Salmon Farming Industry Handbook 2016

Marine Harvest

marineharvest

Forward-looking Statements

This handbook may be deemed to include forward-looking statements that reflect Marine Harvest's current expectations and views of future events. Some of these forward-looking statements can be identified by terms and phrases such as "anticipate", "should", "likely", "foresee", "believe", "estimate", "expect", "intend", "could", "may", "project", "predict", "will" and similar expressions. These forward-looking statements include statements related to population growth, protein consumption, consumption of fish (including both farmed and wild capture), global supply and demand for fish (and salmon in particular), aquaculture's relationship to food consumption, salmon harvests, demographic and pricing trends, market trends, price volatility, industry trends and strategic initiatives, the issuance and awarding of new farming licenses, governmental progress on regulatory change in the aquaculture industry, estimated biomass utilization, salmonid health conditions as well as vaccines, medical treatments and other mitigating efforts, smolt release, development of standing biomass, trends in the seafood industry, expected research and development expenditures, business prospects and positioning with respect to market, and the effects of any extraordinary events and various other matters (including developments with respect to laws, regulations and governmental policies regulating the industry and changes in accounting policies, standards and interpretations). The preceding list is not intended to be an exhaustive list of all our forward-looking statements. These statements are only predictions based on Marine Harvest's current estimates or expectations about future events or future results. Actual results, level of activity, performance or achievements could differ materially from those expressed or implied by the forward-looking statements because the realization of those results, the level of activity, performance or achievements are subject to many risks and uncertainties, including, but not limited to changes to the price of salmon; risks related to fish feed; economic and market risks; environmental risks; risks related to escapes, biological risks, including fish diseases and sea lice; product risks; regulatory risks including risk related to food safety, the aquaculture industry, processing, competition and anti-corruption; trade restriction risks; strategic and competitive risks; and reputation risks. All forward-looking statements included in this handbook are based on information available at the time of its release, and Marine Harvest assumes no obligation to update any forward-looking statement.

The Marine Harvest
Salmon Farming Industry Handbook

The purpose of this document is to give investors and financial analysts a better insight into the salmon farming industry, and what Marine Harvest considers to be the most important value drivers.

Table of content

1. Introduction

Salmon is the common name for several species of fish of the family Salmonidae (e.g. Atlantic salmon, Pacific salmon), while other species in the family are called trout (e.g. brown trout, seawater trout). Although several of these species are available from both wild and farmed sources, most commercially available Atlantic salmon is farmed. Salmon live in the Atlantic Ocean and the Pacific, as well as the Great Lakes (North America) and other land locked lakes.

Typically, salmon are anadromous: they are born in fresh water, migrate to the ocean, then return to fresh water to reproduce.

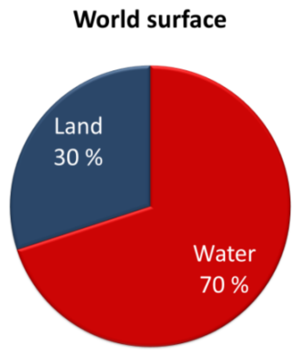
About 70% of the world's salmon production is farmed. Farming takes place in large nets in sheltered waters such as fjords or bays. Most of the cultured salmon come from Norway, Chile, Scotland and Canada.

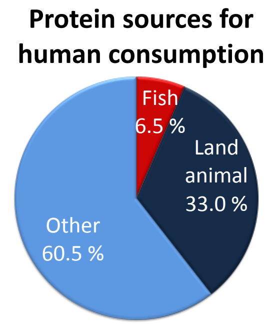
Salmon is a popular food. Salmon consumption is considered to be healthy because of inter alia its high content of protein and Omega-3 fatty acids as well as being a good source of minerals and vitamins.

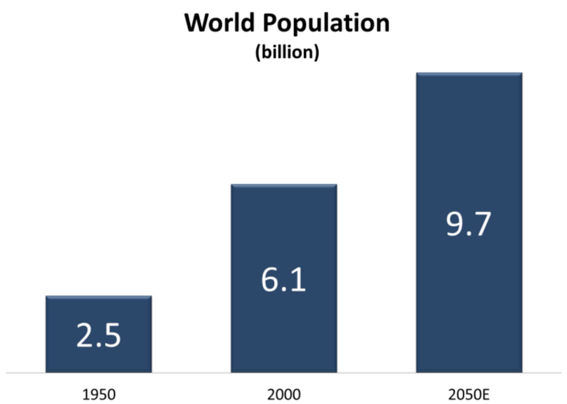
Note: The quantity figures in this industry handbook are mainly expressed in GWE (gutted weight equivalent). For a weight conversion table, see appendix.

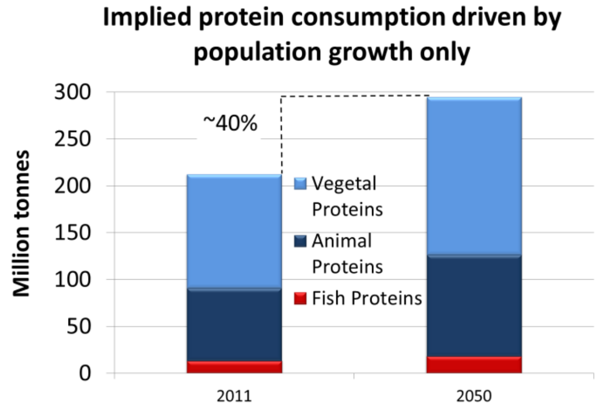
2. Definition of Segment

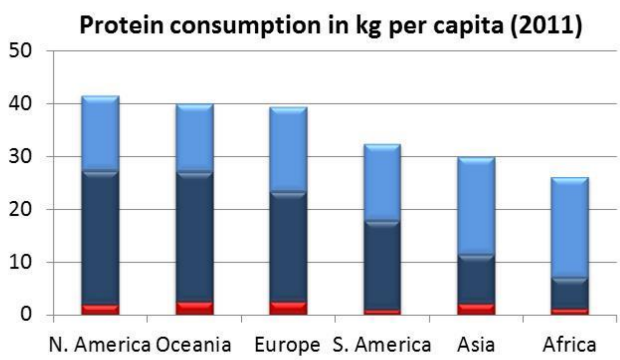
2.1 Seafood as part of a larger protein space

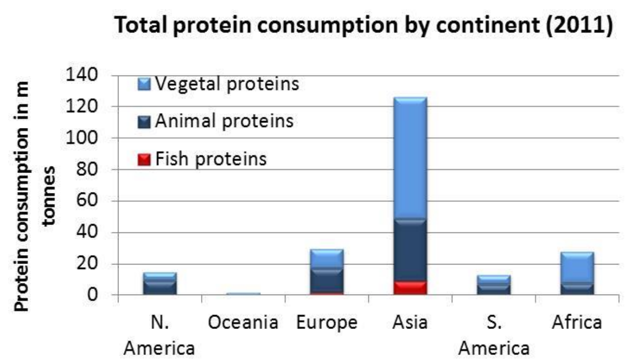












Although 70% of the Earth's surface is covered by water, only 6.5% of the protein sources for human consumption is produced in this element.

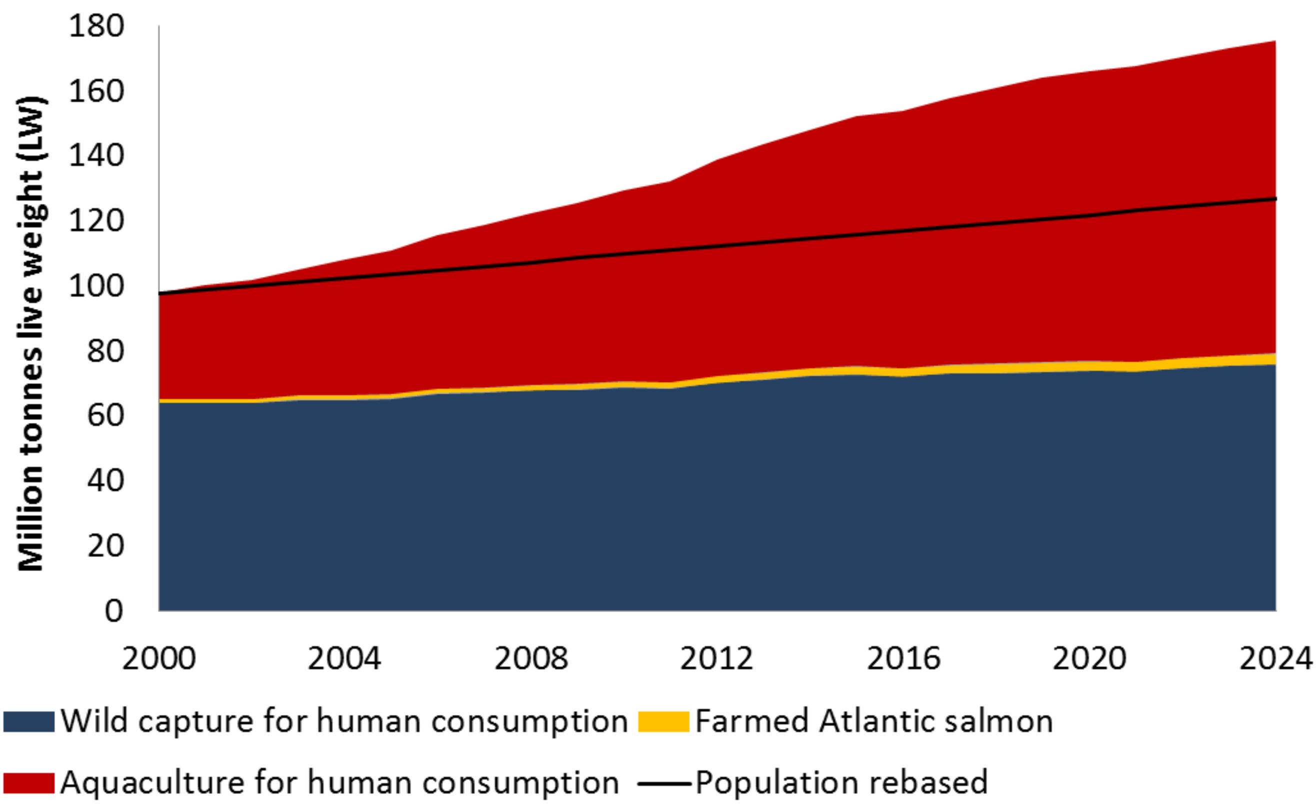
The UN estimates that the global population will grow to approximately 9.7 billion by 2050.

Assuming consumption per capita stays constant, this implies a 40% increase in demand for protein. The UN however, estimates actual demand to double. Knowing that resources for increased land based protein production will be scarce, a key question is how protein production in sea can be expanded.

Sources: FAO (2011); FAOstat Food Balance Sheets,
United Nations population data; *World Population Prospects: The 2015 Revision*

2. Definition of Segment

2.2 Stagnating wild catch – growing aquaculture



Over the past few decades, there has been a considerable increase in total and per capita fish supply, and aquaculture is a major contributor to this as it is the fastest growing, animal-based food producing sector, and it outpaces population growth.

Great progress in breeding technology, system design and feed technology in the second half of the twentieth century has enabled the expansion of commercially viable aquaculture across species and in volume. In 2011, China alone produced 62% of global aquaculture production, while Asia as a whole accounted for 88%.

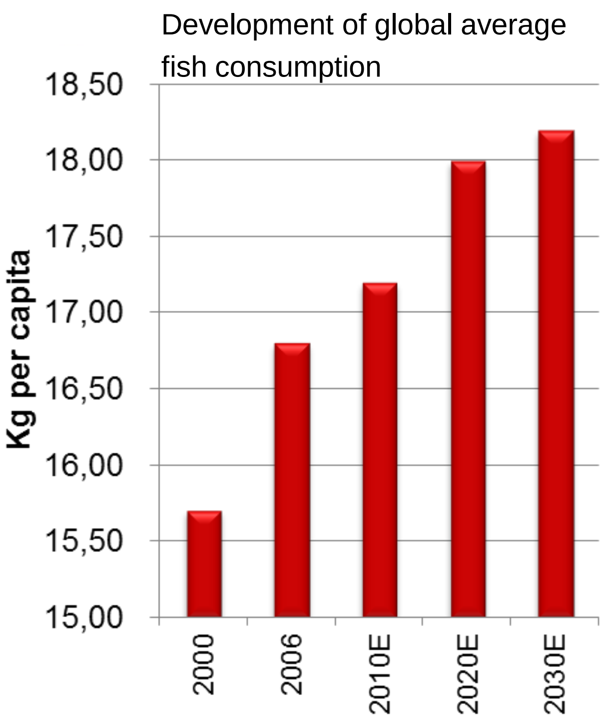
The World Bank developed a scenario analysis in their report *Fish to 2030* (2013) projecting that aquaculture will continue to fill the supply-demand gap, and that by 2030, 62% of fish for human consumption will come from this industry.

