European Commission

FISHMEAL AND FISH OIL

PRODUCTION AND TRADE FLOWS IN THE EU

EUMOFA

European Market Observatory for Fisheries and Aquaculture Products

Maritime Affairs and Fisheries

LAST UPDATE: SEPTEMBER 2023

WWW.EUMOFA.EU

Manuscript completed in September 2023.

Luxembourg: Publications Office of the European Union, 2023

PDF ISBN 978-92-68-07578-4 doi:10.2771/47090 KL-09-23-428-EN-N

FOR MORE INFORMATION AND COMMENTS:

Directorate-General for Maritime Affairs and Fisheries

B-1049 Brussels

E-mail: contact-us@eumofa.eu

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INTRODUCTION

The aim of this report is to provide an overview of the fishmeal and fish oil sectors derived from forage fisheries in the European Union. Landings destined for non-food use vary depending on the level of quotas and catches. Regardless of variations in catches, the EU production is not self-sufficient for fishmeal and fish oil. The gap is thus filled with imports.

As fishmeal and fish oil are global commodities, the market dynamics and price drivers are also affected by factors outside the EU. The study is therefore supplemented with a global overview of catch and production trends.

The study focuses on fishmeal and fish oil produced from fish catches with details by species.

The production data on fishmeal and fish oil also contains production of fish waste and by-products from the processing industry, but it is not possible to separate data on fishmeal produced from raw material from fisheries *versus* by-products and other. Therefore, the figures in the study contain volumes from all types of raw material. However, the report has a separate part covering EU imports and exports of "other non-food use" products.

The study consists of following sections:

1 **Non-food uses in a global perspective:** covers global fishery landings and their share destined for non-food use. The section analyses the development in the global production of fishmeal and fish oil and the main producing countries, as well as global price trends.

2 **World fishmeal/fish oil market use by sector:** explores the market segments in which the global fishmeal and fish oil volumes are used.

3 **EU landings for non-food use:** covers the main species landed in the EU which are destined for non-food use.

4 **EU production of fishmeal and fish oil:** covers the development of the fishmeal and fish oil production in the EU and the price development in the EU internal market and other European markets.

5 **Import – Export:** covers the import/export trends over the years, the trade balances, markets, and prices. A short highlight on the trade flows of other non-food use products besides fishmeal and fish oil is also provided.

1 SUMMARY

Each year, the EU produces from 370.000 tonnes to above 520.000 tonnes of fishmeal and from 120.000 tonnes to 190.000 tonnes of fish oil. This constitutes around 10-15% of the global production.

Denmark is by far the largest producer in the EU, accounting for 40% to 50% of the total production. The Danish production is mainly based on landings of small pelagic species like sprat, sandeels, blue whiting and herring. The fisheries destined to produce fishmeal and fish oil in the EU are limited by quotas and the demand for human consumption. The raw material from fisheries varies dependent on quotas.

The price level on European fishmeal and fish oil follows global prices to a large degree, which depend highly on the production in South America (Peru). Over the past 12 years, European fish oil prices on average increased by 181% and fishmeal prices on average increased by 67%.

EU consumption of fishmeal decreased by around 40% from 2009 to 2022 to around 450.000 tonnes.

The imports of fishmeal from non-EU27 suppliers decreased by 42% from 2012 to 2022. The difference between import and export varies from year to year depending on domestic production, but the EU is still a net importer of fishmeal. Imports from Peru decreased by nearly 79% in the period and reached no more than 43.200 tonnes in 2022; the import share of imports from Peru on total EU27 imports decreased from 49% to 18%. EU27 exports of fishmeal decreased by 31% in the same period which compensates for the decrease in import (Peru).

EU27 import of fish oil decreased by 19% to 196.500 tonnes from 2012 to 2022 and exports decreased by 2% to 145.000 tonnes. In 2022, around 69% of the exports of fish oil from the EU27 was exported to Norway.

2 NON-FOOD USES IN A GLOBAL PERSPECTIVE

The type of products known as non-food products are mainly fishmeal and fish oil, but also different types of live ornamental fish, fish waste, dead fish, seaweeds, and algae unfit for human consumption, as well as frozen fish roes used for the manufacture of acids or sulphates.

2.1 Fishmeal and fish oil

Fishmeal is a product obtained by cooking, pressing, drying, and grinding fresh raw fish or shellfish. Typical species are small fatty species like anchovy, sprat, herring, capelin, and krill. After the cooking and drying process, the fish is turned into a coarse brown flour: the fishmeal. Fishmeal is an excellent protein source mainly used in the feed for aquaculture species and livestock.

Fish oils are produced whenever fatty fish is processed into fishmeal. It is a 100% marine oil with high content of omega-3 fatty acids. Fish oil is mainly used to produce feed for farmed fish and refined fish oil for human consumption (fish oil capsules).

Virtually, any fish or shellfish in the sea can be used to make fishmeal. Most of the world's fishmeal is made from whole fish, and the pelagic species are the most utilized for this purpose. When a catch is solely destined for the fishmeal industry, it is referred to as an "industrial fishery".

100 kg of raw material produces around 21 kg of fishmeal and between 2 and 6 kg of fish oil.

Countries with major industrial fisheries are Peru, Iceland, Denmark, Chile, USA, Norway, and South Africa.

2.2 Global landings destined for non-food use.

The yearly world landings of fish, shellfish and crustaceans are stable at around 90 million tonnes. Of this, around 70 million tonnes are used as food for human consumption and around 20 million tonnes are destined for non-food use. Of the 20 million tonnes for non-food use, FAO states that 15 million tonnes are channelled into fishmeal and fish oil production. The rest is largely used for ornamental purposes, fingerlings, bait, pharmaceutical uses, and as raw material for direct feeding in aquaculture[1].

The species used for feed, especially sandeels, sprat, Norway pout, capelin, and South American anchoveta, have relatively short lifecycles, so population numbers can rise and fall substantially depending on fishing pressure and other environmental variables. Stocks of anchoveta, for instance, are well known to be influenced by the periodic El Niño climatic events and stocks of most feed fish species are thought likely to be affected by climate change[2].

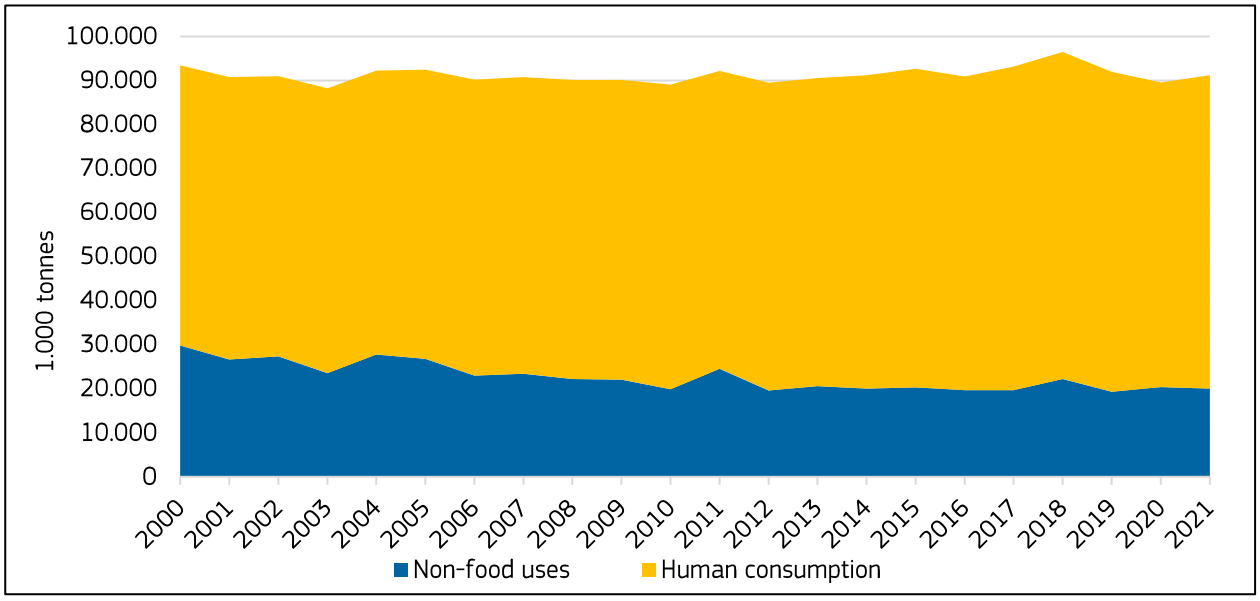
Fishery is a limited resource and the competition between landing for human consumption and non-food use goes in the favor of human consumption due to better prices and government decisions to use as much as possible for food. The share of fishmeal and fishoil in feed for aquaculture is increasingly replaced by vegetable sources which is necessary for further growth. The use of rest raw material from the fishery processing industry is also increasing.

[1] Source: Fishmeal and fish oil facts and figures, Seafish, March 2018 (link: https://www.seafish.org/media/Publications/Seafish_FishmealandFish oil_FactsandFigures2018.pdf)

[2] Source: U.S. Department of Commerce – National Oceanic and Atmospheric Administration (link: https://www.pfeg.noaa.gov/research/climatemarine/cmffish/cmffishery4.html)

From 2000 to 2021, there was a 32% decrease in the non-food use share of total landings. The reason for this was the increased use for human consumption and a decrease in the fishing for feed production due to reduced quotas and better fishery management[3].

Figure 1: Global Landings By Destination Use



Source: FAO

2.3 Global production of fishmeal and fish oil

The share of world fisheries destined to produce fishmeal and fish oil has decreased over the past 22 years. From 2001 to 2011, average yearly fishmeal production was above 5,5 million tonnes, while from 2012 to 2022 it was around 4,9 million tonnes. The production of fish oil amounts to 0,8-1,3 million tonnes annually.

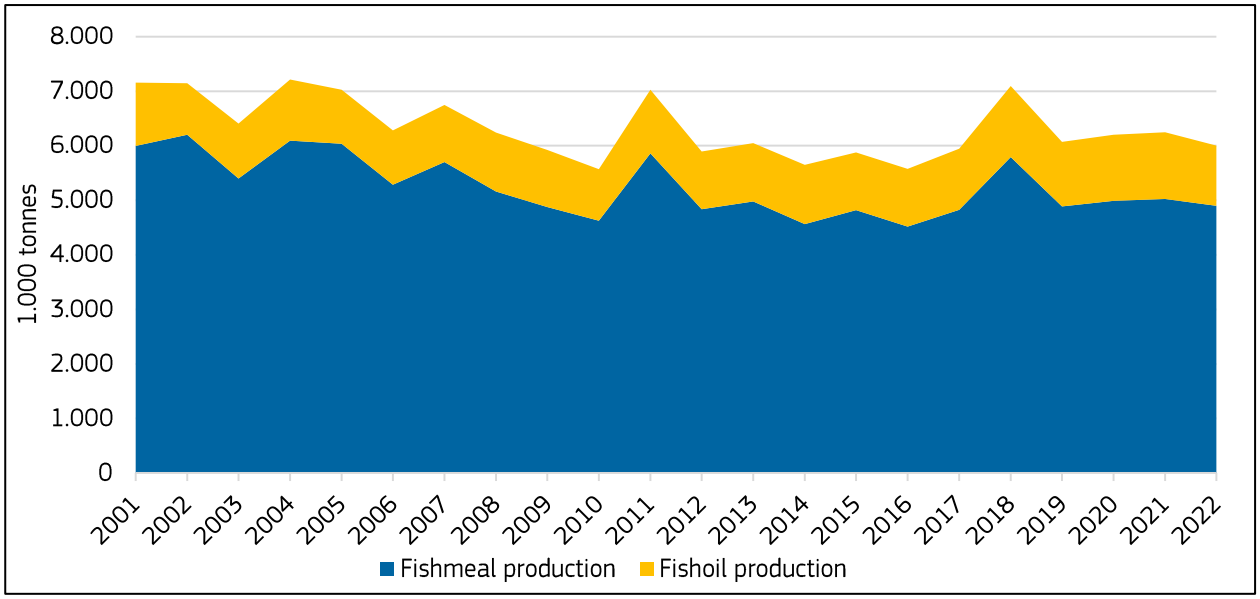
The variations from one year to another are much affected by the supply of forage fish and particularly by the Peruvian anchoveta fisheries, the latter being the world's largest in terms of volume, varying between 3 and 7 million tonnes a year. The strong variations in the landings of this species are closely linked to the periodic El Niño[4] climate events which bring warm water into the upwelling areas. In years when this arises, fisheries suffer, and catches might decrease by several million tonnes in one season.

