



FISHMEAL AND FISH OIL



PRODUCTION AND TRADE FLOWS IN THE 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 (EU). Landings destined for non-food use vary depending on the level of quotas and catches. Regardless of variations in catches, the EU is not self-sufficient fishmeal and fish oil production. 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 the catch and production trends.

The study focuses on fishmeal and fish oil 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 the 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 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 400.000 tonnes to above 600.000 tonnes fishmeal and from 120.000 tonnes to 200.000 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, sandeel, 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 depending on quotas.

The price level of European fishmeal and fish oil follows to large degree the global prices, which depend highly on the production in South America (Peru). Over the past 12 years, European fish oil prices on average have increased by 85% and fishmeal prices on average have increased by 37%.

The EU consumption of fishmeal decreased by around 40% from 2009 to 2020, to around 450.000 tonnes.

The imports of fishmeal from non-EU27 suppliers decreased by 54% from 2009 to 2020. The difference between imports and exports is shrinking but the EU is still a net importer of fishmeal. Imports from Peru decreased by nearly 90% in the period, to reach more than 42.000 tonnes in 2020; and the import share of imports from Peru on total EU27 imports decreased from 64% to 18%. EU27 exports of fishmeal decreased by 36% in the same period which compensates for the decrease in imports (Peru).

EU27's imports of fish oil decreased by 19% to 217.000 tonnes from 2009 to 2020 and exports increased by 15% to 174.000 tonnes. In 2020, around 72% 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 and krill. After the cooking and drying process, the fish is turned into a coarse brown flour: fishmeal. Fishmeal is an excellent protein source mainly used as feed for aquaculture species and livestock.

Fish oil is produced whenever fatty fish is processed into meal. 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 utilised for this purpose. Where a catch is solely destined for the fishmeal industry, it is referred to as an "industrial fishery".

100 kg of raw material produce around 21 kg of fishmeal and between 3 and 6 kg of fish oil.

The countries with major industrial fisheries are Peru, Iceland, Denmark, Chile, Norway and South Africa.

2.2 Global landings destined for non-food use

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, the 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 aquaculture¹.

The species used for feed, especially sandeel, sprat, Norway pout and South American anchoveta, have relatively short lifecycles, so population numbers can rise and fall substantially depending on fishing pressure and other environmental variables. Anchoveta stocks, for instance, are well known to be influenced by the periodic El Niño climatic events; similarly, the stocks of most feed fish species are believed to be affected by climate change².

From 2000 to 2018, there was a 25% 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 management³.

¹ Fishmeal and fish oil facts and figures, Seafish, March 2018:

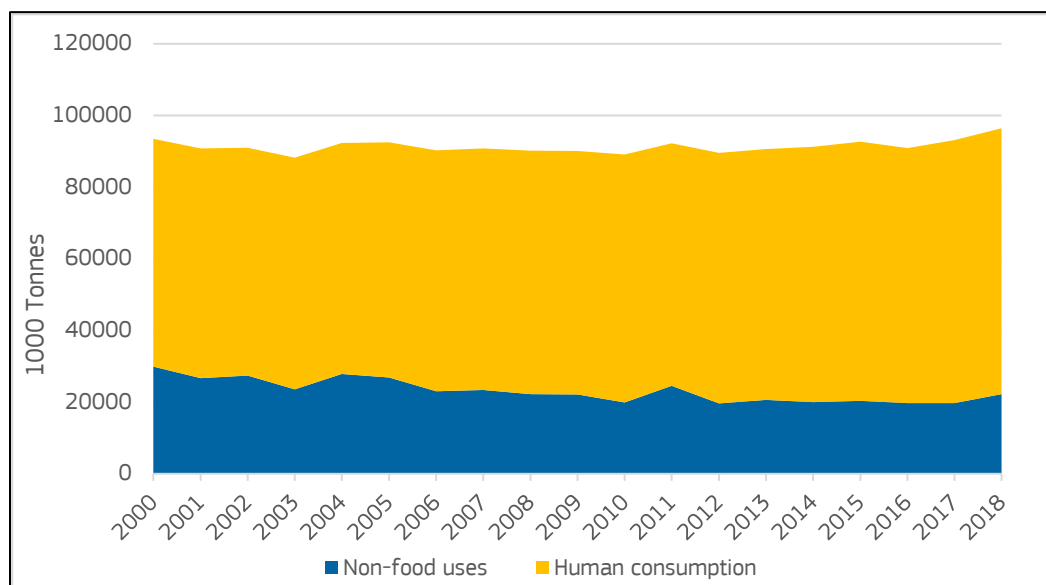
https://www.seafish.org/media/Publications/Seafish_FishmealandFish_oil_FactsandFigures2018.pdf

² U.S. Department of Commerce – National Oceanic and Atmospheric Administration:

<https://www.pfeg.noaa.gov/research/climate/marine/cmffish/cmffishery4.html>

³ FAO: fao.org

Figure 1: GLOBAL LANDINGS BY DESTINATION USE



Source: FAO

2.3 Global production of fishmeal and fish oil

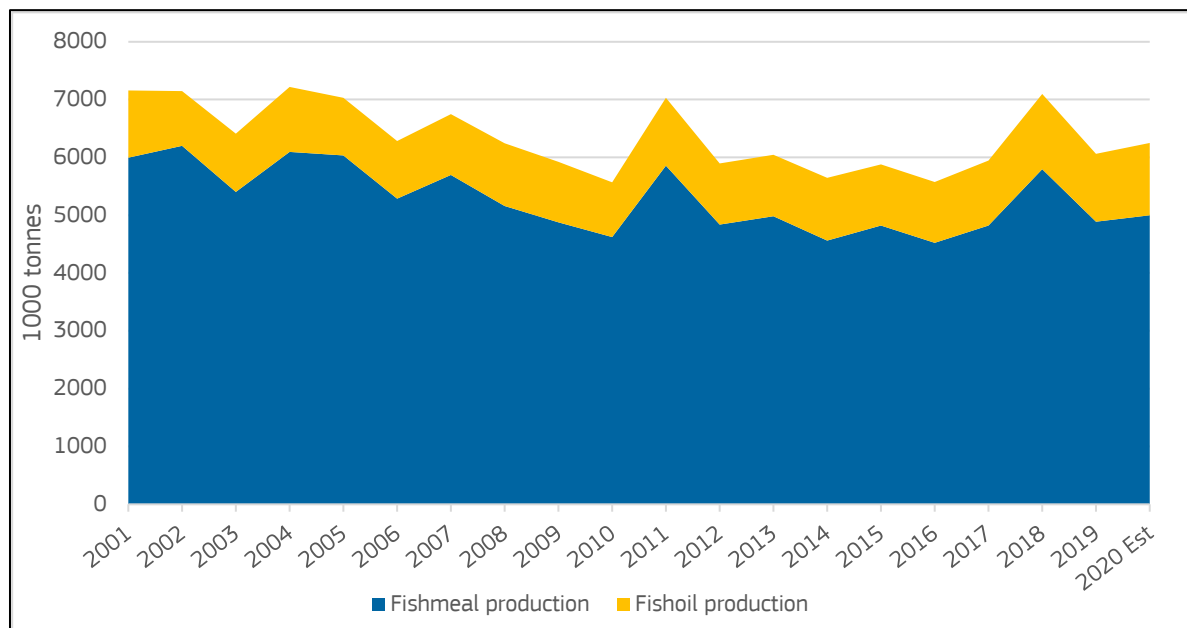
The share of world fisheries destined for the production of fishmeal and fish oil has decreased over the past 20 years. From 2001 to 2010, the average yearly fishmeal production was above 5,5 million tonnes, while from 2011 to 2020 it was around 5 million tonnes. The production of fish oil amounts to between 0,8 and 1,3 million tonnes a year.

The variations from one year to another are affected to a great extent 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 Niño⁴ 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 2019 and 2020 is estimated to be much lower, with 4,9 and 5 million tonnes of fishmeal respectively, and 1,17 and 1,25 million tonnes of fish oil. The decrease is again mainly caused by lower catches in Peru.

⁴ U.S. Department of Commerce – National Oceanic and Atmospheric Administration:
<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 2019, the nine largest producers accounted for 61% of total fishmeal production and 70% of fish oil production. The 25 largest accounted for 90% of fishmeal production and 93% of fish oil production⁵.

The world's largest producer is Peru, contributing on average to around 20% of global fishmeal production and between 15% and 20% of global fish oil production since 2010. In 2019, Peru and Chile together accounted for 24% of global fishmeal production and 22% of global fish oil production. Since domestic consumption is quite low in Peru, 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.

