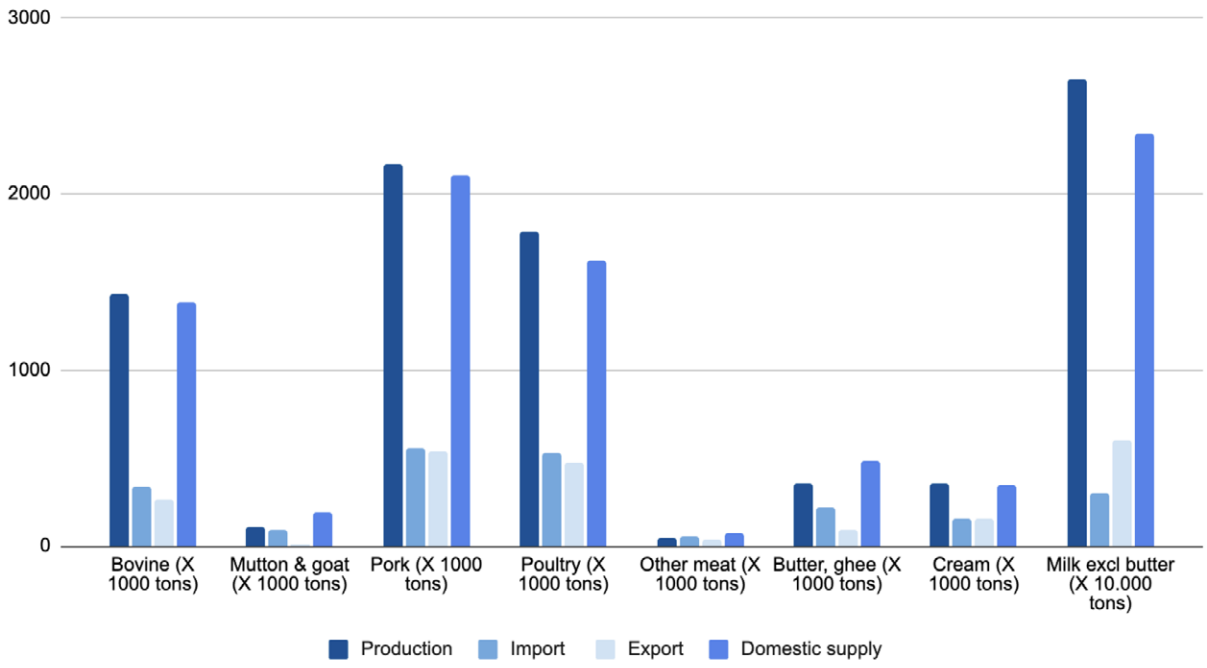


France

While almost all French consumers report eating ASFs at least occasionally, evidence points to a decline in overall meat consumption. Just under half (48 per cent) of French people who were surveyed reported having reduced their meat consumption in the last three years. Many say they want to further reduce it in the future (30 per cent), motivated primarily by health concerns (43 per cent), but also animal welfare (36 per cent), the price of meat (33 per cent) and environmental concerns (33 per cent)[71]. Sales of plant-based food increased by 18 per cent between 2018 and 2020, with plant-based milk being the most popular product[72]. When surveyed about changes in their eating habits in 2020 during Covid-19, the French reported a net reduction in meat consumption, with 19 per cent saying they ate less and 16 per cent eating more[73]. The Climate and Resilience Bill now under review by

the French parliament would restrict meat options in public-sector food service. It would mandate one vegetarian menu per week in all schools, a daily vegetarian choice in all state-run canteens, and training for canteen staff to guarantee high-quality vegetarian menus[74]. The French government is also developing a national ecolabel for food products, to be made mandatory by 2025[75].

Figure 22: Production, import, export and domestic supply of meat and dairy in France (2018)



Data source: FAOstat[76]