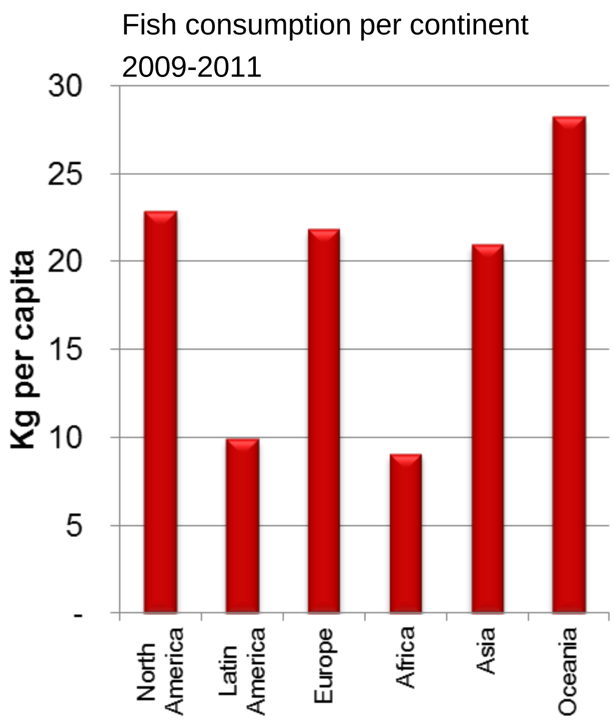
In 2014, Aquaculture provided around half (50.3%) of all fish supplies destined for direct human food consumption. However, fish has been estimated to account for only 6.5% of the global protein consumption (and about 14% of total fish and animal protein supply).

Sources: FAO (2013) *World Fisheries and Aquaculture,*
OECD-FAO (2015) *Agricultural Outlook 2015-2024*
World Bank (2013) *Fish to 2030*

2. Definition of Segment

2.3 Fish consumption



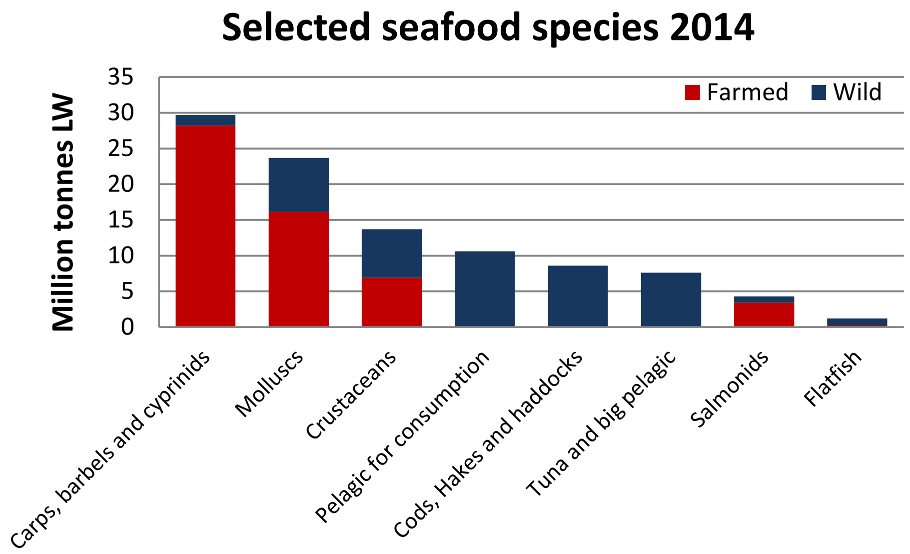


Given the expected *production* growth of 23.6% during the 2010–30 period and the projected world *population* growth of 20.2% over the same period, the world will most likely manage to increase the fish consumption level, on average.

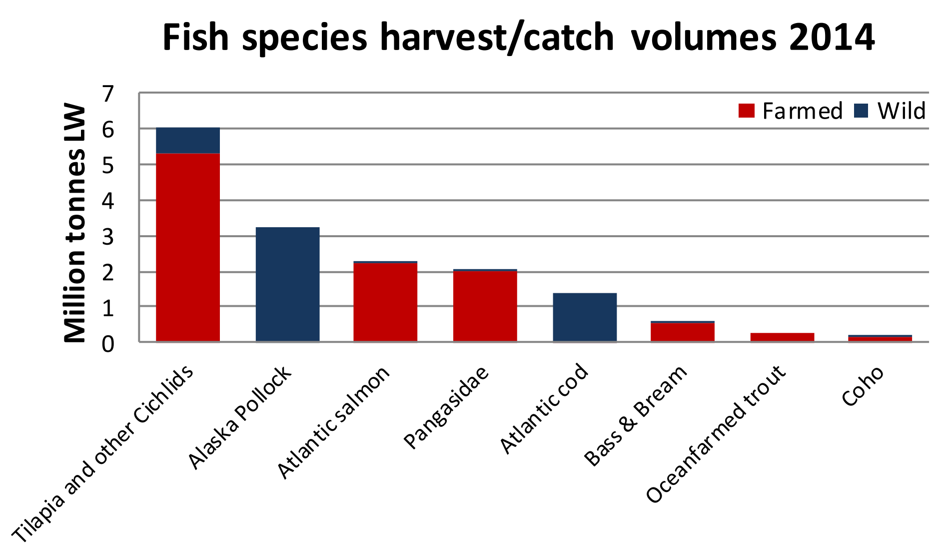
In 2030, per capita fish consumption is estimated to be 18.2kg (vs. 9.9kg in the 1960s and 19.2kg in 2012). This is equivalent to another 23 million tonnes supply of seafood, which aquaculture will have to provide.

According to FAO, per capita consumption is expected to increase in all continents in the period 2015-2024. Asia is expected to have the highest growth, while the growth in Africa is projected to only be slightly positive. In general, per capita fish consumption is likely to grow faster in developing countries. However, more developed economies is expected to have the highest per capita consumption.

Source: *World Bank (2013): Fish to 2030*
FAO (2014); The State of World Fisheries and Aquaculture
OECD-FAO (2015) *Agricultural Outlook 2015-2024*



Although several of the salmon species are available from both wild and farmed sources, almost all commercially available Atlantic salmon is farmed. Even with an increase in production of Atlantic salmon of more than 800% since 1990, total global supply of salmonids is still marginal compared to most other seafood categories (4.3% of global seafood supply). Whitefish is about ten times larger and consists of a much larger number of species.

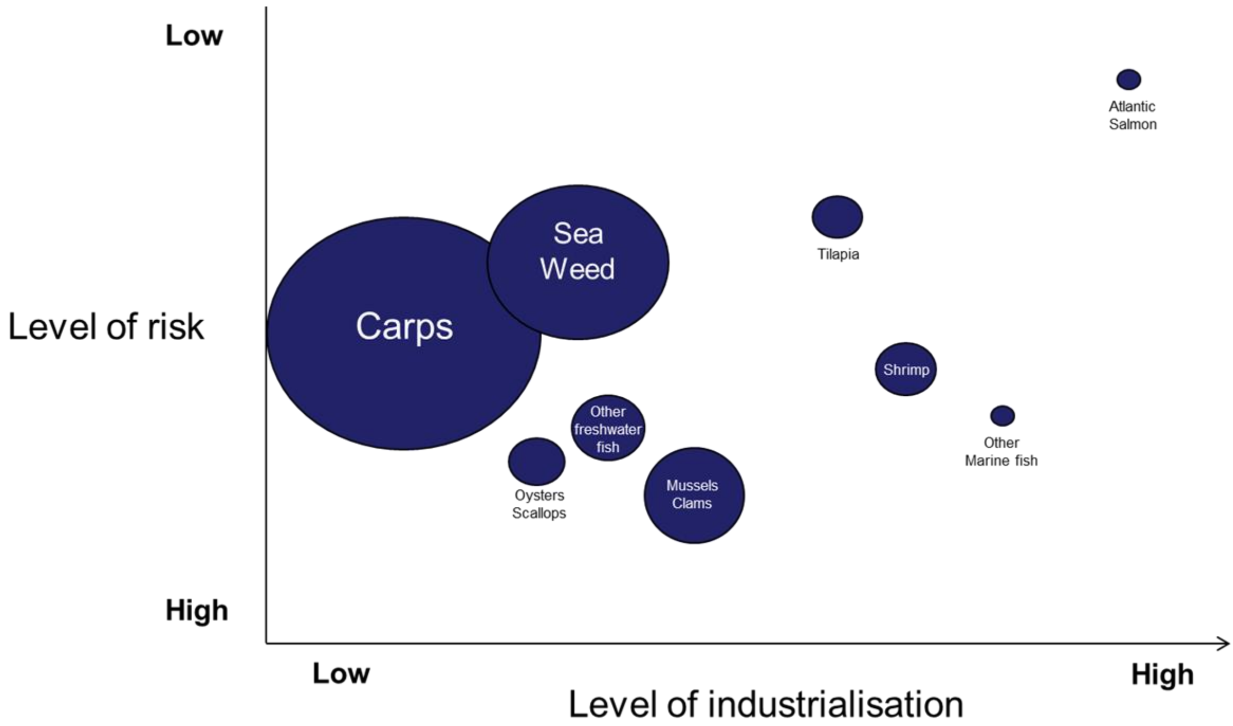


In 2014, harvest of Atlantic salmon was greater than Atlantic cod and pangasius. Compared to two of the largest whitefish species, tilapia and Alaska pollock, Atlantic salmon is about half the volume harvested.

Note: Live weight (LW) is used because different species have different conversion ratios
Source: Kontali Analyse

2. Definition of Segment

2.5 Large opportunities within aquaculture



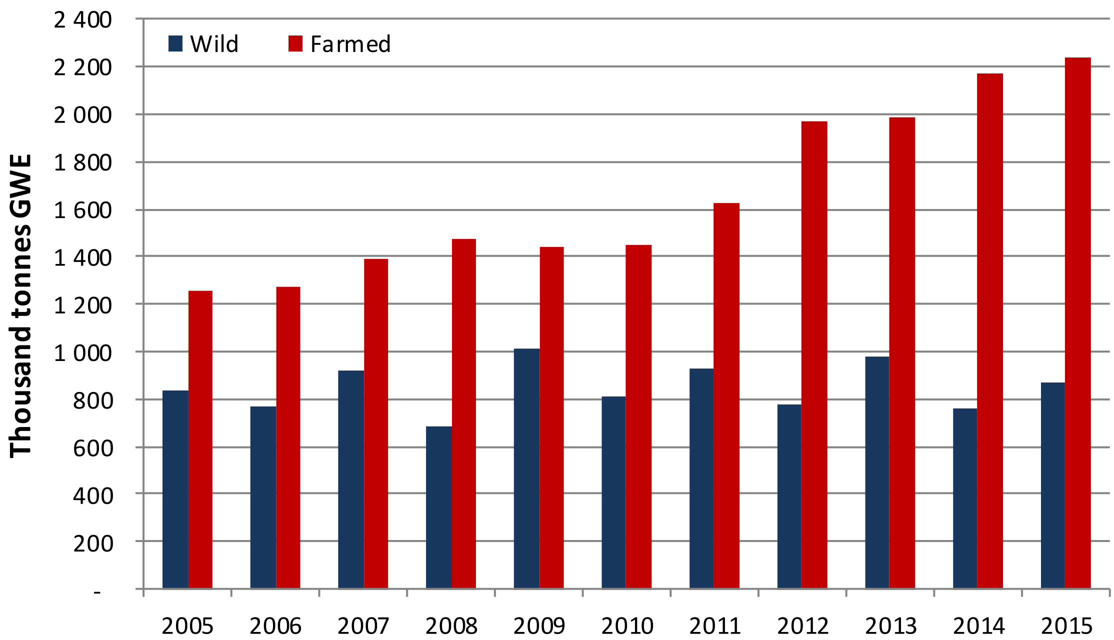
The illustration above shows that Atlantic salmon has the highest level of industrialisation and the lowest level of risk amongst other aquaculture products. The size of the circles indicates volume harvested.

Although Atlantic salmon is relatively small in harvest volume compared to other species, it is a very visible product in many markets due to the high level of industrialisation.

Source: Kontali Analyse

2. Definition of Segment

2.6 Supply of farmed and wild salmonids



The general supply of seafood in the world is shifting more towards aquaculture as the supply from wild catch is stagnating in several regions and for many important species. Wild catch of salmonids is varying between 700 000 and 1 000 000 tonnes GWE, whereas farmed salmonids are increasing. The first year the total supply of salmonids was dominated by farmed, was in 1999. Since then, the share of farmed salmonids has increased and has become the dominant source.

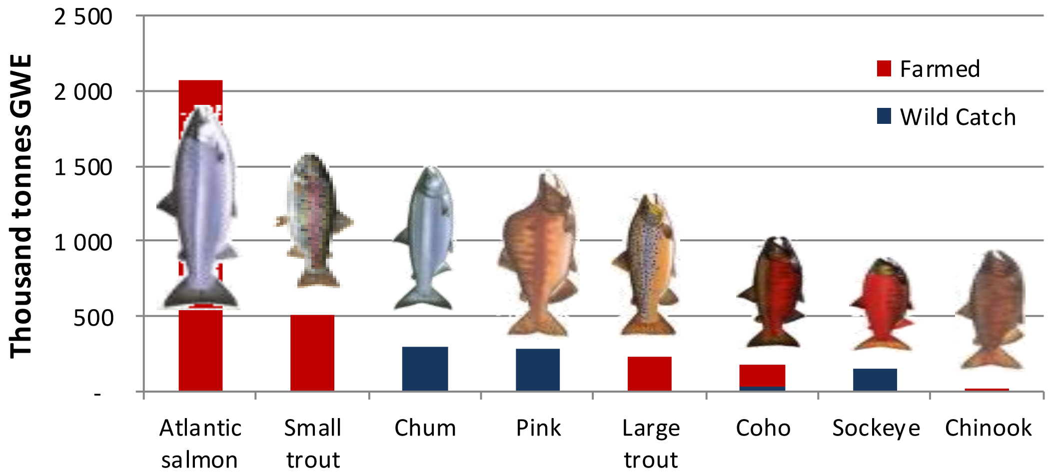
The total supply of all farmed salmonids exceeded 2.2 million tonnes (GWE) in 2015. The same year, the total catch volume of wild salmonids was about two fifths of farmed, with chum, pink and sockeye being the most common species.