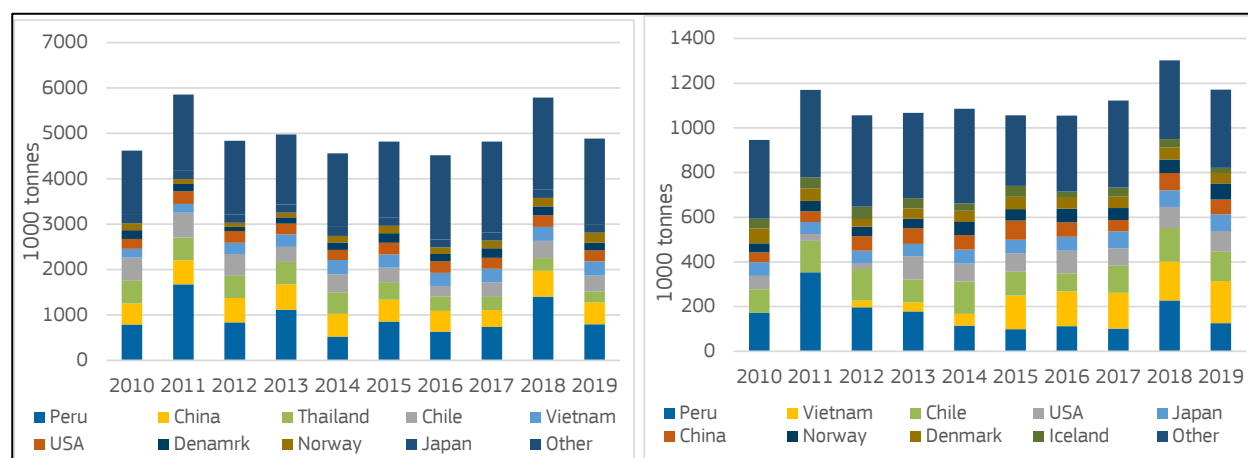
In Asia, China, Thailand, and Vietnam are ranked as the three largest fishmeal producers, producing 1,03 million tonnes in 2019, of which the majority was consumed within the Asian markets.

In 2019, US fishmeal and fish oil production amounted to 240.000 tonnes and 90.000 tonnes, respectively. Catches of menhaden species form the basis to produce both.

In Europe, Norway and Denmark together produced 390.000 tonnes of fishmeal and 120.000 tonnes of fish oil in 2019. 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.iffco.com/members-area/annual-yearbook-2019>

Figure 3: WORLD FISHMEAL AND FISH OIL PRODUCTION BY PRODUCING COUNTRIES
(fishmeal, left; fish oil, right)



Source: IFFO

2.4 Peruvian prices

The evolution global fishmeal and fish oil prices is, to a large extent, linked to the Peruvian prices. Peru is the largest source of fishmeal and fish oil output today, and the 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 a 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 January 2021, the average FOB⁶ export price in real terms⁷ of Peruvian fishmeal increased by 55% to 1.078 EUR/tonne and fish oil price increased by 115% to 1.406 EUR/tonne.

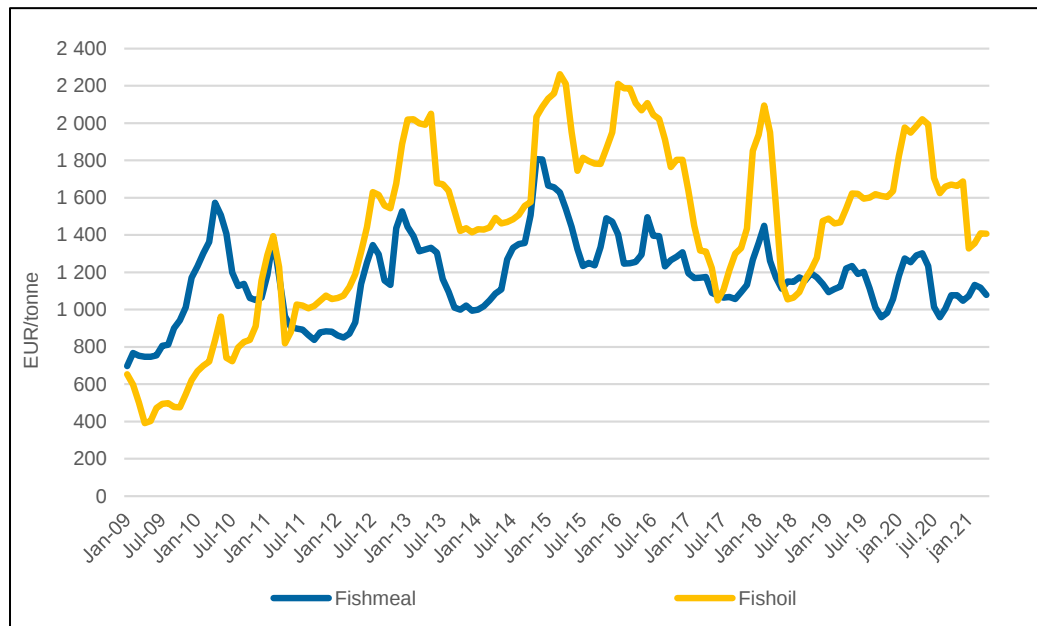
Between 2009 and 2020, China became an increasingly important destination market for Peruvian fishmeal, accounting for 77% of total Peruvian exports in 2020. By comparison, in 2009, fishmeal exports to China accounted for less than half of total Peruvian fishmeal exports. Exports to the EU showed an opposite trend, as 26% of Peruvian fishmeal went to the EU in 2009 and only 5% in 2020⁸.

⁶ Free On Board

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

⁸ Superintendencia Nacional de Aduanas y de Administración Tributaria:
<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 during the past 10 years. Most 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 an ever-increasing demand for fishmeal and fish oil from the aquaculture industry, and in particular from the farming of marine species, the composition of feed has changed considerably over the last decades. While it used to be made up mostly of marine ingredients, it now includes a substantial part of plant ingredients⁹.

There are several challenges for the 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 has not showed dramatic changes over the past 10 years, though in the last few years an increasing share has been used by aquaculture. In 2009, the share of fishmeal used in the aquaculture sector was 63%. The share remained stable at around 70% from 2010 till 2017-2019, when it grew to 78%. In 2019, around 25% of the fishmeal going into aquaculture was used to feed crustaceans, 15% to feed salmon and trout, 17% 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 2019, 34% of fishmeal was used in China and 35% in other Asiatic countries. 9% of fishmeal was used in Europe, 11% in Latin-America and 7% in the Middle East.

The pig industry is the second largest consumer of fishmeal, accounting for 14% of total consumption in 2019; a decrease from 25% from 2009. Fishmeal in poultry feed accounted for 5% of total consumption in 2019, in line with the previous years¹⁰.

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 for the coming years, the overall amount of fishmeal that goes to 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 inputs¹¹.

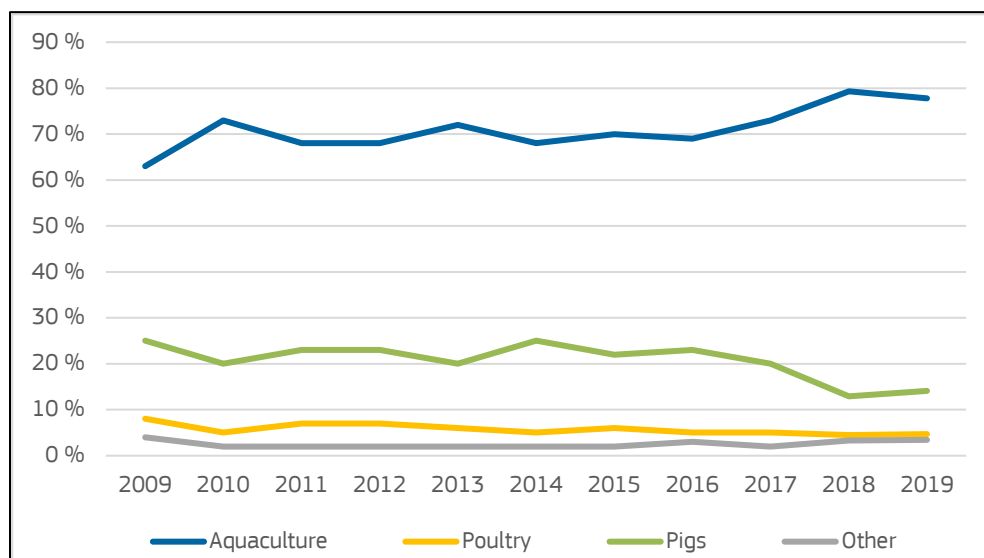
Aquaculture production is growing and is expected to grow further in the coming years. Fishmeal and fish oil production remains stable or is slightly increasing as the utilisation of by-products increases and new investments are made in developing other raw material sources (algae, krill, insects etc.).

⁹ NOFIMA: <http://www.nofima.com>

¹⁰ IFFO: <http://www.iffonet/>

¹¹ FAO: <http://www.fao.org/3/i3640e/i3640e.pdf>

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 years¹².

Though aquaculture production of salmonids is growing, decreased feed formulas with lower shares of fish oil have caused a decline in the global use of fish oil in aquaculture. In 2009, 81% of global use was as feed for aquaculture species, which constituted nearly 830.000 tonnes of fish oil consumption. In 2019, 68% of global use was for aquaculture, i.e. around 610.000 tonnes of fish oil consumption that year.

In 2019, nearly 71% of fish oil consumption in aquaculture was used to feed salmon and trout, 17% was used in the feed of marine fish, 3% in the feed for cyprinids, 1% in the feed for tilapias and the rest for other species.

In 2019, 41% of the fish oil used in aquaculture was consumed in Europe, 20% in Latin America, 11% in China, 12% in the Middle East and 8% in Asia, and the rest in other areas.

