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# Protein supply and demand

This factsheet provides an overview of the supply and demand of protein in the EU. It details the different types of protein, plant and animal, as well as their usages as food and feed. It covers their production, consumption, import, export, and highlights the different market segments.

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# I. EU-grown plant protein sources

## Fact #1.1: 64 million tonnes of EU origin plant protein

Throughout this factsheet, all references to crop production, use, import, and export, pertain to **crude protein**, as outlined in the enclosed table. Unless explicitly stated otherwise, all references to protein are also to be understood as referring to crude protein content.

Product	Protein Content (%)
Common wheat	0.11
Barley	0.10
Durum	0.12
Maize	0.08
Rye	0.11
Sorghum	0.11
Oats	0.11
Triticale	0.11
Others	0.11
Soya beans	0.33
Rapeseed	0.19
Sunflower seed	0.15
Field peas	0.23
Broad beans	0.26
Lupins	0.35
Grass	0.026
Silage maize	0.029
Fodder legumes	0.072
Dried fodder	0.170

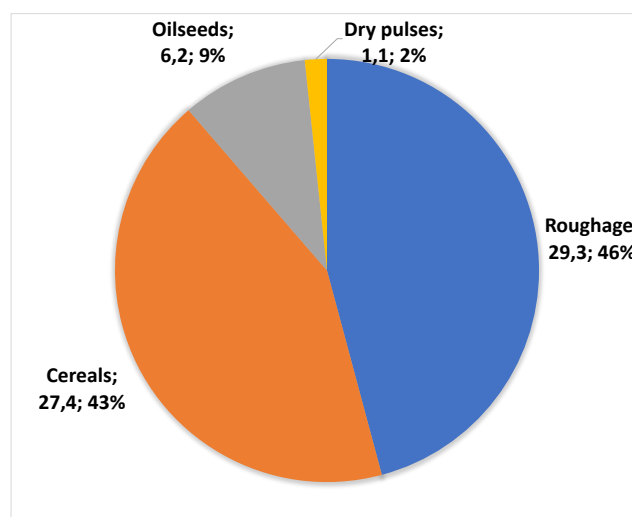
**Figure 1: A detailed breakdown of the protein content of various plant sources**

Source: DG AGRI EU Feed Balance Sheet

In marketing year 2023/24, it is estimated that 64 million tonnes of plant protein were produced from the main crops grown in the EU <sup>(1)</sup>.

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<sup>(1)</sup> Commission estimates based on the EU cereals and oilseeds balance sheets and EU feed protein balance sheet.



**Figure 2: EU plant protein production in marketing year 2023/24 (million tonnes of crude protein and share)**

Source: DG AGRI/EUROSTAT/MS

### Fact #1.2: Roughage is the main source of EU origin plant protein

2023/24			(mio. t)
ROUGHAGE	Production	Conversion rate	Protein
Grass	632.0	2.6%	16.4
Silage maize	237.0	2.9%	7.0
Fodder legumes	73.4	7.2%	5.3
Dried fodder	3.6	17.0%	0.6
<b>Total</b>	<b>946.1</b>		<b>29.3</b>

**Figure 3: EU roughage protein (million tonnes)**

Source: DG AGRI/EUROSTAT/MS

The largest single source of plant protein is **roughage**, at around 29 million tonnes of protein per year <sup>(2)</sup>. Roughage is primarily produced and directly used on farms. Within the roughage heading, grass, predominantly used by ruminants, accounts for 16.4 million tonnes, which is 56% of the total. Silage maize protein production is at 7 million tonnes (24% of the total), fodder legume protein at 5 million tonnes (18%), and dried fodder protein at 0.6 million tonnes (2%).

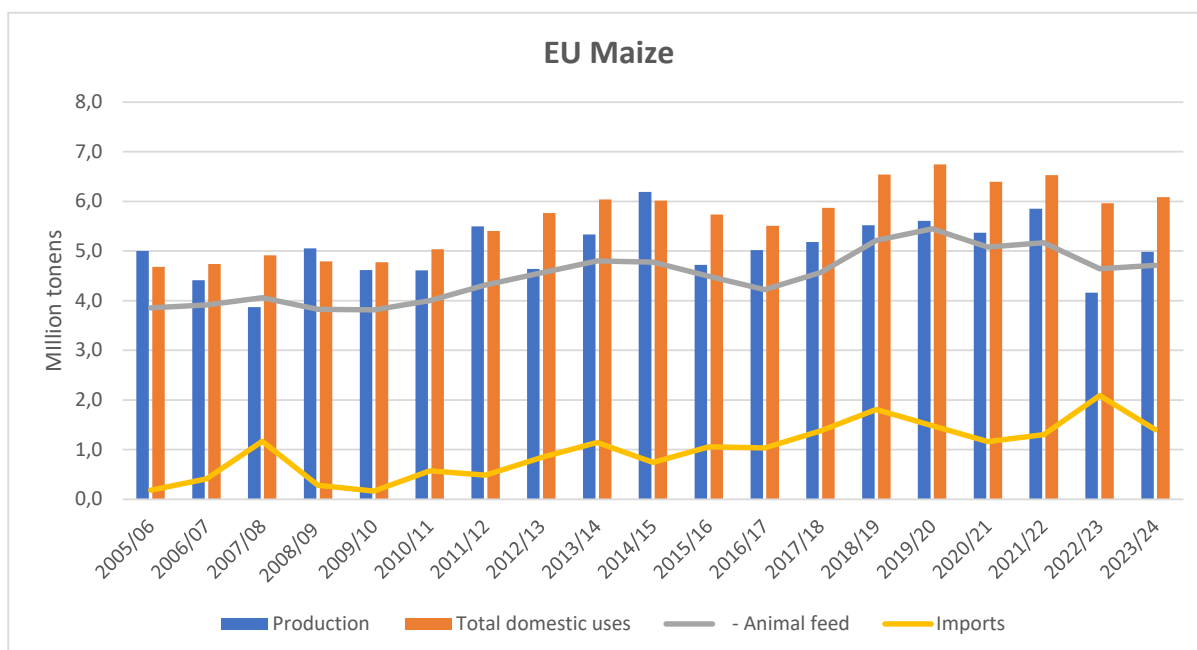
### Fact #1.3: The gap between EU production and EU consumption of maize protein is increasing

Over the past two decades, **EU origin cereal protein** increased from 26.4 to 27.4 million tonnes (3.6%), even if total cultivated land in the EU decreased by 9.2% over the same period. On the other hand, the total domestic use of cereal protein increased slightly with 25.1 million tonnes used in 2005/06 and 25.5 million tonnes in 2023/24 (1.6%).

<sup>(2)</sup> Roughage is grass, silage maize, fodder legumes, and dried fodder.

The main cereals cultivated across Member States include wheat, barley, maize, and rye. Each of these cereals plays a vital role in both human consumption and animal feed. However, maize holds a unique position, bridging the gap between food and feed industries.

In marketing year 2023/24, the EU total domestic use of **maize protein** totalled 6.1 million tonnes, with human consumption accounted for 0.4 million tonnes. **The most significant use of maize protein is in the animal feed sector**, with EU consumption reaching 4.7 million tonnes - **a 22% increase over the past two decades**. In addition, biofuel production used 0.6 million tonnes due to the increased importance of renewable energy. The EU production of maize protein remained relatively stable at 5 million tonnes between marketing year 2005/06 and 2023/24, despite some variations over the period, illustrating a persisting gap between EU production and consumption.



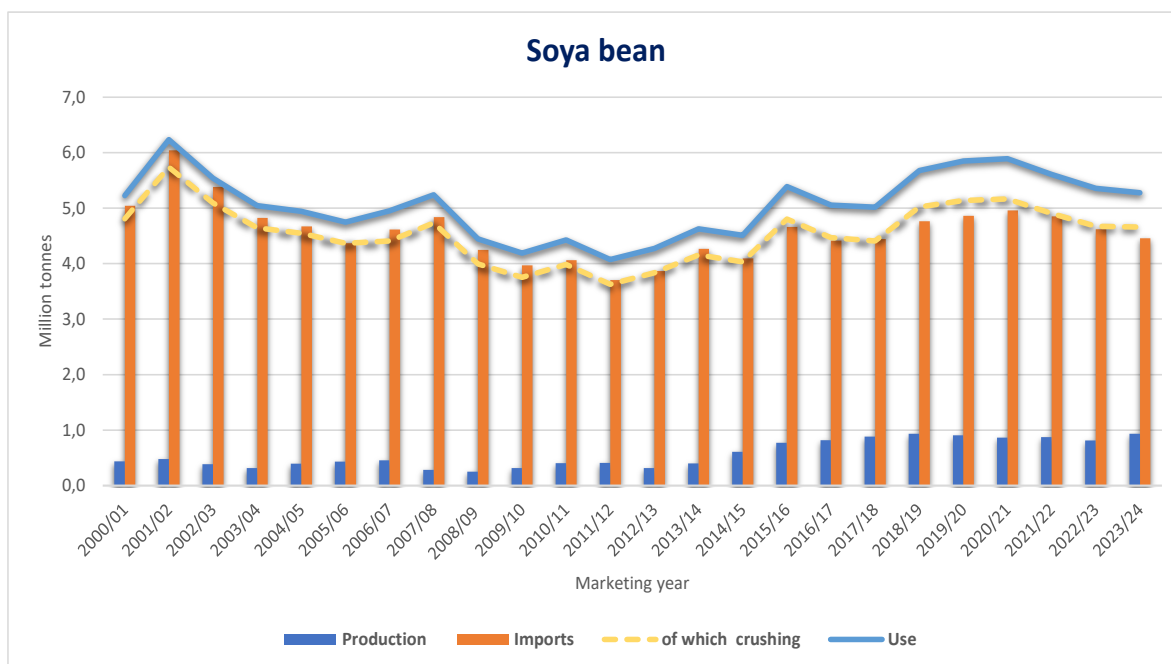
**Figure 4: EU maize protein (million tonnes)**

Source: DG AGR/EUROSTAT/MS

### Fact #1.4: Rapeseed is the main protein-rich plant cultivated in the EU

The **EU origin protein-rich plants** <sup>(3)</sup> in 2023/24 stood at 7.2 million tonnes of protein, including 0.9 million tonnes of soya bean protein and 3.7 million tonnes of rapeseed protein, having grown significantly over the previous two decades. The production of protein from **dry pulses** reached 1.1 million tonnes in 2023, of which 0.4 million tonnes from field peas and 0.3 million tonnes from broad beans. Although dry pulse protein is a small share of the total, its production increased by 42% in the EU over the previous decade.

<sup>(3)</sup> Protein-rich plants are defined as crops with a protein content of more than 15%, i.e., oilseeds and legumes.

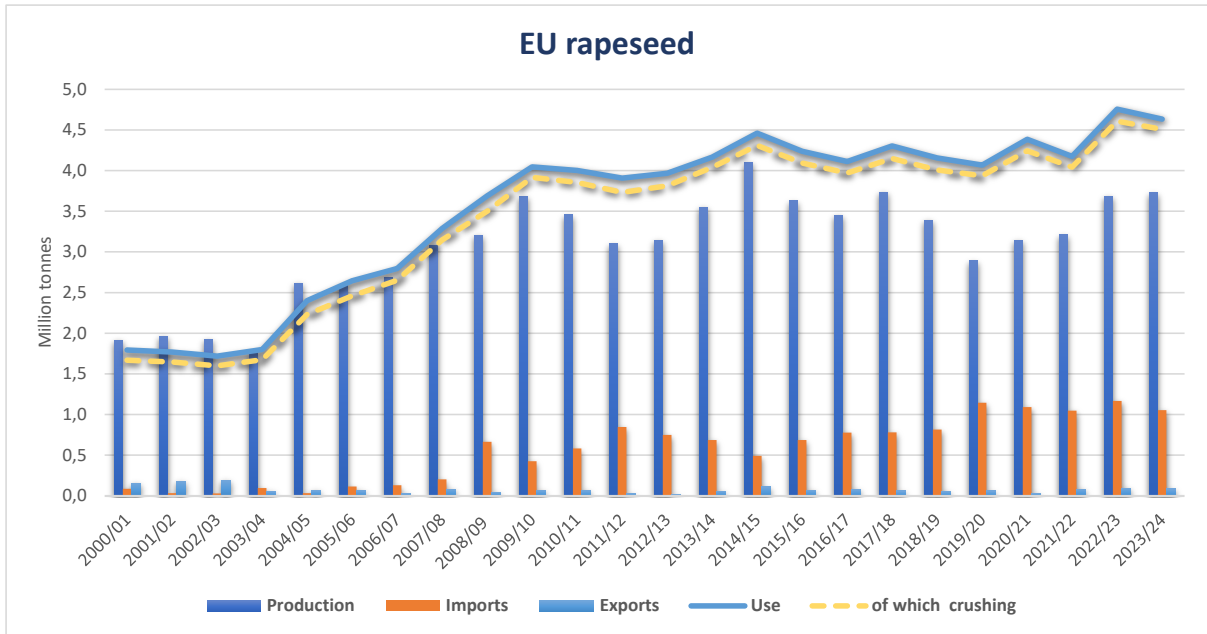


**Figure 5: EU soya bean protein (million tonnes)**

Source: DG AGRI/EUROSTAT/MS

Soya bean protein use increased marginally over the past two decades to 5.3 million tonnes in 2023/24. Rapeseed protein use expanded by 103%, from 2.2 million tonnes in marketing year 2004/2005 to 4.5 million tonnes in marketing year 2023/24. In recent years, the importance of rapeseed in the EU increased in part due to rapeseed oil use as feedstock for biodiesel production. Its co-product, rapeseed meal is used by all the livestock sectors and is one of the main sources of feed in aquaculture. In addition, rapeseed meal is used as an alternative to soya bean meal, in particular for organic poultry. The food industry is also a traditional user of rapeseed oil.



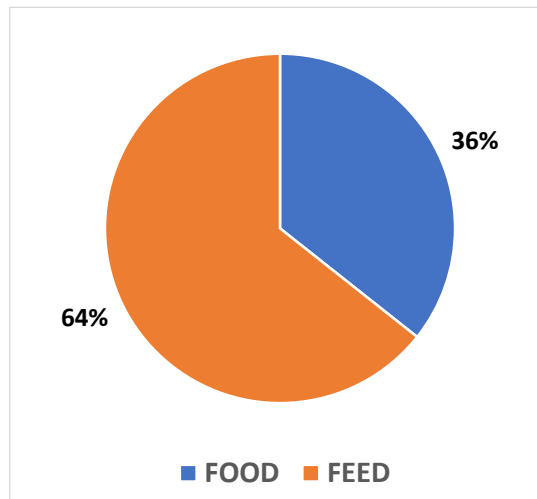


**Figure 6: EU rapeseed protein (million tonnes)**

Source: DG AGRI/EUROSTAT/MS

### Fact #1.5: Dry pulse protein from EU origin increased over the last decade but remains low

In the marketing year 2023/24, the total output of dry pulses protein in the EU reached 1.1 million tonnes compared to 0.8 million tonnes of protein a decade ago. This represents a 42% increase over the past decade. As regards **dry pulses**, total protein use of 1.4 million tonnes is shared between feed use (64%) and food use (36%) in marketing year 2023/24. Peas and broad beans are generally used for animal feed, while lentils and chickpeas in human consumption.



**Figure 7: EU dry pulses protein use in marketing year 2023/24**

Source: DG AGRI/EUROSTAT/MS

## II. Imported plant protein

## **Fact #II.1: EU cereal protein imports expanded in the last two decades**

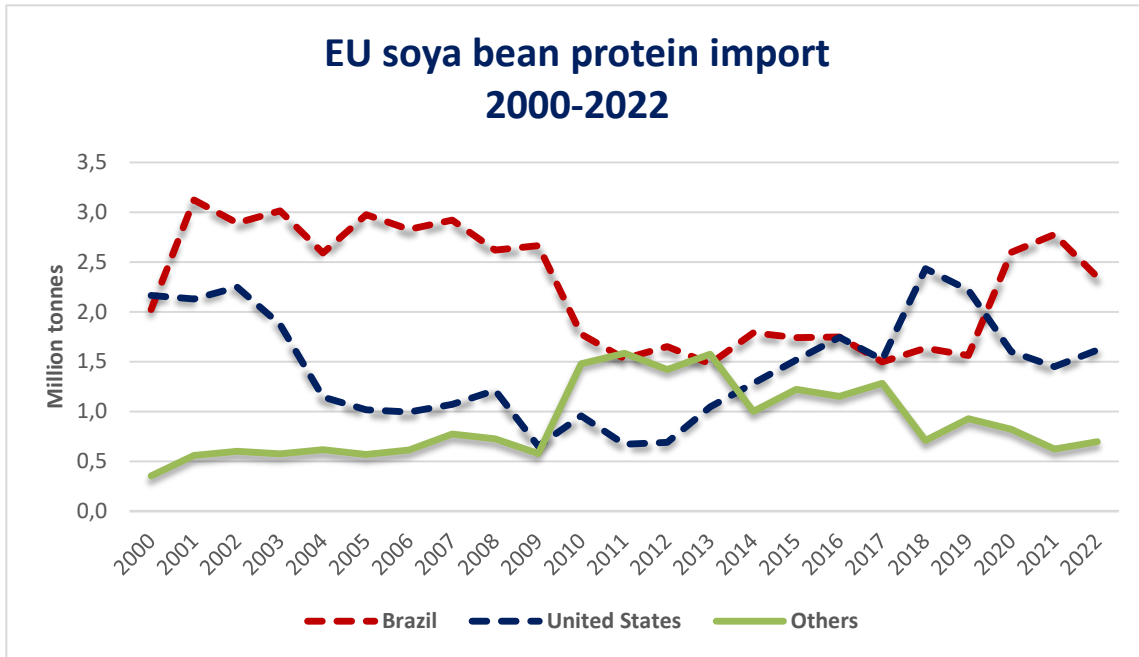
EU **cereal protein imports** increased significantly from 1.2 million tonnes in marketing year 2005/06 to 2.8 million tonnes in marketing year 2023/24 (130% increase). During the same period, maize imports increased from 0.2 million tonnes to 1.4 million tonnes.

While **EU oilseed protein** exports remained stable at 0.2 million tonnes, **imports** slightly increased from 4.8 million tonnes in 2005/06 to 5.7 million tonnes in 2023/24 (18% increase).

## **Fact #II.2: The EU relies on imports to supply soya bean and soya meal**

Soya bean and soya meal protein dominate EU imports of protein, at around 11.3 million tonnes annually. Consequently, one could argue that the EU relies on arable land outside of its territory to complement its supply. For soya bean protein, it primarily relies on the US and Brazil, as well as Argentina for soya meal.

Over the past two decades, the primary sources of EU soya bean protein imports have been Brazil and the United States. In 2022, total EU imports of soya bean protein reached 4.7 million tonnes, of which 4 million tonnes originated from these two main suppliers (Brazil – 2.4 million tonnes and the US – 1.6 million tonnes). Concurrently, the proportion of imports from Brazil and the US has fluctuated over time. Brazil emerged as the primary source of soya bean protein imports for the EU between 2001 and 2016 and regained this position in 2020. In 2022, the two main origins accounted for 85% of the total EU soya bean protein imports.