About 20% of total wild catch of salmon has been imported frozen by China (from the US, Russia and Japan), and later been re-exported as frozen fillets.

Source: Kontali Analyse

2. Definition of Segment

2.7 Salmonids harvest 2015



Atlantic salmon: By quantity, the largest species of salmonids. Farmed Atlantic salmon is a versatile product, which can be used for a variety of categories such as smoked, fresh, sushi, as well as ready-made meals. The product is present in most geographies and segments. Due to biological constraints, seawater temperature requirements and other natural constraints, farmed salmon is only produced in Norway, Chile, UK, North America, Faroe Islands, Ireland and New Zealand/Tasmania.

Pink: Caught in USA and Russia and used for canning, pet food and roe production. Since quality is lower than the other species it is a less valued salmonid. The fish is small in size (1.5-1.7 kg) and all catch happens in a very short time period.

Large trout: Produced in Norway, Chile and the Faroe Island and the main markets are Japan and Russia. Trout is mainly sold fresh, but is also used for smoked production.

Small trout: Produced in many countries and most often consumed locally as a traditional dish as hot smoked or portion fish. Small trout is not in direct competition with Atlantic salmon.

Chum: Caught in Japan and Alaska. Most is consumed in Japan and China. In Japan, it is available as fresh, while in China it is processed for local consumption and re-exported. Little chum is found in the EU market. Varied quality and part of the catch is not for human consumption.

Coho: Produced in Chile and is mostly used for salted products. It is in competition with trout and sockeye in the red fish market. Although Russia has increased its import of this fish the last years, Japan remains the largest market.

Sockeye: Caught in Russia and Alaska. It is mostly exported frozen to Japan, but some is consumed locally in Russia and some canned in Alaska. Sockeye is seen as a high quality salmonid and is used as salted products, sashimi and some smoked in EU.

Chinook/King: Small volumes, but highly valued. Alaska, Canada and New Zealand are the main supplying countries. Most quantities are consumed locally. Chinook is more in direct competition to Atlantic salmon than the other species and is available most of the year.

Source: Kontali Analyse

2.8 A healthy product

Atlantic salmon is rich in the long chain omega-3, EPA and DHA, which reduce the risk for cardiovascular disease. Data also indicates that EPA and DHA reduce the risk for a large number of other health issues.

Salmon is viewed upon as a very versatile product, which can be used in numerous dishes in most culinary traditions. It is popular with retailers as it is produced in a controlled environment and is stable in supply throughout the year (not subject to seasons).

Salmon is nutritious, rich in micronutrients, minerals, marine omega-3 fatty acids, very high quality protein and several vitamins, and represents an important part of a varied and healthy diet. FAO highlights "Fish is a food of excellent nutritional value, providing high quality protein and a wide variety of vitamins and minerals, including vitamins A and D, phosphorus, magnesium, selenium and iodine in marine fish".

The substantial library of evidence from multiple studies on nutrients present in seafood indicates that including salmon in your diet will improve your overall nutritional status, and may even yield significant health benefits. In light of the global obesity rates, governments and food and health advisory bodies in Europe and the United States are encouraging people to consume more fish. The U.S. National Institute of Health, the UK National Health Service, the Norwegian Directorate of Health and several other national health organisations, recommend eating fish at least twice a week

Sources: FAO, Marine Harvest, WHO, The Norwegian Directorate of Health (2011), U.S. Department for Agriculture, and Health and Human Services (2010)

2. Definition of Segment

2.9 Resource efficient production

Protein Retention	31 %	21 %	18 %	15 %
Energy Retention	23 %	10 %	14 %	27 %
Edible Yield	68 %	46 %	52 %	41 %
Feed Convertion Ratio (FCR)	1.1	2.2	3.0	4-10
Edible Meat pr 100 kg fed	61 kg	21 kg	17 kg	4-10 kg

To optimize resource utilization it is pivotal to produce animal proteins in the most efficient way. Protein resource efficiency is expressed as “Protein retention”, which is a measure of how much animal food protein is produced per unit feed protein fed to the animal. Salmon has a protein retention of 31%, which is the most efficient compared to Chicken, Pork, and Cattle (see table above).

Energy retention is measured by dividing energy in edible parts on gross energy fed. Both cattle and Atlantic salmon has a high energy retention compared to pork and chicken.

The main reason why salmon convert protein and energy to body muscle and weight so efficiently is because they are cold-blooded and therefore do not have to use energy to heat their bodies, as well not having to stand up, compared to land animals.

- Edible yield is calculated by dividing edible meat by total body weight. As much as 68% of Atlantic salmon is edible meat, while other protein sources have a higher level of waste or non-edible meat.

- Feed conversion ratio measures how productive the different animal protein productions are. In short, this tells us the kilograms of feed needed to increase the animal’s bodyweight by one kg. Feeds for Atlantic salmon is high in protein and energy explaining why feed conversion ratio is even more favourable for Atlantic salmon than protein and energy retention when comparing with land animal protein productions.

- Edible meat per 100kg of feed fed: The combination of the FCR ratio and edible yield, gives salmon a favourably high quantity of edible meat per kg of feed fed.

Sources: *Ytrestøyl T., Aas T.S., Åsgård T. (2014) Resource utilisation of Norwegian salmon farming in 2012 and 2013. Nofima report 36/2014 pp. 35., Volden, H and N. I. Nielsen, (2011) NorFor-The Nordic feed evaluation system. Wageningen Academic Publishers. Energy and metabolizable protein supply, www.journalofanimalscience.org, Skretting (2012) Delivering SUSTAINABLE FEED SOLUTIONS for aquaculture, SINTEF Report (2009) Carbon Footprint and energy use of Norwegian seafood products*

In addition to the resource efficient production, farmed fish is also a climate friendly protein source. It is expected to become an important solution to providing the world with vitally important proteins while limiting the negative effect on the environment. There is for example less environmental impact in salmon production compared to other protein producers.

When comparing the carbon footprint of farmed salmon to traditional meat production, the carbon footprint for the farmed salmon is 2.9 carbon equivalents per kilogram of edible product whereas corresponding numbers are 2.7kg, 5.9kg of edible product for chicken and pork, respectively. Cattle’s carbon footprint is as much as 30 carbon equivalents per kilogram of edible product.

Freshwater is a renewable but limited natural resource, and human activities can cause serious damage to the surrounding environment. In Norway, farmed Atlantic salmon requires 2,000 litres per kg of fresh water in production which is significantly less than other proteins.

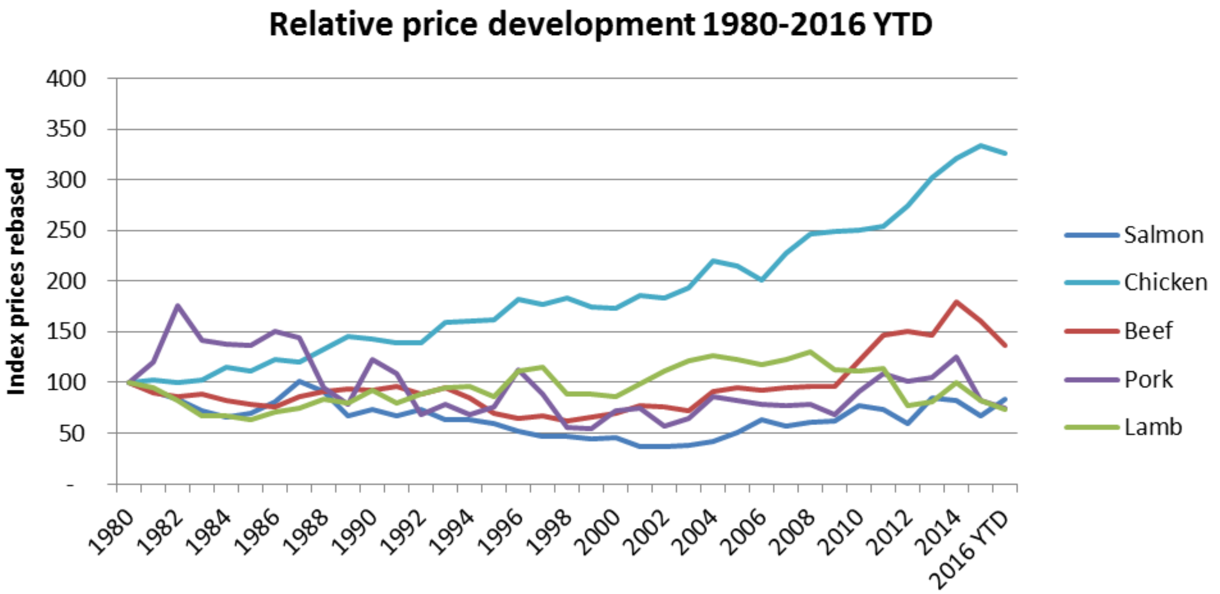
Carbon Footprint kg CO_2/kg edible meat	2.9 kg	2.7 kg	5.9 kg	30 kg
Water Consumption litre/kg edible meat	2,000 litre (1)	4,300 litre	6,000 litre	15,400 litre

Note: 1) The figure reflects total water footprint for farmed salmonid fillets in Scotland, in relation to weight and content of calories, protein and fat .

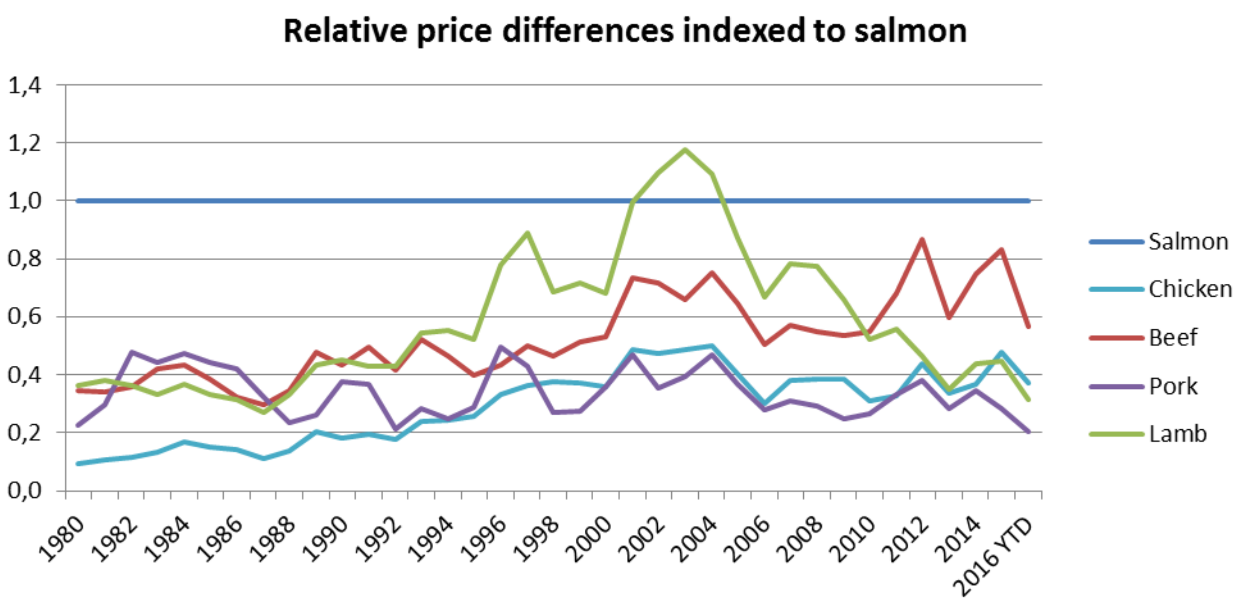
Sources: Marine Harvest, Mekonnen, M.M. & Hoekstra A.Y. (2010), Ytrestøyl et. al. (2014), SINTEF Report (2009) Carbon Footprint and energy use of Norwegian seafood products, IME (2013). SARF. (2014) Scottish Aquaculture’s Utilisation of Environmental Resources

2. Definition of Segment

2.11 Relative price development of protein products



Salmon has along with some other major food sources containing animal protein, like pork and lamb, become relatively cheaper during the last decades.

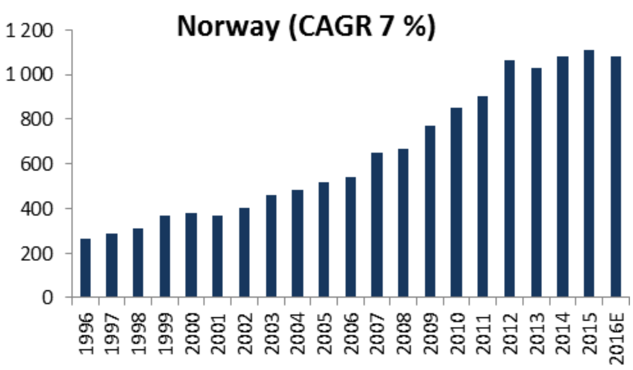


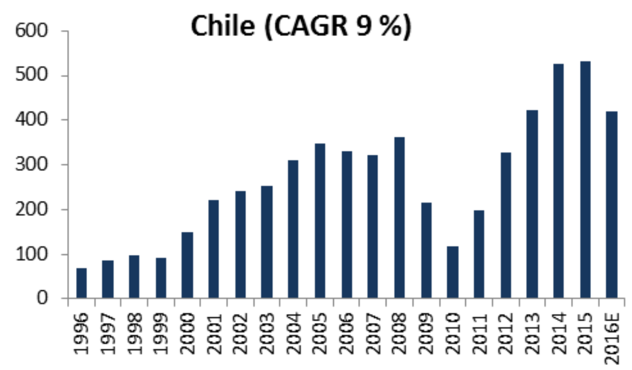
Despite salmon having become relatively cheaper over time, it is still a rather expensive product in the shelves. Only lamb have had a higher relative price compared to salmon.