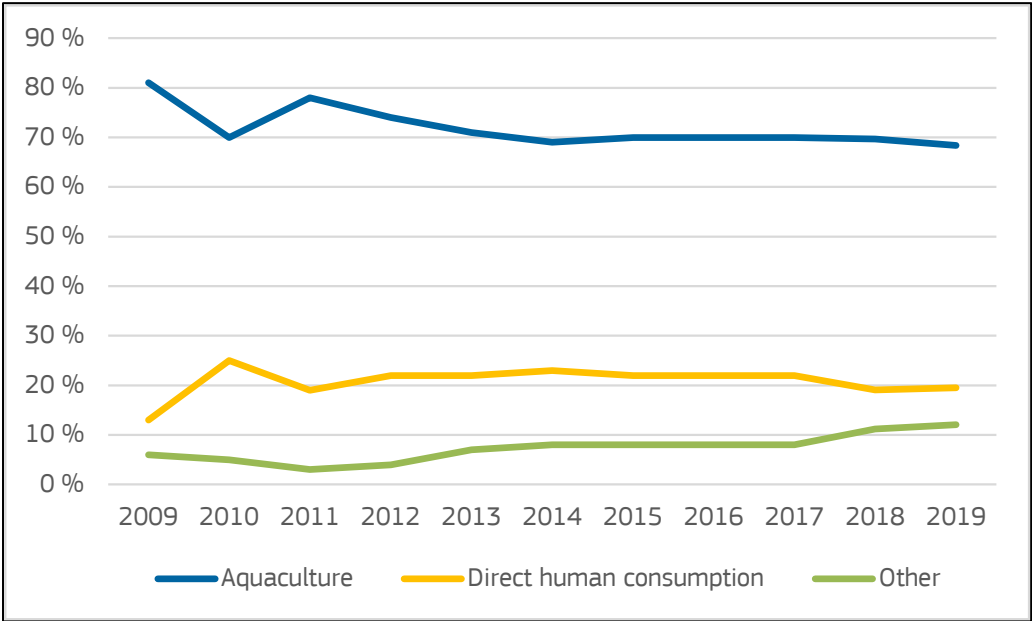
Farmed fish, and particularly marine fish, need to be provided the beneficial omega-3 fatty acids (EPA and DHA) through their feed¹³. This will secure a final product comparable with and as healthy as their wild counterparts. Fish oil is currently the only economically viable source of these essential fats for feed purposes¹⁴. 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 aquaculture producers as well as for the human consumption sector.

¹² IFFO: <https://www.iffonet/system/files/LipidTechpaper-finalpdf.pdf>

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

¹⁴ FAO: <http://www.fao.org/in-action/globefish/fishery-information/resource-detail/en/c/338773/>

Figure 6: WORLD FISH OIL USE BY SECTOR



Source: IFFO

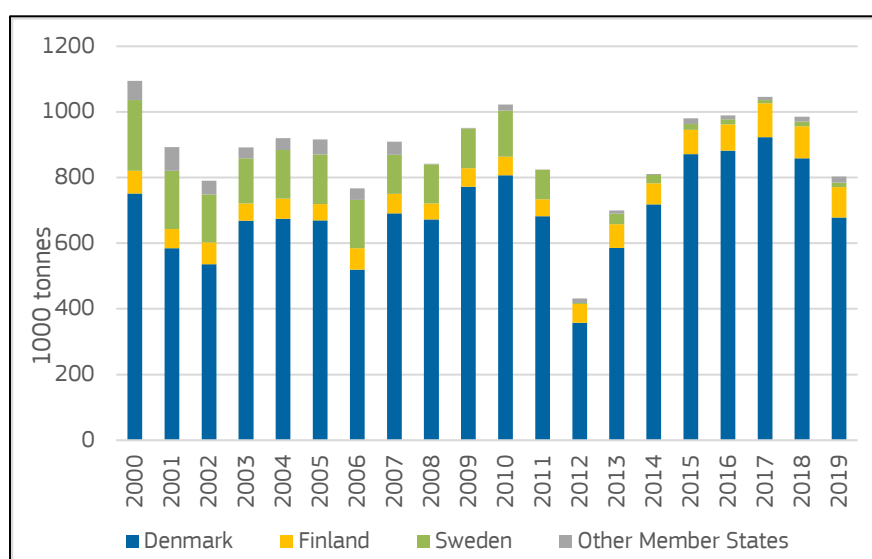
4 EU LANDINGS FOR NON-FOOD USE

In the period from 2000 to 2019, EU landings destined for non-food use varied between 433.000 tonnes at its lowest (2012) to nearly 1,1 million tonnes at its highest (2000).

Denmark is the largest of the EU industrial fishing nations, accounting for 84% of total EU landings in 2019. The country has a large part of the EU quotas for principal pelagic species such as sandeel, 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 43% of the values produced in 2019.

Other important EU countries catching feed fish are Sweden and Finland. In 2019, Finland was the second largest, accounting for 12% of total catch.

Figure 7: EU LANDINGS FOR NON-FOOD USE BY MEMBER STATE



Sources: Eurostat, fiskeridir.dk

The major fish species landed for industrial use in the EU are sandeel, blue whiting, sprat and herring, of which sandeel and sprat historically were the two main species. Blue whiting has become increasingly important over the past 5 years, accounting for 20% of total landings in 2019. Herring is mainly destined for human consumption, but due to the large volumes caught and the subsequent low prices, a part of catches is used in the production of fishmeal and fish oil. Due to significant variations in the quotas for the different species utilised 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 sandeel (+900%), due to a quota increase of the same proportion. In 2018 and 2019, sandeel landings more than halved compared to 2017.

From 2018-2019, total EU landings of all species for industrial use decreased by 18% to 803.000 tonnes. The decrease was mainly due to decreased landings of sandeel and blue whiting.

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 Skagerrak¹⁵.

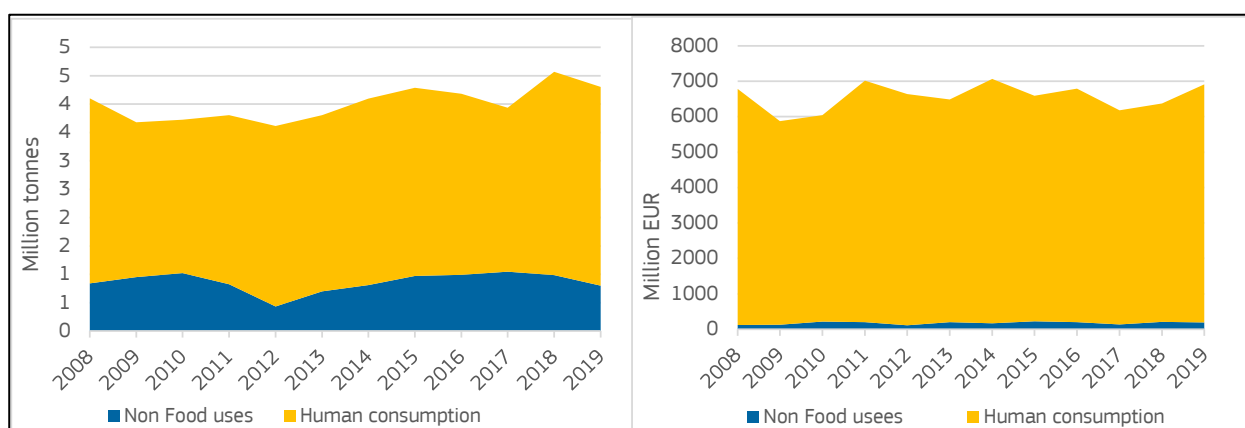
¹⁵ Working paper of the European Parliament: [https://www.europarl.europa.eu/RegData/etudes/etudes/join/2003/341942/IPOL-PECH_ET\(2003\)341942_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/etudes/join/2003/341942/IPOL-PECH_ET(2003)341942_EN.pdf)

Table 1: EU LANDINGS FOR NON-FOOD USE BY SPECIES (1.000 TONNES)

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sandeel	282	324	347	356	59	254	204	227	40	411	206	124
European sprat	320	415	380	292	182	185	253	391	330	258	296	255
Blue whiting	70	4	4	1	3	70	174	185	155	191	250	165
Herring	130	133	126	105	75	117	116	131	149	154	197	166
Norway Pout	33	29	73	5	27	39	32	27	32	21	16	48
Boarfish	6	44	103	18	43	26	15	<0,5	<0,5	0	0	0
Capelin	0	0	0	44	31	8	10	3	0	0	4	0
Other	1	2	2	4	12	6	8	15	16	11	12	45
Total	842	951	1 036	825	433	704	812	979	722	1.046	981	803

Source: Eurostat, <https://fiskeristatistik.fiskeristyrelsen.dk/stat/industri/ugetabel18.html> The totals may differ from the sums in columns due to rounding

In 2019, fishery landings in the EU were 4,3 million tonnes, of which 19% was destined for fishmeal and fish oil production. Economically, fish for industrial use is a relatively small sector compared to other fisheries. In 2019, the value of fish for industrial use constituted 3% of total EU landings.