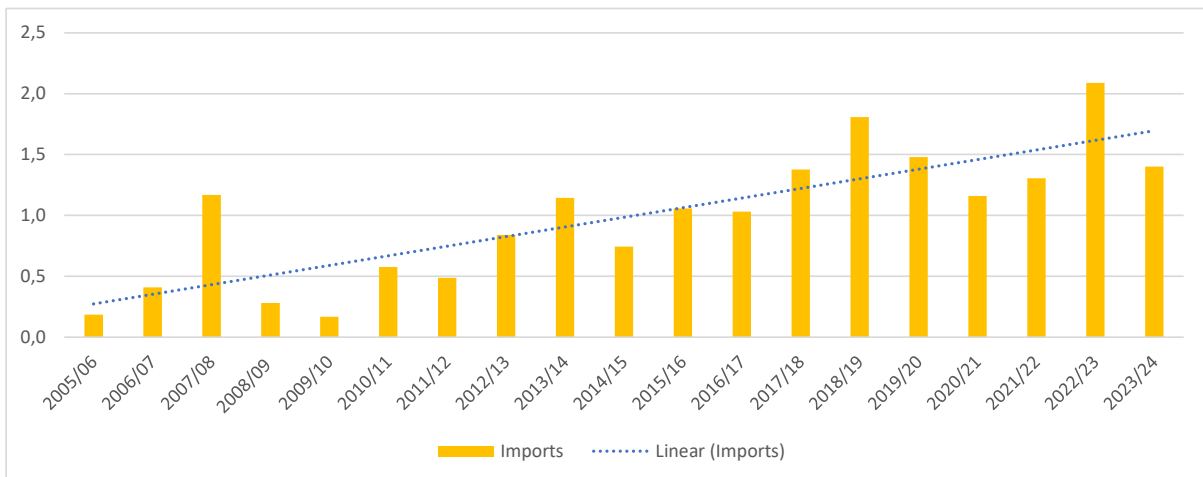


**Figure 8: EU soya bean protein import from Brazil and US – 1999-2022 (millions of tonnes of protein)**

Source: COMEXT

In marketing year 2023/24, **protein** imports of 0.5 million tonnes from **dry pulses** generally offset EU exports of 0.2 million tonnes. Trade of **roughage** is negligible with exception of dried fodder which exports amounted to 0.37 million tonnes in protein content for the same marketing year.

**Fact #II.3: The EU is increasingly relying on maize imports**



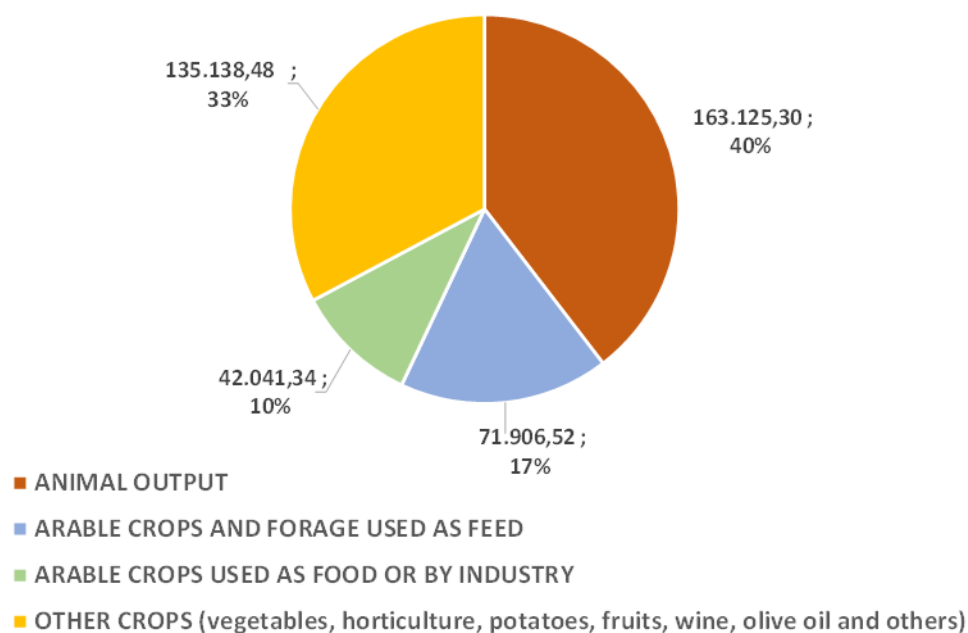
**Figure 9: EU maize protein imports (millions of tonnes of protein)**

Source: COMEXT

While the EU production of maize remained relatively stable over the last two decades, the import of maize significantly increased. With a volume of 1.4 million tonnes in 2023/24, maize imports is now the second source of imported protein after soya.

# III. Livestock demand

### Fact #III.1: Importance of the livestock sector in the agricultural economy



**Figure 10: Agricultural Goods Output- 2021 - (Million Euro; Share of total)**

Source: DG AGRI based on Eurostat (Economic accounts for agriculture - values at current prices)

The livestock sector is the biggest user of plant protein and, together with arable crop production used as feed, represented 57% of total agricultural goods output in 2021<sup>4</sup>. Arable crops used as food or for industrial purposes (energy, chemistry, etc) represent 10% of the total agricultural goods output. 33% of the total agricultural goods output concern the production of vegetables, horticulture, fruits, wine and other crops.

### Fact #III.2: Importance of the livestock sector in rural activity and employment

From an economic point of view, livestock is crucial for EU agriculture. In 2020, approximately 4.5% of the EU's total employment, an estimated 9.4 million people, worked within the agriculture, forestry, and fishing sector. The vast majority (around 8.8 million people) worked in agriculture<sup>5</sup>. **Livestock farming is of crucial importance for many European regions.** There were 4.1 million agricultural holdings (farms) with livestock in the EU in 2020 out of a total of 9.1 million farms, the equivalent of 44.9 % of all farms. This share was much lower than in 2010 (55.7 %), reflecting a sharper decline (-39.3 %) in livestock farms than the decline (-24.8 %) in the overall number of farms<sup>6</sup>. European livestock farms employ around 4 million people (salaried and non-salaried), 80% of whom reside in the more recent EU member-states. Mixed crop-and-livestock and dairy farms

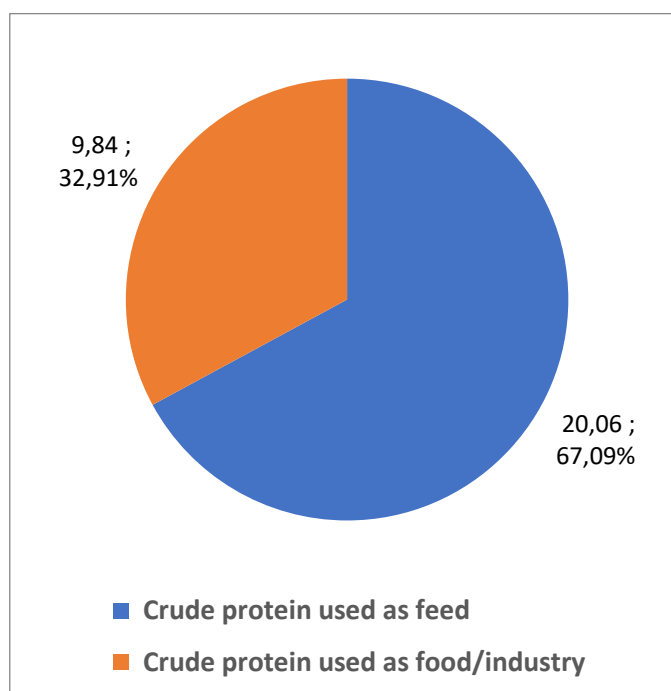
<sup>4</sup> This includes both output coming from animal production (40%) and from arable crop production used as feed (17%).

<sup>5</sup> <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20231011-1>

<sup>6</sup> Statistics Explained - Agri-environmental indicator - livestock patterns: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental\\_indicator\\_-\\_livestock\\_patterns](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicator_-_livestock_patterns)

account for the largest share of jobs (37% and 25% respectively), far ahead of pig and poultry farms (8%), which are fewer in number but larger in size and have the largest percentage of salaried positions<sup>7</sup>. Some geographical areas are highly dependent on such jobs, given the importance of animal production in the local economy. The average livestock farm typically employs 1 to 2 workers. Therefore, European livestock system is based on family farms, which are on average neither mega farms with thousands/millions heads as bovine feedlot as in North America or industrial pig farms in China or new poultry farms in Ukraine nor small farms as in developing countries.

### Fact #III.3: Most of the crops are used as feed

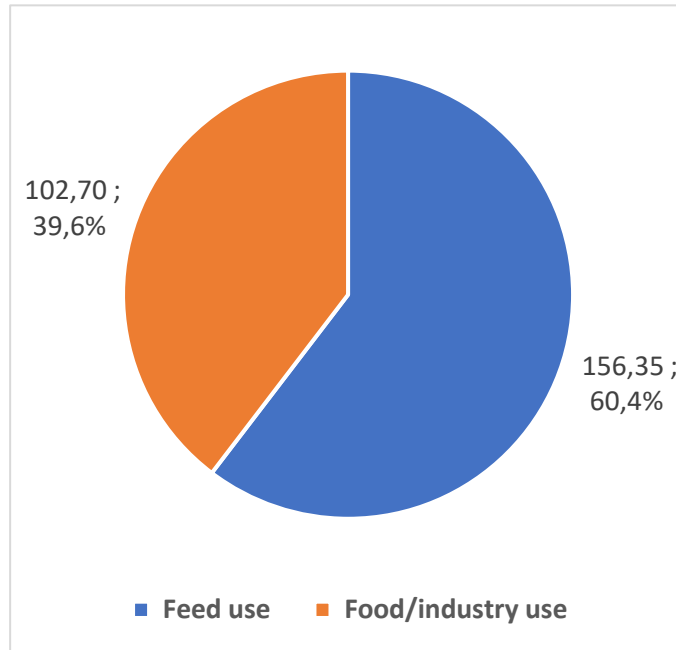


**Figure 11: Crude protein of crops produced and used in the EU (million tonnes and share)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

67% of the crude protein from crops (cereals, oilseeds and pulses) produced and consumed in the EU (i.e., EU production MINUS exports) is used as feed. Details per crop are provided below.

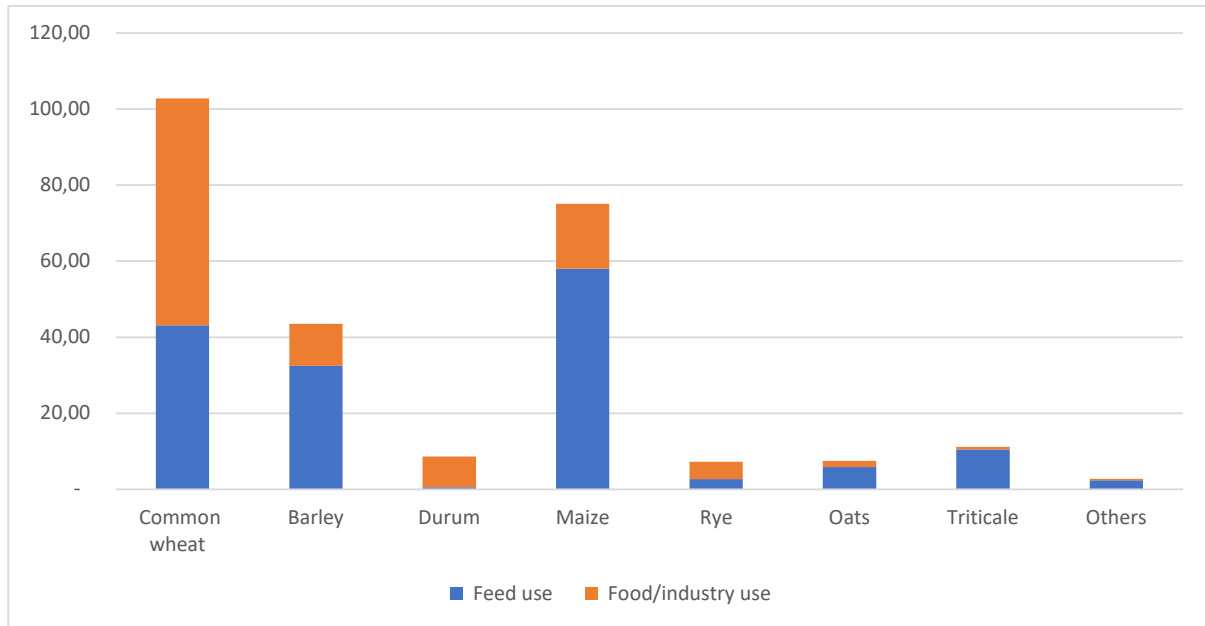
<sup>7</sup> European Commission, Directorate-General for Agriculture and Rural Development, Peyraud, J., MacLeod, M., *Future of EU livestock – How to contribute to a sustainable agricultural sector? – Final report*, Publications Office, 2020, <https://data.europa.eu/doi/10.2762/3440>



**Figure 12: Use of cereals in the EU (volume in million tonnes of raw materials; share of total volume)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

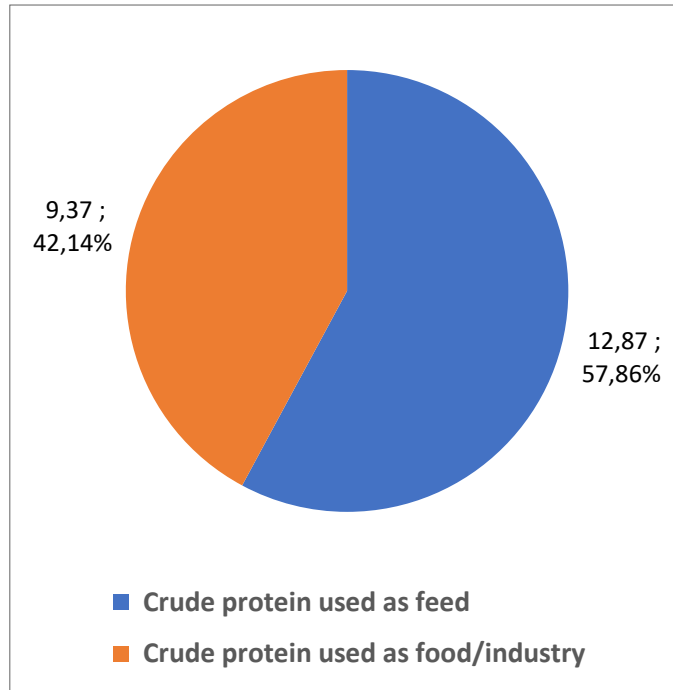
60% of the cereals consumed in the EU is used to feed the EU livestock.



**Figure 13: Use of cereals in the EU (volume in million tonnes)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

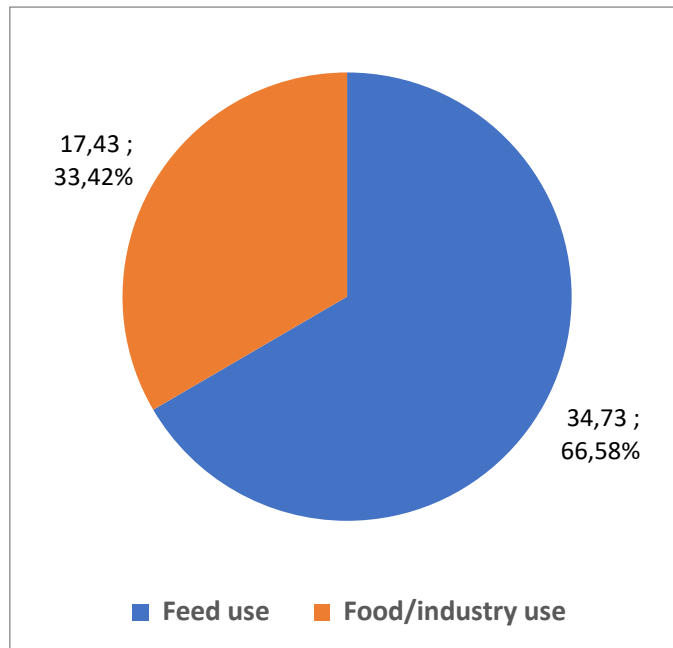




**Figure 14: Crude protein of cereals produced and used in the EU (volume in million tonnes)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

58% of the crude protein from cereals produced and consumed in the EU (i.e., EU production MINUS exports) is used as feed.

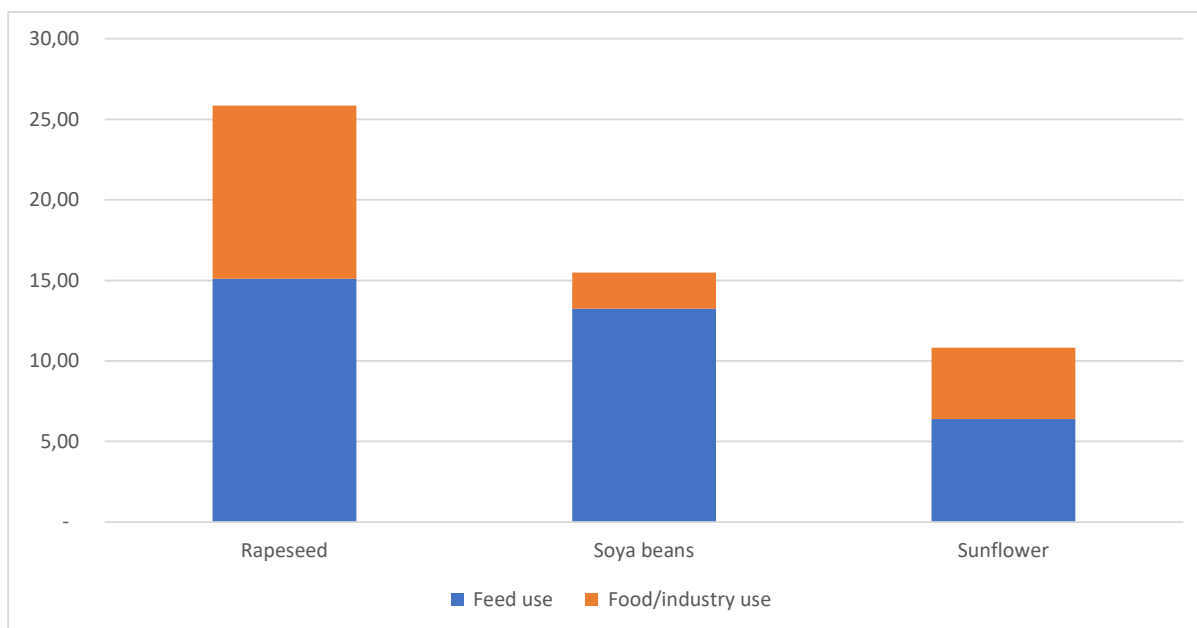


**Figure 15: Use of oilseeds in the EU (volume in million tonnes of raw materials; share of total volume)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

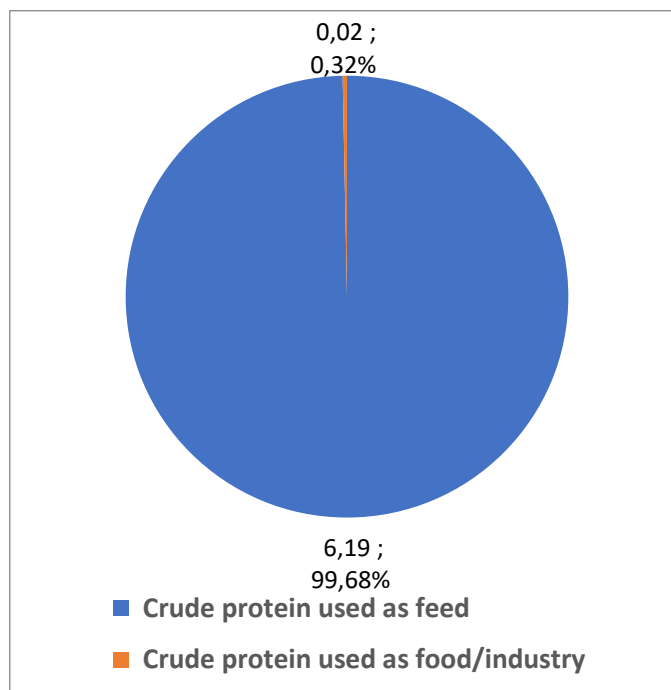
67% of the oilseeds consumed in the EU is used to feed the EU livestock. This amount includes oilseed that is produced or imported in the EU, crushed and transformed into meals. It does not

consider imported oilseed meal. The oil extracted following the crushing is included in the use as food or by the industry (mostly energy).