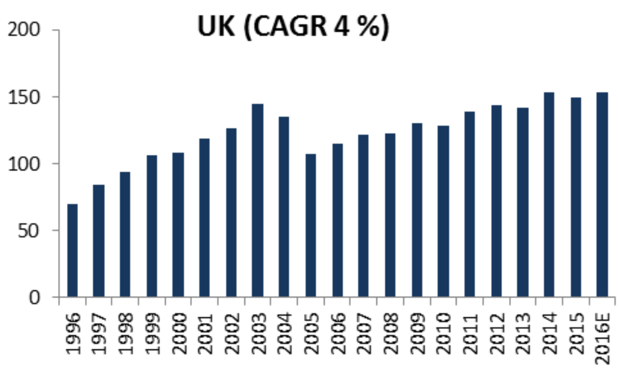
Sources: International Monetary Fund
Marine Harvest

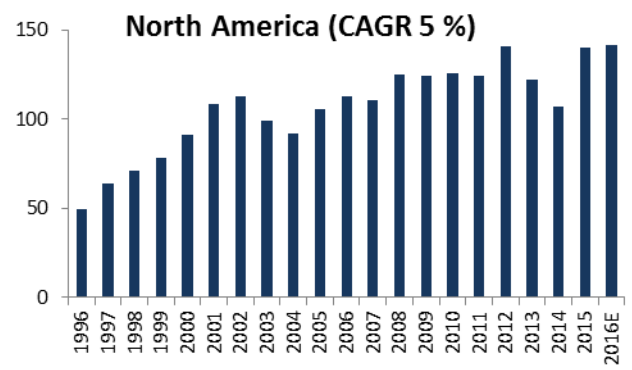
3. Salmon Supply

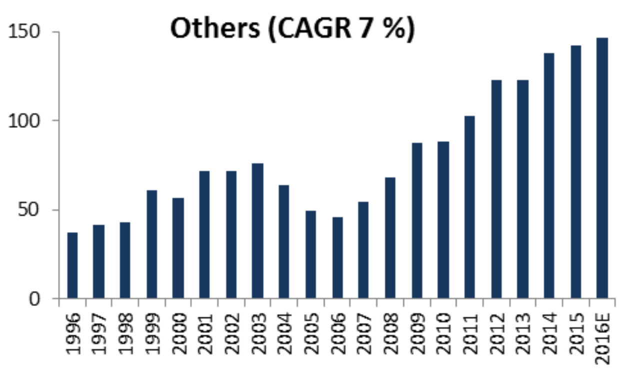
3.1 Historic total harvest of Atlantic salmon 1996-2016E

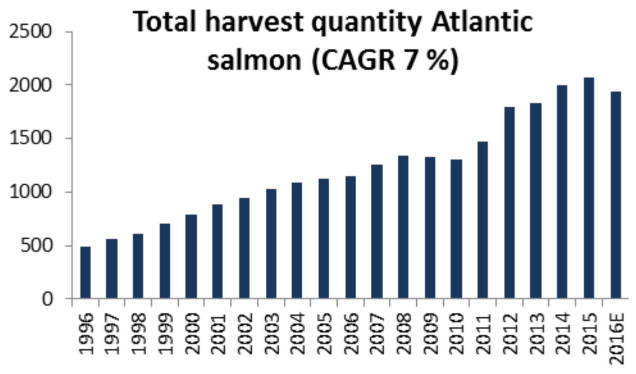












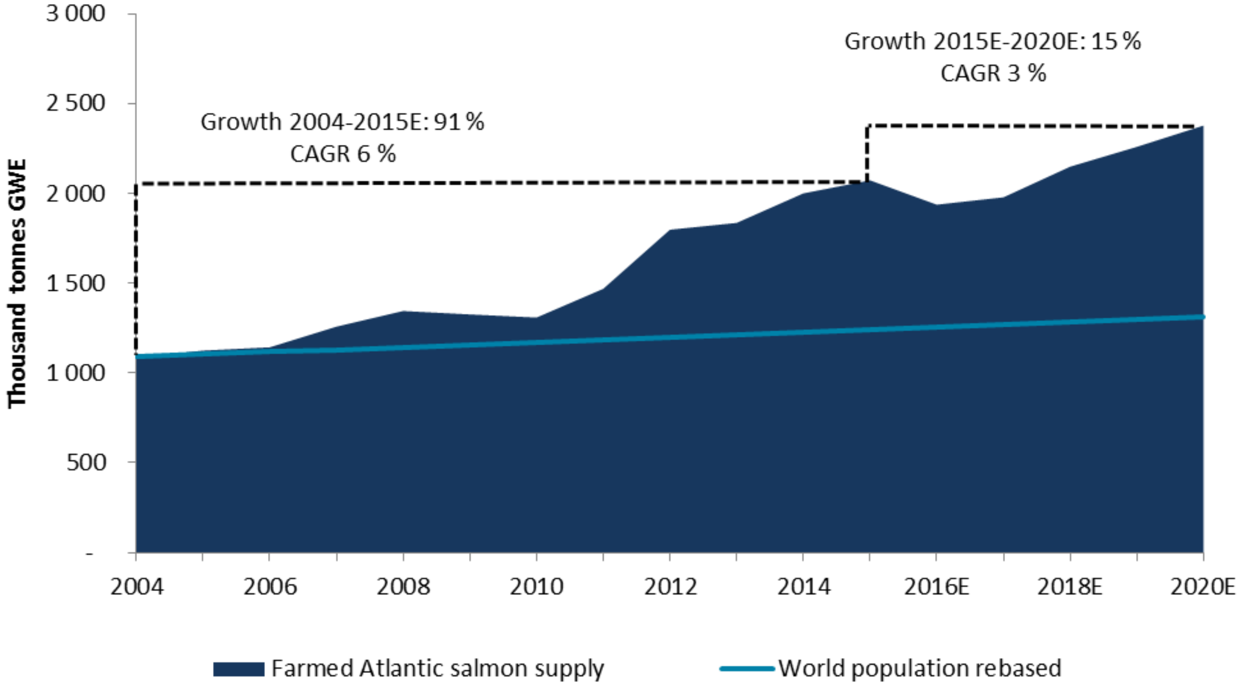
CAGR	Norway	Chile	UK	North America	Others	Total
1996-2016E	7 %	9 %	4 %	5 %	7 %	**7 %**
2005-2016E	7 %	2 %	3 %	3 %	10 %	**5 %**
2010-2016E	4 %	24 %	3 %	2 %	9 %	**7 %**

Note: Figures are in thousand tonnes GWE and “Others” includes the Faroe Islands, Ireland, Tasmania, Iceland and Russia.

Source: Kontali Analyse

3. Salmon Supply

3.2 Diminishing growth expected going forward



Supply of Atlantic salmon has increased by 417% since 1995 (annual growth of 9%). The annual growth has diminished in recent years and the annual growth has been 6% in the period 2004-2015E. Kontali Analyse expects growth to diminish further going forward and has projected a 3% annual growth from 2015 to 2020.

The background for this trend is that the industry has reached a production level where biological boundaries are being pushed. It is therefore expected that future growth can no longer be driven by industry/regulators decisions alone, but be subject to implementation of means to reduce the industry's biological footprint. This requires progress in technology, development of improved pharmaceutical products, implementation of non-pharmaceutical techniques, improved industry regulations and intercompany cooperation.

Too rapid growth without these conditions being met adversely impacts biological indicators, costs, and in turn output.

Note: Marine Harvest does not provide guidance of industry supply except from guidance depicted in quarterly presentations.

Sources: Kontali Analyse, Population Division of the Department of Economic and Social Affairs of the United Nations, World Population Prospects: The 2015 Revision

3. Salmon Supply

3.3 Few coastlines feasible for salmon farming

The main coastal areas adopted for salmon farming are depicted on the above map. The coastlines are within certain latitude bands on the Northern and Southern Hemisphere.

A key condition is a temperature range between north of zero and 18-20ºC. The optimal temperature range for salmon is between 8 and 14ºC.

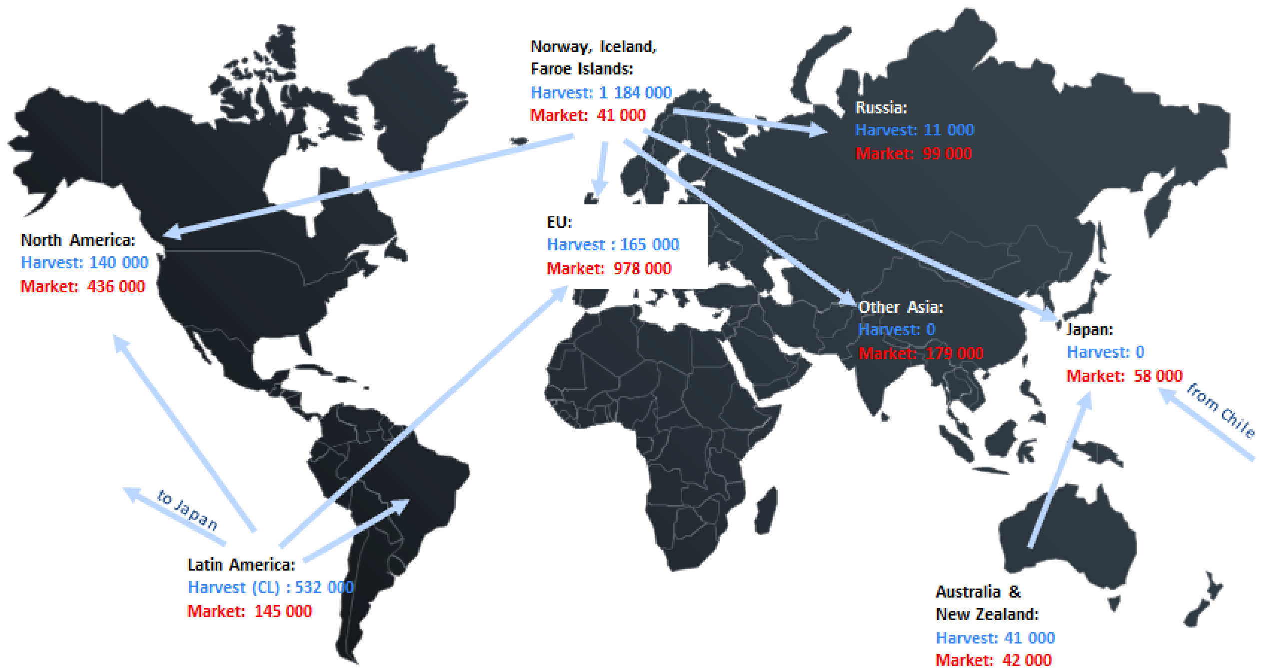
Salmon farming also requires a certain current in order to exchange the water. The current must however be below a certain level to allow the fish to move freely around in the sites. Such conditions are typically found in waters protected by archipelagos and fjord. This condition is prohibitive for several coastlines.

Certain biological parameters are also required to allow efficient production. The biological conditions vary significantly within the adopted areas and are prohibitive for certain other areas.

Political willingness to allow for salmon farming and to regulate the industry is also required. Licence systems have been adopted in all areas where salmon farming is carried out.

4. Salmon Markets

4.1 Global trade flow of farmed Atlantic salmon



Historically, the main market for each production origin has been:

- Norway – EU, Russia and Asia
- Chile – USA, South America and Asia
- Canada – USA (west coast)
- Scotland – mainly domestic/within the UK (limited export)

Each producing region has historically focused on developing the nearby markets. As salmon is primarily marketed as a fresh product, time and cost of transportation has driven this trend.

A relatively high price differential is therefore required to justify trade from cross Atlantic trade as this requires the cost of airfreight. Such trade varies from period to period and depends on arbitrage opportunities arising from short term shortage and excess volume from the various producing countries.

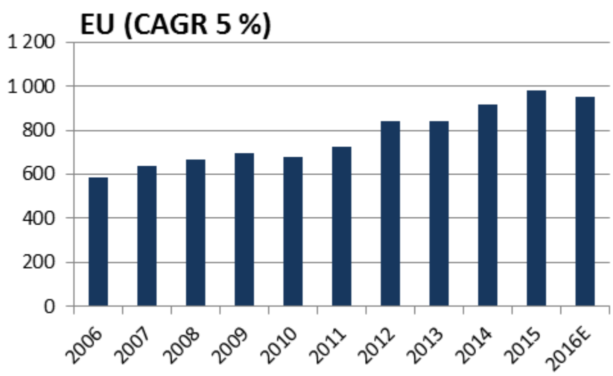
The Asian market is generally shared by all the producing regions as the transportation cost is quite similar from all origins.