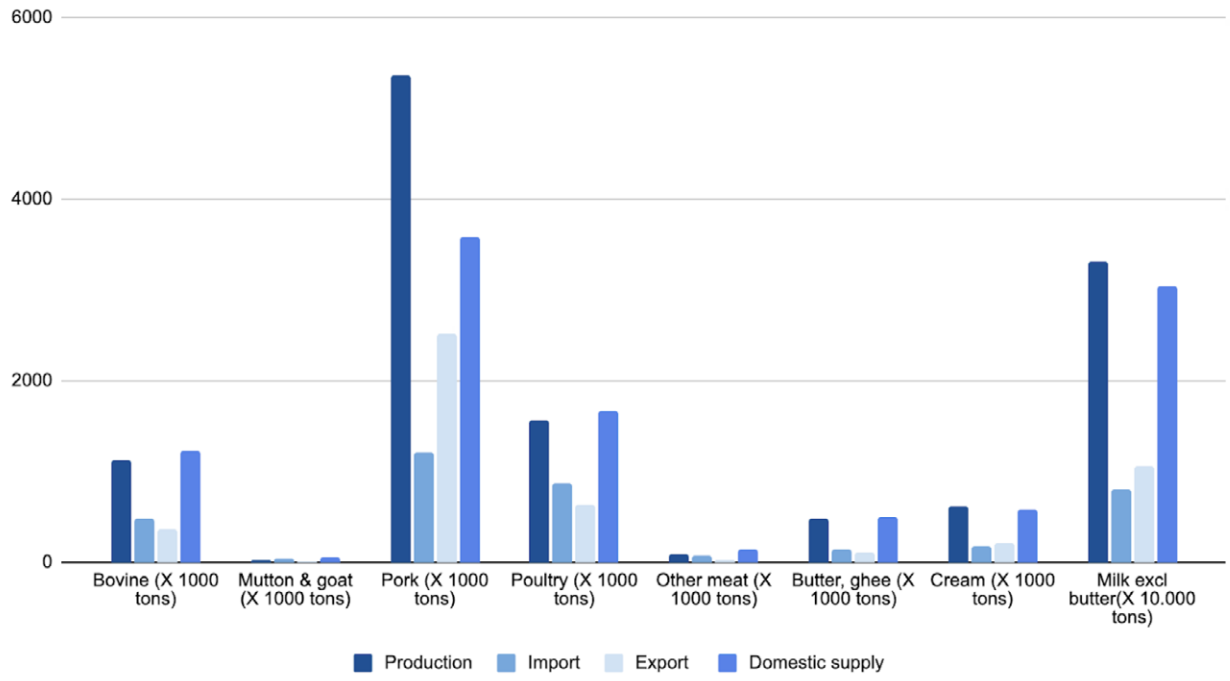
Germany

While Germany has a long tradition of ASF culture – including sausages, schnitzel and abundant meat platters – the country may have Europe's highest prevalence of self-reported vegans and vegetarians. A 2020 study of 2,600 Germans reports that 2.6 million people, or 3.2 per cent of the population, are following a vegan diet[77]. In 2021, the Federal Agency for Agriculture and Food reported that per capita meat consumption in Germany (extrapolated from production statistics) was 57.3kg, the lowest level since first recorded in 1989. During Covid-19, Germans reported modest increases in consumption in most categories. But, alongside France, Germany, was the only EU country out of 10 surveyed that reported an overall reduction in meat consumption, with 17 per cent eating less and only 10 per cent consuming more[78]. Other surveys find that 63 per cent of Germans say they are trying to reduce their meat consumption[79]. An analysis of the German

National Nutrition Survey found similar demographic trends as in other countries, with women, young people and more educated people reporting a plant-based diet. Men and people with lower education levels reported eating high amounts of meat[80]. Between 2018 and 2020, the sales value of plant-based foods in Germany grew by 97 per cent. Discount retailers played a leading role in this increase and accounted for 25 per cent of the overall plant-based sales value. Plant-based milks were by far the biggest seller over this period (€396m), more than double plant-based meat sales (€181m)[81].

In 2017, Germany's federal environment agency proposed raising taxes on animal products from 7 per cent to 19 per cent for environmental reasons. In the same year, the minister for the environment announced a ban on serving meat at all official functions due to its environmental impacts. In 2019, politicians from the Social Democrats and the Greens proposed raising the value-added tax on meat and dairy from 7 per cent to the standard rate of 19 per cent[82]. A consensus on the next steps has yet to emerge from the government.

Figure 23: Production, import, export and domestic supply of meat and dairy in Germany (2018)



Data source: FAOstat[83]