**Figure 16: Use of oilseeds in the EU (volume in million tonnes of raw materials)**

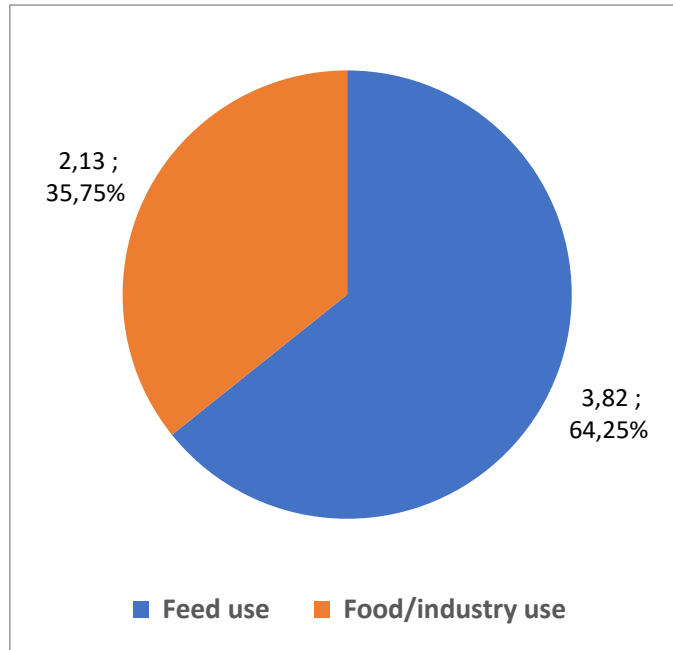
Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23



**Figure 17: Crude protein of oilseed produced and used in the EU (volume in million tonnes)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

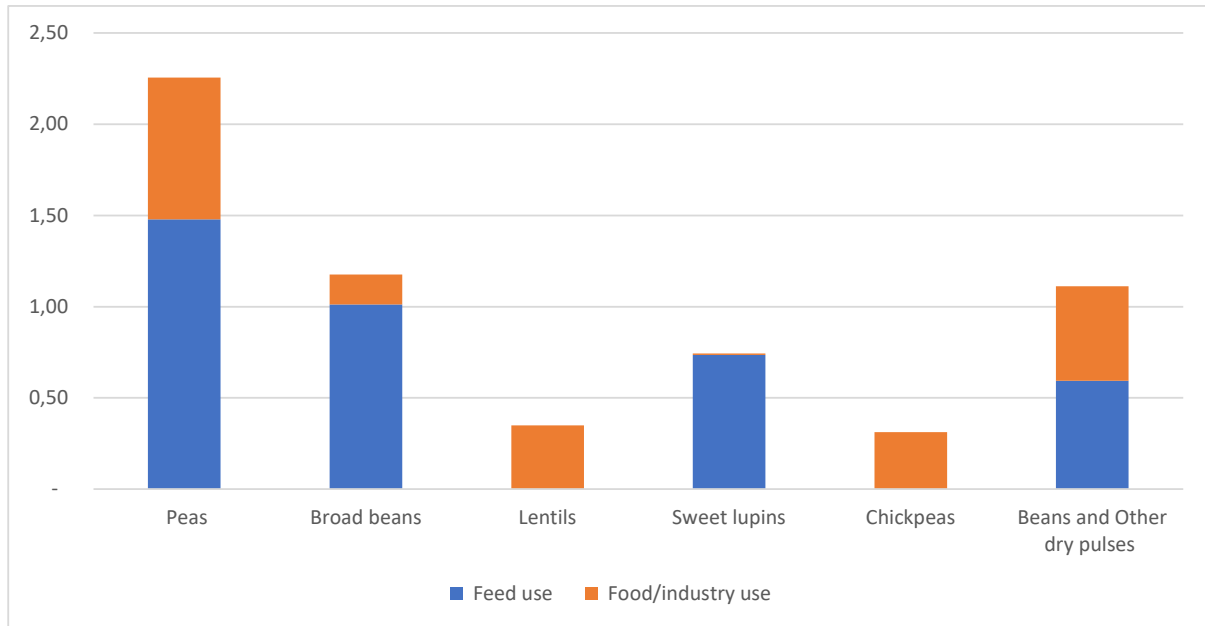
Nearly the total volume of the crude protein from oilseeds produced and consumed in the EU (i.e., EU production MINUS exports) is used as feed. This is because the volume of oilseed directly consumed as food is very minor and that oil extracted from oilseeds does not contain protein.



**Figure 18: Use of pulse in the EU (volume in million tonnes of raw materials; share of total volume)**

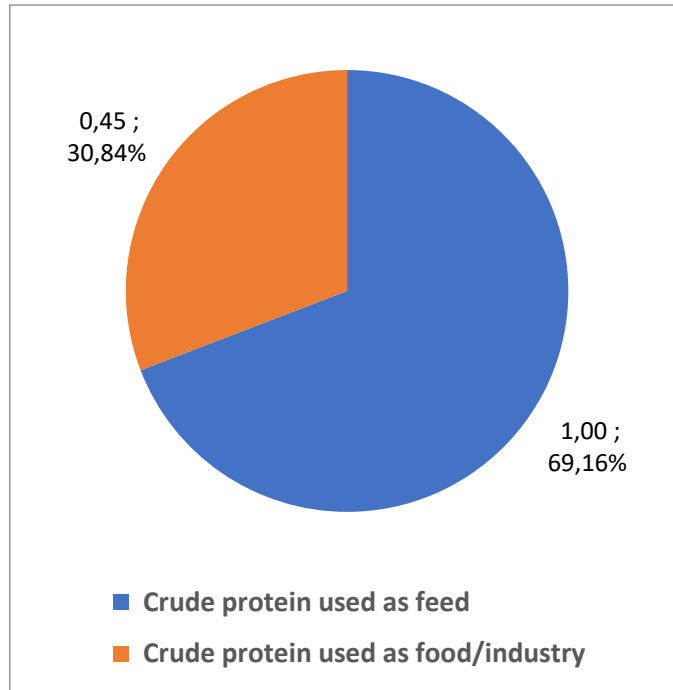
Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

64% of pulses consumed in the EU is used to feed the EU livestock.



**Figure 19: Use of Pulses in the EU (volume in million tonnes of raw materials)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

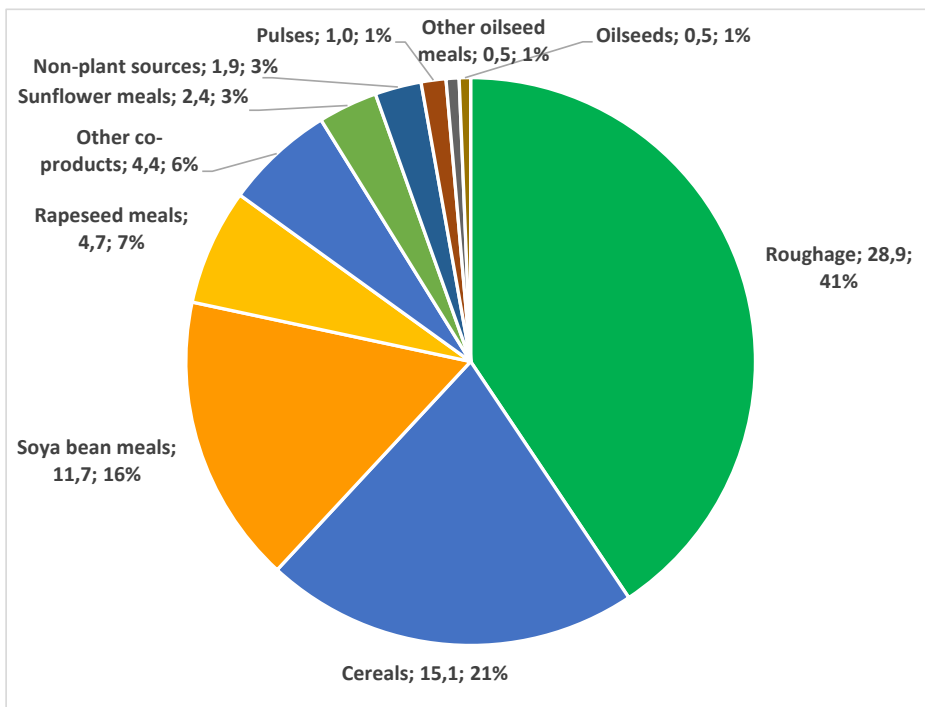


**Figure 20: Crude protein of cereals produced and used in the EU (volume in million tonnes)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

69% of the crude protein from pulses produced and consumed in the EU (i.e., EU production MINUS exports) is used as feed.

**Fact #III.4: Main source of feed protein is roughage**

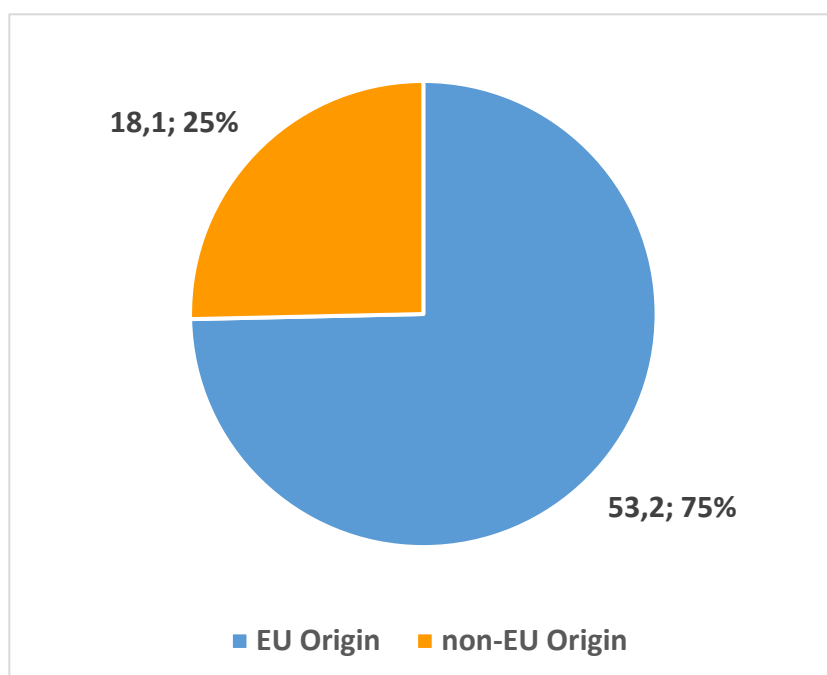


**Figure 21: Share of main feed sources (in million tonnes of crude protein; share of total amount of crude protein used for feed)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

The EU livestock sector uses 72 million tonnes of protein as feed. The main sources of feed protein are roughage (42%), soya bean meals (27%), cereals (21%) and other oilseed meals (10%). Co-products (i.e. soya bean meals, other oilseed meals, other co-products and non-plant sources) represent 35% of the protein intake of EU livestock. Co-products from the food and beverage industry (in the graph above identified as “other co-products”) account for 6% of the protein intake of EU livestock. Non-plant sources (i.e. fish meal, whey powder, skimmed milk powder, processed animal protein and former foodstuff) represents 2% of the protein intake of EU livestock, of which former foodstuffs only represents 0.4%.

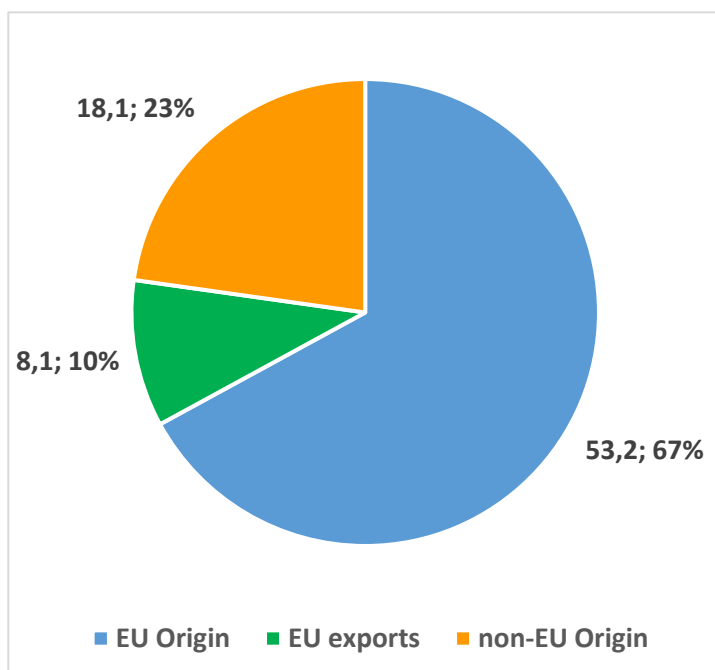
### Fact #III.5: A quarter of feed protein is non-EU origin



**Figure 22: EU origin versus non-EU origin of crude protein used for feeding EU livestock (million tonnes of crude protein and share of total feed consumption)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

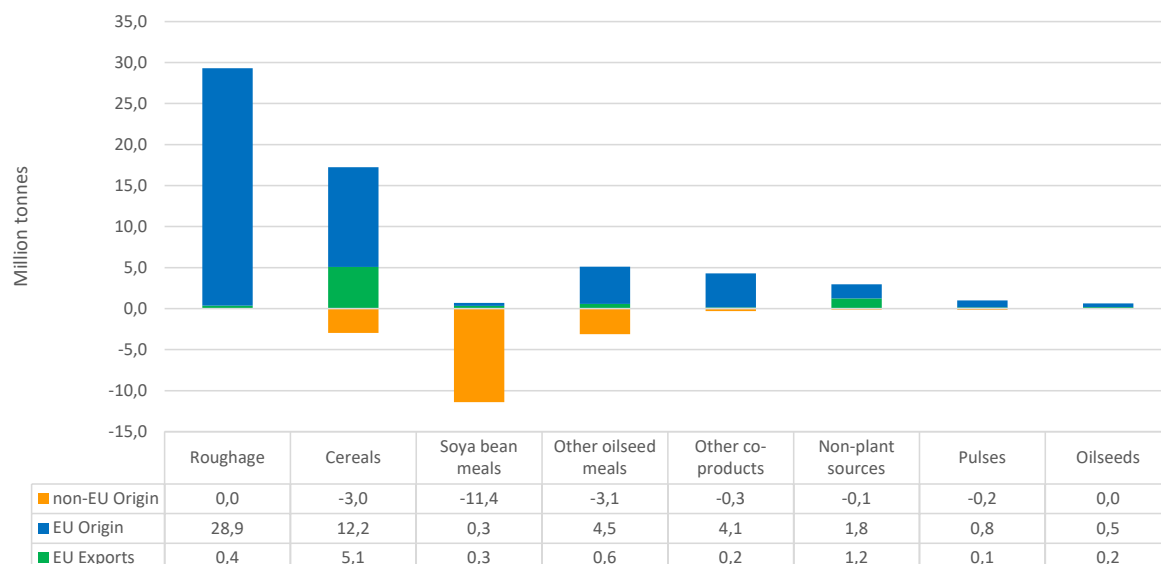
From the 71 million tonnes of protein used as feed, **18 million tonnes are imported, which corresponds to 25% of the protein used to feed EU livestock.**



**Figure 23: Origin of protein used for feeding EU livestock and EU export of plant protein (in million tonnes of crude protein)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

EU exports of crops, co-products (including from non-plant sources), and roughage expressed in protein are equivalent to 8 million tonnes, which corresponds to 10% of the EU protein use in animal feed (10.2% = 8.1Mt/(53.2MT+18.1MT+8.1MT). Therefore, if the volume of exported crop protein is taken into account, **the net reliance on imported protein for feed is about 15% of total EU feed use** (or 10 million tonnes, i.e. 18.1MT-8.1MT).