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

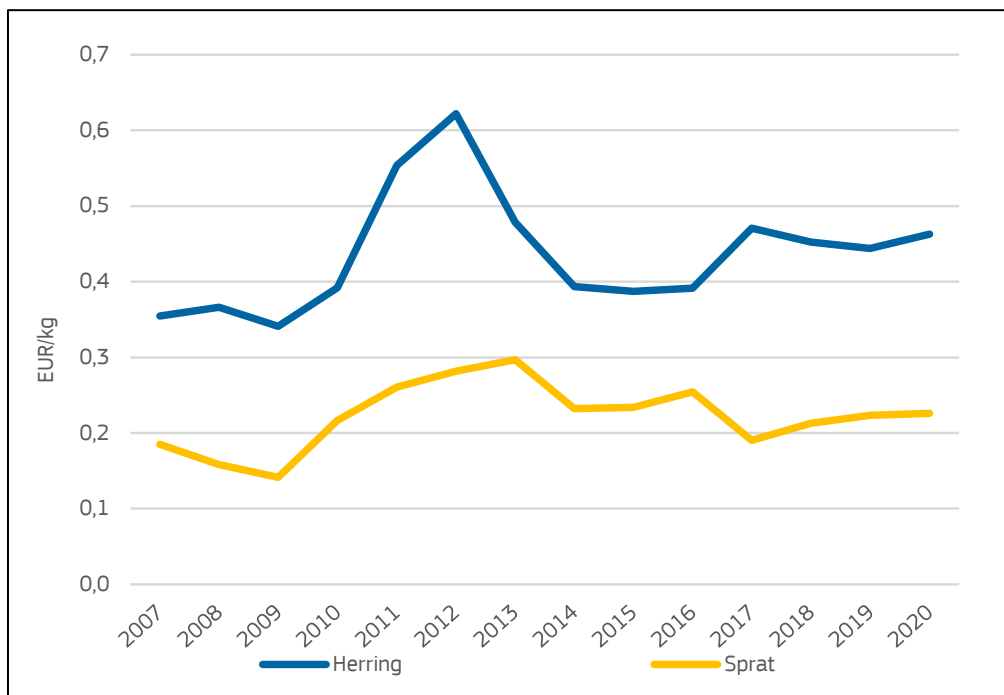
Sources: Eurostat, Fiskeristyrelsen

4.1 First-sale prices

In 2019, EU landings of European sprat for non-food use amounted to 255.000 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 fishmeal and fish oil producers in Denmark, who need significant volumes of fresh fish. The yearly first sale price of sprat varied between 0,19 EUR/kg and 0,28 EUR/kg from 2007 to 2020, and herring prices varied between 0,38 EUR/kg to 0,73 EUR/kg. The price fluctuations of the raw material for the reduction industry is closely linked to volumes landed in Denmark and to the price level of fishmeal and fish oil.

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 Fiskeristyrelsen: <https://dwp.fiskeristyrelsen.dk/landingsrapport/rapport/main.html>

Figure 9: FIRST SALE PRICE OF HERRING AND SPRAT IN EU (excluding UK)

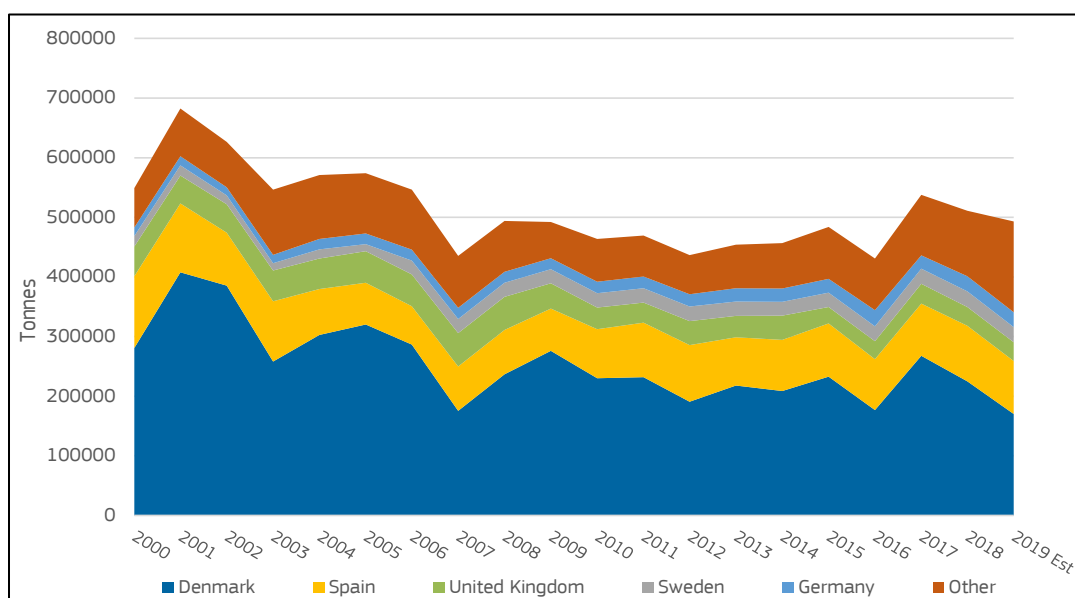
Source: EUMOFA. Values are deflated by using the GDP deflator (base=2015). The countries covered by the first sale data are: Denmark, Belgium, Estonia, France, Latvia, Lithuania, Netherlands, Poland, and Sweden

5 EU PRODUCTION OF FISHMEAL AND FISH OIL

In the 2000-2010 period, the annual average fishmeal production in the EU was above 540.000 tonnes, while it was around 474.000 tonnes in the period from 2010 to 2019. The declining trend is connected to increased use of small pelagic species (herring, mackerel) for human consumption, and to a general decrease in fishing for feed production¹⁸.

Denmark is the largest producing EU Member State, accounting for around 50% of total EU fishmeal output. The production in Denmark is mainly based on landings of small pelagic species, such as blue whiting, sandeel, Norway pout and sprat. Spain is the second largest producer, with 15-18% of total production. Fishmeal and fish oil in Spain are produced from waste/trimmings from the processing industry. Due to decreasing landings in Denmark (sandeel etc.), the Danish fishmeal production decreased 39% from 2000-2019

Figure 10: EU PRODUCTION OF FISHMEAL



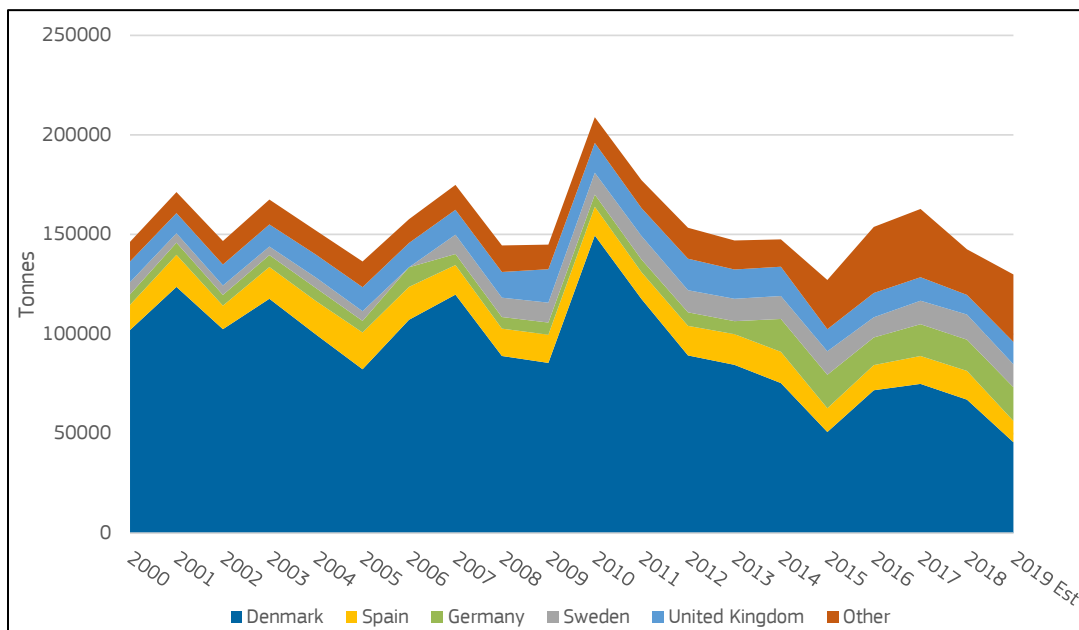
Sources: FAO, IFFO

Fish oil production has fluctuated from a minimum of 127.000 tonnes (2015) to a maximum of 209.000 tonnes (2010) from 2000 to 2019. The average yearly production in the same period was 155.000 tonnes. In 2019, fish oil production is estimated at 130.000 tonnes, a 9%-decrease from 2018.

Denmark is the largest producer accounting for 35% of total EU production in 2019. Mainly due to decreased landings of sandeels and other species used for the purpose, the Danish fish oil production decreased 55% from 2000-2019.

¹⁸ Seafish: https://www.seafish.org/media/Publications/Seafish_FishmealandFish_oil_FactsandFigures2018.pdf

Figure 11: EU PRODUCTION OF FISH OIL



Sources: FAO, IFFO

5.1 European fishmeal and fish oil prices

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

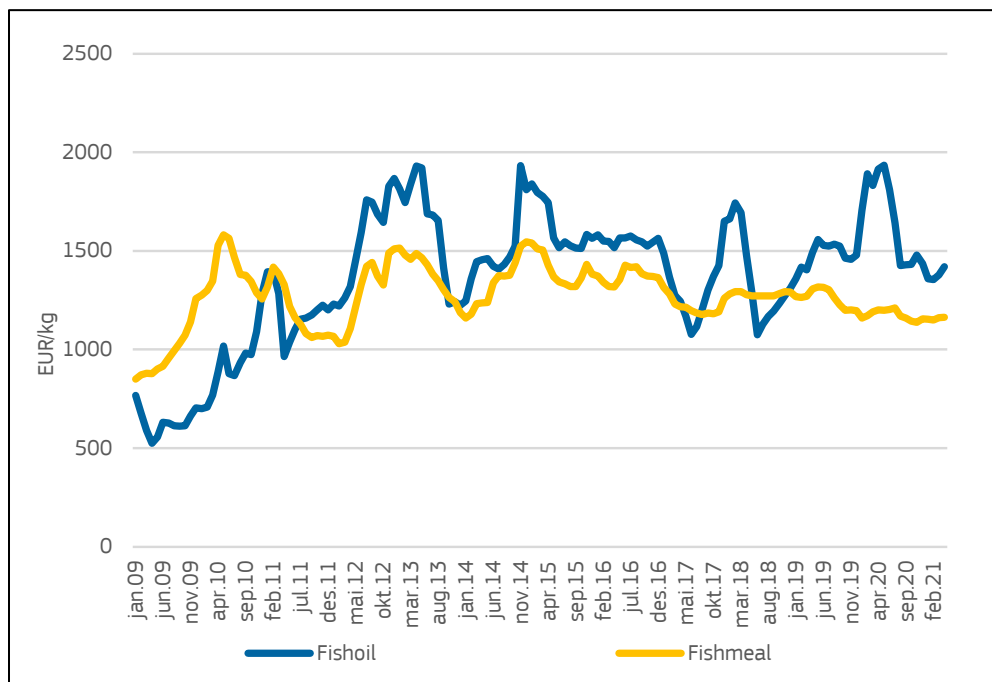
From January 2009 to January 2021, European fishmeal prices increased 37% to 1.164 EUR/tonne. During that period, the price level fluctuated in line with global price trends. A general higher price increase was seen for fish oil which increased 85% to 1.419 EUR/tonne in that period.