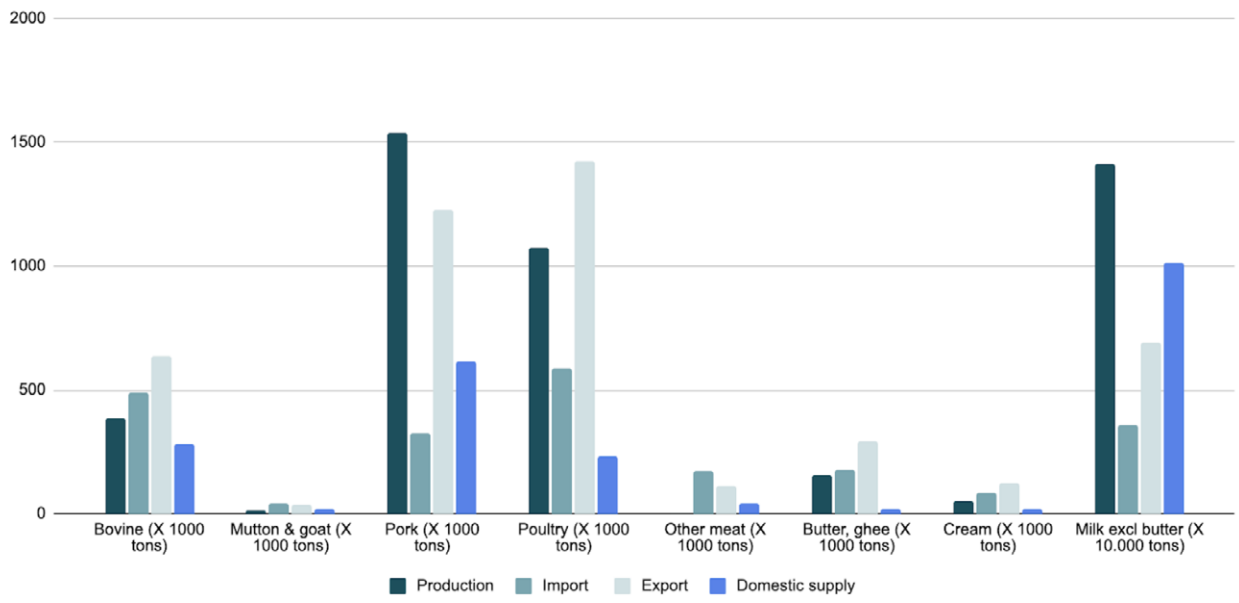
The Netherlands

Dagevos et al. (2020) estimated that total consumption of meat and meat products per capita in the Netherlands was 77.8kg in 2019. This was the second consecutive annual increase in the country, with most of the rise coming from poultry. The consumption of beef, sheep, goat and horse meat did not change from 2018 to 2019. After a decline in the previous decade, the estimated overall meat consumption per capita has now returned to 2007 levels. The research,

conducted at Wageningen University, relied on production data to estimate meat consumption per capita. The researchers argue that consumption in fast-food restaurants may be a significant factor, given the high proportion of meat-rich meals offered. They also speculate that the overall consumption increase could be driven in part by the increasing numbers of tourists visiting the Netherlands and eating at these restaurants[84]. This is confirmed by the recently published figures over 'Corona year' 2020: The total consumption of meat per capita was 75.9 kg, a decrease of 1.9 kg. The sales in supermarkets increased, while the meat consumption in restaurants and other catering (by a.o. tourists) decreased - since it was closed as a preventative measure against the pandemic[85]. Between 2018 and 2020, the volume of plant-based food sales grew 35 per cent, with sales of plant-based meat leading the way (€174m), followed by plant-based milk (€62m) and plant-based yoghurt (€43m). However, plant-based cheese saw the largest growth over that period, up 140 per cent in sales value[86].

In November 2019, the Dutch finance minister committed to a study into "fair meat prices". A levy of 10-27 cents per 100g of meat was proposed from 2021 onwards, rising to 20-57 cents in 2030. Revenues would be used to lower the prices of fruit, vegetables and plant-based meat alternatives, while additional financial support would be given to farmers for sustainability[87]. The policy discussion is still at an early stage, but could feature in 2021 election debates. The TAPP Coalition's 2020 survey found that up to 63 per cent of the Dutch population supported the policy[88].

Figure 24: Production, import, export and domestic supply of meat and dairy in the Netherlands (2018)

