UNLOCK

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Date: **20th Dec 2021**

UNLOCK Deliverable 2.1

Analysis of Feather Waste Sources and Management in the EU

https://unlock-project

This project has received funding from the Bio-based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement Nº 101023306

BBI JU

Bio-based Industries Consortium

Technical References

Project Acronym	UNLOCK
Project Title	Unlocking a new feather bioeconomy for keratin-based agricultural products.
Project Coordinator	Sarah Montes, CIDETEC
Project Duration	48 months

Deliverable No.	2.1 Analysis of Feather Waste Sources and Management in the EU
Type of deliverable	Report
Dissemination level [1]	PU
Work Package	WP2: Sectoral Supply Chain Analysis in the Targeted Regions (Poland, France, German, Italy & Spain)
Task	2.1 – Value chain analysis in the targeted regions, including and industrial stakeholder survey and desk research 2.2 – Analysis of residual streams in the targeted sectors (poultry breading, meat processing and rendering)
Lead beneficiary	Farrelly and Mitchell Business Consultants Ltd
Contributing beneficiary(ies)	CEDROB & BIOEXTRAX
Due date of deliverable	20/12/21
Actual submission date	21/12/21

[1] PU = Public

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PP = Restricted to other programme participants (including the Commission Services)

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CO = Confidential, only for members of the consortium (including the Commission Services)

Document history

V	Date	Beneficiary	Author
1	20/12/21	Public	Farrelly and Mitchell Business Consultants Ltd

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Disclaimer & Acknowledgement

This project has received funding from The Horizon 2020 programme of Europe and the Bio-based Industries Joint Undertaking (BBI JU) under grant agreement Nº 101023306. Project Unlock was initiated by The EU Framework Programme for Research and Innovation, which aims to make investment in research and innovation at the heart of the EU's target of achieving sustainable economic systems.

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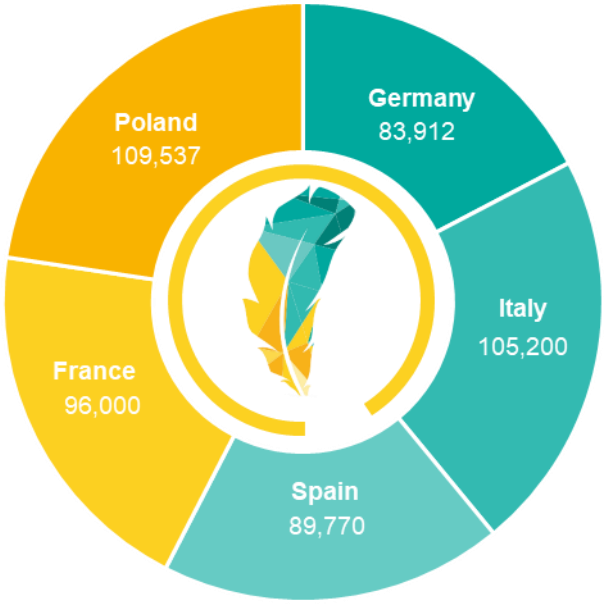
Executive Summary

This report provides a high-level overview of the poultry breeding, meat processing and ABP (Animal By-Product) rendering industries in five target countries in the EU, namely, France, Germany, Spain, Italy and Poland. In particular, this report presents a detailed analysis of the poultry slaughtering throughputs, their regional locations and the subsequent feather feedstock availability (post slaughtering) in these target countries. The geographical distribution of rendering operators currently involved in the valorisation of feather feedstock across these countries is also presented.

The overall findings of the report showed that the EU poultry sector has demonstrated robust growth between 2010 and 2020. Poultry meat production at the EU level was at 13.6 million tonnes in 2020, of which 67% came from target countries. This industry growth has therefore supported the feather feedstock availability generated post slaughter in the EU where annual feather supply was estimated at an average of 621,200 tonnes between 2010 and 2020, from which 484,419 tonnes of feathers were available across Germany, France, Poland, Italy and Spain.

Figure1: Average annual feather feedstock availability from target countries (tonnes)



Source: Farrelly & Mitchell

Key findings relating to each of the target countries, Germany, France, Spain, Italy and Poland are as follows:

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Germany

- On an annual basis the average throughput of approved poultry slaughtering establishments in Germany is 1.5 million tonnes, with 66% reported to be broilers, 30% turkey, 3% spent hens and 2% ducks. The dominant geographical areas for location of poultry slaughtering establishments within Germany are Bavaria, Baden-Württemberg and Sachsen.
- The annual average volume of poultry feathers in Germany during the period 2010-2020 was 83,912 tonnes, with 60% of feathers sourced from the broiler industry, followed by turkeys (33%), ducks (4%) and spent hens (3%). Over this period, feather availability increased by 15%. This is in part due to the increase in broiler slaughter numbers which increased the feather supply by an extra 14,062 tonnes.
- Ninety-five establishments are licenced for handling feather by-products with the highest concentration in Baden-Wurttemberg, Bayern, Sachsen, Niedersachsen and Nordrhein-Westfalen and Hessen.

France

- On an annual basis, the average annual throughput of approved poultry slaughtering establishments in France is 1.8 million tonnes, with 68% reported as broilers, 19% turkey, 11% ducks and 2% guinea fowl. The dominant geographical areas for location of poultry slaughtering establishments are Occitanie, Nouvelle Aquitaine and Auvergne Rhone Alpes.
- The annual average volume of poultry feathers in France during the period 2010-2020 was 96,000 tonnes, with 63.5% of feathers sourced from broilers followed by 19.7% from turkeys and 16.8% from ducks. Over this period, feather availability decreased by 3%. This is in part due to the decline in slaughter throughputs for turkeys and ducks.
- Eighty-four establishments are licenced for handling feather by-products with the highest concentration in Nouvelle-Aquitaine, Occitanie, Auvergne-Rhone-Alpes, Grand Est, and Brittany.

Spain

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- On an annual basis the average throughput of approved poultry slaughtering establishments in Spain is 1.6 million tonnes, with 85% reported to be broilers, 11% turkey and 4% from other types of birds. The dominant geographical areas for location of poultry slaughtering establishments are Cataluña, Valencia and Baleares.
- The annual average volume of poultry feathers in Spain during the period 2010-2020 was 89,770 tonnes, with 87.5% of feathers sourced from the broilers industry followed by 12.6% from turkeys. Over this period, feather availability increased by 53%. This growth was strongest for duck feathers (9.7%), followed by chickens (4.4%) and turkey (3.6%).
- Forty-one establishments are licenced for handling feather by-products with the highest concentration in Andalucía, Cataluña, Castilla y Leon and Castilla-La Mancha.

Italy

- On an annual basis the average throughput of approved poultry slaughtering establishments in Italy is 1.8 million tonnes, with 78% reported to be broilers and 22% turkey. The dominant geographical areas for location of poultry slaughtering establishments are Veneto, Piedmont and Lombardy.
- The annual average volume of poultry feathers in Italy during the period 2010-2020 was 105,200 tonnes, with 76.4% of feathers sourced from the broiler industry, followed by 23.5% from turkeys. Over this period, feathers availability increased by 13%, with chicken feathers increasing by 1.6%, turkey by 0.3%, whereas duck feathers availability declined by 55%.
- Fifty-seven establishments are licenced for handling feather by-products with the highest concentration in Lombardy, Veneto, Piedmont, and Tuscany.

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Poland

- On an annual basis the average throughput of approved poultry slaughtering establishments in Poland is 1.9 million tonnes, with 83% reported to broilers, 15% ducks and 2% turkey. The dominant geographical areas for location of poultry slaughtering establishments are Wielkopolskie, Lodzkie and Swietokrzyskie.
- The annual average volume of poultry feathers in Poland during the period 2010-2020 was 109,537 tonnes with 80.3% sourced from the broilers industry, followed by 16.2% from turkeys and 3.6% from ducks. Over this period feathers availability increased by 8.3% CAGR. This is in part due to a strong growth in duck feathers (+16.5%), followed by chicken feathers (+8.3%), then turkey (7.1%).
- A total of 257 establishments are licenced for handling feather by-products with the highest concentration in Greater Poland, Masovian, Lesser Poland, Łódź, Lubuskie, and Pomorskie.

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1. Introduction

1.1. Background

The annual waste generated by EU countries is expected to increase by 70% by 2050 (European Commission 2020), causing major losses of resources and impeding the targets to achieve climate neutrality. The European Commission has launched the Circular Economy Action Plan (CEAP) in 2015 as an effort to apply the circular economy principles across its industries and enable the achievement of climate neutrality by 2050. The focus of the CEAP is to shift the status quo in relation to generated waste materials by making a better use of existing resources and exploiting those which have not been used to date, in order to create a new regenerative growth economic model. This strategy would create opportunities for industries to make use of disposed materials for purposes of re-use, repair or high-quality recycling, which will make designed products more efficient, affordable and sustainable.

A new Circular Economy Action Plan was launched in 2020 to accelerate the EU sustainability transition and move from a fossil fuel-based economy to a circular bioeconomy. Among the measures and initiatives of this new plan is the Sustainable Product Policy Framework (SPPF) which aims to address high impact products, including textiles, construction products, electronics and plastics, and to ensure that production in the EU is resource efficient, climate neutral and aligned with principles of a circular bio-based economy (European Commission 2020).

Adopting a circular bio-based economy model implies that the EU will reduce its reliance on polluting and increasingly scarce carbon resources, such as fossil fuels, oils and gas, and move towards biobased resources as a primary source of raw materials. The vision behind this bioeconomy is to build new value chains that utilise resources more efficiently and make industrial processes sustainable and more cost effective, with the support of biorefinery technologies. These value chains will be built through the establishment of an innovative model of production that makes use of renewable biological resources such as plant crops, animals, microorganisms and derived biomass to produce food, feed bio-based products, bioenergy, and biodegradable products (Horizon 2020).

Biomass, which is derived from plant and animal materials, including organic waste, has significant potential to enable a bio-based economy. It is estimated that 138 million tonnes of bio-waste is generated annually in the EU, from which 40% goes to landfills (Horizon 2020). Additionally, the new Circular Economy Action Plan notes that raw material extraction and material processing are responsible for 90% of biodiversity loss and water stress (CEAP 2020). Given this large share of bio-waste and its high potential to be used as a source of sustainable raw material for industrial processes and for creating added value in the economy, the EU has launched several research and innovation projects targeting the bio-based sectors. These projects are expected to facilitate the development and adoption of bio-based solutions including new bio-based plastic alternatives, sustainable business models and sustainable bio-refineries.

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Project Unlock, which is the focus of this report is an example of such EU projects launched to strengthen and expand opportunities within the bio sector industries.

1.2. Project UNLOCK

Project UNLOCK (https://unlock-project.eu) is an EU funded project comprising of a consortium of 15 organisations with the specific objective of designing and demonstrating an economically and environmentally sustainable supply chain for a feather-based bioeconomy by generating innovative bio-based functional materials for agricultural applications (e.g., forest/seed trays, nonwoven geotextiles, mulch films and hydroponic foams).

Mulch films | Hydroponic foams | Nonwoven geotextiles | Forest and seed trays

The advantages of these materials include biodegradation aligned to the duration of crops, the capacity to add nitrogen back to soils and generating zero waste at end-of-life. Keratin-based materials could outperform their fossil-based counterparts by providing additional functionalities during the product lifespan and environmental benefits at the end-of-life (controlled biodegradability, enrichment of organic - nitrogen to soil and zero waste generation).

Figure 1.2-1 below summarises the project's concept idea.

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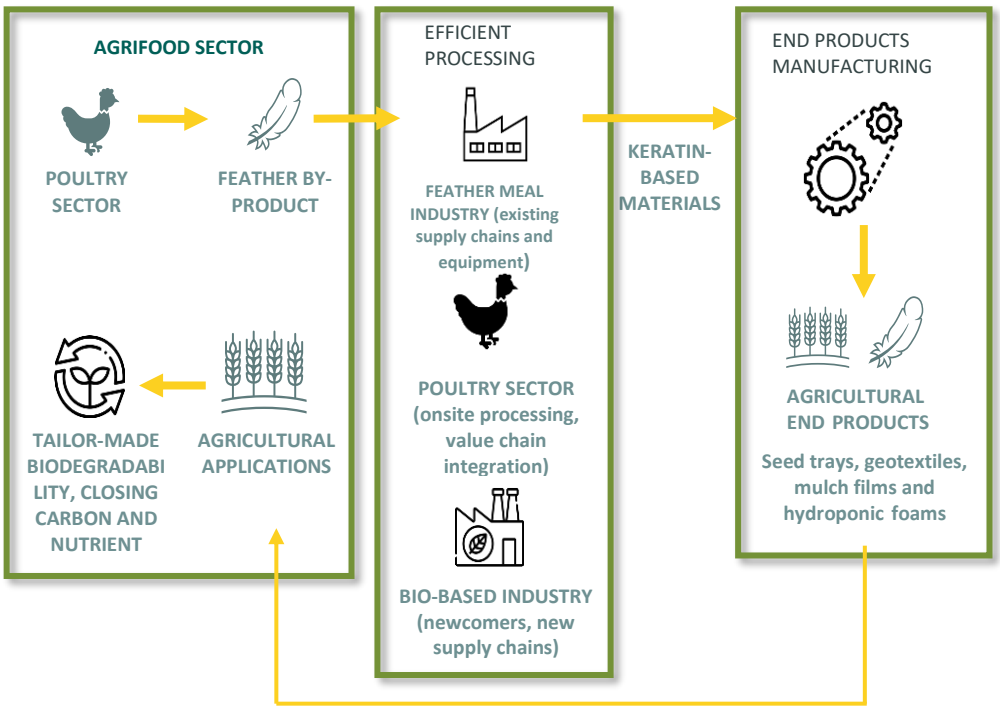
Figure 1.2-1 UNLOCK Project Concept



A NEW FEATHER-BASED BIOECONOMY:

- EU FEATHER SUPPLY CHAIN ANALYSIS (GEOGRAPHICAL, AVAILABILITY, WASTE MANAGEMENT PRACTICES, ETC.)
- FEATHER-BASED PROCESSING BIOREFINERIES AND SUPPLY CHAIN DESIGN ADAPTED TO REGIONAL POULTRY SECTORS
- CONVERSION TECHNOLOGIES OPTIMISATION
- ECODESIGN OF KERATIN-BASED END PRODUCTS
- TAILOR-MADE BIODEGRADABILITY
- CLOSED NUTRIENT AND CARBON CYCLES
- EASILY REPLICABLE IN EXISTING POULTRY AND FEATHER MEAL VALUE CHAINS
- REGIONAL APPROACH FOR DISSEMINATION AND EXPLOITATION ACTIVITIES THROUGH CLUSTERS

Source: UNLOCK Research

1.1.1. The Vision behind UNLOCK

The poultry sector represents the second largest meat producing sector within Europe's agri-food industry, accounting for 31% of meat production. More than 13.5 million tonnes of poultry meat was produced in 2020 (EU DG Agri Dashboard, 2021). Feathers, a by-product of the poultry sector within the agri-food industry, are composed of almost 90% keratin, a valuable protein which can be used as a source of raw materials for biodegradable products, such as bioplastics which can be applied to agricultural or commercial settings.

A closer look at the structure and composition of feathers shows that the whole part of a chicken feather (rachis and barb) can be used as a source of a pure structural protein called keratin, which can be exploited for conversion into a number of high-value bioproducts. Additionally, several technologies can be used to convert other biological components of feathers into high value-added products.

Therefore, conversion of the waste into valuable products can make feathers an attractive raw material for the production of bioproducts (European Commission 2018). However, despite the interesting properties of keratin-based materials and their promising applications, there is still no widespread market for feather valorisation.

Although poultry feathers and keratin, the main component of feathers, have been

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tested for various applications, there is still limited use of feathers as a raw material in industrial applications. This is mainly due to the lack of technologies for processing keratin and established routes for utilising keratin-based products. Most of the valorised feather waste is currently converted into low-value products such as animal feed and fertiliser.

Feather meal, which can be used as feed in the aquaculture and more recently the pig industry, represented 175,000 tonnes of annual production at 250-500 €/tonne (Karma 2020).

1.1.2. Project UNLOCK Objectives

To unlock the full potential of feathers as raw material for functional molecules, there are many technical, logistic and market hurdles to be resolved in the supply chain to enable the take-off of profitable value chains and the easy market uptake of keratin-based products.

UNLOCK will enable the setup of two first-of-its-kind commercial biorefineries following completion of the project. The co-creation and replication will be reinforced through a specific regional cluster approach to multiply the impacts during and after the project.

This project focuses on key areas of work as follows:

- Analysis of feather clusters in the most promising regions in Europe due to the diminishing lifespan of usable feathers;
- Optimising the logistical and operational conditions of such value at pilot scale in order to better understand and solve the different technical, logistic and sustainable hurdles;
- Eco-designing processes and products to guarantee the recyclability of materials;
- Determining the adequate process parameters and end-product characteristics needed to place in the market high-quality, sustainable and cost-competitive products; and
- Testing and implementing adapted business models which ensure a fair return of the benefits to the rural primary sector and a robust and profitable value chain.

1.3. Report Objectives

The objective of this study was to conduct an in-depth analysis of the poultry value chains in Germany, France, Spain, Italy and Poland. This analysis included the mapping of the current poultry breeding, meat processing and rendering industries in these countries, identifying number of companies, sizes and the current feather feedstock volumes. It is recommended to read this report in conjunction with the results presented in Deliverable 2.2.

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The results from this analysis will direct the work of Task 2.3 of work package 2 (EU's feather-based economy-the challenges ahead) and the direction of work under work package 3 (Setting the basis for the feather economy; designing the novel value chains).

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2. Research Methodology

This research has been conducted using deep dive desktop analysis, as well as interactions with key industry stakeholders and experts through a consultation process.

The analysis of the poultry value chain and feather feedstock availability is based on collected information in relation to poultry production, processing, slaughtering, and rendering in the five targeted countries: Germany, France, Spain, Italy and Poland. Given the limited research availability on poultry feathers, this report acquired a large share of information and insights from market intelligence gathering and direct consultations with stakeholders in the poultry industry, in addition to the inputs of field experts.

Source: Farrelly & Mitchell

2.1. Secondary and Desktop Research

In order to allow for an in-depth assessment of the poultry value chain and feather feedstock volumes, the desktop research extracted and analysed available data and information from publications and national statistical databases.

Statistical data and figures were obtained from a number of secondary sources, including national government bodies for agriculture, national statistics authorities and the European statistical database 'Eurostat'.

Some of the challenges that have been faced in this phase of the research relate to the unavailability of detailed regional data for some EU poultry sectors in addition to some missing updates in the poultry slaughtering data. The noticed delay across the EU in carrying out and publishing some annual data and the 2020 regional slaughtering surveys (e.g. in France and Poland) has contributed to the lack of updated data and figures in some instances. In France for instance, the latest data published for regional

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poultry slaughtering on Agreste refer to 2015, while no regional slaughter data was available for Poland. Furthermore, this limitation in data availability, implies that the type of published information will vary for each of the target countries, necessitating that the analysis and writing of each section is based on the target country's available data. Although this has impacted the manner at which the analysis was conducted, the final findings on feather availability are kept consistent across the report.

2.2. Industry Stakeholder Consultations

Key industry experts were consulted for the purpose of gathering an in-depth knowledge and understanding of the complex characteristics of the poultry value chain and the overall poultry sector.

This was achieved through a combination of face-to-face meetings, workshops with industry experts and leveraging industry connections to gather critical information and informed insights.

In particular the consultation aimed at gathering data and information in relation to practices across the poultry value chain, the number of companies, sizes, current feather waste management practices, current economic distribution of profits and costs within the sector.

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3. Findings

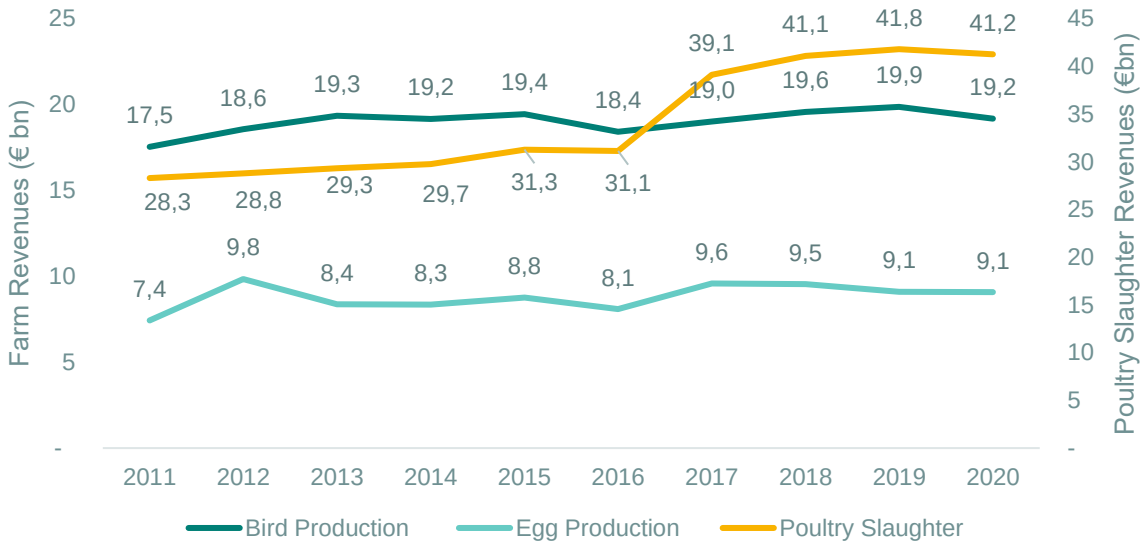
In this chapter, an analysis of poultry slaughtering in the EU and each of the target countries was conducted as well as the regional distributions of poultry slaughterhouses across Germany, Poland, Italy, Spain and France. This has enabled an understanding of feather availability in these countries and the estimation of the feather feedstock between 2010 and 2020. Furthermore, an economic analysis was conducted of the industry which outlines value add, cost structure and price development in slaughterhouses. This information is presented in Annex 6 of the report.

3.1. Poultry Production in the EU:

The poultry industry is one of the most important within the EU agri-food sector. The sector has shown robust long-term growth, driven by increased domestic and international sales. As presented in Figure 3.1-1 below, revenues from poultry production activities at farm level increased at a 1.4% CAGR over the 10-year period from 2010 to 2020 to reach €28.2 billion. While bird production accounted for 68% of this revenue, revenue from egg production has grown faster (1.0% vs 2.2% CAGRs). Revenues from poultry slaughter increased at a 4.2% CAGR to reach an estimated €41.2 billion in 2020.

Figure 3.1-1 below illustrates revenues from poultry farming and slaughter in the EU over the period 2011-2020.

Figure 3.1-1: Estimated Revenues from Poultry Production in the EU-27 2011-2020



Source: Eurostat, Farrelly & Mitchell

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With both EU and global consumption growth expected to continue, the long-term demand outlook for the industry is positive. EU consumers view poultry products as a cheaper and more sustainable source of animal protein which has contributed to increased consumption and production in the EU (European Commission, 2020). Demand is expected to grow in export markets where poultry meat is expected to continue replacing more expensive animal proteins.

Factors that support the favourable outlook for the industry also include:

- Efficient feed to food conversion ratios;
- Short production cycles;
- Relatively low production costs; and
- A rich source of nutrients for human consumption.

3.1.1. Poultry Value Chain

Commercial poultry value chains are highly intensive and among the most sophisticated in the EU agri-food sector. Each stage of production, from production of genetic stock through to poultry slaughter (or table egg production), is highly delineated, with different production units involved at each stage of the value chain.

The delineated nature of production helps drive efficiencies in the industry and provides a level of biosecurity (in terms of protecting one part of value chain from outbreaks of disease in another part of the chain).

Figure 3.1-2 illustrates the value chains for intensive (commercial) broiler meat and table egg production.

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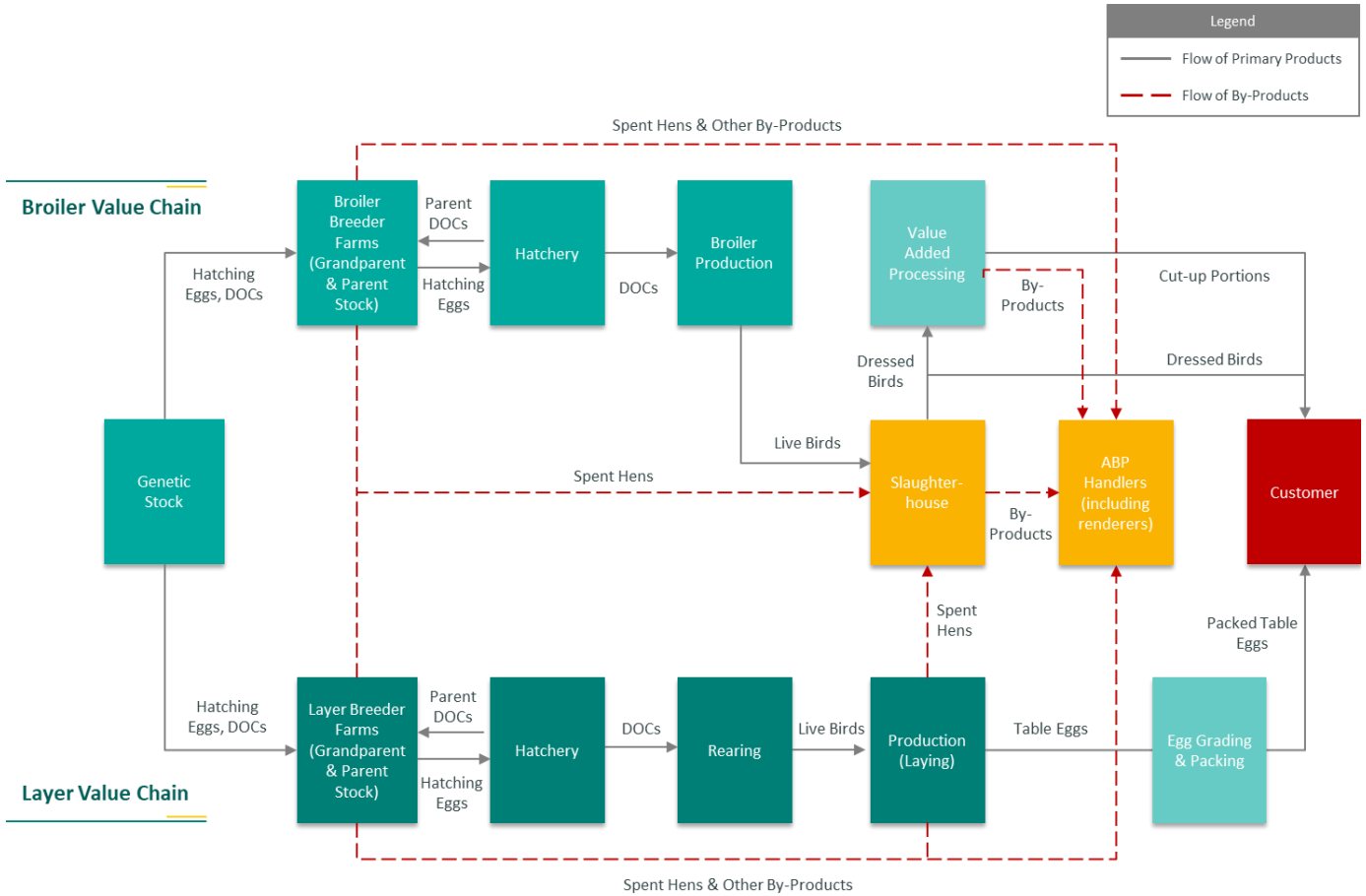
Figure 3.1-2: Simplified Commercial Value Chains (Broiler Meat & Table Eggs)[1]



Source: Farrelly & Mitchell.
DOCs: Day Old Chicks

[1] The value chain for turkey meat is similar to the broiler meat value chain

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3.1.1.1. Broiler Value Chain

Genetic selection has contributed to a 400% increase in broiler growth rates since the 1950s. A small number of companies control the global market for genetic stock. The main suppliers of broiler genetic stock in the EU are Aviagen and Cobb-Vantress. These supply parent and grandparent stock to broiler breeder farms[2] across the EU, who in turn produce fertilised hatching eggs which are incubated and hatched at hatcheries. Day old broiler chicks are then transported to broiler production farms where they are grown to a target weight (c2.3 kg) over a period of between 35 to 45 days.

It is estimated that there are approximately 75 million broiler breeder hens in the EU. Broiler production tends to take place on larger farms, with intensive broiler farming systems (i.e. those with more than 5,000 broilers) accounting for approximately 90% of EU boiler production, but less than 1% of farm holdings.

At the end of the production cycle, broilers are sent to slaughter, with slaughter by-products (including feathers) disposed of in-line with regulatory guidelines by approved animal by-product (ABP) handlers. Spent hens from breeder farms must also be disposed of in this way.[3]

Integrated broiler production models, where a single company controls several or all links in the value chain (either through direct ownership or contracting with growers[4]), are dominant in France, Germany, Italy and Spain. Non-integrated production models, where the different links in the value chain are independent, are more common in Poland (Marie-Laure Augère-Granier, 2019).

3.1.1.2. Layer Value Chain

Intensive broiler and table egg production generally occur on different farms and their value chain is somewhat differently structured. Breeding, hatching, rearing and egg laying often take place on different farms to prevent the possible spread of diseases in line with best practice.

It is estimated that there are approximately 7-million-layer breeder hens in the EU, the key suppliers of layer genetic stock are Hyline, Hendrix Genetics. and Lohmann Breeders.

Layer farms, especially the larger ones, often include the egg grading and packing activities preceding delivery to the end customers. Sometimes, these large companies

[2] Grandparent and parent stock are grown on different broiler breeder farms.
[3] A spent hen is a commercial egg producing chicken (layer or breeder) which has over peaked its optimal egg laying potential. Broiler breeders start producing eggs at between 21-23 weeks of age, with optimal egg production lasting until 60-65 weeks of age.
[4] It is common for the integrator to contract the production of birds to individual growers and pay them a set fee for their facilities, labour and variable costs.

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keep more than a million laying hens in cage systems. However, egg production is less integrated than broiler production with independent layer farms active across all countries.

There is a link between housing systems for hens (either enriched cages or non-cage systems, such as barns), farm size and level of production chain integration. Integrated production models (with coordination by a single company or cooperative) are common in Germany, Spain, Italy and Poland.

In France, feed mills often play an important role in egg production, providing producers with feed, pullets and advice.
Spent hens from layer farms must be disposed of as per the EU ABP regulations. Hens that are at the end of their laying life are considered a by-product and are of limited commercial value.[5]

These hens may be:

- Euthanised and then either sent for rendering to be converted into protein meal for feed or turned into pet food.
- Slaughtered in poultry slaughterhouses for their meat (mainly used in soups, stock or stews);
- Sold on to smaller scale farms (where they can still produce egg); or
- Disposed of by other means in line with regulatory standards (e.g. composted, incinerated or buried a euthanised because of their low market value).

There is limited demand for the meat of spent hens in the EU, with significant volumes exported to Asia and Sub-Saharan Africa where demand is higher.

3.1.2. Poultry Farming

The EU poultry production industry is one of the most intensive farming systems in the EU. Most poultry farms have more than 5,000 birds, while larger farms can have more than 100,000 birds (Eurostat, 2021).

According to a European Parliament's policy report (Broom et al., 2017) broiler chicken, ducks and turkeys account for 1st, 5th and 6th most common animals (respectively) on farm which are destined for use in the food chain.

Poultry birds are generally raised in an intensive system featuring high stocking densities, indoor rearing and genetic breed selection. It is estimated that 90% of broiler chickens are produced using this system (Marie-Laure Augère-Granier, 2019). In line with best practice to maintain biosecurity, breeding and rearing activities are generally undertaken at separate locations or even by different companies.

[5] Spent layer hens are usually killed when egg production slows down ('end-of-lay'), at around 72 weeks of age, although their life expectancy is otherwise six years

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3.1.2.1. Overview of Bird Production

Figures 3.1-3 and 3.1-4 provide a breakdown of the total number of farm holdings with poultry and total birds by type and species in the EU-27 in 2016 (latest available data).

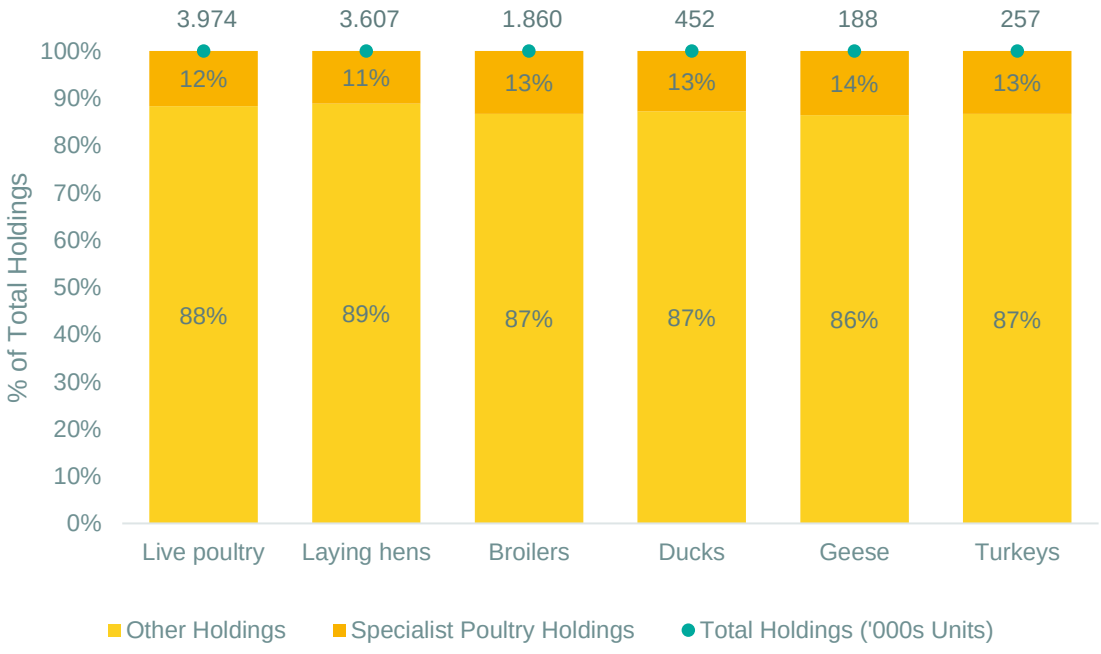
There were almost 4 million farm holdings with poultry in 2016, with specialist poultry farms accounting for 12% of all holdings but 85% of bird production. The breakdown between specialist and other holdings is similar across the different bird types.

While the five countries that are the focus of this report accounted for less than 10% of specialist poultry holdings and total holdings with poultry, they account for significant volumes of birds produced. The five countries account for:

- **52% of layer production;**
- **62% of broiler production; and**
- **74% of other poultry production.**

France was the largest producer of layer hens (13% of total), broilers (17% of total) and other poultry (33% of total). See Table 3.1-1 below for more details.

Figure 3.1-3: Number of Farm Holdings with Poultry 2016: Breakdown of Specialist Poultry vs Other Holdings



Source: Eurostat

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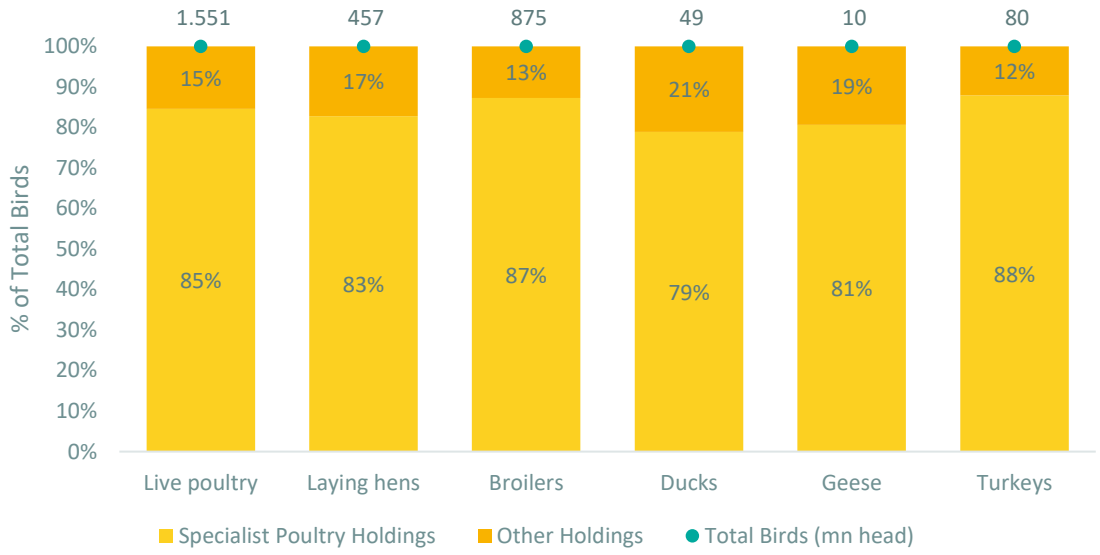
Figure 3.1-4: Poultry Population: Breakdown of Birds on Specialist Poultry vs Other Holdings



Source: Eurostat

Table 3.1-1: Breakdown of Specialist and Total Poultry Holdings by Country and Type

Unit	Country	Specialist Poultry Holdings			Total Holdings		
		Laying Hens	Broilers	Other	Laying Hens	Broilers	Other
No of Holdings (% of Total)	Germany	0.4%	0.4%	0.7%	1.2%	0.2%	1.0%
	Spain	0.6%	1.3%	0.6%	1.8%	1.1%	0.8%
	France	0.7%	2.3%	5.0%	0.7%	1.0%	1.9%
	Italy	0.2%	1.0%	0.7%	0.3%	0.5%	0.4%
	Poland	2.3%	1.3%	2.8%	13.5%	3.5%	17.3%
	Other	96%	94%	90%	83%	94%	79%
No of Birds (% of Total)	Germany	11%	8%	9%	10%	9%	12%
	Spain	13%	14%	11%	11%	13%	9%
	France	14%	15%	32%	13%	17%	33%
	Italy	9%	11%	13%	7%	10%	11%
	Poland	9%	14%	10%	10%	13%	9%
	Other	45%	38%	25%	48%	38%	26%

Source: Eurostat

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3.1.2.2. Overview of Egg Production

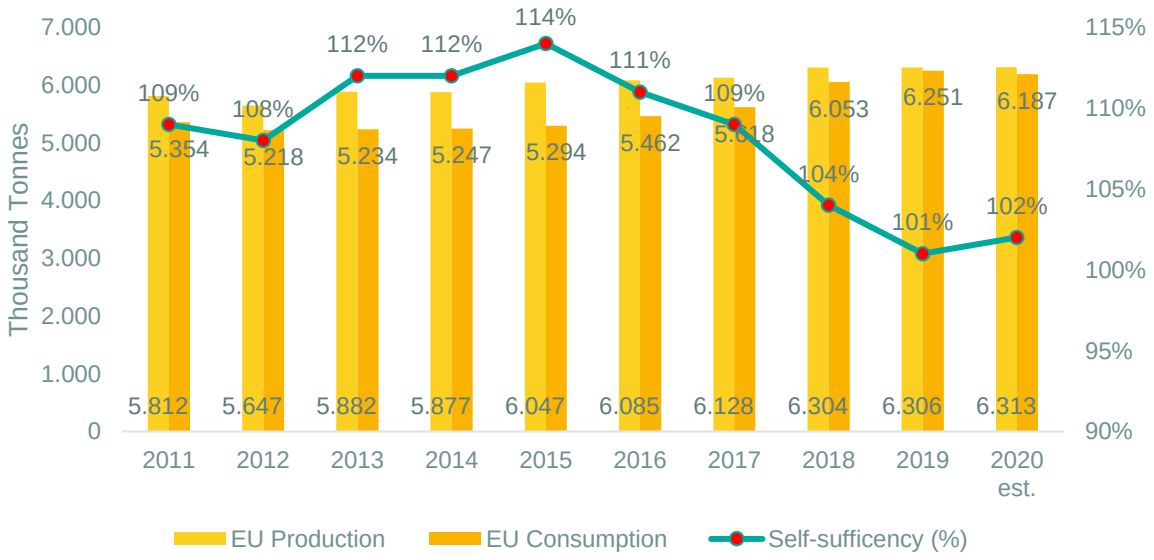
The EU is the world's second largest producer of eggs after China and a net exporter of eggs and egg products (European Commission, 2019). It is 102% self-sufficient. There are 372,420,338 million laying hens in the EU-27 member states producing over 6.1 million tonnes of eggs in 2020 (see Figure 6 below).

Figure 3.1-5 presents the breakdown of laying hen producers in the EU. Over 70% of production is concentrated in 6 key countries: France (14%), Germany (14%), Spain (12%), Italy (12%), Netherlands (10%) and Poland (9%) (see Figure 7 below). About 10% of production consists of hatching eggs (for consumption and chicken rearing). The organisational structure in the laying hen industry differs from other commercial poultry meat industries. There is less integration in the laying hen value chain compared to the broiler meat industry. However, in larger egg producing countries, such as Germany, Spain, Italy and Poland, egg production is widely integrated, with large companies having stocks of over a million laying hens (Marie-Laure Augère-Granier, 2019).

This integrated model means that substantial portions of the value chain from pullet rearing, layer management, feed supply, packing, processing, marketing and retailer are undertaken by a single organisation or cooperative (European Commission 2020).

There are 4 main layer hen production types: enriched cages (48%), barns (33.9%), free range (11.9%) and organic (6.2%) (European Commission, 2020). There is a link between housing systems for hens, farm sizes and level of value chain integration, either semi-integration or with no coordination.

Figure 3.1-5: EU Egg Production and Consumption between 2011-2020



Source: Eurostat 2021

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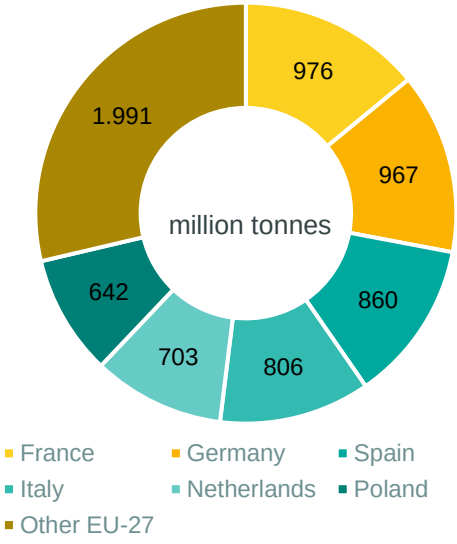
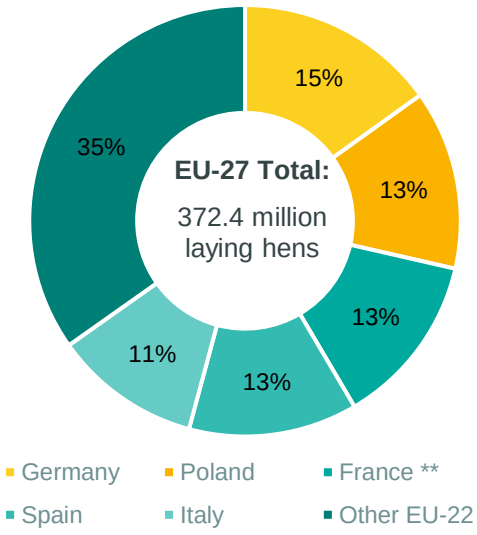
Figure 3.1-6: Main Egg Producing Countries & Laying Hen Populations by Country

Main Egg Producing Countries 2020



Laying Hens Numbers 2019**



Source: Eurostat. ** 2019 figures (latest available)

3.1.3. Poultry Meat Production

Feather availability in the poultry value chain is largely concentrated at poultry slaughterhouses. In 2018, poultry slaughter was carried out by some 1,600 enterprises across the EU.[6]

Poultry meat is the second most produced and consumed meat in the EU. In 2019, 13.3 million tonnes of poultry meat was slaughtered compared to 22.8 million tonnes of pig meat (see Figure 3.1-7 below).