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, or those species that receive high market prices (e.g., salmon and shrimp)¹⁹.

During 2020, Peruvian fishmeal and fish oil production increased from the year before and reached more than 1 million tonnes of fishmeal and around 165.000 tonnes of fish oil. The increased supply from Peru contributed to balance the global fishmeal and fish oil market and helped stabilise prices. Fishmeal prices in Europe were on an upward trend throughout the second half of 2020, and remained stable throughout the rest of the year and during the first months of 2021. Fish oil prices fluctuated from 1.993 EUR/tonne in June 2020 to 1.355 EUR/tonne in February 2021.

¹⁹ Seafood Source: <https://www.seafoodsource.com/news/aquaculture/iffo-head-aquaculture-growth-portends-bright-profitable-future-for-marine-ingredients-industry>

Figure 12: FISHMEAL AND FISH OIL PRICES IN EUROPE



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

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 plummeted in the last 20 years. In particular, the Danish sector has seen a reduction from 20 plants to 3, situated in Esbjerg, Skagen and Hanstholm, respectively.

6 IMPORT – EXPORT

6.1 EU trade balance

6.1.1 Fishmeal

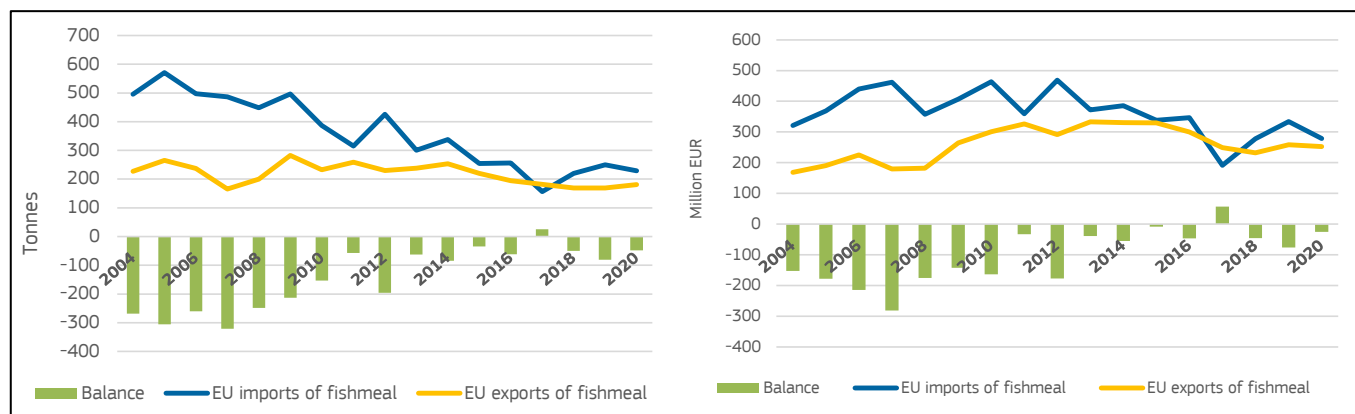
The EU can maintain a high level of fishmeal and fish oil consumption by sourcing it from other countries in addition to their own production, although the trade deficit (export *minus* import) has decreased over time. From 2004 to 2020, EU imports of fishmeal decreased by 54% in volume and 13% in value to 229.000 tonnes and EUR 278 million, respectively. From its lowest level in 2017, imports increased in 2018 and 2019, but they decreased again in 2020.

From 2004 to 2020, export volumes decreased by 21% and values increased by 50% to 180.000 tonnes and EUR 253 million, respectively.

In 2020, the trade deficit was -48.500 tonnes and EUR -26 million.

EU fishmeal consumption decreased by 50% from 2004 to 2020 to around 450.000 tonnes²⁰.

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).

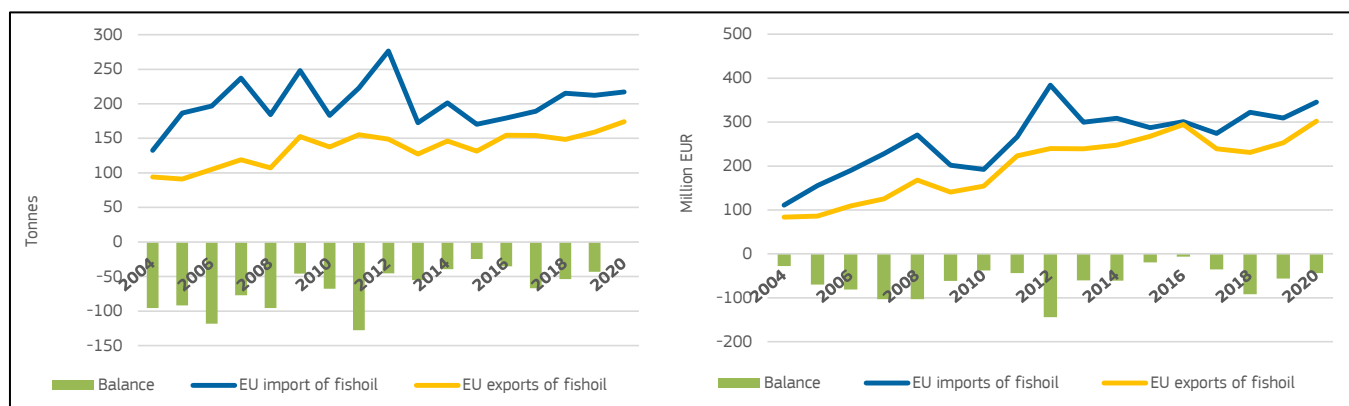
²⁰ US Department of Agriculture: <https://www.usda.gov/>

6.1.2 Fish oil

In the 2004-2020 period, EU imports of fish oil increased by 64% in volume and 292% in value to 217.000 tonnes and EUR 346 million. Export volumes increased by 254% and values increased by 352% to 174.000 tonnes and EUR 369 million in the same period.

The trade deficit was on its highest in 2012 amounting to nearly -127.000 tonnes and EUR -137 million. In 2020, the trade deficit was -43.000 tonnes and EUR -46 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

During the past 12 years, more than 90% of the fishmeal import (both in terms of volume and value) to the EU was sourced from 9 countries. In terms of volume, imports decreased by 54% from 2009 to 2020, while value decreased by 32%. In 2020, fishmeal imported by the EU amounted to 229.000 tonnes, an 8%-decrease from 2019 and a 4%-decrease from 2018. In terms of value, fishmeal imports in 2020 decreased by 17% compared with 2019, and by less than 1% compared with 2018.

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

Peru was the main supplier 12 years ago accounting for 64% of the fishmeal volumes and 62% of the values in 2009. By 2020, Peruvian supply to the EU was reduced by 87% in terms of volume and 80% in terms of value, accounting for 18% of the EU import volume and 18% of the value.

Imports from Norway decreased by 3% in volume but increased by 49% in value from 2009 to 2020. At the same time, Norway increased its volume share from 6% in 2009 to 13% in 2020 and its value from 8% to 17%.

Imports from Morocco increased by 208% in volume and 313% in value from 2009 to 2020, and Morocco increased its volume share from 3% in 2009 to 20% in 2020 and its value share from 3% to 18%. Other African suppliers like South Africa and Mauretania has also increased their supply and market shares strongly in the period.

Around 24% of fish oil imported in the EU is absorbed by Germany, where 75.000 tonnes were sold in 2019. Denmark and Spain are second and third covering 22% and 13% respectively.