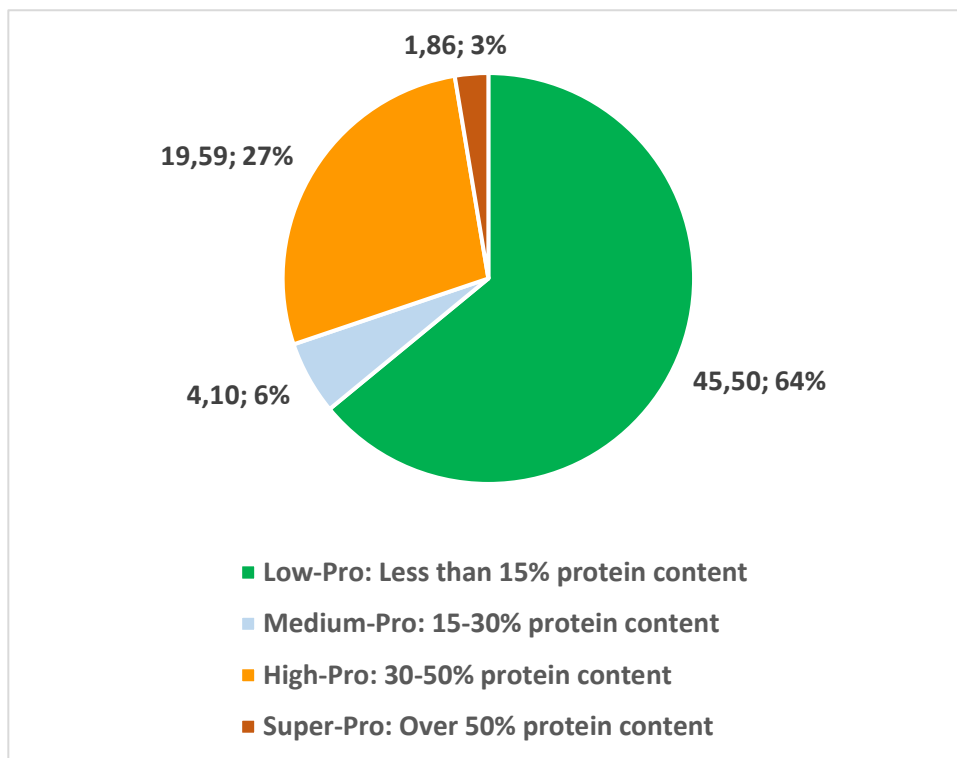


**Figure 24: Origin of protein used for feeding EU livestock and exports of those products (in million tonnes of protein)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

Roughage is the main source of protein for the EU livestock and is fully produced in the EU. Most of cereals are produced in the EU. The exported volume is much higher than the imported volume (in orange). There is no dependency on roughage and cereals. The volume of protein from soya imported to feed our livestock corresponds to around 11,5 million tonnes. It shows the extend of the EU dependency on soya meals.

### Fact #III.6: High dependency on imported high-protein feed

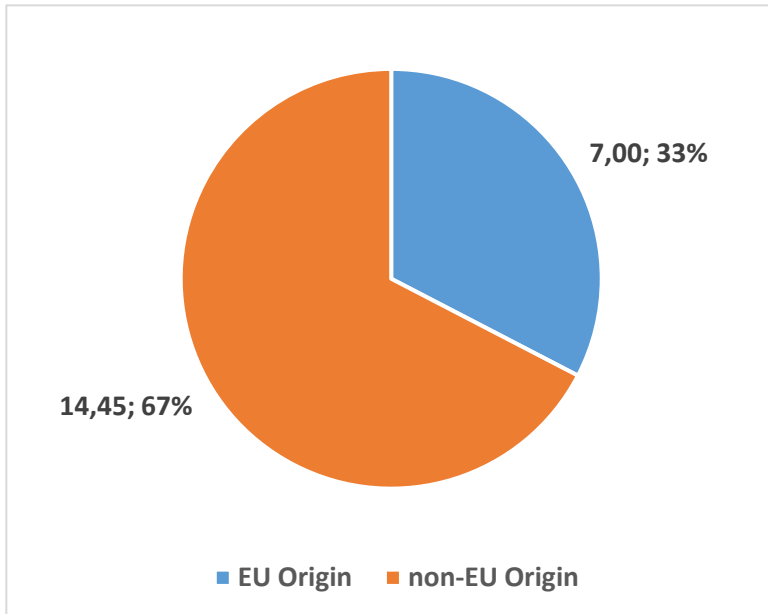


**Figure 25: EU feed protein used by product category (in million tonnes of protein and share)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

High-protein plant-based feed<sup>8</sup> represents 30% of total EU feed use (21.4 million tonnes).

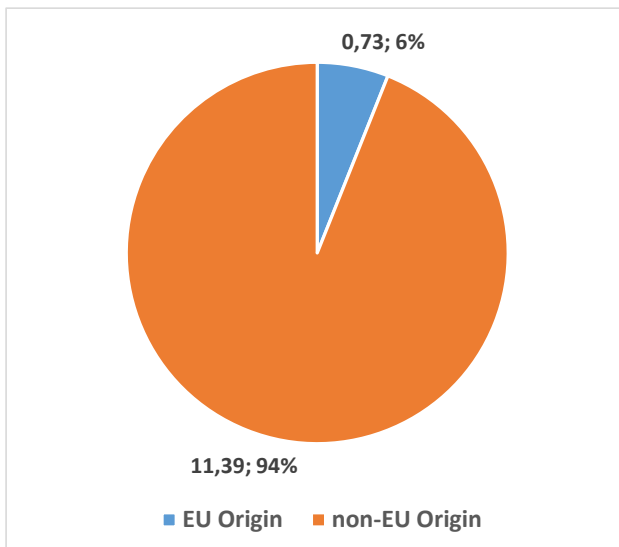
<sup>8</sup> High protein feed has a protein content above 30%, such as most types of oilseed meals and some co-products.



**Figure 26: Origin of high-protein feed (above 30% protein content) (in million tonnes of protein and share)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

While the EU is largely self-reliant on low and medium-protein content feed, **only 33% of EU high-protein feed is of EU origin.**



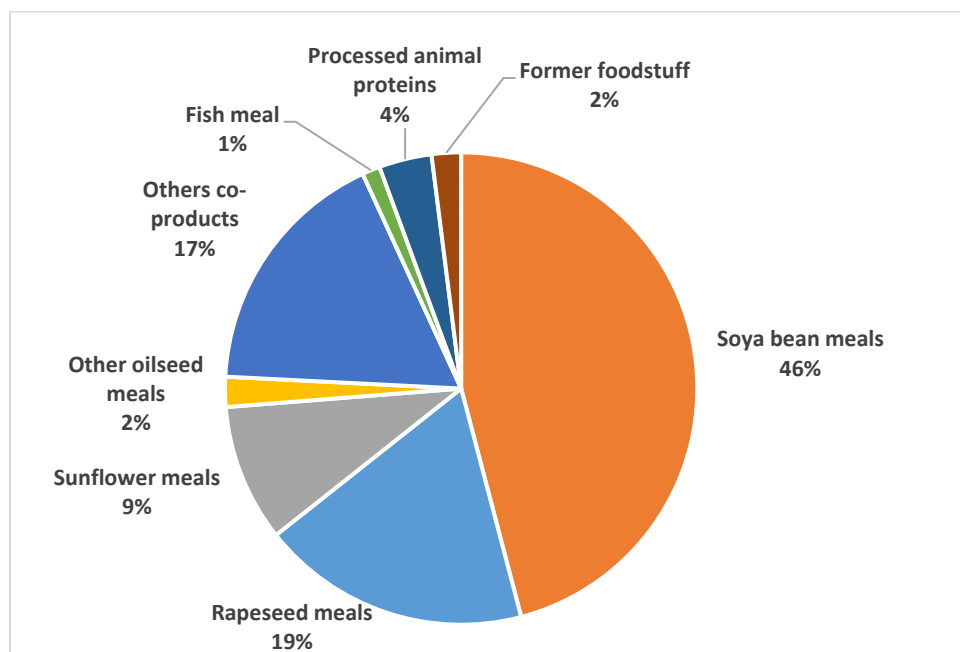
**Figure 27: Origin of soya protein used as feed in the EU (in million tonnes of protein and share)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

94% of soya protein used by EU livestock, as bean or meal, is imported. Around half of EU origin soya protein used as feed is consumed as meal.



### Fact #III.7: Co-products are mostly high-protein feed and play an important part in circular economy

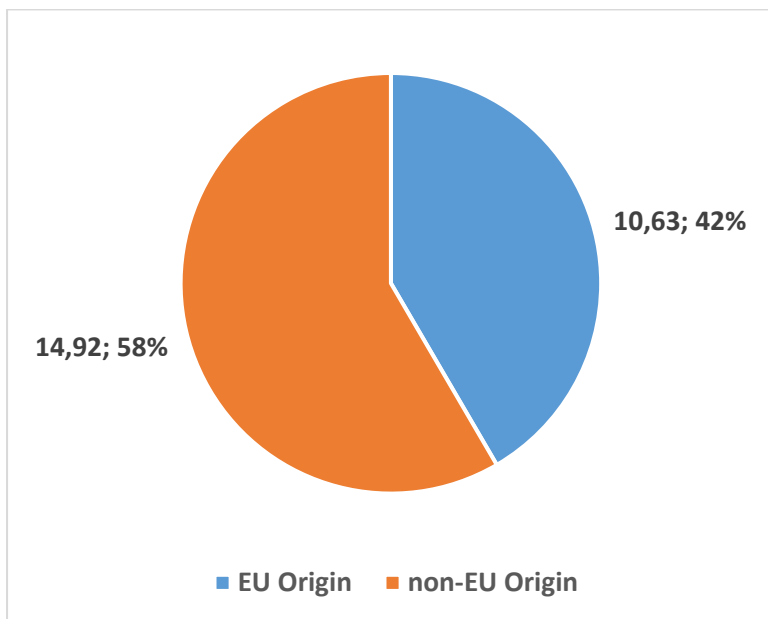


**Figure 28: Co-products (share of total amount of co-product crude protein)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

Except soya beans, lupins, other protein crops and skimmed milk powder, all the high-protein feed products are co-products. Even if several co-products are low- or medium-protein feed products<sup>9</sup>, high-protein feed products represent the majority (81.3%) of the crude protein of co-products. Oilseed meals represent 76% of the crude protein of co-products, soya meals representing alone 46% of the crude protein of co-products.

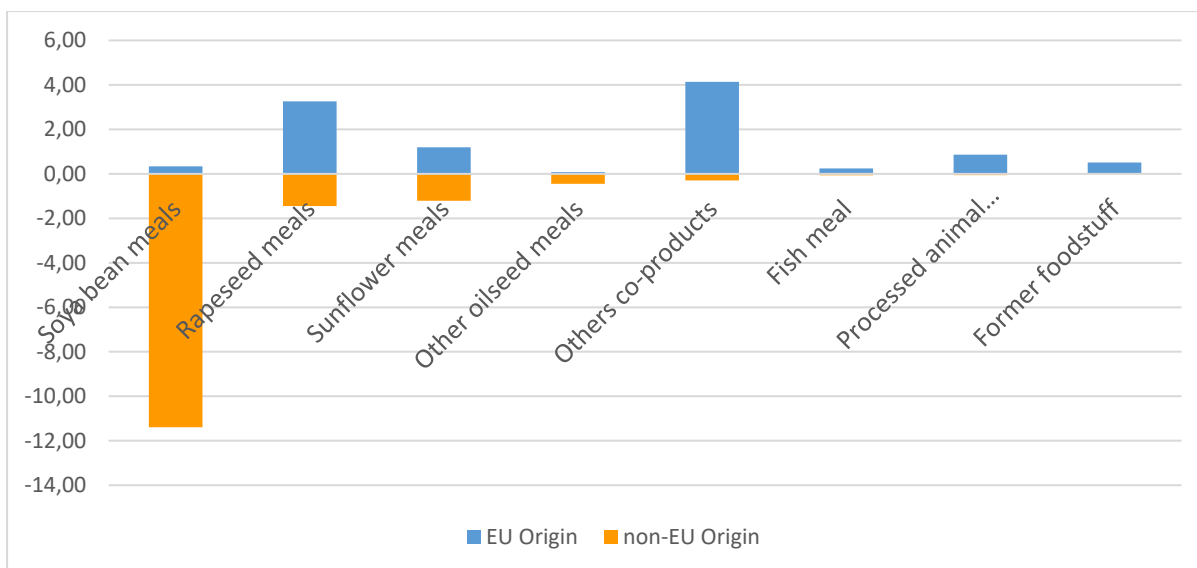
<sup>9</sup> The following co-products are low- or medium-protein feed (i.e. with a crude protein content below 30%): palmkern meal, starch industry's medium protein products, distillers' dried grains with solubles, wet distillers' grain, wheat bran, citrus pulp, beet pulp pellets, molasses and former foodstuff.



**Figure 29: Origin of co-products (in million tonnes of crude protein and share)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

The majority of feed co-products (58%) is imported.



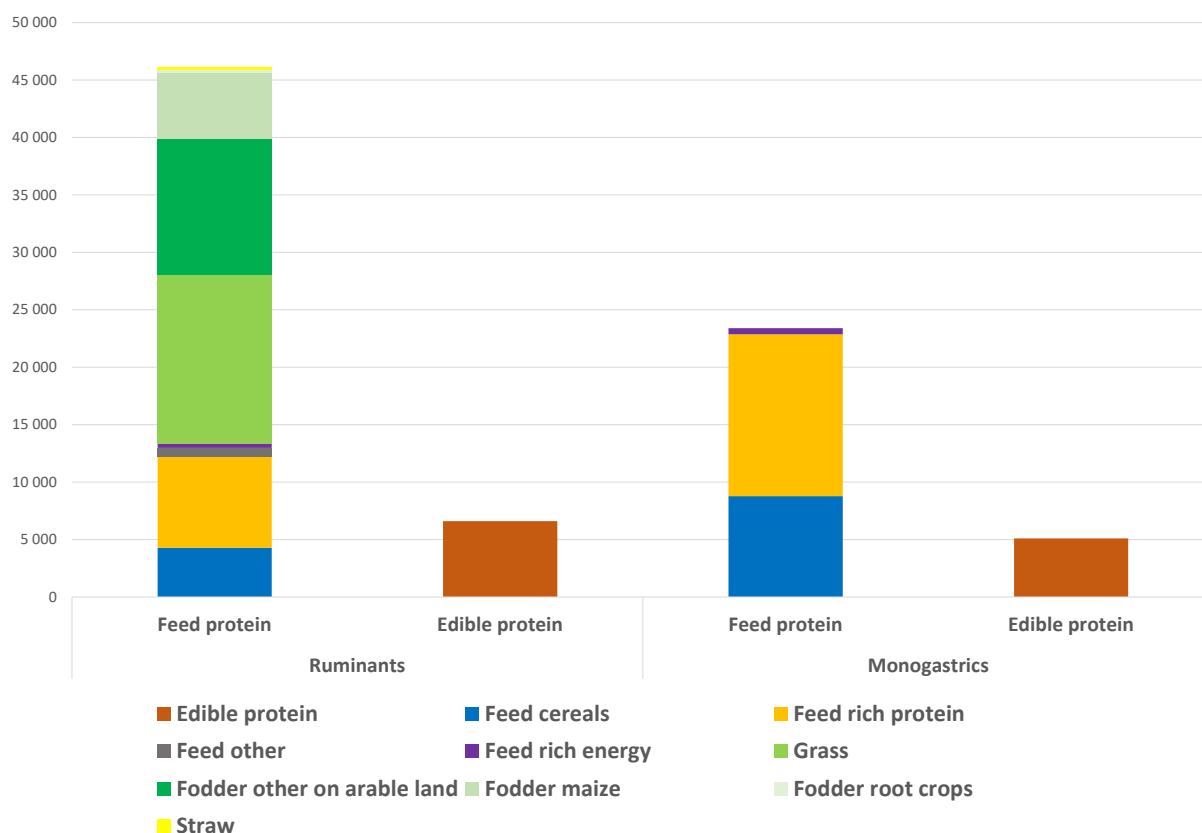
**Figure 30: Origin of co-products (in million tonnes of crude protein)**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

97% of soya protein used as meal is non-EU origin (imported as meal or imported as bean and crushed in the EU). Most of sunflower and other oilseed meals are also non-EU origin (sunflower meals and other oilseed meals are respectively 50.4% and 85.4% from non-EU origin). 69.3% of rapeseed meals and 93.3% of other co-products<sup>10</sup> are EU origin.

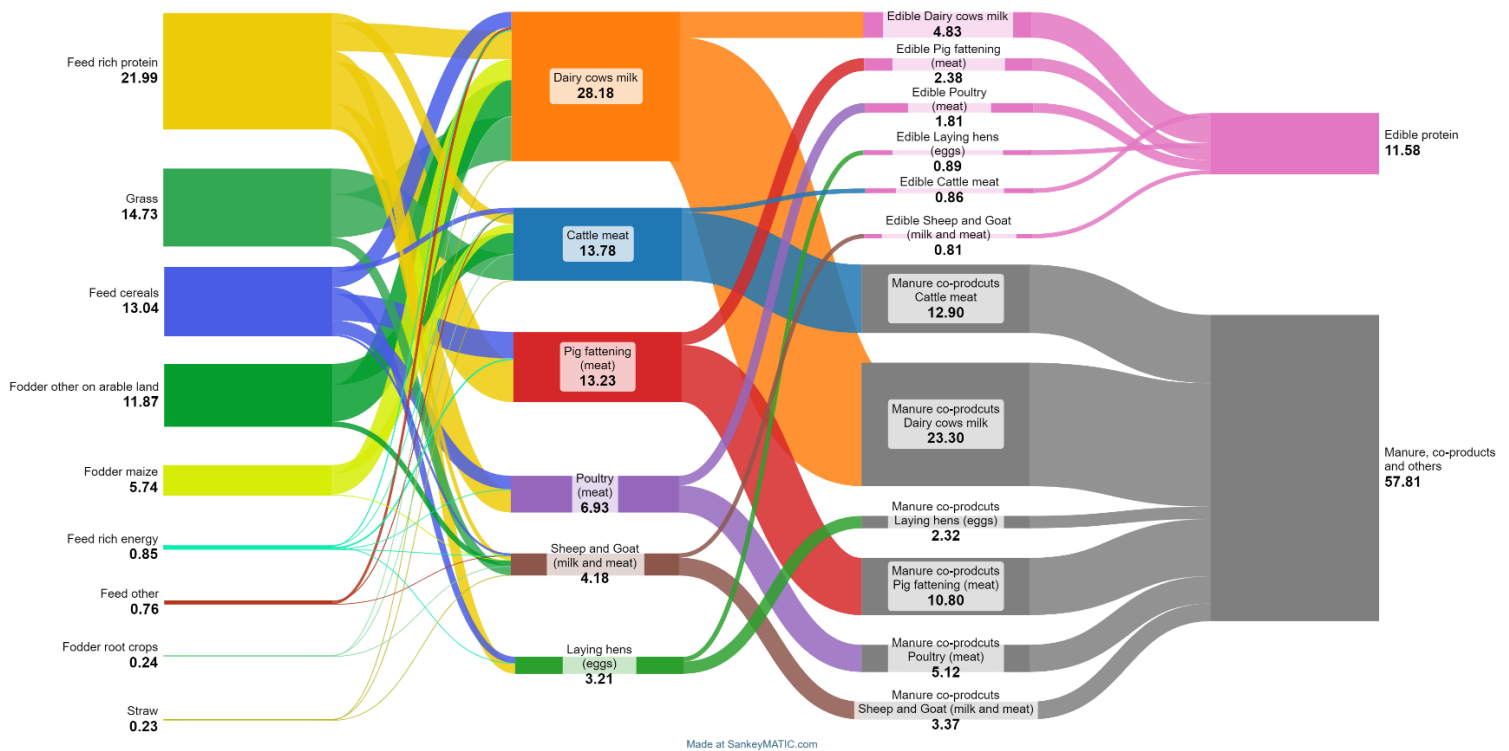
<sup>10</sup> "Other co-products" are plant-based co-products that are not oilseed meals, i.e. starch industry's medium protein products, distillers' dried grains with solubles, wet distillers' grain, wheat bran, citrus pulp, beet pulp pellets and molasses.