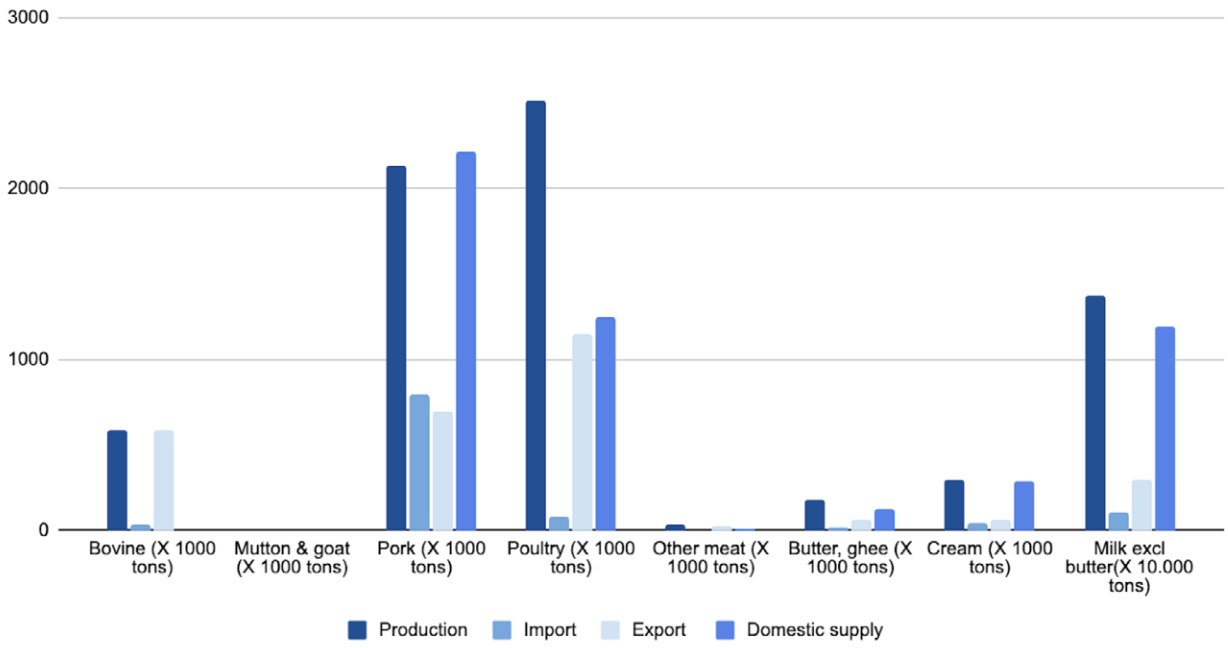


Data source: FAOstat[89]

Poland

There is strong evidence of declining consumption of ASFs in Poland, similar to other European countries. The Central Statistical Office reported that annual meat consumption per capita fell by 1.4kg (2.2 per cent) in 2019 compared to 2018[90]. A 2020 survey of Poles found 10 per cent reported following a vegetarian diet and another 4 per cent were vegan[91]. Both groups were disproportionately young and female. Poland is part of the plant-based boom also occurring in Germany, the UK and the Netherlands, with many urban restaurants embracing plant-based dishes, and expanding numbers of meat-free products on supermarket shelves. In 2021, Warsaw was included among the world's top 10 most vegan-friendly cities[92]. However, Poland is a very conservative European country and the plant-based trend and its challenge to traditional cuisine has led to a backlash, with veganism being seen by some as a more general threat to the nation's culture and values. This mirrors the tensions along gender lines in Poland, where women generally hold much more liberal views and young men are more likely to have conservative and nationalistic beliefs.

Figure 25: Production, import, export and domestic supply of meat and dairy in Poland (2018)