In 2018, global fishmeal production reached its highest level since 2011 at 5,8 million tonnes, a 20% increase from 2017. Fish oil production was nearly 1,3 million tonnes, the highest level recorded over the past 20 years. The increased production was a result of high catches of Peruvian anchoveta. The global production in 2021 and 2022 is estimated much lower with 5,0 and 4,9 million tonnes of fishmeal respectively, and 1,2 and 1,1 million tonnes of fish oil. The decrease is again mainly caused by lower catches in Peru and lower oil yield in the fish.

[3] https://www.fao.org/common-pages/search/en/?q=Pelagic%20fishery%20management

[4] Source: U.S. Department of Commerce – National Oceanic and Atmospheric Administration (link: https://oceanservice.noaa.gov/facts/ninonina.html)

Figure 2: Global Production Of Fishmeal And Fish Oil



Source: IFFO

There are many countries producing fishmeal and fish oil to a greater or lesser extent. In 2022, the nine largest producers accounted for 64% of the total fishmeal production and 75% of the fish oil production. The 25 largest accounted for 90% of the fishmeal production and 93% of the fish oil production[5].

The world's largest producer is Peru, contributing on average with around 20% of global fishmeal production and between 15% and 20% of the global fish oil production since 2010. In 2022, Peru and Chile together accounted for 27% of the global fishmeal production and 22% of the global fish oil production. Since Peru has very little domestic consumption, the fishmeal and fish oil are sold on the global markets. On the other hand, in Chile, a significant share of fishmeal and fish oil production is used in the production of salmon and trout feed.

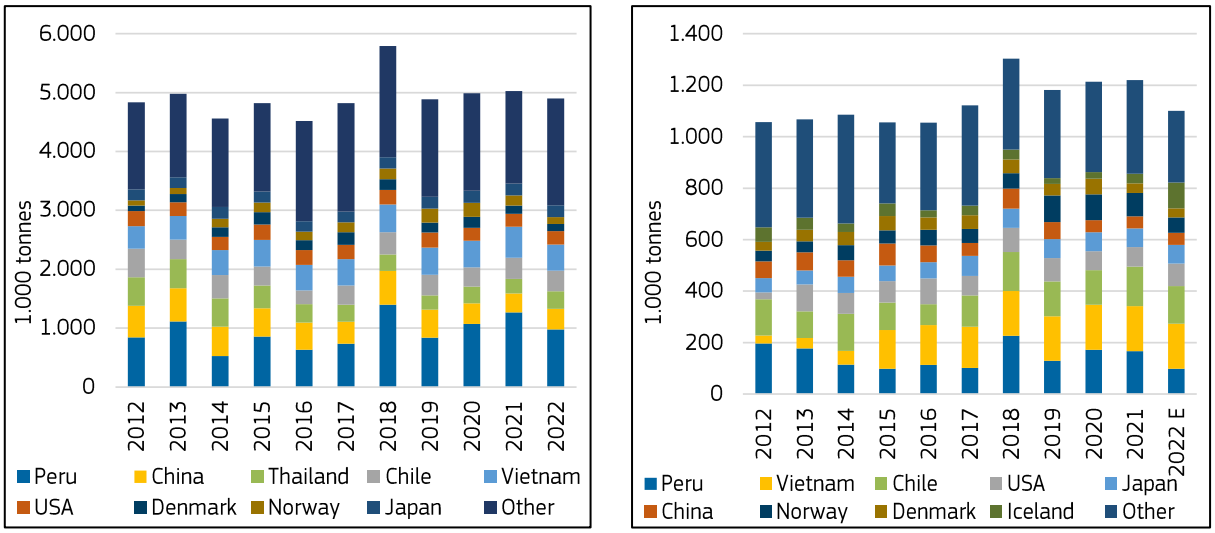
In Asia, China, Thailand, and Vietnam are ranked as the three largest fishmeal producers, producing 1,1 million tonnes in 2022, whereof the majority was consumed within the Asian markets.

In 2022, US fishmeal and fish oil production amounted to 230.000 tonnes and 88.000 tonnes, respectively. Catches of menhaden species form the basis to produce both.

In Europe, Norway and Denmark together produced 240.000 tonnes of fishmeal and 95.000 tonnes of fish oil in 2022. Due to its aquaculture production (salmon and trout), Norway is one of the world's largest consumers of fishmeal and fish oil.

[5] https://www.iffo.com/members-area/annual-yearbook-2021

Figure 3: World Fishmeal And Fish Oil Production By Producing Countries (fishmeal left, fish oil right)



Source: IFFO

2.4 Peruvian prices

The development in the global fishmeal and fish oil prices is, to a large extent, linked to the Peruvian prices. Peru is the biggest source of fishmeal and fish oil output today and world's largest producer and exporter of fishmeal and fish oil, so the big consumers always have an eye on Peru. An unsuccessful season in Peru might cause as much as 20%-decrease in global output.

Prices fluctuate in line with the supply/demand balance, but the general trend is a growth in both fishmeal and fish oil prices. From January 2009 to May 2023, the average FOB[6] export price in real terms[7] of Peruvian fishmeal increased by 111% to 1.607 EUR/tonne and fish oil price increased by 477% to 3.965 EUR/tonne. Since the beginning of 2022 and up to date, fish oil prices showed the strongest growth ever. From December 2021 to May 2023 the price growth was 99%. The main reason is the global scarcity of fish oil due to low oil yield in the anchovy fishery in Peru during both fishing seasons in Northern Peru last year. Due to El Niño conditions, the Peruvian first season in 2023 was cancelled which means no or very little supply from Peru the coming months. This will further strengthen the tight fish oil market.

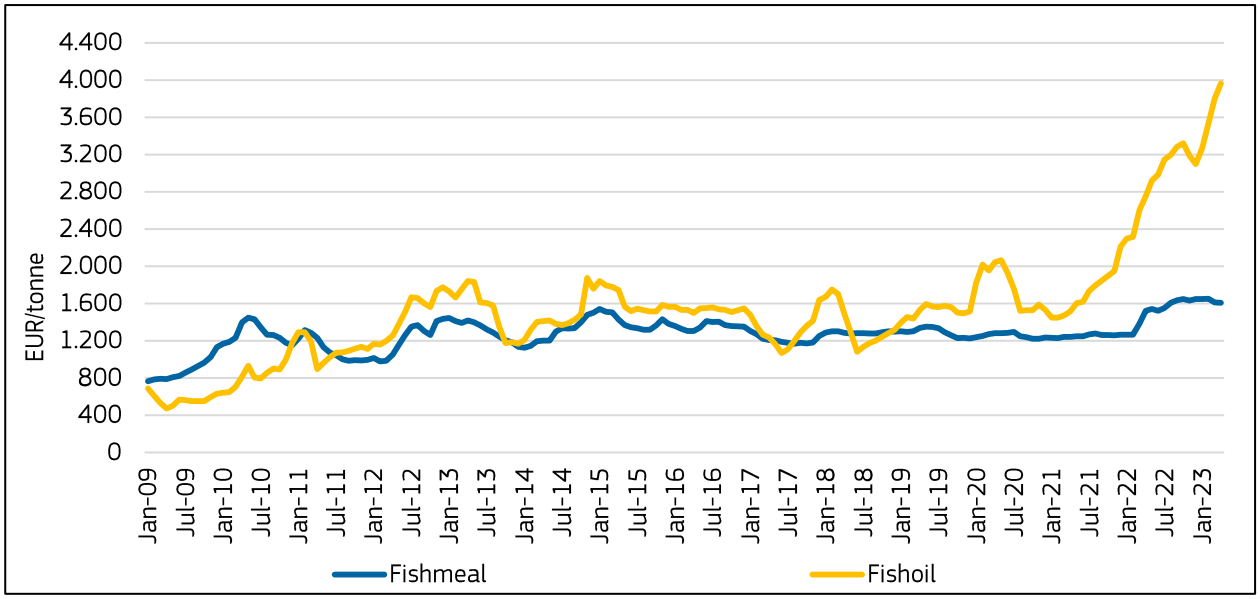
During 2009-2022, China became increasingly important as a destination market for Peruvian fishmeal, accounting for 78% of total Peruvian export in 2022. By comparison, in 2009, fishmeal exports to China accounted for less than half of total Peruvian fishmeal export. Exports to the EU showed an opposite trend, as 22% of the Peruvian fishmeal went to the EU in 2009 and only 6% in 2022[8].

[6] Free On Board

[7] Values are deflated by using the GDP deflator (base=2015)

[8] Source: Superintendencia Nacional de Aduanas y de Administración Tributaria (link: http://www.sunat.gob.pe/operatividadaduanera/index.html)

Figure 4: Prices Of Fishmeal And Fish Oil Exported By Peru



Source: Oilworld. Values are deflated by using the GDP deflator (base=2015).

3 WORLD FISHMEAL/FISH OIL MARKET USE BY SECTOR

Marine feed ingredients are limited resources with relatively stable production over the past 10 years. Most of the fishmeal is used as a high protein (60-72%) ingredient in feed for aquaculture species and farmed animals. Fish oil is used mainly in the feed of farmed marine fish and for human consumption. Very little is used in land animal feed.

To meet the demand for fishmeal and fish oil from the growing aquaculture industry, and in particular the farming of marine species, the composition of feed has changed considerably over the last decades, from mainly marine ingredients to inclusion of a substantial part of plant ingredients[9].

There are several challenges associated with use of non-marine proteins and oils from plants in the feed for marine fish in terms of quality of feed, energy balance, fish health, growth, and the final quality of the product.

3.1 Fishmeal use

The global fishmeal use by sector remained stable for many years but during the past 3-4 years we have seen an increased share going into aquaculture. In 2009, the share of fishmeal used in the aquaculture sector was 63%. The share remained stable at around 70% from 2010 till 2017 but rose in the years after and was 87% in 2021. In 2021, around 33% of the fishmeal going into aquaculture was used to feed crustaceans, 14% to feed salmon and trout, 18% to feed marine fish and 21% to feed freshwater species. The rest was divided between tilapias, cyprinids, and eels.

