
Fishmeal and Oil: Why Bother? Opportunities and Challenges

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Key Messages

- The use of fishmeal and fish oil has changed significantly in recent decades with the growth, first of the aquaculture industry and then the food supplement industry.
- Prices have been increasing relatively to vegetable meals and oils during the last decade, as these new users demand fishmeal and fish oil due to their unique characteristics and not as cheap substitutes for other inputs in animal feeds.
- Despite increasing prices, landings in targeted fisheries for reduction has declined. To a large extent this reduction in raw material availability has been made up with increased use of cut-offs and trimmings. As most cut-offs and trimmings are not used, this represents a large source of raw materials. Supply chains and fisheries management systems are the most important factors preventing such developments.
- There are people questioning the reduction of fish to meal and oil.
- The aquaculture industry multiplies seafood availability and functional foods with marine ingredients are good for public health.
- As demand from the food supplement and aquaculture industries continue to increase, this presents a great opportunity for the fishmeal and fish oil industry if new raw material sources can be found. Given that alternative raw material sources are not likely to have a high oil content, particularly fish oil prices may increase.

Introduction

The fishmeal and fish oil industry has experienced two major revolutions during the last decades with respect to uses and which markets are being served. These revolutions have substantially increased the value of the landings of forage fish because new opportunities have been identified and exploited due to the unique characteristics of fishmeal and fish oil, and thereby created additional value. It has been a long journey, from a start as cheap substitutes for vegetable meals and oils to an increasingly valued input that helped create the aquaculture industry, to an even more valuable input in the nutritional supplement industry. In many ways, it is a success story of better fisheries management and better fish handling, helping new opportunities to be exploited. However, it is also a controversial story as reducing fish to fishmeal and fish oil is seen by some as destroying rather than creating value by removing food for higher level species in the ecosystem or from poor people.

Harvest

A substantial share of the world's fisheries landings have for a more than 50 years been reduced to fishmeal and fish oil. During the last decades, annual fishmeal production has been around 6 million tonnes and fish oil production at about 1 million tonnes. For most of this period, the main input has been from targeted fisheries, also known as reduction fisheries, because they target fish for the purpose of reducing it to fishmeal and fish oil. To a large extent, the species used for this purpose is small and bony, and have low prices because there is limited demand for them for human consumption. Among the most important species are small pelagics like anchovies, pilchards and mackerels, but also other species like blue whiting, sandeel and Norway pout are used. Poor management contributed to creating reduction fisheries, as there was little time for good fish handling when the fishery was characterized as a "race to fish".

There has been a slightly declining trend in the production of fishmeal and fish oil since the end of the millennium. This is largely due to improved management that has shifted the landings in some fisheries like

herring from reduction to fishmeal and fish oil to human consumption. The fact that reduction fisheries are limited by the production capacity of the oceans also means that the quantities that can be landed are limited. The only potential increased landings come by targeting smaller lower trophic level species like krill. Currently, there are a few companies fishing for krill in the Antarctic Ocean. Harvesting costs are high and the focus is on high quality oils and meals. In addition, the fishery is controversial from an environmental perspective. Hence, it is doubtful whether quantities from such sources will be significant, at least without important technological breakthroughs. However, it is an area where knowledge is limited and further studies are warranted.

Increased Demand

Traditionally, fishmeal was a part of the large global market for protein meals, where soybean meal has provided the largest volume; the price of fish meal was closely linked to the global meal prices. The main use for fishmeal was, as for other meals, as an ingredient in different animal feeds, and particularly for pigs and chicken. Fish oil, a less desirable product, was mostly transformed into hardened fats and industrial uses including as heating oil in Alaska salmon canneries.

In recent decades, the fishmeal and fish oil markets have experienced substantial supply and demand shocks that have fundamentally changed the market. On the demand side, the first shock was increased demand from aquafeed producers for both fishmeal and fish oil. Fishmeal and fish oil are, due to their marine content, recognized as having specific attributes that make them particularly useful in aquafeeds. This is especially true for species where one has limited nutritional knowledge, which of course is the case for virtually all new species. As aquaculture has been the world's fastest growing food production technology for the last three decades, demand has increased rapidly. In the late 1990s, one started observing that fishmeal and fish oil's relationship to the larger vegetable meal and oil markets weakened in periods with low production such as in *El Nino* years. This was the first evidence that a sufficiently large number of buyers purchased fishmeal and fish oil for their unique characteristics rather than as a cheap substitute for other meals and oils. The fact that aquafeed producers could easily win market shares from other animal feed producers is evidence that for these producers, fishmeal and fish oil were just cheap substitute ingredients.

For fish oil, a second demand shock occurred when the health benefits of marine ingredients such as Omega-3 became better understood and the demand for food capsules containing Omega-3 took off. With a highly successful nutritional supplement industry, fish oil and fishmeal are increasingly valued components in various functional foods, healthy diets and even for medical purposes. This created a further increase in demand, and from 2011 the price of fish oil appears to have decoupled from the vegetable oil market and are now substantially higher. Also fishmeal prices are getting a looser relationship to the vegetable meals market, but have so far returned to this market in periods with more abundant supply.

Reduced Quantities of Wild Fish

On the supply side, there have been two main shocks that have reduced production of fishmeal and fish oil, and one shock that has increased production by finding new raw material sources.