## Fact #III.8: Only a share of feed protein is converted into edible protein



**Figure 31: Conversion of feed protein (per feed source) into edible protein for ruminants and monogastrics in the EU in million tonnes, for 2022**

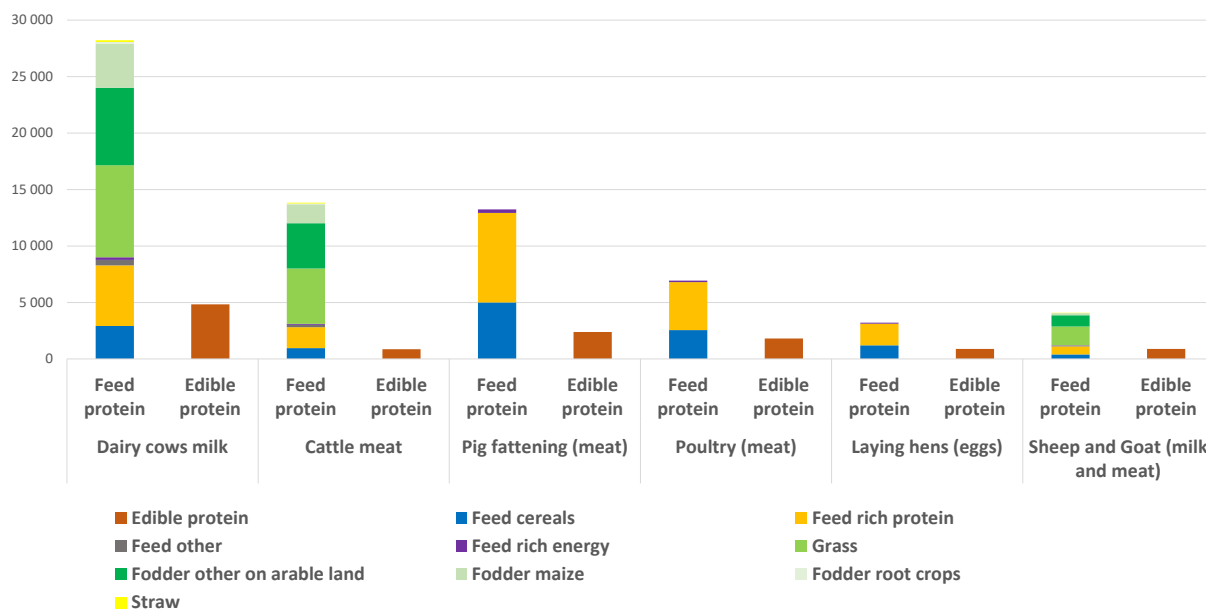
Only 17% of feed protein is converted to edible protein with important variability between the ruminants and monogastrics. While ruminants are the leading user of feed protein, it mostly relies on roughage which is exclusively produced in the EU.



**Figure 32: Protein flow between feed protein (per feed source) and edible protein (per livestock sector) in the EU in million tonnes, for 2022**

Source: CAPRI model database

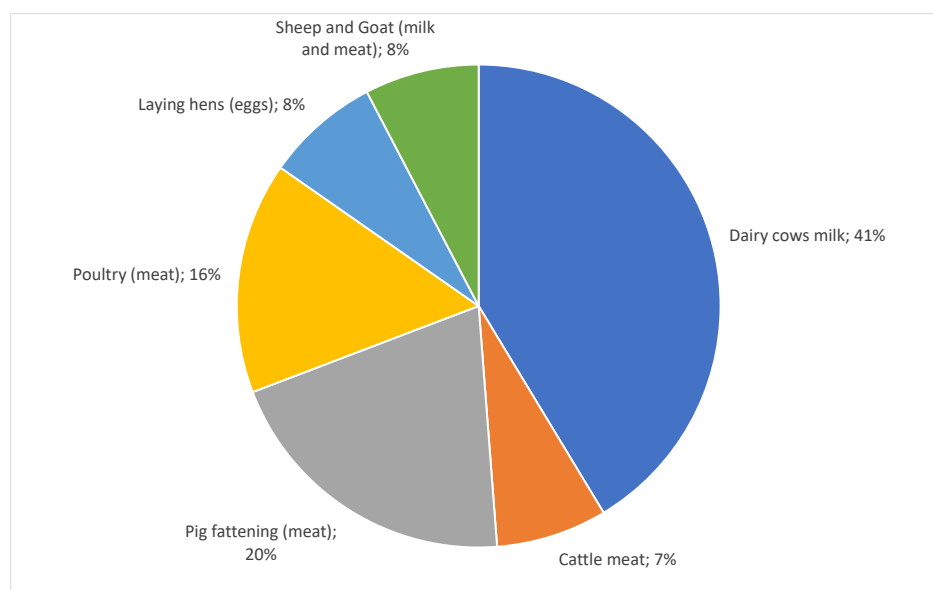
The above figure shows the protein flow between feed protein and animal protein that is edible for humans or present in manure, co-products and in other output streams such as industrial use. In this protein flow diagram, edible cattle meat includes the volume of meat from cull dairy cows. Therefore, the volume of feed used during the fattening period of cull dairy cows is included in the feed for cattle meat. In this flow diagram, it is assumed that there is no fattening period for spent laying hens (i.e. laying hens that are slaughtered for their meat). These calculations focus only on protein, and other components of food/feed, such as micro- and macronutrients and amount of energy are not considered here even though they are essential elements of the food system.



**Figure 33: Conversion of feed protein (per feed source) and edible protein for each livestock sector in the EU in million tonnes, for 2022**

This graph represents the flow diagram in a bar diagram.

### Fact #III.9: Dairy cow sector is the main producer of animal edible protein

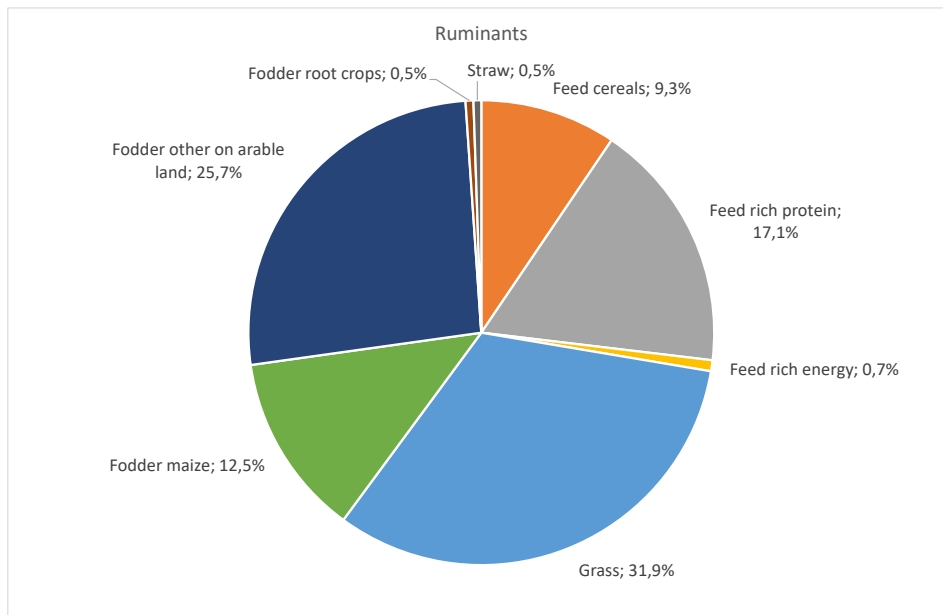


**Figure 34: Share of edible animal protein produced in the EU per livestock sector, for 2022**

Source: CAPRI model database

The dairy cow sector is the main producer of edible protein, followed by pigmeat and poultry meat.

**Fact #III.10: Ruminants mostly rely on roughage**

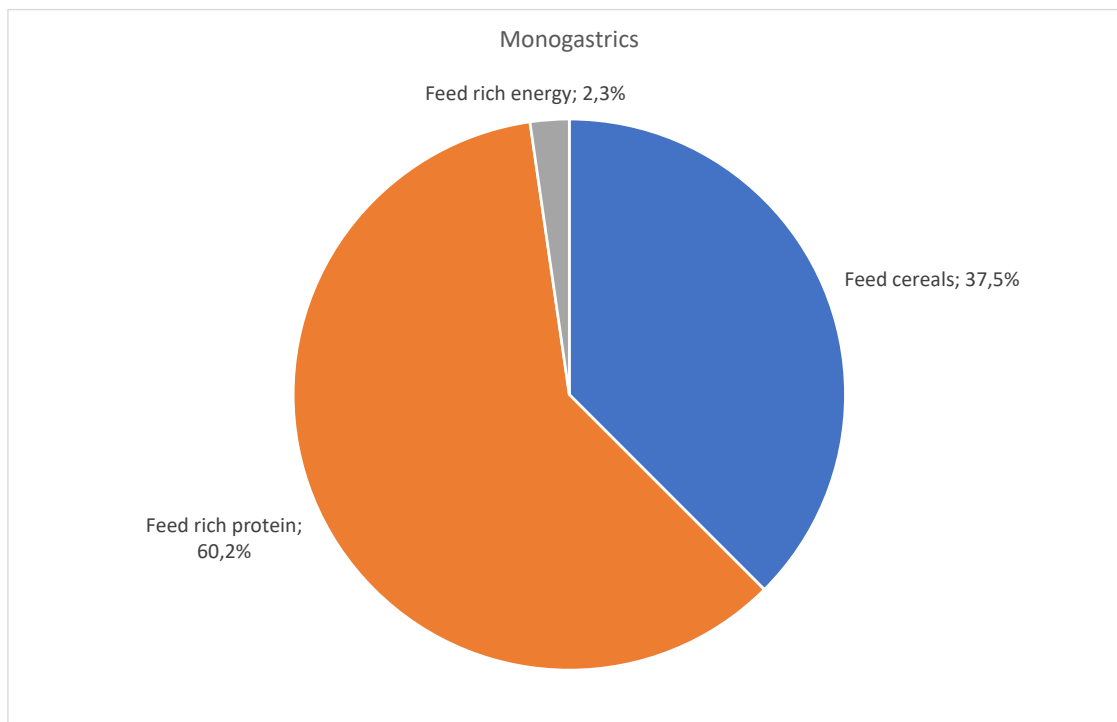


**Figure 35: Share of feed category used by ruminants in the EU, for 2022**

Source: CAPRI model database

Roughage (Grass, Fodder maize, Fodder other on arable land, Fodder root crops and Straw) accounts for 71% of the protein consumed by ruminants in the EU. Rich protein feed (oilseeds and pulses) only represents 17% of feed used by ruminants.

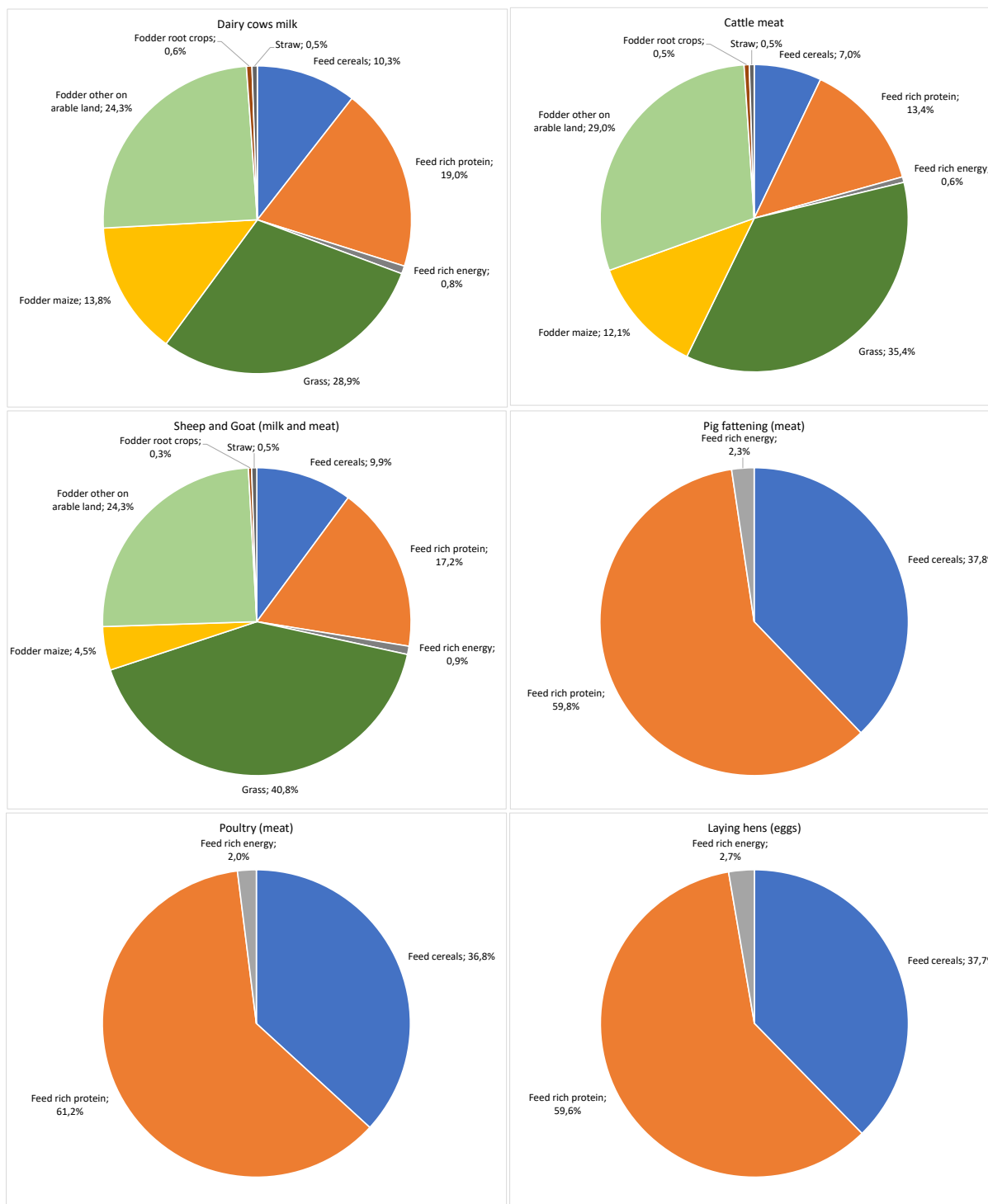
**Fact #III.11: Monogastric mostly rely on oilseeds and pulses**



**Figure 36: Share of feed category used by monogastric animals in the EU, for 2022**

Source: CAPRI model database

Rich protein feed (oilseeds and pulses) only represents 60% of feed used by monogastric animals.



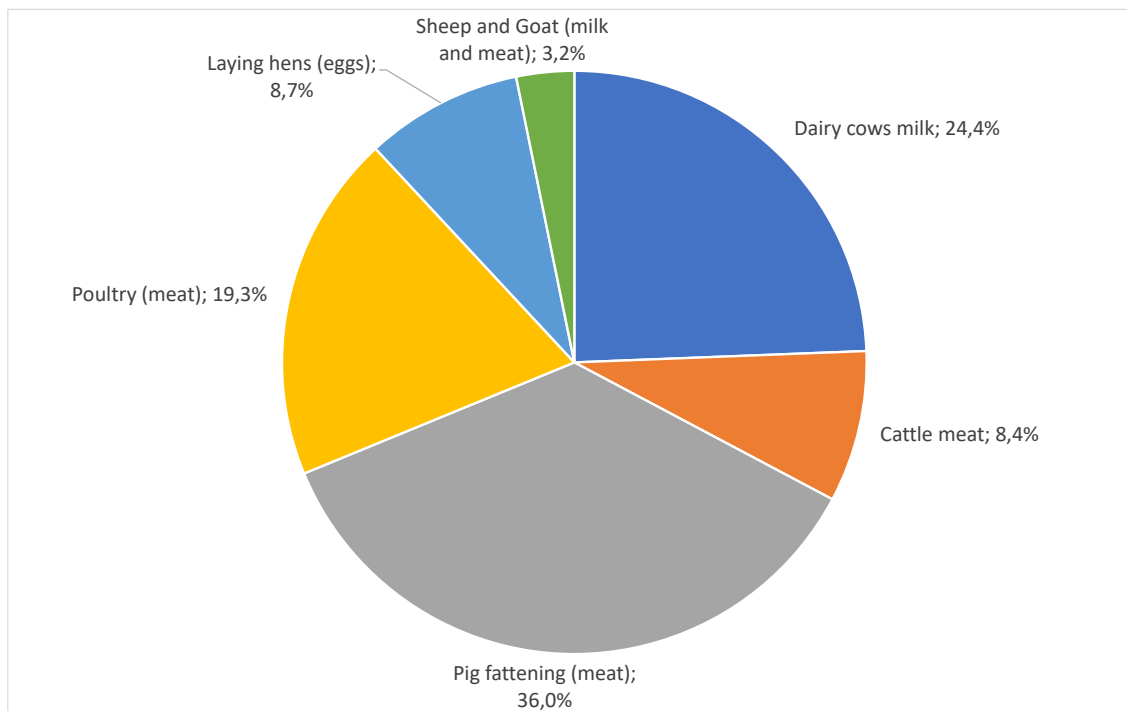
**Figure 37: Share of feed category used by livestock sector in the EU, for 2022**

Source: CAPRI model database

Roughage accounts for 68% (including roughage, fodder maize, fodder from sources other than arable land and fodder root crops) of the protein consumed by **dairy cows** in the EU. Dairy ranks second in the consumption of protein rich feed (such as oilseeds meals). The **meat cattle sector**

relies mainly on roughage for feed (78% of protein consumed). Roughage also dominates both sheep and goat dairy and meat production (41%). For pig meat, rich protein feed makes the most of all feed used (60%). Rich protein feed also makes up the majority of feed used for poultry meat production (62%) as well as laying hens (60%).