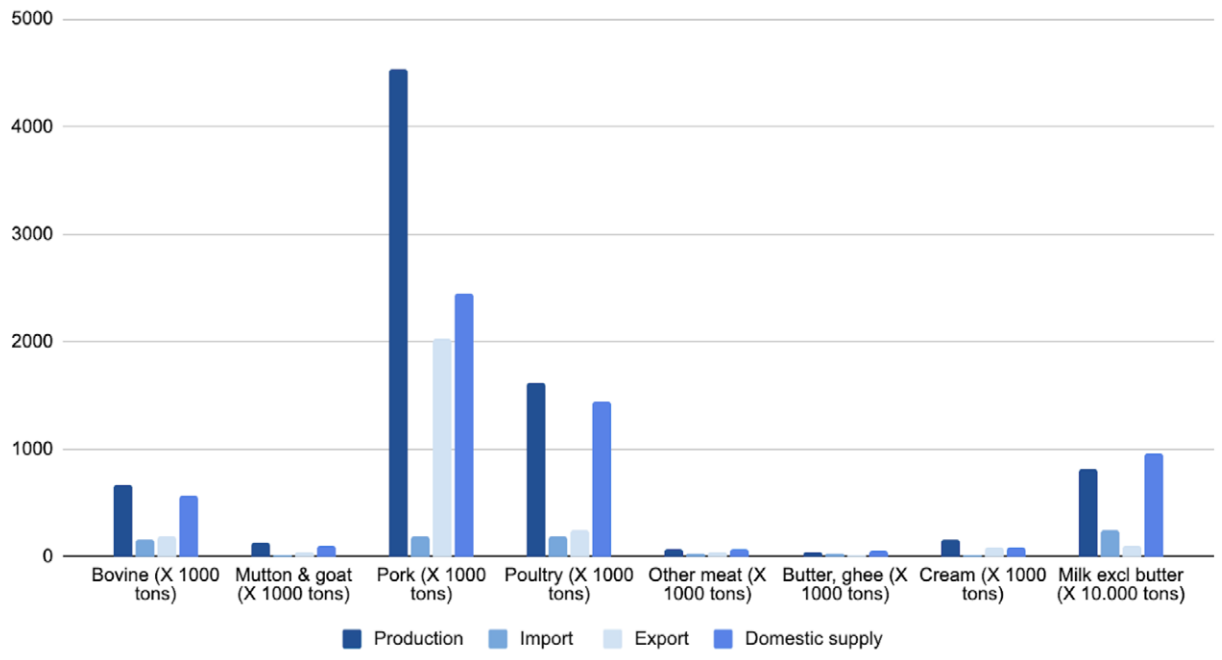


Data source: FAOstat[93]

Spain

In 2018, figures showed that meat consumption decreased in Spain for the sixth consecutive year, down 12 per cent from 2012[94]. Consumption of all types of meat has decreased – including poultry, which has been on the rise in most countries. This decline in meat-eating may be linked to an increased interest in alternative protein sources, recent scandals involving the meat industry, and a falling population with smaller families. Meat consumption during Covid-19 appears to have remained relatively stable in Spain. However, a consumer survey found that 33 per cent of people reported eating more dairy products over that period, compared to only 3 per cent who consumed less[95]. Plant-based milk is by far the most popular ASF alternative, with annual sales almost four times that of plant-based meat replacements. From 2018 to 2020, the overall value of plant-based food sales grew 48 per cent[96]. Policy debates on meat reduction have been quieter in Spain than in EU neighbours. However, the government has invested in cultured meat projects, including €5.2 million for a project led by BioTech Foods in 2021[97].

Figure 26: Production, import, export and domestic supply of meat and dairy in Spain (2018)



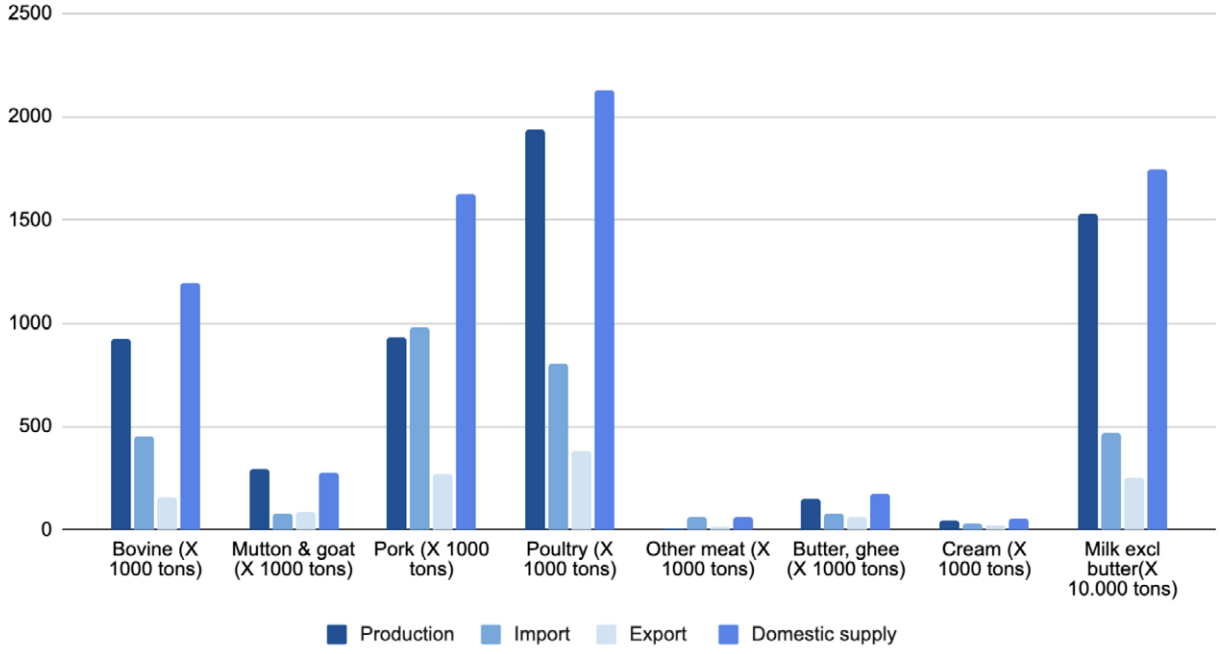
Data source: FAOstat[98]