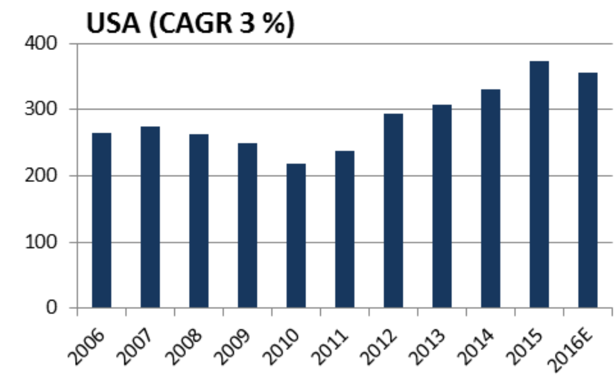
The degrees of freedom with respect to distribution of frozen salmon is obviously much greater. This category is however diminishing.

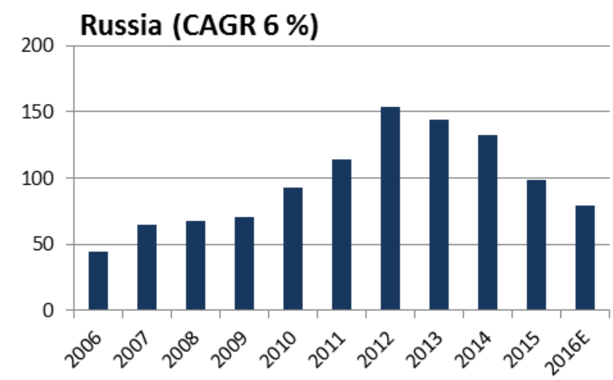
Note: Figures are from 2015 and in thousand tonnes GWE
Source: Kontali Analyse

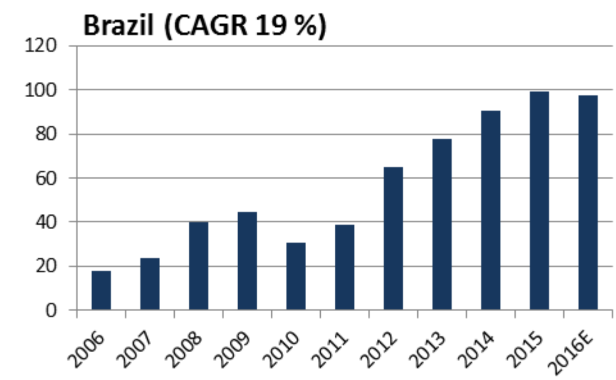
4. Salmon Markets

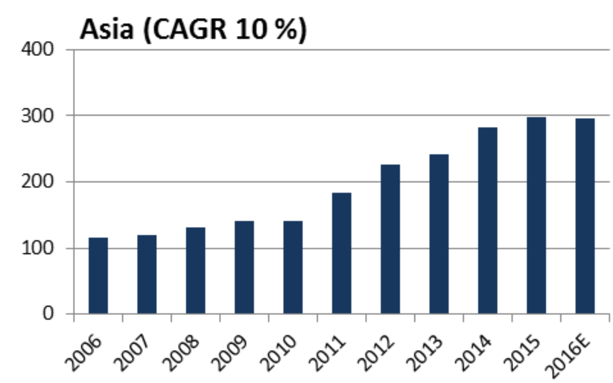
4.2 Farmed Atlantic salmon by market

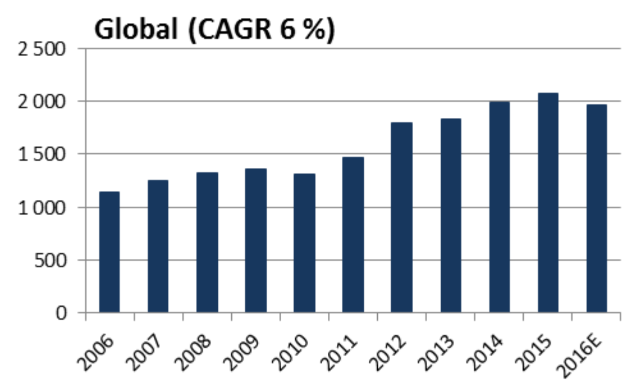










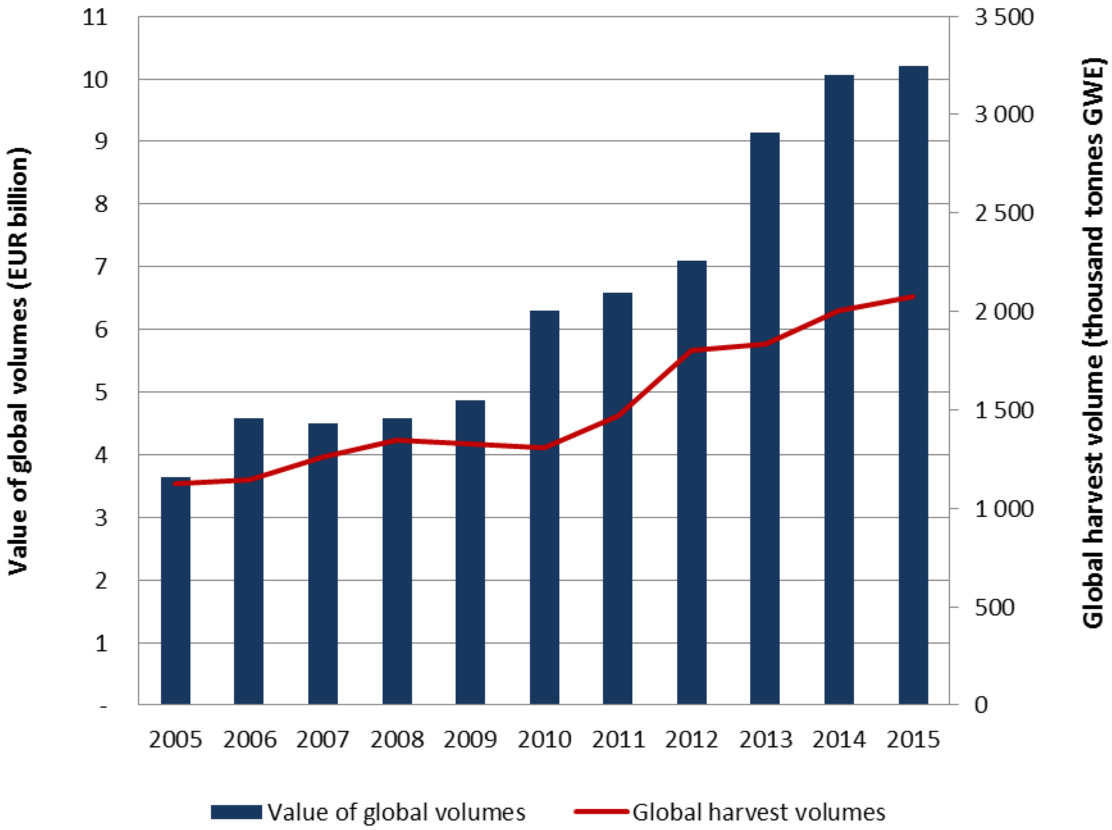


Europe (incl. Russia) and North America are by far the largest markets for Atlantic salmon. However, emerging markets are growing at significantly higher rates than these traditional markets. As all harvested fish is sold and consumed in the market, the demand beyond 2015 is assumed equal to supply (estimated by Kontali Analyse). The market for Atlantic salmon has, on average, increased by 6.2% in all markets the last 10 years and by 8.6% the last 20 years.

Source: Kontali Analyse

4. Salmon Markets

4.3 Development of value vs. volume

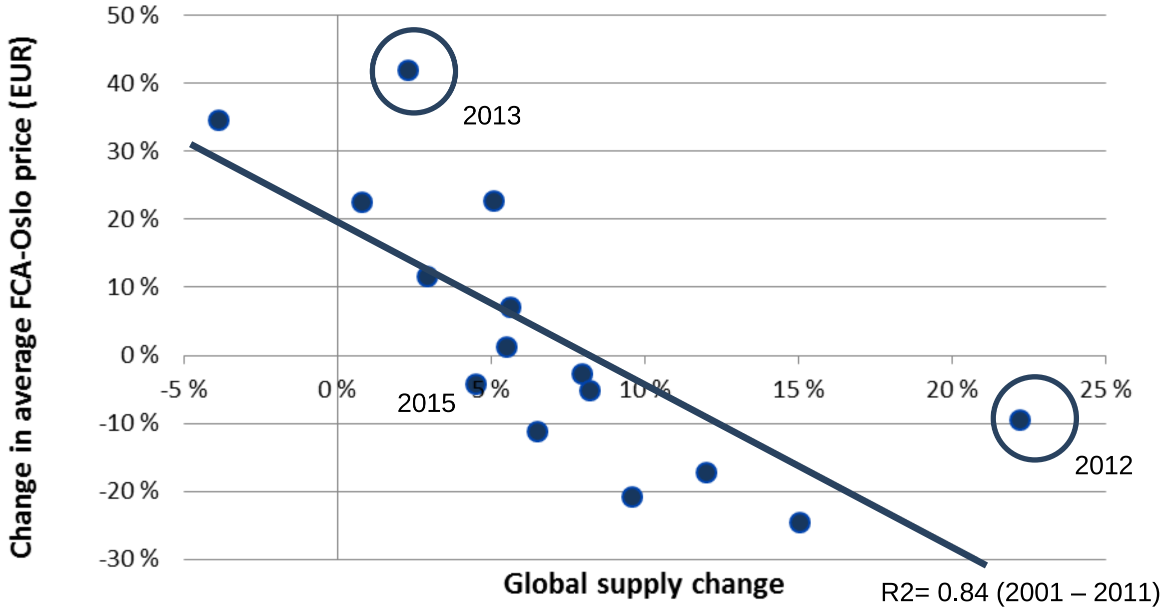


When applying a blend of the reference prices, the value of salmon sold has almost tripled since 2005. During the same period the underlying volume has only grown by 84% (CAGR 6%). This is a good illustration for the strong underlying demand for the product.

Source: Kontali Analyse

4. Salmon Markets

4.4 Price neutral demand growth - historically 6-8%



	Global supply growth YOY	Change in avg price FCA Oslo
2001	15 %	-25 %
2002	8 %	-3 %
2003	7 %	-11 %
2004	6 %	7 %
2005	5 %	23 %
2006	1 %	23 %
2007	10 %	-21 %
2008	5 %	1 %
2009	3 %	12 %
2010	-4 %	35 %
2011	12 %	-17 %
2012	22 %	-10 %
2013	2 %	42 %
2014	8 %	-5 %
2015	5 %	-4 %

Combining the data gives a linear correlation between change in global supply and change in the Nasdaq price from Norway. This relation had an explanatory power of 84% of the annual price development between 2000 and 2011. In 2012 and 2013 demand for salmon significantly overperformed.

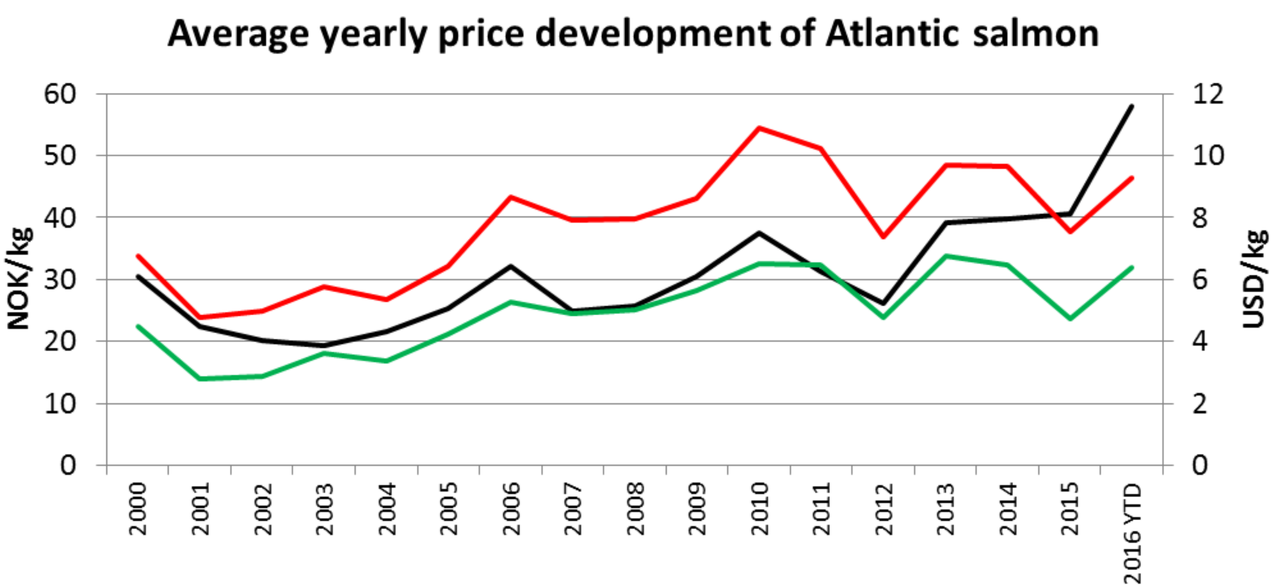
The price correlation across regional markets is generally strong for Atlantic salmon.

Growth in global supply of Atlantic salmon is estimated to 168% in the period 2000-2015 (annual CAGR 7%), varying between -4% and 22% annually. Variation in growth rates has been the main determinant for the variation in prices. Annual average prices have varied between EUR 2,42 (2003) and EUR 4.97 (2013).