Most fishmeal in aquaculture feed is consumed in Asia. In 2021, 41% of the fishmeal was used in China and 28% in other Asian countries. 10% of the fishmeal was used in Europe, 13% in Latin-America and 4% in the Middle East.

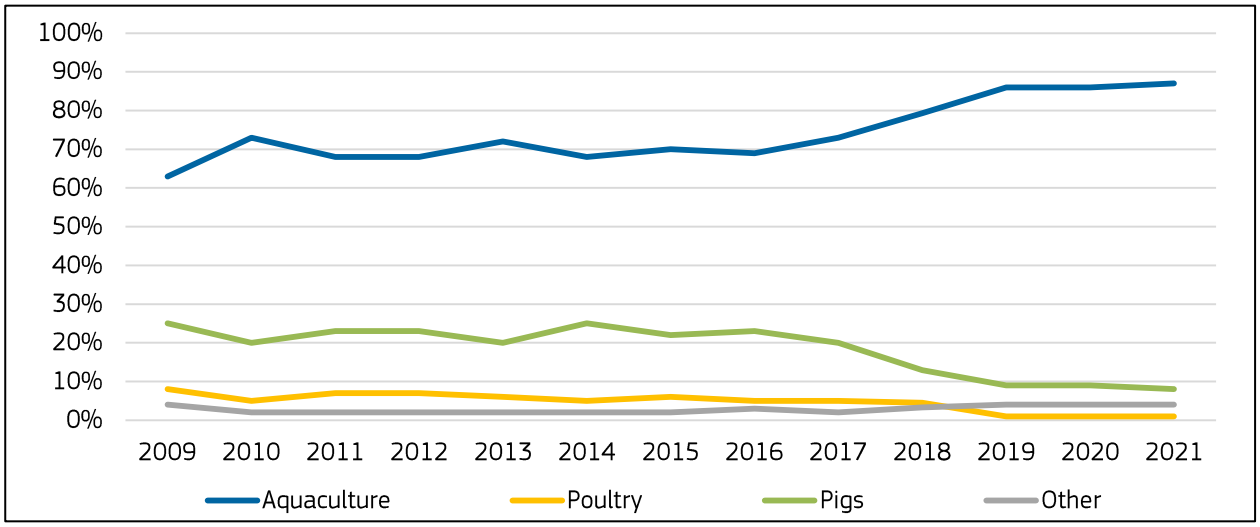
[9] Source: NOFIMA (link: http://www.nofima.com)

The pig industry is the second largest consumer of fishmeal accounting for 8% of total consumption in 2021, a decrease from 25% in 2009. Fishmeal in poultry feed accounted for 1% of total consumption in 2021[10].

The pressure for aquaculture to improve efficiency of fishmeal use also reflects the increasing competition for fishmeal on the global animal feed markets between aquaculture and livestock producers. Given the substantial and sustained growth of aquaculture that is projected, the overall amount of fishmeal that goes toward aquaculture will likely continue to grow. Higher feed prices will imply that only feed-efficient and high-valued aquaculture products can be profitable with such inputs[11].

Aquaculture production is growing and is expected to grow further in the coming years. Fishmeal and fish oil production remains stable or is slightly increasing as the utilization of by-products increases and new investment is done in developing other raw material sources (algae, krill, insects etc.).

Figure 5: World Fishmeal Use By Sector



Source: IFFO

3.2 Fish oil use

The main use of fish oil is for aquaculture – especially for carnivorous fish such as salmonids (salmon and trout) and marine species. Direct use in human foods and capsules are increasingly significant outlets. Other uses include carrier for pesticides, in paints, and in leather making. The use in nutraceuticals has been increasing even more rapidly than that in aquaculture, at around an average of 10% per year over the last 10 years[12].

Due to lower shares of fish oil in the feed formulas, the limited available volumes of fish oil have not limited the growth in the global aquaculture production. In 2009, 81% of the global uses was in the feed for aquaculture species which constituted nearly 830.000 tonnes of fish oil consumption. In 2021, 75% of the global uses was for aquaculture, constituting around 670.000 tonnes of the fish oil consumption that year.

[10] Source: IFFO (link: http://www.iffo.net/)

[11] Source: FAO (link: http://www.fao.org/3/i3640e/i3640e.pdf)

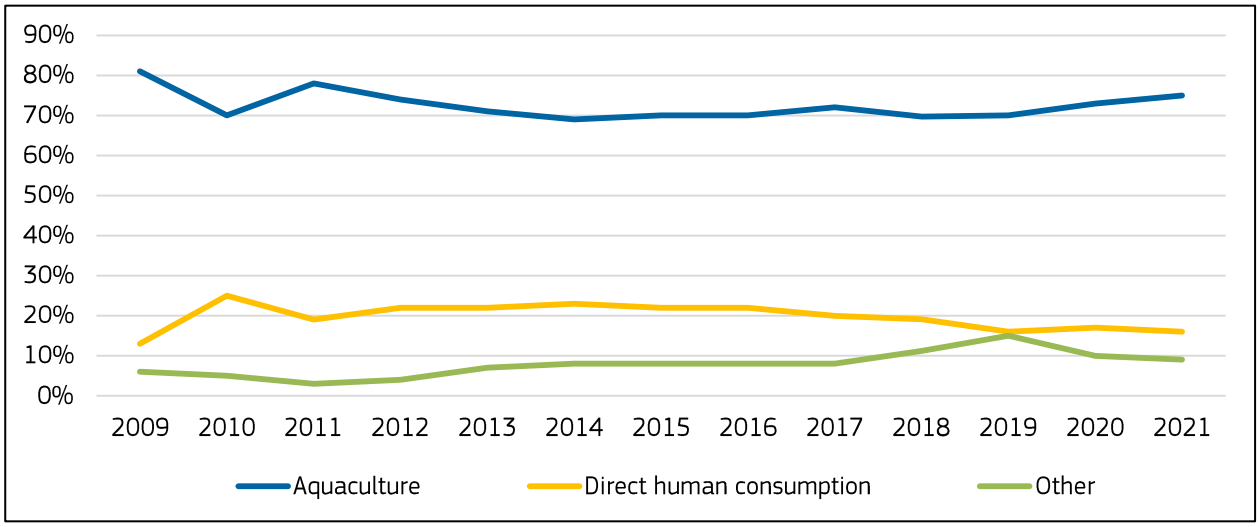
[12] Source: IFFO (link: https://www.iffo.net/system/files/LipidTechpaper-finalpdf.pdf)

In 2021, nearly 58% of the fish oil consumption in aquaculture was used to feed salmon and trout, 15% was used in the feed of marine fish, 23% in the feed for crustaceans, 3% in the feed for other species.

In 2021, 39% of the fish oil used in aquaculture was consumed in Europe, 21% in Latin America, 11% in China, 8% in the Middle East and 14% in Asia, and the rest in other areas.

Farmed fish, and particularly marine fish, need to be provided the beneficial omega-3 fatty acids (EPA and DHA) through their feed[13]. This will secure a final product comparable and as healthy as their wild counterparts. Fish oil is currently the only economically viable source of these essential fats for feed purposes[14]. Access to omega-3 resources in fish feed is therefore a limiting factor for growth in aquaculture. New oil sources for fish feed are therefore of big interest for the aquaculture producers as well as the human consumption sector.

Figure 6: World Fish Oil Use By Sector



Source: IFFO

4 EU LANDINGS FOR NON-FOOD USE

In the period from 2005 to 2021, EU landings destined for non-food use varied between 432.000 tonnes at its lowest (2012) to nearly 1,05 million tonnes at its highest (2017). This is due to the strong variations in the fishing quotas/landings. In particular this is the case for the sandeel. This size of this stock might vary strongly from one year to another and so will the fishing quotas. See table 1 below and the landings of the different species in 2012 and 2017.

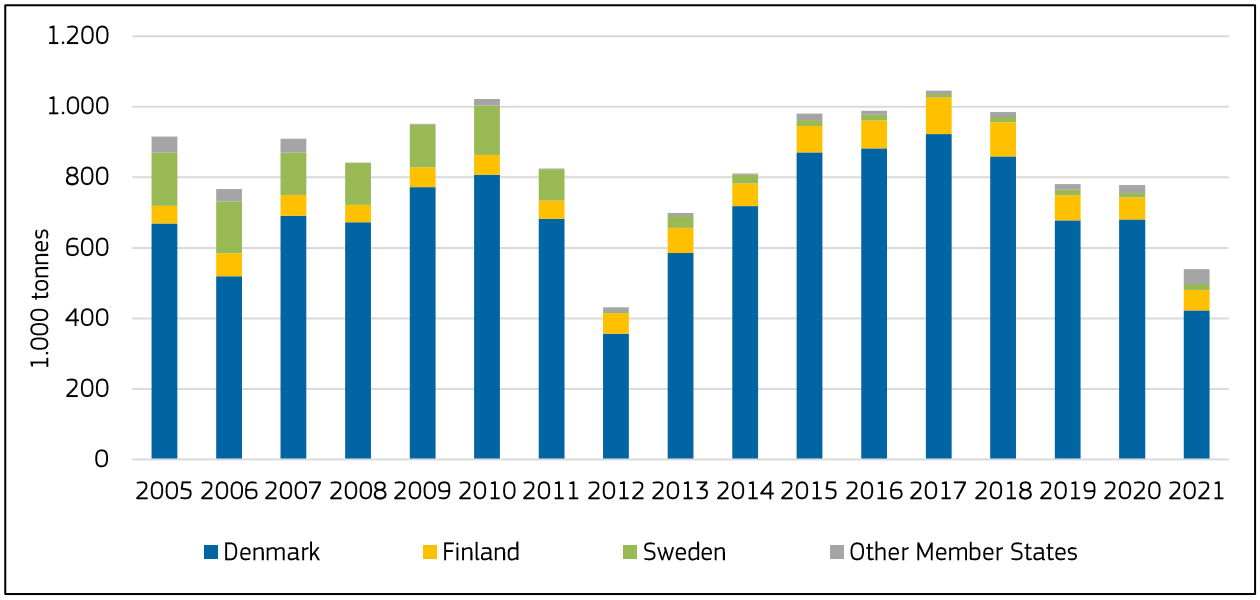
Denmark is the largest of the EU industrial fishing nations, accounting for 87% of total EU landings in 2020 and 78% in 2021. The country has a large part of the EU quotas for principal pelagic species such as sandeels, sprat and blue whiting fished for fishmeal and fish oil. The feed fish fisheries constitute a substantial part of the Danish fishery sector accounting for 39% of the values produced in 2020 and 28% in 2021.

[13] EPA (eicosapentanoic acid) DHA (docosahexaenoic acid), https://nofima.no/en/nyhet/2017/05/farmed-salmon-need-marine-omega-3/

[14] Source: FAO (link: http://www.fao.org/in-action/globefish/fishery-information/resource-detail/en/c/338773/)

Other important EU countries catching feed fish are Sweden and Finland. In 2021, Finland was the second largest accounting for 11% of total industrial EU catch.

Figure 7: EU Landings For Non-Food Use By Member State



Sources: Eurostat, fiskeridir.dk

The major fish species landed for industrial uses in the EU are sandeels, blue whiting, sprat, and herring whereof sandeels and sprat historically were the two main species. Blue whiting has increasingly become important over the past years accounting for 26% of total landings in 2021. Herring is mainly destined for human consumption, but of the large volumes caught and subsequent low prices, some are used in the production of fishmeal and fish oil. Due to significant variations in the quotas for the different species utilized for non-food uses, the availability in the EU fisheries vary from year to year. From 2016 to 2017, there was a large increase in the landings of sandeels (+900%) due to a quota increase of the same proportion. In 2021, landings of sandeels more than halved compared to 2020.