Table 2: EU27 FISHMEAL IMPORTS BY TRADE SUPPLIER - tonnes

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supplier	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume
Morocco	15.133	50.153	29.645	32.129	25.064	29.474	35.133	50.596	28.185	27.988	39.522	46.601
Peru	319.918	215.258	174.279	207.432	100.461	139.940	43.140	62.264	18.627	27.904	40.465	42.359
Norway	30.326	26.677	25.110	37.870	39.954	37.874	54.585	30.379	15.241	22.723	28.067	29.264
South Africa	0	0	1.463	12.284	3.342	9.691	10.320	20.536	10.419	15.860	24.356	26.776
Chile	85.337	57.654	53.542	64.872	34.634	44.783	17.754	18.427	20.175	19.431	26.753	26.313
UK	4.957	3.432	2.675	2.331	1.854	3.067	2.006	2.557	9.622	9.927	9.038	13.794
USA	9.907	344	2	0	0	3.453	7.312	8.677	459	19.378	22.085	9.858
Faroe Islands	2.634	10.860	1.564	7.167	11.988	10.454	13.984	8.676	7.111	21.237	9.036	9.667
Mauritania	0	421	2.977	11.341	23.334	39.369	17.183	29.492	10.308	21.230	22.293	8.021
Other	28.167	21.630	24.016	50.250	59.832	19.307	53.068	24.434	36.403	34.048	28.441	16.593
Total	496.378	386.429	315.271	425.676	300.463	337.411	254.487	256.036	156.549	219.726	250.056	229.246

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 –1000 EUR

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supplier	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
Peru	251.313	246.291	192.745	237.247	126.171	172.067	56.997	85.674	23.982	34.511	55.082	49.547
Morocco	11.850	54.979	30.488	30.784	27.521	30.552	46.318	62.479	29.885	30.302	44.661	48.926
Norway	30.980	38.463	32.143	30.476	35.421	27.154	59.906	40.187	22.631	35.797	46.538	46.173
Chile	73.050	75.885	63.074	77.391	46.607	55.783	27.784	27.445	26.074	26.703	36.678	32.502
South Africa	0	0	1.292	14.221	4.351	12.287	13.214	27.363	11.996	19.687	29.450	29.848
UK	4.954	3.487	2.371	2.945	2.877	4.721	4.115	4.489	6.699	6.438	11.166	15.866
Faroe Islands	2.228	14.466	1.908	8.150	15.823	13.388	19.397	12.709	8.907	29.498	14.158	12.680
USA	7.432	420	18	4	0	3.824	8.493	10.951	831	22.627	26.708	11.752
Mauritania	0	413	2.922	13.028	26.873	39.167	21.816	37.468	12.861	25.829	26.733	8.499
Other	24.755	29.621	32.551	54.697	86.493	26.617	80.337	37.663	47.825	46.634	42.868	22.626
Total	406.561	464.025	359.514	468.943	372.138	385.561	338.376	346.429	191.692	278.026	334.041	278.421

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

6.2.2 Fish oil

During the past 12 years, 80-95% of the fish oil import volumes and values to the EU was sourced from 9 countries. In terms of volume, imports decreased 12% from 2009 to 2020 while values increased 71%, reflecting the general increase in fish oil price. In 2020, fish oil imported in the EU amounted to 217.000 tonnes, which was slightly higher than the volume in 2018 and 2019. In terms of value, fish oil imports increased by 7% from 2018 and 12% from 2019.

Norway, Morocco, and the USA are the top three suppliers accounting for 33% of total import volumes and 24% of the values in 2020.

Peru, the main supplier 12 years ago, accounted for 47% fish oil volume and 34% of value in 2009. Since then, import volume decreased by 86%, although value increased by 52%. By 2020, Peru accounted for 8% of EU import volume and 9% of value.

In the 2009 – 2020 period, imports from Norway increased by 84% in volume and 119% in value to 72.000 tonnes and EUR 83 million, and Norway increased its volume share from 16% to 33% and its value share from 19% to 24% in 2020.

Imports from the USA increased by 14% in volume and 123% in value to 18.400 tonnes and EUR 29 million. The share of USA imports decreased from 9% to 8% in volume, whereas it increased from 6% to 8% in value.

Imports from Morocco increased by 34% in volume and 262% in value to 22.832 tonnes and EUR 38 million and Morocco increased its volume share from 7% to 11% and increased its value share from 5% to 11%.

Almost 50% of fish oil imported in the EU is absorbed by Denmark, where 107.544 tonnes were sold in 2019. 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. Belgium and France follow, covering 9% each.

Table 4: EU27 FISH OIL IMPORTS BY SUPPLIER –tonnes

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supplier	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume
Norway	39.474	37.257	53.563	53.506	44.737	40.443	53.125	56.321	54.062	47.873	53.756	72.466
Morocco	17.025	30.815	13.041	28.252	13.125	21.482	17.546	10.816	8.482	7.283	11.564	22.832
USA	21.391	17.620	36.095	11.968	22.434	26.196	13.225	39.887	25.189	24.980	14.775	18.407
Peru	116.804	71.105	77.508	118.378	38.175	56.821	45.819	20.139	31.732	58.252	37.106	16.532
Chile	10.100	4.843	5.361	4.836	2.797	19.528	7.932	5.256	2.225	5.868	27.671	14.500
United Kingdom	17.816	8.105	18.623	30.303	5.295	6.746	5.843	6.698	9.205	10.299	14.041	12.086
Iceland	5.734	4.269	5.435	4.666	10.543	3.688	4.420	7.718	9.215	3.753	2.332	11.394
Mexico	343	0	40	1.972	1.837	0	0	0	9.486	8.002	6.244	10.881
Mauritania	0	0	933	4.459	13.766	15.401	10.434	12.696	15.160	17.128	9.833	8.580
Other	19.486	9.228	12.350	18.015	19.931	11.020	12.215	19.724	24.448	31.888	35.082	29.488
Total	248.173	183.241	222.947	276.355	172.640	201.325	170.558	179.255	189.204	215.326	212.403	217.166

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 –1.000 EUR

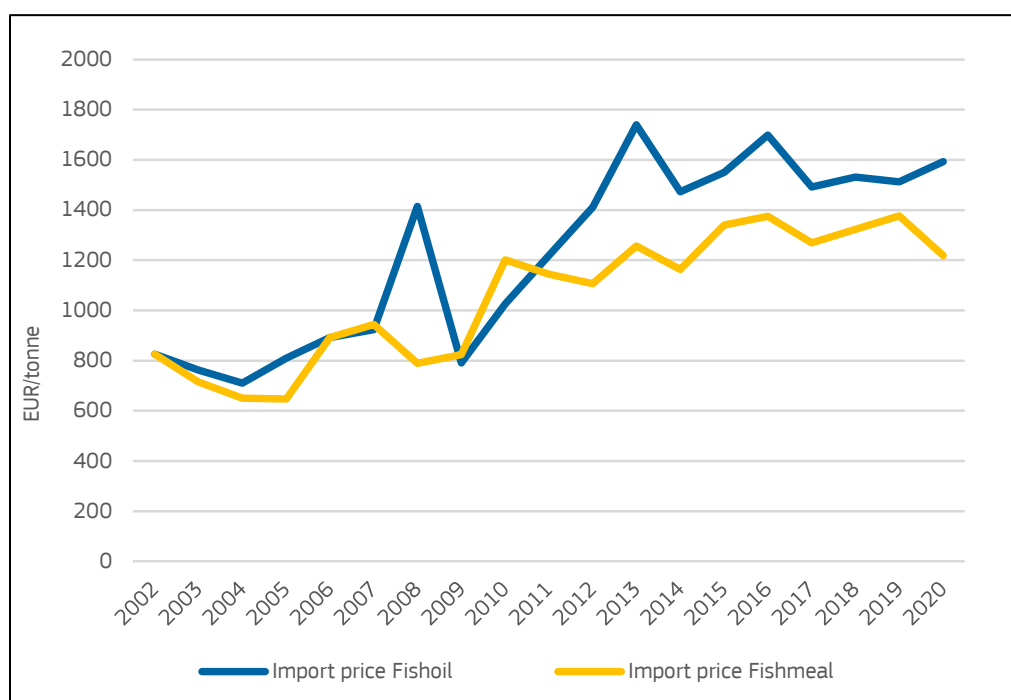
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Supplier	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
Norway	38.257	35.784	61.014	65.118	59.718	47.580	56.762	63.038	56.177	52.025	58.816	83.652
Morocco	10.444	27.236	16.085	40.416	22.490	32.245	31.517	22.578	20.662	17.563	19.963	37.860
Peru	67.980	58.487	80.820	165.223	66.623	88.133	87.031	42.986	48.212	82.998	62.959	32.700
USA	12.895	14.384	32.961	13.852	28.877	37.043	25.241	65.621	35.341	29.194	19.003	28.755
Chile	11.738	3.123	5.968	7.251	4.490	24.937	10.662	5.170	2.333	8.707	40.161	26.122
Iceland	5.610	6.594	10.030	8.647	21.737	6.871	10.394	13.007	14.230	8.717	5.967	20.563
UK	26.620	18.450	18.017	20.647	14.555	21.092	12.597	13.244	15.509	17.382	14.743	19.741
Mexico	470	0	45	2.636	3.250	0	0	0	10.880	8.422	7.062	15.115
Panama	7.219	1.323	1.626	6.235	7.195	3.531	5.814	4.272	6.671	8.119	15.285	12.923
Other	59.070	62.710	100.981	119.329	130.326	94.611	103.891	133.866	120.353	141.582	124.257	151.974
Total	202.046	192.307	266.533	384.237	299.543	308.463	287.149	300.745	274.190	322.683	309.401	345.753

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

6.2.3 Import prices of fishmeal and fish oil

The average yearly import prices of fishmeal and fish oil to the EU showed a strong growth over the past 10-15 years with some ups and downs in line with global price trends. Between 2002 and 2020, the yearly average fish oil price increased by 93% to 1.593 EUR/tonne and the average fishmeal price increased by 48% to 1.218 EUR/tonne.