Source: Kontali Analyse

4. Salmon Markets

4.5 Supply and demand – historic prices



Due to the long production cycle and the short shelf life of the fresh product (about 3 weeks), the spot price clears on the basis of the overall price/quantity preference of customers.

As fish, and therefore salmon, is perishable and marketed fresh, all production in one period has to be consumed in the same period. In the short term, the production level is difficult and expensive to adjust as the planning/production cycle is three years long. Therefore, the supplied quantity is very inelastic in the short term, while also demand is shifting somewhat with the season. This has a large effect on the price volatility in the market.

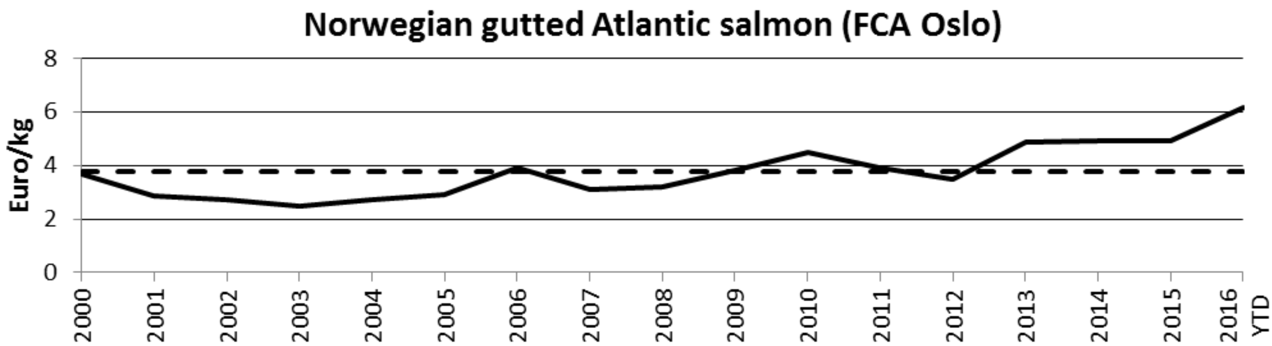
Factors affecting market price for Atlantic salmon are:

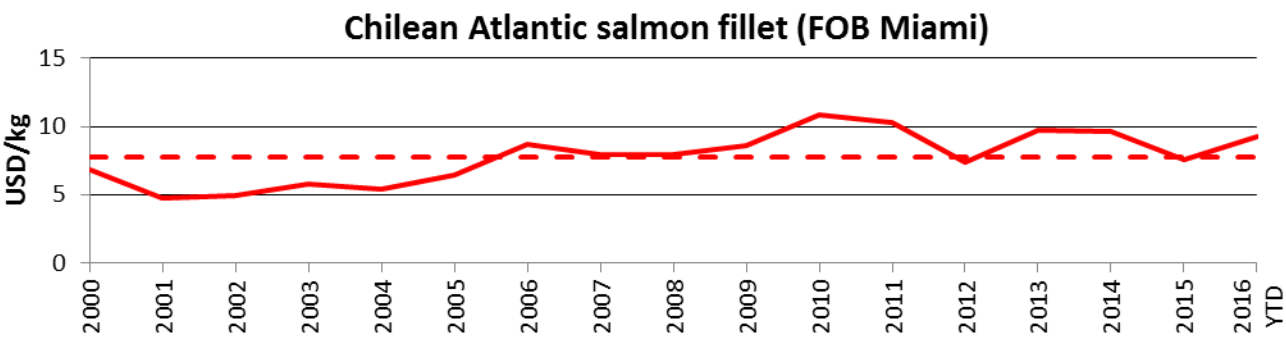
- Supply (absolute and seasonal variations)
- Demand (absolute and seasonal variations)
- Globalisation of the market (arbitrage opportunities between regional markets)
- Presence of sales contracts reducing quantity availability for the spot market
- Flexibility of market channels
- Quality
- Disease outbreaks
- Food scares

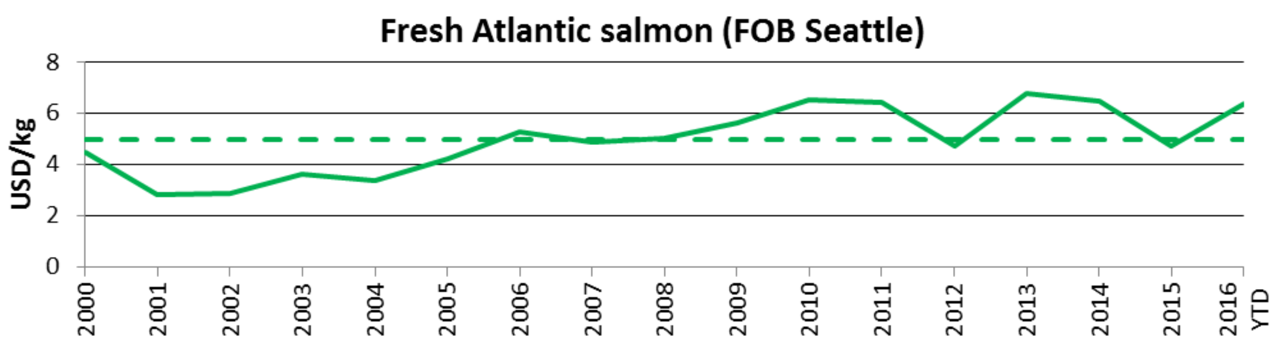
Comparing FCA Oslo, FOB Miami and FOB Seattle, there are clear indications of a global market as the prices correlate to a high degree.

Source: Kontali Analyse

4.6 Historic price development by local reference prices

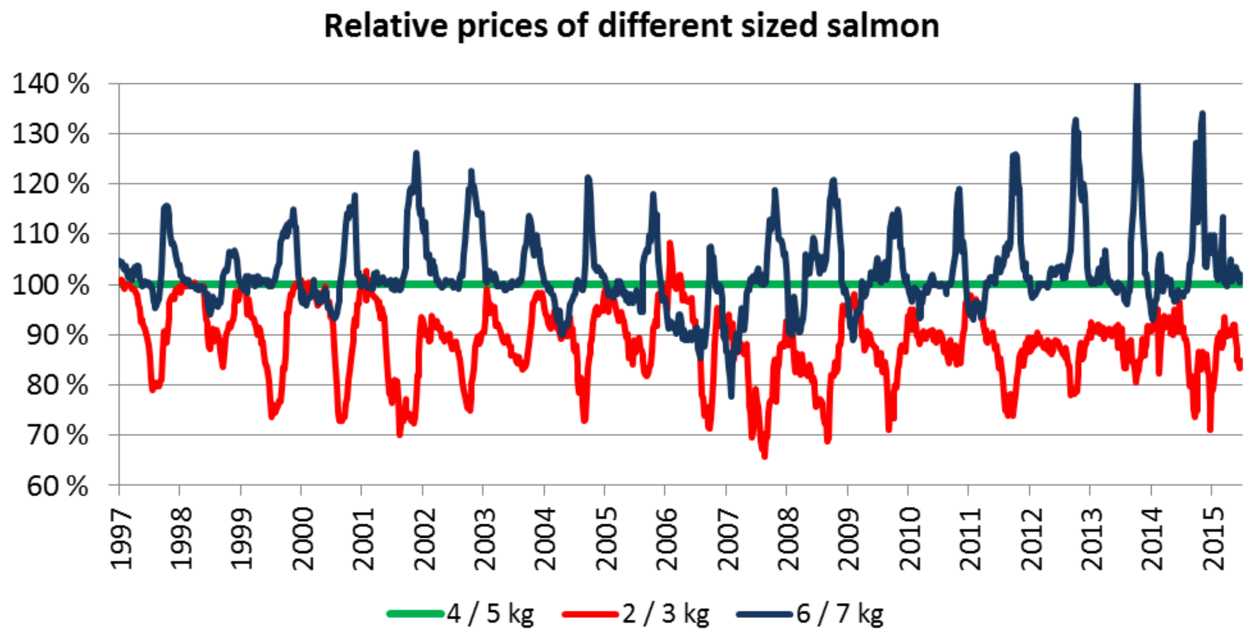






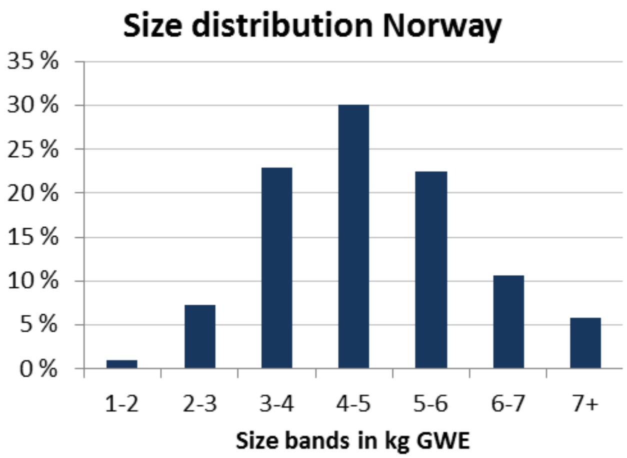
The three graphs shows yearly average prices of salmon from 2000 to April 2016. As in most commodity industries, the producers of Atlantic salmon are experiencing large volatility in the price achieved for the product. The average price (GWE based) for Norwegian whole salmon since 2000 has been about EUR 3.77/kg (NOK 29.79/kg), for Chilean salmon fillet (2-3lb) USD 3.51/lb (USD 7.76/kg), and for Canadian salmon (8-10lb) USD 2.22/lb (USD 4.96/kg). The pricing of Scottish and Faroese salmon is linked to the price of Norwegian salmon. The price of Scottish salmon has normally gained a premium of EUR 0.4-0.6/kg (NOK 3-5/kg) to Norwegian salmon. The price of the Faroese salmon used to trade with a small discount versus Norwegian salmon. However, due to geopolitical events in recent years salmon from Faroes has received a premium to Norwegian salmon in selected markets.

Source: Kontali Analyse



The most normal market size for a salmon is 4/5 kg GWE. The reason for the different sized fish is mainly because salmon farming is a biological production process, where the fish has different growth cycles and the biomass represents a normal distributed size variation.

The markets for the different sizes vary, as can be seen in the above graph. The processing industry in Europe mainly uses 3-6 kg GWE but there are niche markets for small and large fish. As these markets are minor compared to the main market, they are easily disrupted if quantities become too high. Generally, small fish sizes are discounted and large sized fish are sold at premium.



In Norway over the past 5 years, we have seen a normal distribution on harvest size about the mean of 4-5 kg (GWE), where market risk and biological risk are balanced out. Drivers behind a smaller size can for instance be disease, early harvest when there is a need for cash flow or early harvest to realise ongoing capacity. Larger fish (6-7kg +) may be a result of economies of scale/lower production costs, production for niche markets or other market requirements.

Source: Kontali Analyse

5. Industry Structure

5.1 Top 5-10 players of farmed Atlantic salmon

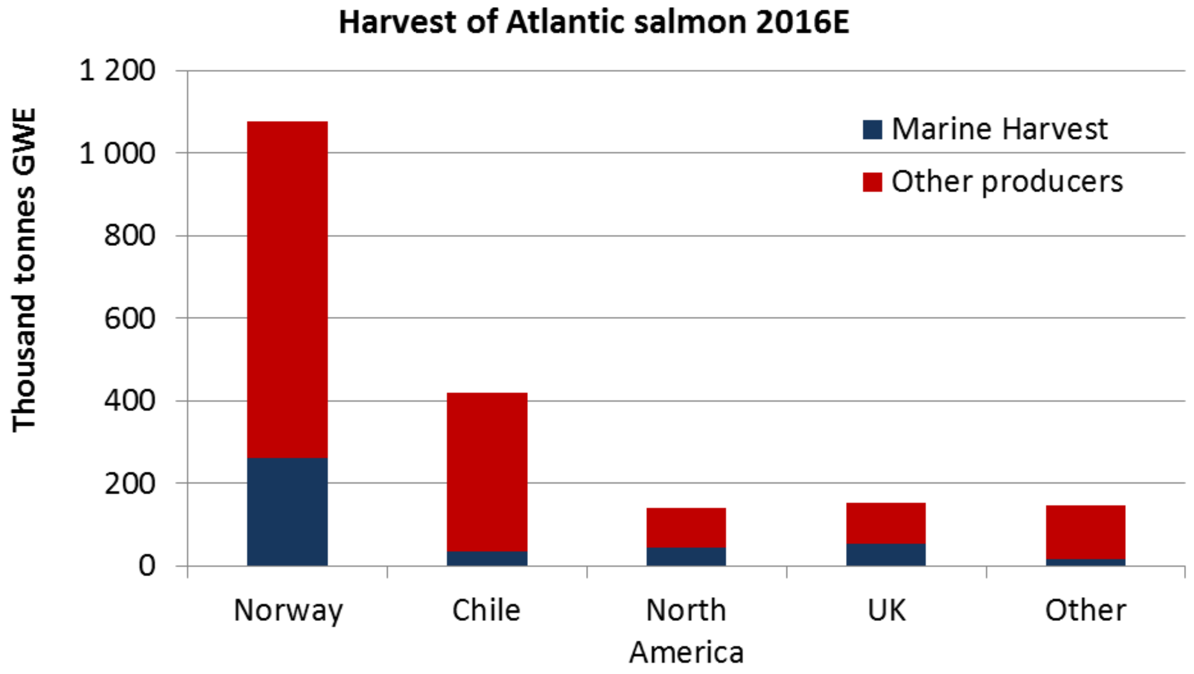
	Top 10 Norway	Harvest	Top 5 UK [1)]	Harvest	Top 5 North America [1)]	Harvest	Top 10 Chile	Harvest
1	Marine Harvest	254 800	Marine Harvest	50 100	Cooke Aquaculture	42 000	Empresas Aquachile	63 000
2	Salmar	136 400	Scottish Seafarms	27 000	Marine Harvest	40 100	Marine Harvest	62 500
3	Lerøy Seafood	135 000	The Scottish Salmon Co.	25 600	Mitsubishi (Cermaq)	21 000	Mitsubishi	60 000
4	Mitsubishi (Cermaq)	58 000	Cooke Aquaculture	19 000	Grieg Seafood	14 300	Salmones Multiexport	51 000
5	Nordlaks	39 000	Grieg Seafood	16 400	Northern Harvest	13 000	Camanchaca	39 000
6	Nova Sea	37 400					Australis Seafood	38 100
7	Midt-Norsk / Bjørøya	32 000					Pesquera Los Fiordos	30 000
8	Grieg Seafood	31 700					Blumar	25 800
9	Norway Royal Salmon	27 900					Cooke Aquaculture	25 000
10	Alsaker Fjordbruk	27 000					Ventisqueros	22 000
	Top 10	779 200	Top 5	138 100	Top 5	130 400	Top 10	416 400
	Total	1 110 800	Total	149 700	Total	139 900	Total	531 800
	Total	70 %	Total	92 %	Total	93 %	Total	78 %

Note: All figures in tonnes GWE for 2015

1) UK and North American industry are best described by top 5 producers.