**Fact #III.12: Cattle sector, the second user of oilseeds and pulses**



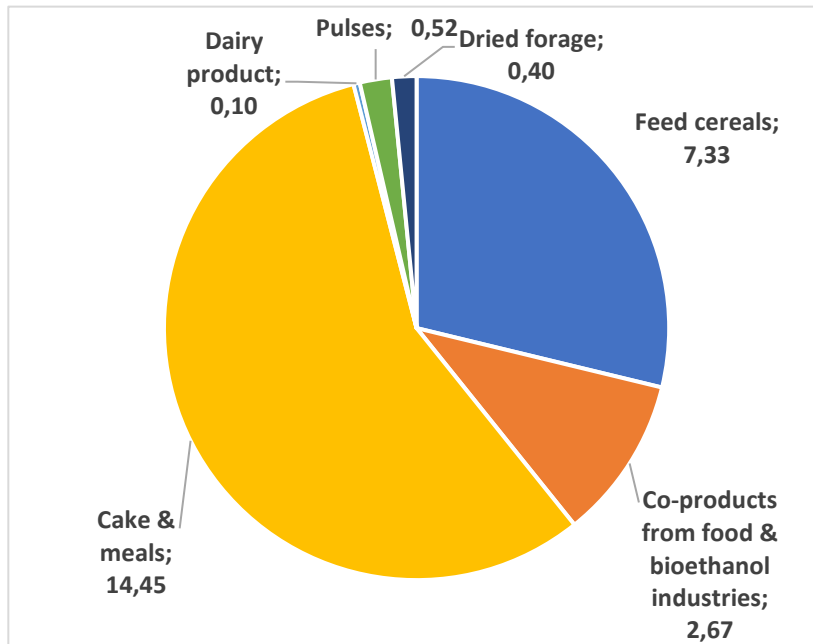
**Figure 38: Share of total used of rich protein feed per livestock sector in the EU, for 2022**

Source: CAPRI model database

The pigmeat sector is the main user of rich protein feed (oilseeds and pulses). Even though most of the feed protein used by cattle sector (dairy cow milk and cattle meat) comes from roughage (see below), this sector is the second user of rich protein feed (oilseeds and pulses). The poultry meat is the third sector for the use of rich protein feed. Monogastric animals (pigmeat, poultry meat and laying hens) account for 64% of protein-rich feed consumed in the EU. Import dependency and reliance on arable land is higher for these sectors.



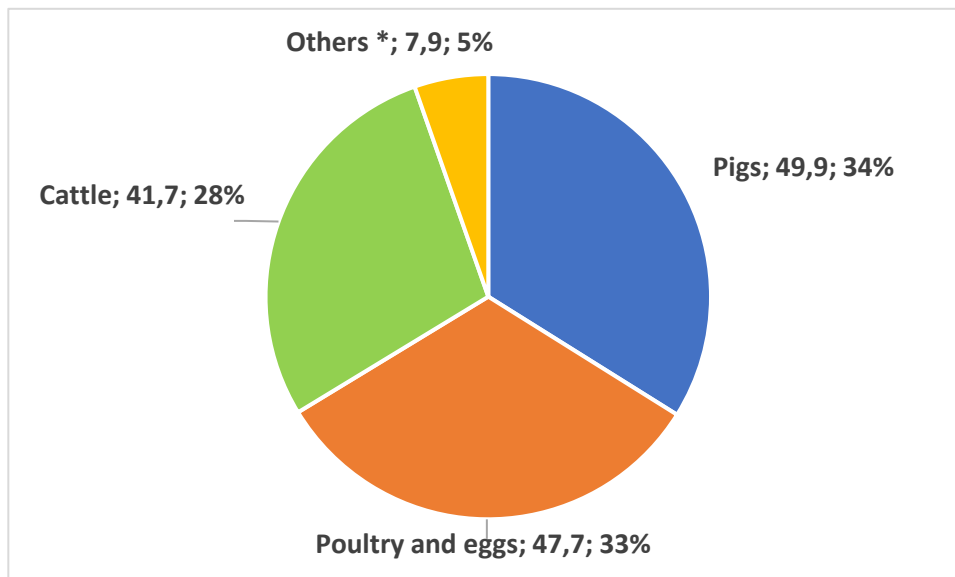
**Fact #III.13: Compound feed represents more than one third of livestock protein intake**



**Figure 39: Volume of crude protein per compound feed material (in million tonnes, in 2022)**

Source: DG AGRI based on FEAC Feed & Food Statistical Yearbook 2023.

The EU compound feed industry processes 25.5 million tonnes of feed protein annually. This represents 36% of total protein use by EU livestock in the form of high-protein meals, supplying adapted feed in a timely manner.



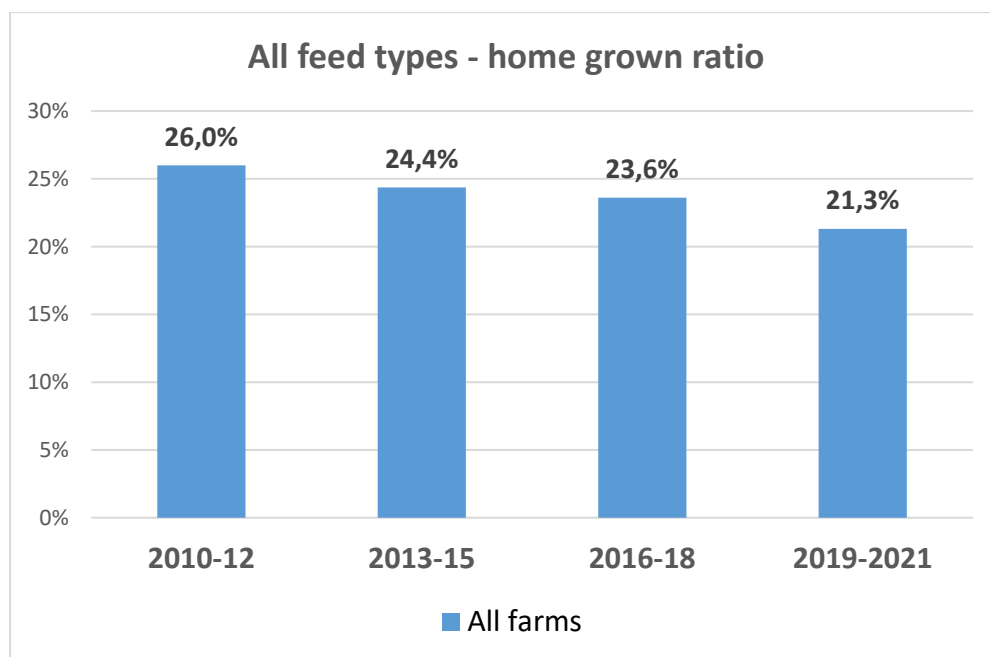
**Figure 40: Industrial compound feed production in EU (excl. Luxembourg, Greece and Malta) (million tonnes in 2022) (\*: sheep, goat, fish, horse, games and rabbits)**

Source: FEAC Feed & Food Statistical Yearbook 2023

The pig sector together with the poultry and egg sector represent 66% of the compound feed use in the EU. The cattle sector represents 28%.

### **Fact #III.14: Constant decrease of feed self-sufficiency at farm level**

The level of farm feed self-sufficiency is estimated by calculating, in monetary terms at farm level, the share of home-produced feed on total feed (purchased plus home produced). Home-produced feed also includes grassland and grazing, though through estimations.<sup>11</sup>

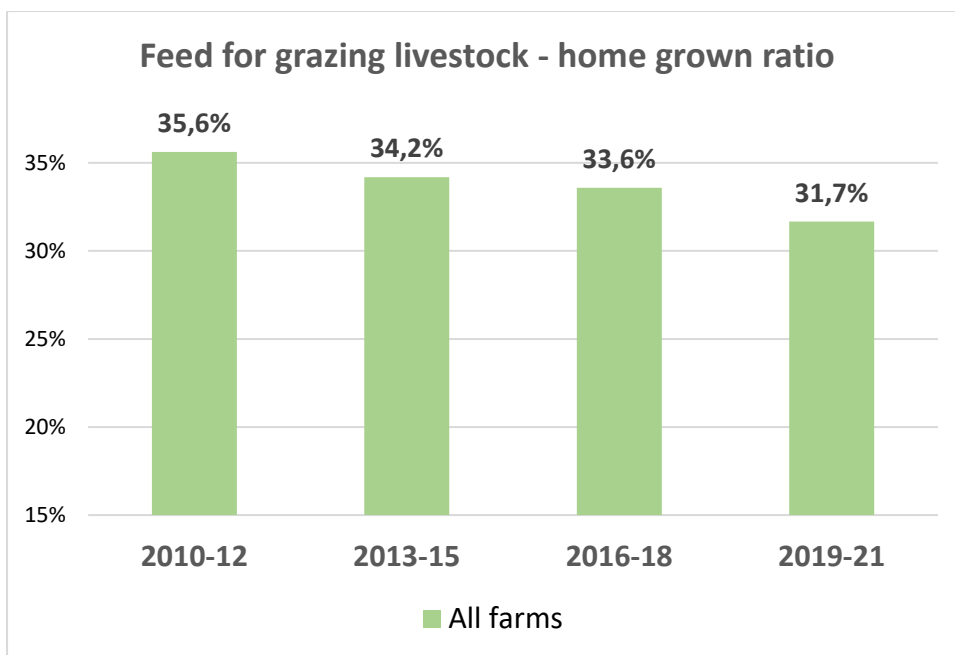


**Figure 41: Feed self-sufficiency at EU level**

Source: DG AGRI – FADN

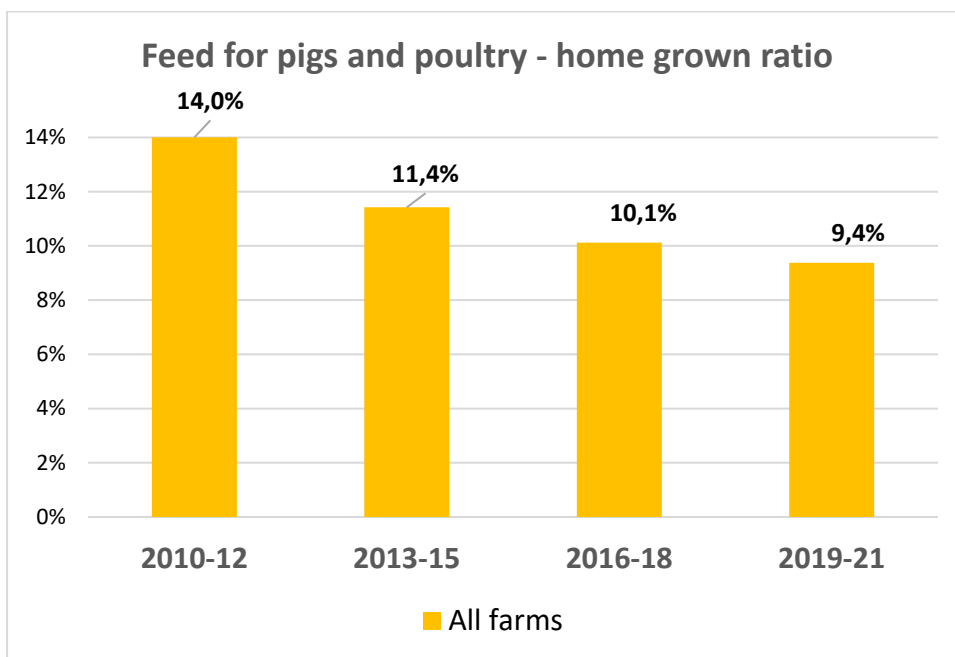
Considering all farms and all types of feed, the level of self-sufficiency decreases from 26.4% in 2010-2012 to 21.3% in 2019-2021.

<sup>11</sup> In the section on the EU compound feed, the distribution of feed sources (industrial compound, feed materials used on farm and forages) is in volume of production (million tonnes) while the distribution under this section is in monetary terms. It partially explains why share of forages and feed materials used on farm are more important under the section on the EU compound feed.



**Figure 42: Feed self-sufficiency at EU level for grazing livestock**

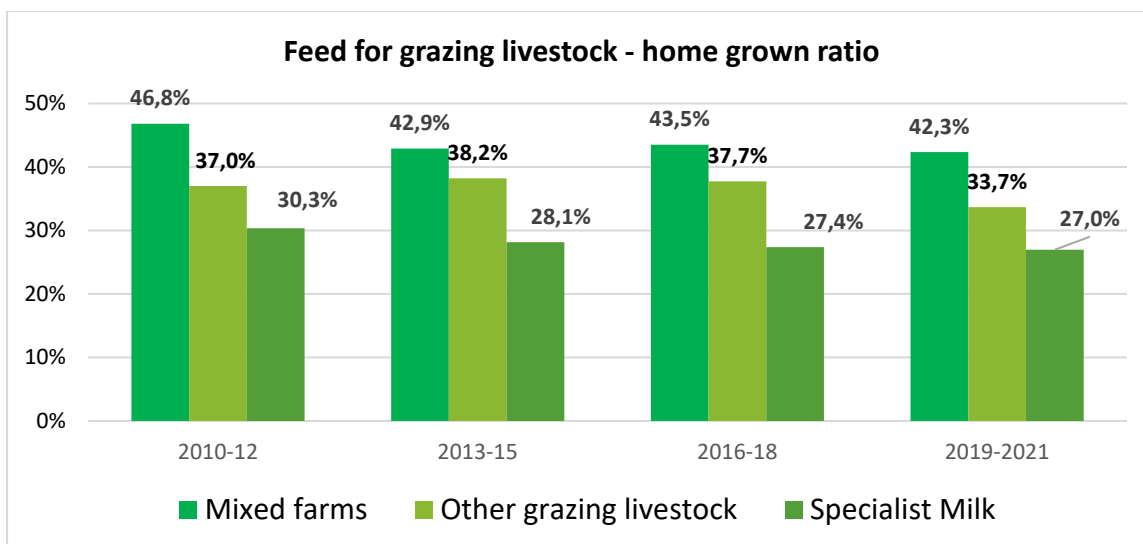
Source: DG AGRI – FADN



**Figure 43: Feed self-sufficiency at EU level for pigs and poultry livestock**

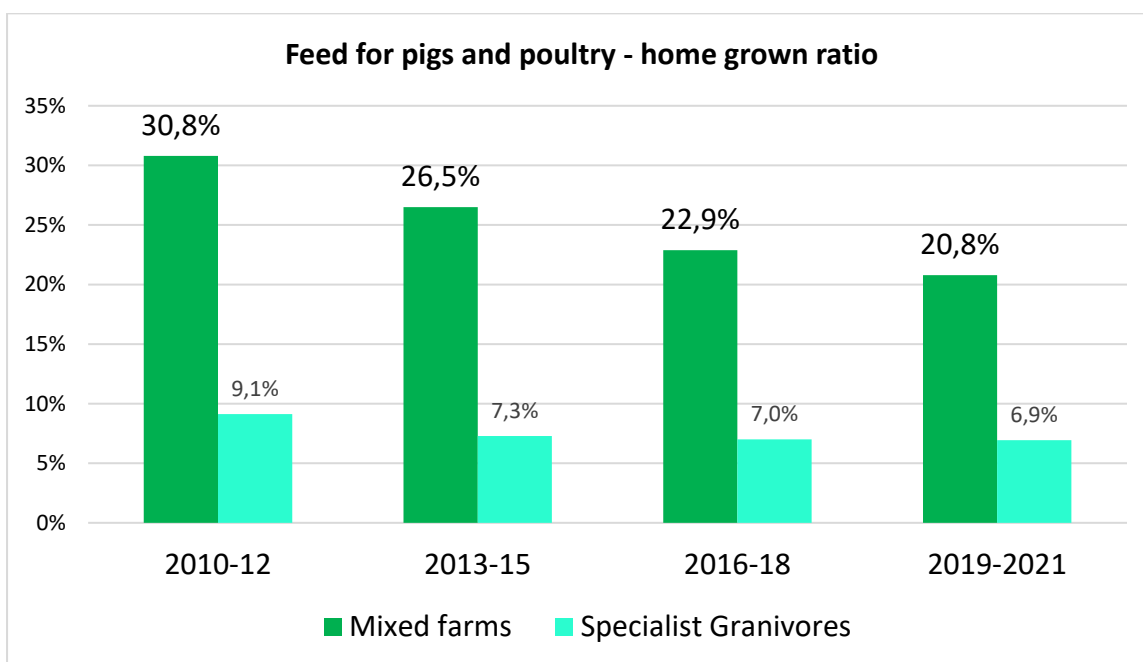
Source: DG AGRI – FADN

Self-sufficiency for feed decreased from 35.6% to 31.7% for grazing livestock in the same period and from 14.0% to 9.4% for feed for pigs and poultry .



**Figure 44: Feed self-sufficiency at EU level per farm type – grazing livestock**

Source: DG AGRI – FADN



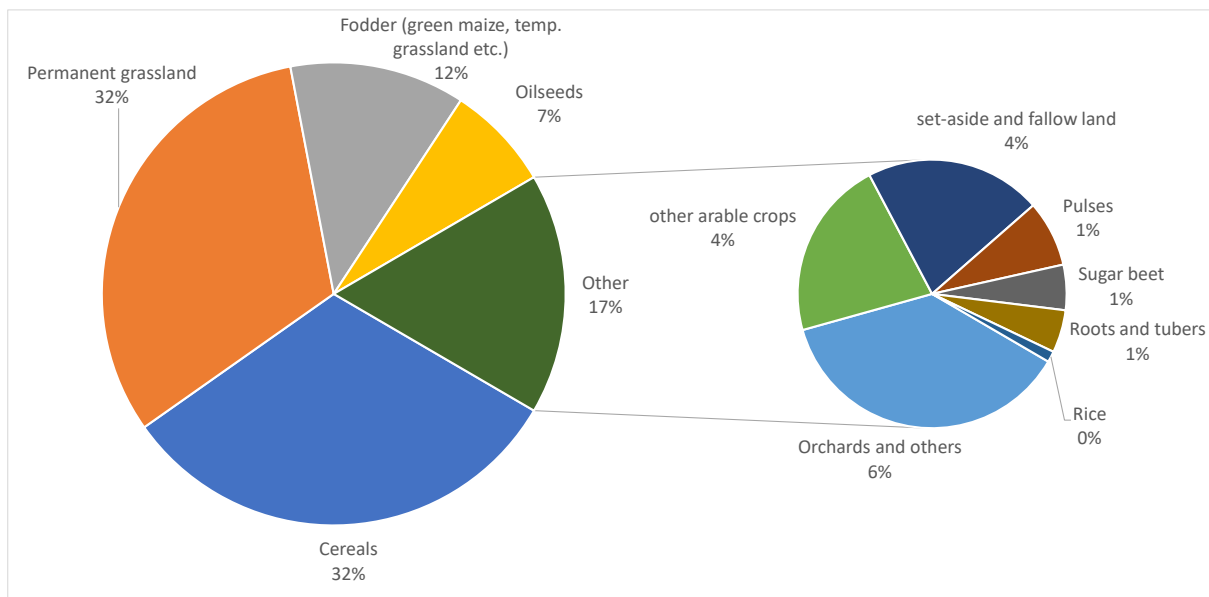
**Figure 45: Feed self-sufficiency at EU level per farm type – pigs and poultry livestock**

Source: DG AGRI – FADN

The decrease concerns all livestock and farm types (mixed versus specialised). Non-specialised (mixed) farms keep a higher level of feed self-sufficiency than specialised farms despite a strong decrease for pigs and poultry (reduction by a quarter in 2019-2021 compared to 2010-2012).