Figure 15: EU IMPORT PRICES OF FISHMEAL AND FISH OIL



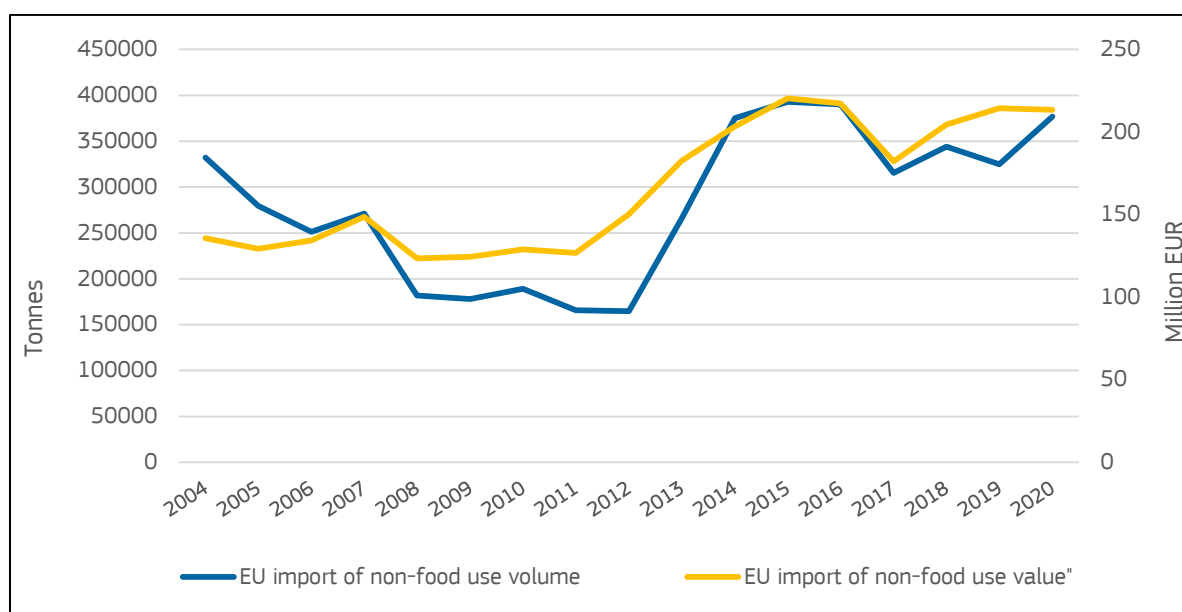
Source: EUMOFA elaboration of Eurostat-COMEXT data. Values are deflated by using the GDP deflator (base=2015)

6.2.4 Other non-food use products

EU imports of other non-food use products mainly include live ornamental fish, fish waste, seaweeds and other algae, crustaceans and molluscs unfit for human consumption. In 2020, these products accounted for 89% of the volumes and 80% of the values in the collecting pot “other non-food use”. The total import of other non-food uses products accounted for 46% of volume (377.000 tonnes) and 25% (213 million EUR) value in the non-food use category.

EU imports of other non-food use products varied between 390.000 (2016) tonnes at their highest to 165.000 (2012) tonnes at their lowest in the period from 2004-2020. During the same period, import value increased 57% to EUR 213 million. In terms of volume, fish waste, seaweed and algae and different products of crustaceans and molluscs constituted 99% of the volumes. A large share of volume goes to Denmark, where it is used in feed for the fur industry and other livestock.

Figure 16: 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, more than between 75% and 90% of the fishmeal export volumes and between 83-91% of the values from EU were exported to 9 countries.

In terms of volume, exports decreased by 36% from 2009 to 2020 and values decreased by 4% reflecting the general increasing price level of fishmeal. In 2020, fishmeal exports from the EU amounted to 180.744 tonnes, a 7%-increase from both 2018 and 2019. In terms of value, fishmeal exports decreased by 2% compared with 2019 and increased by 9% compared with 2018.

The three largest destination countries are Norway, the UK, and Canada accounting for 76% volume and 77% of value in 2020.

Exports to Norway, the main destination country in the past 12 years, decreased by 57% in volume and 35% in value from 2009 to 2020, accounting for 58% of volume and value in 2009 and 39% of volume and value in 2020. From 2019 to 2020, export volume increased by 2%, while value decreased by 10% to 71.000 tonnes and EUR 99 million, respectively.

Exports to Canada increased by 154% in volume and 272% in value from 2009 to 2020, accounting for 1% of volume and 2% of value in 2009, and 6% of volume and value in 2020. From 2019 to 2020, export volume decreased by 11%, and value by 18% to 10.000 tonnes and 16 million EUR, respectively.

The UK became a destination market for EU fishmeal exports in 2020, with 57.000 tonnes valued at 79,3 million EUR. The UK was the second largest market both in terms of volume and value in 2020.

Table 6: EU27 FISHMEAL EXPORT BY DESTINATION –tonnes

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Country	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume
Norway	163237	119558	147485	126801	115661	141926	85698	97819	54083	52737	69404	70748
United Kingdom	53191	47212	46494	39797	41179	47465	40111	40537	35992	39088	47810	57313
Canada	3949	7842	9344	6276	5196	5370	5682	7095	8449	8143	11296	10031
Taiwan	7218	3621	3973	3984	3632	3424	8073	6414	10606	7536	4383	6693
China	0	0	3651	4720	17732	8683	16619	9703	22725	13895	7700	6435
USA	1158	1591	2112	2014	1842	1430	2786	4583	2993	6103	3555	3317
Saudi Arabia	3013	2340	1997	655	1796	1307	4030	1363	3102	3188	1463	3314
South Korea	5015	6255	3470	3980	5218	4030	7434	3957	4246	3506	2865	3130
Ukraine	4573	2577	3951	4611	4536	1645	1074	1632	2478	2705	3017	2339
Other	41516	41790	35955	37156	40785	38069	48577	21369	37032	32523	18035	17423
Total	282871	232786	258432	229992	237576	253350	220083	194472	181708	169424	169529	180744

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 – 1.000 EUR

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Country	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
Norway	153.293	153.596	183.622	161.589	163.966	189.980	122.852	149.264	75.125	72.096	109.749	98.892
UK	49.059	61.998	59.598	49.940	56.511	61.991	57.105	60.408	47.745	54.689	66.891	79.387
Canada	4.330	10.599	14.480	9.985	8.461	8.283	9.853	12.493	14.316	13.815	19.706	16.107
China	0	0	5.112	7.345	26.491	11.878	26.834	15.205	29.911	20.356	11.962	9.250
Taiwan	6.983	5.160	5.104	5.131	5.175	4.679	11.857	9.658	13.373	10.014	6.370	8.384
USA	1.827	3.075	3.687	3.353	3.334	2.809	5.253	8.921	6.442	9.158	6.888	5.855
South Korea	4.945	9.273	4.735	5.383	7.996	5.791	12.413	6.371	6.041	4.972	4.356	4.107
Saudi Arabia	3.547	3.334	2.987	965	2.723	1.859	6.430	2.428	4.206	4.733	2.316	3.751
Thailand	1.149	967	556	1.647	1.407	1.370	2.775	2.316	3.696	2.260	3.874	3.606
Other	39.030	52.319	46.530	46.303	56.751	42.064	74.543	32.430	47.782	40.343	25.982	23.395
Total	264.163	300.321	326.414	291.639	332.814	330.703	329.915	299.495	248.637	232.435	258.094	252.734

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

6.3.2 Fish oil

During the past 12 years, more than 94% of the fish oil export volumes and between 75-95% of the values from the EU were exported to 9 countries.

In terms of volume, exports increased by 14% from 2009 to 2020 and values increased by 115%, reflecting the general increasing trend in fish oil price. In 2020, fish oil exports from the EU amounted to 174.000 tonnes, a 10%-increase from 2019 and a 17%-increase compared with 2018. In terms of value, fish oil exports increased by 20% from 2019 and by 31% compared with 2018.

Exports to Norway, the main destination country in the past 11 years, increased by 17% in volume and 197% in value from 2009 to 2020, accounting for 70% of volume and 49% of value in 2009, and 72% of volume and 68% of value in 2020. From 2019 to 2020, export volume to Norway decreased by 2% and value increased by 10% to 125.000 tonnes and 206 million EUR, respectively.

Between 80% and 95% of the yearly EU exports is sourced from Denmark.

Table 8: EU27 FISH OIL EXPORT BY DESTINATION – tonnes

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Country	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume
Norway	106.703	93.561	79.005	92.285	88.766	113.444	92.282	114.143	113.702	118.615	127.985	125.221
United Kingdom	33.306	32.903	56.584	33.115	26.146	25.179	23.991	28.353	28.924	18.424	20.633	20.921
Peru	0	3.001	0	1	1	424	2.250	1.535	2.391	130	4	7.941
Faroe Islands	4.000	1.030	10.515	14.456	1.207	0	3.338	1.000	0	0	1.197	3.498
Chile	0	0	0	1	2	1	2	1	1	857	775	3.494
Turkey	2.194	262	11	4	806	320	39	58	164	778	951	2.074
Iceland	182	1.182	3.247	2.766	2.296	318	3	44	289	500	333	1.772
Canada	76	2	71	787	574	1.003	37	1.284	443	1.150	182	1.429
Russia	388	211	257	402	434	803	1.045	1.034	949	984	1.054	967
Nigeria	9	8	0	0	15	44	17	0	22	181	87	804
Other	5.650	5.518	5.749	4.970	6.936	4.801	8.417	7.181	7.145	6.778	5.667	6.148
Total	152.507	137.677	155.439	148.788	127.182	146.337	131.422	154.634	154.029	148.398	158.867	174.269