The Marine Harvest Group represents the largest total production and holds about one quarter of the quantity in Norway, and about one third of the quantity in North America and UK.

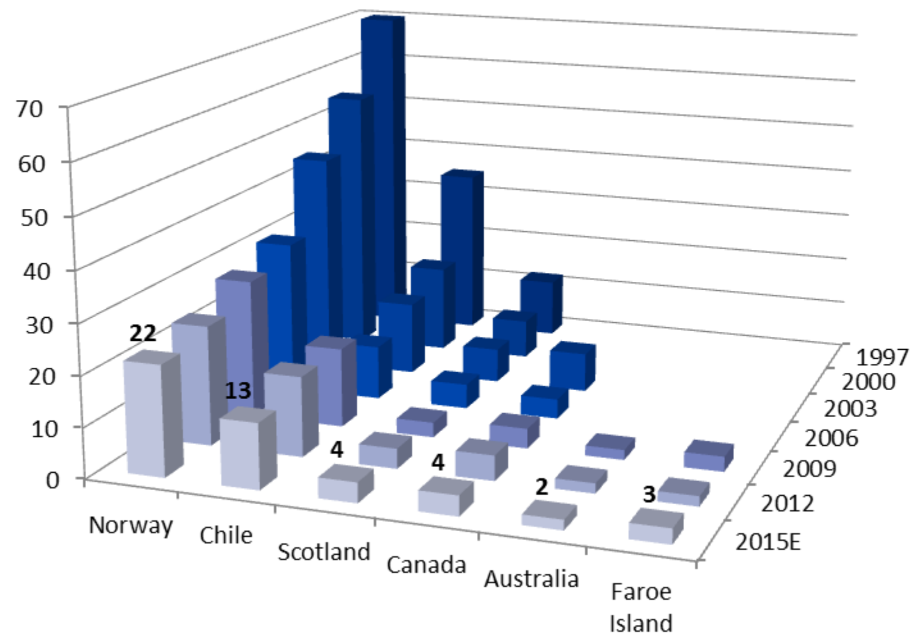
In Norway and Chile there are several more companies with a significant production quantity of Atlantic salmon. In Chile, several of the companies also produce other salmonids, such as coho and large trout.



Note: 2016E volumes are Marine Harvest's guiding figures.

Source: Kontali Analyse, Marine Harvest, Quarterly reports

5. Industry Structure
5.2 Number of players in producing countries



The graph shows the number of players producing 80% of the farmed salmon and trout in each major producing country.

During the last decade the salmon farming industry has been through a period of consolidation in all regions. The consolidation of the industry is expected to continue.

Historically, the salmon industry has been made up by many, small firms. As illustrated above, this has been the case in Norway, and to some degree in Scotland and Chile.

The higher level of fragmentation in Norway compared to Chile is the result of the Norwegian government's priority to decentralised structures and local ownership. In Chile the government put fewer demands on ownership structures in order to grow the industry faster.

There are a total of 151 companies owning commercial licenses for salmon and trout in Norway, however some of these are controlled by other companies. So the total number of companies producing 100% of the supply in Norway is 98 (through themselves or subsidiaries).

There are close to 1,350 commercial licenses granted for the on-growing of Atlantic salmon, Trout and Coho in Chile. The 20 largest license-holding companies, represent approximately 87% of these, while the 10 largest account for 2/3's of the total number. Out of the total number of licenses, only between 300-350 are in operation.

Note: See appendix for some historical acquisitions and divestments
Source: Kontali Analyse

6.1 Establishing a salmon farm

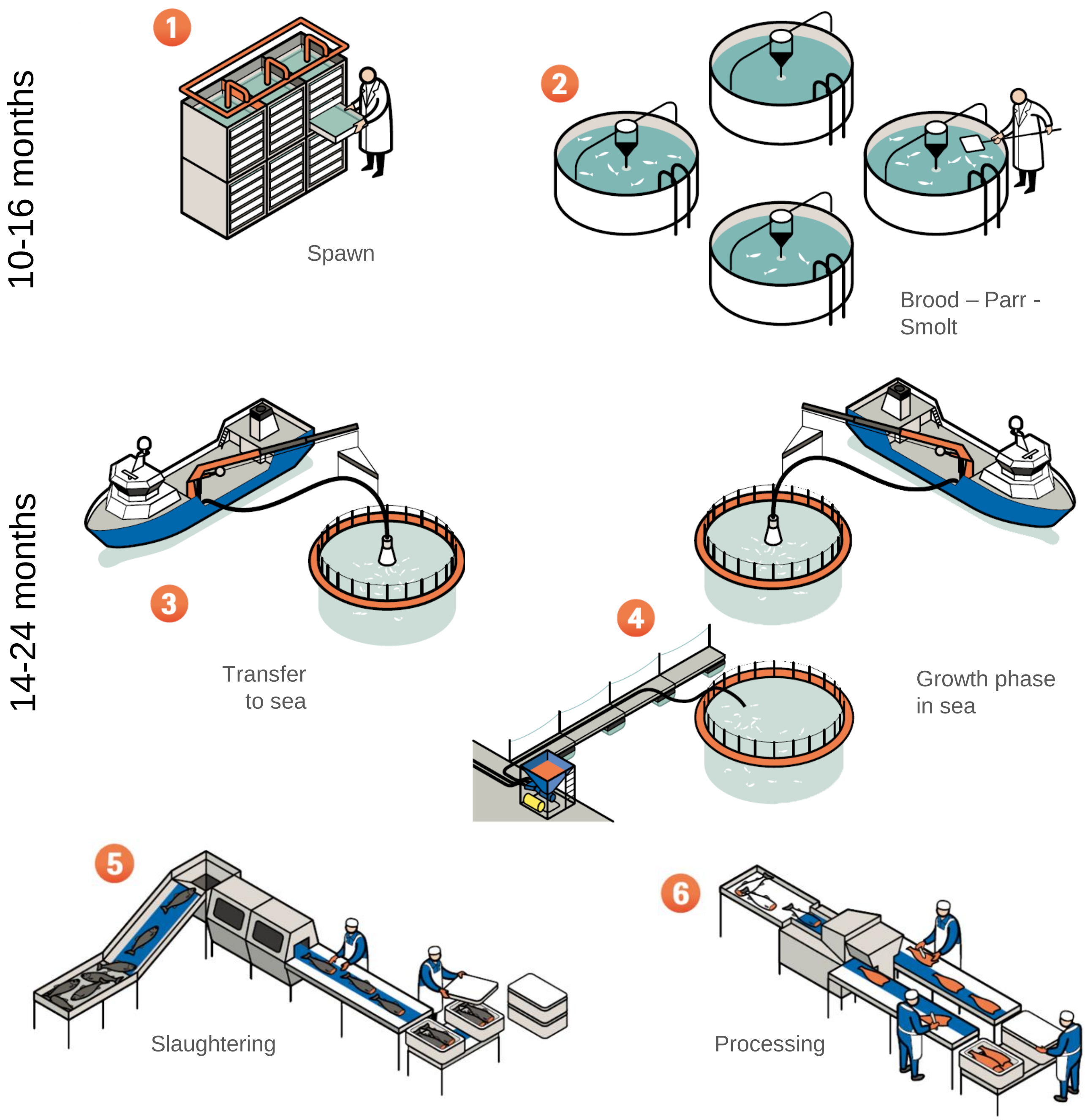
The salmon farming production cycle is about 3 years. During the first year of production the eggs are fertilised and the fish is grown into approx. 100 grams in controlled freshwater environment.

Subsequently, the fish is transported into seawater cages where it is grown out to approx. 4-5 kg during a period of 14-24 months. The growth of the fish is heavily dependent on the seawater temperatures, which varies by time of year and across regions.

Having reached harvestable size, the fish is transported to primary processing plants where it is slaughtered and gutted. Most salmon is sold gutted on ice in a box (GWE).

6. Salmon Production and Cost Structure

6.2 The Atlantic salmon life/production cycle



Note: See appendix for a more detailed illustration of the production cycle.
Source: Marine Harvest

6. Salmon Production and Cost Structure

6.2 The Atlantic salmon life/production cycle

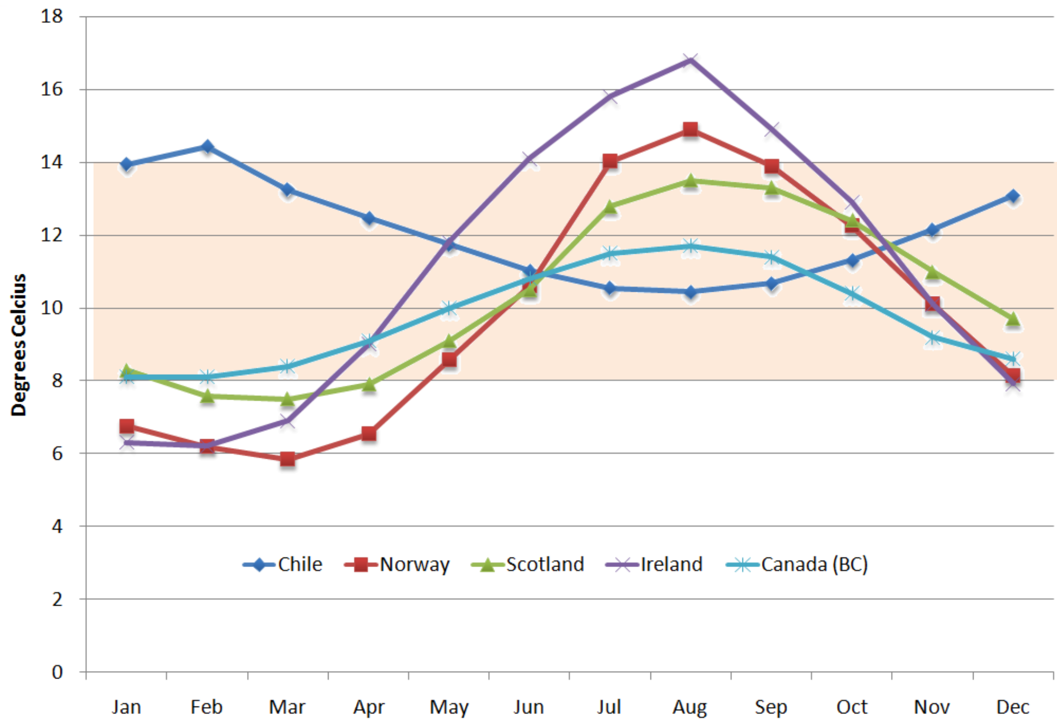
The total freshwater production cycle takes approximately 10-16 months and the total seawater production cycle take approximately 14-24 months, hence a total cycle length of 24-40 months. In Chile, the cycle is slightly shorter as the sea water temperatures are more optimal.

In autumn, the broodstock are stripped for eggs and the ova inlay happens between November and March. The producer has the possibility to speed up the growth of the juveniles with light manipulation to accelerate the smoltification process by up to 6 months.

In Norway, smolt is mainly released into seawater twice a year. Harvesting volume is spread evenly throughout most of the year, although harvesting quantity is largest in the last quarter of the year as this is the period of best growth. During summer, the supply to the market is significantly different than the rest of the year as the harvesting pattern shift generation. During this time the weight dispersion between the large and small harvested salmon is greater than the rest of the year.

After a site is harvested, the location is fallowed between 2 and 6 months before the next generation is put to sea at the same location. Smolt may be released in the same location with a two year cycle.

Source: Marine Harvest



The sea water temperatures vary much throughout the year in all production regions. While the production countries on the Northern hemisphere see low temperatures during the beginning of the year, and high temperatures in autumn varying with as much as 10ºC, the temperature in Chile is more stable varying between 10ºC and 14ºC. Chile has the highest average temperature of 12ºC, while Ireland has 11ºC and the three other regions have an average temperature of about 10ºC.