Over the period 2010-2019, EU poultry meat production growth was the highest when compared to that from other key meat categories (bovine, pig, sheep, goat), increasing by 2.8 million tonnes (CAGR 2.7%) between 2010-2019.

[6] Latest available data. These enterprises employed some 146,200 employees in 2018.

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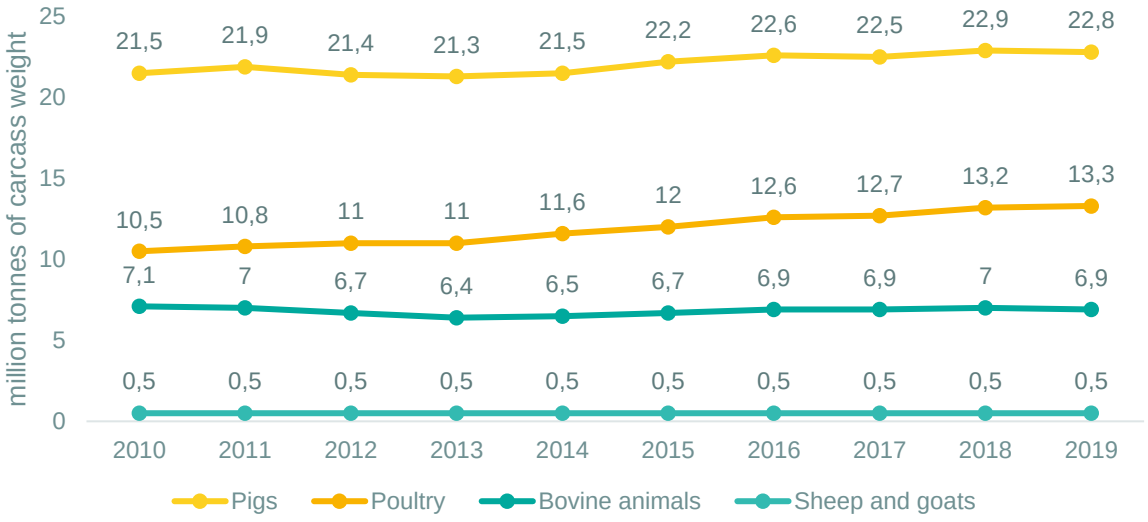
Figure 3.1-7: Production of meat from Slaughterhouses by Species between 2010 – 2019 (million tonnes of Carcass Weight Equivalent CWE)



Source: Eurostat 2021

It is reported that the poultry meat sector was the only sector to have increased production during the Covid-19 pandemic, even without increasing exports. Consistent growth in this sector has been observed in the EU for the last 20 years and is expected to increase by CAGR 2.7% from 2010 (OECD-FAO Outlook, 2021).

In 2020, EU countries produced a total of 13.6 million tonnes of poultry meat, 67% of which (or 9.1 million tonnes of poultry meat) was produced by the five largest poultry meat producing EU countries (Poland, Spain, France, Germany and Italy). These 5 key countries are the focus of this report. These countries accounted for 63% of enterprises and 61% of employees active in the EU poultry meat production sector (OECD-FAO Outlook, 2021).

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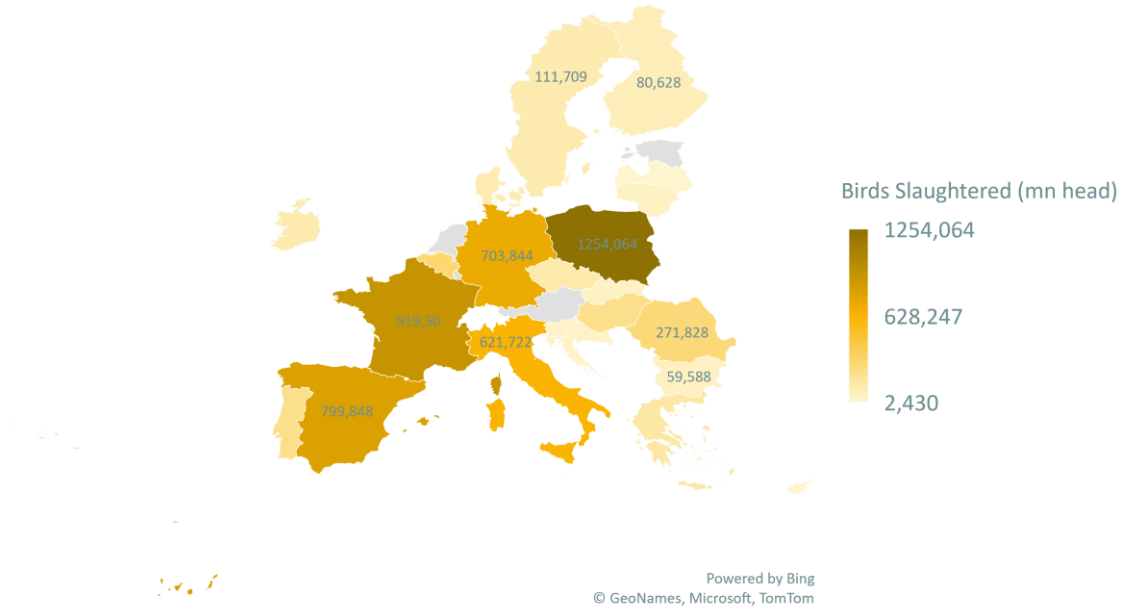
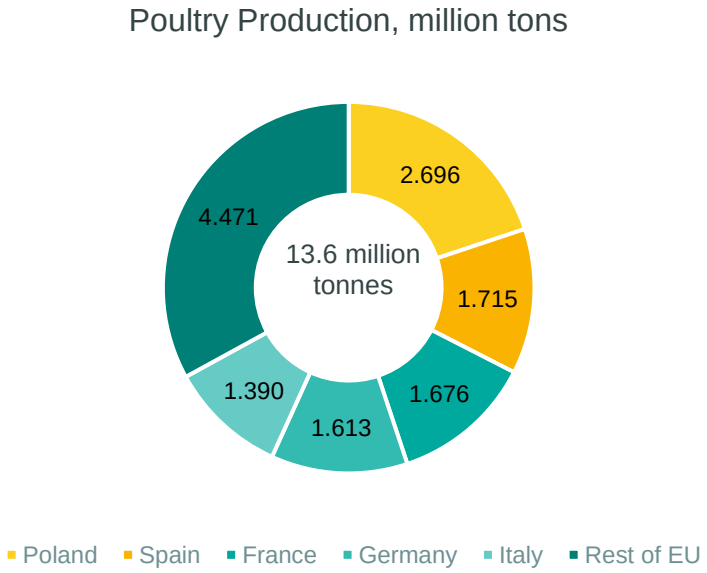
Figure 3.1-8: Birds Slaughtered by Country 2020



Source: Eurostat

Other EU countries produced another 4.5 million tonnes between them. EU production of poultry meat increased by more than 1% year on year in 2020 (Eurostat 2021).

Figure 3.1-9: Main Poultry Producing Countries in the EU in 2020



Source: Eurostat, 2021.
*Carcass weight equivalent (C.W.E)

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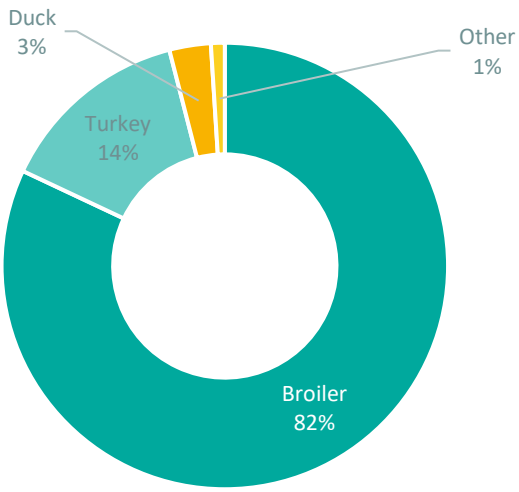
Broiler production is the largest sub-sector of the poultry meat production chain, followed by turkeys and ducks (see Figure 3.1-10). Over 88% of total EU turkey production is concentrated in Poland, Spain, France, Germany, Italy and the Netherlands. France is the largest producer of ducks in the EU accounting for 43% of total production.

Figure 3.1-10: Breakdown of EU Poultry Meat by Species



Source: MSs notifications – Expert group.
*Other includes spent hens, geese, guinea fowl, ostriches, pheasants, quail & pigeons

The latest OECD-FAO agricultural outlook (2021) expects the poultry meat sector to be the only meat sector in the EU to increase production over the next ten years. Annual poultry meat production is expected to grow by 4.6% (or 520,000 tonnes) compared to 2020 (see Figure 3.1-11 below).

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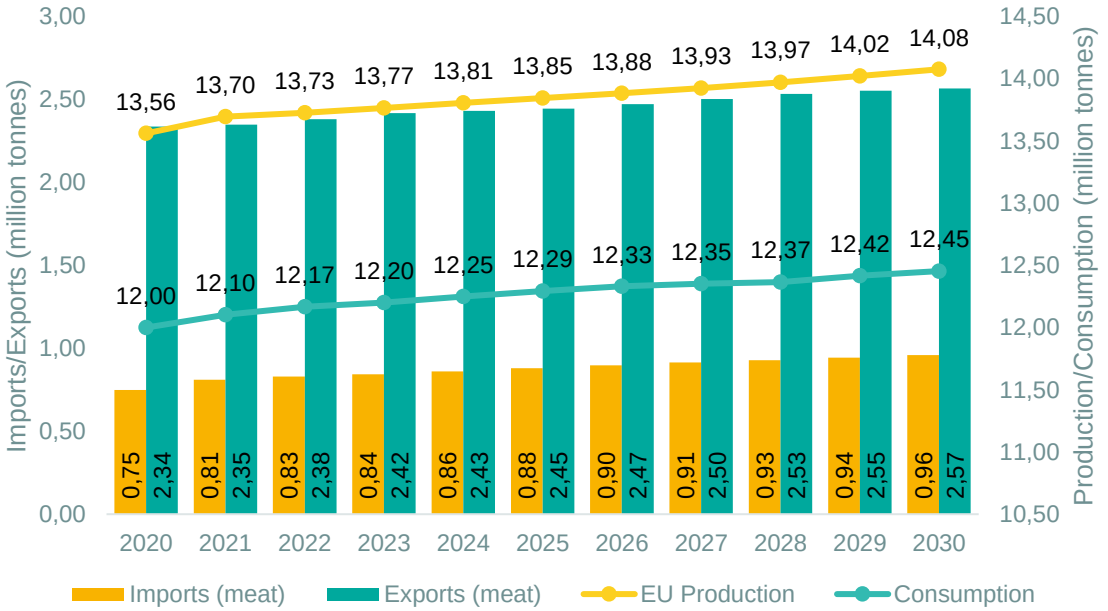
Figure 3.1-11: Forecast of EU Poultry Meat between 2020-2030 (million tonnes)



Source: Eurostat, OECD-FAO Outlook, 2021

The expansion of poultry production around the world has increased the generation of different poultry by products, i.e., viscera, feet, head, bones, blood and feathers. Feathers constitute up to 10% of all by-products generated by the poultry industry (KARMA 2020). Globally, around 8.5 million tonnes of chicken feathers, 0.6 million tonnes of turkey feathers and 0.4 million tonnes of duck feathers are generated annually (EFPRA 2020).

According to the European Commission, 13.1 million tonnes of poultry meat was produced in the EU (EU-28) only in 2014, with an estimated generation of 3.1 million tonnes of feather by-products.

3.1.4. EU 27 Feather Waste Supply from Slaughterhouses:

To estimate the available raw material (feathers) in the EU-27 for the main bird species, slaughtering data from Eurostat was used together with various assumptions around kill-out ratios and feather as a percentage of liveweight. These are detailed below:

Table 3.1-2: Assumptions Used in Feather Calculation

Assumption	Chickens**	Turkeys	Ducks
Average Carcass Weight*	1.62	9.54	2.80
killing-out percentage	75%	80%	72%
Average Liveweight	2.16	11.93	3.88
Feathers %	4.00%	4.70%	6.00%

Source: Kokoszyński and Bernacki, 2008, Eurostat.

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*Average carcass weight and yield (kill-out %) was calculated based on data published by National Authorities for the period 2010-2020. **Includes spent layers and breeders.

Kill-out ratios were used to calculate the total liveweight value of poultry used as inputs in French slaughterhouses. From the literature it is referenced that 4% of broilers and spent hens total body weight consist of feathers, 4.70% for turkeys and 6% for ducks. Using these figures, it was possible to estimate total available feathers from the main commercial poultry species in the EU-27 (see Table 3.1-3 and Figure 3.1-12 below).

Table 3.1-3: Estimated Feather Availability in the EU-27 in 2020

Bird Type	Total Feather Availability (tonnes)
Chickens	558,434
Ducks	28,024
Turkey	112,100
Total	**698,557**

Source: Farrelly & Mitchell

Chicken (broilers/layers) feathers are the largest source of raw materials making up 80% of the total available feathers in 2020. This is followed by turkeys (16%), with duck feathers accounting for just 4% of estimated feather availability among these species.

Average annual feather availability from these species during the period 2010-2020 was almost 621,200 tonnes.

Total feather availability among these species increased at a CAGR of 2.6% to 698,600 metric tonnes over the period 2010-2020.

The availability of both chicken and turkey feathers grew over the period (3.2% and 1.2% CAGRs), with duck feather availability falling at a CARC of -1.8%.

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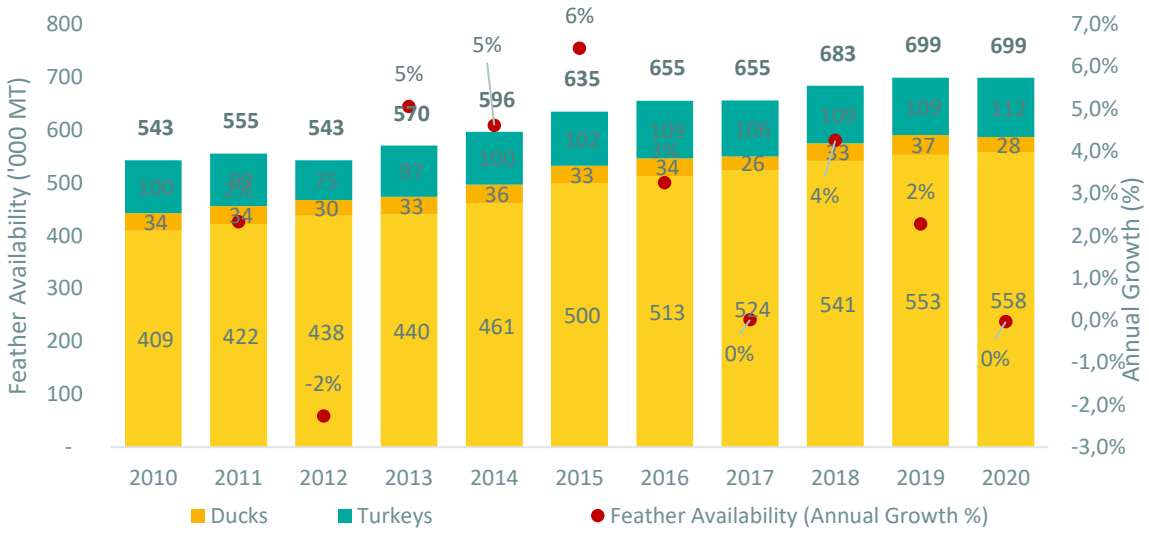
Figure 3.1-12: Feather Volumes Available from Slaughtered Birds in the EU-27 2010-2020*



Source: Farrelly & Mitchell.
Based on Eurostat slaughtering data. Note that not data was not provided for a small number of countries, most notably, Romania, which accounted for c4% of EU poultry slaughter in 2015.

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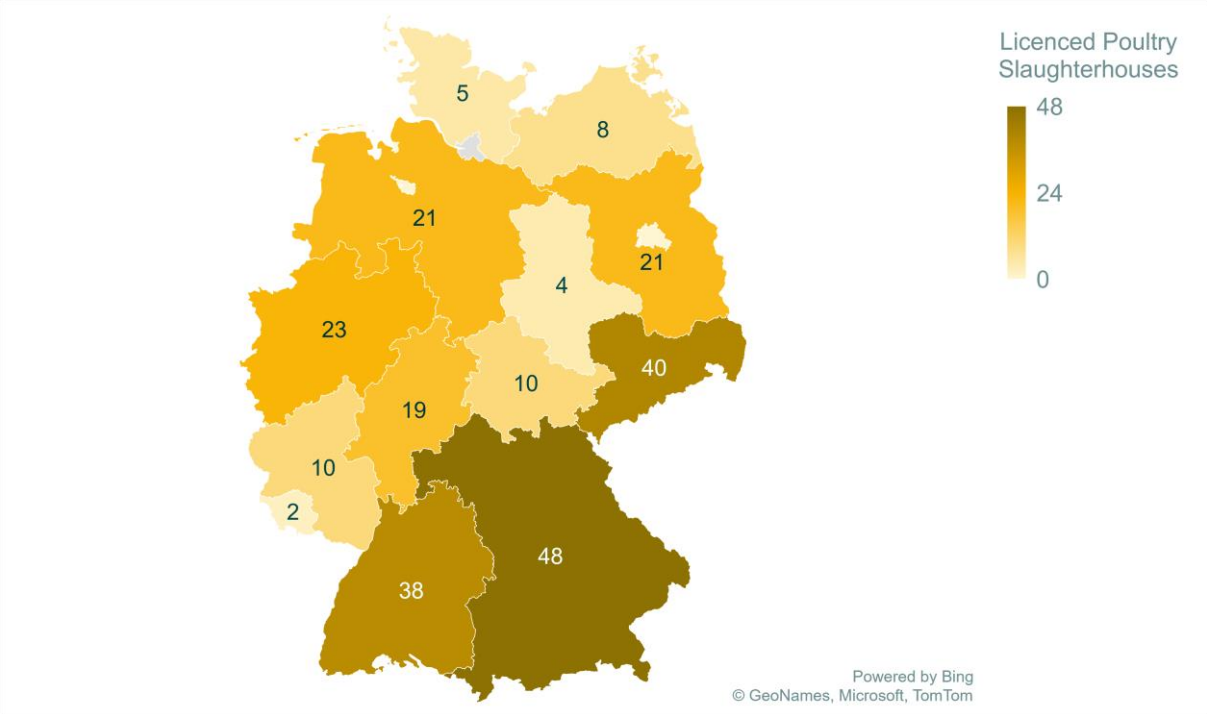
3.2. German Poultry Slaughterhouses

3.2.1. Sector Overview

There are 249 EU approved poultry slaughterhouses in Germany. These are located across 81% (n=13) of Germany's administrative regions, with Berlin, Bremen and Hamburg being the only regions without such slaughterhouses.

The main regional concentrations of slaughterhouses are to the South, Southeast and Northwest of Germany. The Bavaria, Baden-Württemberg and Sachsen regions in the South-Southeast account for 51% of slaughterhouses, with Niedersachsen, Nordrhein-Westfalen, Hesse to the Northwest accounting for a further 25%.

Figure 3.2-1: Distribution of EU Approved Poultry Slaughterhouses in Germany



Source: German Federal Office of Consumer Protection & Food Safety

According to the latest data from Destatis,[7] approximately 199 (n=199) of these EU approved slaughterhouses were operational during 2020.

Figure 3.2-2 gives an overview of birds slaughtered, poultry meat production volumes and operating slaughterhouses over the period 2010-2020.

[7] https://bit.ly/3mBc2kP

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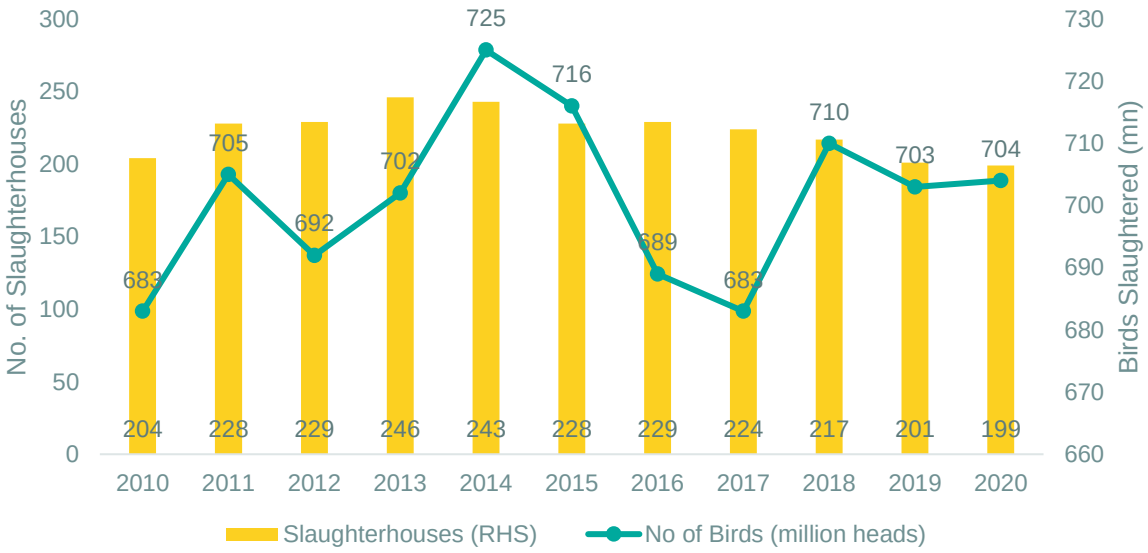
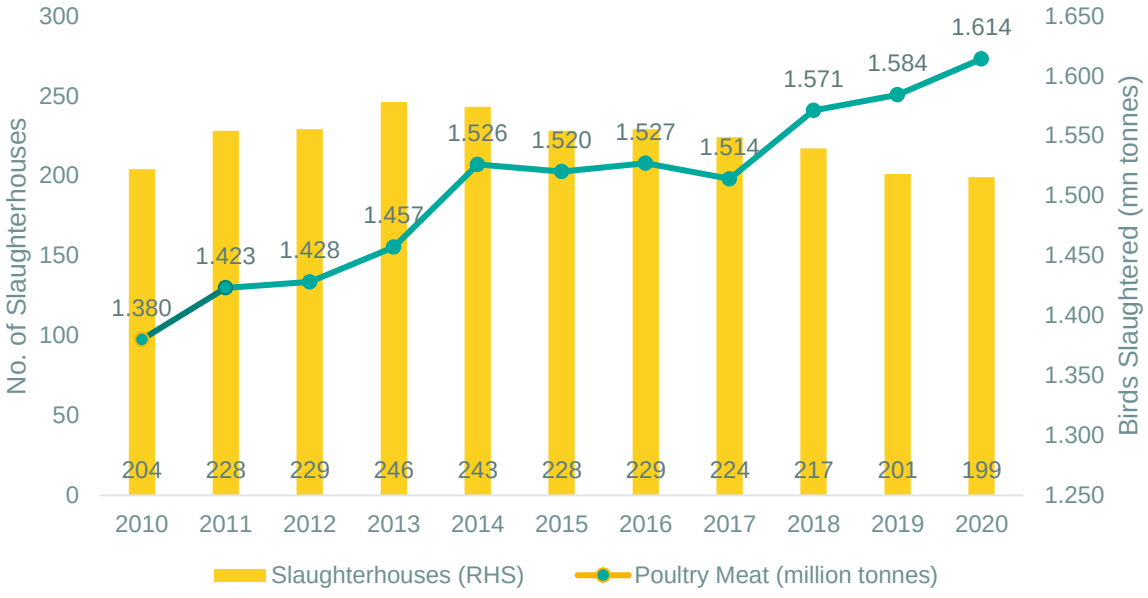
Figure 3.2-2: Overview of Poultry Meat Slaughter (Birds Slaughtered & Operating Slaughterhouses 2010-2020)



Source: Destatis. *Carcass weight

Figure 3.2-3: Overview of Poultry Meat Slaughter (Poultry Meat Produced & Operating Slaughterhouse 2010-2020)



Source: Destatis. *Carcass weight

Many slaughterhouses process multiple species of birds. Table 3.2-1 gives a breakdown of the number of slaughterhouses processing different bird species and the average number per species of birds slaughtered by poultry slaughterhouses.

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The majority of slaughterhouses (n>100) process multiple species, (geese, ducks and broilers) with 77 slaughterhouses handling turkeys and 71 approved for slaughtering spent hens.

Table 3.2-1: Breakdown of No. of Slaughterhouses & Average No. of Birds Slaughtered by Species

Species	Average No. of Slaughterhouses	Average No. of Birds Slaughtered
Broilers	**100**	**6,230,000**
Spent Hens	**71**	**467,000**
Geese	**106**	**6,000**
Ducks	**101**	**120,000**
Turkeys	**77**	**454,000**
Ostriches	**28**	**100**
Pigeons	**11**	**300**
Guinea Fowl	**10**	**200**
Quail	**6**	**100**
Phesants	**4**	**100**

Source: Destatis

Only a relatively small number of slaughterhouses process each of the other species. The average number of birds slaughtered by slaughterhouses ranged from 6.23 million (for broilers) to just 100 for quails and pheasants. Table 3.2-2 gives a breakdown of the average number of birds processed each month in 2020.

Table 3.2-2: Average Number of Birds Slaughtered by Bird Type

Bird Type	Average Monthly Slaughter Rate (No. of Birds)
Broilers	51,930,431
Spent Hens	2,758,434
Ducks	1,089,419
Turkey	2,908,362
Other	48,084

Source: Destatis

Output from German poultry slaughterhouses grew at 1.6% CAGR between 2010-2020, increasing from 1.38 to 1.61 million tonnes. While meat output increased, the number of birds slaughtered over the period remained relatively steady.

The increase in meat production was due to steady increases in meat yields from broilers (+26% over the 2010-2020 period) and turkeys (+14%).

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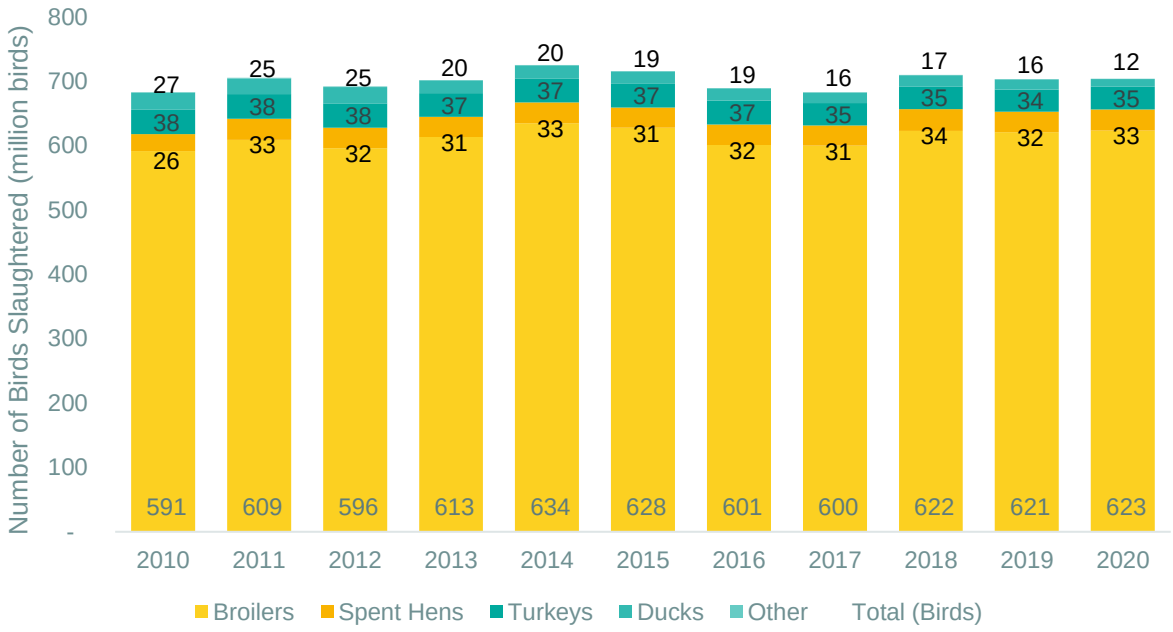
Total birds slaughtered ranged between 683 million to 725 million birds over the period 2010-2020. In 2020, 703 million birds were slaughtered which was an increase of 3% compared with 2010 volumes and a decrease of 3% compared with the 2014 peak.

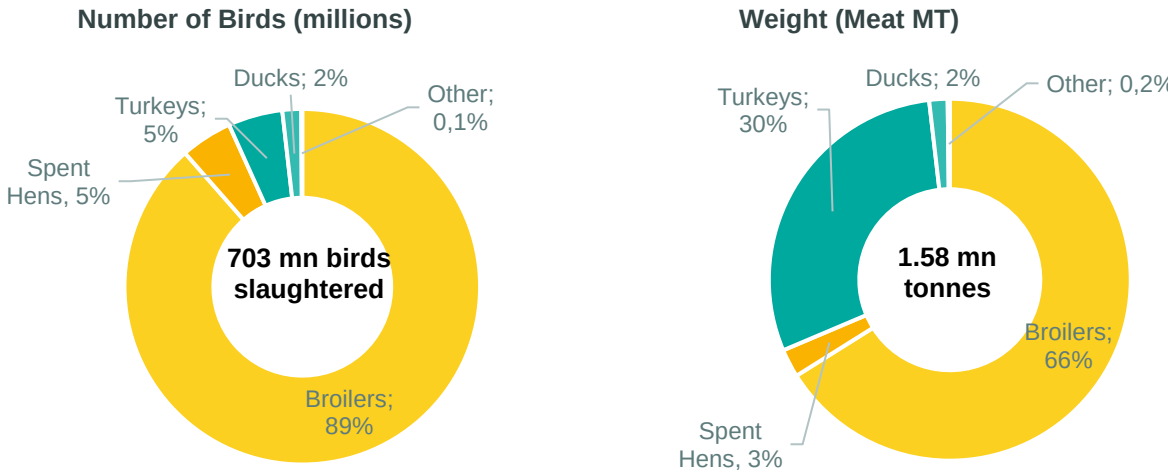
Chickens (broilers and spent hens) accounted for 93% of birds slaughtered in 2020, with turkeys and ducks accounting for 5% and 2% respectively.

Figure 3.2-4: Number of Birds Slaughtered in Germany by Species & Total Poultry Meat Produced 2010-2020



Source: Eurostat 2020

Figure 3.2-5: Breakdown of Birds Slaughtered by Species 2020



Source: Destatis

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3.2.2. Regional Analysis

The Federal Statistical Office (Destatis) provides regional data for poultry slaughterhouse production across six of Germany's thirteen regions. These regions slaughtered some 441 million birds in 2020, accounting for around 63% of total poultry meat production in Germany.

Over the ten-year period (2010-2020), annual slaughter in Germany grew at 0.3% CAGR. Output declined in Baden-Württemberg (-5.5% CARC) and grew across the other regions, with CAGR's ranging from 0.2% in Niedersachsen to 3.3% in Rheinland-Pfalz.

Average slaughter by slaughterhouse in Germany in 2020 was 3.54 million birds and ranged from 13,000,000 birds in Niedersachsen to just 10,000 birds in the Rheinland-Pfalz region.

Average slaughter by slaughterhouses over the period declined at -6.7% CARC in Baden-Württemberg and -1% in other regions. The average annual slaughter by processors increased across the other regions, ranging from a 2.6% CAGR in Baveria to a 6.8% CAGR in Schleswig-Holstein.

Table 3.2-3: Regional Slaughter in 2020 & Average Slaughter by Slaughterhouses

Region	Birds Slaughtered (mil. head) 2020	Birds Slaughtered (CARC 2010-2020)	Average Slaughter by Slaughterhouse 2020	Average Slaughter by Slaughterhouse (CARC 2010-2020)
Niedersachsen	324,850,000	0.2%	13,000,000	2.7%
Bavaria	76,190,000	0.8%	2,060,000	2.6%
Nordrhein-Westfalen	36,340,000	1.9%	1,350,000	5.7%
Baden-Württemberg	3,390,000	-5.5%	170,000	-6.4%
Schleswig-Holstein	210,000	0.5%	60,000	6.8%
Rheinland-Pfalz	50,000	3.3%	10,000	3.3%
Other Regions	262,870,000	0.2%	3,330,000	-1.0%
All Regions	***703,860,000***	***0.3%***	***3,540,000***	***0.5%***

Source: Destatis

3.2.3. International Trade

Germany is c. 90% self-sufficient in poultry meat production, with the domestic industry producing c. 1.6 million tonnes of poultry meat in 2020. However, the German poultry meat industry faces stiff competition from imports, which account for more than 50% of local consumption.

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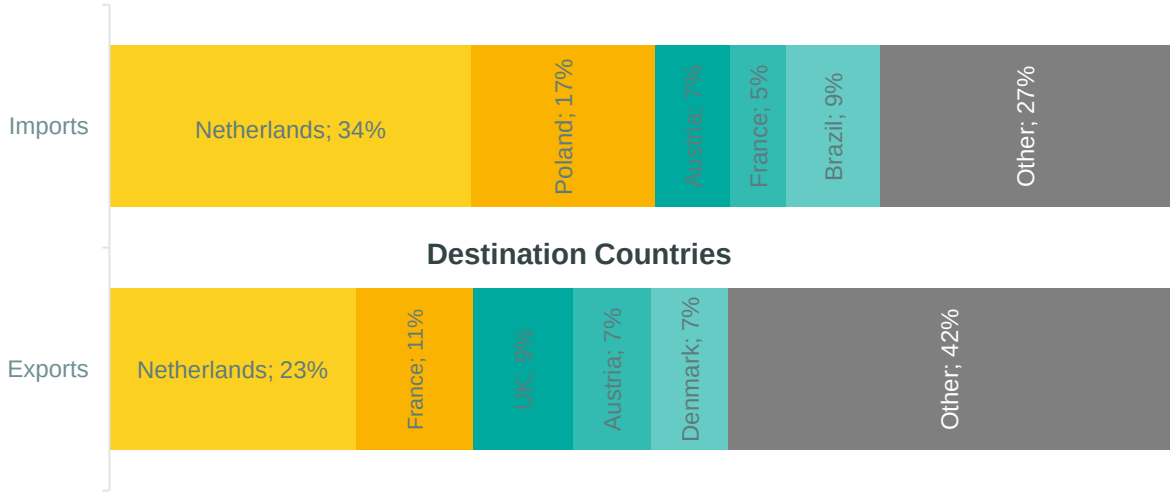
Although Germany exports around 50% of production from poultry slaughterhouses, the domestic market accounts for the majority of sales revenue (78%). The German industry is competing with the same international processors in both the German and international markets.

Figure 3.2-6: Breakdown of Germany's Poultry Meat Trade Volumes by Key Partner & Type



Source: UN Comtrade 2020

Key international suppliers to the German market include the Netherlands, Poland, Austria, France and Brazil. Together these account for 73% of Germany' poultry meat imports.

The top 5 export destinations for German poultry meat products are listed in Figure 3.2-6. They account for 58% of German exports. Other European markets make up the bulk of the rest of German exports.

3.2.4. Breeding and Rearing

3.2.4.1. Hatcheries

Figure 3.2-10 gives an overview of estimated breeder birds by type in Germany. Broiler breeders account for the vast majority of breeding stock (84%), with turkey breeders accounting for 8% and layer breeders a further 7%.

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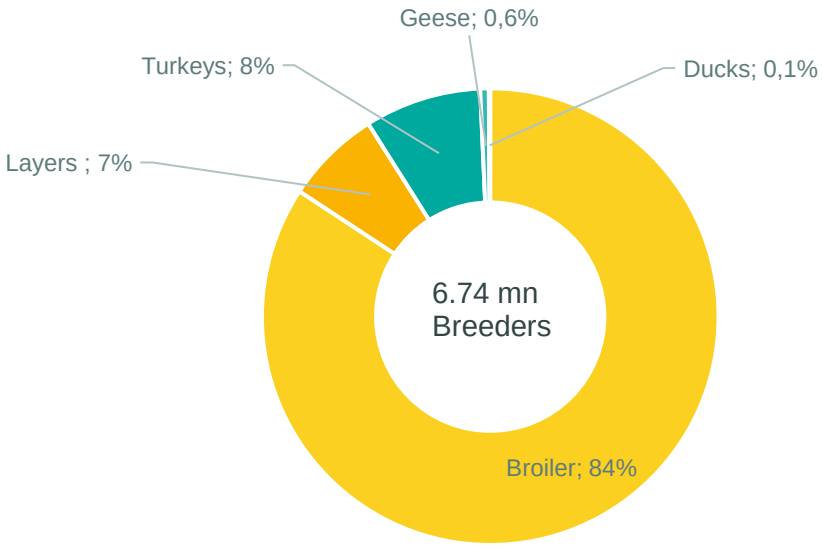
Figure 3.2-7: Estimated Breakdown of Breeding Birds by Type in Germany 2020



Source: Farrelly & Mitchell Research

An estimated 6.74 million breeder birds are supplying hatcheries across Germany, who in turn supply poultry rearing farms.

There are 58 hatcheries in Germany spread across 10 regions. The number of hatcheries declined by 20 between 2010-2020.

Table 3.2-4: Breakdown of Number of Hatcheries by Type and Region in Germany 2020

Region	Broiler Breeder	Broiler DOC	Layer Breeder	Layer DOC	Duck	Geese	Guinea Fowl	Turkey	**Total Hatcheries**
Niedersachsen	0	6	1	4	2	6	0	5	**23**
Nordrhein-Westfalen	0	2	0	8	1	1	0	1	**11**
Bayern	2	7	2	4	2	2	1	1	**7**
Sachsen	2	3	0	0	0	4	0	0	**7**
Baden-Württemberg	0	0	0	2	0	0	0	1	**3**
Sachsen-Anhalt	0	2	0	0	0	0	0	0	**2**
Schleswig-Holstein	0	0	0	1	0	1	0	0	**2**
Brandenburg	0	0	0	0	1	0	0	0	**1**
Hessen	0	0	0	1	0	0	0	0	**1**

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Mecklenburg-Vorpommern	0	0	0	1	0	0	0	0	**1**
Total by Type*	4	20	3	21	6	14	1	8	**58**

Source: Destatis.
*Note that some hatcheries supply multiple value chains.

There are twenty hatcheries supplying the broiler value chain, including four hatcheries that produce breeder birds. Twenty-two hatcheries supplying the layer value chain, of these 21 produce DOCs for layers farms and 3 produce layer breeders. Fourteen hatcheries supply farmers with geese; with 8 supplying the turkey value chain, 6 the duck value chain and 1 supplying guinea fowl.

Hatcheries are largely concentrated in four regions, Niedersachsen, Nordrhein-Westfalen, Baveria and Sachsen. These regions account for more than 80% of the hatcheries operating in Germany and produced some 1.42 billion hatched eggs and 2.16 billion fertilised eggs in 2020.

Output from hatcheries in these regions increased over the period 2010-2020. The number of hatched eggs increased at 1.4% CAGR and the number of fertilised eggs increased at a 0.8% CAGR over the period.

3.2.4.2. Poultry Husbandry (Rearing Farm)

Primary production of poultry in Germany was worth some €3.5 billion in 2020 (8% of the total value of agricultural production).

Birds production accounted for 70% of poultry production value (€2.47 billion), however, its share declined over the period 2014-2020. Egg production's share of production value increased from 25% to 30% over the period (to €1.06 billion).

While Germany's poultry population increased substantially since the turn of the millennium (up 42% since 2001 to reach 173 million birds in 2020), the size of Germany's poultry flock has declined somewhat since 2013.

Since 2000, there has been growth across all bird species/types except other (geese and ducks), however, increased production of broiler hens has been a key driver of growth. The number of broilers increased by 80%, with layers increasing by 14% and turkeys up 22%.

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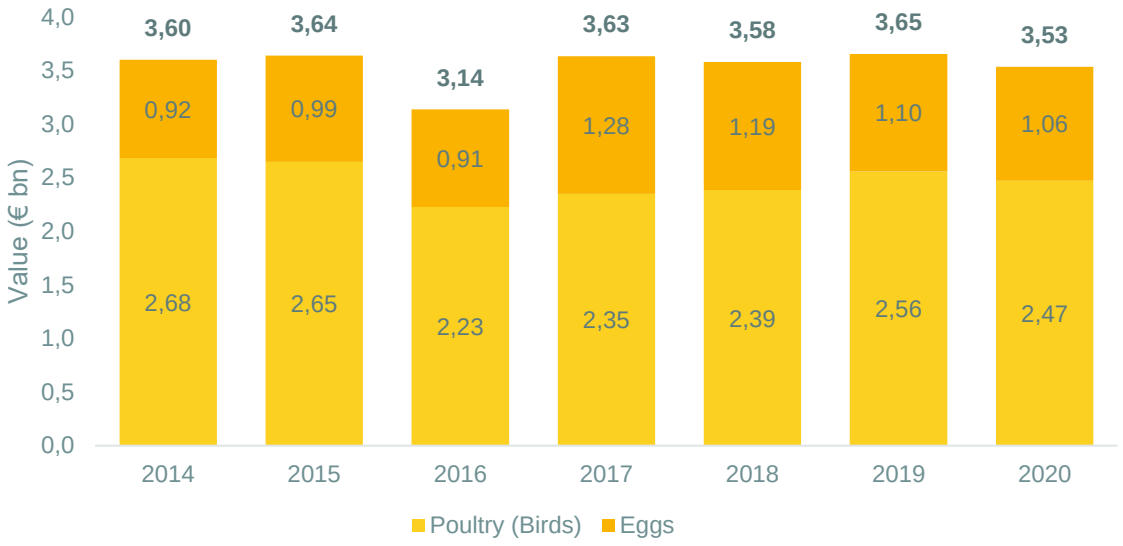
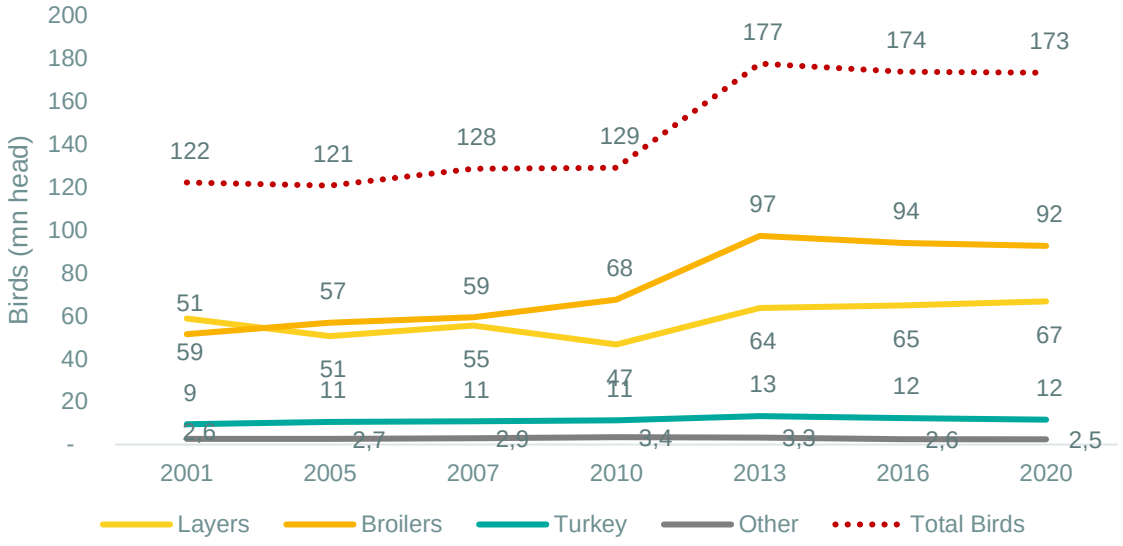
Figure 3.2-8: Value of Poultry Farm Production 2014-2020



Source: BMEL

Figure 3.2-9: Evolution of Germany's Poultry Population by Species 2001-2020*



Source: Destatis. *Surveys of poultry flock populations are carried out every two to four years.

Table 3.2-5 details the breakdown of poultry farm holdings and birds by bird type and flock size in 2020. This data shows that chicken production is concentrated on larger holdings, with broiler farming more concentrated on large farms compared to layers.