United Kingdom

An analysis of dietary intake records from the UK National Diet and Nutrition Survey shows that meat consumption has decreased over the last decade. Compared to 2009, the average person in the UK ate 17.4g per day less meat in 2019, a 16.8 per cent drop[99]. Most of the reduction was driven by a decline in red meat consumption, but over the same period, poultry intake increased by 3.2g per person per day (or 1.2kg per year). In the data, the two middle birth-year groups (1960-1979 and 1980-1999) and those living in the lowest socioeconomic areas were the highest meat consumers. The decline in meat consumption was greater among women than men. Whereas other sources have suggested an increase in the adoption of vegan and vegetarian diets among young people, the survey analysis found that the youngest segment (born after 1999) were the only group to increase their overall meat consumption over the decade. However, the youngest survey respondents still had the lowest baseline level of reported meat consumption. In the UK, the early 2020 Covid lockdown led to record increases in beef retail purchases, as well as higher pork sales[100]. However, it is unclear how much of this led to overall increases in red meat consumption, given the absence of out-of-home eating options.

Consumers' interest in meat and dairy alternatives has increased in recent years. Mintel has reported strong sales increases in meat-free and dairy-free products. In 2018, the UK surpassed Germany as the country with the highest number of new vegan food product launches[101]. However, public understanding of the environmental impacts of food choices is still relatively low. Culliford and Bradbury (2020) surveyed UK residents about the environmental benefits of diet choices and found only 42 per cent believed they should "prioritise plant-based proteins". A large majority believed reducing air miles (79 per cent) and "buying locally grown produce" (78 per cent) were important environmental choices[102], despite research showing that these behaviours have far less impact in comparison to reducing ASF consumption[103]. While plant-based options are becoming more popular on UK supermarket shelves, the charity Feedback declared in its 2021 report card that UK food retailers are failing to honour their climate commitments in the way they sell ASFs to customers. Many corporate policies have improved since Feedback's 2019 report card, but supermarkets are not applying them to how and what they promote in stores[104].

Figure 27: Production, import, export and domestic supply of meat and dairy in the UK (2018)



Data source: FAOstat[105]

Annex VIII:

Consumption of beans, peas and pulses across the EU-28 (2018)

Food supply quantity Beans, Peas a.o. Pulses in EU28 2018 (KG/cap/year)