Table 1: EU Landings For Non-Food Use By Species (volume in 1.000 tonnes)

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sandeels	356	59	254	204	227	40	411	206	124	238	99
European sprat	292	182	185	253	391	330	258	296	255	241	170
Blue whiting	1	3	70	174	185	155	191	250	165	114	139
Herring	105	75	117	116	131	149	154	197	160	120	80
Norway Pout	5	27	39	32	27	32	21	16	48	65	42
Boarfish	18	43	26	15	<0,5	<0,5	0	0	0	0	4
Capelin	44	31	8	10	3	0	0	4	0	0	0
Other	4	12	6	8	15	16	11	16	29	1	6
Total	**825**	**433**	**704**	**812**	**979**	**722**	**1.046**	**985**	**781**	**779**	**540**

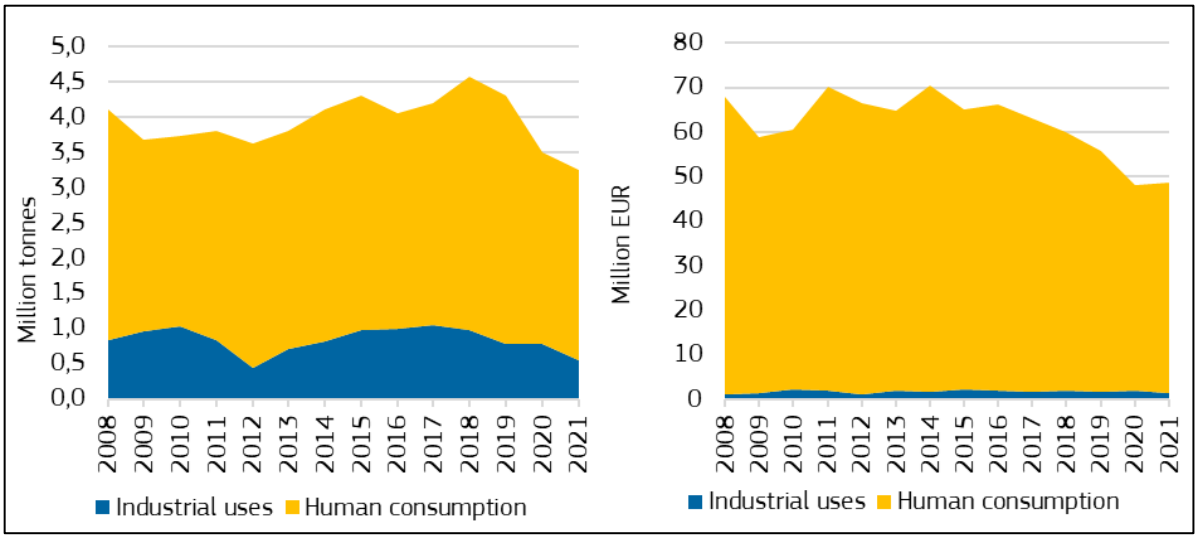
*Source: Eurostat, **Fiskeristyrelsen***

From 2020-2021, total EU landings of all species for industrial uses decreased by 31% to 540.000 tonnes. The decrease was mainly due to decreased landings of sandeels and European sprat.

Most sandeel is caught in the North Sea, whilst sprat is caught in the Baltic, North Sea, and Kattegat/Skagerrak. Blue whiting is taken as a directed fishery in the North Sea and East Atlantic. Norway pout is caught in the North Sea, Kattegat, and Skagerrak[15].

In 2021, fishery landings in the EU were 3,25 million tonnes, of which 17% was destined for fishmeal and fish oil production. Economically, the fish for industrial uses is relatively small compared to other fisheries. In 2021, the value of fish for industrial uses constituted 3% of total EU landings.

Figure 8: TOTAL LANDINGS IN THE EU PER DESTINATION USE (volume left, value right)[16]



Sources: Eurostat, Fiskeristyrelsen

4.1 First-sale prices

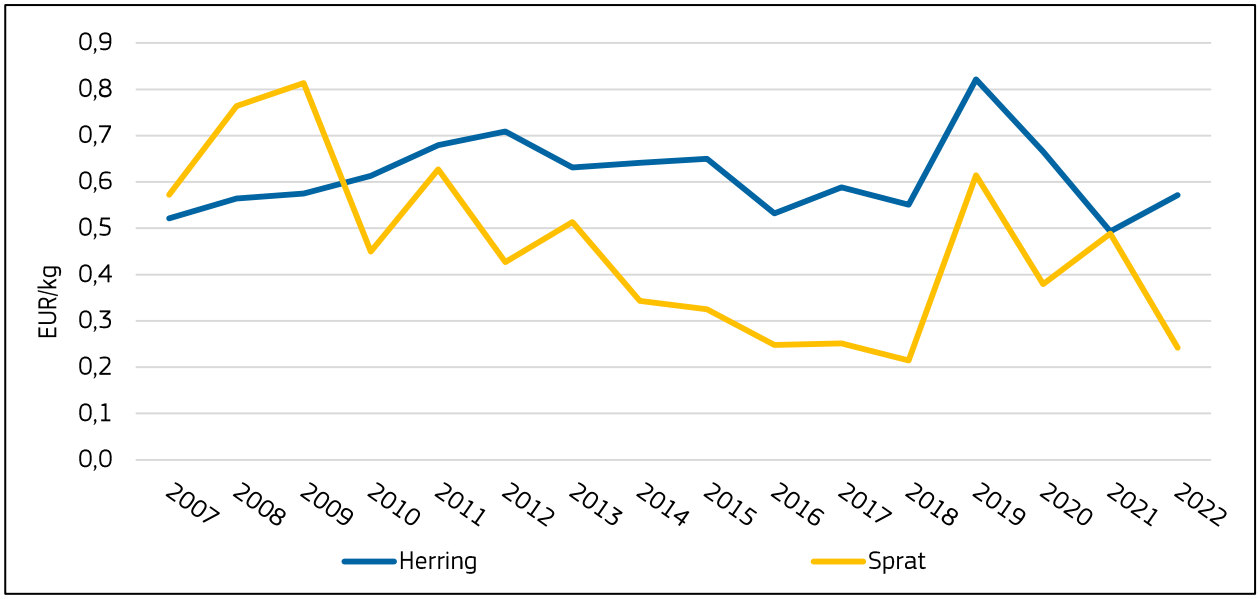
In 2021, EU landings of European sprat for non-food use amounted to 170.000 tonnes, of which 96% was landed in Denmark. The comparison between catches and landings shows that several EU fleets landed sprat in Denmark (Sweden, Poland, Germany, Lithuania)[17]. The main reason is that sprat is used as raw material for the fishmeal and fish oil producers in Denmark, which need significant volumes of fresh fish. The yearly first sale price of sprat varied between 0,21 EUR/kg and 0,81 EUR/kg from 2007 to 2021, and herring prices varied between 0,49 EUR/kg to 0,81 EUR/kg. The price fluctuations for the raw material used in the reduction industry is closely linked to volumes landed in Denmark and the price level on fishmeal and fish oil. The price is an average first sale price for all uses.

[15] Source: working paper of the European Parliament (link: https://www.europarl.europa.eu/RegData/etudes/etudes/join/2003/341942/IPOL-PECH_ET(2003)341942_EN.pdf)

[16] Eurostat only provides value data for 2018 for all countries except Denmark. Volumes refer to both 2018 and 2019 data for all countries except Denmark, Sweden and Finland. 2017 - 2019 figures for Denmark are therefore sourced from national statistics in Denmark, and figures from Sweden and Finland are estimated based on national statistics for 2019.

[17] Source: Fiskeristyrelsen (link: https://dwp.fiskeristyrelsen.dk/landingsrapport/rapport/main.html)

Figure 9: First Sale Price Of Herring And Sprat In EU (excluding UK)



Source. EUMOFA. Values are deflated by using the GDP deflator (base=2015). The countries covered by the first sale data are: Denmark, Belgium, Estonia, France, Latvia, Lithuania, Netherlands, Poland, and Sweden

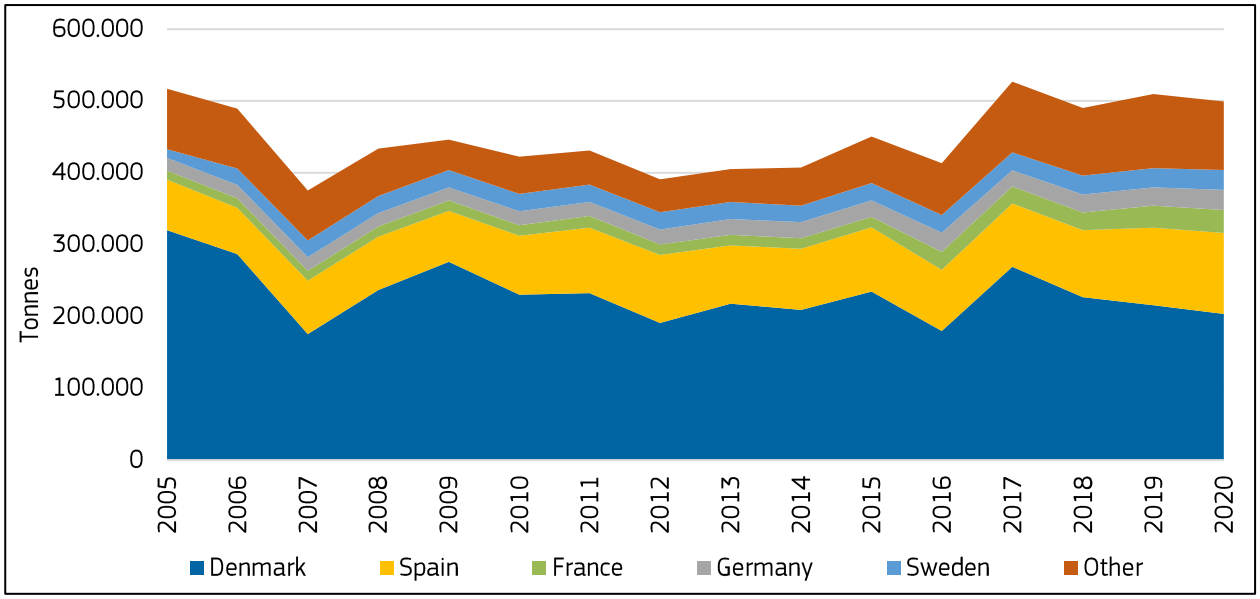
5 EU PRODUCTION OF FISHMEAL AND FISH OIL

In the 2005-2015 period, the annual average EU fishmeal production in the EU was above 433.000 tonnes, while it was around 480.000 tonnes in the period from 2015 to 2020. The increasing trend in the 2015-2020 period is connected to increased utilization of rest raw material from the processing industry (herring, mackerel, whitefish etc.) and a good supply from dedicated fishing for feed production[18].

The largest EU producing nation is Denmark, accounting for around 41% of the total EU fishmeal output in 2020. The production in Denmark is mainly based on landings of small pelagic species like blue whiting, sandeels, Norway pout and sprat. Spain is the second largest producer constituting 23% of the total. Fishmeal and fish oil in Spain are produced from waste/trimmings from the processing industry and the production is increasing. For the past three years, fishmeal production in Spain was well above the 10-year average.