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There are 3,828 farms with broiler keeping places in Germany. Approximately 36% of these farms keep more than 30,000 broilers account and account for 99% of broiler production.

There are some 4,325 layer farms that keep at least 3,000 birds (these account for c10% of all farms that keep layer hens). Of these, 18% keep more than 30,000 layer birds, accounting for 60% of layer production.

Turkey production is also concentrated on larger holdings, with 91% of birds concentrated on farms with more than 10,000 birds (26% of holdings with turkey places).

Table 3.2-5: Breakdown of Poultry Holdings and Birds by Flock Size in 2020

Flock Size (No. of Birds)		< 5,000	5,000 to 9,999	10,000 to 29,999	30,000 to 49,999	>50,000
Layers*	Holdings	23%	22%	37%	9%	9%
	Birds	3%	7%	29%	14%	46%
Broilers	Holdings	45%	14%	5%	18%	18%
	Birds	0.03%	0.1%	1%	19%	81%
Flock Size (No. of Birds)		1 to 99	100 to 999	1,000 - 9,999	>10,000	
Turkeys	Holdings	57%	6%	11%	26%	
	Birds	0.1%	0.2%	9%	91%	

Source: BMEL

*Layer farm data is for farms holdings with at least 3,000 hen keeping places

3.2.4.3. Regional Distribution of Poultry Flock

The national poultry flock is concentrated in five regions which account for 82% of birds (Niedersachsen, Sachsen-Anhalt, Bayern, Nordrhein-Westfalen and Brandenburg).

The Niedersachen region accounts for 50% of the German poultry flock, with the other top five regions account for between 6% and 9% of total birds.

Table 3.2-6: Top 5 Poultry Producing Regions by Type in 2020 (% of Total Poultry Birds)

Region	Broilers	Layers	Other Poultry
Niedersachsen	60%	37%	43%
Nordrhein-Westfalen	6%	10%	12%
Bayern	7%	10%	
Sachsen-Anhalt	11%	8%	9%
Sachsen		7%	
Brandenburg	5%		12%
Baden-Württemberg			8%
Other	**11%**	**29%**	**24%**

Source: Destatis

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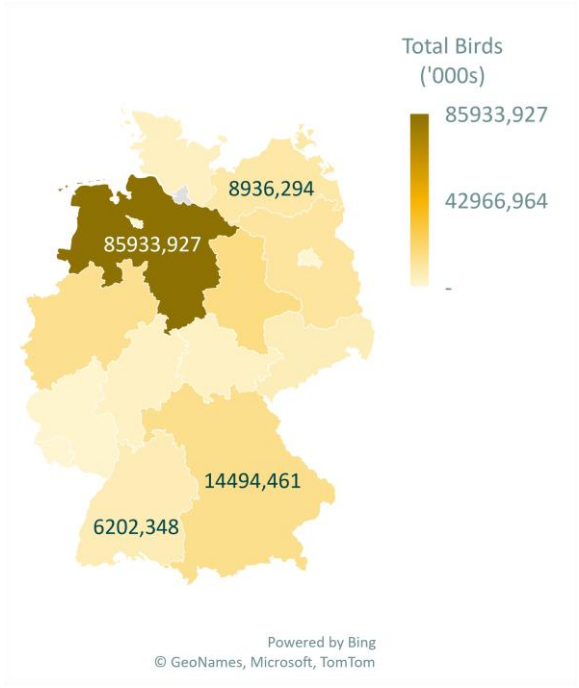
Figure 3.2-10 provides a regional breakdown of Germany's poultry population by flock type. The broiler flock is more concentrated than the layer flock, with 89% of broilers concentrated in five regions (compared to 71% of layers). Some 84% of other poultry birds are concentrated in 5 regions.

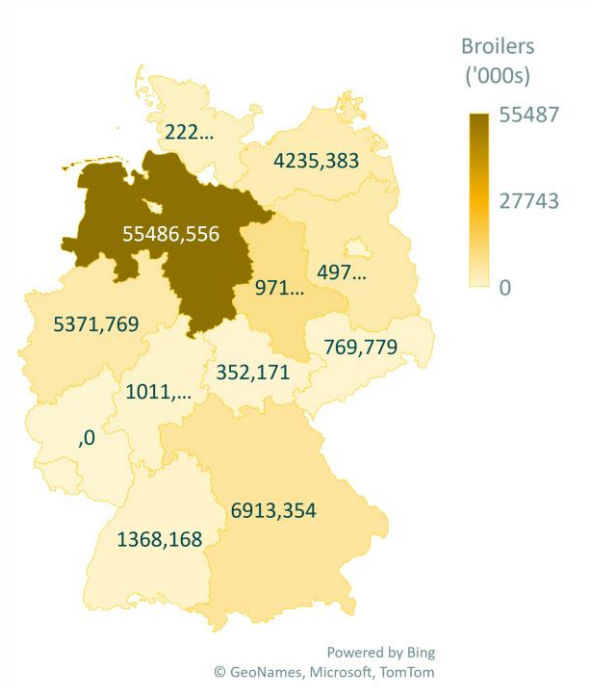
Niedersachen is the leading region for the production of all bird types (60% of broilers, 37% of layers and 43% of other poultry). The Sachsen-Anhalt and Nordrhein-Westfalen regions are also among the top five producing regions for broilers, layers and other poultry.

Figure 3.2-10: Regional Distribution of Germany's Poultry Flock by Bird Type*

Total Poultry Population ('000s of Birds)



Broiler Population ('000s of Birds)



Layer Population ('000s of Birds)

Population of Other Species ('000s of Birds)

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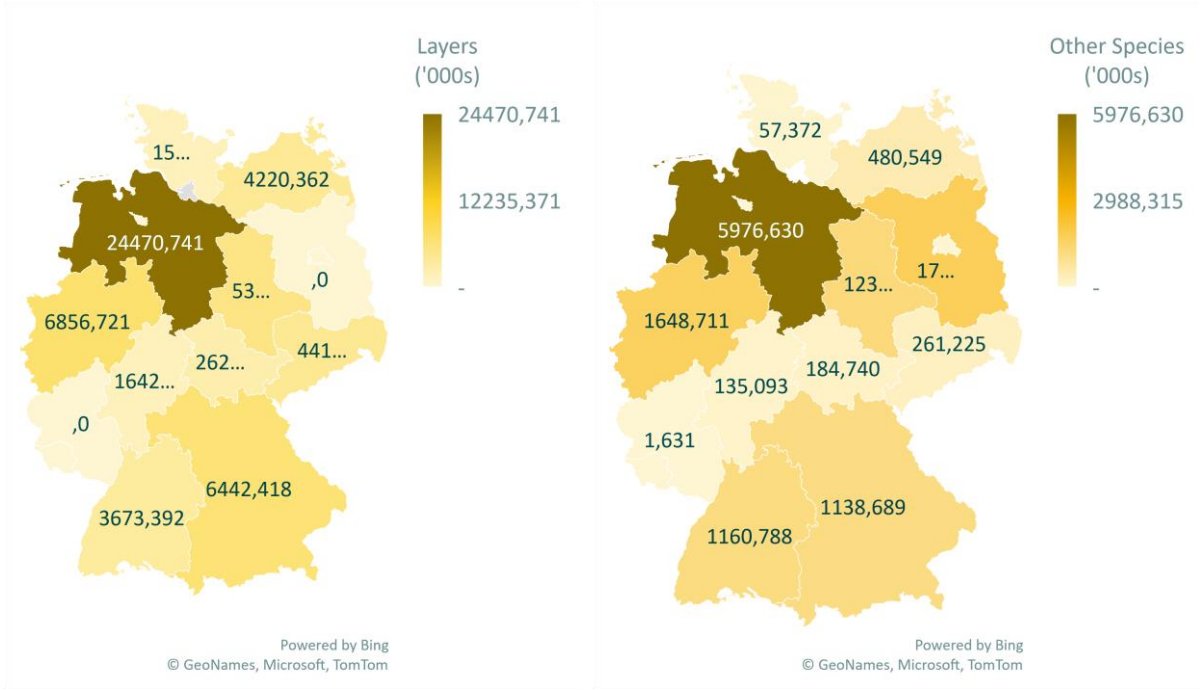

Source: Destatis. *Based on a March 2020 survey.
Other species includes turkey, duck and geese.

Table 3.2-7 gives a breakdown of the regional distribution of farms keeping birds by bird type/ species. Poultry farms are largely concentrated across four regions (Baden-Württemberg, Bayern, Niedersachsen and Nordrhein-Westfalen). These regions account for 78% of layer farms, 77% of broiler farms and 68% of other poultry farms. Bayern (46% of farms) and Baden-Württemberg (15% of farms) have the most layer farms. Niedersachsen (31% of broiler farms and 14% of other poultry farms) and Bayern (26% and 30%) have the most broiler farms and other poultry farms.

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Table 3.2-7: Regional Distribution of Poultry Farms by Type/Species 2016

Region	All Chickens	Pullets	Layers	Broilers	Other Poultry	Geese	Duck	Turkey
Baden-Württemberg	**7,103**	254	6,940	260	**976**	541	496	283
Bayern	**20,953**	635	20,458	870	**2,491**	1,154	1,801	456
Berlin	**6**	2	6	3	**5**	3	3	2
Brandenburg	**819**	61	764	84	**317**	134	222	64
Bremen	**19**	1	19	1	**8**	5	7	0
Hamburg	**29**	1	28	0	**4**	4	2	1
Hessen	**2,953**	122	2,848	220	**566**	336	331	124
Mecklenburg-Vorpommern	**586**	47	506	100	**198**	85	129	56
Niedersachsen	**5,183**	203	4,167	1,046	**1,201**	561	619	398
Nordrhein-Westfalen	**3,840**	213	3,558	372	**991**	682	422	216
Rheinland-Pfalz	**1,182**	64	1,146	91	**225**	144	#	#
Saarland	**204**	9	201	15	**38**	23	22	4
Sachsen	**1,567**	83	1,528	51	**474**	243	354	57
Sachsen-Anhalt	**494**	33	456	46	**198**	76	140	49
Schleswig-Holstein	**1,445**	72	1,366	137	**386**	229	277	59
Thüringen	**820**	50	795	34	**250**	133	181	33
Total	**47,203**	**1,850**	**44,786**	**3,330**	**8,328**	**4,353**	**5,006**	**1,802**

Source: Destatis.
#Numerical value unknown or not disclosed

3.2.5. Feather Waste Supply from Slaughterhouses in Germany

To estimate the available raw material (feathers) in Germany, slaughtering data from Destatis (2021) was used together with various assumptions regarding kill-out ratios and feather as a percentage of liveweight. These are detailed below:

Table 3.2-8: Assumptions Used in Feather Calculation

Assumption	Broilers	Spent hens	Turkeys	Ducks
Average Carcass Weight*	1.71	1.23	13.66	2.2
killing-out percentage	75%	75%	80%	72%

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Liveweight	2.3	1.6	17.1	3
Feathers %	4.00%	4.00%	4.70%	6.00%

Source: Kokoszyński and Bernacki, 2008
*Average carcass weight was calculated based on data published by Destatis

These kill-out ratios were used to calculate the total liveweight value of poultry as inputs in the slaughterhouses in Germany. Published literature references that 4% of broilers and spent hens total body weight consist of feathers, 4.70% for turkeys and 6% for ducks. Using these figures, the following table estimated the total available feathers for Germany in 2020 (see Table 8 below).

Table 3.2-9: Estimated Feather Availability for Germany in 2020

Bird Type	Total Feather Availability (tonnes)
Broilers	56,882
Spent hens	2,175
Ducks	2,209
Turkey	28,011
Total	**89,276**

Source: Destatis, BMEL, Farrelly & Mitchell

Broilers feathers are the largest source of raw materials making up 64% of the total available feathers, followed by turkeys (31%) and spent hens (2%). Duck feathers make up just 2% of the market but these feathers are considered of higher value due to their potential use in apparel and fibre production industry.

The total average feather availability during the period 2010-2020 was 83,912 tonnes. The broiler industry was the largest source of feathers during this period providing 60% of the volume, followed by turkeys (33%), ducks (4%) and spent hens (3%). See Figure 3.2.-11 below for a further breakdown.

Overall feather availability has increased by 15% since 2010. This is in part due to the increase in broiler slaughter numbers which results in an increase in feather availability from 55% in 2010 to 64% in 2020, providing an extra 14,062 tonnes of feathers.

Feather availability from the laying hen and turkey industries has remained relatively constant throughout this period with availability from the duck industry declining by 2,904 tonnes.

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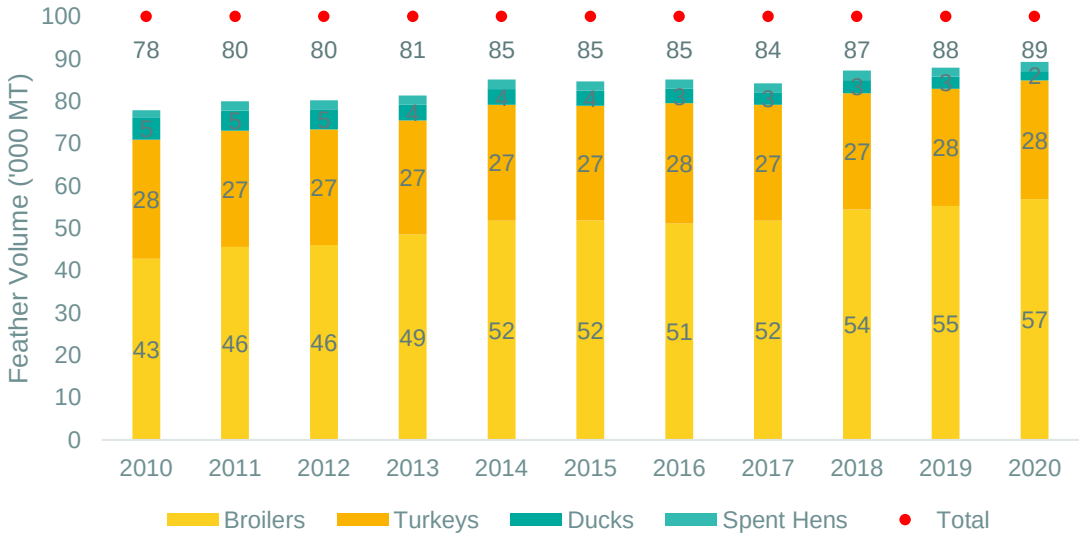
Figure 3.2-11: : Feather Volumes Available from Slaughtered Birds 2010-2020



Source: Farrelly & Mitchell

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3.3. French Poultry Slaughterhouses

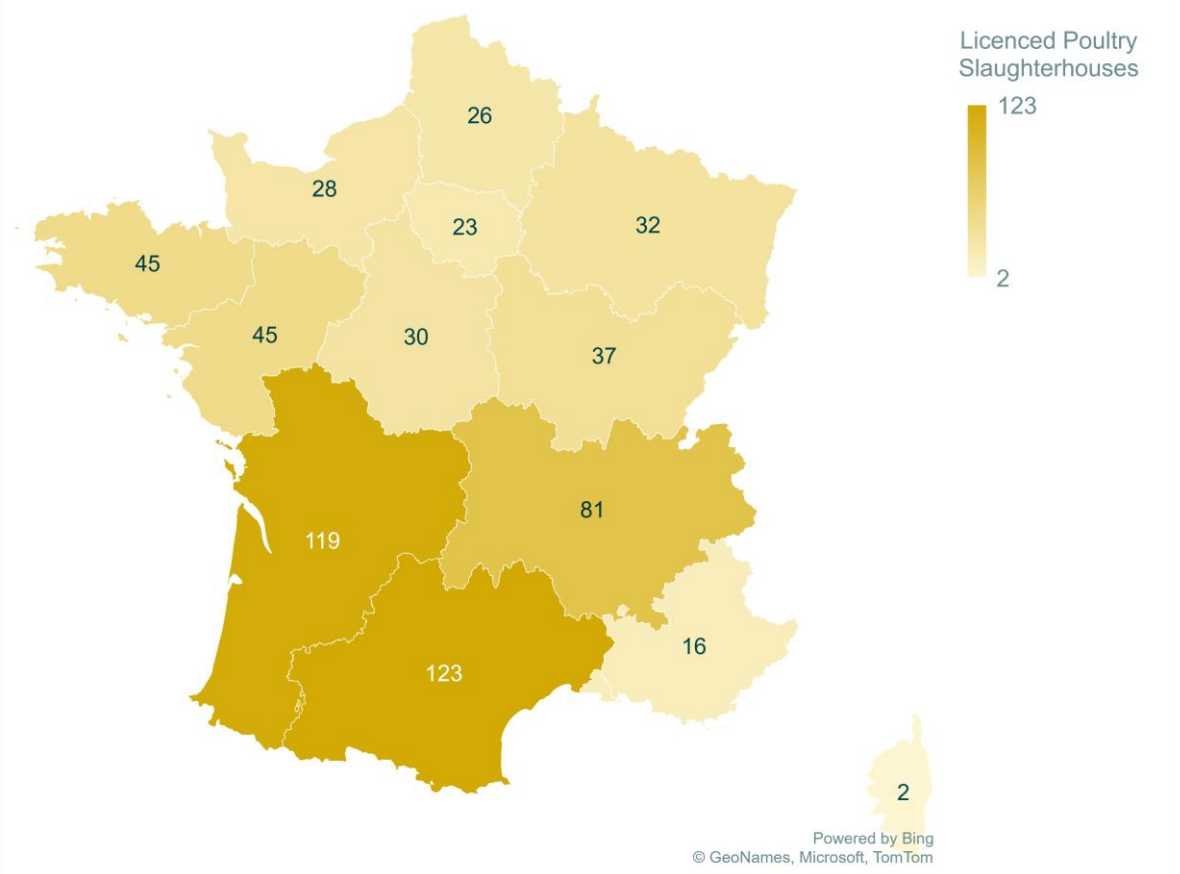
3.3.1. Sector Overview

There are 621 EU approved poultry slaughterhouses across France's 18 metropolitan and overseas regions. Besides poultry meat, there are 91 establishments within these that also slaughter lagomorphs rabbits and ratite birds.

The slaughterhouses are located across 98% of France's metropolitan regions (n=13) and 2% of France's overseas region (n=5). The main regional concentrations of slaughterhouses are to the South, Southwest and Southeast central France.

The regions of Occitanie, Nouvelle Aquitaine and Auvergne Rhone Alpes account for 52% of slaughterhouses, while Brittany, Pays de la Loire and Bourgogne-Franche-Comté account for a further 20%.

Figure 3.3-1: Distribution of EU Approved Poultry Slaughterhouses in France



Source: French Ministry of Agriculture and Food, 2021

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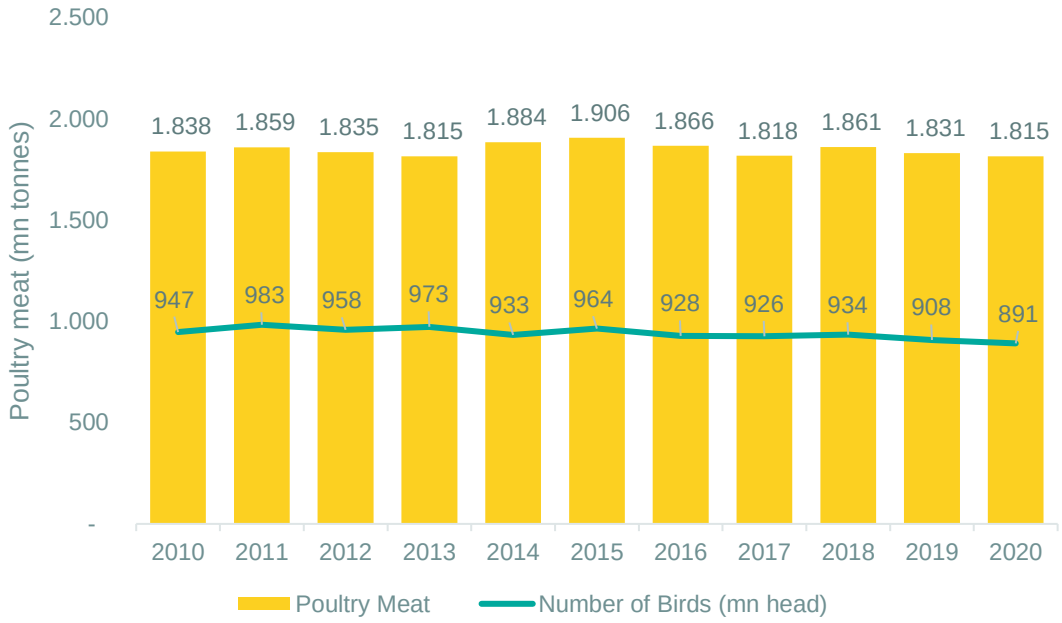
French poultry slaughterhouses have processed a total of 891 million tonnes of birds in 2020 which yielded around 1,815 million tonnes of poultry meat. Figure 3.3-2 gives an overview of birds slaughtered and poultry meat production volumes over the period 2010-2020.

Figure 3.3-2: Overview of Poultry Meat Slaughter (Birds Slaughtered and Poultry Meat Produced)



Source: Agreste, 2021

Slaughterhouses in France process multiple species of birds (geese, turkeys, guinea fowl, ducks and broilers). Slaughtered meat reduced from 1,696 million tonnes in 2010 to 1,670 million tonnes in 2020. The number of birds slaughtered in 2020 ranged from 786 million birds for broilers to just 186,000 birds for geese. Figure 3.3-3 gives a breakdown of birds slaughtered in France over the period 2010-2020.

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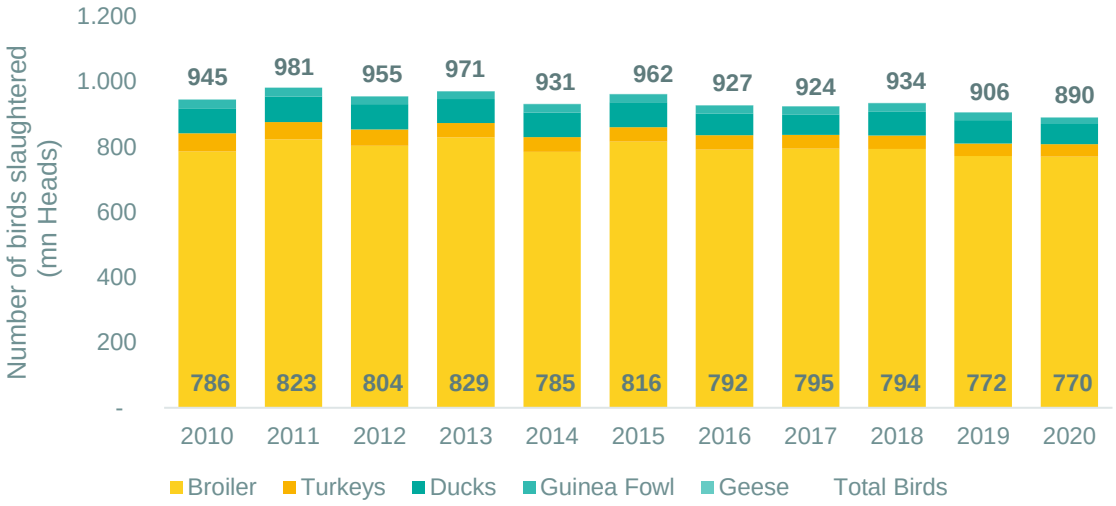
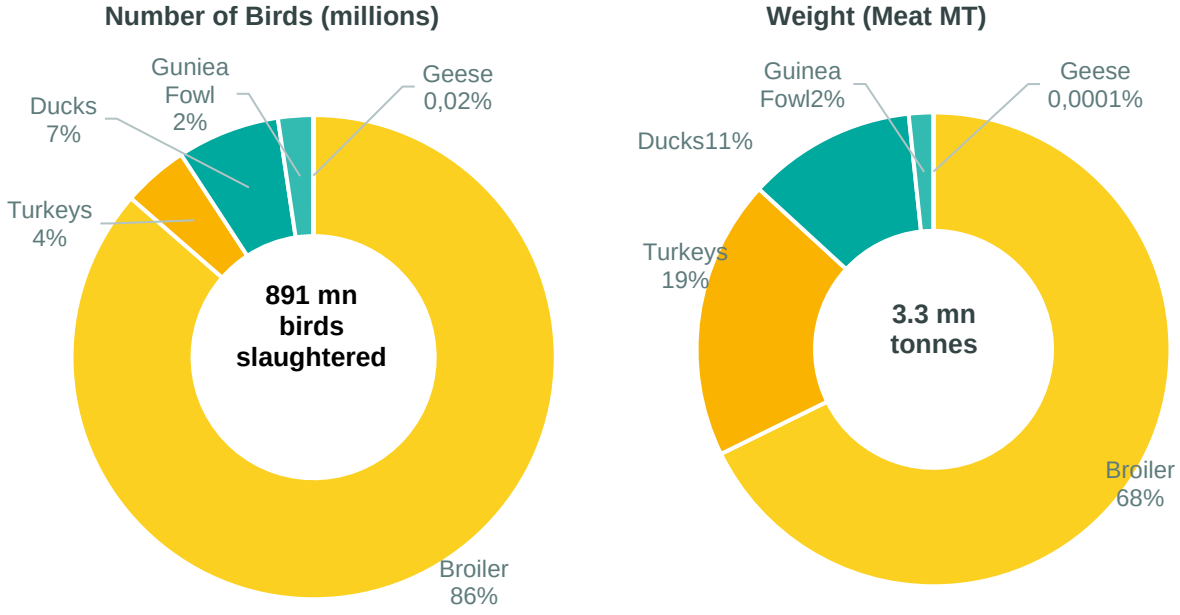
Figure 3.3-3: Number of Birds Slaughtered in France by Species



Source: Agreste, 2021

Broiler chickens followed by turkeys and ducks represent the majority of bird species slaughtered and hold the largest share of poultry production. In 2020, broilers accounted for 86% of poultry slaughtering, turkeys for 19% and ducks for 11%. Figure 3.3-4 gives an overview of number of birds slaughtered in France by species.

Figure 3.3-4: Breakdown of Birds Slaughtered by Species 2020



Source: Agreste, 2021

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Output from French poultry slaughterhouses declined by -0.15% between 2010 and 2020, reducing from 1,858 million tonnes in 2010 to 1,830 million tonnes in 2020. While total meat output has reduced, the number of broiler birds slaughtered has slightly grown from 1,031 to 1130 million birds over the same period. Similar to meat output, the total number of birds slaughtered has declined by around 0.5% between 2010 and 2020.

Table 3.3-1 gives a breakdown of the average number of birds processed each month in 2020.

Table 3.3-1: Average Number of Birds Slaughtered by Bird Type

Bird Type	Average Monthly Slaughter Rate (No. of Birds)
Broiler	64,206,500
Turkeys	3,257,250
Ducks	61,119,000
Guinea Fowl	1,741,583
Geese	15,500

Source: Agreste, 2021

3.3.2. Regional Analysis

Agreste, the Agricultural Statistics Authority in France provides regional data for poultry slaughterhouse production across 7 of France's 18 regions. This data is part of a a special survey conducted by Agreste for national slaughterhouses. The latest available data was published on a survey from 2015.

These 7 French regions have slaughtered some 1.3 million tonnes of birds in 2015 accounting for 78% of production in the same period. Average slaughter in 2015 was 115,136, ranging from 43,843 birds for Brittany to just 2,508 for Rhones-Alpes.

Table 3.3-2: Regional Slaughter & Average Monthly Slaughter

Region	Weight of Birds Slaughtered (Tonnes)	Average Monthly Slaughter 2020
Bretagne	526,122	43,843
Pays de la Loire	513,709	42,809
Aquitaine	112,861	9,405
Bourgogne	75,543	6,295
Midi-Pyrénées	67,693	5,641
Centre	55,623	4,635
Rhône-Alpes	30,100	2,508

Source: Agreste

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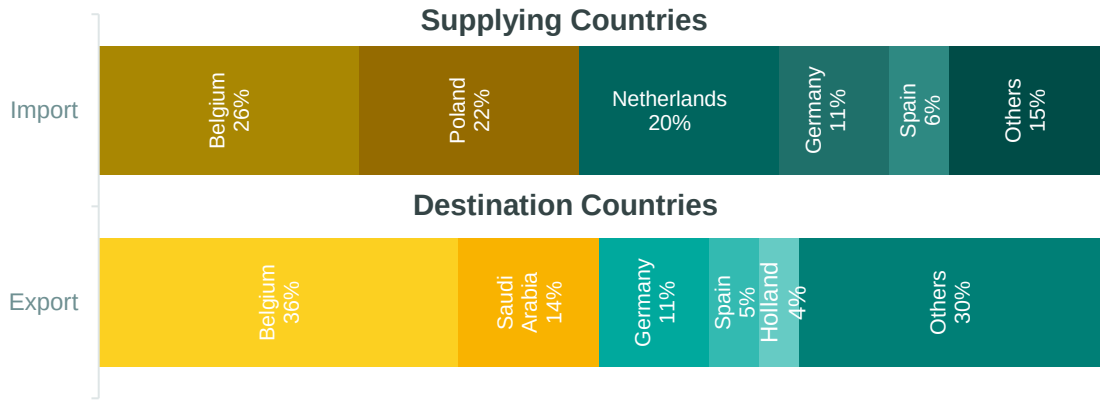
3.3.3. International Trade

Similarly to Germany, France also faces stiff competition from poultry imports which accounts for 45% of local meat consumption in France.
Mainly imported from within the EU, key poultry meat suppliers into France are Belgium, Poland, Netherlands and Germany. On the other hand, exports are destinated to various world countries in Europe, Asia and Africa. Destination countries outside Europe include Saudi Arabia, Morocco, Mali, Egypt and Cote d'Ivoire.

Figure 3.3-5: Breakdown of France's Poultry Meat Trade Volumes by Key Partner & Type



Source: UN Comtrade 2020

3.3.4. Breeding & Rearing

3.3.4.1. Breeding:

There were an estimated 10.9 million breeder birds in France in 2020. The breeder stock declined slightly between 2010-2020, falling at -0.7% CARC.

Broiler breeders are estimated to have accounted for 78% of breeder birds in 2020. Layer breeders accounting for a further 7% of breeder stock, with 6% for ducks and turkeys 5%. Other (mainly guinea fowl and unclassified species) accounted for 4%.

Over the period 2010-2020, there was slight increases in the number of broiler and layer breeders (0.04% and 1.0% CAGR), however, breeder bird numbers declined for each of the other types/species of birds.

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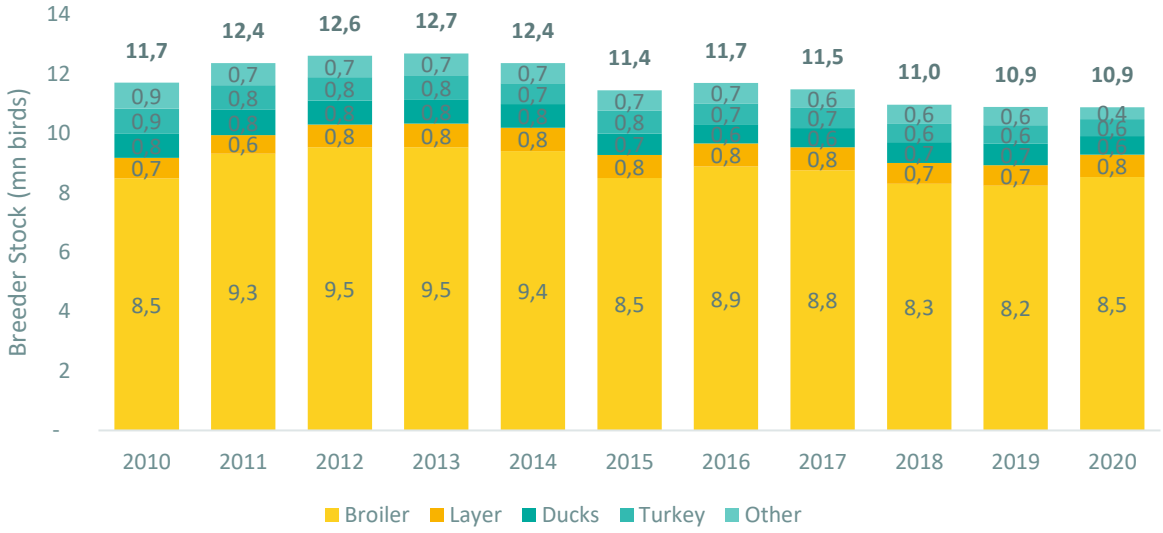
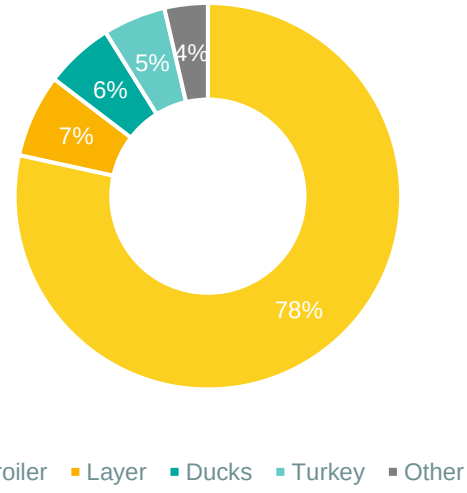
Figure 3.3-6: Estimated French Breeder Stock by Species 2010-2020*



Source: Eurostat, Farrelly & Mitchell. *Includes parent and grandparent stock. Other includes geese, guinea fowl and unclassified chicken breeds.

Figure 3.3-7: Breakdown of Estimated French Breeder Stock by Species 2020



Source: Eurostat, Farrelly & Mitchell

3.3.4.2. Meat and Egg's Production:

Primary production of poultry in France was worth c. €3.2 billion in 2020 (4.4% of the total value of agricultural production).
Bird production accounted for 68% of poultry production value (€2.2 billion) and recorded modest growth (0.6% CAGR) over the period 2010-2020. Egg production's share of production value ranged from 27% to 43% of the total value of poultry

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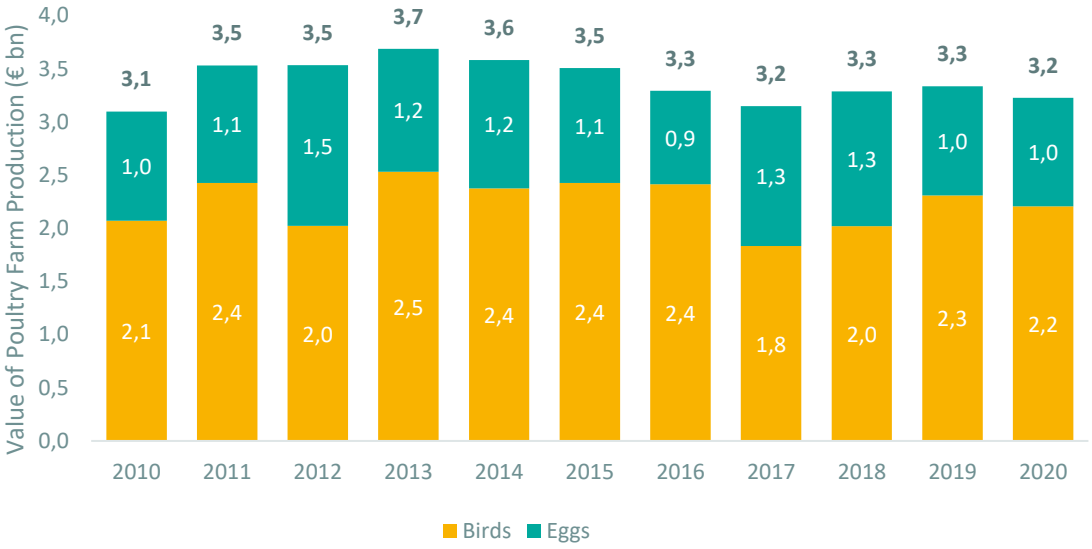
production over the same period (with egg production value declining at a -0.02% CARC to €1.02 billion in 2020).

Figure 3.3-8: Value of Poultry Farm Production by Production Type 2010-2020



Source: Eurostat, FAO, Farrelly & Mitchell

There has been limited growth in France's poultry population over the last two decades. Poultry bird numbers increased at 0.1% CAGR over the period 2000-2020, increasing from 285 to 288 million birds. Over the last ten years, a 0.2% CAGR rate was recorded. Broiler and layer hens are the key bird types, accounting for 55% and 26%, respectively.

France differs somewhat from the other countries reviewed in this report in terms of the significance of ducks (8% of birds), turkeys (6% of birds) and other birds (5% of birds). However, flocks have been declining across species over recent decades. (-2.1% CARC).

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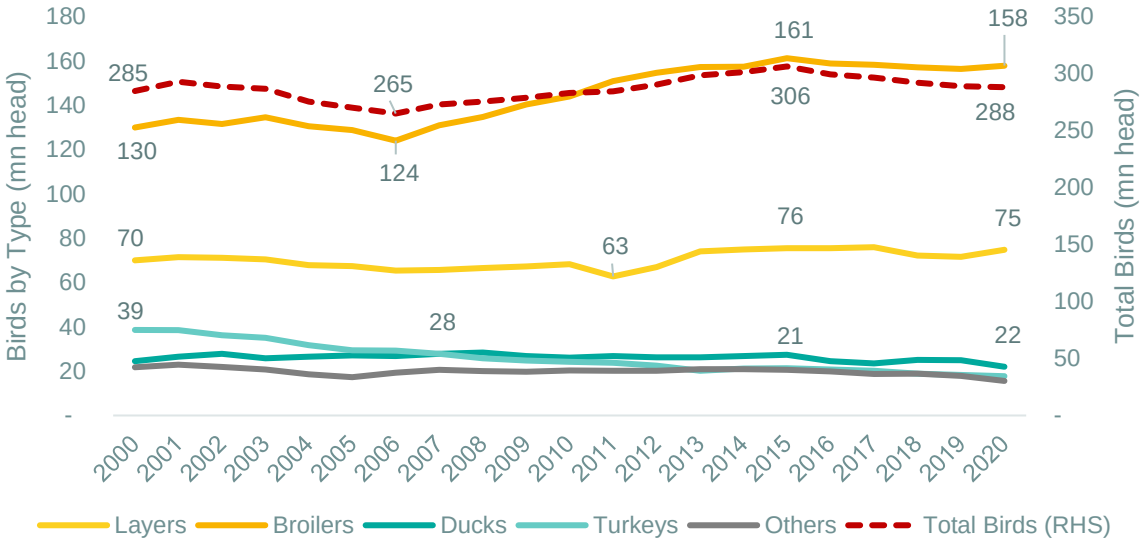
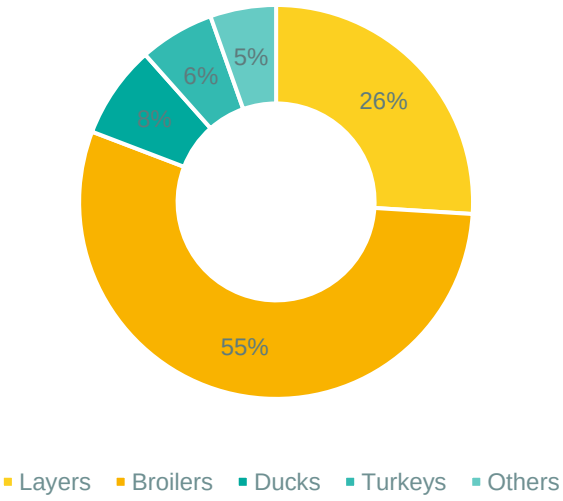
Figure 3.3-9: Evolution of France's Poultry Population by Species 2000-2020*



Source: Agreste

Figure 3.3-10: Breakdown of France Poultry Population by Type 2020



Source: Agreste

There were some 15,300 specialist poultry farms in France in 2020. These farms account for 26% of farm holdings with poultry birds almost 80% of bird production. Table 3.3-3 provides a breakdown of birds and poultry holdings by type. Broilers are present on 50% of specialist poultry farms, with layers present on 25% of farms. Ducks and turkeys are present on 30% and 19% of specialist farms, respectively.

Table 3.3-3: Breakdown of Poultry Holdings and Birds by Bird and Holding Type 2016*

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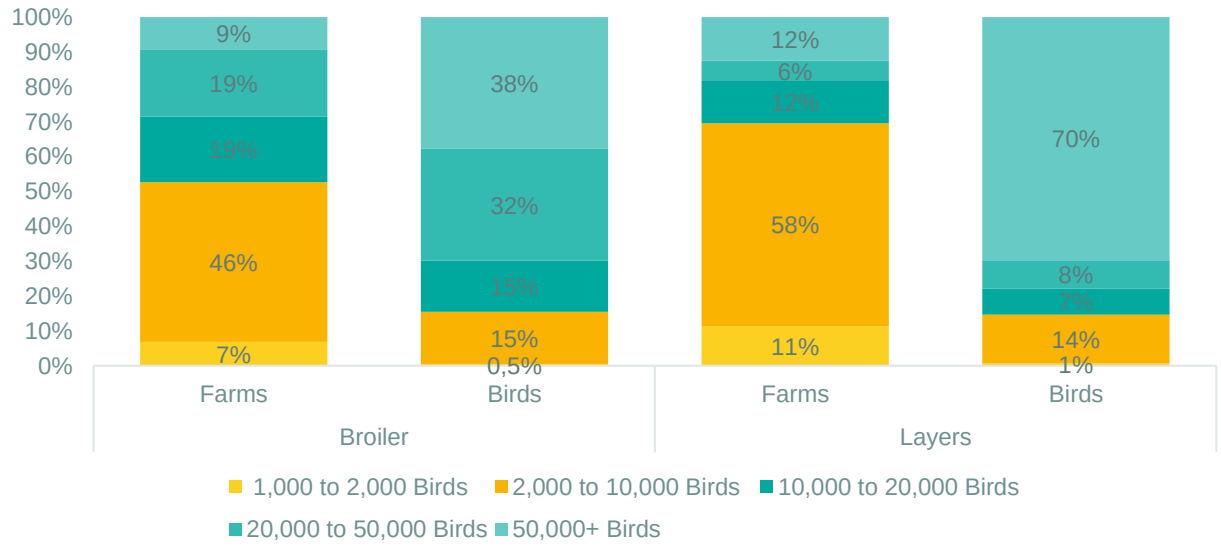
Item		Total Poultry	Laying Hens	Broilers	Ducks	Geese	Turkeys	Other
No of Farm Holdings	Specialist Poultry (%)	26%	11%	31%	38%	16%	52%	38%
	Other (%)	74%	89%	69%	62%	84%	48%	62%
	Total No. of Holdings	43,900	24,730	18,090	8,870	2,790	4,110	5,600
No of Birds	Specialist Poultry (%)	79%	89%	76%	81%	67%	78%	n.a
	Other (%)	21%	11%	24%	19%	33%	22%	n.a
	Total No. of Birds	308,140	67,790	165,580	29,020	300	22,160	n.a

Source: Eurostat. *Latest available data.

Figure 3.3-14 gives a breakdown of broilers and layers farm holdings and birds flock size in 2019. It can be seen that both broilers and layers are concentrated in larger farms.
Large farms (i.e. those with more than 10,000 birds) account for 47% of broiler farms and 85% of birds. Production in the layer sector is more concentrated, with large farms accounting for 30% of farms and 85% of bird production.

Figure 3.3-11: : Breakdown of Layer & Broiler Holdings and Birds by Flock Size in 2019



Source: Agreste.

3.3.5. Feather Waste Supply from Slaughterhouses:

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To estimate the available raw material (feathers) in France for the main bird species, slaughtering data from Agreste (2020) was used together with various assumptions for kill-out ratios and feather as a percentage of liveweight. These are detailed below.

Table 3.3-4: Assumptions Used in Feather Calculation

Assumption	Chickens**	Turkeys	Ducks
Average Carcass Weight*	1.4	7.7	3.1
killing-out percentage	75%	80%	72%
Liveweight	1.82	9.62	4.23
Feathers %	4.00%	4.70%	6.00%

Source: Kokoszyński and Bernacki, 2008, Eurostat.
*Average carcass weight and yield (kill-out %) was calculated based on data published by Agreste for the period 2010-2020.
**Includes spent layers and breeders.