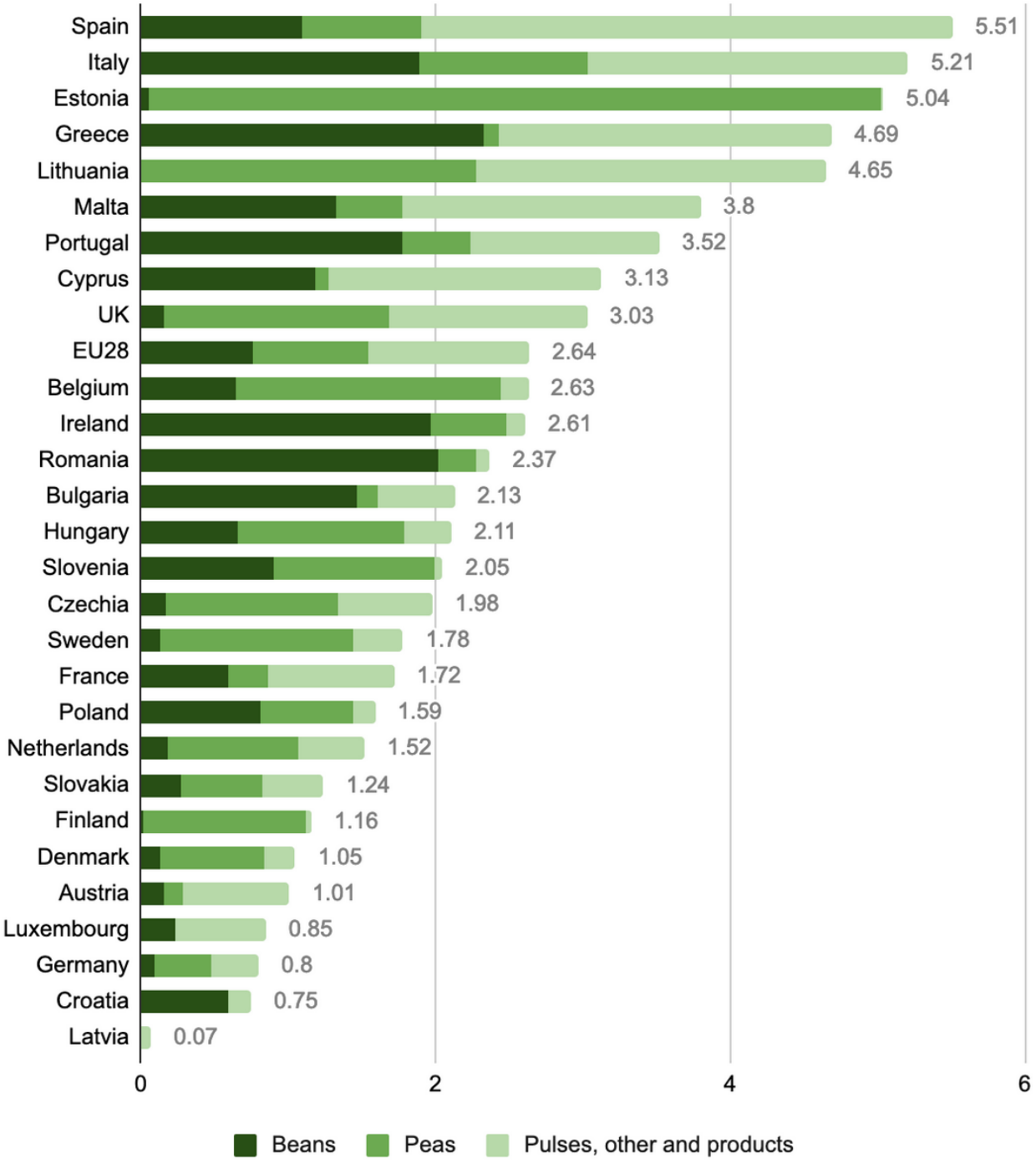


Figure 28. *Data source: FAOstat*[106]

Annex VIII:

Consumption of beans, peas and pulses across the EU-28 (2018)

Estimating the required reductions in consumption and production of animal-based foods is complex and nuanced. Many different factors influence the possible available ecological production space, and subsequent available amounts of ASFs. Important questions include: What does "better production" of ASFs look like in practice? What kind of feed should animals receive – do ruminants feed on grass, pigs on swill and chickens on food waste, or are they fed grains and protein feed? Is the food system organic and agroecological or high-tech and industrialised? Is the food system localised or globalised? Does everyone in the global population get a fair share? And what are the effects of global warming for agricultural productivity?

Different assessments incorporate different perspectives and factors in their models, resulting in different outcomes. For the purpose of this scoping study, below are six analyses and recommendations that suggest what the reduction of ASF consumption and production could look like as part of transitioning towards healthy diets within planetary boundaries. Based on the results of these six studies, we propose a rough reduction of meat consumption in Europe by 75 per cent by 2050, and of dairy consumption by 50-80 per cent. These figures emerge from an analysis and approximation of the multiple studies outlined below.

It is important to note that there are enormous differences in levels of consumption of ASFs between regions and countries. Within Europe, the difference between the countries with the highest and the lowest consumption quantity is 40kg per capita per year, with the highest being around 100kg per capita per year, and the lowest 60 kg (see Annex IV).

Source	Analysis and conclusions	Estimated reduction
Calculations in Briefing II, based on Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., ... & Murray, C. J. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. The Lancet, 393(10170), 447-492.	In Briefing II, we compare the diet of the "average European" to the EAT-Lancet reference diet. As we note, "[t]o align with these recommendations, the 'average European' would need to reduce beef consumption by 68 per cent, pork by 91 per cent and poultry by 43 per cent. The consumption of dairy and fish would need to decrease by 53 per cent and 43 per cent, respectively". That corresponds with an overall reduction of meat consumption of 73.8 per cent.	73.8 per cent meat 53 per cent dairy