# IV. Transformation to animal protein

## Fact #IV.1: Land use, mainly roughage



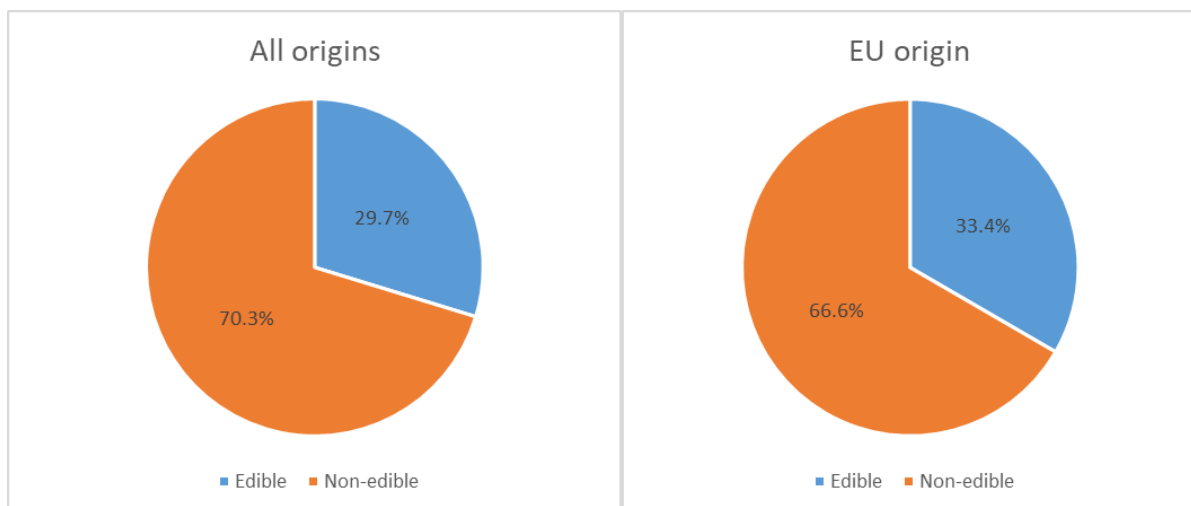
**Figure 46: Land-use in EU (2023)**

Source: DG AGRI - Medium term outlook.

Roughage (permanent grasslands and fodder) which is the main source of protein for EU livestock (see: Fact #III.4: above) represents 44% of utilised agricultural area in the EU. Cereals, which represent 21% of the protein used by the EU livestock, cover 33% of the utilised agricultural area.

## Fact #IV.2: A large share of feed is not edible

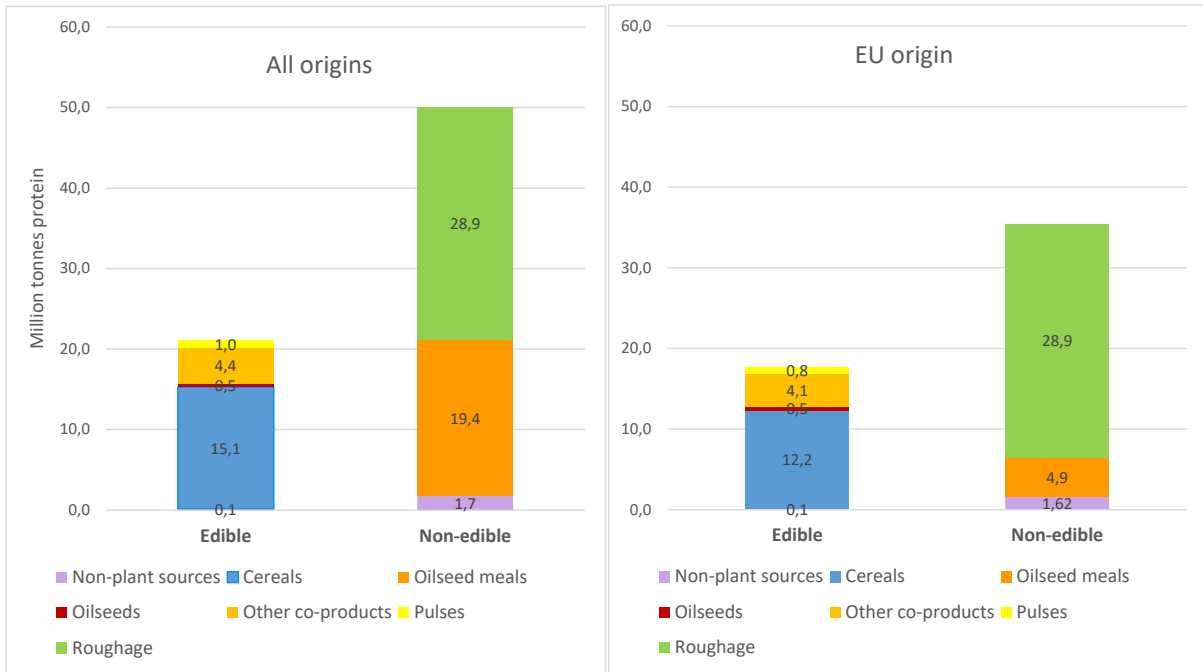
A large share of livestock feed, like forage and crop co-products, is inedible to humans as such.



**Figure 47: Share of edible and non-edible feed protein by origin**

Source: DG AGRI - EU Feed Protein Balance Sheet –2022/23

70% of feed protein used in the EU is not fit for human consumption. With feed protein originating from EU, this share is 64%.

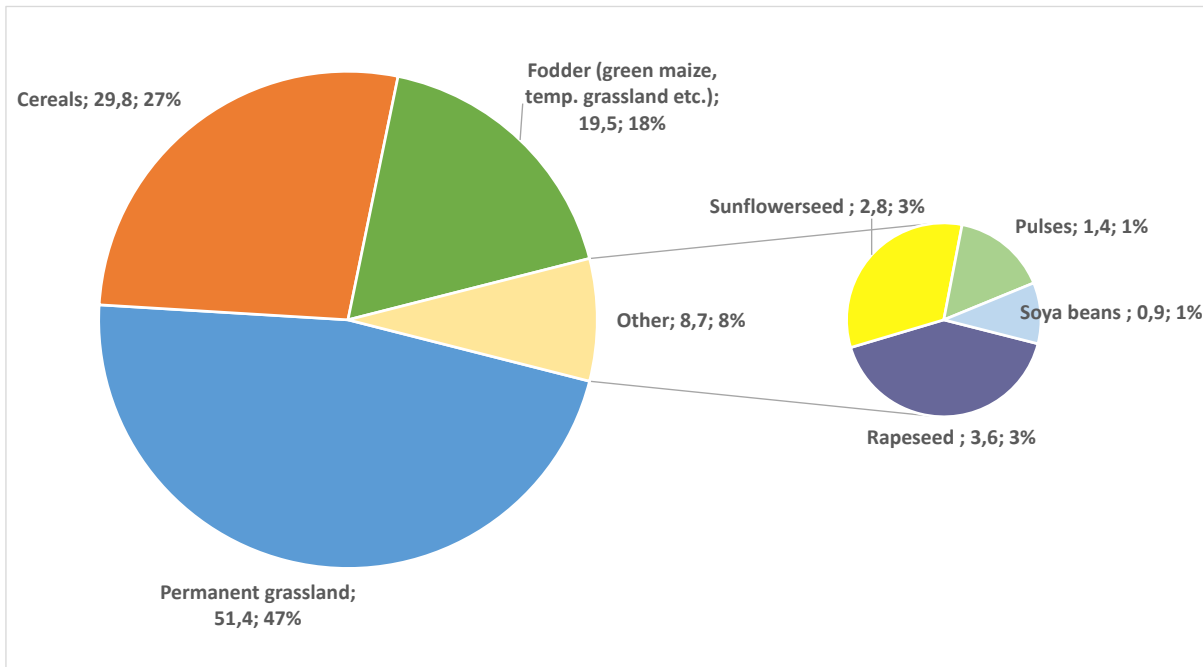


**Figure 48: Feed protein types by origin (in million tonnes of crude protein)**

Source: DG AGRI - EU Feed Protein Balance Sheet -2022/23

A majority of feed protein fit for human consumption, i.e., edible protein, comes from cereals, both for all origins and EU origin. The main source of inedible protein consists of roughage both for all origins and EU origin.

### Fact #IV.3: Permanent grassland, the main area used for feed production

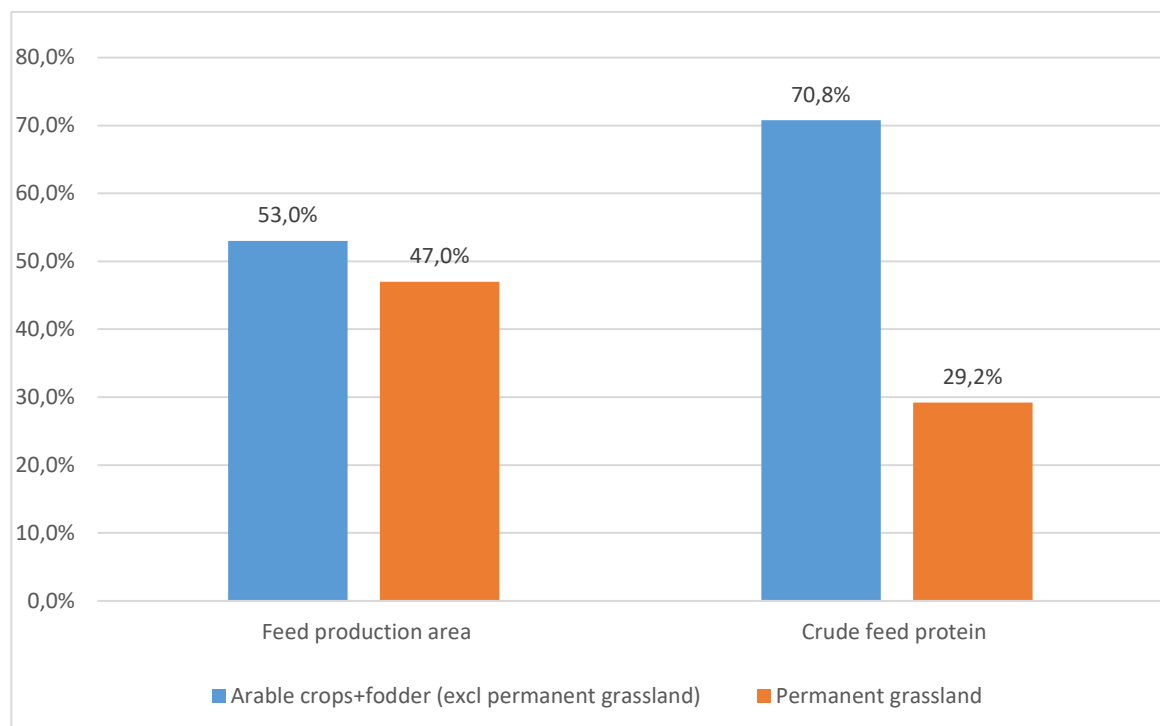


**Figure 49: Areas used for feed in the EU by type (in Mha and share) (2023)**

Source: DG AGRI - Medium term outlook.

Permanent grasslands take the largest share (47%) of the area used for feed production in the EU. Cereals account for a 27% share of the agricultural area used for feed production. Fodder, which consists of green maize, temporary grasslands and others, takes 18% of agricultural area used to produce feed. Oilseeds and pulses used as feed are produced in the remaining area (8%).

#### Fact #IV.4: Most of the feed is produced on arable land



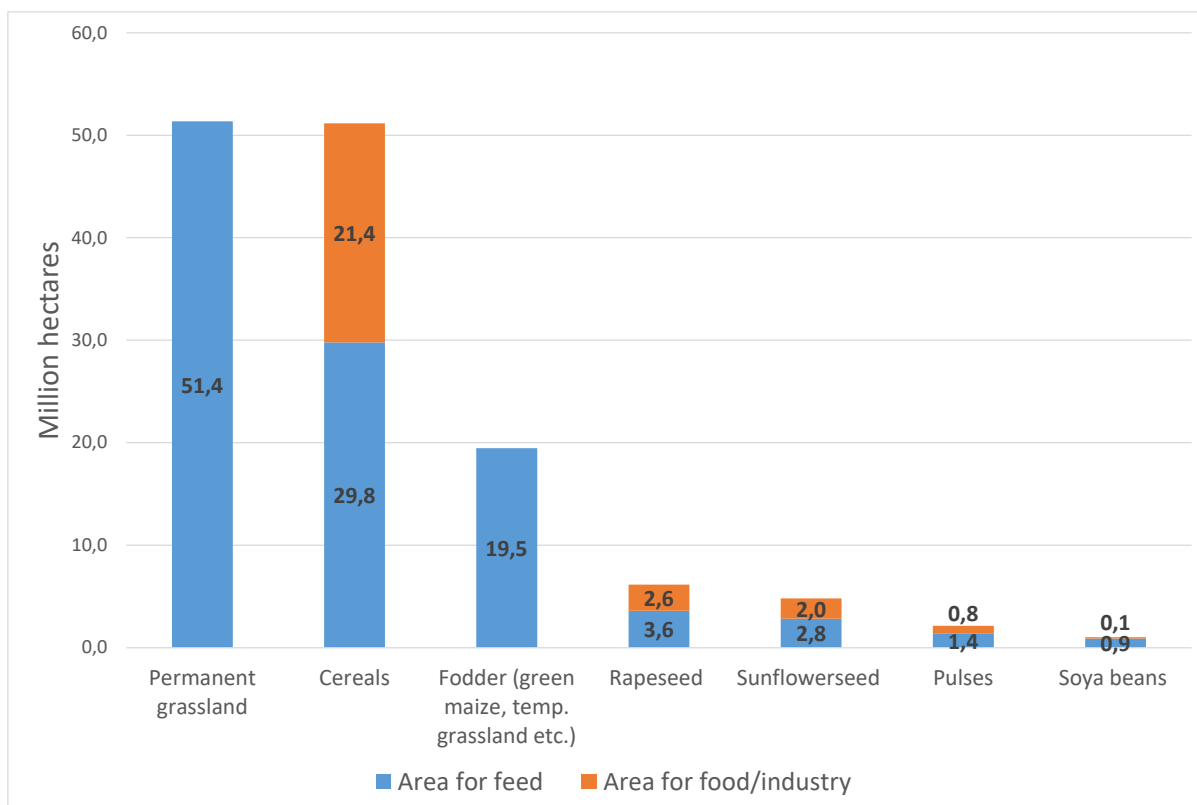
**Figure 50: Feed production area by type of land and feed crude protein by type of land (2023)**

Source: DG AGRI - Medium term outlook.

A little over half of the land used for the production of feed is used for the cultivation of arable crops and fodder (green maize, temporary grasslands and others, excluding permanent grasslands). This area produces 71% of all crude protein used as feed. Permanent grasslands correspond to 47% of the agricultural area used for producing feed but only produce 29% of all crude protein used as feed. These areas are often unsuitable for crop production.

A majority of feed protein comes from areas that produce arable crops and fodder (excluding permanent grasslands). These areas could be physically suitable for cultivating other crops, even though the yield could vary between locations and alternative production may not be economically sustainable. Some of them are used for both food and feed production depending on the rotation cycle of crops and some crops planted for food production end up as feed if they do not meet quality criteria for food.





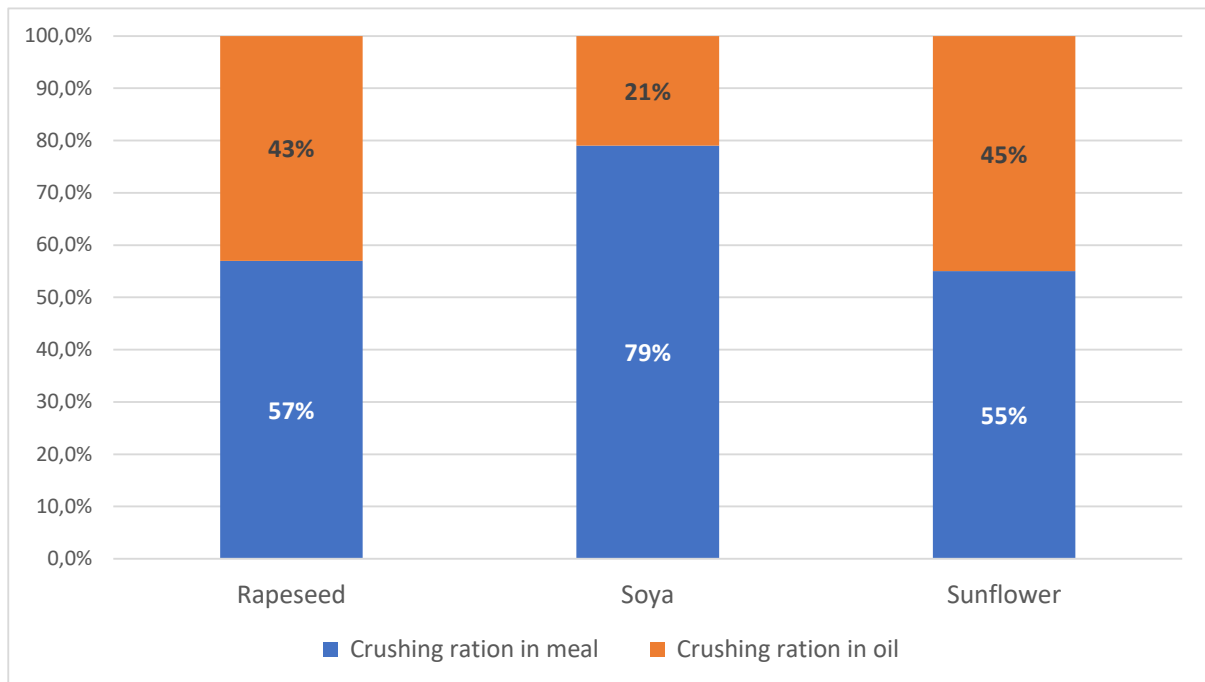
**Figure 51: Agricultural area used for feed, food and industry (in Mha) (2023)**

Source: DG AGRI - Medium term outlook

All agricultural areas dedicated to permanent grasslands and fodder are used for the production of feed. More than half of the area used to cultivate cereal crops is used to produce feed (i.e., 58%=29.8 Mha/51.2 Mha). For pulses, 64% (=1.4 Mha/2.2 Mha) of the area is involved with feed production. Only a small share of oilseed is directly used as feed for animals. Most of it is consumed by livestock as co-product after crushing (meal or oil). The oils are mainly used for human consumption or by the industry with only a small share used for compound feed. There are slight differences between oilseeds: most of the rapeseed oil obtained after crushing is used by the industry or as food. A majority of sunflower seed oil is used for food. The opposite stands for soya bean oil which is largely used for feed.

Therefore, the share of the total area of oilseeds (rapeseed, sunflower seed and soya bean) used for feed is defined as the share of the oilseed seeds or their co-products used for feed. For instance, in 2022/23, 195 000 tonnes of rapeseed seed (0.7% of the EU domestic use) was directly used to feed animals, 14 270 000 tonnes of rapeseed meal (55.2% of the EU domestic use) was used as feed and only 53 000 tonnes of rapeseed meal (0.2% of the EU domestic use) was used as feed. The share of the EU rapeseed domestic consumption used as feed is 56.1%. For the graph above, we consider that 56.1% of the EU area used for rapeseed production is used to produce feed.