[18] Source: Seafish (link: https://www.seafish.org/media/Publications/Seafish_FishmealandFish oil_FactsandFigures2018.pdf)

Figure 10: EU Production Of Fishmeal

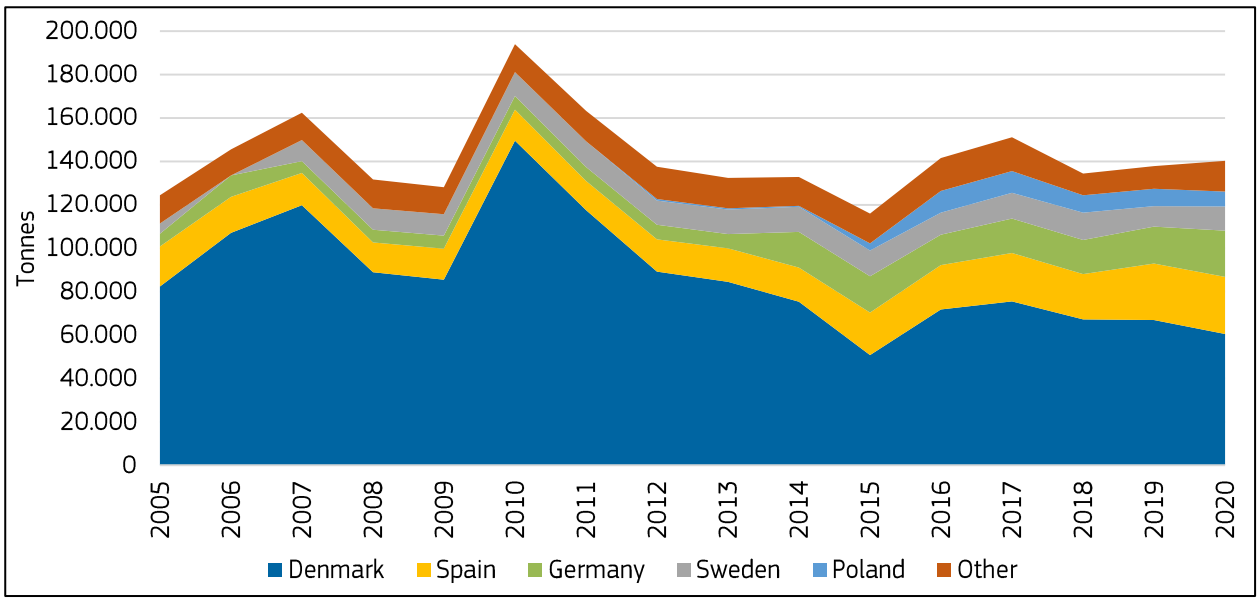


Sources: FAO, IFFO

Fish oil production has fluctuated from a minimum of 127.000 tonnes (2015) to a maximum of 192.000 tonnes (2010) over the years from 2005-2020. Average yearly production in the same period was 142.000 tonnes. In 2020, fish oil production is estimated to 140.000 tonnes, a 2% increase from 2019.

Denmark and Spain are the largest producers accounting for 43% and 19% respectively of total EU production in 2020. Mainly due to decreased landings of sandeels and other species used for the purpose, the Danish fish oil production decreased 27% from 2005-2020.

Figure 11: EU Production Of Fish Oil



Sources: FAO, IFFO

5.1 European fishmeal and fish oil prices

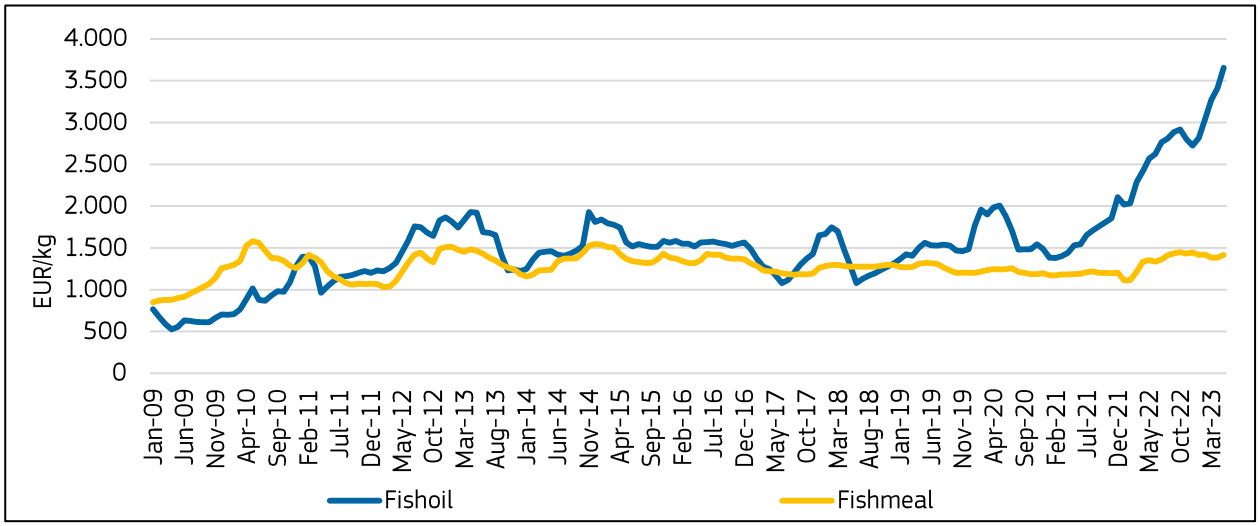
With some local variations, the fishmeal and fish oil prices in Europe are highly correlated to the global prices, which are linked to the supply situation in South America (Peru and Chile) and demand from Asia (primarily China).

From January 2009 to May 2023, European fishmeal prices increased 67% (in real terms) to 1.416 EUR/tonne. During that period, the price level experienced several ups and downs in line with global price trends. A general higher price increase was seen for fish oil which increased 181% to 3.655 EUR/tonne in that period.

The growth in the prices of fishmeal and fish oil is driven by both falling supply and rising demand and reflects the high quality of the nutritional contribution that these materials supply to feed. The growth in the global aquaculture industry favours species consuming feed with low inclusion rates of marine ingredients (e.g., Tilapia and Pangasius) or those species that receive high market prices (e.g., salmon and shrimp)[19].

After two good production years in Peru, production decreased in 2022. Low oil yield in the landings caused a 41% decrease in fishoil output while fishmeal production decreased by around 20%. This resulted in a strong price pressure on fishoil as other regions did not manage to compensate for the lower Peruvian production. Global fish oil prices have, since the beginning of 2022, continued upwards and reached an all-time high during winter/spring 2023 passing EUR 3.650/tonne (deflated value) in May. This was a 42% increase from May last year and a 139% increase from the same month two years ago. In the same period European fishmeal price increased 5% from May 2022 to May 2023 and 19% compared to two years ago. On top of that the first Peruvian anchovy season in 2023 is dismissed due to El Niño conditions, so little or no supply can be expected from Peru in the coming months.

Figure 12: Fishmeal And Fish Oil Prices In Europe



Source: Oilworld. Values are deflated by using the GDP deflator (base=2015).

[19] Source: Seafood Source (link: https://www.seafoodsource.com/news/aquaculture/iffo-head-aquaculture-growth-portends-bright-profitable-future-for-marine-ingredients-industry)

5.2 EU fishmeal and fish oil industry

Industrial fisheries in the EU are conducted by both EU registered vessels and non-EU vessels landing in EU ports. The number of fishmeal plants has fallen the last 20 years. In particular, the Danish sector has seen a reduction from 20 plants to 3, situated in Esbjerg, Skagen and Hanstholm.

6 IMPORT – EXPORT

6.1 EU trade balance

6.1.1 Fishmeal

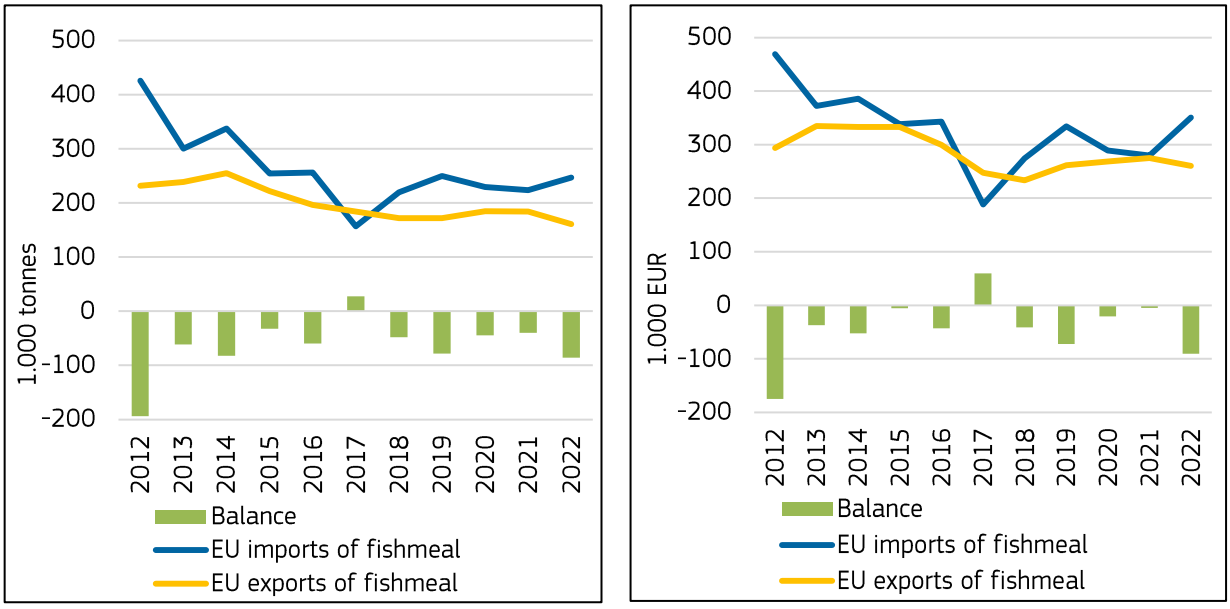
The EU can maintain a high level of fishmeal and fish oil consumption by sourcing it from other countries in addition to their own production, but the long trend is that the trade deficit (export *minus* import) has decreased. In the long term, during 2012-2022 EU imports of fishmeal decreased by 42% in volume and 25% in value to 246.000 tons and EUR 350 million, respectively. From its lowest level in 2017, imports increased in 2018-2022.

From 2012 to 2022, export volumes decreased by 31% and values decreased by 11% to 161.000 tonnes and EUR 260 million, respectively.

In 2022, the trade deficit was -85.600 tonnes and EUR –90 million.

EU fishmeal consumption decreased by 18% from 2012 to 2022 to around 450.000 tonnes.[20]

Figure 13: EU27 Fishmeal Trade (volume left, value right)



Source: EUMOFA elaboration of Eurostat-COMEXT data. Values are deflated by using the GDP deflator (base=2015).