Kill-out ratios were used to calculate the total liveweight value of poultry used as inputs in French slaughterhouses. From literature research it is referenced that 4% of broilers and spent hens total body weight consist of feathers, 4.70% for turkeys and 6% for ducks. Using these figures, it was possible to estimate total available feathers from the main commercial poultry species in France (see Table 3.3-5 and Figure 3.3-12 below).

Table 3.3-5: Estimated Feather Availability in France in 2020

Bird Type	Total Feather Availability (tonnes)
Chickens	60,303
Ducks	15,959
Turkey	18,762
Total	**95,025**

Source: Farrelly & Mitchell

Broilers feathers are the largest source of raw materials making up 63.5% of the total available feathers in 2020. This is followed by turkeys (19.7%), with duck feathers accounting for 16.8%. Duck feathers are considered of higher value because of their potential use in apparel and fibre production industry.

Average annual feather availability from these species during the period 2010-2020 was almost 96,000 tonnes. Total feather availability among these species was 95,025 tonnes in 2020, a decrease of -3% since 2010 (-0.3% CARC).

There has been growth in availability of chicken (0.9% CAGR), however, feather volumes from turkeys and ducks both declined at a -2.1% CARC over the period.

Pays de la Loire and Bretagne are the key feather producing regions, each accounting for 29% of feather availability. Available volumes were also identified in five other regions. These account for 19% of feather availability in France. Figure 3.3-13 details a breakdown of the regional distribution feather availability by species.

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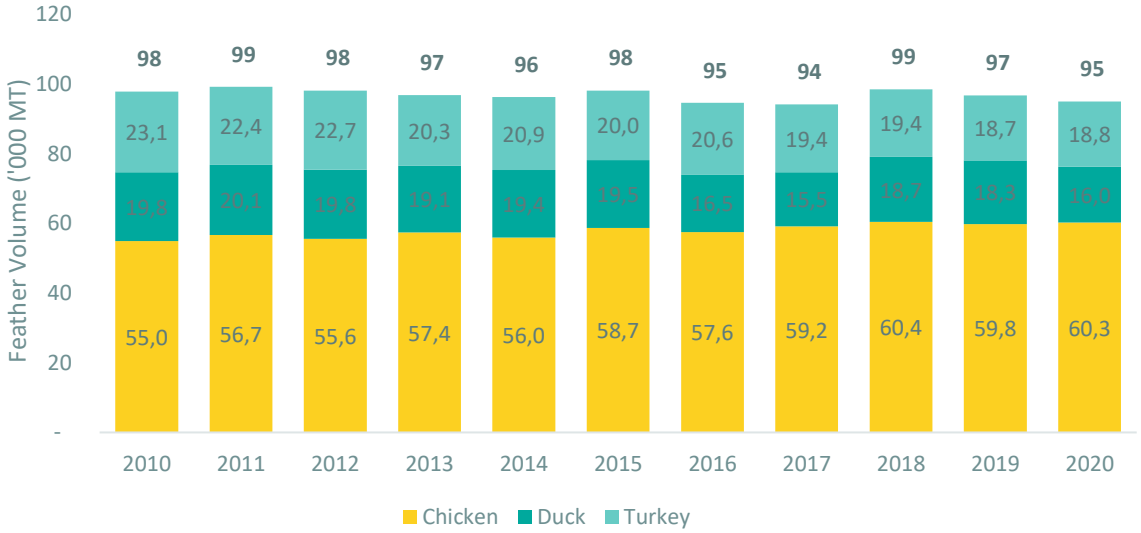
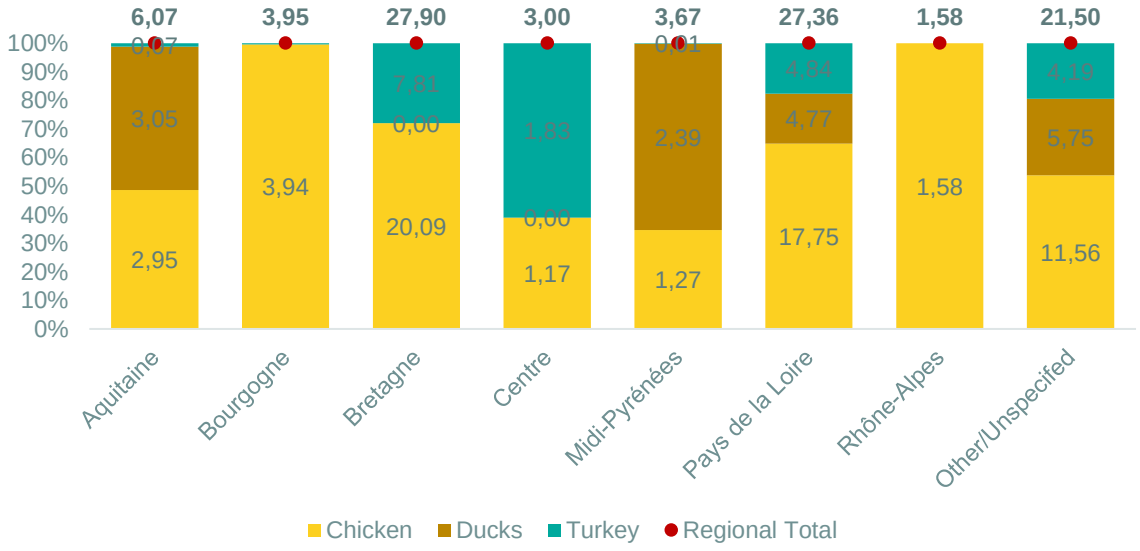
Figure 3.3-12: Feather Volumes Available from Slaughtered Birds 2010-2020



Source: Farrelly & Mitchell

Figure 3.3-13: Estimated Regional Breakdown of Feather Availability from Slaughterhouses 2020 ('000 MT)



Source: Farrelly & Mitchell

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3.4. Italian Poultry Slaughterhouses

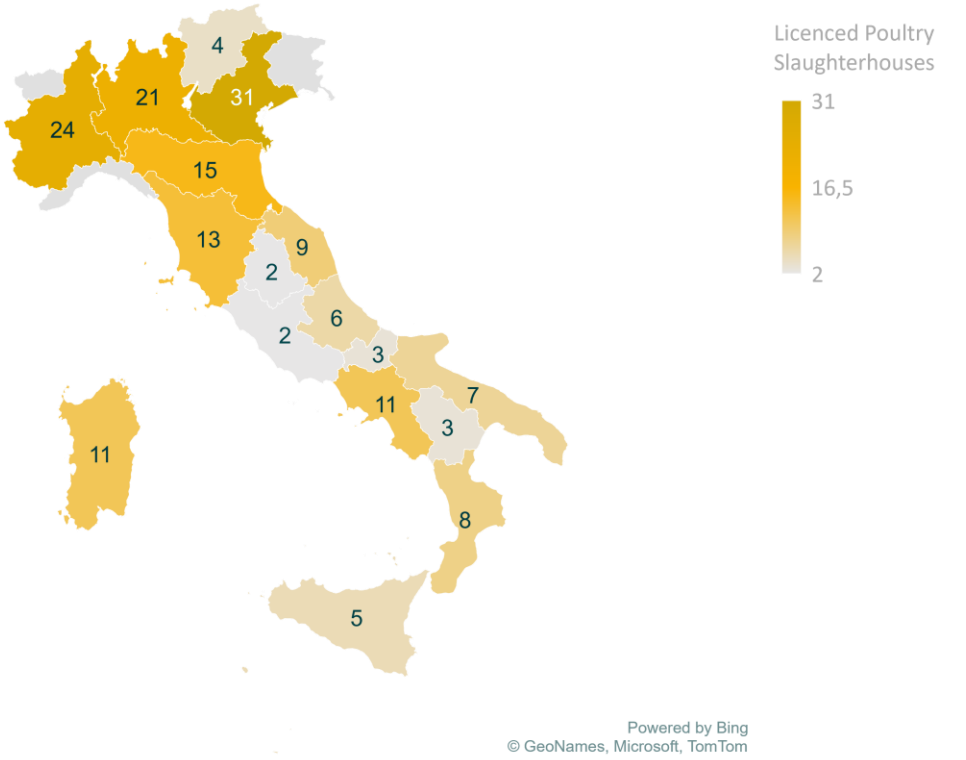
3.4.1. Sector Overview

There are 175 EU approved poultry slaughterhouses in Italy. These are located across 85% (n=20) of Italy's administrative regions, with Friuli-Venezia Giulia, Liguria, Aosta Valley without such facilities.

The main regional concentrations of slaughterhouses are concentrated in the Northern half of the country especially around the regions of Veneto, Piedmont and Lombardy. These three regions account for 43% of total Italian slaughterhouses.

The five regions of Lombardy, Piedmont, Trentino-South Tyrol, Veneto, Emilia-Romagna in North-Western and North-Eastern regions account for 51% of slaughterhouses. Poultry slaughterhouses are less concentrated in Central and Southern Italy with these regions accounting for 15% and 22% respectively.

Figure 3.4-1: Distribution of EU Approved Poultry Slaughterhouses in Italy



Source: Istituto Nazional di Statistica, 2021

Operating slaughterhouses in Italy have slaughtered a total of 621 million birds in 2020. Figure 3.4-2 gives an overview of birds slaughtered and poultry meat production volumes over the period 2010-2020.

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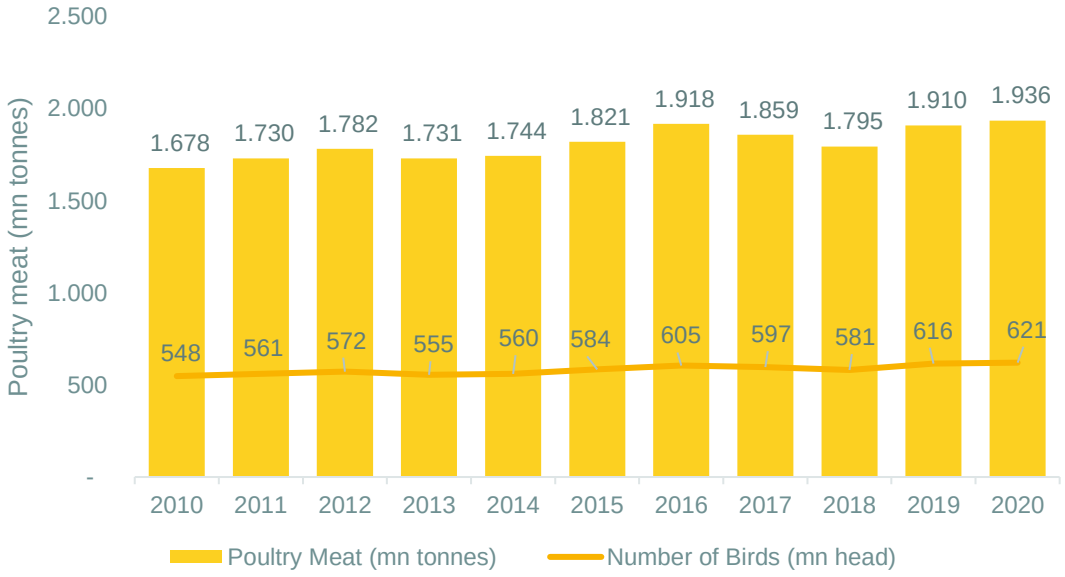
Figure 3.4-2: Overview of Poultry Meat Slaughter (Birds Slaughtered, Poultry meat slaughtered volumes)



Source: ISTAT 2020

The main species processed in Italy are broilers, turkeys, guinea fowl, ducks and geese. The number of birds slaughtered in 2020 ranged from 573 million for broilers to just 5,188 for geese. Figure 3.4-3 gives a breakdown of birds slaughtered in Italy over the period 2010-2020.

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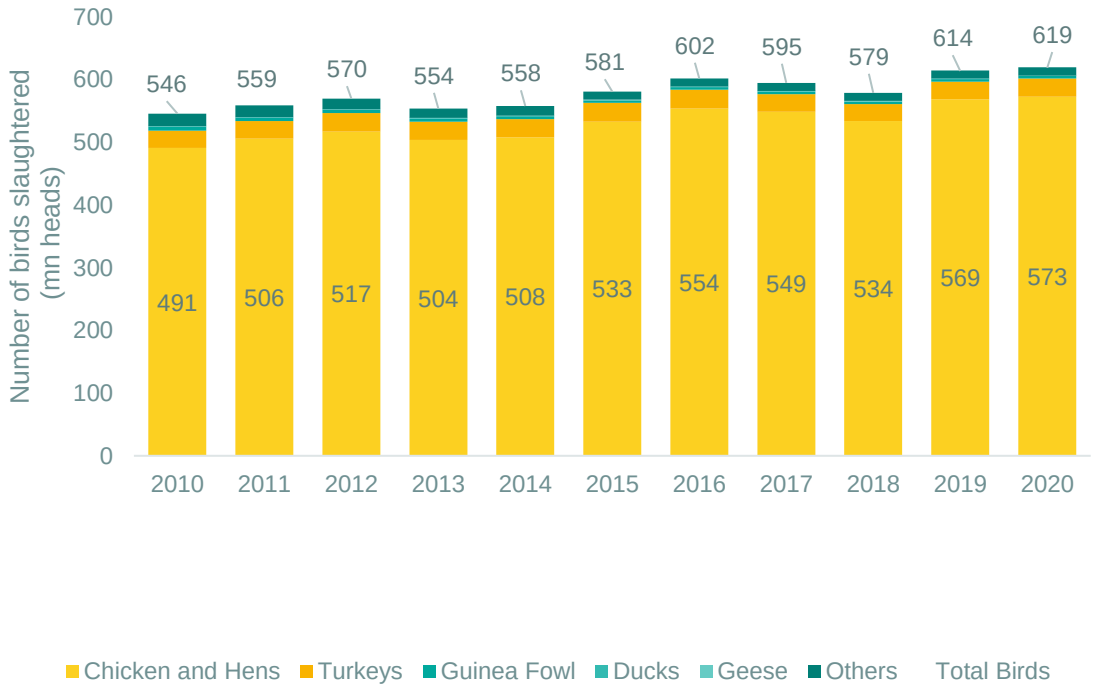
Figure 3.4-3: Number of Birds Slaughtered in Italy by Species 2010-2020



Source: ISTAT 2020

Broiler chickens and turkeys represent the majority of bird species slaughtered in Italy and hold the largest share of poultry production. In 2020, broilers accounted for 78% of poultry slaughtering weight followed by turkeys with 22%, Figure 3.4-4 gives an overview of number of birds slaughtered in Italy by species.

Poultry meat production increased by 1.15% CAGR between 2010 and 2020 with an increase of c. 262,000 tonnes and c. 73 million birds. While the number of chickens and turkeys have increased over this period, the number of ducks has recorded a significant decline of -8%, a decrease of 1.2 million birds.

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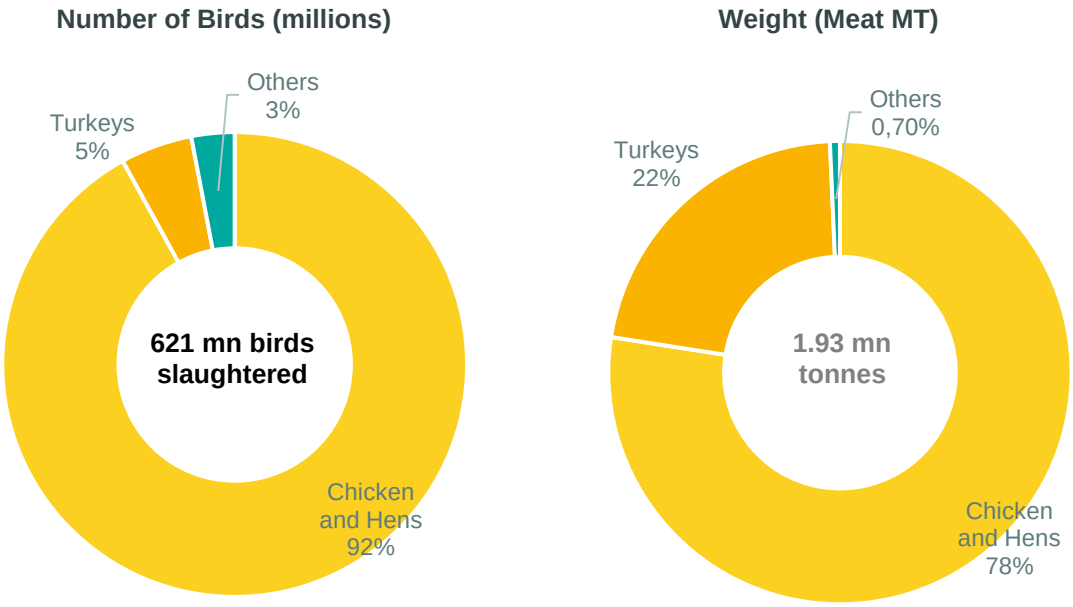
Figure 3.4-4: Breakdown of Birds Slaughtered by Species 2020



Source: ISTAT 2020

Table 3.4-1 gives a breakdown of the average number of birds processed each month in 2020.

Table 3.4-1: Average Number of Birds Slaughtered by Bird Type

Bird Type	Average Monthly Slaughter Rate (No. of Birds)
Chicken and Hens	47,820,481
Turkeys	2,452,601
Guinea Fowl	349,852
Ducks	59,509
Geese	432
Others	1,127,436

Source: ISTAT 2020

3.4.2. Regional Analysis:

Istat provides regional data for poultry slaughterhouse production across ten of Italy's 20 regions. These regions slaughtered an average of 63 million birds in 2020, ranging from 22.9 million birds for Veneto to just 24,500 for Lazio.

Table 3.4-2: Regional slaughter in 2020 and average monthly slaughter by region

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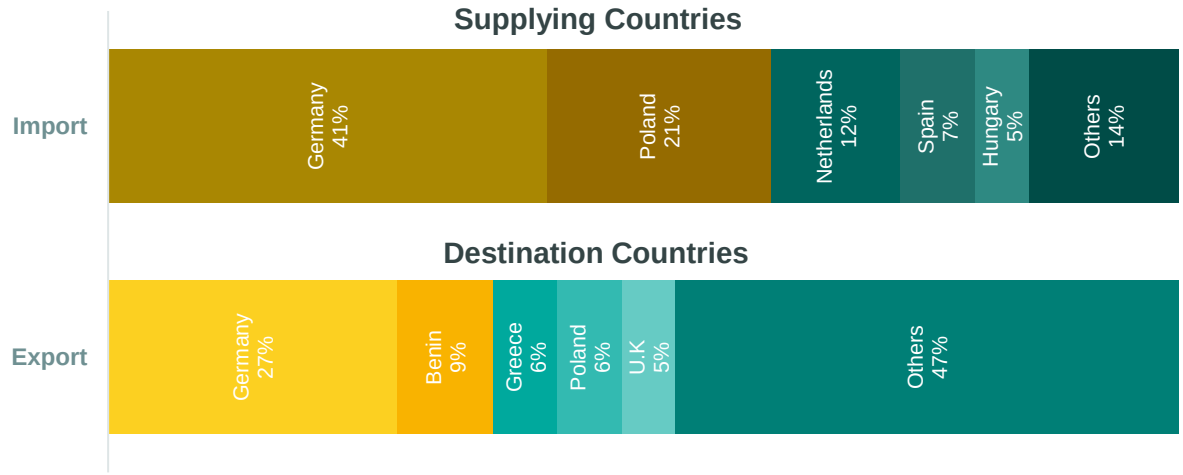
Region	Birds Slaughtered 2020	Average Monthly Slaughter 2020
Veneto	275,517,492	22,959,791
Emilia-Romagna	120,351,892	10,029,324
Mezzogiorno	83,039,388	6,919,949
Lombardia	63,867,128	5,322,261
Abruzzo	47,702,028	3,975,169
Marche	43,508,466	3,625,706
Piemonte	30,707,515	2,558,960
Toscana	4,111,565	342,630
Umbria	326,274	27,190
Lazio	294,013	24,501

Source: ISTAT 2020

3.4.3. International Trade

Italy imported around 67,500 tonnes of poultry meat in 2020.Around 62% of imports came from Germany and Poland with 23% from the Netherlands, Spain and Hungary. Around 165,000 tonnes of Italian poultry meat was exported to other world countries with a significant share of export to Germany (27%), Benin (9%), followed by Greece and Poland (6% each).

Figure 3.4-5: Breakdown of Italy's Poultry Meat Trade Volumes by Key Partner & Type



Source: UN Comtrade 2020

3.4.4. Breeding and Rearing:

3.4.4.1. Breeding:

There were an estimated 5.3 million breeder birds in Italy in 2020. The breeder stock population fluctuation between 4.6 - 5.6 million birds over the period 2010-2020 (averaging 5.1 million).

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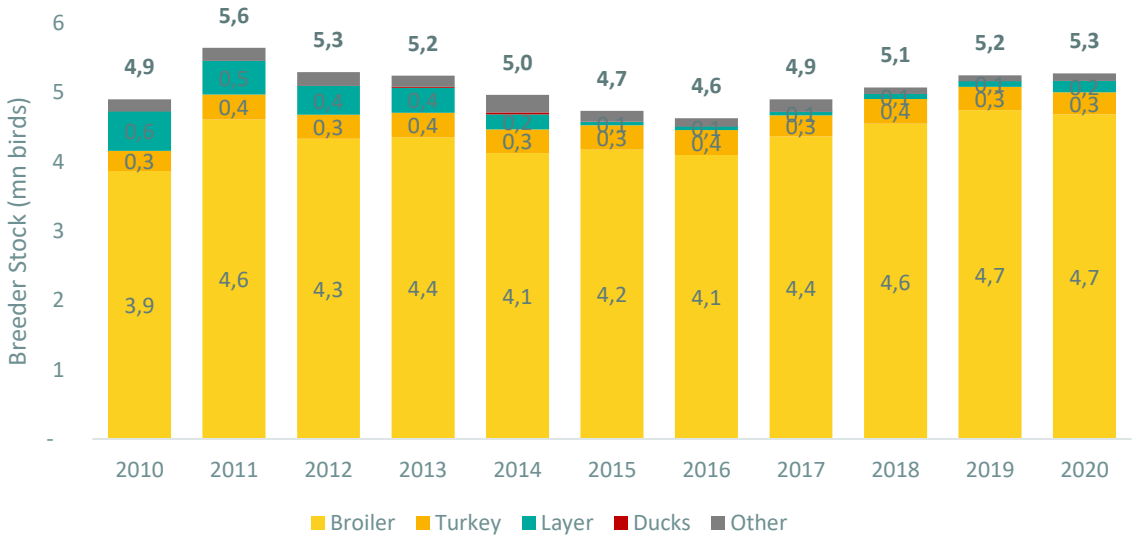
Broiler breeders are estimated to have accounted for 89% of breeders. Turkey breeders accounting for a further 6% of breeder stock, other breeders (mainly unclassified breeder species) accounted for 2%, with ducks accounting for less than 0.0004%.

Other breeder birds accounted for 3% of total stock, with geese accounting for the majority of these breeders.

Over the period 2010-2020, the number of broiler breeders increased at 1.9% CAGR, with Turkey breeding stock increasing by a 1% CAGR. Populations of each of the other types of breeder birds declined over the period.

Figure 3.4-6: Estimated Italian Breeder Stock by Species 2010-2020*



Source: Eurostat, Farrelly & Mitchell. *Includes parent and grandparent stock. Other includes geese, guinea fowl and unclassified chicken breeds.

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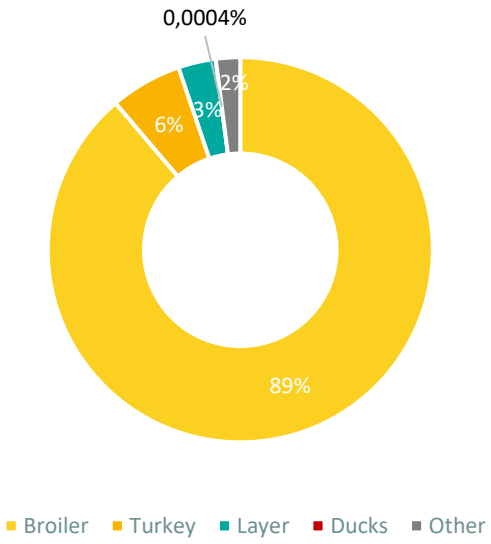
Figure 3.4-7: Breakdown of Estimated Italian Breeder Stock by Species 2020



Source: Eurostat, Farrelly & Mitchell

3.4.4.2. Meat and Egg Production:

Primary production of poultry in Italy was worth some €2.4 billion in 2020 (4.6% of the total value of agricultural production). Bird production accounted for 59% of poultry production value (€1.44 billion) and recorded robust value growth (4% CAGR) over the period 2010-2020. Egg production's share of production value decreased over the same period, falling from 54% to 41% of poultry farm production value (declining at -1% CARC to €993 million in 2020).

The number of producing birds increased at a 1.5% CAGR over the period 2010-2019 to reach almost 755 million birds. Broiler and turkeys are the key bird types, accounting for 69% and 18% respectively. Broiler numbers grew at a 2% CAGR, with turkeys increasing a 0.8% CAGR. The number of layers (which accounted for 9% of birds in 2019) were relatively stable, growing at 0.05% CAGR.

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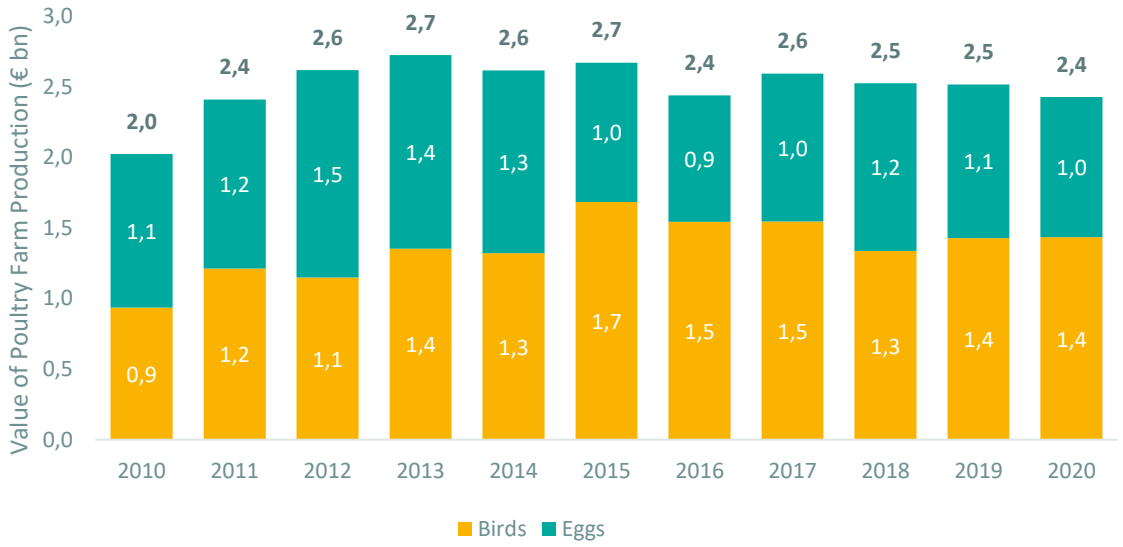
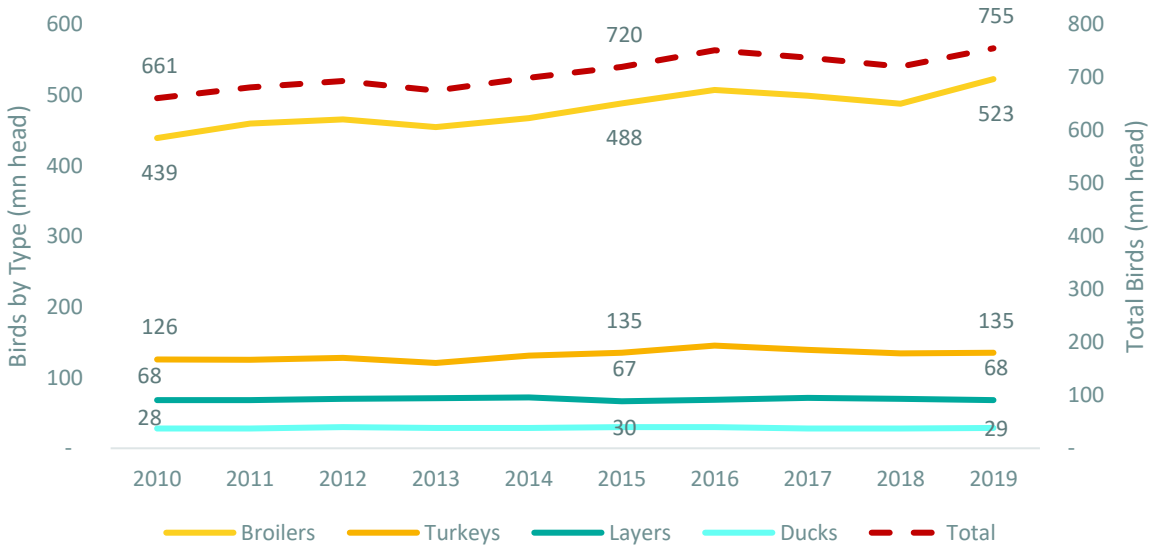
Figure 3.4-8: Value of Poultry Farm Production by Production Type 2010-2020



Source: Eurostat, FAO, Farrelly & Mitchell

Figure 3.4-9: Evolution of Italy's Poultry Production by Species 2010-2019



Source: FAO, Farrelly & Mitchell

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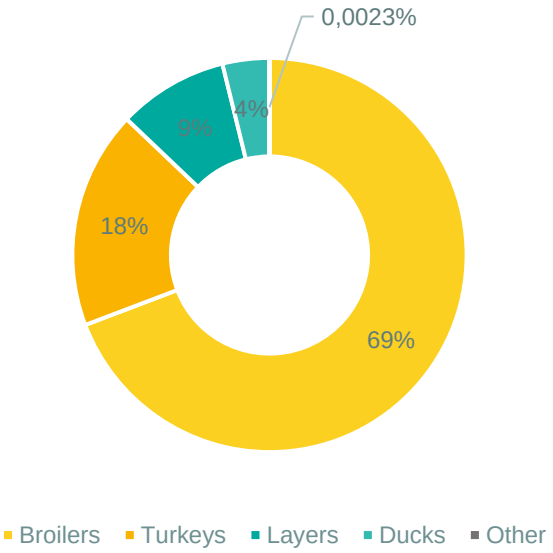
Figure 3.4-10: Breakdown of Italy's Poultry Bird Production by Type 2019



Source: FAO, Farrelly & Mitchell

The most recent agricultural survey in Italy identified c. 15,400 farms with poultry. However, poultry production is concentrated on around 3,900 specialised poultry farms. These specialist producers, who account for just 25% of farm holdings with poultry, account for 98% of poultry birds produced.
Poultry rearing on these farms is highly intensive with an average flock size of almost 40,000 birds.

Table 3.4-3: Breakdown of Poultry Holdings and Birds by Bird and Holding Type 2016*

Item		Total Poultry	Laying Hens	Broilers	Ducks	Geese	Turkeys
No of Farm Holdings	Specialist Poultry (%)	25%	9%	27%	10%	6%	27%
	Other (%)	75%	91%	73%	90%	94%	73%
	Total No. of Holdings	15,430	10,780	8,880	1,280	1,330	1,530
No of Birds	Specialist Poultry (%)	98%	98%	99%	97%	86%	97%
	Other (%)	2%	2%	1%	3%	14%	3%
	Total No. of Birds	158,030	37,390	96,210	1,600	280	13,700

Source: Eurostat. *Latest available data.

3.4.5. Feather Waste Supply from Slaughterhouses:

To estimate the available raw material (feathers) in Italy for the main bird species, slaughtering data from IStat (2021) was used together with various assumptions for kill-out ratios and feather as a percentage of liveweight. These are detailed below:

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Table 3.4-4: Assumptions Used in Feather Calculation

Assumption	Chickens**	Ducks	Turkeys
Average Carcass Weight*	2.59	3.05	14.24
killing-out percentage	70%	78%	75%
Liveweight	3.70	3.94	19.10
Feathers %	4.00%	6.00%	4.70%

Source: Kokoszyński and Bernacki, 2008, Eurostat. *Average carcass weight and yield (kill-out %) was calculated based on data published by ISTAT for the period 2010-2020. **Includes spent layers and breeders.

Kill-out ratios were used to calculate the total liveweight value of poultry used as inputs in Italian slaughterhouses. From literature research it is referenced that 4% of broilers and spent hens total body weight consist of feathers, 4.70% for turkeys and 6% for ducks. Using these figures, it was possible to estimate total available feathers from the main commercial poultry species in Italy (see Table 3.4-5 and Figure 3.4-11 below).

Table 3.4-5: Estimated Feather Availability in Italy 2020

Bird Type	Total Feather Availability (tonnes)
Chickens	84,992
Ducks	177
Turkey	26,124
Total	**111,293**

Source: Farrelly & Mitchell

Broilers feathers are the largest source of raw materials making up 76.4% of the total available feathers in 2020. This is followed by turkeys (23.5%), with duck feathers accounting for just 0.2% of estimated feather volumes. Duck feathers are considered of higher value because of their potential use in apparel and fibre production industry.

Average annual feather availability from these species during the period 2010-2020 was 105,200 tonnes.

Feather availability reached almost 111,300 tonnes in 2020, an increase of 13% since 2010 (1.2% CAGR).

There has been growth in availability of chicken (1.6% CAGR) and Turkey (0.3% CAGR) feathers other the period, however, duck feather availability declined by -55% (-7.8% CARC).

Figure 3.4-15 details a breakdown of the regional distribution feather availability by species. Feather availability is highly concentrated particularly in the north-east Italy. Just four regions accounting for 83% of feathers, these include:

- Veneto – 42%;
- Emilia-Romagna – 19%;
- Lombardia – 11%; and

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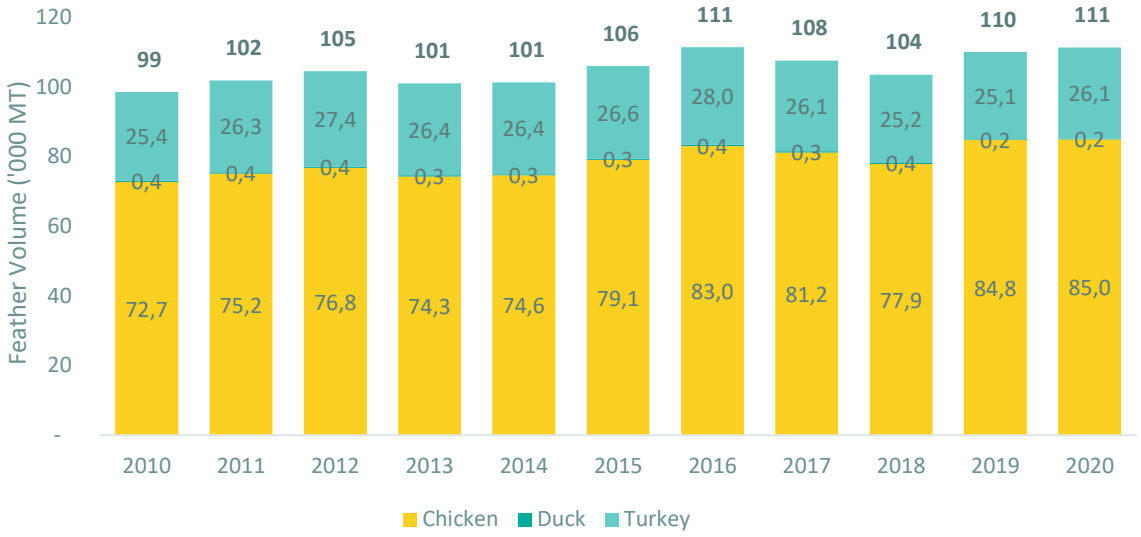
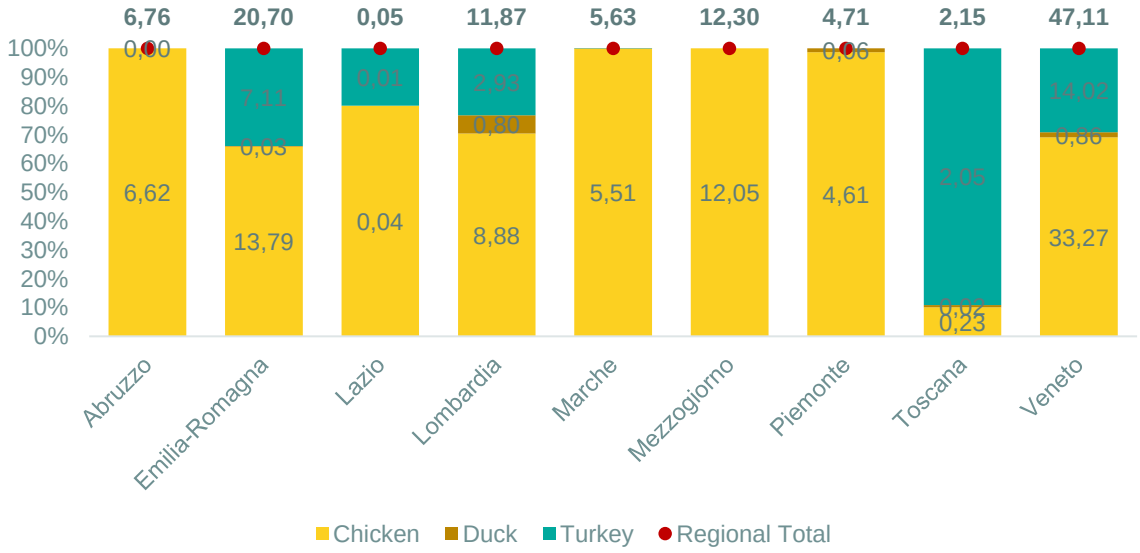
- Mezzogiorno: 11% of feathers.

Figure 3.4-11: Feather Volumes Available from Slaughtered Birds 2010-2020



Source: Farrelly & Mitchell

Figure 3.4-12: Regional Breakdown of Feather Volumes from Slaughtered Birds 2020 ('000 MT)



Source: Farrelly & Mitchell

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3.5. Spanish Poultry Slaughterhouses

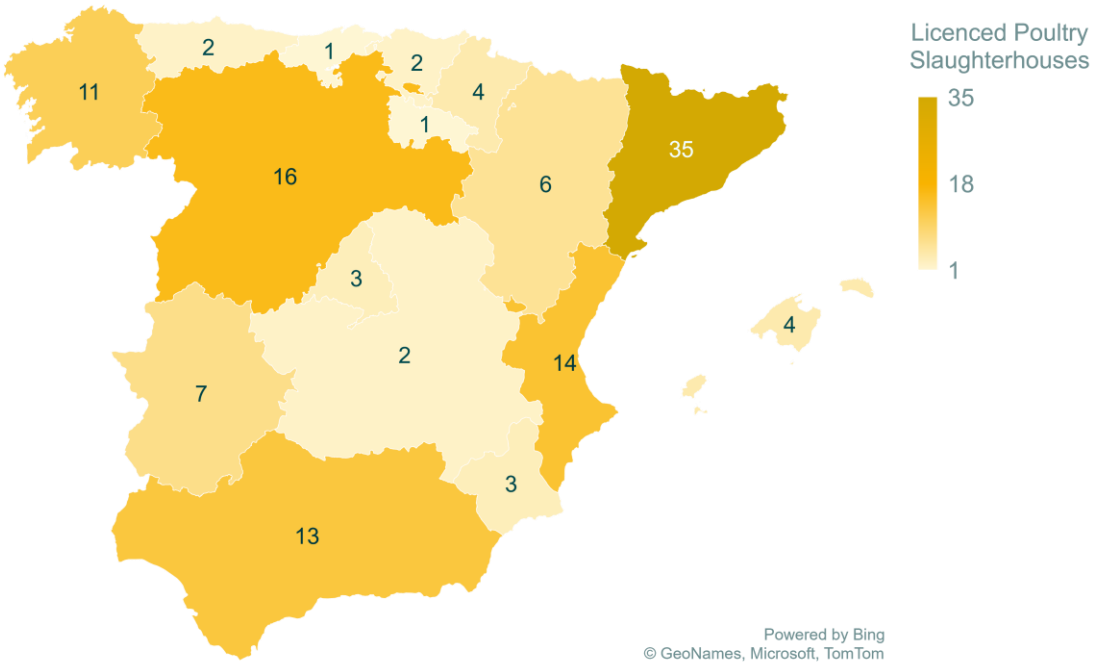
3.5.1. Sector Overview

There are 127 licenced poultry slaughterhouses in Spain which are located across 17 of Spain's administrative regions.

The main concentration of slaughterhouses is in the Eastern, Southern and Central regions accounting for 74% of total poultry slaughterhouses.

The highest concentration of poultry slaughterhouses are located in the Eastern regions of Cataluna, Valencia and Baleares making up 42%. The Central regions of Castilla y Leon, Castilla la Mancha and Extremadura have the next highest concentration of slaughterhouses at 20%.

Figure 3.5-1: Distribution of EU Approved Poultry Slaughterhouses in Spain



Source: Spanish Ministry of Agriculture, Fisheries and Food, 2021

Operating slaughterhouses in Spain have processed a total of 801 million birds in 2020. Output ranged from 1,598 million tonnes in 2011 to 2,028 million tonnes in 2020.

Figure 3.5-2 gives an overview of slaughtered volumes and weight over the period 2010-2020.

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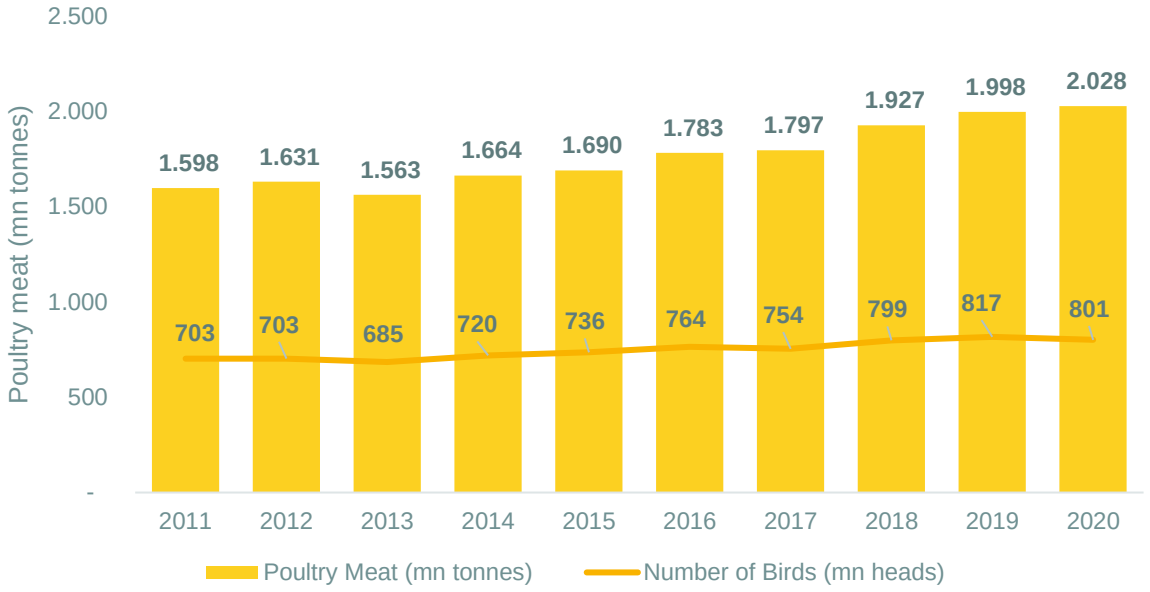
Figure 3.5-2 Overview of Poultry Meat Slaughter (Number of Birds Slaughtered, Poultry Meat Produced)

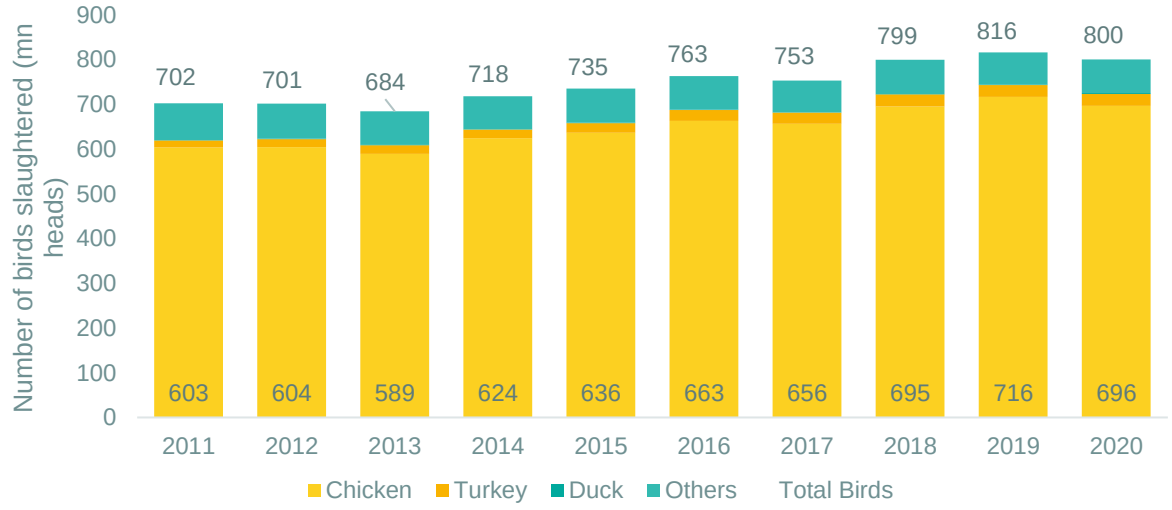


Source: Eurostat: 2020

Various species are processed in Spain such as chickens, turkeys and ducks. The number of birds slaughtered in 2020 ranged from 603 million birds for chickens to just 2 million birds for ducks.