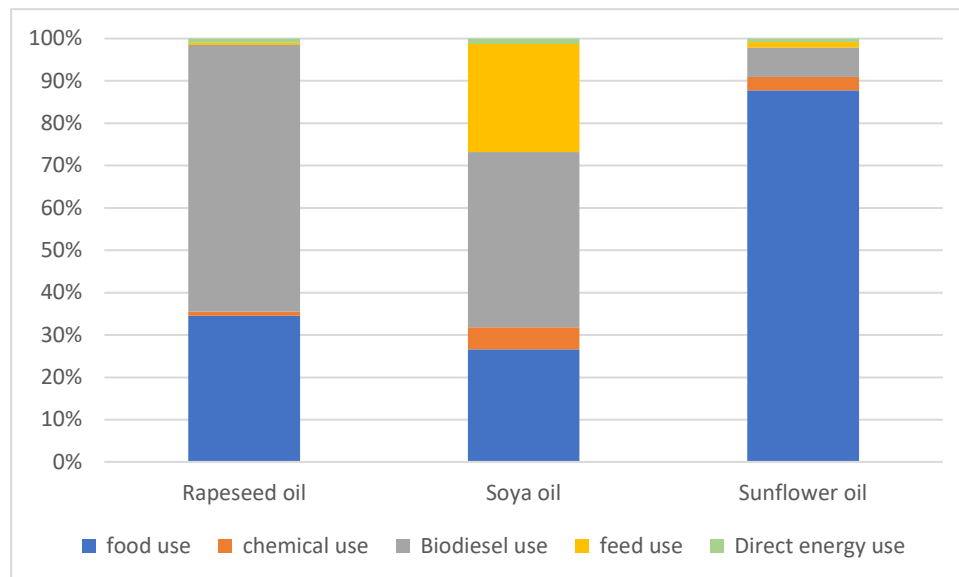
## Fact #IV.5: Meal is the main product of oilseeds



**Figure 52: Crushing ratio of oilseed in meal and oil**

Source: DG AGRI EU Feed Balance Sheet

Crushing ratios for transforming oilseeds into meal and oil show that most of the raw material is transformed into meal.

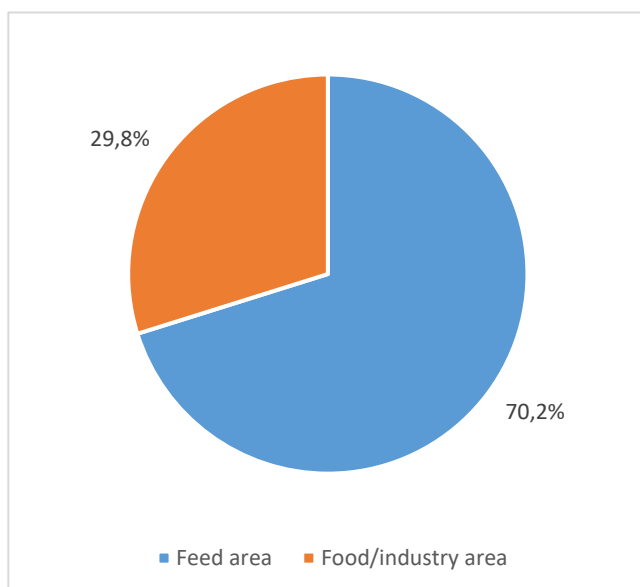


**Figure 53: Use of oilseed oils (share of total use)**

Source: DG AGRI

Only a limited share of rapeseed and sunflower oils is used as feed. Rapeseed and soya oils are mainly used for biodiesel. Sunflower oil is mainly used as food.

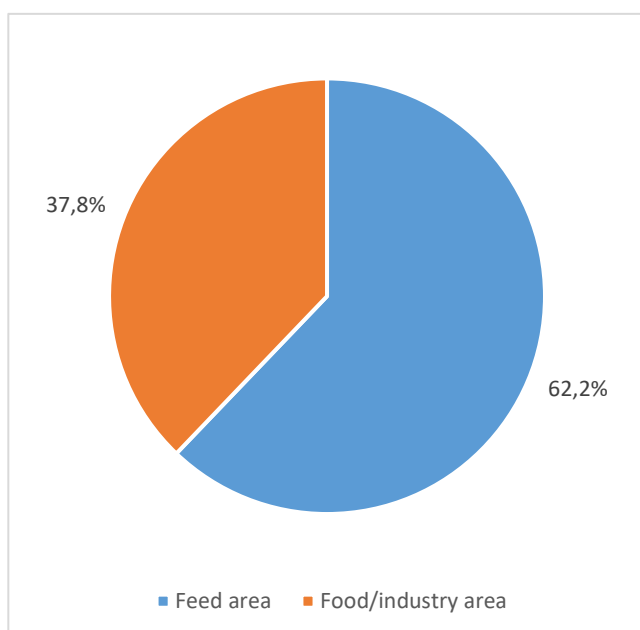
## Fact #IV.6: Arable crop area is mostly used for feed



**Figure 54: Share of utilised agricultural area used for feed, food and industry (2023)**

Source: DG AGRI - Medium term outlook.

70% of the utilised agricultural area (i.e., 109.3 Mha/155.8 Mha) is used to produce feed and 30% (=46.5 Mha/155.8 Mha) is used to produce food or is used by the industry for other uses than food (energy, chemistry, etc).

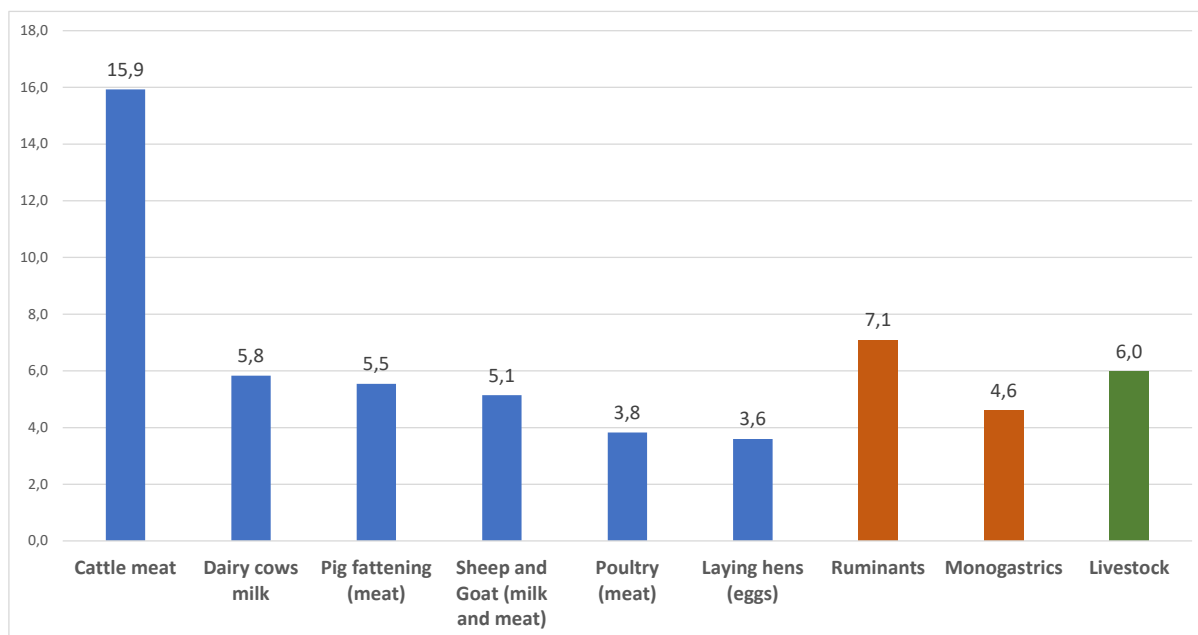


**Figure 55: Share of arable area used for feed, food and industry (2023)**

Source: DG AGRI - Medium term outlook.

If arable crop area is only considered (excluding permanent grassland and orchards), 62% of the arable area (=57.9 Mha/93.2 Mha) is used to produce feed and 38% (=35.3 Mha/93.2 Mha) is used to produce food or is used by the industry for other uses than food (energy, chemistry, etc).

## Fact #IV.7: A variation of efficiency per species

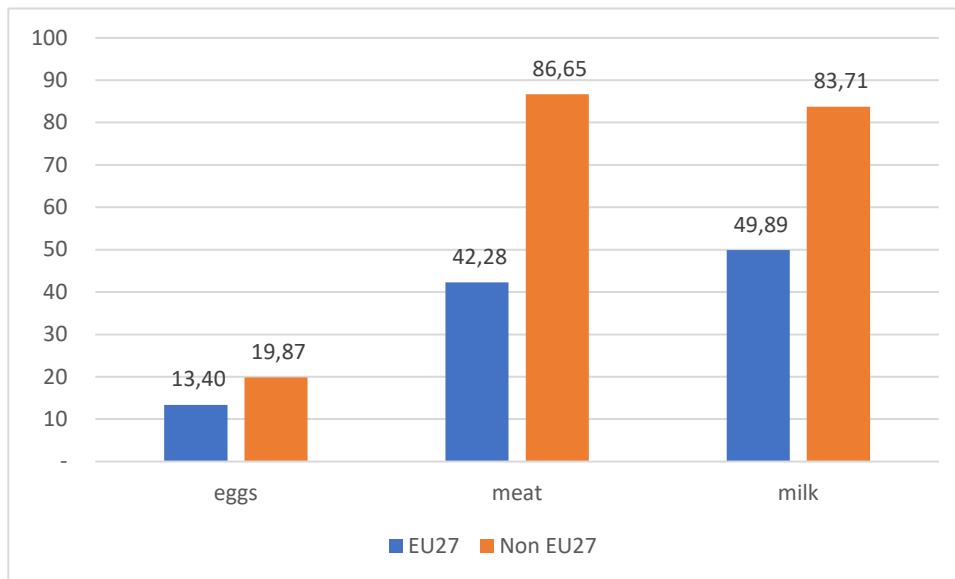


**Figure 56: Protein conversion ratio for different livestock systems (kg of feed protein to produce 1 kg of edible protein)**

Source: CAPRI model database.

There is a high variability in efficiency between the different species, regions, and farming methods to convert feed protein into animal product. At EU level, the beef conversion ratio from feed protein to edible protein is 15.9 for beef, meaning 15.9 kg of feed protein are needed to produce 1kg of beef protein, while this ratio is of 3.6 for eggs. It should be noted that conversion ratios are variable between available sources (academic studies or data modelling tools).

## Fact #IV.8: The EU is efficient in terms of GHG



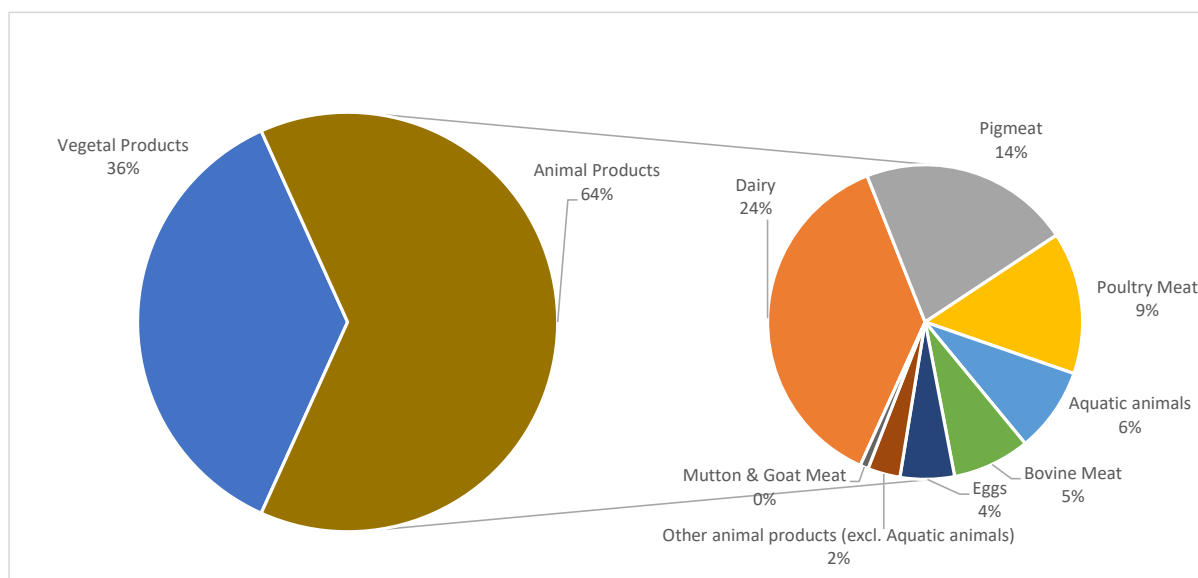
**Figure 57: Emission Intensity in 2015 - EU versus the rest of the world (kg CO2eq / kg Protein)**

*Source: Global Livestock Environmental Assessment Model (GLEAM.)*

The EU is among the most efficient global producers of animal protein in terms of greenhouse gas (GHG) emissions. Reducing the share of the EU in global animal production without changes to consumer demand would likely be neither good for the global environment nor for the EU economy.

# V. Food

**Fact #V.1: At EU level, animal products are the first source of food protein.**



**Figure 58: EU Protein supply quantity per product (g/capita/day) (2021)<sup>12</sup>**

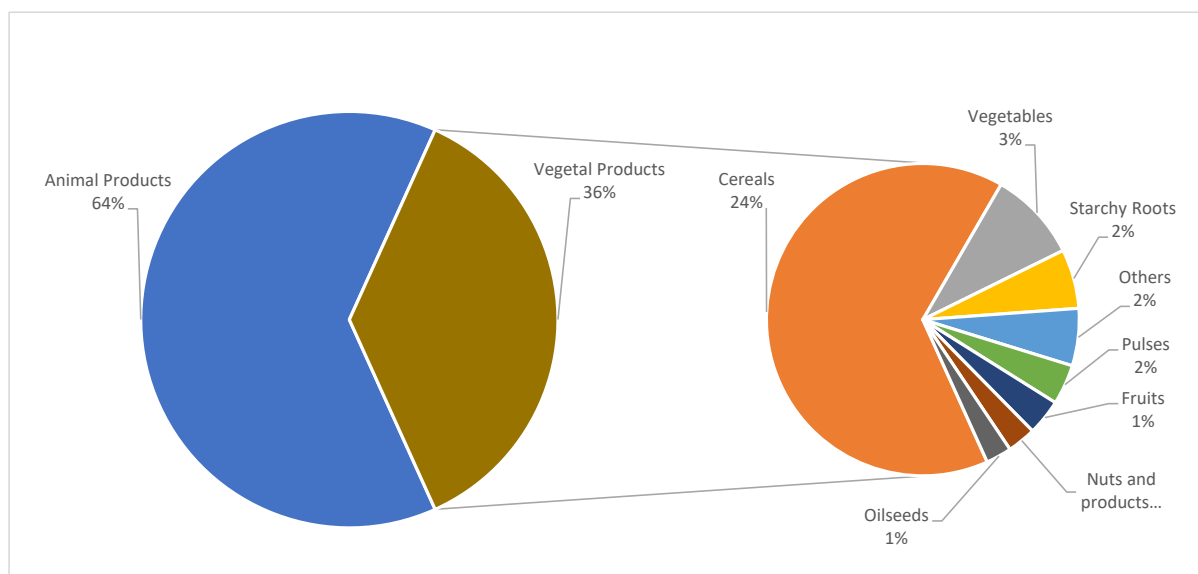
Source: FAO - Food Balances – 2021.

In 2021, the EU population mostly consumed protein coming from animal products (64%). Dairy products account for 24% of protein intake by humans, while pig meat accounts for 14%, poultry meat for 9%, bovine meat for 5%, and eggs for 4% (<sup>13</sup>).

<sup>12</sup> Protein supply quantity refers to the total amount of protein available for human consumption resulting from the multiplication of the quantity of food available.

<sup>13</sup> FAO Food Balance (2010-): <https://www.fao.org/faostat/en/-/data/FBS>.

## Fact #V.2: Cereals are the main source of food plant-based protein

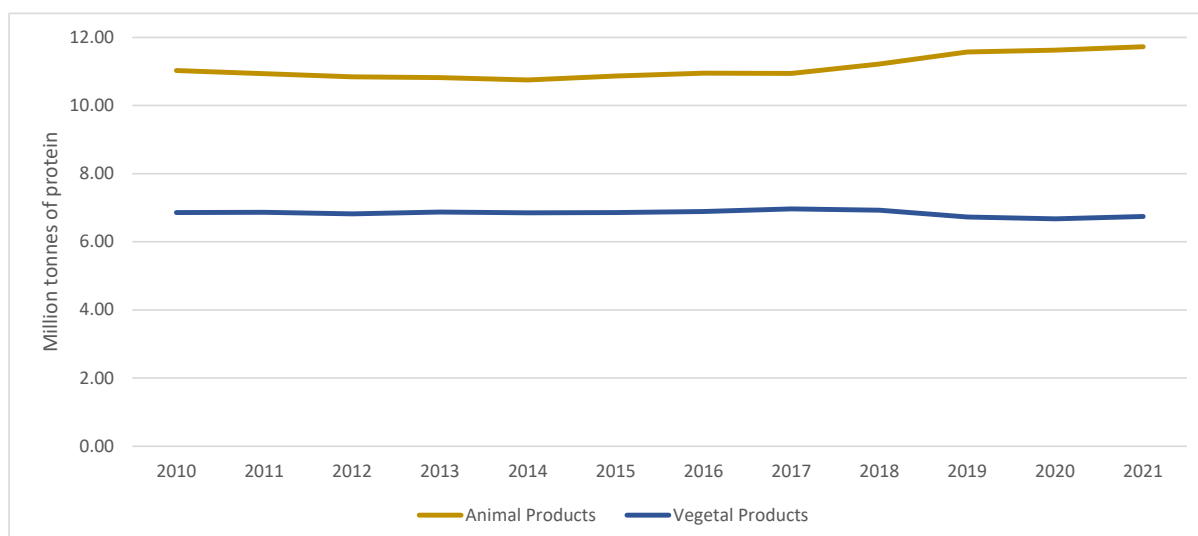


**Figure 59: EU Protein supply quantity per product (g/capita/day) (2021)<sup>14</sup>**

Source: FAO - Food Balances – 2021.

For plant-based protein, the main sources are cereals (24% of protein intake by humans) and fruit and vegetables (5%).

## Fact #V.3: Animal protein is replacing vegetal protein



**Figure 60: EU consumption of animal protein versus plant protein (in million tonnes of crude protein)**

Source: FAO - Food Balances – 2021.

In 2021, 18.5 million tonnes of crude protein were consumed as food in the EU, among which 11.7 million tonnes were originating from animal products and 6.7 million tonnes from vegetal products.

<sup>14</sup> Protein supply quantity refers to the total amount of protein available for human consumption resulting from the multiplication of the quantity of food available.



From 2010 to 2021 the animal protein consumption in the EU-27 Member States increased by 6%, while the average plant-based protein consumption decreased by 2%.