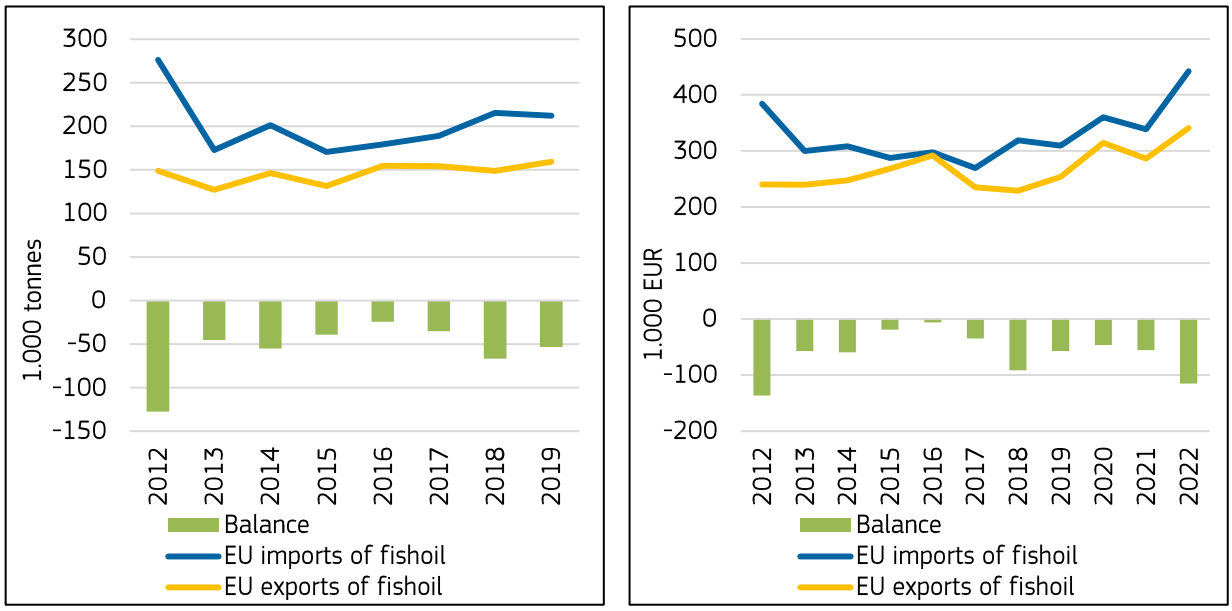
[20] Source: US Department of Agriculture (link: https://www.usda.gov/)

6.1.2 Fish oil

In the 2012-2022 period, EU imports of fish oil decreased by 29% in volume and increased by 15% in value to 196.500 tonnes and EUR 442 million. Export volume decreased by 2% and value increased by 42% to 145.000 tonnes and EUR 340 million in the same period.

The trade deficit was on its highest in 2012 amounting to nearly -128.000 tonnes and EUR -144 million. In 2022, trade deficit was -51.000 tonnes and EUR -101 million.

Figure 14: EU27 FISH OIL TRADE (volume left, value right)



Source: EUMOFA elaboration of Eurostat-COMEXT data. Values are deflated by using the GDP deflator (base=2015).

6.2 Imports

6.2.1 Fishmeal

Over the past 12 years, between 80% and 95% of the fishmeal import (both in terms of volume and value) to the EU were sourced from nine countries. In terms of volume, imports decreased by 42% from 2012 to 2022 and value decreased by 25%. In 2022, fishmeal imported by the EU amounted to 246.600 tonnes, a 10% increase from 2021 and a 7% increase from the 2020 level. In terms of value, fishmeal imports in 2022 increased by 25% compared to 2021 and by 21% compared to 2020.

The three largest suppliers are Morocco, Peru, and Iceland.

Peru was the main supplier 12 years ago accounting for 49% of the fishmeal volume and 51% of the value in 2012. By 2022, Peruvian supply to the EU was reduced by 79% in terms of volume and 73% in terms of value, accounting for 18% of the EU import volume and 19% of the value.

Imports from Iceland decreased by 12% in volume but increased by 3% in value from 2012 to 2022. At the same time, Iceland increased its volume share from 8% in 2012 to 12% in 2022 and its value from 8% to 11%.

Imports from Morocco increased by 76% in volume and 137% in value from 2012 to 2022, and Morocco increased its volume share from 8% in 2012 to 23% in 2022 and its value share from 7% to 21%.

Around 27% of fishmeal imported to the EU is absorbed by Germany, where 108.000 tonnes were sold in 2022. Denmark and Spain are second and third covering 25% and 20% respectively.

Table 2: EU27 Fishmeal Imports By Trade Supplier (volume in tonnes)

Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Morocco	32.100	25.100	29.500	35.100	50.600	28.200	28.000	39.500	46.600	49.400	56.600
Peru	207.400	100.500	139.900	43.100	62.300	18.600	27.900	40.500	42.400	29.500	43.200
Iceland	32.800	48.400	11.400	42.700	10.900	22.700	22.700	7.300	3.500	24.700	28.900
Norway	37.900	40.000	37.900	54.600	30.400	15.200	22.700	28.100	29.300	32.200	19.900
South Africa	12.300	3.300	9.700	10.300	20.500	10.400	15.900	24.400	26.800	19.200	21.100
Chile	64.900	34.600	44.800	17.800	18.400	20.200	19.400	26.800	26.300	22.400	18.000
Faroe Islands	7.200	12.000	10.500	14.000	8.700	7.100	21.200	9.000	9.700	12.300	14.500
Mauritania	11.300	23.300	39.400	17.200	29.500	10.300	21.200	22.300	8.000	3.600	9.000
Mexico	1.500	3.100	0	0	0	0	0	0	0	1.900	6.700
Other	18.400	10.200	14.500	19.700	24.800	23.800	40.700	52.200	36.800	28.400	28.700
Total	**425.800**	**300.500**	**337.600**	**254.500**	**256.100**	**156.500**	**219.700**	**250.100**	**229.400**	**223.600**	**246.600**

Source: EUMOFA elaboration of Eurostat-COMEXT data. The totals may differ from the sums in columns due to rounding.

Table 3: EU27 Fishmeal Imports By Supplier (value in 1.000 EUR)

Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Morocco	30.784	27.521	30.552	46.318	61.811	29.339	29.926	44.643	50.750	55.721	73.074
Peru	237.247	126.171	172.067	56.997	84.758	23.544	34.083	55.060	51.394	37.696	65.035
Iceland	38.933	71.886	15.756	63.927	16.686	27.027	31.100	11.662	4.167	31.586	40.057
Norway	30.476	35.421	27.154	59.906	39.758	22.217	35.353	46.519	47.938	50.626	35.416
South Africa	14.221	4.351	12.287	13.214	27.070	11.777	19.443	29.438	30.961	23.865	30.738
Chile	77.391	46.607	55.783	27.784	27.151	25.597	26.372	36.664	33.713	29.279	25.808
Faroe Islands	8.150	15.823	13.388	19.397	12.573	8.744	29.132	14.152	13.153	15.047	23.754
Mauritania	13.028	26.873	39.167	21.816	37.068	12.625	25.509	26.722	8.816	4.044	11.193
Mexico	1.282	3.313	0	0	0	0	11	0	0	2.256	8.820
Other	17.431	14.195	19.407	29.018	35.853	27.317	43.649	69.047	47.999	29.551	36.768
Total	**468.943**	**372.161**	**385.561**	**338.376**	**342.728**	**188.188**	**274.577**	**333.907**	**288.890**	**279.671**	**350.663**

Source: EUMOFA elaboration of Eurostat-COMEXT data.

6.2.2 Fish oil

Over the past 12 years, 65-85% of the fish oil import volume and 60-80% of the value to EU were sourced from nine countries. In terms of volume, imports decreased 29% from 2012 to 2022 while value increased by 15%, reflecting the general increasing price level of fish oil. In 2022, fish oil imported to the EU amounted to 196.500 tonnes, which was a 5% decrease from 2021. In terms of value, fish oil imports increased by 30% from 2021 to 442 million EUR.

Peru, Norway, and Chile are the top three suppliers accounting for 60% of total import volume and 54% of the value in 2022.

Peru, the main supplier 12 years ago, accounted for 43% of the fish oil volume and 43% of the value in 2012 but reduced its volume by 71% and its value by 37% in the period. By 2022, Peru accounted for 17% of EU import volume and 24% of the value.

In the 2012–2022 period, imports from Norway increased by 21% in volume and 39% in value to 64.500 tonnes and EUR 90 million and Norway increased its volume share from 14% to 33% and its value share from 17% to 20% in 2022.

Imports from Chile increased by 306% in volume and 494% in value to 19.500 tonnes and EUR 43 million and Chile increased its volume and value share from 2% to 10%.

Around 40-50% of fish oil imported in the EU is absorbed by Denmark, where 83.600 tonnes were sold in 2022. In Denmark, most of the fish oil is used in animal feeds, mostly poultry and pig and, to a lesser and decreasing extent, salmonid aquaculture. Greece and the Netherlands follow, covering 12% and 11% respectively.

Table 4: EU27 Fish Oil Imports By Supplier (volume in tonnes)

Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Peru	118.400	38.200	56.800	45.800	20.100	31.700	58.300	37.100	16.500	60.000	34.300
Norway	53.500	44.700	40.400	53.100	56.300	54.100	47.900	53.800	72.200	64.100	64.500
Chile	4.800	2.800	19.500	7.900	5.300	2.200	5.900	27.700	14.500	19.000	19.500
Morocco	28.300	13.100	21.500	17.500	10.800	8.500	7.300	11.600	22.900	9.400	11.600
Iceland	4.700	10.500	3.700	4.400	7.700	9.200	3.800	2.300	11.400	5.200	10.100
South Africa	500	0	1.100	0	2.300	2.600	3.500	1.300	3.500	3.700	7.700
Mauritania	4.500	13.800	15.400	10.400	12.700	15.200	17.100	9.800	8.600	6.500	7.500
China	100	100	100	700	600	2.200	2.100	1.300	1.400	1.900	1.900
Oman	0	0	0	0	0	0	2.100	4.600	7.200	2.900	7.800
Other	61.700	49.400	42.700	30.600	63.400	63.500	67.400	62.900	59.100	34.300	31.600
Total	**276.500**	**172.600**	**201.200**	**170.400**	**179.200**	**189.200**	**215.400**	**212.400**	**217.300**	**207.000**	**196.500**

Source: EUMOFA elaboration of Eurostat-COMEXT data. The totals may differ from the sums in columns due to rounding.