Figure 3.5-3 gives a breakdown of birds slaughtered in Spain over the period 2011-2020.

Figure 3.5-3: Number of Birds Slaughtered in Spain by Species 2011-2020



Source: Eurostat: 2020

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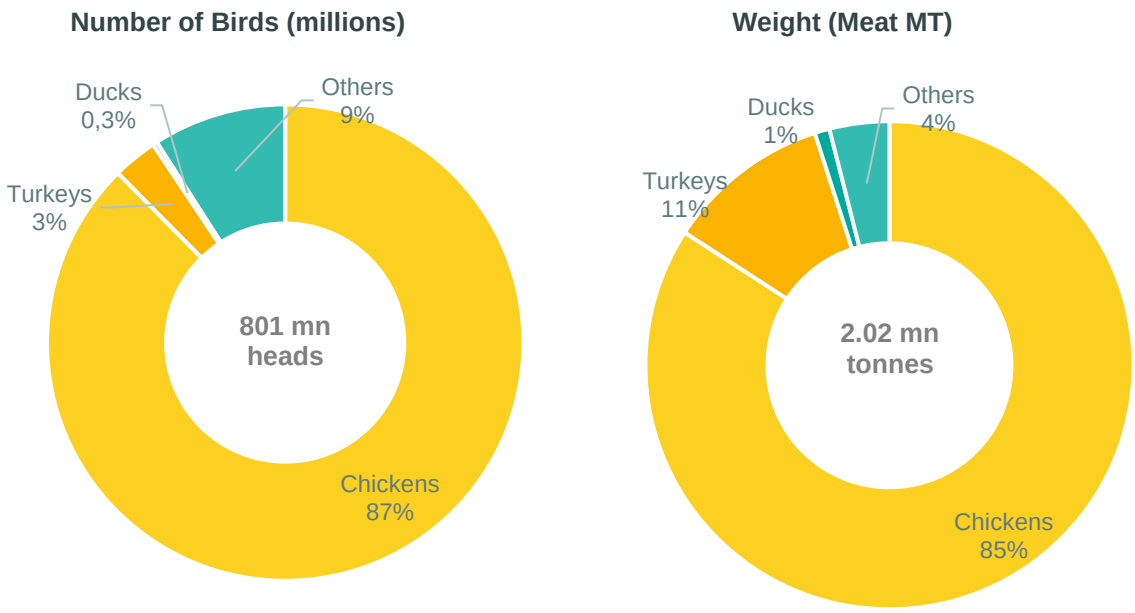
Chicken and turkeys represent the majority of bird species slaughtered in Spain and hold the largest share of poultry production. In 2020, chickens accounted for 85% of poultry slaughtering weight, turkeys 11% and ducks 1%.

Figure 3.5-4 gives a breakdown of the volume of birds slaughtered by species.

Figure 3.5-4: Breakdown of Birds Slaughtered by Species 2020



Source: Eurostat: 2020

Table 3.5-1 gives a breakdown of the average number of birds processed each month in 2020.

Table 3.5-1: Average Number of Birds Slaughtered by Bird Type

Bird Type	Average Monthly Slaughter Rate (No. of Birds)
Chicken	58,032.2425
Turkeys	2,284.45
Ducks	219.40
Others	6,250.04

Source: Eurostat: 2020

3.5.2. Regional Analysis:

The Spanish Ministry of Agriculture, Fisheries and Food provides regional production data on poultry slaughterhouses across fifteen Spanish regions. This data is published in a monthly slaughter survey conducted by the Spanish Agriculture Ministry which

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collects information on slaughterhouses, numbers slaughtered and carcass weight obtained. On average these regions have slaughtered some 67,797 birds in 2020, ranging from 15,819 birds in Cataluña to just 9.50 in Balereas.

Table 3.5-2: Regional Slaughter in 2020 & Average monthly slaughter by region

Region	Birds Slaughtered (mil. head) 2020	Average Monthly Slaughter 2020
CATALUÑA	189,837	15,819
ANDALUCÍA	158,250	13,187
GALICIA	98,164	8,180
C. VALENCIANA	97,465	8,122
CAST. Y LEÓN	59,751	4,979
NAVARRA	56,404	4,700
EXTREMADURA	41,294	3,441
C. LA MANCHA	31,046	2,587
MADRID	25,444	2,120
R. DE MURCIA	18,807	1,567
PAÍS VASCO	13,928	1,160
LA RIOJA	12,928	1,077
CANARIAS	6,927	577
ARAGÓN	3,213	267
BALEARES	114	9.5
Total	813,572	67,797

Source: MAPA 2020

3.5.3. International trade:

In 2019, Spain exported c. 15% of its local poultry production, mainly to EU countries. Key destination countries are France, Portugal, South Africa and UK. Spanish imports on the other hand, were c. 174,000 tonnes of chicken meat in the same period. Over 60% percent of these imports came from other EU countries, France, Poland, Germany and the U.K, Brazil is the main supplier outside the EU.

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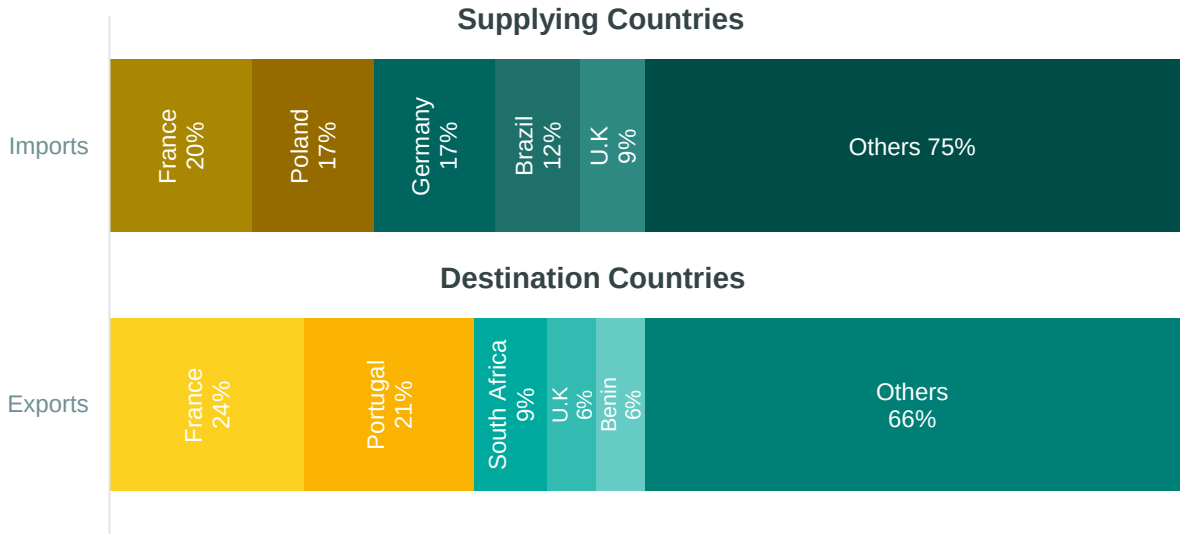
Figure 3.5-5: Breakdown of Spain's Poultry Meat Trade Volumes by Key Partner & Type



Source: UN Comtrade 2019

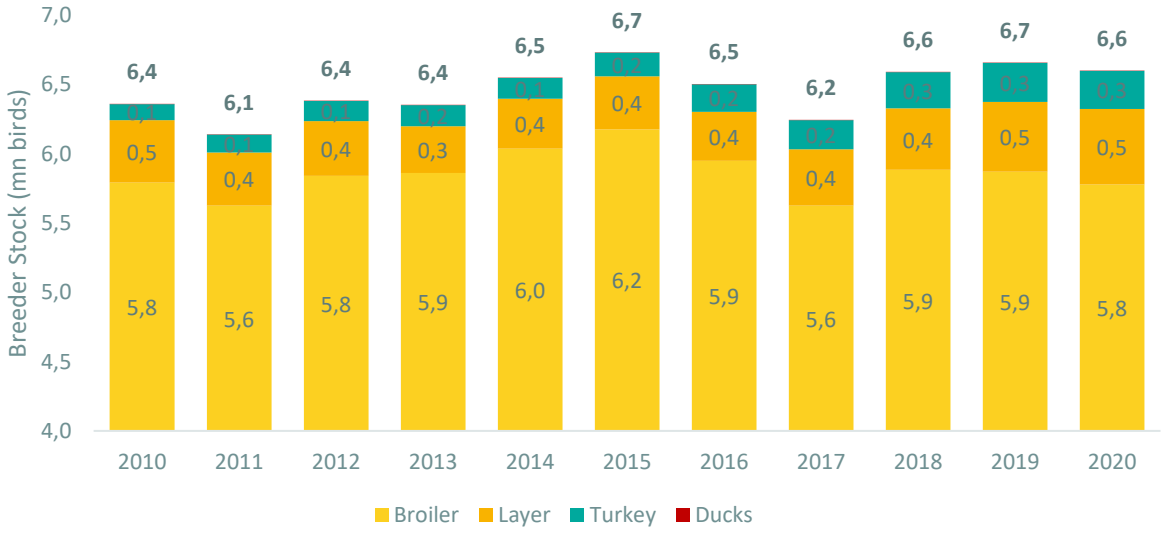
3.5.4. Breeding and Rearing:

3.5.4.1. Breeding:

There were an estimated 6.6 million breeder birds in Spain in 2020. Annual volumes fluctuated between 6.1 and 6.7 million over the period 2010-2020.

Broiler breeders are estimated to have accounted for 88% of breeders. Layer breeders accounting for a further 8% of breeder stock and turkey breeders 4%, with only a minimal number breeder ducks in Spain.

Figure 3.5-6: Estimated Spanish Breeder Stock by Species 2010-2020



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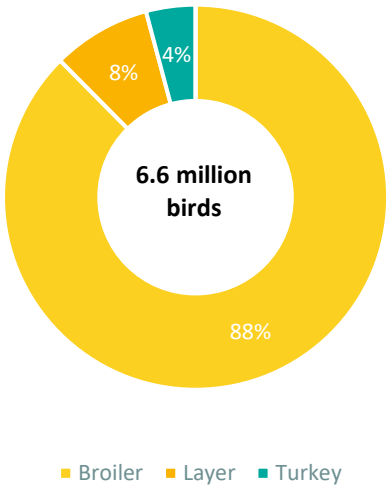
Source: Eurostat, Farrelly & Mitchell. *Includes parent and grandparent stock

Figure 3.5-7: Breakdown of Estimated Spanish Breeder Stock by Species 2020



Source: Eurostat, Farrelly & Mitchell. *Includes parent and grandparent stock

3.5.4.2. Meat and Egg Production:

Primary production of poultry in Spain was worth some €2.5 billion in 2020 (5% of the total value of agricultural production). Meat production accounted for 54% of poultry production value (€1.36 billion) and recorded strong value growth (6% CAGR) over the period 2010-2020.

Egg's share of poultry production value decreased over the same period, falling from 61% to 46% (with a production value growing at a 0.1% CAGR to €1.17 billion in 2020).

The number of producing birds grew at 1.6% CAGR over the period 2010-2019 to reach more than 745 million birds.

Broilers and layers are the main birds produced in Spain, accounting for 86% and 6% of birds, respectively. While the number of broilers grew at 1.6% CAGR over the period to reach 670 million, the number of layers declined at 1% CARC to 46.5 million.

The number of other bird types grew across species over the period, ranging from CAGR 1.6% (others) to 7.3% (turkeys).

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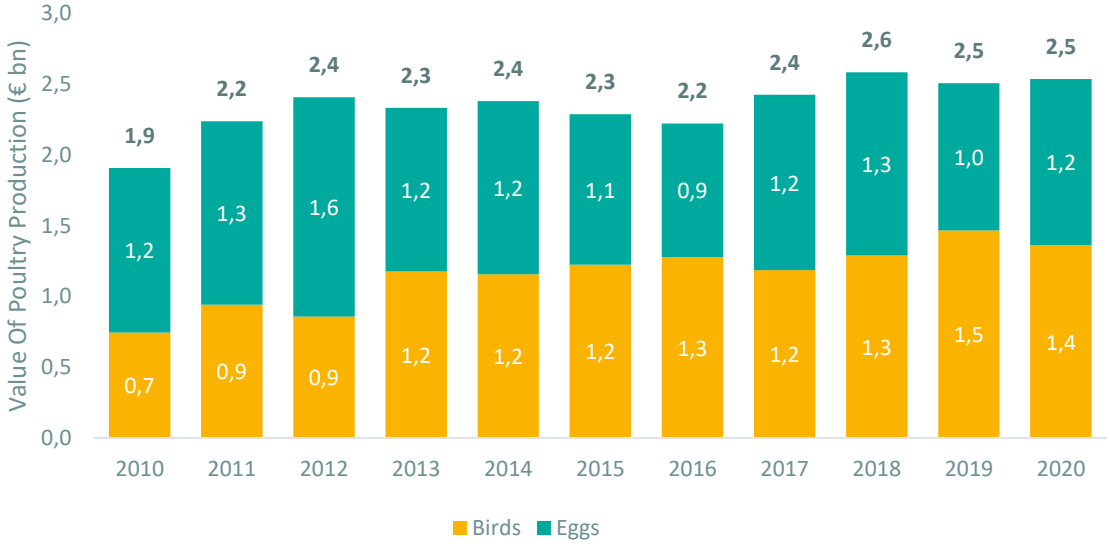
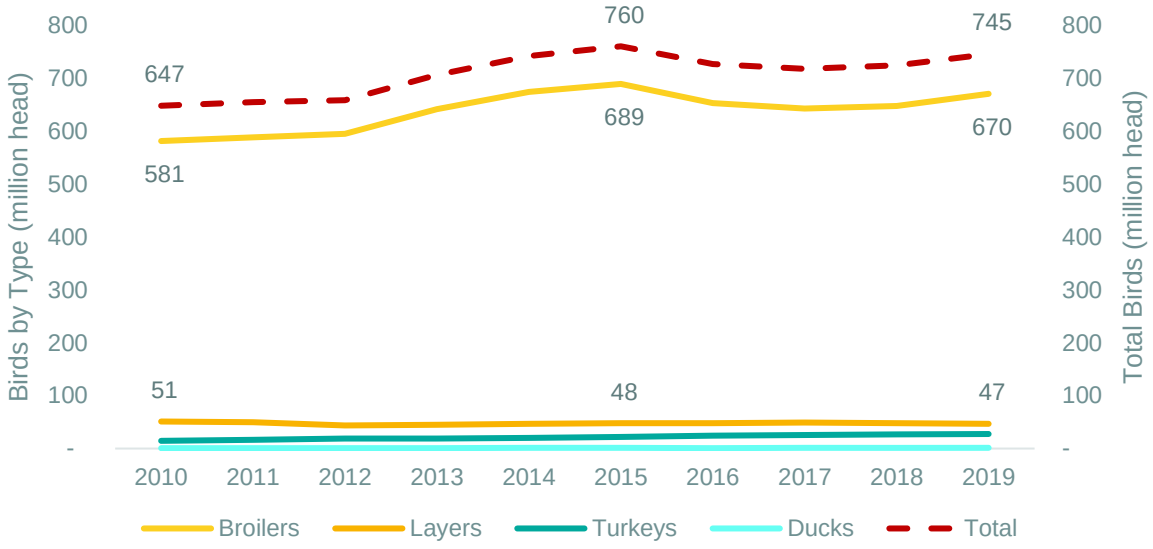
Figure 3.5-8: Value of Poultry Farm Production by Production Type 2010-2020



Source: Eurostat, FAO, Farrelly & Mitchell

Figure 3.5-9: Evolution of Spain's Poultry Production by Species 2010-2019



Source: FAO, Farrelly & Mitchell

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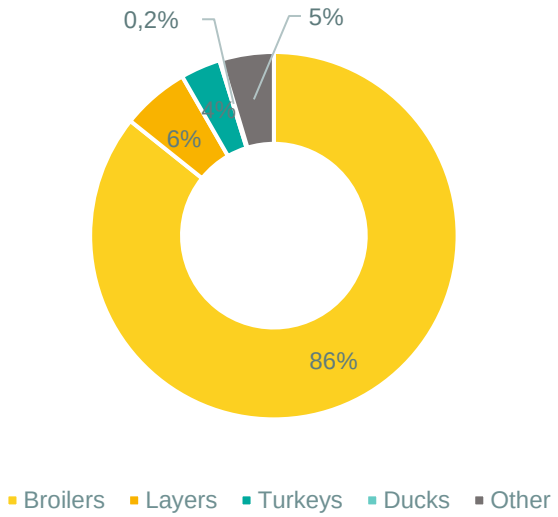
Figure 3.5-10: Breakdown of Spain's Poultry Bird Production by Type 2019



Source: FAO, Farrelly & Mitchell

The most recent agricultural survey in Spain identified 69,000 farm holdings with poultry. Around 5,490 of these were specialised poultry farms within which poultry production is concentrated.

Poultry rearing in Spain is highly intensive with most production taking place on farm with more than 20,000 birds.

Table 3.5-3: Breakdown of Poultry Holdings and Birds by Bird and Holding Type 2016*

Item		Total Poultry	Laying Hens	Broilers	Ducks	Geese	Turkeys
No of Farm Holdings	Specialist Poultry (%)	8%	4%	15%	4%	1%	15%
	Other (%)	92%	96%	85%	96%	99%	85%
	Total No. of Holdings	**68,790**	**63,900**	**20,780**	**2,170**	**1,610**	**2,460**
No of Birds ('000s)	Specialist Poultry (%)	95%	96%	95%	86%	0%	97%
	Other (%)	5%	4%	5%	14%	100%	3%
	Total No. of Birds	**203,110**	**55,750**	**126,450**	**280**	**10**	**8,890**

Source: Eurostat. *Latest data.

3.5.5. Feather Waste Supply from Slaughterhouses:

To estimate the available raw material (feathers) in Spain for the main bird species, slaughtering data from MAPA and Eurostat (2021) was used together with various assumptions around kill-out ratios and feather as a percentage of liveweight.

These are detailed below:

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Table 3.5-4: Assumptions Used in Feather Calculation

Assumption	Chickens**	Turkeys	Ducks
Average Carcass Weight*	2.3	8.2	4.3
killing-out percentage	75%	80%	72%
Liveweight	3.05	10.21	5.93
Feathers %	4.00%	4.70%	6.00%

Source: Kokoszyński and Bernacki, 2008, Eurostat. *Average carcass weight was calculated based on data published by MAPA for the period 2010-2020. **Includes spent layers and breeders.

Kill-out ratios were used to calculate the total liveweight value of poultry used as inputs in Spanish slaughterhouses. From the literature it is referenced that 4% of broilers and spent hens total body weight consist of feathers, 4.70% for turkeys and 6% for ducks. Using these figures, it was possible to estimate total available feathers from the main commercial poultry species in Spain (see Table 3.5-5 and Figure 3.5-14 below).

Table 3.5-5: Estimated Feather Availability in Spain 2020

Bird Type	Total Feather Availability (tonnes)
Chickens	91,457
Ducks	956
Turkey	13,275
Total	**105,687**

Source: Farrelly & Mitchell

Broilers feathers are the largest source of raw materials making up 87.5% of the total available in 2020. This is followed by turkeys (12.6%), with duck feathers accounting for 0.9% of estimated volumes. Duck feathers are considered of higher value because of their potential use in apparel and fibre production industry.

The total average feather availability during the period 2010-2020 was 89,770 tonnes.

Feather availability from the main commercial species reached almost 105,700 tonnes in 2020, an increase of 53% since 2010 (4.3% CAGR). There has been growth in availability across species, with growth strongest for duck feathers (9.7% CAGR). Chicken feather availability grew at a 4.4% CAGR, and turkey feather availability 3.6% CAGR.

Figure 3.5-12 and Table 3.5-6 detail estimated regional distribution of feathers by species from slaughtering houses in 2020. Feather availability is concentrated in 5 of Spain's 17 regions, these regions (Andalucía, Cataluna, Galicia, Valencia, Castilla y León) account for 83% of feather availability.

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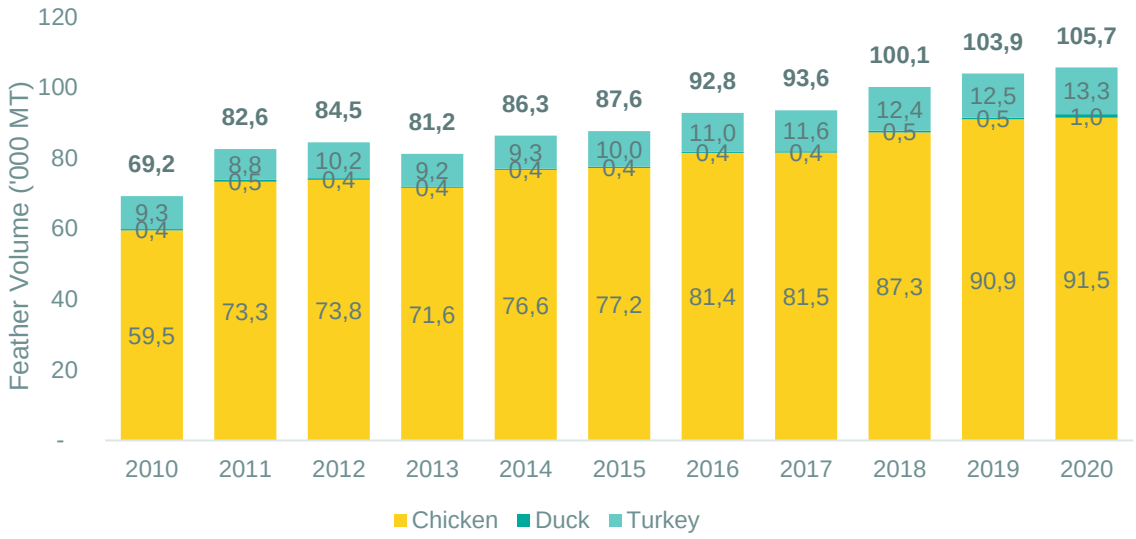
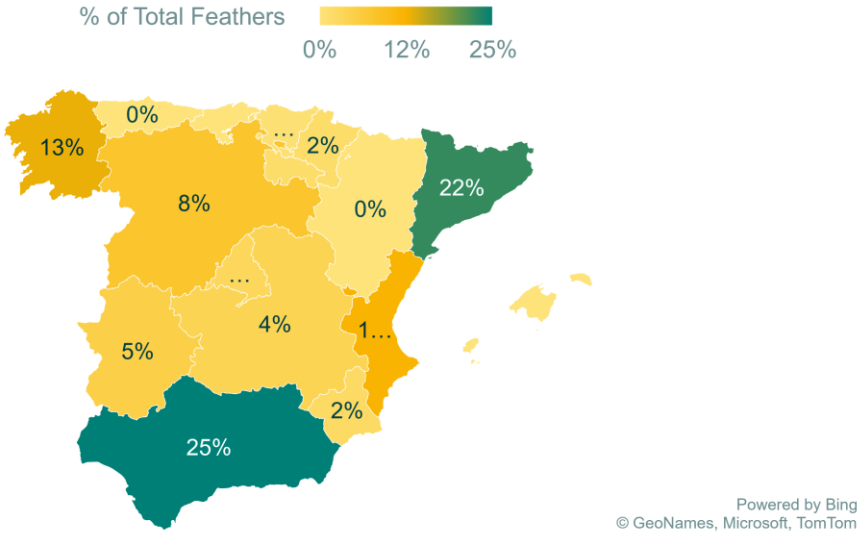
Figure 3.5-11 Feather Volumes Available from Slaughtered Birds 2010-2020



Source: Farrelly & Mitchell

Figure 3.5-12: Regional Distribution of Total Feathers Available from Slaughtered Birds 2020



Source: Farrelly & Mitchell

Table 3.5-6: Estimated Regional Distribution of Feather by Bird Species 2020

Region	Chickens	Ducks	Turkey	% of National Total	Regional Total (MT)
Andalucía	21%	0%	53%	25%	26,339
Cataluna	21%	12%	29%	22%	23,597
Galicia	14%	0%	11%	13%	13,983

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Valencia	14%	0%	1%	12%	12,904
Castilla y León	8%	7%	5%	8%	8,328
Extremadura	6%	0%	0%	5%	5,406
Castilla la Mancha	4%	5%	0%	4%	4,078
Madrid	4%	0%	0%	3%	3,325
Murcia	3%	0%	0%	2%	2,510
Navarra	2%	63%	0%	2%	1,730
La Rioja	2%	0%	0%	2%	1,692
Canarias	1%	0%	0%	1%	907
País Vasco	1%	0%	0%	1%	785
Aragón	0%	13%	0%	0%	88
Baleares	0%	0%	0%	0%	15
Cantabria	0%	0%	0%	0%	0
Asturias	0%	0%	0%	0%	0
Spain (Total, MT)	**91,457**	**956**	**13,275**	**-**	**105,687**

Source: Farrelly & Mitchell

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3.6. Polish Poultry Slaughterhouses

3.6.1. Sector Overview

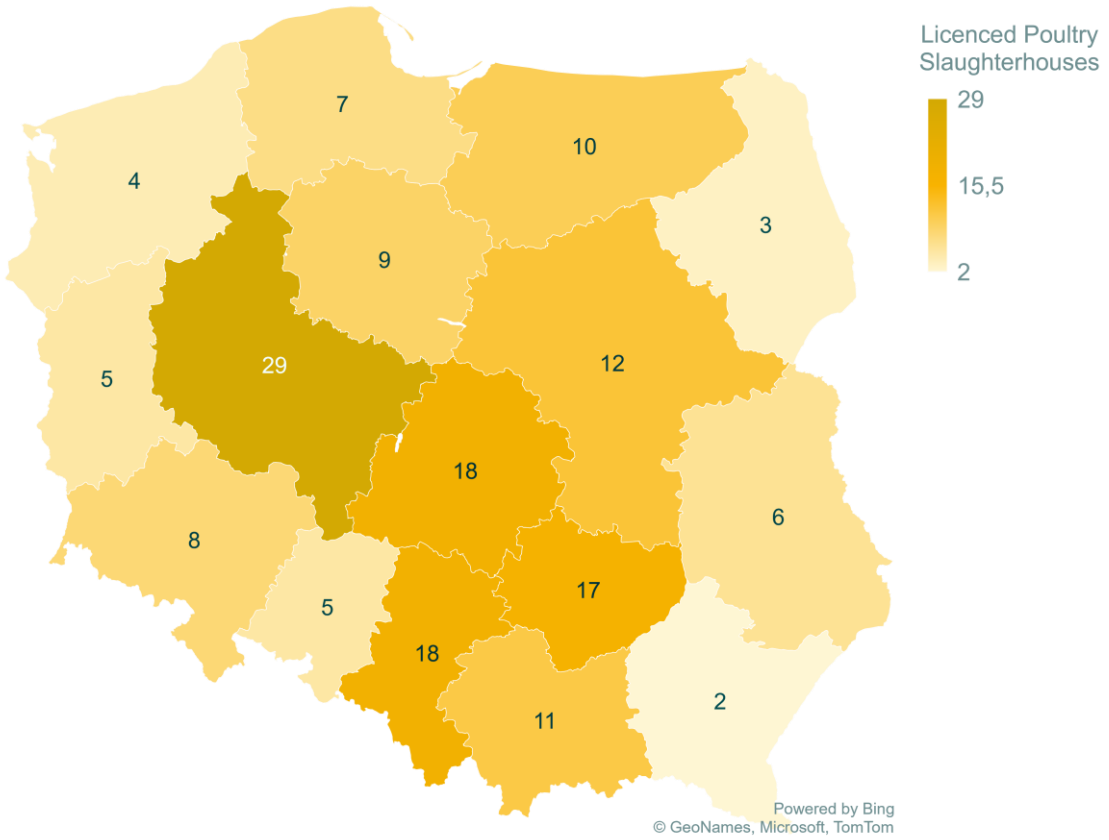
There are 164 licenced poultry slaughterhouses in Poland. These are located across all 16 Polish Voivodeships/regions.

Wielkopolskie in North-Western Poland has the highest concentration of licenced slaughterhouses in accounting for 18%.

The next largest regional concentration of slaughterhouses is located along the spine of the country in the North, Central and South. These three macro-regions along with Wielkopolskie account for 73% of all poultry slaughterhouses in Poland.

The Northern regions of Kujawsko-Pomorskie, Pomorskie and Warminsko-Mazurskie account for 16%. The Central regions of Lodzkie and Swietokrzyskie account for 21% and Southern regions of Malopolskie and Slaskie account for 18% of slaughterhouses.

Figure 3.6-1: Distribution of EU Approved Poultry Slaughterhouses in Poland



Source: Poland Ministry of Agriculture and Rural Development

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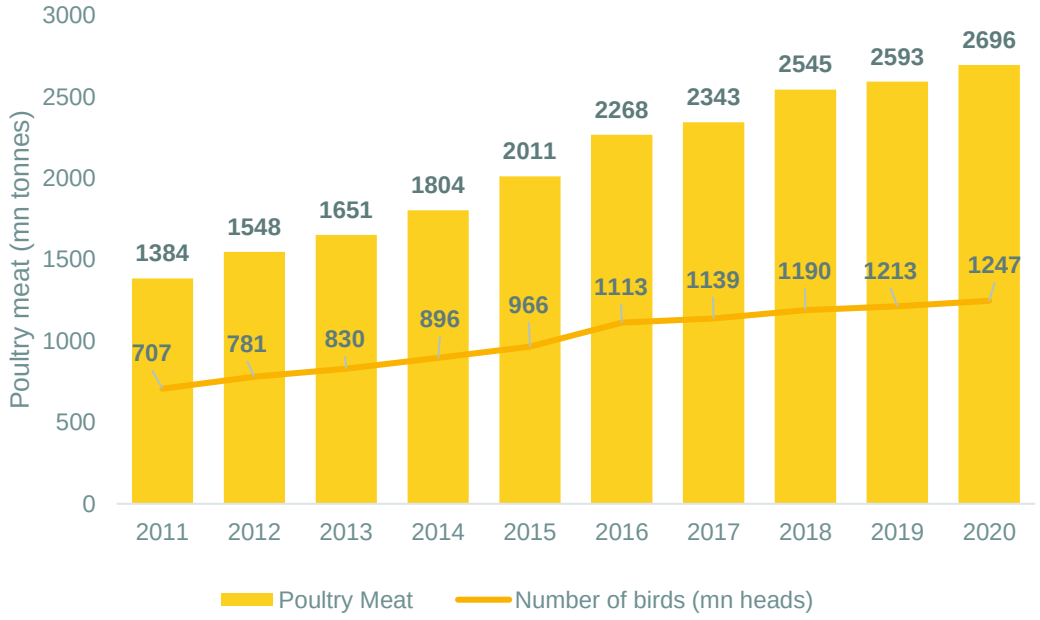
Polish processing facilities have slaughtered a total of 1,247 million birds in 2020. Slaughtered meat in Poland increased from 1,384 million tonnes in 2011 to 2,696 million tonnes in 2020.

Figure 3.6-2 Overview of Poultry Meat Slaughter (Birds Slaughtered and Poultry Meat Produced)



Source: Eurostat: 2020

The principal poultry species produced in Poland are broilers, ducks and turkeys. The number of birds slaughtered by slaughterhouses in 2020 ranged from 1,178 million birds for broilers to just 27 million birds for ducks. Figure 3.6-3 gives a breakdown of birds slaughtered in Poland over the period 2011-2020.

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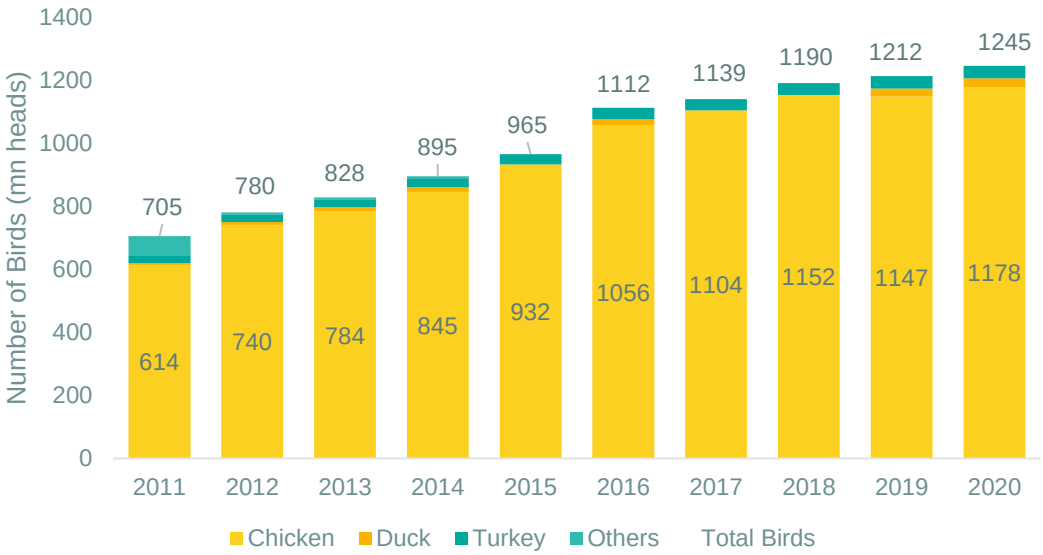
Figure 3.6-3 Number of Birds Slaughtered in Poland by Species 2011-2020

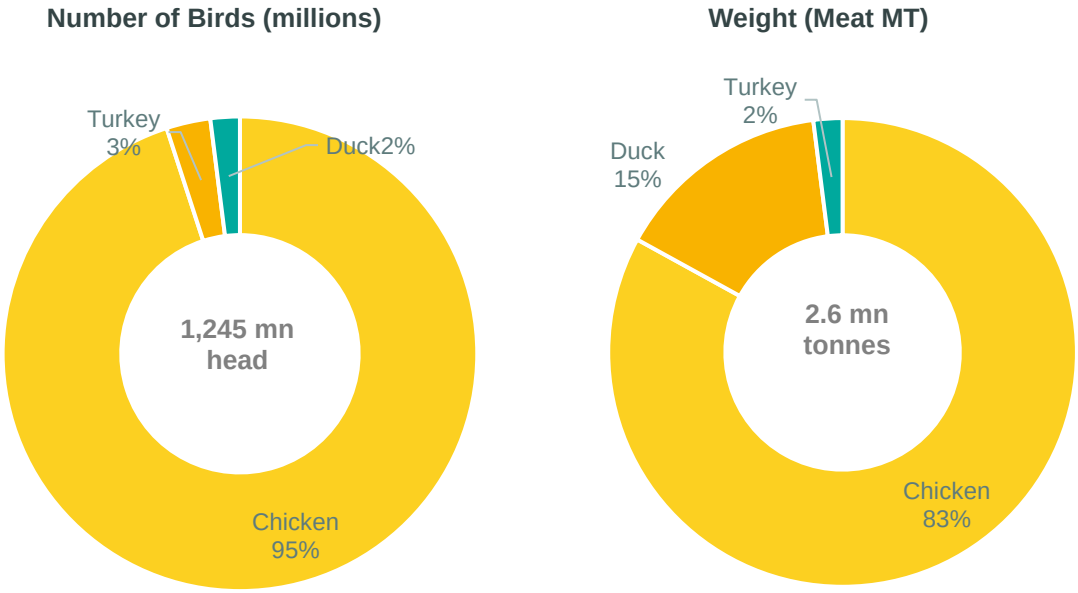


Source: Eurostat: 2020

Broilers and turkeys represent the majority of bird species slaughtered and hold the largest share of poultry production. In 2020, broilers accounted for 83% of poultry slaughtering weight, turkeys 15% and ducks 2%.

Figure 3.6-4 gives an overview of number of birds slaughtered in Poland by species.

Figure 3.6-4: Breakdown of Birds Slaughtered by Species 2020



Source: Eurostat: 2020

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Table 3.6-1 gives a breakdown of the average number of birds processed each month in 2020.

Table 3.6-1: Average Number of Birds Slaughtered by Bird Type

Bird Type	Average Monthly Slaughter Rate (No. of Birds)
Broilers	98,234
Duck	2,286
Turkey	3,409

Source: Eurostat: 2020

3.6.2. International Trade

Poland is the largest poultry meat producer in the EU. In 2020, c. 1.5 million tonnes of Polish poultry meat was exported. Key destination countries included, Germany, the Netherlands, Hungary, France and the U.K. Germany, Hungary and the Netherlands accounted for half of supplying countries' imports.

Figure 3.6-5: Breakdown of Poland's Poultry Meat Trade Volumes by Key Partner & Type

Source: UN comtrade 2020

3.6.3. Breeding and Rearing:

3.6.3.1 Breeding:

There were an estimated 13.7 million breeder birds in Poland in 2020. The breeder stock population showed consistent growth over the period 2010-2020, recording 5.6% CAGR.

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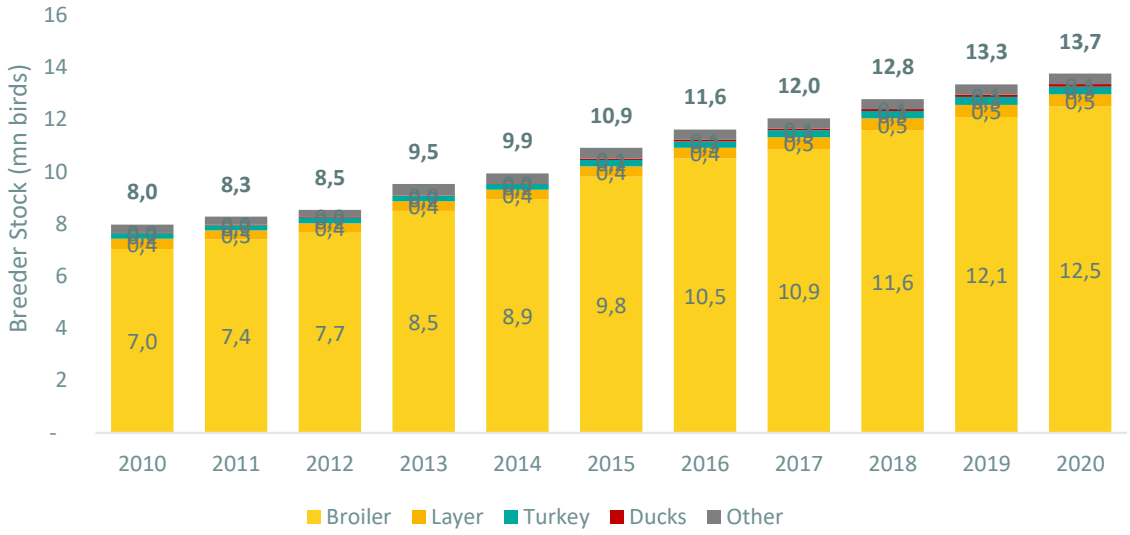
Broiler breeders are estimated to have accounted for 91% of breeders with layer breeders making up 3% of breeder stock, turkeys 2% and ducks 1%.

Other breeder birds accounted for 3% of total stock, with geese accounting for the majority.

Over the period 2010-2020, there was growth across all types and species. The highest growth was for duck breeders (21% CAGR), followed by broiler breeders (5.9% CAGR).

Turkey breeders grew at 3.4% CAGR, with layer breeders growing at 1.3% CAGR and other species at 2.1% CAGR.

Figure 3.6-6: Estimated Polish Breeder Stock by Species 2010-2020*



Source: Eurostat, Farrelly & Mitchell. *Includes parent and grandparent stock. Other includes geese, guinea fowl and unclassified chicken breeds.

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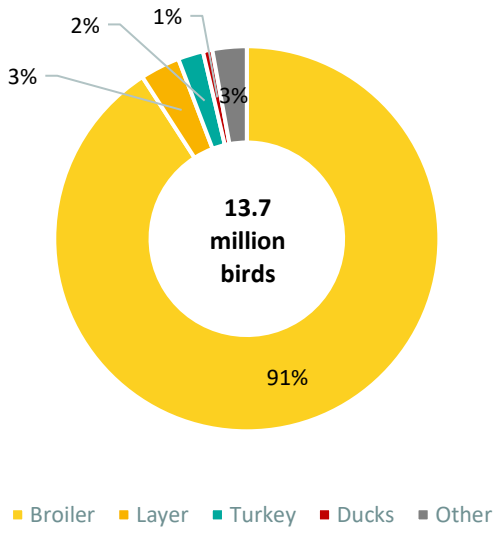
Figure 3.6-7: Breakdown of Estimated Polish Breeder Stock by Species 2020



Source: Eurostat, Farrelly & Mitchell

3.6.3.2 Meat and Egg's production:

Primary production of poultry in Poland was worth €3 bn in 2020 (11.4% of the total value of agricultural production). Meat production accounted for 81% of poultry production value (€2.43 bn) and recorded strong value growth (8% CAGR) over the period 2010-2020. Egg production's share of poultry farm production value decreased over the same period, falling from 52% to 19% (-1% CARC decline in production value to €579 mn in 2020).

The number of producing birds grew strongly over the period 2010-2019 (6.3% CAGR) reaching more than 1.2 bn in 2020.

Broilers are the key bird type, accounting for 90% in 2019. The number of broilers grew at 6.6% CAGR reaching 1.1 bn.

Turkeys and layers are the next most common bird types, accounting for 3% and 4% of birds respectively. While layer number declined over the period (-1.1% CARC), turkey numbers grew strongly (6.1% CAGR).

The number of ducks also grew rapidly, increasing at a 18% CAGR to reach almost 27 million birds.