There has been an increasing demand for seafood for decades, and despite a substantial increase in total seafood production mainly from aquaculture, demand has increased even faster leading to higher prices. Hence, food markets for fish have become more attractive. As fisheries management has improved in recent decades, the ability of fishers to exploit this market opportunity has also improved. Of particular interest has been the introduction of individual vessel quotas, as these have allowed fishers to focus on maximizing profits from their harvest rather than maximizing their share of the catch. This has led to more careful treatment of the fish, and enabled consumers to be served with better quality fish. As the reduction market most often is the lowest paying market with the least emphasis on quality, this is a market many fishers shy away from, if they can. It should be noted that also within the fishmeal and fish oil markets there are

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substantial price premiums from better quality product, and better fisheries management in reduction fisheries has improved the quality of these products.

An increasing number of people, particularly in wealthy countries, are questioning the ethics of reducing fish that can be used for human consumption and provide highly nutritional food. In some countries this has led to the prohibition to use the fish for fishmeal and oil, thereby reducing the quantities available for fishmeal production. Two examples are the California sardines in California, USA and anchovies from the coastal fishery in Peru. While this legislation is well-intended, it does not necessarily lead to the expected results. For instance, California sardines are no longer reduced to fishmeal and fish oil. However, they are not used for direct human consumption as they are mostly exported frozen to Japan and used as bait or to Australia and used as tuna feed, and as such. Similarly, fisheries like capelin remain reduction fisheries even when well-managed, as the human consumption demand for such species is non-existent or weak.

New Raw Material Sources

Decreasing quantities of fishmeal and fish oil from reduction fisheries together with increased demand and prices have created a market opportunity if one can find other raw material sources than from targeted fisheries. At least one obvious source exists; trimmings and cut-offs from fish produced for human consumption. These can come from wild fish, but also from farmed fish. For most species, the fillet yield is between 30% and 60%. That implies that there is a substantial biomass that disappears in many supply chains when this raw material is not used. Currently, less than 15% of the trimmings are actually used, and this is accordingly a greatly underutilized resource.

The use of trimmings and cut-offs has, however, increased rapidly in recent years and has led to a positive supply shock for fishmeal and fish oil. This has not completely been able to offset the reduction in production from targeted fisheries, but has mitigated the effect of this to a large extent. This is particularly true for fishmeal as about a third of the global fishmeal production is now based on cut-offs and trimmings. It is a larger challenge for fish oil, as oil content of cut-offs and offal generally is lower than for forage fish.

This increased use of cut-offs and trimmings is very interesting, in part because the use of these trimmings have largely been the garbage dump. Hence, utilization of this raw material is both an economic opportunity and good environmental practice. The fact that seafood cut-offs and trimmings are used in substantial quantities in some fisheries or aquaculture sectors indicates that with the right structure in the supply chain such utilization is economically viable. In general, the main conditions that need to be satisfied in fisheries are large enough quantities available at a given geographical location and good fisheries management system that allow and even force fishers to focus also on secondary products. For aquaculture scale is the most important condition. At the same time, the large quantities of trimmings and cut-offs left unused create a tremendous potential. This potential is increased by the fact that seafood production is rapidly growing due to the growth in aquaculture production, since this also increase the production of cut-offs. Advanced meat industries provides a good measuring point, in that all biological product that goes into a processing plant is turned into a commercially viable product. This is also happening in some modern seafood supply chains, but much more could be achieved.

Challenges

The main challenges in the fishmeal and fish oil sector are the limited access to forage fish and the ethical concerns related to reducing fish to fishmeal that can be used for human consumption or for other species in the ecosystem. It is hard to do anything about the last concern except for noting that there are a number of controversial aspects in the global food production system that are unlikely to be resolved to every party's satisfaction. Sound economic activity is based on selling a product to the buyer with the highest willingness to pay. Moreover, it is hard to argue that the use of marine ingredients in aquafeed reduces seafood

availability as even farmed salmon is now a net provider of marine protein with the current low levels of marine ingredients in the feed. The ecosystem effect of leaving more forage fish in the sea is also uncertain, and it is far from obvious that this would create a more balanced ecosystem.

Opportunities

The opportunities for fishmeal and particularly for fish oil are what we really should care about. Increasing prices is a strong signal that the world wants more of these products. This is true despite the fact that prices for seafood for human consumption also increase and make these markets attractive alternatives for fishers who can access them, and thereby limits sourcing of raw material from wild fisheries. Better fisheries management and the EU's new bycatch regulation should contribute to create more raw materials for fishmeal and fish oil production, as will a larger aquaculture production. With increased demand from higher value uses, the opportunities for the fishmeal and fish oil industry are set to continue to improve. For fish oil, the part of the industry with access to oily wild fish will have a particular advantage, as few aquaculture species as well as wild sources for cut-offs and trimmings will provide oil rich ingredients. Hence, fishmeal production is likely to increase relatively to fish oil production, while fish oil prices are likely to increase more than fishmeal prices. Finally, on a global scale more fishmeal and fish oil will contribute to better public health, independently of whether they contribute to higher seafood consumption via aquaculture products or in functional foods. And they will support jobs and activity in coastal communities.