Table 5: EU27 Fish Oil Imports By Supplier (value in 1.000 EUR)

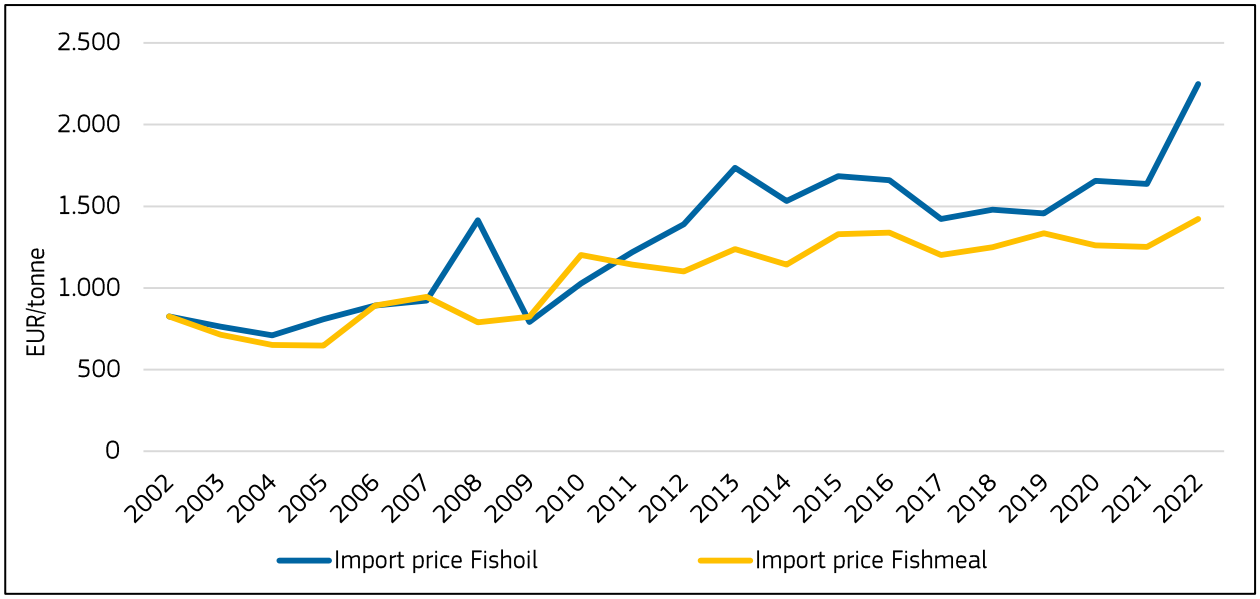
Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Peru	165.223	66.623	88.133	87.031	42.526	47.330	81.968	62.934	33.919	111.708	104.508
Norway	65.118	59.718	47.580	56.762	62.365	55.149	51.379	58.793	86.729	76.808	90.239
Chile	7.251	4.490	24.937	10.662	5.115	2.290	8.599	40.145	27.095	25.718	43.084
Morocco	40.416	22.490	32.245	31.517	22.337	20.284	17.346	19.955	39.322	17.997	31.099
Iceland	8.647	21.737	6.871	10.394	12.868	13.970	8.608	5.965	21.329	11.779	24.229
South Africa	613	64	1.849	0	3.885	2.878	4.854	2.243	5.927	5.598	20.877
Mauritania	5.177	19.902	17.830	15.099	21.230	17.254	23.361	11.864	11.434	9.142	16.159
China	1.470	1.690	2.005	6.319	4.963	8.221	9.955	8.657	7.575	11.521	15.818
Oman	0	0	0	0	0	43	2.658	6.368	11.739	4.191	13.844
Other	90.322	102.829	87.013	69.364	122.241	101.755	109.952	92.353	114.765	64.334	82.188
Total	**384.237**	**299.543**	**308.463**	**287.149**	**297.530**	**269.176**	**318.680**	**309.277**	**359.835**	**338.797**	**442.044**

Source: EUMOFA elaboration of Eurostat-COMEXT data.

6.2.3 Import prices of fishmeal and fish oil

The average yearly import prices of fishmeal and fish oil to the EU showed strong growth over the past 15-20 years with some ups and downs in line with global price trends. Between 2002 and 2022, the yearly average fish oil price increased by 173% to 2.249 EUR/tonne and the average fishmeal price increased by 72% to 1.422 EUR/tonne.

Figure 15: EU Import Prices Of Fishmeal And Fish Oil



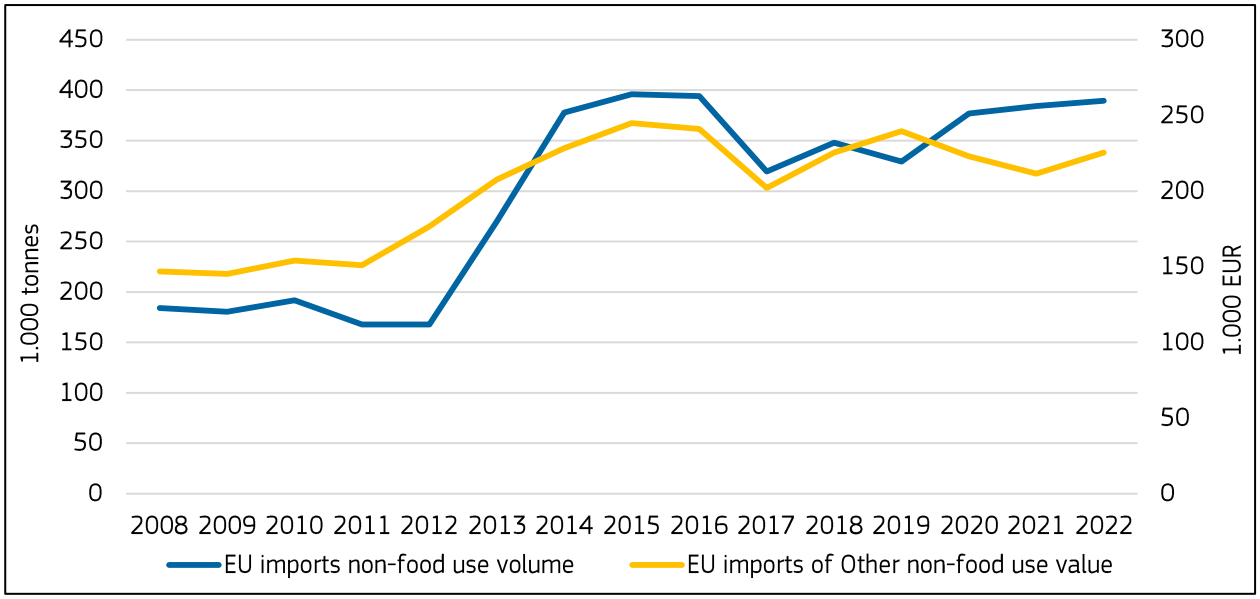
Source: EUMOFA elaboration of Eurostat-COMEXT data. Values are deflated by using the GDP deflator (base=2015)

6.2.4 Other non-food use products

The EU import of other non-food use products mainly include fish waste, seaweeds and other algae, crustaceans and molluscs unfit for human consumption, marine mammal solubles and different types of live ornamental fish. In 2022, these products accounted for 99% of the volume and 97% of the value in the category "other non-food use". The total import of other non-food use products accounted for 47% of the volume (390.000 tonnes) and 22% (257 million EUR) of the value in the non-food use category.

The EU import of other non-food use products varied between 396.000 (2015) tonnes at its highest to 167.000 (2012) tonnes at its lowest in the period from 2008-2022. During that period, import values increased 53% to EUR 225 million. In terms of volume, fish waste, seaweed and algae and different products of crustaceans and molluscs constituted 98% of the volume. A large share of the volume (171.000 tonnes in 2022) goes to Denmark and is used in feed for the fur industry and other livestock.

Figure 15: EU27 Imports Of Other Non-Food Use Products



Source: EUMOFA elaboration of Eurostat-COMEXT data. Values are deflated by using the GDP deflator (base=2015).

6.3 Export

6.3.1 Fishmeal

During the past 12 years, between 75-90% of the fishmeal export volumes and between 73-92% of the values from EU were exported to nine countries.

In terms of volume, exports decreased by 31% from 2012 to 2022 and values decreased by 16% reflecting the general increasing price level on fishmeal. In 2022, fishmeal exports from the EU amounted to 161.000 tonnes, a 13% decrease from 2021. In terms of value, fishmeal exports decreased by 5% compared to 2021.

The three largest destination countries are Norway, the UK, and Canada accounting for 69% of the volumes and 70% of the values in 2022.

Exports to Norway, the main destination country the past 12 years, decreased by 38% in volume and 24% in value from 2012 to 2022 accounting for 55% of the volumes and values in 2012 and 49% of the volumes and 50% of values in 2022. From 2021 to 2022, export volumes increased by 1% and values increased by 8% to 78.900 tonnes and EUR 131 million.

Exports to Canada increased by 44% in volume and 55% in value from 2012 to 2022, accounting for 3% of the volumes and 3% of the values in 2012 and 6% of the volumes and 6% of the values in 2022. From 2021 to 2022, export volumes decreased by 20% and values by 14% to 10.200 tonnes and 16 million EUR, respectively.

Exports to the UK decreased by 42% in volume and 33% in value from 2012 to 2022, accounting for 17% of the volumes and 17% of the values in 2012 and 14% of the volumes and 14% of the values in 2022. From 2021 to 2022, export to the UK decreased 43% in volume and 41% in value to 23.000 tonnes and 35 million EUR.

Table 6: EU27 Fishmeal Export By Destination (volume in tonnes)

Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Norway	126.800	115.700	141.900	85.700	97.800	54.100	52.700	69.400	70.700	78.400	78.900
United Kingdom	39.800	41.200	47.500	40.100	40.500	36.000	39.100	47.800	57.400	40.400	23.000
Canada	6.300	5.200	5.400	5.700	7.100	8.400	8.100	11.300	10.000	11.400	9.100
China	4.700	17.700	8.700	16.600	9.700	22.700	13.900	7.700	6.400	10.900	10.200
USA	2.000	1.800	1.400	2.800	4.600	3.000	6.100	3.600	3.300	3.800	7.100
Turkey	2.300	5.300	2.000	3.200	1.900	12.600	7.600	1.900	2.800	8.300	6.900
Serbia	1.800	1.300	1.700	1.900	2.000	2.300	2.400	2.300	3.000	4.100	4.100
Taiwan	4.000	3.600	3.400	8.100	6.400	10.600	7.500	4.400	6.700	6.800	4.800
Philippines	1.400	1.300	800	300	900	1.000	800	1.900	1.700	1.700	3.500
Other	42.700	45.700	42.300	57.600	25.600	33.300	33.600	21.700	22.800	18.200	13.400
Total	**231.800**	**238.800**	**255.100**	**222.000**	**196.500**	**184.000**	**171.800**	**172.000**	**184.800**	**184.000**	**161.000**

Source: EUMOFA elaboration of Eurostat-COMEXT data. The totals may differ from the sums in columns due to rounding.

Table 7: EU27 Fishmeal Export By Destination (value in 1.000 EUR)

Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Norway	170.955	170.953	199.060	122.852	147.668	73.751	71.202	109.705	102.578	120.723	130.687
United Kingdom	52.834	58.919	64.953	57.105	59.763	46.872	54.011	66.865	82.474	59.391	35.198
Canada	10.563	8.821	8.678	9.853	12.360	14.054	13.643	19.698	16.707	19.035	16.414
China	7.770	27.620	12.446	26.834	15.043	29.364	20.103	11.958	9.594	15.529	14.763
USA	3.548	3.476	2.944	5.253	8.825	6.324	9.044	6.885	6.073	6.488	13.607
Turkey	2.063	7.303	2.533	4.548	2.720	15.749	9.117	2.182	3.479	9.217	8.724
Serbia	2.310	2.064	2.622	2.978	3.311	3.331	3.613	3.501	4.633	6.834	7.262
Taiwan	5.429	5.395	4.902	11.857	9.555	13.128	9.890	6.367	8.697	8.460	6.182
Philippines	2.244	2.278	1.254	539	1.509	1.403	1.267	2.917	2.354	2.284	5.975
Other	53.181	62.303	49.774	91.149	38.903	43.478	41.387	31.575	31.834	26.839	21.392
Total	**310.898**	**349.133**	**349.167**	**332.968**	**299.657**	**247.455**	**233.278**	**261.653**	**268.424**	**274.800**	**260.204**

Source: EUMOFA elaboration of Eurostat-COMEXT data.