Figure 3.6-8: Value of Poultry Farm Production by Production Type 2010-2020

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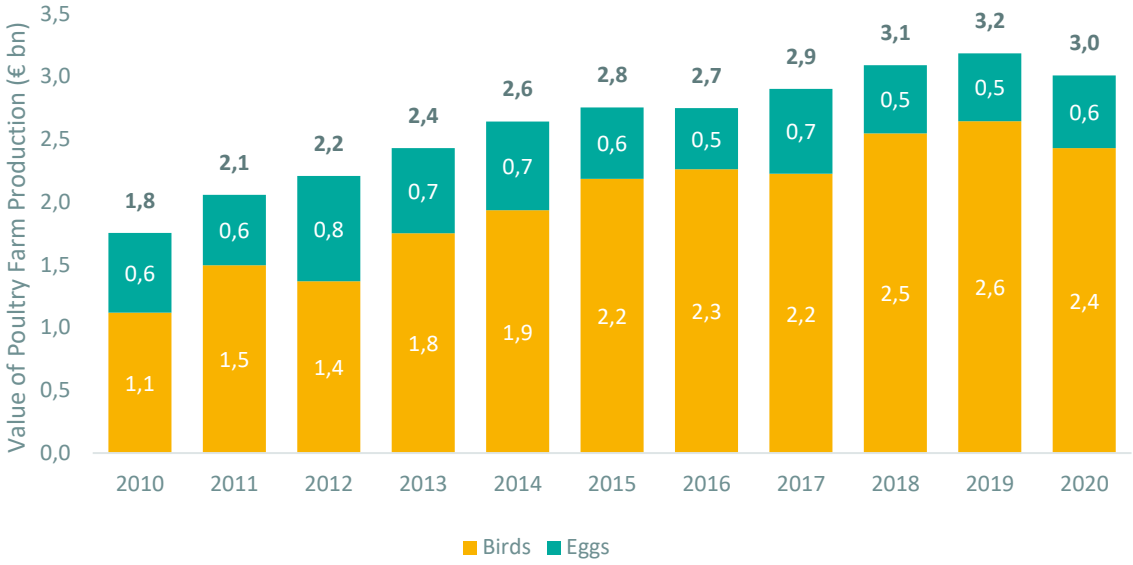
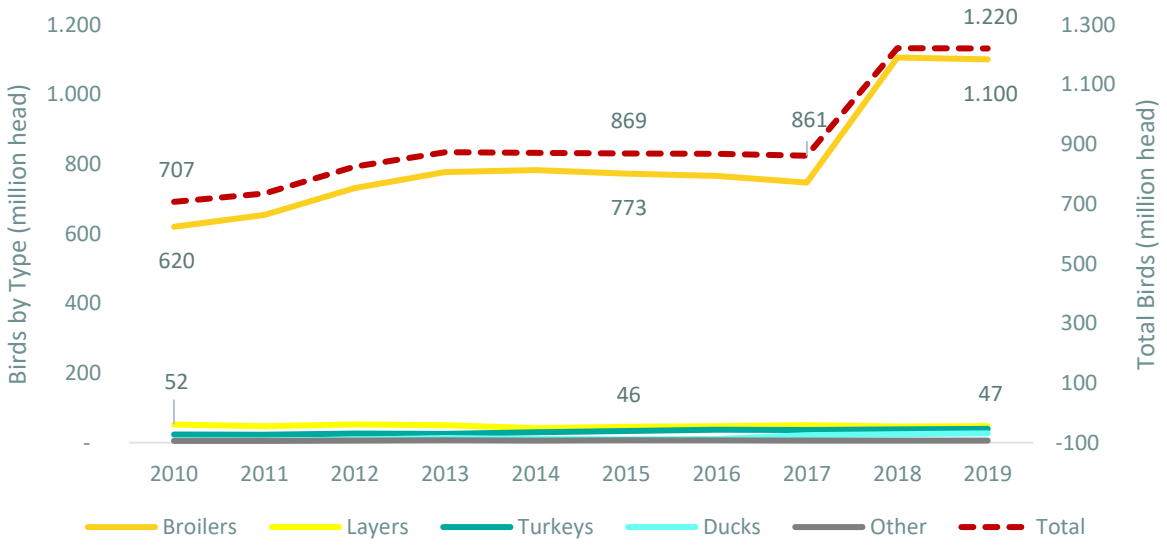


Source: Eurostat, FAO, Farrelly & Mitchell

Figure 3.6-9: Evolution of Poland's Poultry Production by Species 2010-2019



Source: FAO, Farrelly & Mitchell

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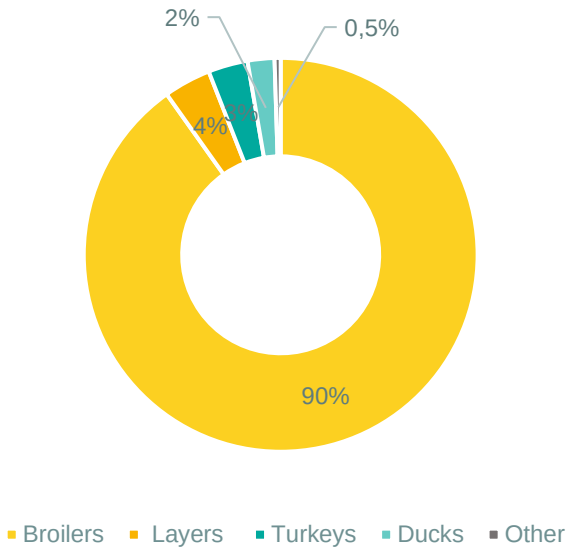
Figure 3.6-10: Breakdown of Poland's Poultry Bird Production by Type 2019



Source: FAO, Farrelly & Mitchell

The most recent agricultural survey in Poland identified more than half a million farms with poultry. However, production is concentrated on around 13,300 specialised poultry farms. These specialist producers, who account for just 3% of farm holdings with poultry, account for 91% of poultry birds produced.

Poultry rearing on these farms is highly intensive with an average flock size of c. 15,000 birds.

Table 3.6-2: Breakdown of Poultry Holdings and Birds by Bird and Holding Type 2016*

Item		Total Poultry	Laying Hens	Broilers	Ducks	Geese	Turkeys
No of Farm Holdings	Specialist Poultry (%)	3%	2%	5%	1%	4%	5%
	Other (%)	97%	98%	95%	99%	96%	95%
	Total No. of Holdings	**506,680**	**488,920**	**64,490**	**114,620**	**32,670**	**21,420**
No of Birds ('000s)	Specialist Poultry (%)	91%	76%	97%	55%	87%	97%
	Other (%)	9%	24%	3%	45%	13%	3%
	Total No. of Birds	**211,390**	**50,210**	**126,890**	**3,410**	**4,250**	**13,280**

Source: Eurostat. *Latest available data.

3.6.4. Feather Waste Supply from Slaughterhouses:

To estimate the available raw material (feathers) in Poland for the main bird species, slaughtering data from Eurostat (2021) was used together with various assumptions around kill-out ratios and feather as a percentage of liveweight.

These are detailed below:

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Table 3.6-3: Assumptions Used in Feather Calculation

Assumption	Chickens**	Turkeys	Ducks
Average Carcass Weight*	1.8	9.3	2.3
killing-out percentage	75%	80%	72%
Liveweight	2.4	11.6	3.2
Feathers %	4.00%	4.70%	6.00%

Source: Kokoszyński and Bernacki, 2008, Eurostat. *Average carcass weight was calculated based on data published by Eurostat for the period 2010-2020. **Includes spent layers and breeders.

Kill-out ratios were used to calculate the total liveweight value of poultry used as inputs in Polish slaughterhouses. From the literature it is referenced that 4% of broilers and spent hens total body weight consist of feathers, 4.70% for turkeys and 6% for ducks.

Using these figures, it was possible to estimate total available feathers from the main commercial poultry species in Poland (see Table 3.6-4 and Figure 3.6-11 below).

Table 3.6-4: Estimated Feather Availability in Poland 2020

Bird Type	Total Feather Availability (tonnes)
Chickens	118,705
Ducks	5,293
Turkey	23,898
Total	**147,896**

Source: Farrelly & Mitchell

Broilers feathers are the largest source of raw materials making up 80.3% of the total available feathers in 2020. This is followed by turkeys (16.2%), with duck feathers accounting for 3.6% of estimated feather volumes.

Duck feathers are considered of higher value because of their potential use in apparel and fibre production industry.

Average annual feather availability from these species during the period 2010-2020 was 109,537 tonnes.

Feather availability reached almost 147,900 tonnes in 2020, an increase of 122% since 2010 (8.3% CAGR).

There has been growth in availability across the species, with growth strongest for duck feathers (16.5% CAGR). Chicken feather availability grew at an 8.3% CAGR, while turkey feather availability increased at a 7.1% CAGR over the period 2010-2020.

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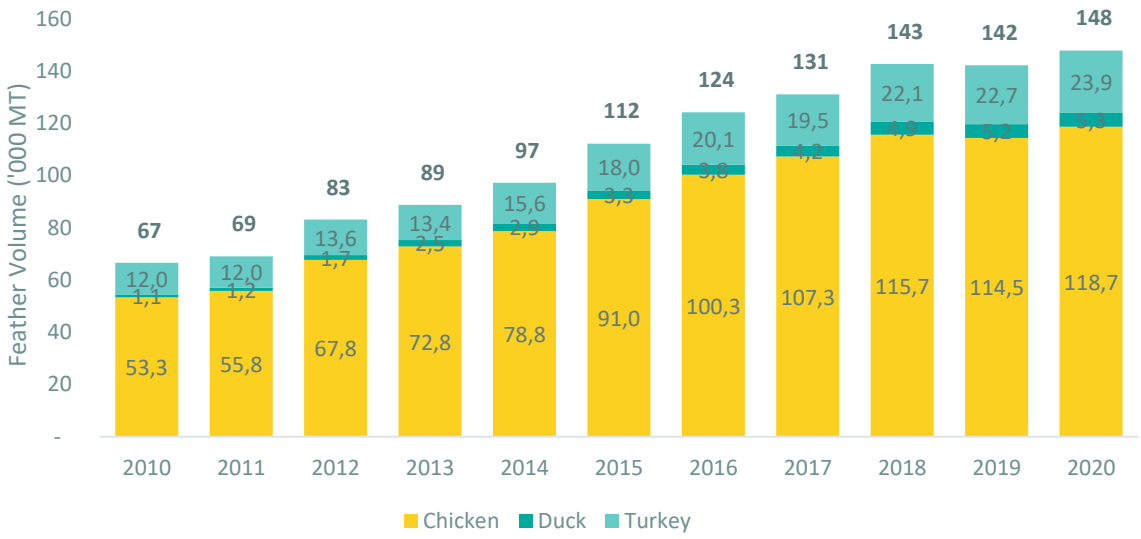
Figure 3.6-11: Feather Volumes Available from Slaughtered Birds 2010-2020



Source: Farrelly & Mitchell

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3.7. Overview of EU Rendering and Animal By-Products (ABP)

3.7.1. Industry:

Rendering is the process that converts by-products from the meat and livestock industry such as feathers into usable materials. Without proper management, meat and animal by-products can become hazardous.

As a result, the rendering industry is underpinned by strict EU veterinary principles to prevent the spread of animal diseases and zoonoses. ABP is regulated by EU Council Regulation No. 1069/2009 and its Implementing Regulation (EU Regulation No 142/2011) (referred to as the ABP Regulations).

The objective of these Regulations is to promote the sustainable use of animal materials and a high level of protection of public and animal health in the EU. Clause 1 of Commission Regulation No 142/2011: 'Regulation (EC) No 1069/2009 specifies animal and public health rules for animal by-products and products derived thereof.

This Regulation determines the circumstances under which animal by-products are to be disposed, in order to prevent the spreading of risks for public and animal health.

In addition, that Regulation specifies under which conditions animal by-products may be used for applications in animal feed and for various purposes, such as in cosmetics, medicinal products and technical applications.

It also lays down obligations for operators in handling animal by-products within establishments and plants which are subject to official controls.

With a view to preventing and minimising risks to the public and animal health arising from ABPs and products derived from them, Regulation (EC) No 1069/2009 assigns products to specific categories that reflect the level of such risks and includes requirements on their safe use and disposal, as follows:

- Category 1 ABPs: Defined in Article 8 of Regulation (EC) No 1069/2009. This material is associated with the highest risk and consists principally of material that is considered a TSE risk, i.e. Specified Risk Material.

- Category 2 ABPs: Defined in Article 9 of Regulation (EC) No 1069/2009. This material is associated with medium risk. It includes fallen stock, manure and gastrointestinal tract contents. Category 2 is also the default status of any animal by-product not defined in the ABP Regulation as either Category 1 or Category 3 material and includes such material as slaughterhouse drain-trap waste.

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- Category 3 ABPs: Defined in Article 10 of Regulation (EC) No 1069/2009. It is the lowest risk category of animal by-product. It includes parts of animals that have been considered fit for human consumption in a slaughterhouse, but that are not intended for consumption for commercial or other reasons.

Companies rendering products of animal origin need to comply with Regulation (EC) No 1069/2009 which establishes a list of rules and procedures regarding the production of end-products derived from animal by-products. Once a company complies with these regulations, they are given an approval or registration number (European Commission, 2009).

Rendering uses heat and pressure to sterilise and stabilise animal materials. Sterilisation kills harmful microorganisms, while stabilising prevents any further decomposition of by-products and makes them stable for storage and reprocessing.

A key step in the rendering process is the removal of water. Approximately 6 million tonnes of useful end-products are produced from the 17 million tonnes of material taken in by EFPRA members, the difference is lost as water (EFPRA, 2021)[8].

Europe generates approximately 3.6 million tonnes of feathers per year as a by-product from the poultry sector. Poultry feathers constitute between 4-7% of the total body weight of chickens. These can be found in large amounts during the processing of poultry into meat product at slaughterhouses.

Companies involved in the transport, handling, storage and processing of animal by-products are registered according to their compliance with EU Regulation 1069/2009. There are 14 subsections under this regulation of which this report focuses on 5 key subsections that are most relevant to mapping the rendering industry in the 5 key target countries.

The most relevant sections for this project are:

- **Section I**: Establishments or plants carrying out intermediate activities and storage of animal by-products;
- **Section II**: Establishments or plants for the storage of derived products;
- **Section IV**: Processing (Rendering) plants;
- **Section IX**: Establishments or plants dealing with products with purposes outside the food chain; and
- **Section XIII**: Establishments or plants carrying out other registered activities outside of the food chain.

[8] EFPRA = European Fat Processors and Renderers Association

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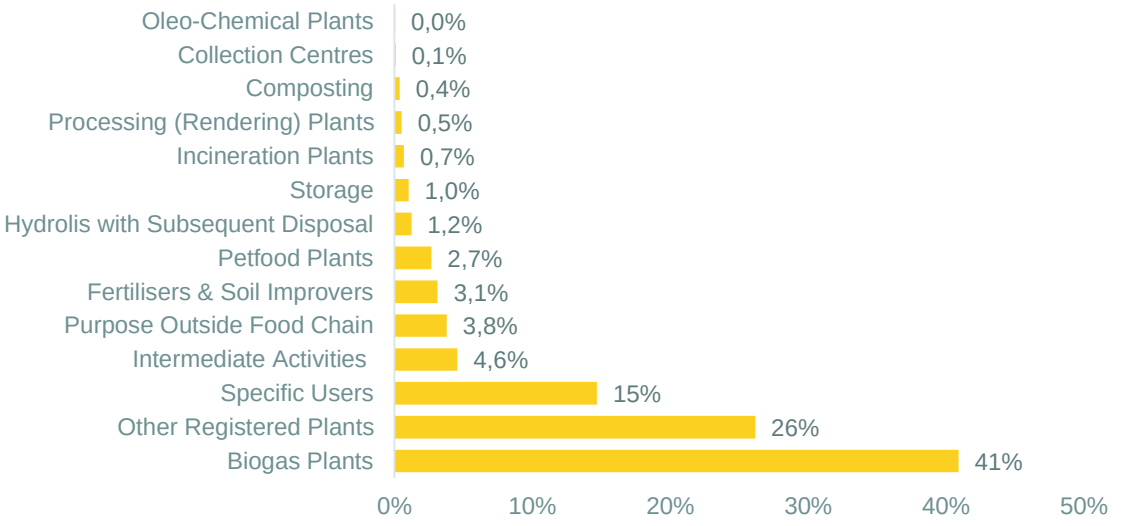
3.8. German Rendering and ABP Industries

3.8.1. Sector Overview

The German Federal Ministry of Food and Agriculture (BMEL) has issued a total of 18,404 licences to establishments that deal with ABPs (i.e. for ABP use and/or disposal). These licences are issued across 14 activities as laid out in EU Reg No 1069/2009 (and detailed in figure 21). The activities include collection, storage, use and disposal of ABPs and derived products.

Licenced establishments are located across Germany's 16 regions (see Figure 3.8-1). The highest concentrations of licensed establishments are located in Bayern, Nordrhein-Westfalen, Niedersachsen and Baden-Württemberg (67% of all licenses). The three most common categories of activities (in terms of number of licenses) are Section VI (biogas plants; 41% of licences), Section XIII (other registered plants; 26% of licenses) and Section X (specific users; 15% of licenses).

Figure 3.8-1: Breakdown of ABP Licenses Issued by Activity



Source: BMEL

Bayern/Bavaria (2,379 licenses), Niedersachsen (1,472 licenses) and Baden-Württemberg (858 licenses) account for 63% of the overall licenses in the biogas plants. One of these establishments, located in Mecklenburg-Vorpommern, lists feathers as its main activity.

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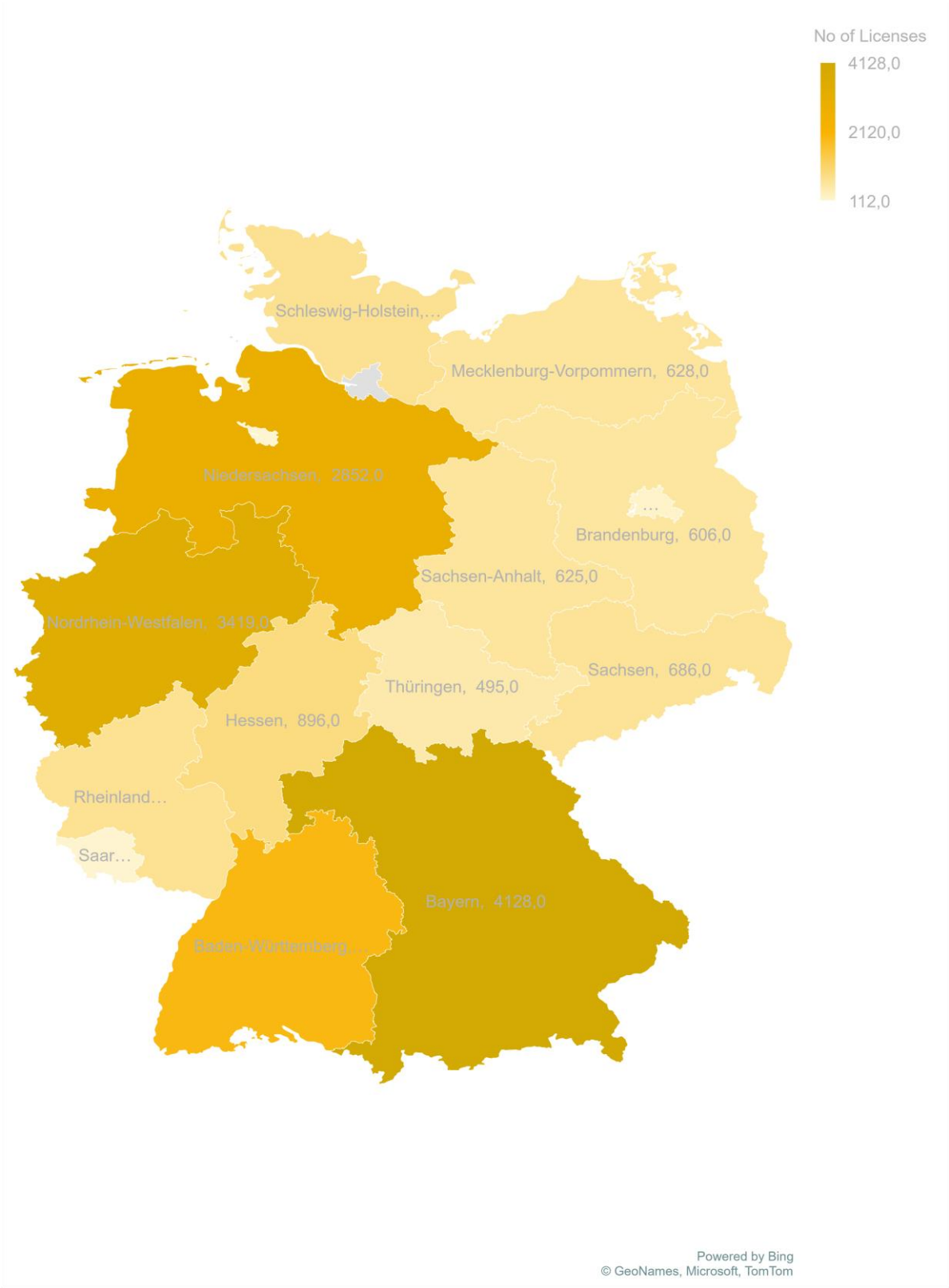
Figure 3.8-2: Figure Distribution of ABP Licences by Region in Germany



Source: BMEL

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A small portion (n=31) of the 4,816 establishments licensed under Section XIII[9] list feathers as one of their products (n=17) or WHBF (wool, hair, pig bristles, feathers, parts of feathers and down) as an associated activity (n=14). Feather meal is listed as a product by 13 establishments.

Two of these establishments (located in Bayern and Nordrhein-Westfalen) listing WHBF as an associated activity also list hydrolysed protein as one of their activities.

Table 3.8-1: Regional Breakdown of Section XIII Licences Referencing Feather Related Products and Activities

Region	Product: Feather Meal	Product: Other Feather	Activity: WHBF
Niedersachsen	5	1	2
Bayern	4	1	1
Nordrhein-Westfalen	2	1	1
Baden-Württemberg	2		1
Hessen		1	2
Sachsen			3
Schleswig-Holstein			2
Mecklenburg-Vorpommern			1
Hamburg			1
Total	13	4	14

Source: BMEL

WHBF is listed as an activity for 53 of the 2,704 establishments listed in Section X (specific users). Most of these establishments (44) are located in Baden-Württemberg. The others are located in Sachsen (5), Hessen (3) and Schleswig-Holstein (1).

Hydrolysed protein is listed as an activity of 8 of the 53 establishments. These are located in Baden-Württemberg (7) and Sachsen (1).

Four of Germany's 16 regions (Bayern, Niedersachsen, Nordrhein-Westfalen and Baden-Württemberg) account for 63% of the 1,829 licences issued across Section I (intermediate activities), II (derived product storage), IV (processing plants) and IX (purposes outside the food chain).

There are some 840 established companies licensed under Section I (see Figure 3.8-3 for a regional breakdown of Section I licenses). Of these, 10 establishments list WHBF as one of their activities.

[9] Licenced under Section Xiii of EU Regulation 1069 /2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation).

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Table 3.8-1: Regional Breakdown of Section I Licences Referencing Feathers

Number of Licences	Region
3	Nordrhein-Westfalen
2	Mecklenburg-Vorpommern
2	Bremen
1	Bayern
1	Hessen
1	Schleswig-Holstein

Source: BMEL

There are 192 establishments licensed to store derived products (Section II). Two of these (located in Bremen and Schleswig-Holstein) list feather meal as one of their products and another in Niedersachsen lists WHBF as an activity.

There are 97 licenced processing plants registered under Section IV. These are mostly (74%) concentrated in four regions; Niedersachsen (24), Bayern (18), Mecklenburg-Vorpommern (15) and Nordrhein-Westfalen (15).

One of the establishments (located in Thüringen) lists WHBF feather products as a primary activity. Figure 3.8-5 provides a breakdown of licensed processing plants by region in Germany.

There are 700 licences issued for purposes outside the food chain (section IX). The highest concentrations of these plants are in Bayern (145 licences), Baden-Württemberg (136), Nordrhein-Westfalen (96) and Hessen(70).

Feathers are listed as a product for nine of the licenced plants under Section IX. An additional 55 plants list WHBF as an activity.

Table 3.8-2: Regional Breakdown of Section IX Licences Referencing Feather Related Products and Activities

Region	Other Feather Product	WHBF
Baden-Württemberg		15
Sachsen		12
Bayern	9	1
Hessen		7
Nordrhein-Westfalen		7
Mecklenburg-Vorpommern		3
Niedersachsen		3
Thüringen		3
Brandenburg		2
Schleswig-Holstein		2
Total	9	55

Source: BMEL

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In addition to the sections outlined above, feathers and related activities are also listed in Section's VII (composting) and XII (fertilisers and soil improvers). Section VII shows one establishment located in Baden-Württemberg with WHBF as an activity. Section XII has four establishments with feathers as a primary activity (located in Baden-Württemberg) with another two listing WHBF as an activity in Bayern and Baden-Württemberg.

In summary, of the 18,404 approved licences for handling ABP's only a very small portion (0.5%) of them list Feather Meal, Other Feather Products or WHBF as products or associated activities. Of the 95 licenced establishments handling feather products, the highest concentration is in:

- **Baden-Wurttemberg (19%);**
- **Bayern (17%);**
- **Sachsen (16%);**
- **Niedersachsen and Nordrhein-Westfalen (each 12%); and Hessen (11%)**

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Figure 3.8-3 Regional Breakdown of Section I Licences (Intermediate Activities)

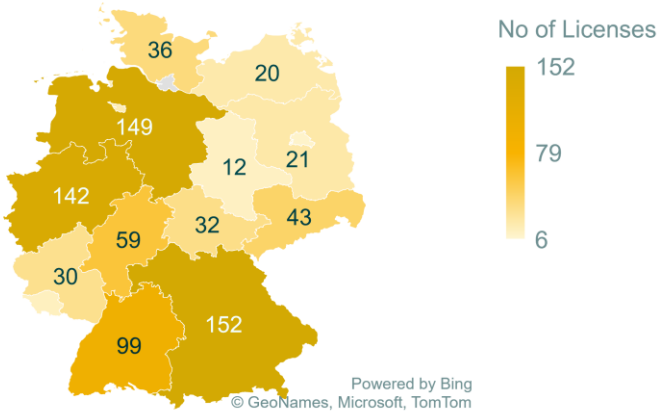


Figure 3.8-4: Regional Breakdown of Section II Licences (Derived Product Storage)

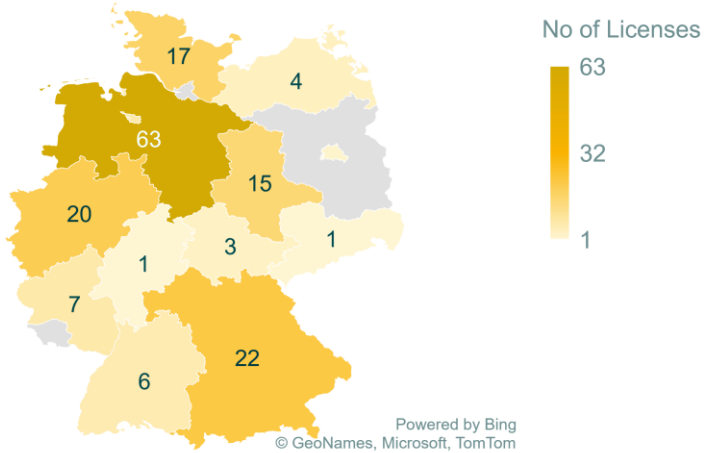


Figure 3.8-5: Regional Breakdown of Section IV Licences (Processing Plants)

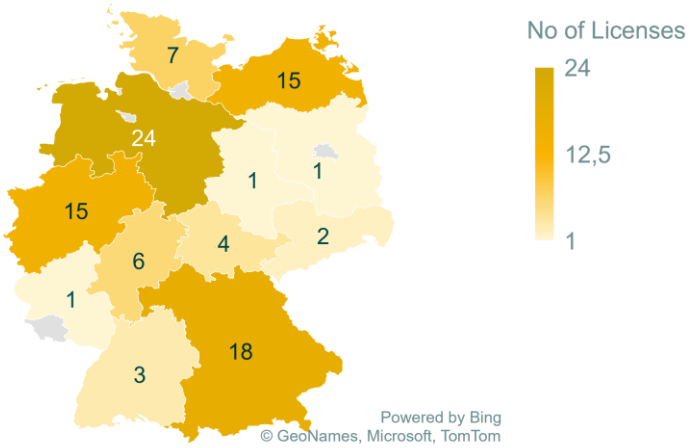
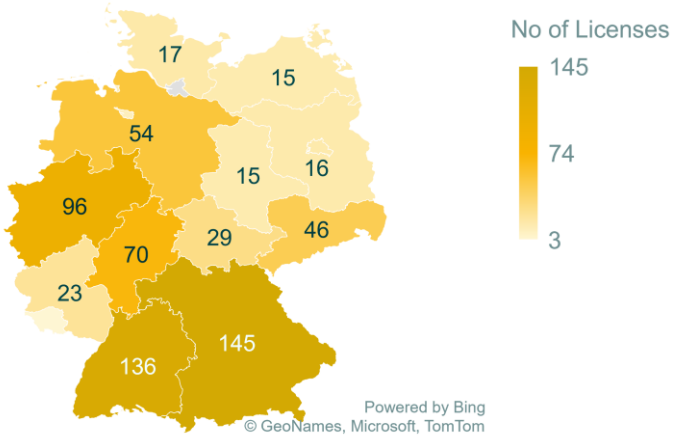


Figure 3.8-6: Regional Breakdown of Section IX Licences (Purposes Outside the Food Chain)



Source: BMEL

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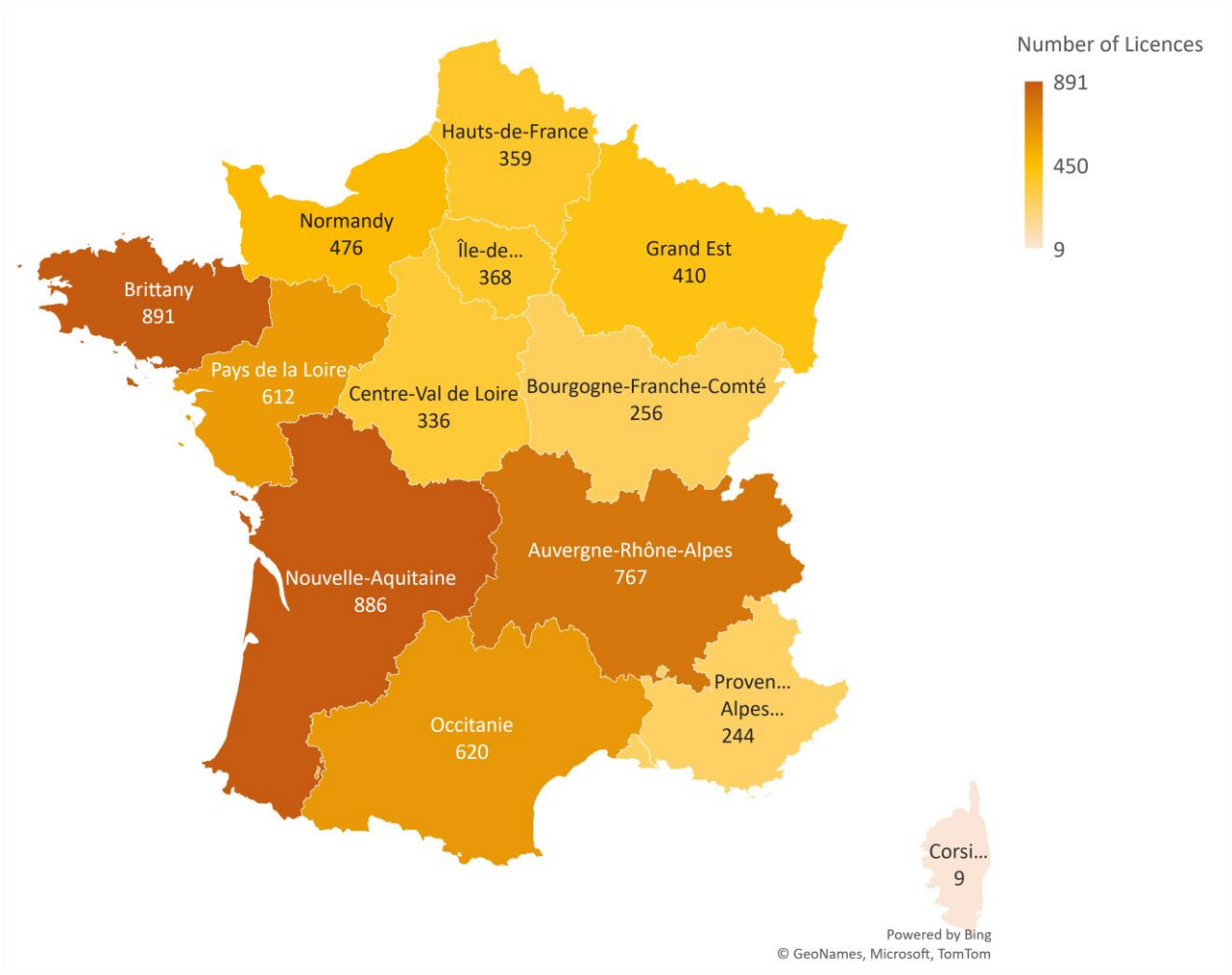
3.9. French Rendering and ABP Industries

3.9.1. Sector Overview:

The French Ministry of Agriculture and Food has issued 6,286 licences to establishments that deal with ABPs (i.e. for ABP use and/or disposal). These establishments are located across 13 metropolitan regions (see Figure 3.9-1) and 5 overseas regions (for which 52 licences are allocated). The highest concentrations of licensed establishments are located in Brittany, Auvergne-Rhône-Alpes, Occitanie and Pays de la Loire.

Figure 3.9-1: Distribution of ABP Licences by Region in France



Source: French Ministry of Agriculture and Food

Licences are issued across 14 subsection activities as laid out in EU Reg No 1069/2009 (see Figure 3.9-2). These activities include collection, storage, use and disposal of ABPs and derived products. The two most common activity categories of

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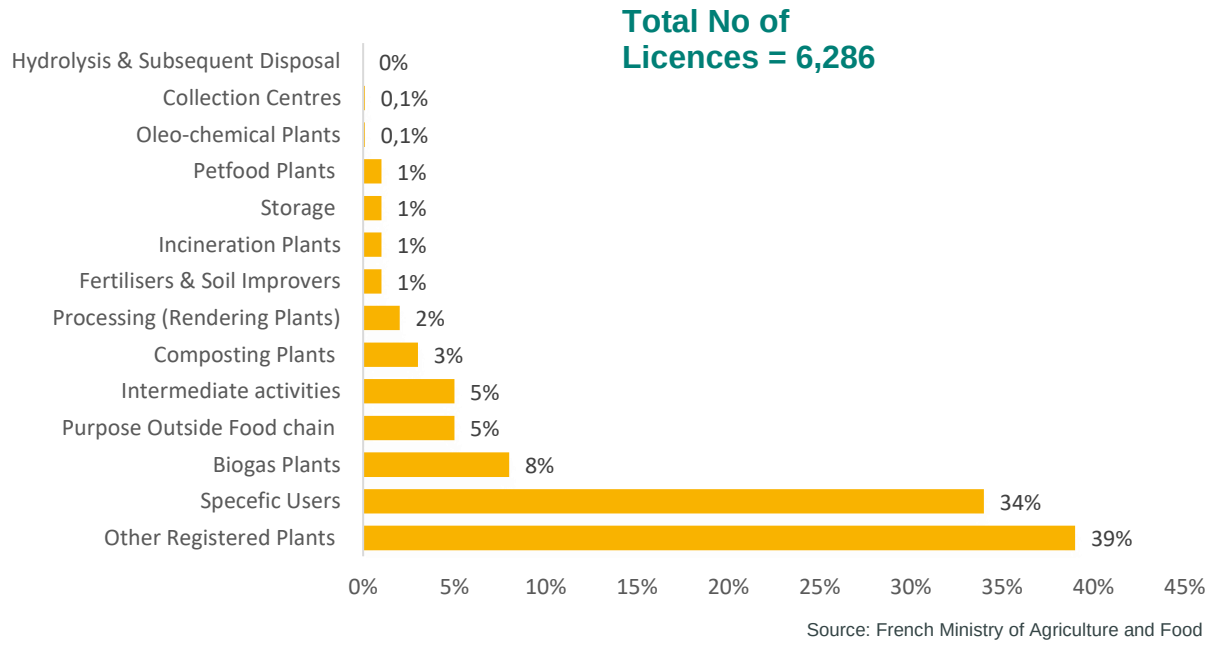
(in terms of number of licenses) are other registered plants (39% of licences) and specific users (34% of licenses).

The primary activity of other registered plants is listed as the transport of ABP and other derived products. A range of associated activities are listed for these companies and the most common are transport, collection of dead animals, storage and trade.

For specific users, the principal associated activities refer to special feeding uses and use for diagnostic, educational and research purposes.

Figure 3.9-2: Breakdown of Licences issued by activity



Source: French Ministry of Agriculture and Food

Five of France's 18 regions account for 63% of the 840 licences issued across Brittany, Auvergne-Rhône-Alpes, Normandy, Occitanie and Pays de la Loire.

85 of the establishments listed deal with wool, hair, pig bristles, feathers, parts of feathers and down plants (WHBF). This product is the only reference to feathers across 8 sections among the overall 14 subsections of the EU Reg. 1069/2009 (see table 4 for Regional Breakdown of Licences Referencing Feather Related Products by Sections).

There are some 318 established companies licensed under Section I (see Figure 3.9-3 for a regional breakdown of Section I licenses). Only 5% of these establishments list WHBF (feather related product) as one of their products.

From the total 70 plants responsible for storage activities, only 3% list WHBF as a product stored within their facilities.

There are 113 licenced processing plants registered under Section IV. More than half are concentrated in three regions, Brittany (28), Nouvelle-Aquitaine (18) and Pays de la Loire (16). Figure 3.9-5 provides a breakdown of licensed processing plants by

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region in France. Ten plants list hydrolysed protein as a product (4 in Occitanie, 3 in Brittany, 2 in Hauts-de-France and 1 in Provence-Alpes-Côte d'Azur).

There are 339 licences issued for purposes outside the food chain. The highest concentrations of these plants are in Auvergne- Rhône-Alpes (21%), Normandy (13%), Occitanie (13%), Brittany (13%), Grand Est (8%) and Pays de la Lorie (7%).

WHBF is listed as a product in a total of 25% of establishments (across eight of the subsections, including those establishments in the 4 key subsections listed above). Table 3.9-1 gives a breakdown of these establishments by region and section.

The highest concentration of licences referencing WHBF is seen across Section XIII (other registered plants) with a total of 39 establishment (with 97% located in mainland France and 3% located overseas). The principal activity associated with this section is the transport of ABP and derived products.

Table 3.9-1: Regional Breakdown of Licences Referencing Feather Related Products (WHBF) by Section

Region	Intermediate Activities (Section I)	Other Registered Plants (Section XIII)	Purposes Outside the Food Chain (Section IX)	Derived Product Storage (Section II)	Composting Plants (Section VII)	Specific Users (Section X)	Collection centres (Section XI)	Fertilisers & Soil Improvers (Section XII)
Nouvelle-Aquitaine	9	13	2			1		
Provence-Alpes-Côte d'Azur	2		2				1	1
Occitanie	2	7	9				1	
Pays de la Loire	2	2	1					
Auvergne-Rhône-Alpes	1	5	3	1		1		
Brittany	1	6						
Grand Est		3		1	5			
Bourgogne-Franche-Comté		1						
Hauts-de-France		1						
Total	**17**	**38**	**17**	**2**	**5**	**2**	**2**	**1**

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Source: French Ministry of Agriculture and Food

In summary, of the 6,286 approved licences for handling ABP's only a very small portion (1.34%) list Feather Meal, Other Feather Products or WHBF as their main or associated activities. Of the 84 licenced establishments handling feather products, the highest concentration are in:

- Nouvelle-Aquitaine (30%),
- Occitanie (23%),
- Auvergne-Rhone-Alpes (13%),
- Grand Est (11%) and Brittany (8%).
- The remaining regions of Provence-Alpes-Cote-d'Azur, Pays de la Loire, Bourgogne-Franche-Comte and Hauts-de-France have a combined (15%) of licenced establishments.

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Figure 3.9-3: Regional Breakdown of Section I Licences (Intermediate Activities and Storage)

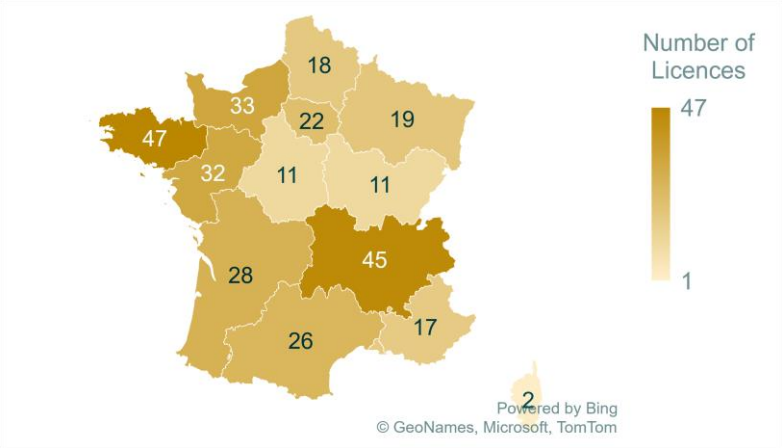


Figure 3.9-4: Regional Breakdown of Section II Licences (Derived Product Storage)

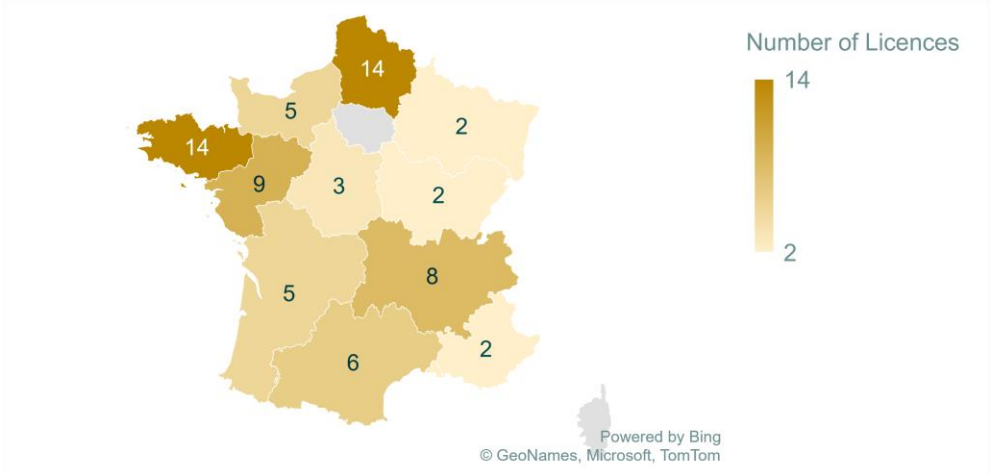


Figure 3.9-5: Regional Breakdown of Section IV Licences (Processing Plants)

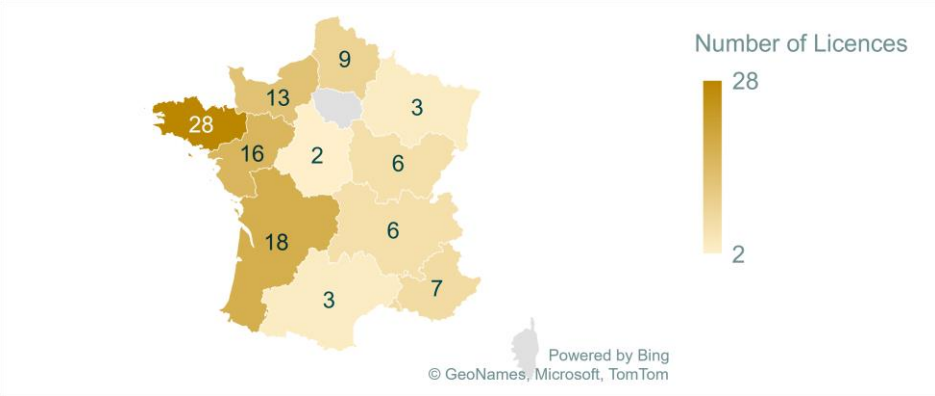
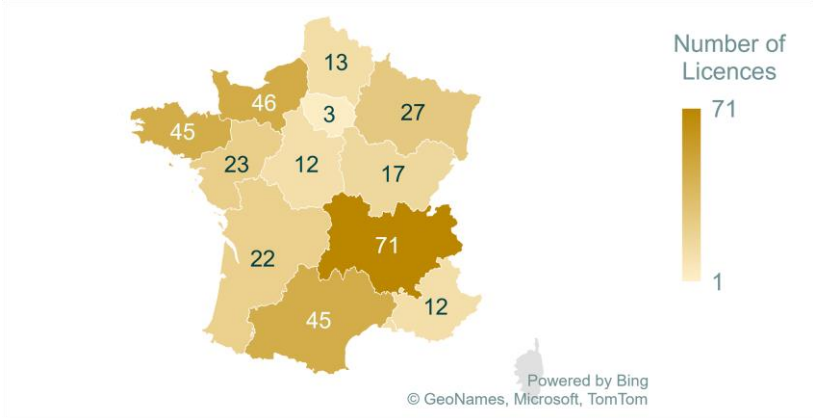


Figure 3.9-6: Regional Breakdown of Section IX Licences (Purposes outside the food chain)



Source: French Ministry of Agriculture and Food

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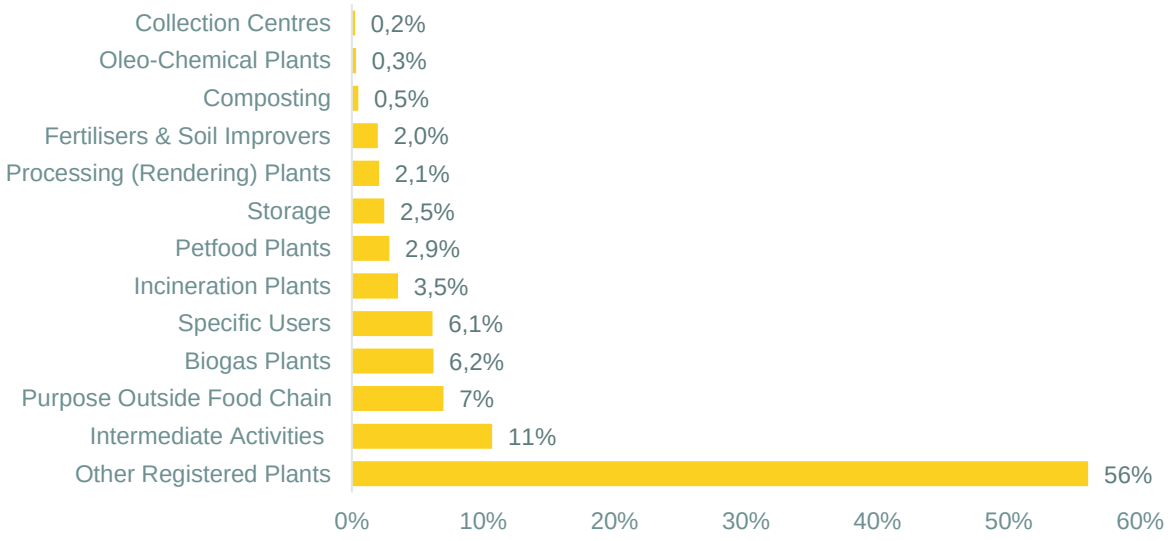
3.10. Italian Rendering and ABP Industries

3.10.1. Sector Overview

The Italian Ministry of Agriculture, Food and Forestry Products (MIPAFF) has issued 5,843 licences/approval numbers to establishments that deal with ABPs (i.e. for ABP use and/or disposal).