Source	Analysis and conclusions	Estimated reduction
Greenpeace Research Unit (2018). Reducing Meat and Dairy for a Healthier Life and Planet: Scientific background on the Greenpeace vision of the meat and dairy system towards 2050. Available from: https://cutt.ly/TTzzdMa	"...**a global reduction of 50 per cent** in production and consumption of animal products by 2050 and a change in the way we produce them." "Under the Greenpeace goal, we estimate a **global consumption of meat of 16kg per capita per year**. That relates to approximately 300 grams per capita per week of all meat products (in carcass weight, meaning raw unprocessed products at the point of retail sale). Similarly, for dairy, the 50 per cent reduction results in an estimated global **consumption of dairy of 33kg per capita per year in 2050,** which results in 630 grams per capita per week (a glass of milk is roughly 200 grams)." This research suggests a **73.4 per cent meat reduction and 82.1 per cent reduction of dairy** for the average European by 2050.	73.4 per cent meat reduction in Europe on average by 2050. 82.1 per cent dairy reduction in Europe on average by 2050.
Buckwell, A., & Nadeu, E. (2018). What is the Safe Operating Space for EU livestock. The RISE Foundation, Brussels. Available at: https://cutt.ly/fTzl2yd	**This report works with a concept termed the "safe operating space", in line with the Paris Agreement.** "The position of the climate boundary in relation to cur-rent livestock activity is initially indicated by calculating the percentage reductions from 2013 in direct livestock emissions necessary to achieve the EU's GHG [greenhouse gas] target cuts set following the Paris Climate Agreement of 40%, 60% and 80% by 2030, 2040 and 2050, respectively. Agriculture is not formally included in these targets and the commitments. The calculations show the adjustments needed in livestock emissions if this sector is not gradually to become a growing share of remaining emissions as energy supplies are decarbonised. **The results show the average EU28 reductions required are 21%, 47% and 74% respectively for the three dates."** Note that this is the needed reduction in emissions. The researchers state that the role of technology in achieving these reductions is limited, therefore the way to reduce these emissions is by shrinking the herd size. The research by Rise also calculates for other environmental impacts such as nutrient flows, biodiversity and livestock units per hectare.	

Source	Analysis and conclusions	Estimated reduction
Muller, A., Schader, C., Scialabba, N. E. H., Brüggemann, J., Isensee, A., Erb, K. H., ... & Niggli, U. (2017). Strategies for feeding the world more sustainably with organic agriculture. Nature communications, 8(1), 1-13.Available from: https://www.nature.com/articles/s41467-017-01410-w	Muller et al. model different scenarios of agricultural production, including the agronomic characteristics of organic agriculture. Important variables in these scenarios are the amount of food wasted and the amount of food-competing production of animal feed, such as grains and soy. **In the scenarios with reduction of food waste and half the amount of food-competing feed production, organic agriculture offers enough produce for a growing world population.** However, it is not clear what the exact impact is of the change of animal feed on the number of livestock. For highly feed-dependent industrial pig, poultry and dairy farms, this will certainly mean a big change in how animals are fed and the number of animals in the herd.	73.4 per cent meat reduction in Europe on average by 2050. 82.1 per cent dairy reduction in Europe on average by 2050.
Dagevos, H., Verhoog, D., van Horne, P., & Hoste, R. (2020). Vleesconsumptie per hoofd van de bevolking in Nederland, 2005-2019 (No. 2020-078). Wageningen Economic Research. Available from: https://edepot.wur.nl/531409	Wageningen University, on Dutch meat consumption and EAT-Lancet (translated from Dutch): "The prestigious study by the EAT-Lancet Commission, concluded a reference diet with an average of 43gr of meat per day (Willett et al., 2019: 7, 12). 14gr of red meat (beef, pork and lamb are mentioned) per day (bandwidth: 0-28gr) and 29gr of 'white' poultry meat (chicken and poultry) per day (bandwidth: 0-58 gr) are about 100gr of red meat per week and about 200gr of white meat per week. (...) A number around 15 to 16kg means a reduction of about 60% compared to the amount of meat eaten in the Netherlands in 2019, on average." This analysis also compares the current consumption to the Dutch dietary guidelines: 25.5kg per year. Meeting the guidelines would require a **reduction of around 35 per cent.**	60 per cent meat reduction in the Dutch diet. (Note that the Dutch consume significantly lower amounts of meat than "the average European".)

Source	Analysis and conclusions	Estimated reduction
Springmann, M., Clark, M., Mason-D'Croz, D., Wiebe, K., Bodirsky, B. L., Lassaletta, L., ... & Willett, W. (2018). Options for keeping the food system within environmental limits. Nature, 562(7728), 519-525.	Springman et al. analyse several options for reducing the environmental effects of the food system, including dietary changes towards healthier, more plant-based diets, improvements in technologies and management, and reductions in food loss and waste. No single measure is enough to keep environmental effects within all planetary boundaries simultaneously. However, it is clear that while dietary changes (less meat, more plant-based food) contribute the most to reductions in greenhouse gas emissions, other "environmental domains" benefit from a mix of interventions. This is unsurprising, as animal-based products are responsible for the largest part of greenhouse gas emissions.	The "flexitarian diet" in the model "includes more stringent limits for red meat (one serving a week), limits for white meat (half a portion a day) and dairy (one portion a day), and greater minimum amounts of legumes, nuts and vegetables".

Endnotes

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