6.3.2 Fish oil

Over the past 12 years, more than 90% of the fish oil export volumes and between 80-95% of the values from EU were exported to nine countries.

In terms of volume, exports decreased by 2% from 2012 to 2022 and values increased by 34% reflecting the general increasing price level on fish oil. In 2022, fish oil exports from the EU amounted to 145.000 tonnes, a 11% decrease from 2021 and a 17% decrease compared to 2020. In terms of value, fish oil exports increased by 19% from 2021 and by 8% compared to 2020.

Exports to Norway, the main destination country the past years, increased by 8% in volume and 53% in value from 2012 to 2022 accounting for 62% of the volumes and 55% values in 2012 and 69% of the volumes and 63% of the values in 2022. From 2021 to 2022, export volumes to Norway decreased by 9% and values increased by 21% to 99.700 tonnes and 215 million EUR, respectively.

Between 70% and 90% of the yearly EU exports is sourced from Denmark.

Table 8: EU27 Fish Oil Export By Destination (volume in tonnes)

Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Norway	92.300	88.800	113.400	92.300	114.100	113.700	118.600	128.000	125.100	109.900	99.700
United Kingdom	33.100	26.100	25.200	24.000	28.400	28.900	18.400	20.600	20.900	30.100	25.300
Gibraltar	0	0	0	0	0	0	0	0	0	0	3.200
Iceland	2.800	2.300	300	0	0	300	500	300	1.800	4.000	4.000
Secr.Extra	0	600	0	1.700	0	0	0	0	0	0	1.900
Russia	400	400	800	1.000	1.000	900	1.000	1.100	1.000	1.300	1.000
USA	400	300	200	300	1.700	1.200	1.200	100	500	400	1.000
Turkey	0	800	300	0	100	200	800	1.000	2.100	700	1.600
Chile	0	0	0	0	0	0	900	800	3.500	200	1.400
Other	19.800	7.800	6.100	12.100	9.500	8.900	7.400	7.500	20.000	16.300	6.000
Total	**148.800**	**127.100**	**146.300**	**131.400**	**154.800**	**154.100**	**148.800**	**159.400**	**174.900**	**162.900**	**145.100**

Source: EUMOFA elaboration of Eurostat-COMEXT data. The totals may differ from the sums in columns due to rounding.

Table 9: EU27 Fish Oil Export By Trade Partner– 1.000 EUR (value in 1.000 EUR)

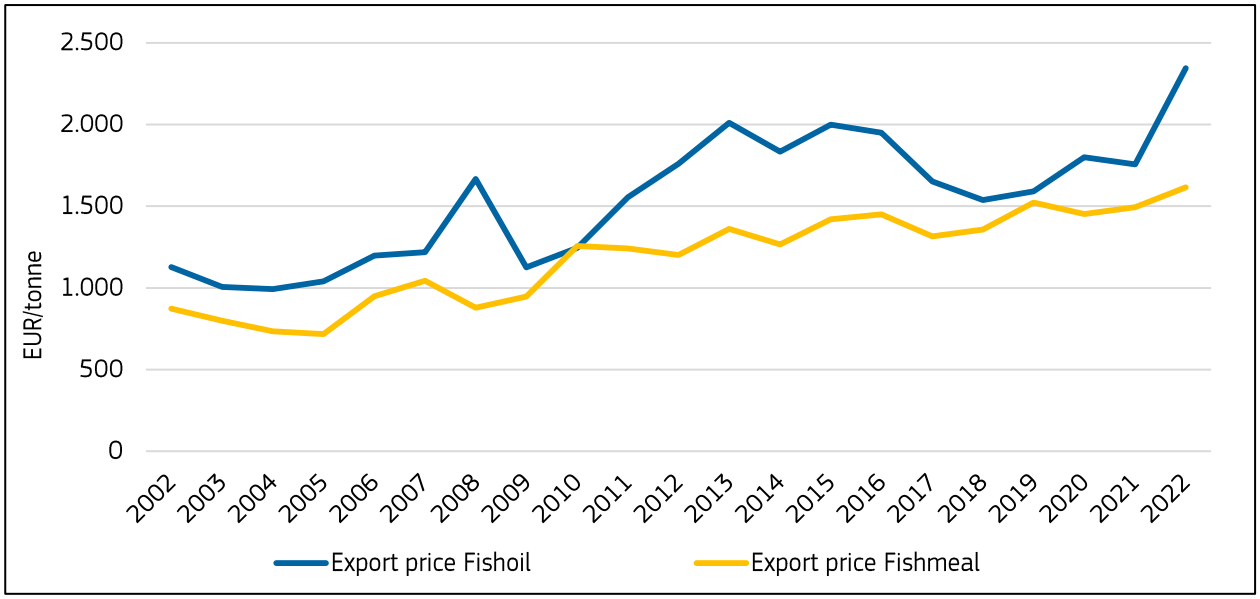
Supplier	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Norway	140.708	152.252	171.680	163.155	190.015	157.252	162.818	188.276	213.968	178.758	215.810
United Kingdom	51.468	48.838	47.370	52.707	57.454	47.552	32.247	35.479	38.142	49.142	65.908
Gibraltar	0	0	0	0	0	1	3	4	0	0	9.417
Iceland	4.215	3.869	1.497	18	75	714	798	586	3.745	8.715	9.252
Secr.Extra	0	2.496	0	6.016	147	0	7	12	0	0	7.088
Russia	1.064	1.721	1.646	3.108	3.703	3.340	3.922	4.594	4.890	4.834	4.844
USA	7.965	3.901	2.179	1.345	3.975	3.620	3.531	1.629	1.502	1.223	2.971
Turkey	63	1.453	462	271	366	670	1.333	1.556	2.587	1.188	2.627
Chile	17	26	35	33	28	23	1.199	501	4.336	142	2.142
Other	48.533	35.181	34.458	41.417	36.031	21.773	22.919	20.905	45.254	42.122	20.728
Total	**254.032**	**249.738**	**259.327**	**268.069**	**291.794**	**234.946**	**228.777**	**253.542**	**314.423**	**286.123**	**340.786**

Source: EUMOFA elaboration of Eurostat-COMEXT data.

6.3.3 Export prices of fishmeal and fish oil

The average yearly export prices of fishmeal and fish oil from the EU to non-EU countries showed a strong growth the past 15-20 years with some ups and downs in line with global price trends. Between 2002 and 2022, the yearly average fish oil price increased by 108% to 2.346 EUR/tonne and the average fishmeal price increased by 85% to 1.616 EUR/tonne.

Figure 166: EU Export Prices Of Fishmeal And Fish Oil



Source: EUMOFA elaboration of Eurostat-COMEXT data, Values are deflated by using the GDP deflator (base=2015).

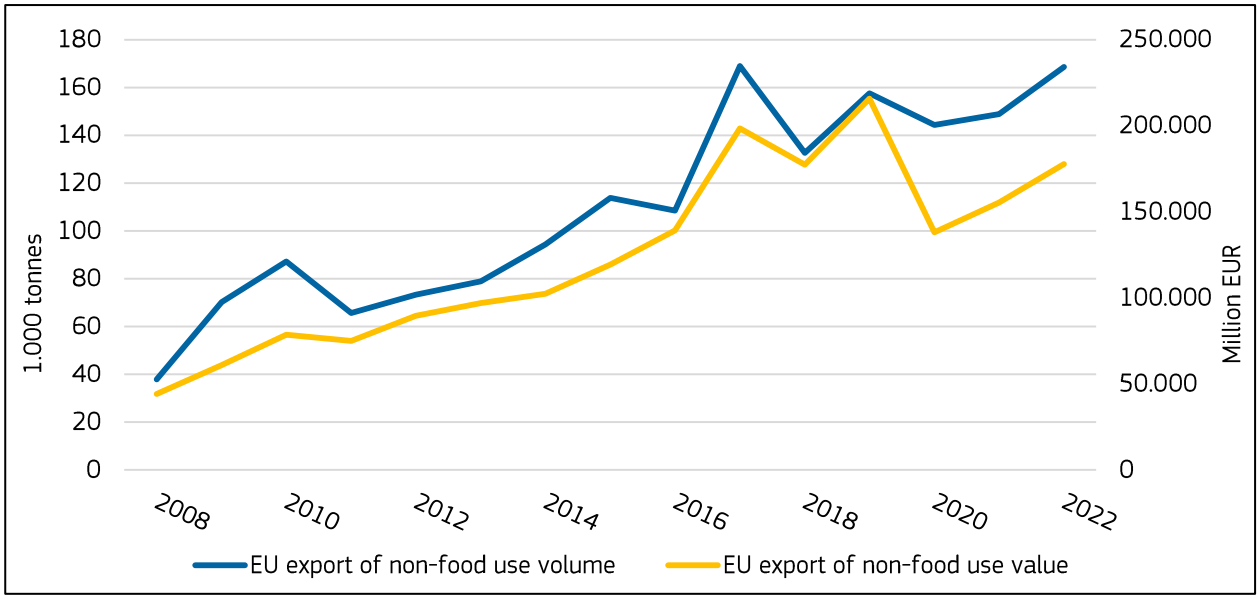
6.3.1 Other non-food use products

Exports of other non-food use products mainly comprise seaweeds and algae and products of fish or crustaceans, fish waste and marine mammal solubles. Total exports of other non-food use products accounted for 38% (183.000 tonnes) of the volumes and 25% (223 million EUR) of the values in the non-food use category in 2022. Of this, around 41% of the volumes was fish or marine mammals solubles, 29% seaweeds, 22% fish waste and 7% was products of crustaceans and molluscs.

The EU exports of other non-food use products varied between 40.000 tonnes (2008) at its lowest to 221.000 tonnes (2019) at its highest in the period from 2008-2022. During that period export values increased nearly 303% to EUR 178 million.

In terms of volume, fish or marine mammal solubles, fish waste, seaweed and algae and different products of crustaceans and molluscs constituted between 98%-100%.

Figure 17: EU27 EXPORTS OF OTHER NON-FOOD USE PRODUCTS



Source: EUMOFA elaboration of Eurostat-COMEXT data. Values are deflated by using the GDP deflator (base=2015).

6.4 Growth, trends, and outlook

The production of fishmeal and fish oil is projected to grow moderately the coming years due to better utilization of by-products from the fish processing industry, and development of other raw material sources like krill, algae, and insects. The growing aquaculture industry will be a main driver behind this. According to OECD, the contribution of aquaculture to global fish production (i.e. excluding algae and seeweed) will continue to grow and surpass that of total fisheries by 2024. By 2029, aquaculture production is projected to reach 105 million tonnes, 10 million tonnes more than the capture sector[21]. Many factors can influence the evolution and dynamics of world fishmeal and fish oil production, consumption, and markets. These include external factors like climate and environmental conditions, fisheries management, trade policies etc.

During the past one and a half year, the fish oil market has tightened strongly due to an imbalance in the supply/demand dynamics. The fish oil production as well as the fishmeal is vulnerable for fluctuations in the landings of forage fish like anchovy and other species. This increases the focus on better utilization of by-products and increases the focus on other raw material sources.

[21] https://www.oecd-ilibrary.org/sites/4dd9b3d0-en/index.html?itemId=/content/component/4dd9b3d0-en#section-d1e19686

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