Licences are issued across 14 subsection activities as laid out in EU Reg No 1069/2009 (and detailed in Figure 3.10-1). These activities include collection, storage, use and disposal of ABPs and derived products. The two most common categories of activities (in terms of number of licenses) are other registered plants (56% of licences) and intermediate activities (11% of licenses).

Figure 3.10-1: Breakdown of Licensed Issued by Activity



Source: SMAFF

The primary activity of other registered plants is listed as transport of ABP and derived products (68%). This is followed by traders of the product with 23%. In total 3,275 licenses have been issued with the majority of them (17%) located in Emilia-Romagna.

Licenced establishments are located across Italy's 20 regions (see figure 3.10-2). The highest concentrations of establishments are in in Emilia-Romagna, Lombardy, Veneto Tuscany and Lazio, (60% of all licenses). Four regions of Italy's 20 regions (Tuscany, Lombardy, Veneto and Emilia-Romagna) account for 59% of the 1,296 licences issued across these 4 sections.

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There are 624 established companies licensed under Section I with Lombardy accounting for 19% of these. See Figure 3.10-3 for a regional breakdown of Section I licenses.

There are 144 establishments licensed to store derived products. The highest concentration of these plants is in Lombardy (26%), Veneto (18%), Emilia-Romagna (17%) and Piedmont (10%). Overall, these account for 70% of the total licenced establishments. Figure 3.10-5 provides a breakdown of establishments licensed to store derived products in Italy.

There are 121 licenced processing plants registered under Section IV. Nearly 60% are concentrated in three regions, Lombardy (24%), Emilia-Romagna (18%) and Veneto (17%). Figure 3.10-4 provides a breakdown of licensed processing plants by region in Italy.

407 licences have been issued for purposes outside the food chain. The highest concentrations of these plants are in Tuscany (184), Veneto (69) and Lombardy (50). These three regions account for 74% overall. See Figure 3.10-6 for a breakdown of licences by region for purpose outside the food chain.

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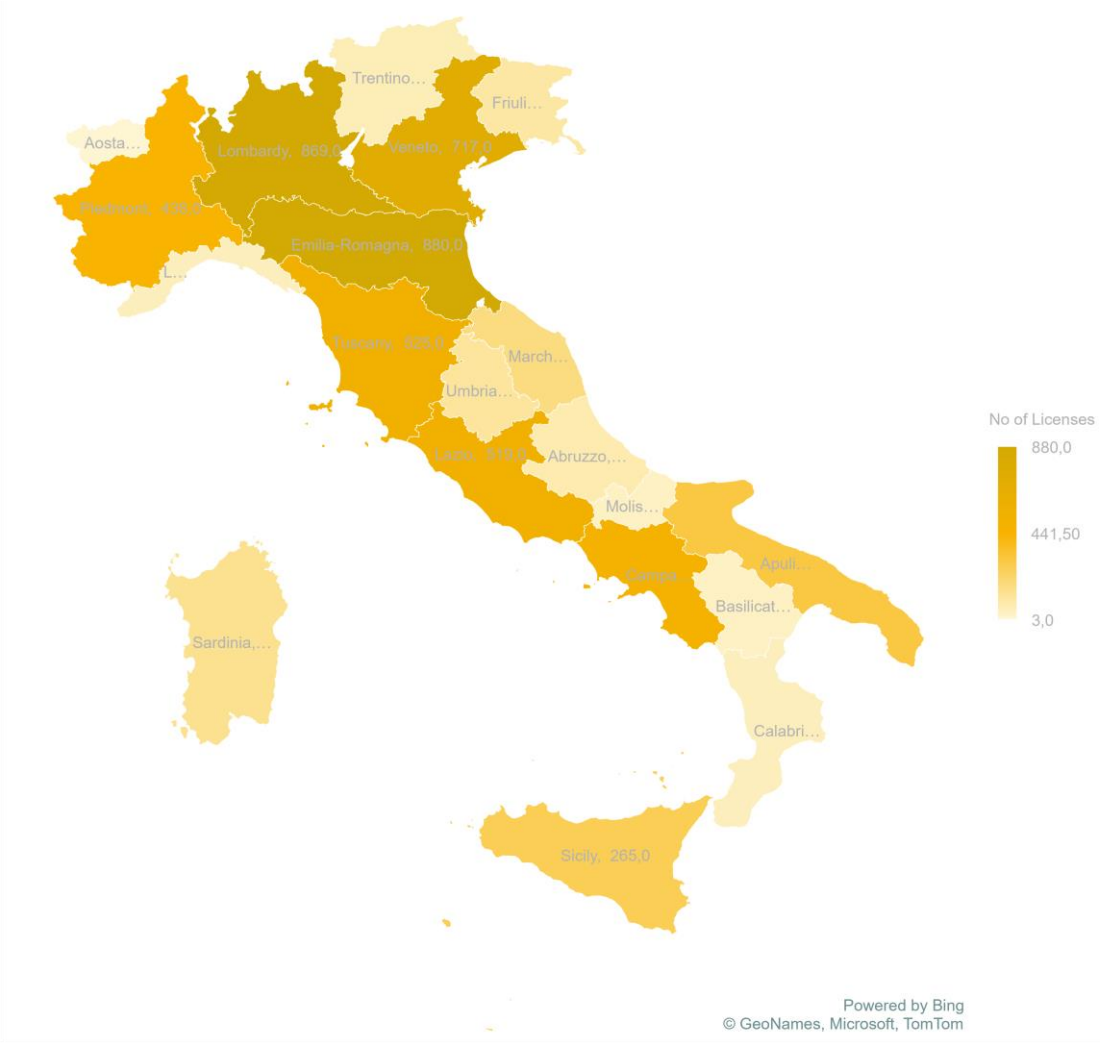
Figure 3.10-2 Distribution of ABP Licences by Region in Italy



Source: MIPAFF

Feathers are listed as a product for 57 of the plants licenced under Section IX. All of these plants list WHBF as a primary activity. See Table 3.10-1 below for more details

Table 3.10-1: Regional Breakdown of Section IX Licences Referencing Feather Related Products

Number of Licences	Region
19	Lombardy
13	Veneto
9	Piedmont
8	Tuscany
2	Basilicata
2	Lazio
1	Campania
1	Emilia-Romagna
1	Marche

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1	Sardinia

Source: MIPAFF.

In summary, of the 5,843 approved licences for handling ABP's only a very small portion (0.98%) list Feather Meal, Other Feather Products or WHBF as their main or associated activities. Of the 57 licenced establishments handling feather products, the highest concentration are in:

- Lombardy (33%),
- Veneto (23%),
- Piedmont (16%),
- Tuscany (14%).

The remaining regions of Basilicata, Lazio, Campania, Emilia-Romagna, Marche and Sardinia have a combined 14% of licenced establishments.

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Figure 3.10-3: Regional Breakdown of Section I Licences (Intermediate Activities and Storage)

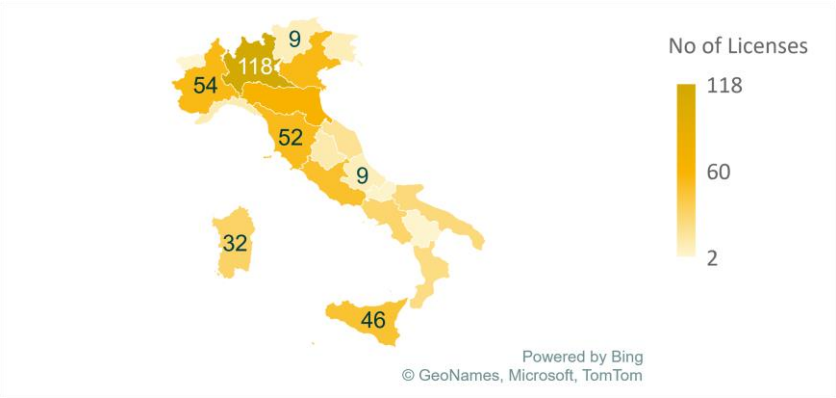


Figure 3.10-4: Regional Breakdown of Section IV Licences (Processing Plants)

Figure 3.10-5: Regional Breakdown of Section II Licences (Derived Product Storage)

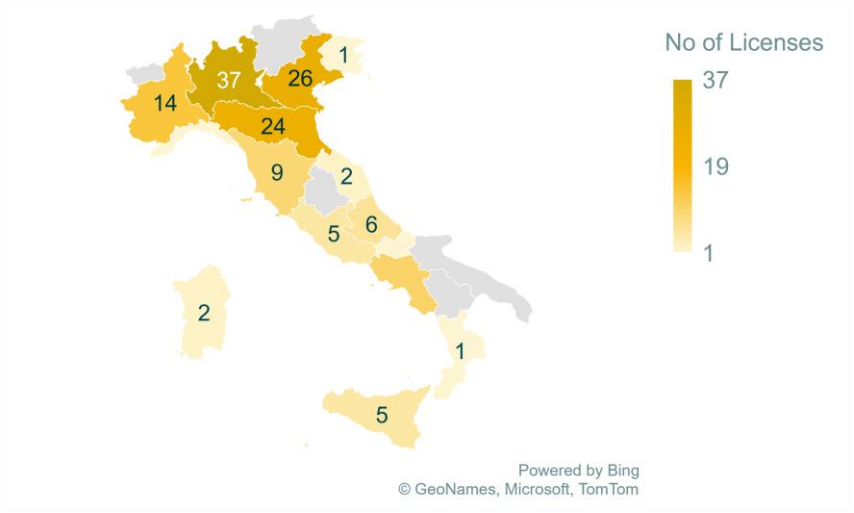
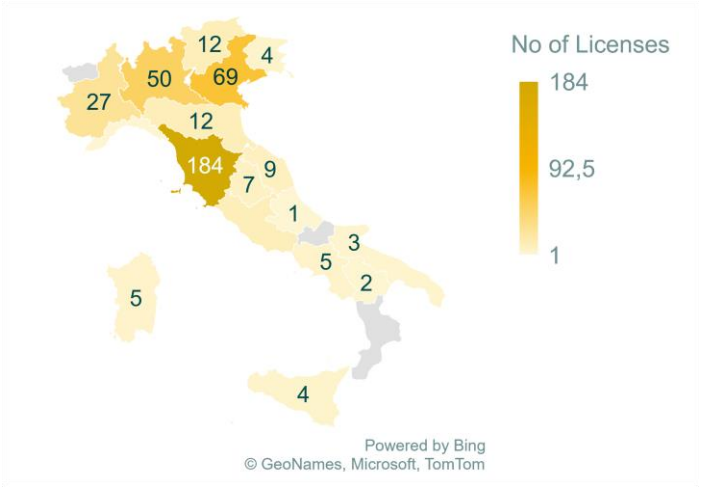


Figure 3.10-6: Regional Breakdown of Section IX Licences (Purposes Outside the Food Chain)



Source: MIPAF

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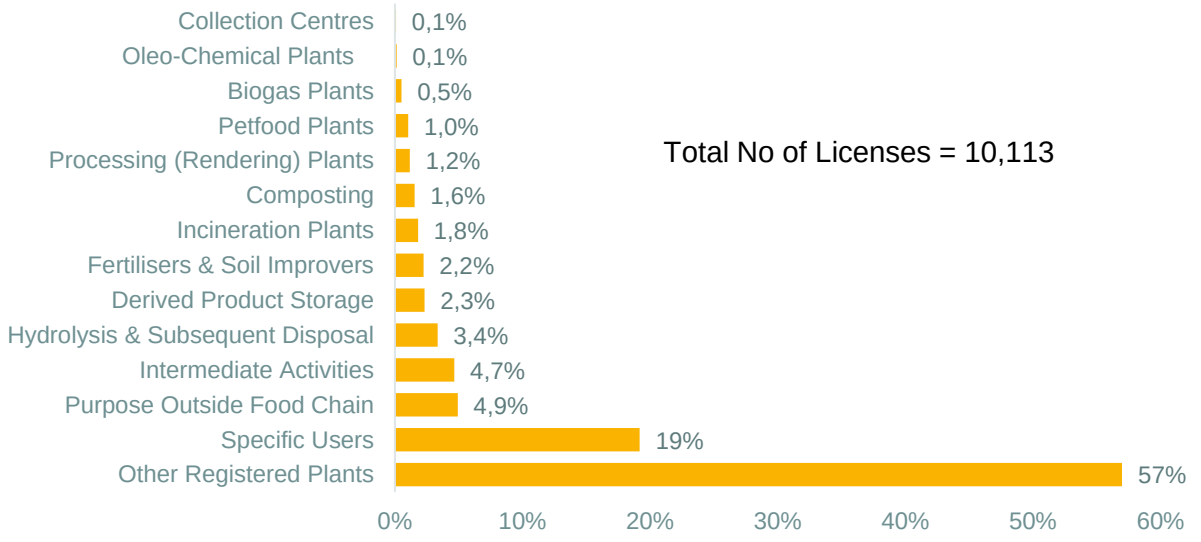
3.11. Spanish Rendering and ABP Industries

3.11.1. Sector Overview

The Spanish Ministry of Agriculture, Fisheries and Food (SMAFF) has issued 10,100 licences to establishments that deal with ABPs (i.e. for ABP use and/or disposal). These establishments are located across Spain's 17 regions (see Figure 3.11-2). The highest concentrations of licensed establishments are located in Andalucía, Cataluña and Castella y Leon and Castella La Mancha (62% of all licenses).

Licences are issued across 14 activities as laid out in EU Reg No 1069/2009 (and detailed in Figure 3.11-1). These activities include collection, storage, use and disposal of ABPs and derived products. The two most common categories of activities (in terms of number of licenses) are other registered plants (57% of licences) and specific users (19% of licenses).

Figure 3.11-1 Breakdown of Licensed Issued by Activity



Source: SMAFF

The primary activity of other registered plants is listed as the transport of ABP and derived products. A range of associated activities are listed for these companies, the most common are collection of dead animals, kennels and animal shelters, tanneries, taxidermies and establishments or plants handling intermediate products.

Eight of the establishments listed deal with wool, hair, pig bristles, feathers, parts of feathers and down (WHBF). These includes 5 tanneries and 1 processor and 2 other establishments.

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About half of the listed licenses for specific users are for kennels and animal shelters, 21% for use for necrophagous birds and a further 18% are for farms using milk, milk-based products and milk-derived products as feed material.

The most relevant sections for this project are:

- Section I: Intermediate activities and storage of animal by-products;
- Section II: Storage of derived products;
- Section IV: Processing (Rendering) plants; and
- Section IX: Purposes Outside the food chain.

5 of Spain's 17 regions (Cataluña, Andalucía, Castilla la Mancha, Castilla y León and Galicia) account for 66% of the 1,306 licences issued across these 4 sections.

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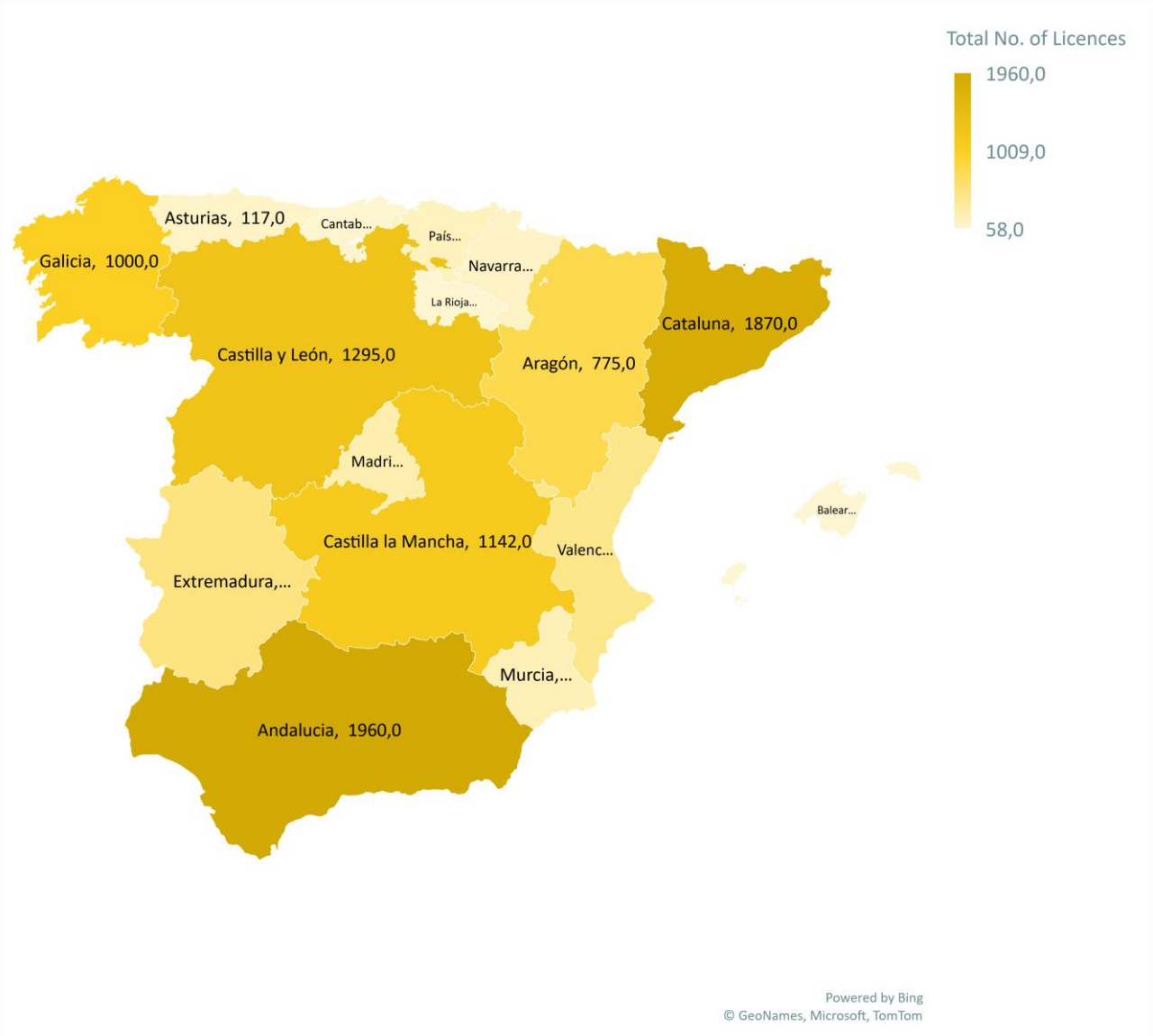
Figure 3.11-2: Distribution of ABP Licences by Region in Spain



Source: SMAFF

There are 472 established companies licensed under Section I (see Figure 3.11-3 for a regional breakdown of Section I licenses). Of these, 47 establishments list feathers as one of their products. The regional breakdown of licences referencing feathers is as follows:

Table 3.11-1: Regional Breakdown of Section Licences Referencing Feathers

Number of Licences	Region
16	Castilla y León
8	Andalucía
6	Aragón

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5	Galicia
3	Castilla la Mancha, Valencia
2	Canarias
1	Baleares, Cantabria, Murcia, Navarra

Source: SMAFF

There are 235 establishments licensed to store derived products. One of these (a meat wholesaler in Castella la Mancha) lists feed as one of its products and WHBF as an associated activity.

There are 118 licenced processing plants registered under Section IV. More than half are concentrated in three regions, Cataluña (22), Castilla y León (21) and Andalusia (20). Table 3.11-2 provides a breakdown of licensed processing plants by region in Spain.

Nine plants list hydrolysed protein as a product (4 in Cataluña, 3 in Aragon and 2 in Castilla La Mancha). Two plants produce products resulting from the alkaline hydrolysis process and one is listed as producing products resulting from the hydrolysis.

There are 498 licences issued for purposes outside the food chain. The highest concentrations of these plants are in Castilla La Manche (112), Andalusia (74), Cataluña (64), Castilla y Leon (56) and the Galicia and Extremadura regions (41 each).

Feathers are listed as a product for 10 plants of licenced under Section IX. These plants list (along with 24 other) list WHBF as a primary activity. An additional 15 plants list WHBF as an associated activity.

Table 3.11-2: Regional Breakdown of Section IX Licences Referencing Feather Related Products and Activities

Region	Product (Feathers)	Activity (WHBF)	Associated Activity (WHBF)
Andalucia	1	2	
Aragón	1	3	1
Castilla la Mancha	5	8	4
Castilla y León		8	
Cataluna	2	9	5
Galicia		2	5
Navarra	1	1	
País Vasco		1	
Total	10	34	15

Source: SMAFF

*WHBF stands for wool, hair, pig bristles, feathers, parts of feathers and down

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Figure 3.11-3: Regional Breakdown of Section I Licences (Intermediate Activities)

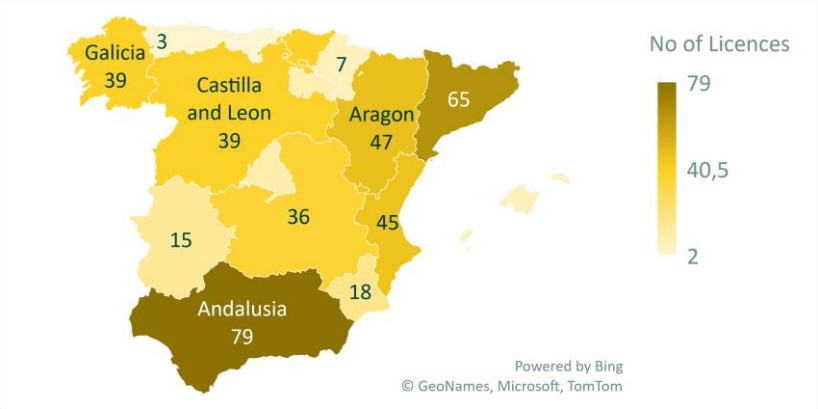


Figure 3.11-4: Regional Breakdown of Section IV Licences (Processing Plants)

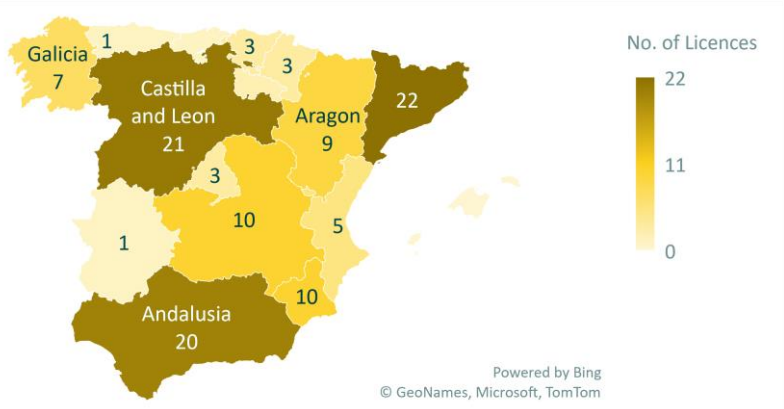
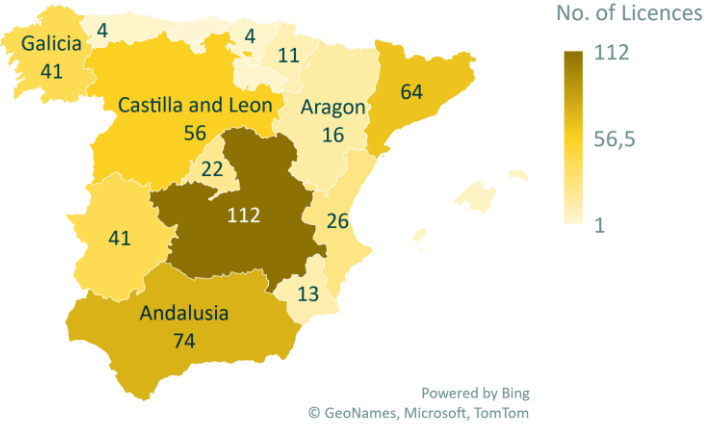


Figure 3.11-5: Regional Breakdown of Section II Licences (Derived Product Storage)

Figure 3.11-6: Regional Breakdown of Section IX Licences (Outside the Food Chain)



Source: SMFF

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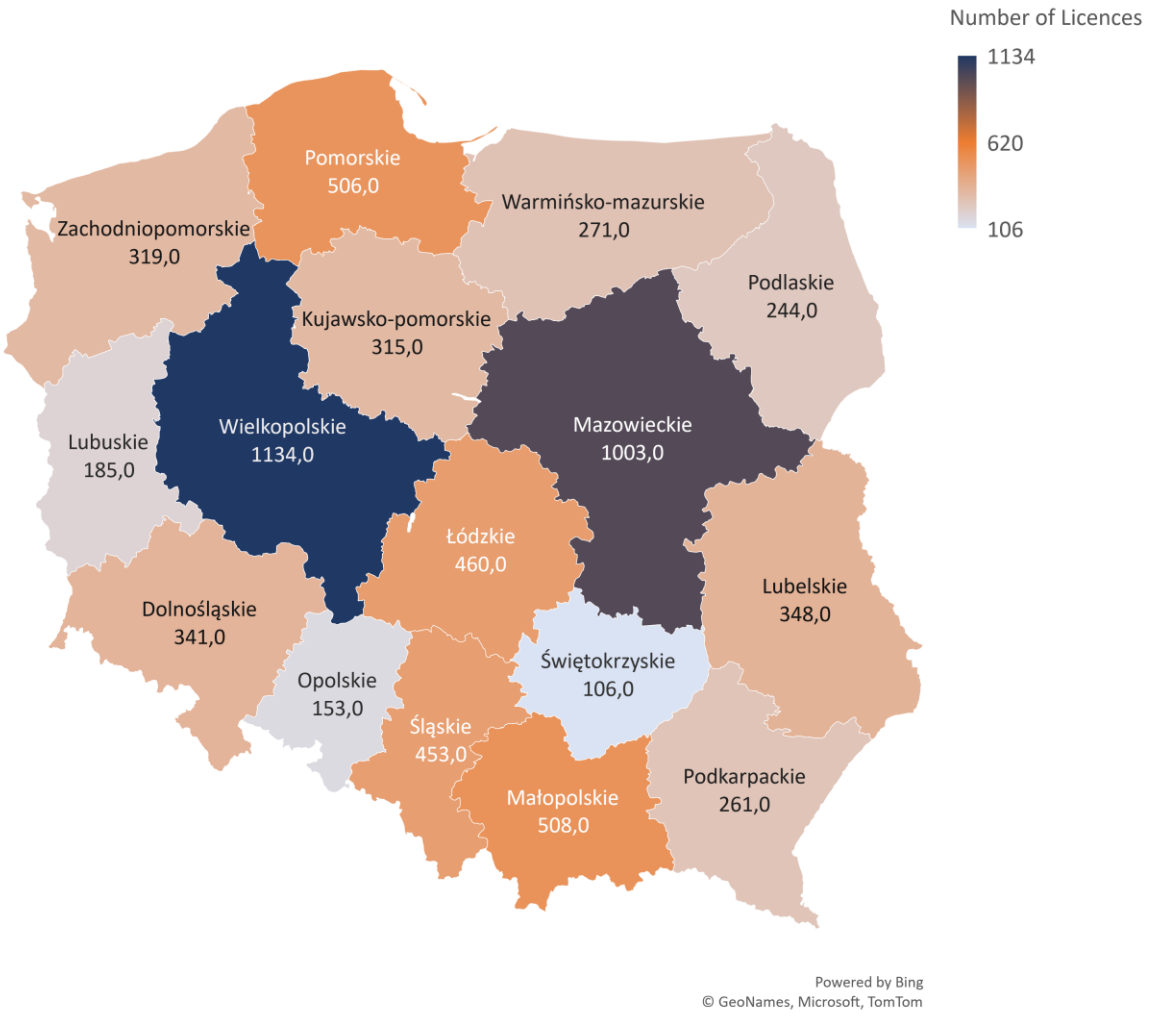
3.12. Polish Rendering and ABP Industries

3.12.1. Sector Overview

The Polish Ministry of Agriculture and Rural Development has issued 6,608 licences/approval numbers to establishments that deal with ABPs (i.e. for ABP use and/or disposal).

These establishments are located across Poland's 16 regions (see Figure 3.12-1). The highest concentrations of licensed establishments are located in Greater Poland Province (Wielkopolskie), Masovia (Mazowieckie), Lesser Poland (Małopolskie) and Pomerania (Pomorskie).

Figure 3.12-1: Distribution of ABP Licences by Region in Poland



Source: GFAR

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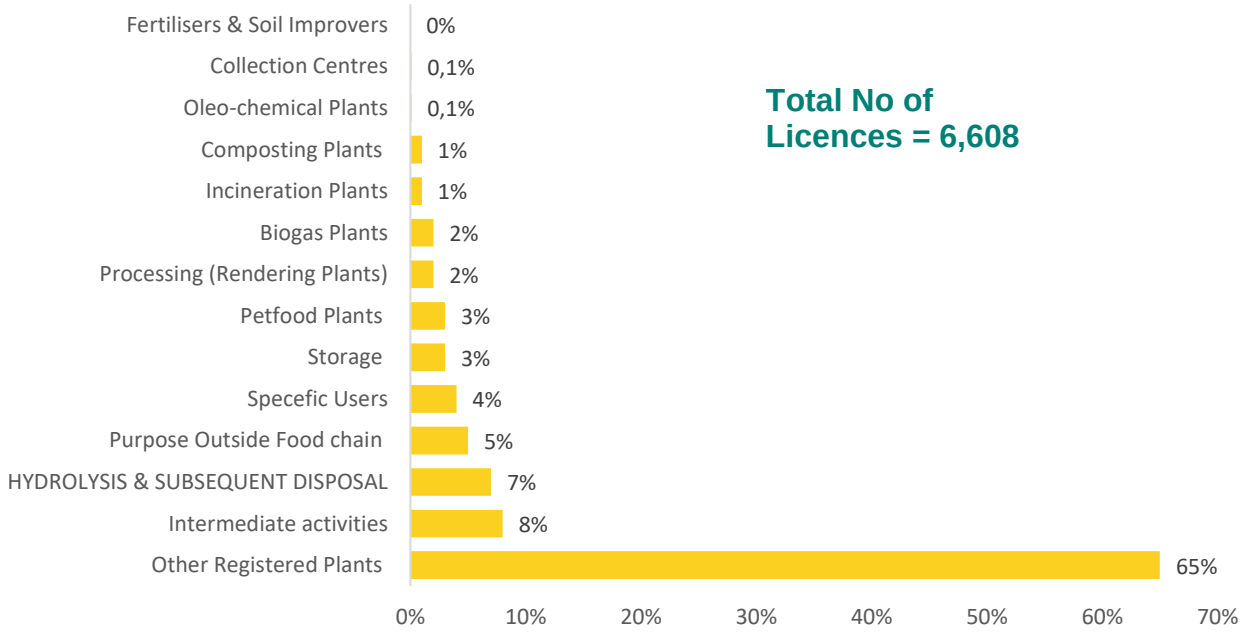
Licences are issued across 14 subsection activities as laid out in EU Reg No 1069/2009 and detailed in Figure 3.12-2. These activities include collection, storage, use and disposal of ABPs and derived products.

The two most common categories of activities (in terms of number of licenses) are other registered plants (65% of licences) and intermediate activities (8% of licenses). There are no licences for establishments specialised in fertilizers and soil improvers in Poland.

The primary activity of other registered plants is listed as the transport of ABP and other derived products. A range of associated activities are listed for these companies, the most common are processing, transport and handling of intermediate products. Collection of ABP product in addition to other intermediate products are key activities for Section I.

Figure 3.12-2: Breakdown of Licences issued by activity



Source: GFAR

5 of Poland's 16 regions (Greater Poland, Masovian, Lesser Poland, Łódź, Silesian) account for 62% of the 1,148 licences issued across these 4 sections. 257 of the total establishments listed deal with wool, hair, pig bristles, feathers, parts of feathers and down (WHBF) across 6 of the 14 sections (see Table 3.12-1 for a regional breakdown of licences referencing feather related products).

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There are some 521 established companies licensed under Section I (see Figure 3.12-3 for a regional breakdown of Section I licenses). Of these, 6% of these establishments list feathers as one of their products.

There are 179 establishments licensed to store derived products. One of these (in Masovian) lists various products including bones, horns, hooves along with raw WHBF as stored products.

There are 107 licenced processing plants registered under Section IV. More than half are concentrated in four regions, Greater Poland (24%), Masovian (10%), Lesser Poland (9%), Łódź (9%). Figure 3.12-4 provides a breakdown of licensed processing plants by region in Poland.

There are 341 licences issued for purposes outside the food chain. The highest concentrations of these plants are in Lesser Poland (22%), Greater Poland (18%), Masovian (12%), Łódź (11%) and Lower Silesian (7%).

11 plants across sections I, II, IV and IX reference hydrolysed protein products:

- 2 plants are located in each of the Masovian, Lesser Poland and Pomeranian regions
- 1 plant is located in each of the Greater Poland, Kuyavian-Pomeranian, Subcarpathian, Silesian and Łódź regions.

Feathers are referenced as a WHBF product for 45 of licenced plants under Section IX, 38 under Section II and 29 under Section I. The highest concentration of licences referencing WHBF in Poland is seen across Section XIII (other registered plants) with a total of 139 establishment. The principal activity associated with this section is the transport of ABP and derived products. There are three hydrolysis and subsequent disposal plants in Masovian reference WHBF for animal fur use.

Table 3.12-1: Regional Breakdown of Licences Referencing Feather Related Products

Region	Intermediate Activities (Section I)	Derived Product Storage (II)	Incineration Plants (Section III)	Purpose Outside Food chain (Section IX)	Other Registered Plants (Section XIII)	Hydrolysis & Subsequent Disposal (Section XIV)
Greater Poland	20	21		24	25	
Lesser Poland	3	9		4	10	
Holy Cross		1		3	3	
Łódź				3	13	

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Lubusz	1			3	8	
Masovian	1	5	1	2	31	3
Silesian	1			2	5	
Lublin		1		1	6	
Podlaskie				1	1	
Pomeranian	1			1	11	
Lower Silesian	1				6	
Warmian-Masurian		1	1	1	4	
West Pomeranian		1				1
Kuyavian-Pomeranian				1		3
Opole					8	
Subcarpathian					4	
Total	**29**	**38**	**3**	**45**	**139**	**3**

Source: GFAR

In summary, of the 6,608 approved licences for handling ABP's only a very small portion (3.89%) of them list Feather Meal, Other Feather Products or WHBF as their main or associated activities. Of the 257 licenced establishments handling feather products, the highest concentration is in:

- Greater Poland (35%),
- Masovian (17%),
- Lesser Poland (10%),
- Łódź (6%),
- Lubuskie (5%), and
- Pomorskie (5%).

The remaining regions of Kujawsko-Pomorskie, Malopoloskie, Dolnoslaskie, Lubelskie, Opolskie, Podlaskie, Silesian, Subcarpathian, Warminsko-Mazurskie and West-Pomorskie have a combined (22%) of licenced establishments

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Figure 3.12-3: Regional Breakdown: Section I Licences (Intermediate Activities/Storage)

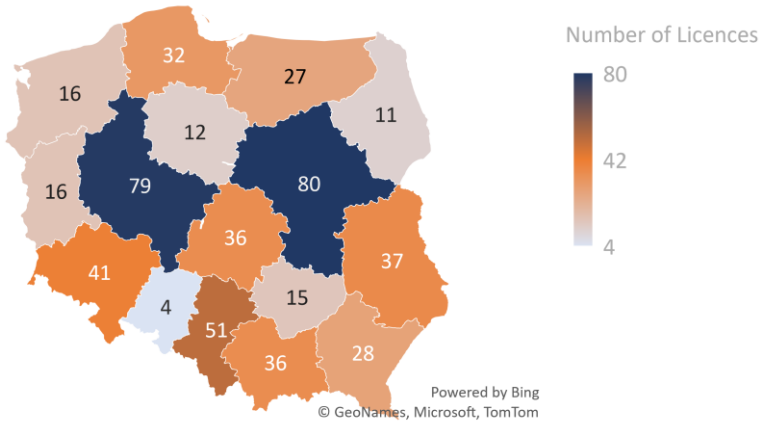


Figure 3.12-4: Regional Breakdown: Section IV Licences (Processing Plants)

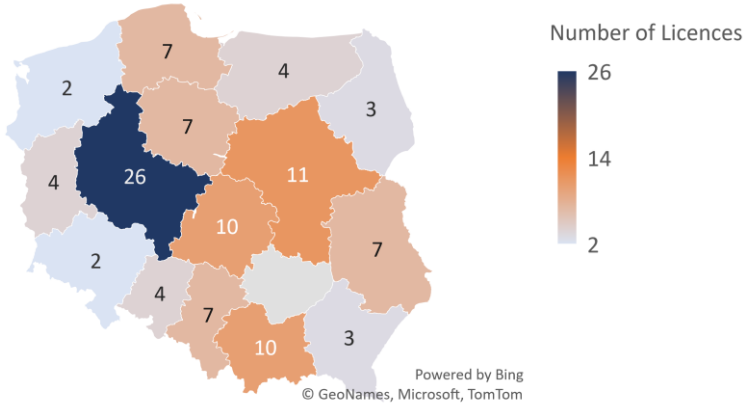


Figure 3.12-5: Regional Breakdown: Section II (Derived Product Storage)

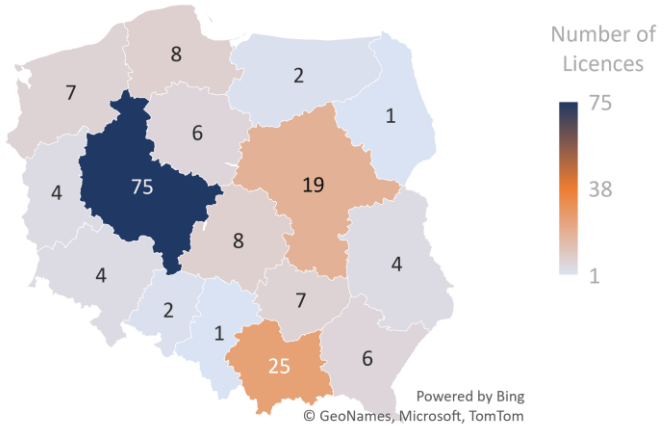
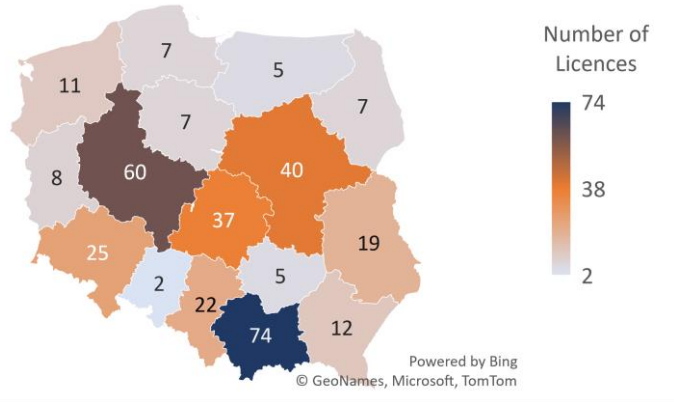


Figure 3.12-6 : Regional Breakdown: Section IX Licences (Outside the Food Chain)



Source: GFAR

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4. Discussion and Summary

By mapping the relevant components characterizing the EU poultry value chain, as well as an economical and statistical analysis of each of these components, this research has enabled the identification of the regional distributions of poultry slaughterhouses across the five target countries, an understanding of the current feather feedstock from these countries and the regional distribution of the ABP rendering operations which are licensed to handle poultry feathers.

In the EU, poultry production activities have shown robust growth in revenues between 2010-2020 (+1.4% CAGR). From these activities, poultry slaughter has contributed the most to this increase in profit, showing the highest growth over the same period (+4.2% CAGR). The key drivers of this positive outlook relates to consumer's perception of poultry products as a cheaper and more sustainable source of animal protein in addition to other factors supporting efficiency around poultry production. This overall increase in local and international consumption of poultry meat is also indicating that growth will be sustained over long term.

In terms of production volumes, there was 13.6 million tonnes of poultry produced in the EU in 2020, from which 67% belonged to the five target countries assessed in this report (Germany, France, Italy, Spain and Poland). The highest proportion of birds slaughtered in the EU is broilers (82%), followed by turkeys (14%) and ducks (3%). For EU duck production, France is the largest producer, accounting for 43%. All of these species have yielded an average of 621,200 tonnes of feathers annually during the period 2010-2020.

The analysis following the EU poultry market assessment focused on national and regional poultry production activities taking place in approved slaughterhouses of the target countries. As poultry feathers are mainly concentrated at regional slaughterhouses, identifying the volume of production in these establishments was carefully assessed to enable an estimation of the feather waste supply.

According to data from national agriculture ministries and statistics offices, Germany, France, Poland, Spain and Italy have slaughtered an average of 1.7 million tonnes of poultry annually between 2010 and 2020. The number of approved slaughterhouses ranged from 621 for France to 127 for Spain, while Germany operated 249, Italy 175 and Poland 164 slaughterhouses. These slaughtering establishments were concentrated in the South and Northwest of Germany, to the South of France, in the North of Italy and the North-west of Poland. In Spain the main concentration of slaughterhouses were located in the Eastern, Southern and Central regions.