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

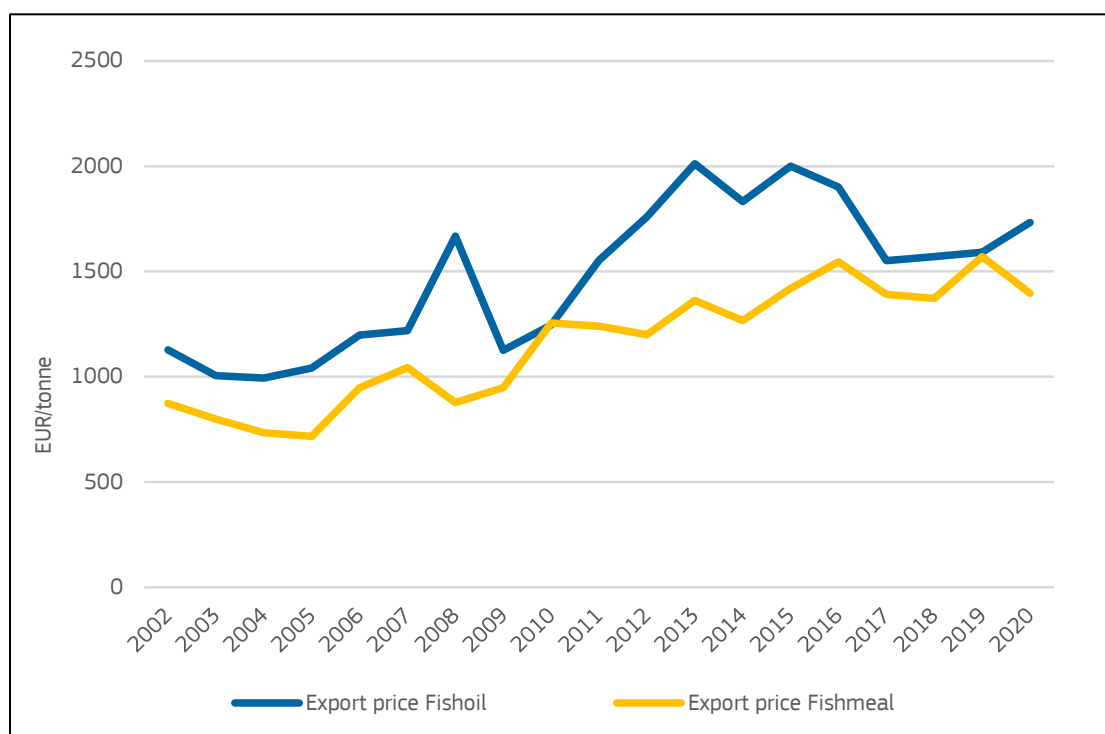
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Country	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
Norway	69.521	71.893	86.308	132.999	146.030	163.849	163.155	192.068	160.182	164.863	188.352	206.272
UK	38.221	38.419	66.483	48.648	46.842	45.209	52.707	58.074	48.438	32.653	35.493	36.801
Peru	3	3.444	0	6	13	685	4.685	3.190	4.465	385	84	17.127
Faroe Islands	1.669	712	10.439	21.105	2.129	2	5.410	1.475	2	1	1.252	6.125
Russia	1.210	365	697	1.005	1.650	1.570	3.108	3.743	3.402	3.971	4.596	4.714
Chile	1	6	6	16	25	33	33	28	24	1.215	501	4.180
Iceland	366	1.190	4.398	3.984	3.711	1.429	18	76	728	808	586	3.610
Canada	525	8	198	1.480	1.991	2.147	263	3.240	1.339	2.317	576	2.757
South Korea	57	324	171	655	972	2.045	3.093	2.354	1.074	1.459	2.616	2.571
Turkey	1.624	297	103	59	1.394	441	271	370	683	1.350	1.556	2.494
Other	65.531	76.325	120.690	78.630	81.400	75.146	87.843	87.957	67.099	54.746	52.862	52.485
Total	140.506	154.565	223.012	239.940	239.316	247.348	267.877	294.502	238.998	231.115	252.981	302.335

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

6.3.3 Export prices of fishmeal and fish oil

The average yearly export prices of fishmeal and fish oil from EU to non-EU countries showed a strong growth the past 10-15 years with some ups and downs in line with global price trends. Between 2002 and 2020, the yearly average price of fish oil increased by 54% to 1.733 EUR/tonne and the average price of fishmeal increased by 60% to 1.396 EUR/tonne.

Figure 17: 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)

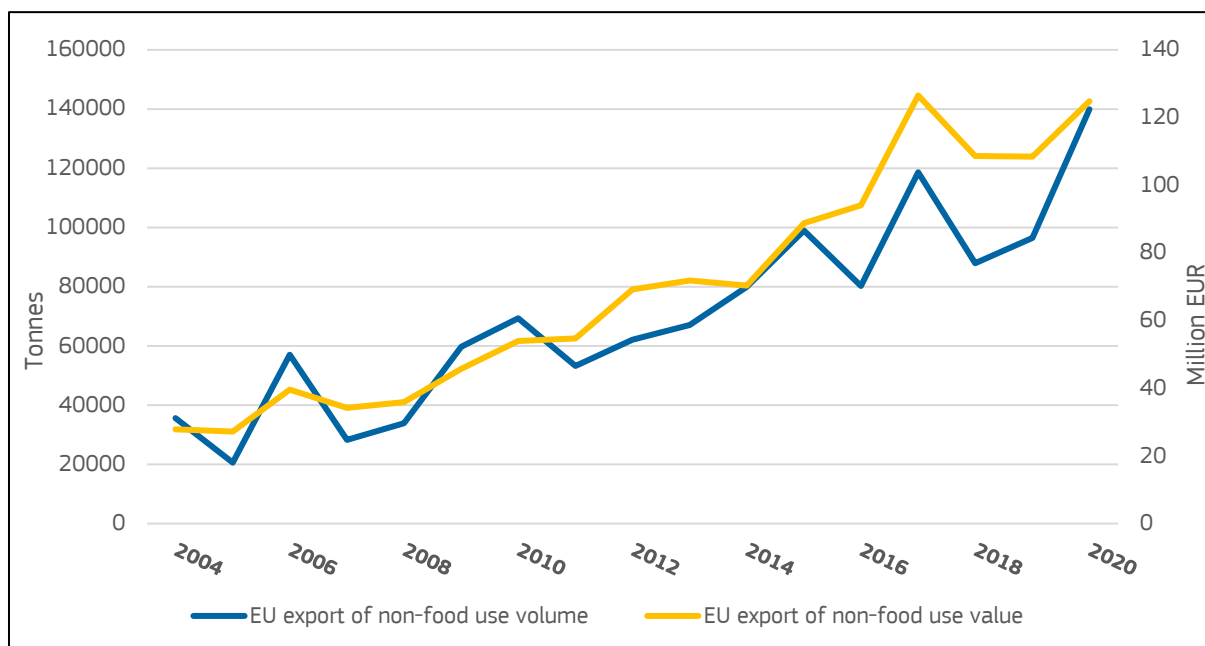
6.3.1 Other non-food use products

Exports of other non-food use products mainly comprise fish feed, seaweeds and algae and products of fish or crustaceans, molluscs and other invertebrates and live ornamental freshwater fish. Total exports of other non-food use products accounted for 28% (140.000 tonnes) of volume and 18% (125 million EUR) of value in the non-food use category. Of this, around 42% of volume was fish feed, 36% seaweeds, 14% fish waste and 9% was products of crustaceans and molluscs.

EU exports of other non-food use products varied between 21.000 tonnes (2005) at its lowest to 139.000 tonnes (2020) at its highest in the period from 2002-2020. During the same period, export value increased nearly 348% to EUR 125 million.

In terms of volume, fish feed, fish waste, seaweed and algae and different products of crustaceans and molluscs made up between 98%-100%.

Figure 18: 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 fishoil is projected to grow moderately the coming years, due to better utilisation 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 the OECD, the contribution of aquaculture to global fish production will continue to grow and surpass that of fisheries by 2024. By 2029, aquaculture production is projected to reach 105 million tonnes, 10 million tonnes more than the capture sector²¹. Fishmeal and fish oil are considered the most nutritious and digestible ingredients for farmed fish. As feed demand has increased along with increased aquaculture production, the inclusion of fish meal and fish oil in feed recipes has shown a clear downward trend, and has partly been replaced by vegetable substitutes like soymeal and rape oil. Fishmeal and fish oil are limited resources and will increasingly be used as strategic ingredients at lower concentrations and for specific stages in production²². Many factors can influence the evolution and dynamics of global fishmeal and fish oil production, consumption, and markets. These include external factors such as climate and environmental conditions, fisheries management, trade policies etc.

During the past year and a half, the COVID-19 pandemic has affected world trade and logistics. The negative impact on the global trade of fishmeal and fish oil was short lived. Peruvian and other relevant authorities have dealt with the various challenges caused by the pandemic, and, as China recovered quite quickly from the pandemic, demand is now back to normal²³.

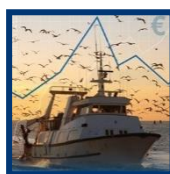
²¹ OECD: <https://www.oecd-ilibrary.org/sites/4dd9b3d0-en/index.html?itemId=/content/component/4dd9b3d0-en#section-d1e19686>

²² SEAFISH: <https://www.seafish.org/document?id=76b459ea-04b0-4ec6-ad6d-dfa2556c5fa0>

²³ GLOBEFISH - Information and Analysis on World Fish Trade: <http://www.fao.org/in-action/globefish/covid-19/market-outlook/fishmeal-and-fish-oil/en/>

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