Based on detailed slaughtering data presented in Sections 3 to Section 7 of the report and using assumptions for kill-out ratios and feather as a percentage of liveweight from published literature, an estimation of available feather supply was calculated for each

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of the target countries. It was found that there was an average of 484,419 MT of poultry feathers between 2010 and 2020 available in French, German, Italian, Spanish and Polish slaughterhouses. All five countries have recorded growths ranging from 13% to 122% in feather volumes in 2020 compared to 2010, except France for which volumes declined by 3% due to lower supply from turkeys and ducks. Figure 4 below summarizes available feather waste supply in the five countries.

The analysis conducted in the rendering section of the report provided an overview of regional distribution of ABP renderers permitted to handle poultry feathers. Considering that the rendering process of animal by products such as feathers is managed by EU licenced ABP establishments, the report identified the number of these establishments in the target countries as well as the portion of establishments handling feathers. It was found that there is between 18,404 and 5,843 licenced establishments across the five countries. However, only a small portion of licenced establishments are dealing with feathers or feather related products such as feather meal, WHBF (Wool, Hair, Bristles) or others. The highest concentration of establishments dealing with feathers was found in Poland (257), followed by Germany (95), France (84), Italy (57) and Spain (41).

Figure 4: Annual Poultry Feather Supply 2010-2020

Source: Farrelly & Mitchell

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5. Conclusion

The analysis conducted in this report demonstrated that significant amounts of feather volumes are produced by EU poultry slaughterhouses, notably by establishments in Germany, Poland, Italy, France and Spain.

Annual feather supply available in the EU over the 2010-2020 period was estimated at 621,200 tonnes on average. The highest concentration of feather supply is located across Poland with 109,537 tonnes and Italy with 105,200 tonnes, followed by 96,000 tonnes in France, 89 770 tonnes in Spain and 83,912 tonnes in Germany. Overall, there is an estimated 484,419 tonnes of annual poultry feathers' supply available across the five target countries.

The positive demand outlook in the EU poultry industry supports the long-term supply and availability of feather waste in poultry slaughterhouses. Increased consumption and production throughout the 2010-2020 period for instance is a favourable factor for the industry and a positive indicator that generated feather waste from poultry slaughterhouses will continue to grow.

The number of licenced ABP establishments dealing with feather waste on the other hand is quite small with only 0.5% to 3.98% of total establishments across the target countries dealing with feather by products. The expected growth in poultry feather volumes alongside the limited number of ABP establishments managing this generated waste highlight the potential and need for further implementation of specialised entities managing the poultry feather waste in the EU, therefore enabling a bio-based economy.

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6. Annex

6.1. Germany Economic Analysis:

6.1.1. Value add and cost structure

The German poultry slaughtering industry employs more than 11,000 employees, with the number of employees growing at 1.7% CAGR between 2009-2020.

Over the same period, the industry's revenues grew at a 2.1% CAGR, reaching €4.9 billion in 2019. Revenue growth outpaced growth in operating costs (1.9% CAGR), with net value add growing at 4.1% CAGR to reach more than €432 million in 2019.

Materials consumption is the key cost item for poultry slaughtering companies, accounting for 61% of costs in 2019. Other major cost items include purchase for resale (11%), other overheads[10] (11%), wages and salaries (6%) and costs for 3rd party contract work (5%).

The proportional distribution of costs in the industry has remained relatively stable over the period 2009-2019. The cost of purchases for resale was the main item showing significant change, declining from 18% to 11% over the same period. This coincided with an increase of more than 200% in the contribution of 3rd party contract costs to total costs.

[10] Advertising costs (marketing agencies, etc.), agent costs, travel expenses, commissions, license fees, outgoing freight, consultancy fees, bank charges etc.

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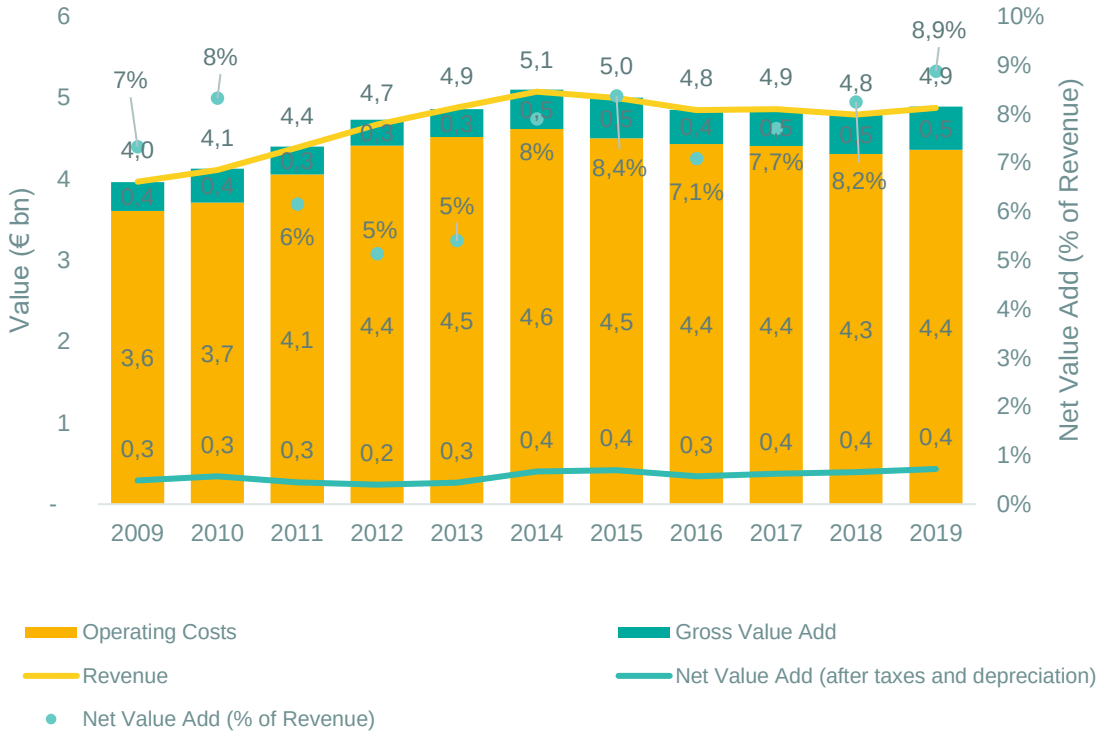
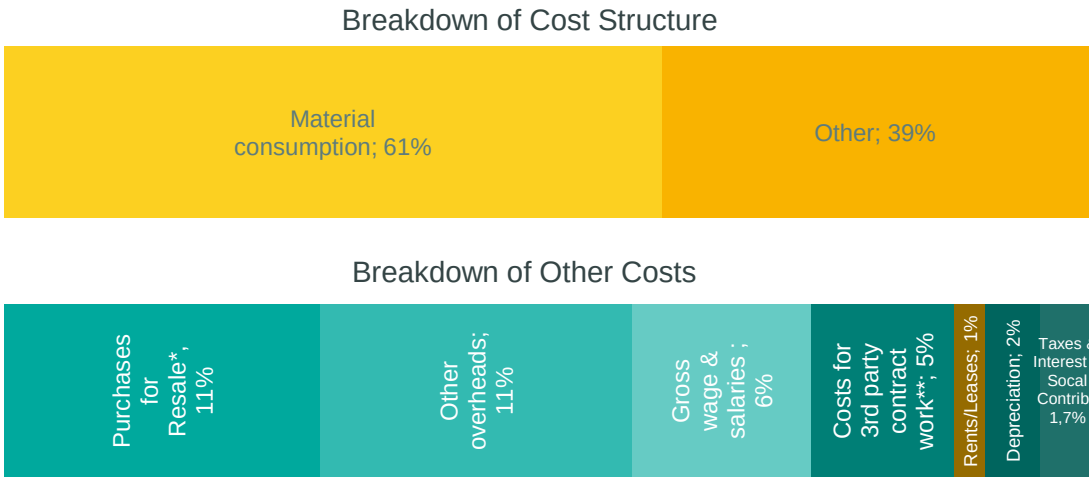
Figure 6.1-1: Revenues, Costs and Value Add in the German Poultry Slaughtering Industry 2009-2019



Source: Destatis

Figure 6.1-2: Costs Structure of the Poultry Slaughtering Industry 2019



Source: Destatis.

*Purchases for resale are purchases of goods for resale to third parties without further processing.

**Includes repairs, maintenance, installations, assemblies etc. from 3rd party service providers.

Wage and salary costs grew from 5.1% to 6.3% of total costs over the period, with average annual compensation to employees growing from €25,700 to €33,300.

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Despite this, labour productivity increased by 26.4%, with gross value add per worker employed increasing from €37,600 to €47,500.

6.1.2. Price Development

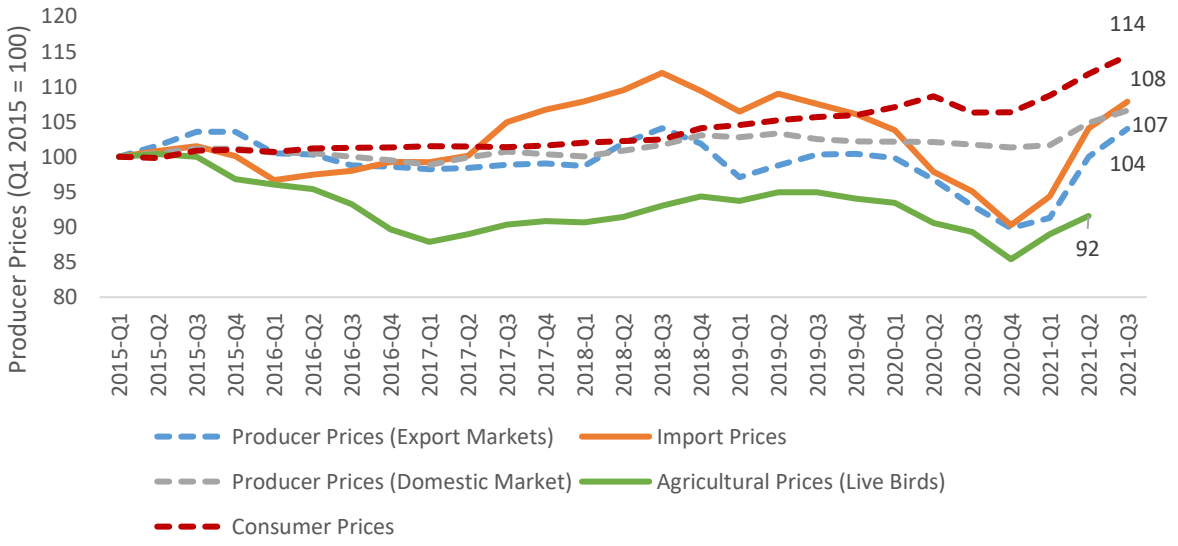
Figure 6.1-3 shows the evolution of poultry meat and related index prices in Germany between 2015 and 2021.

It compares slaughterhouse producer prices (domestic and export market prices) with agricultural selling prices (for live birds) and import and consumer prices for poultry meat.

Domestic market producer prices were the least volatile of the prices under consideration, with agricultural and import prices showing the highest degrees of volatility.

Domestic market producer prices were relatively stable throughout most of the period and were the least affected by the Covid-19 pandemic. However, producer price growth in the domestic market, along with other prices, has accelerated in 2021.

Figure 6.1-3: Price Development of Poultry Meat in Germany (Q1 2015 to Q3 2021)



Source: Eurostat

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6.2. France Economic Analysis:

6.2.1. Value Add & Cost Structure:

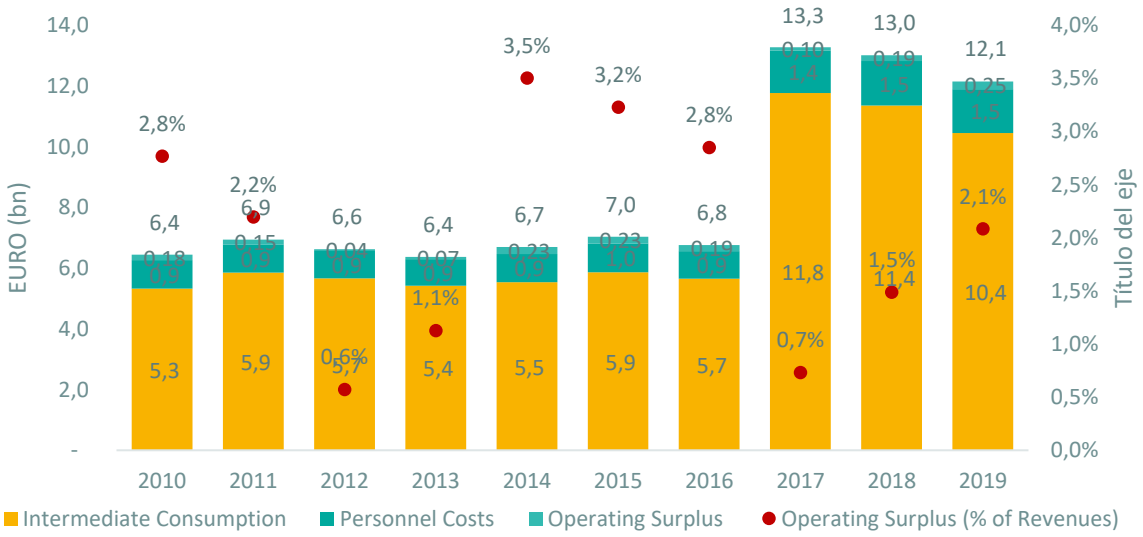
The French poultry slaughtering industry employs 35,900 people. In line with industry output, employment in the industry has grown strongly in recent years (+43% between 2016-2019). Having declined in the early part of the last decade, employment recovered strongly to record 2.5% CAGR over the whole period.

Over the period 2010-2019, the industry's revenues grew at a 7.3% CAGR, reaching €12.15 billion in 2019 (most of this revenue growth can be attributed to 2017. The value-add provided by the industry grew at 4.8% CAGR to reach €1.7 billion in 2019.

Growth in operating costs was somewhat higher than revenue growth (7.4% vs 7.3% CAGR) to reach €11.9 bn in 2019.

Gross operating surplus grew at a 4.0% CAGR to reach more than €253 million in 2019. However, gross operating surplus as a percentage of revenues ranged from 0.6% (2012) to 3.5% (in 2014) over the period.

Figure 6.2-1: Revenues & Costs in the French Poultry Slaughtering Industry 2010-2019



Source: Eurostat

Net investment in tangible goods grew at an 5.2% CAGR over the period to reach €221 million in 2019. Net investment in tangible goods as percentage of revenues ranged from 0.9% (in 2014) to 2.3% (in 2012).

Intermediate consumption accounted for 88% of operating costs in 2019, with personnel costs accounting for the remainder.

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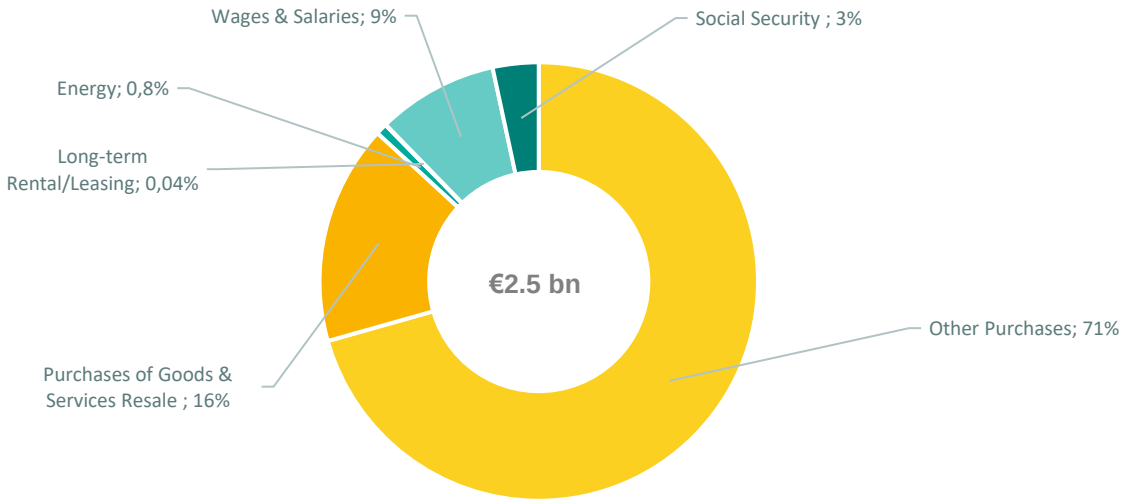
Other purchases (mainly the cost of purchasing birds for slaughter) are the key item within intermediate consumption (71% of operating costs), followed by cost of goods for resale in the same condition (16%).

Wages and salaries accounted for 9% of operating costs in 2019 (with social security costs accounting for a further 3% of operating costs).

Figure 6.2-2: Costs Structure of the Poultry Slaughtering Industry 2019



Source: Eurostat

6.2.2. Price Development:

Figure 6.2-3 shows the evolution of poultry meat and related index prices in France between 2015 and 2021.

It compares slaughterhouse producer prices (domestic and export market prices) with agricultural selling prices (for lives birds) and import and consumer prices for poultry meat. French prices were relatively stable throughout the period, with the exception of import prices.

Domestic producer and agricultural prices were the least volatile of the prices, followed by consumer prices. With import prices, followed by producer export, showing the highest degrees of volatility.

Consumer prices followed a steady upward trajectory throughout the period and recorded the highest overall price increase (up 6.8% in Q2-2021 on Q1-2015). Agricultural prices had the second highest increase (up 6.5%). Import prices increased

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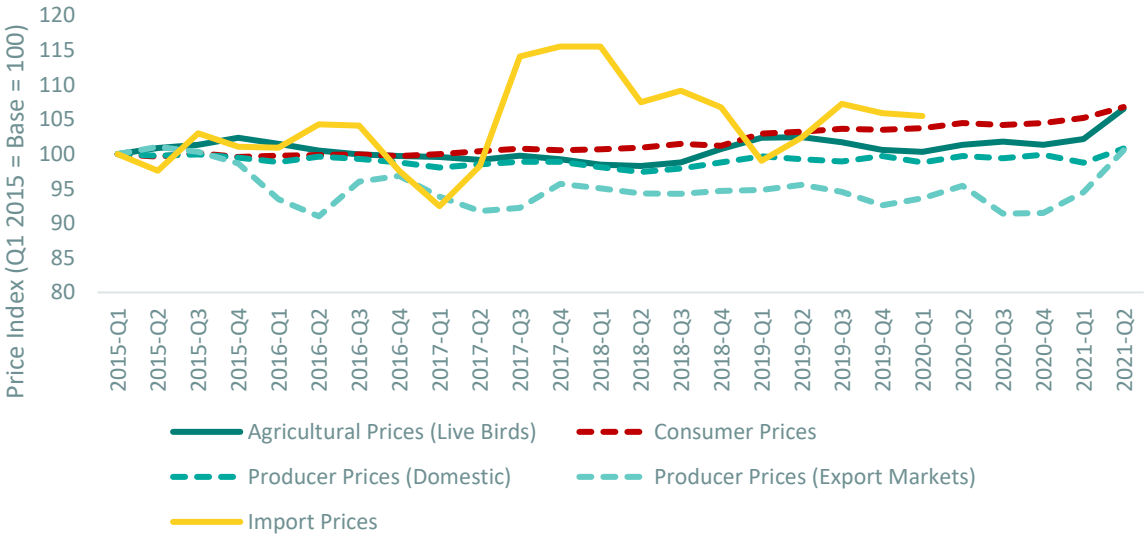
by 5% to Q1-2020, while producer prices (domestic and exports) increased by less than 1%.[11]

Since Q2-2020, available data shows a steady increase across the indices examined, with the exception of domestic producer prices.

Figure 6.2-3: Price Development of Poultry Meat in France (Q1 2015 to Q2 2021)



Source: Eurostat, Comtrade, Farrelly & Mitchel

[11] More recent French import prices were not available at the time of writing.

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6.3. Italy Economic Analysis:

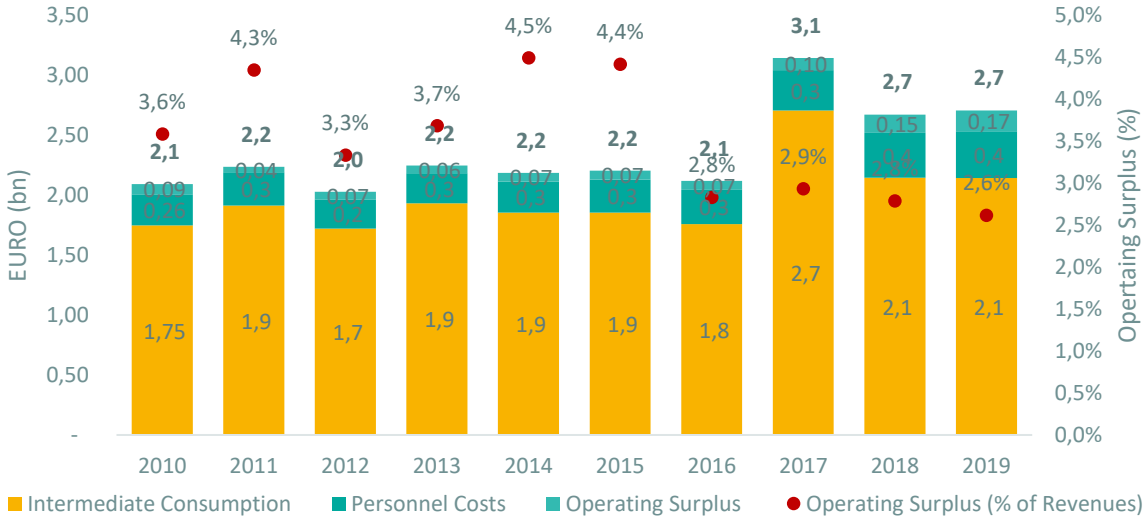
6.3.1. Value add and cost structure:

The Italian poultry slaughtering industry employs 10,500 people. Employment in the industry has recovered somewhat since a significant in the early part of the last decade (falling from 10,900 employees in 2010 to just over 8,000 employees in 2013).

Over the period 2010-2019, the industry's revenues grew at a 2.9% CAGR, reaching €2.7 billion in 2019 (most of this revenue growth can be attributed to 2017. The value-add provided by the industry grew at 5.6% CAGR to reach €564 mn.

Revenue growth outpaced growth in operating costs over the period (2.9% vs 2.3% CAGR), with gross operating surplus growing at a 7.9% CAGR to reach more than €174 million in 2019. However, gross operating surplus as a percentage of revenues declined from 3.6% in 2010 to 2.6% in 2019 (peaking at 4.4% in 2015).

Figure 6.3-1: Revenues & Costs in the Italian Poultry Slaughtering Industry 2010-2019



Source: Eurostat

Net investment in tangible goods grew at an 13.3% CAGR to reach €90.5 million in 2019. Net investment in tangible goods as percentage of revenues ranged from -3.0% (in 2013) to 3.3% (in 2017 and 2019).

Intermediate consumption accounted for 85% of operating costs in 2019, with personnel costs accounting for the remainder.

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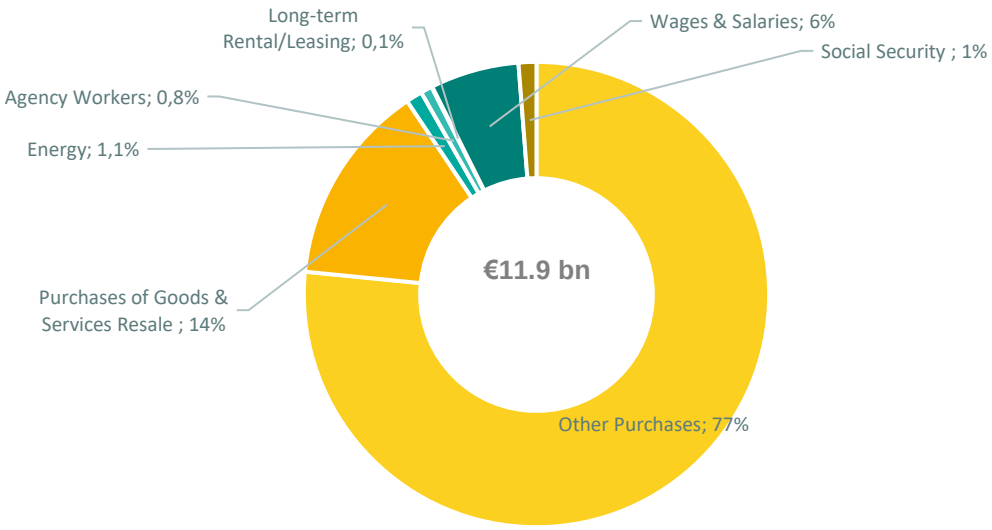
Other purchases (mainly the cost of purchasing birds for slaughter) are the key item within intermediate consumption (70% of operating costs), followed by cost of goods for resale in the same condition (14%).

Wages and salaries accounted for 12% of operating costs in 2019 (with social security costs accounting for a further 3% of operating costs).

Figure 6.3-2: Costs Structure of the Poultry Slaughtering Industry 2019



Source: Eurostat

6.3.2. Price Development:

Figure 6.3-3 shows the evolution of poultry meat and related index prices in Italy between 2015 and 2021. It compares slaughterhouse producer prices (domestic and export market prices) with agricultural selling prices (for lives birds) and import and consumer prices for poultry meat.

Domestic producer and consumer prices were the least volatile of the prices under consideration, with import prices, followed by producer export and agricultural prices, showing the highest degrees of volatility.

Consumer prices were relatively stable throughout much of the period and were the least affected by the Covid-19 pandemic. However, consumer prices had had the highest increase over the period (up 8.5% in Q2-2021 on Q1-2015), with agricultural prices up 2.7%.

Producer domestic prices were down -1.5%, with import prices down -8% and producer export prices down -23%.

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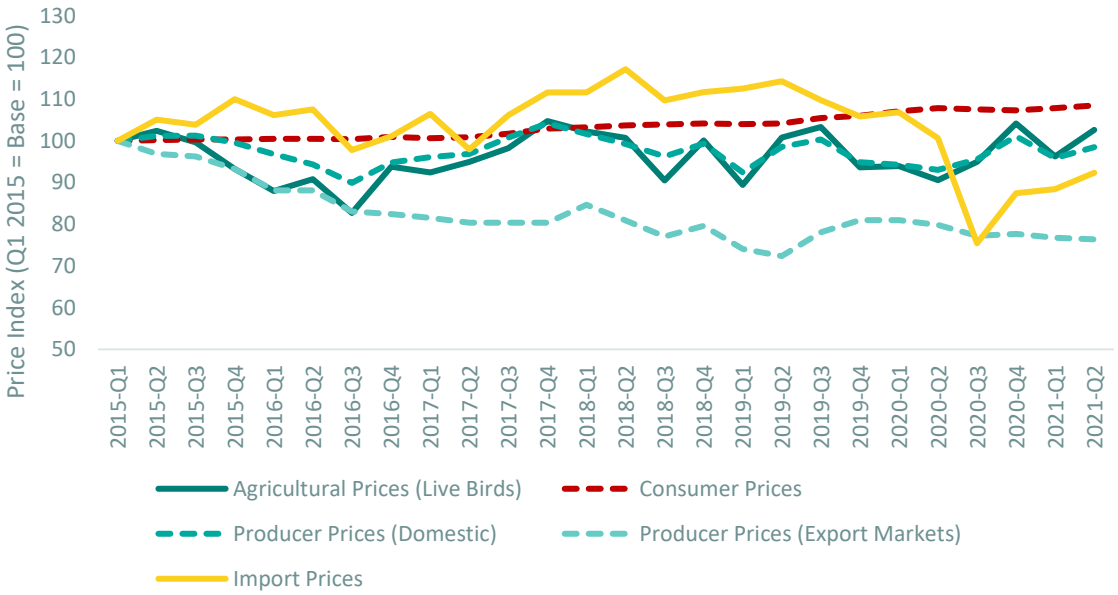
Figure 6.3-3: Price Development of Poultry Meat in Italy (Q1 2015 to Q2 2021)



Source: Eurostat, Comtrade, Farrelly & Mitchel

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6.4. Spain Economic Analysis:

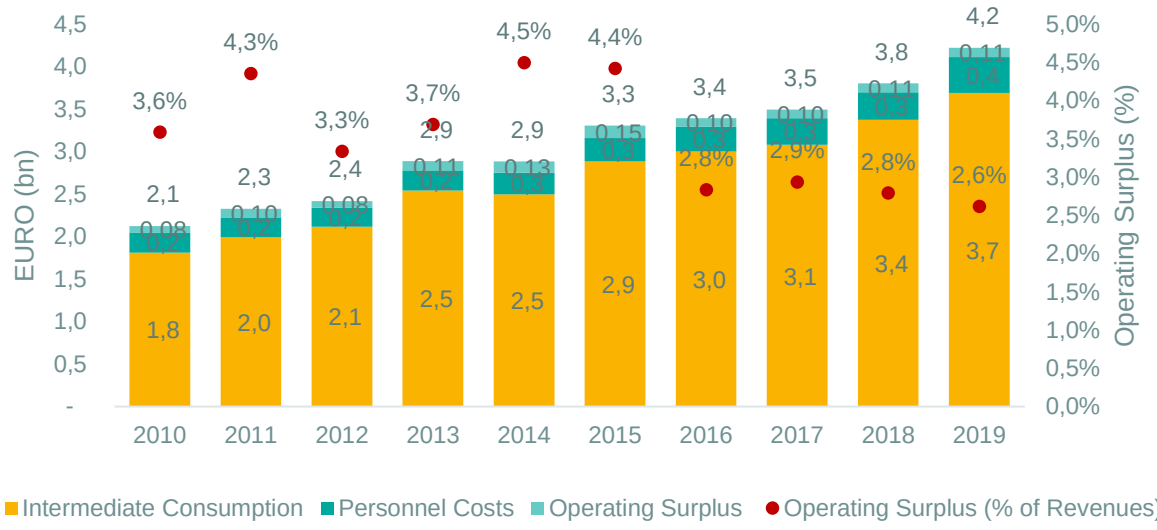
6.4.1. Value Add & Cost Structure:

The Spanish poultry slaughtering industry employs almost 14,300 employees. In line with growth in output from the sector, the number of employees employed in the sector has expanded considerably since 2010. Employment grew at a 5.1% CAGR over the period 2010-2019.

Over the same period, the industry's revenues grew at a 7.9% CAGR, reaching €4.2 billion in 2019. The value add provided by the industry reached €532 million (growing at a 6.1% CAGR over the period 2010-2019).

Revenue growth was slightly lower than growth in operating costs (8.1% CAGR), with gross operating surplus growing at a 4.2% CAGR to reach more than €110 million in 2019. Gross operating surplus as a percentage of revenues ran at between 2.6% and 4.4% through the period.

Figure 6.4-1: Revenues & Costs in the Spanish Poultry Slaughtering Industry 2010-2019



Source: Eurostat

Net investment in tangible goods grew at a 10.2% CAGR over the period. However, it remains low, at just 2.5% of revenues in 2019.

Intermediate consumption accounted for 90% of operating costs in 2019, with personnel costs accounting for the remainder.

Other purchases (mainly the cost of purchasing birds for slaughter) are the key item within intermediate consumption (73% of operating costs), followed by cost of goods for resale in the same condition (16%).

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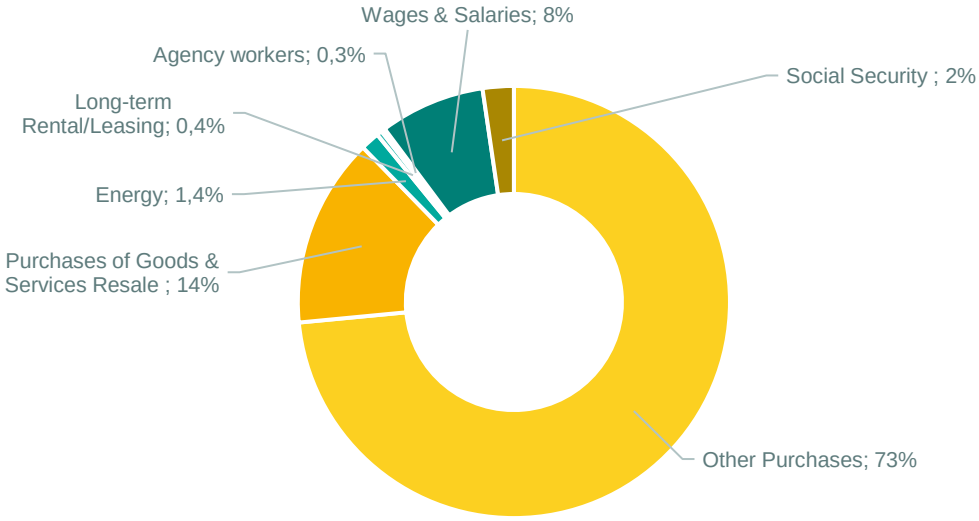
Wages and salaries accounted for 8% of operating costs in 2019 (with social security costs accounting for a further 2% of operating costs).

Figure 6.4-2: Costs Structure of the Poultry Slaughtering Industry 2019



Source: Eurostat

6.4.2. Price Development:

Figure 6.4-3 shows the evolution of poultry meat and related index prices in Spain between 2015 and 2021.

It compares slaughterhouse producer prices (domestic and export market prices) with agricultural selling prices (for lives birds) and import and consumer prices for poultry meat.

Domestic market producer and consumer prices were the least volatile of the prices under consideration, with import and agricultural prices showing the highest degrees of volatility.

Domestic producer and consumer prices were relatively stable throughout much of the period, with domestic producer prices the least affected by the Covid-19 pandemic. However, consumer prices began to steadily increase from 2019 onwards.

Consumer prices had the highest increase over the overall period (up 9% in Q2-2021 on Q1-2015), with agricultural prices and producer prices (domestic and exports) up between 4% and 5%. In Q2021, import prices were down -2% on their Q1-2015 levels

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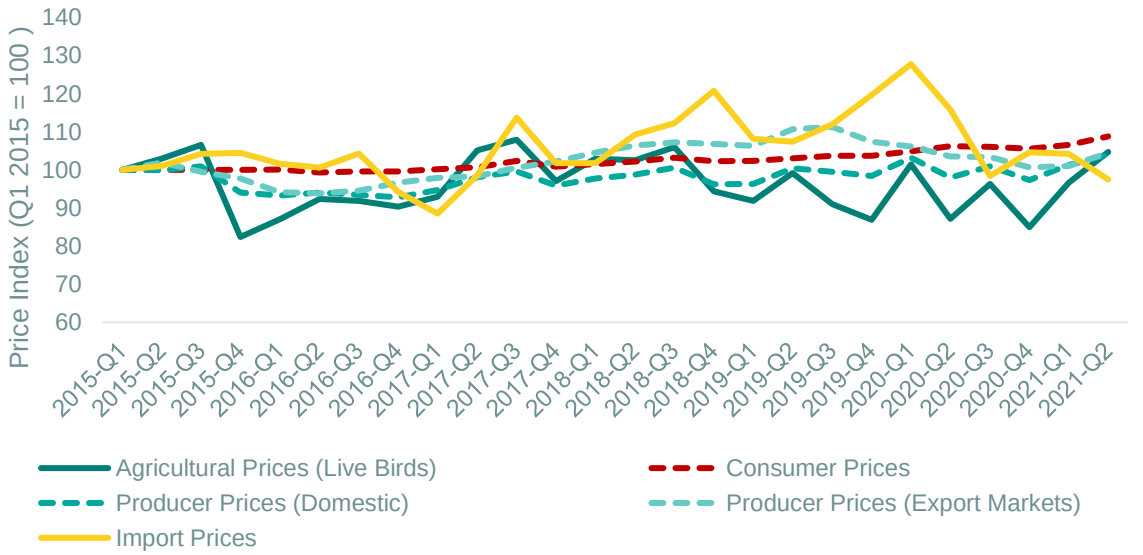
Figure 6.4-3: : Price Development of Poultry Meat in Spain (Q1 2015 to Q2 2021)



Source: Eurostat, Comtrade, Farrelly & Mitchel

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6.5. Poland Economic Analysis:

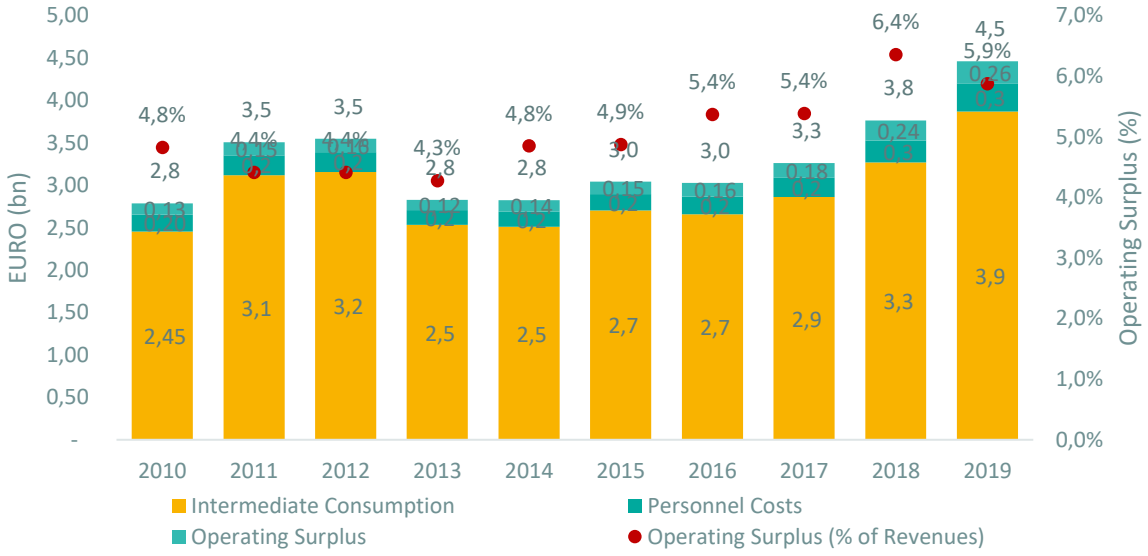
6.5.1. Value add and cost structure:

The Polish poultry slaughtering industry employs 20,900 people. The number of people employed in the industry has declined somewhat in recent years (falling from 25,929 employees in 2011).

Over the period 2010-2019, the industry's revenues grew at a 5.4% CAGR, reaching €4.46 billion in 2019. The value add provided by the industry grew at 6.6% CAGR to reach €595 million.

Revenue growth outpaced growth in operating costs over the period (5.4% vs 5.2% CAGR), with gross operating surplus growing at a 7.7% CAGR to reach more than €262 million in 2019. Gross operating surplus as a percentage of revenues ran at between 4.3% and 6.4% through the period.

Figure 6.5-1: Revenues & Costs in the Polish Poultry Slaughtering Industry 2010-2019



Source: Eurostat

Net investment in tangible goods grew at an 8.3% CAGR over the period to reach €147 million in 2019. Net investment in tangible goods as percentage of revenues ranged from 1.6% (in 2011) to 3.3% (in 2017 and 2019).

Intermediate consumption accounted for 93% of operating costs in 2019, with personnel costs accounting for the remainder.

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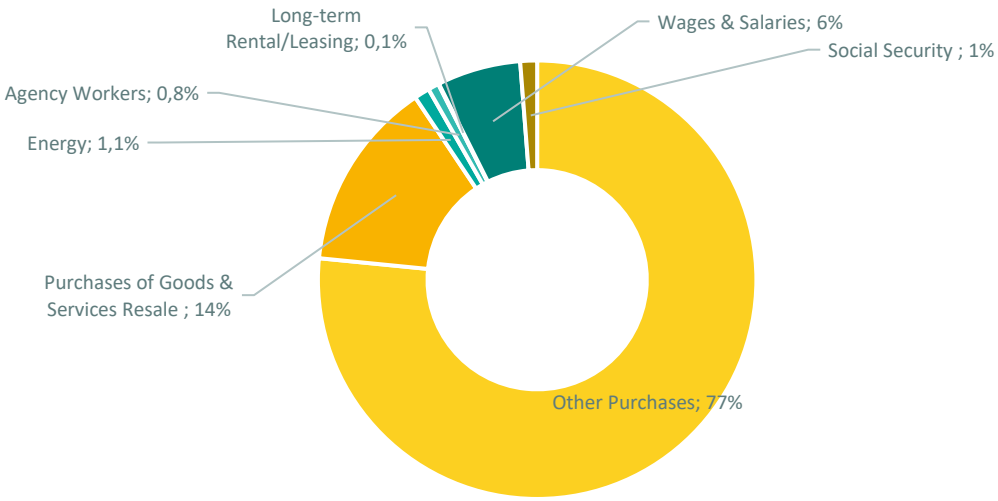
Other purchases (mainly the cost of purchasing birds for slaughter) are the key item within intermediate consumption (77% of operating costs), followed by cost of goods for resale in the same condition (14%).

Wages and salaries accounted for 6% of operating costs in 2019 (with social security costs accounting for a further 1% of operating costs).

Figure 6.5-2: Costs Structure of the Poultry Slaughtering Industry 2019



Source: Eurostat

6.5.2. Price Development:

Figure 6.5-3 shows the evolution of poultry meat and related index prices in Poland between 2015 and 2021.

It compares slaughterhouse producer prices (domestic and export market prices) with agricultural selling prices (for lives birds) and import and consumer prices for poultry meat.

Agricultural and consumer prices were the least volatile of the prices under consideration, with import prices, followed by producer export prices, showing the highest degrees of volatility.

Domestic producer prices and consumer prices were relatively stable throughout much of the period, with consumer prices the least affected by the Covid-19 pandemic. However, all price indexes began to steadily increase from late 2019 onwards.

Domestic producer prices had the highest increase over the period (up 33% in Q2-2021 on Q1-2015), with agricultural prices up 15% and consumer prices up 21%.

Producer export prices increased by just 3%, while import prices declined by -14%.

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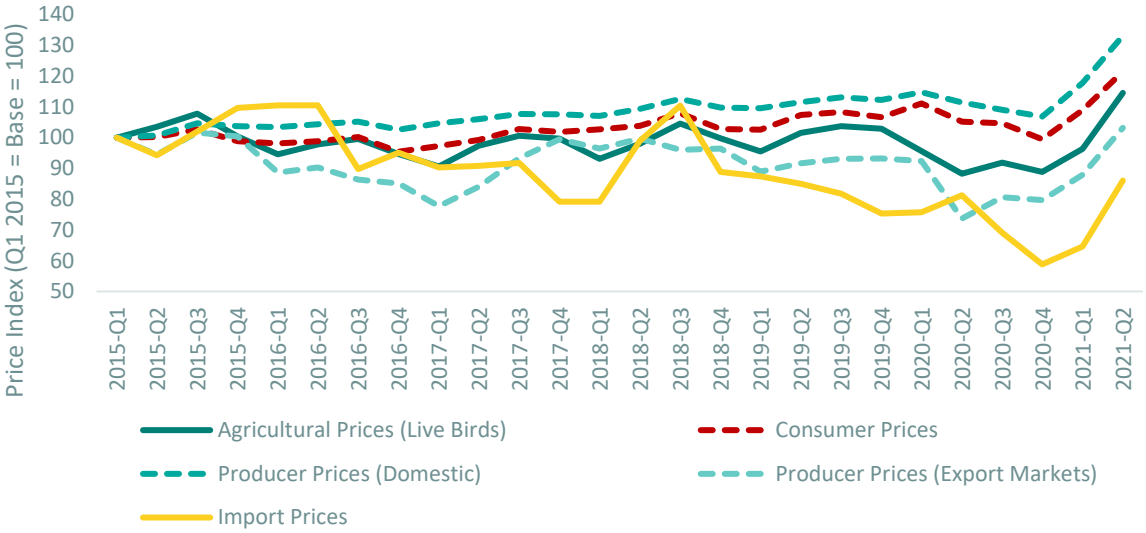
Figure 6.5-3: Price Development of Poultry Meat in Poland (Q1 2015 to Q2 2021)



Source: Eurostat, Comtrade, Farrelly & Mitchel

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