As the salmon is a cold-blooded animal (ectotherm), the temperature plays an important role for its growth rate. The optimal temperature range for Atlantic salmon is 8-14ºC, illustrated by the shaded area on the graph. Temperature is one of the most important natural competitive advantages that Chile has compared to the other production regions as the production time historically has been shorter by a few months.

With high seawater temperatures, disease risk increases, and with temperatures below 0ºC, mass mortality, both of which causes growth rate to fall.

Sources: Marine Harvest, www.seatemperature.org

Eggs

There are several suppliers of eggs to the industry. Aquagen AS, Fanad Fisheries Ltd, Lakeland and Salmobreed AS are some of the most significant by quantities. Egg suppliers can tailor their production to demand by obtaining more or less fish for breeding during the preceding season. Production can easily be scaled. The market for salmon eggs is international.

Smolt

The majority of smolt are produced ”in-house” by vertically integrated salmon farmers. This production is generally captive, although a proportion may also be sold to third parties. A smolt is produced over a 6-12 months period from the eggs are fertilised to a mature smolt with weight of 60-100 grams. There has been a trend that smolts (post smolt) are increasing in size in order to shorten the time at sea (100-1,000 grams)

Labour

According to Nofima there were over 9 600 full time employees in the aquaculture industry in Norway in 2013. The employment effect of derived activities of aquaculture purchases are nearly 15 000 employees. In total there are over 24 000 full time employees either directly or indirectly as a result of the aquaculture industry in Norway.

According to Scotland Salmon Producers Organisation (SSPO), over 2 500 people are employed in salmon production in Scotland. The Scottish Government estimates that over 8 000 jobs are generated directly or indirectly by the aquaculture industry.

Estimates on Canadian employment say that around 15 000 people are employed in aquaculture, where 6 000 are based in British Colombia.

Direct employment in Chilean aquaculture (incl. processing) is estimated to around 30 000 people in 2014.

The Marine Harvest Group has a total of 12 454 employees in 23 countries worldwide (31 Dec 2015).

In Norway, both salaries and levels of automation are highest, while the opposite is the case in Chile. Salaries in UK and Canada are somewhat lower than in Norway.

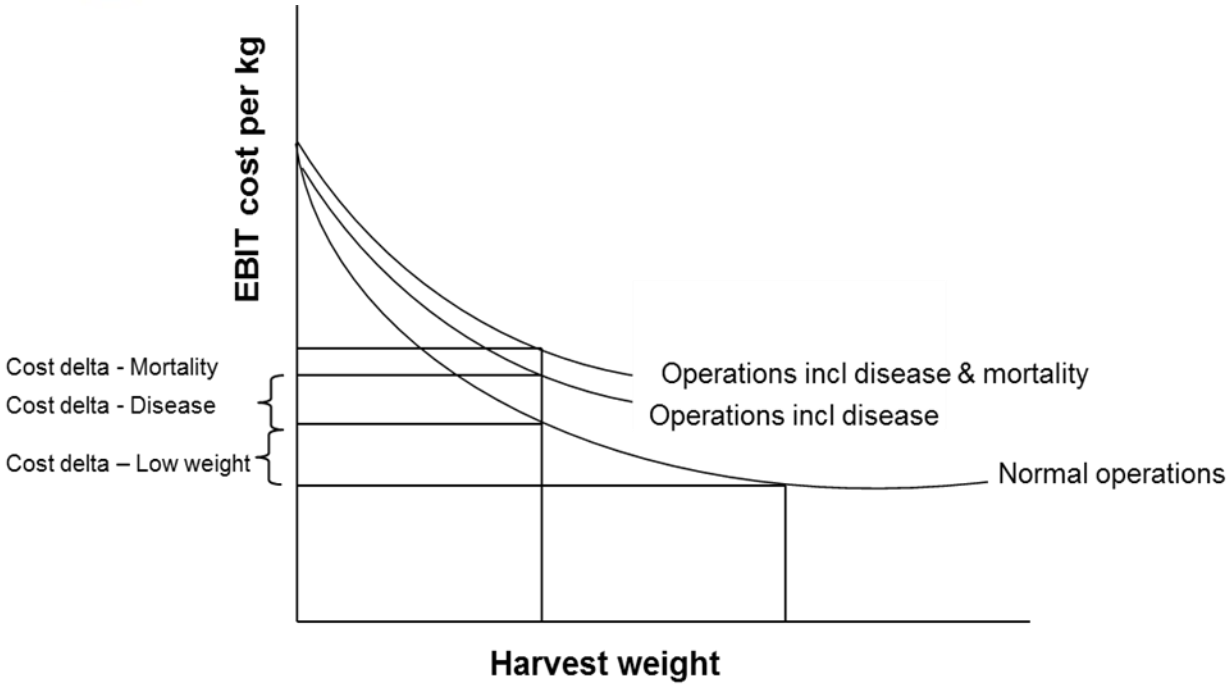
Electricity

Electricity is mainly used in the earliest and latest stage in the salmon's life cycle. To produce a good quality smolt, production normally takes place in tanks on land where the water temperature is regulated and/or recirculated which requires energy (4-5% of smolt cost in Norway). The cost of energy consumption will depend on the price of electricity and the temperature. A cold winter will demand more electricity going into heating of the water used in the smolt facility. The size of the smolt will also affect the electricity consumption as larger smolt has a longer production cycle in the smolt facility. When the salmon is processed energy is consumed. However, this depends on the level of automation (2-3% of harvest cost in Norway).

Sources: Marine Harvest, Kontali Analyse, SSPO, Estudio Situación Laboral en la Industria del Salmón" Silvia Leiva 2014

6. Salmon Production and Cost Structure

6.5 Cost component – disease and mortality



EBIT costs per kg decline with increasing harvest weight. If fish is harvested at a lower weight than optimal (caused by for example diseases), EBIT costs per kg will be higher.

During the production cycle, some mortality will be observed. Under normal circumstances, the highest mortality rate will be observed during the first 1-2 months after the smolt is put into seawater, while subsequent stages of the production cycle normally has a lower mortality rate.

Elevated mortality in later months of the cycle is normally related to outbreaks of disease, treatment of sea lice or predator attacks.

There is no strict standard for how to account for mortality in the books, and there is no unified industry standard. Three alternative approaches are:

- Charge all mortality to expense when it is observed
- Capitalise all mortality (letting the surviving individuals carry the cost of dead individuals in the balance sheet when harvested)
- Only charge exceptional mortality to expense (mortality, which is higher than what is expected under normal circumstances)

It is not possible to perform biological production without any mortality. By capitalising the mortality cost, the cost of harvested fish will therefore reflect the total cost for the biomass that can be harvested from one production cycle.

Biological assets are measured at fair value less cost to sell, unless the fair value cannot be measured reliably.

Effective markets for sale of live fish do not exist so the valuation of live fish implies establishment of an estimated fair value of the fish in a hypothetical market. The calculation of the estimated fair value is based on market prices for harvested fish and adjusted for estimated differences. The prices are reduced for harvesting costs and freight costs to market, to arrive at a net value back to farm. The valuation reflects the expected quality grading and size distribution. The change in estimated fair value is recognised in profit or loss on a continuous basis, and is classified separately (not included in the cost of the harvested biomass). On harvest, the fair value adjustment is reversed on the same line.

The biomass valuation includes the full estimated fair value of fish at and above harvest size (4 kg LW). For fish between 1 kg and 4 kg LW a relative share of future value is included. The best fair value estimate for fish below 1 kg, smolt and broodstock is considered to be accumulated cost. The valuation is completed for each business unit and is based on biomass in sea for each sea water site. The fair value reflects the expected market price. The market price is derived from a variety of sources, normally a combination of achieved prices last month and the most recent contract entered into. For Marine Harvest Norway, quoted forward prices (Fish Pool) are also included in the calculation.

Operational EBIT

Operational EBIT and other operational results are reported based on the realised costs of harvested volume and do not include the fair value adjustments on biomass.

The salmon farming industry is capital intensive and volatile. This is a result of a long production cycle, a fragmented industry, market conditions and a biological production process, which is affected by many external factors.

Over time, production costs have been reduced and productivity has increased as new technology and new competence has been achieved. In recent years, costs have trended upwards due to several factors including rising feed costs, biological costs and more stringent regulatory compliance procedures.

Reported revenues: Revenues are a gross figure; they can include invoiced freight from reference place (e.g. FCA Oslo) to customer, and have discounts, commissions and credits deducted. Reported revenues can also include revenues from trading activity, sales of by-products, insurance compensation, gain/loss on sale of assets etc.

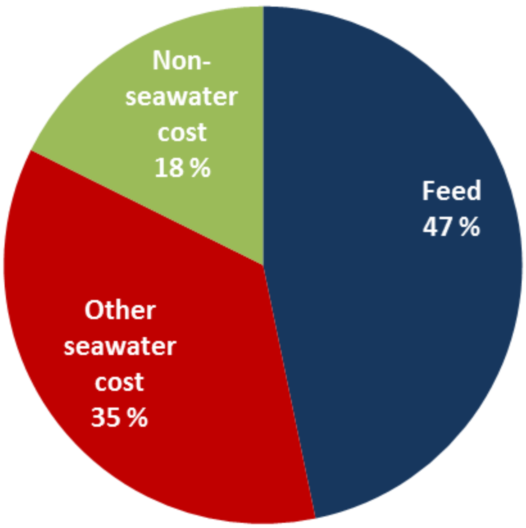
Price: Reported prices are normally stated in the terms of a specific reference price e.g. the Nasdaq price for Norway (FCA Oslo) and UB price for Chile (FOB Miami). Reference prices are not reflecting freight, and other sales reducing items mentioned above. Reference prices are for one specific product (Nasdaq price = sales price per kg head on gutted fish packed fresh in a standard box). Sales of other products (frozen products, fresh fillets and portions) will cause deviation in the achieved prices vs. reference price. Reference prices are for superior quality fish, while achieved prices are for a mix of qualities, including downgrades. Reference prices are spot prices, while most companies will have a mix of spot and contract sales in their portfolio.

Quantity: Reported quantity can take many forms. Quantity harvested = Fish harvested in a specific period in a standardized term; e.g. Gutted Weight Equivalent (GWE), which is the same weight measure as Head-on-Gutted (HOG), or Whole Fish Equivalent (WFE), the difference being gutting loss. Quantity sold can be reported using different weight scales:

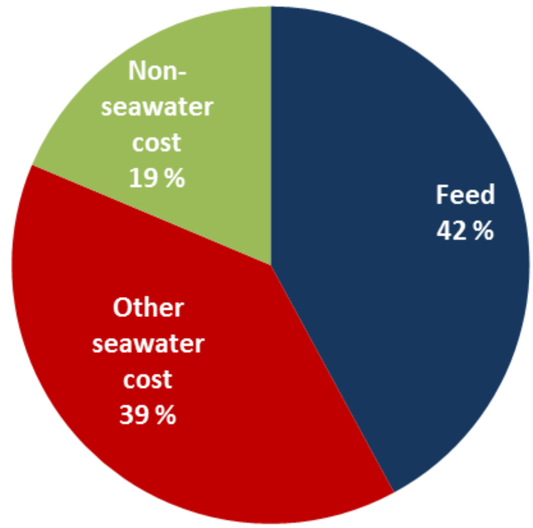
- Kg sold in product weight.
- Kg sold converted to standard weight unit (GWE or WFE).
- Quantity sold could also include traded quantity.

6.8 Cost structure for Marine Harvest in 2015

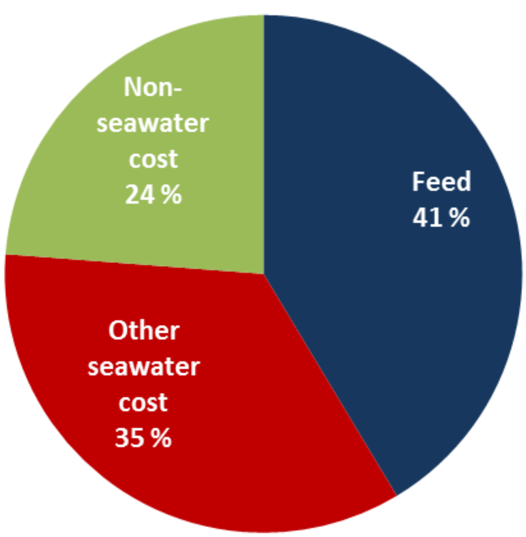
Norway (NOK)



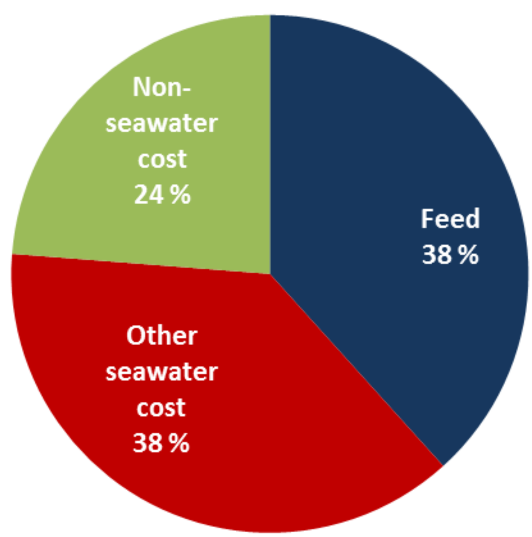
Canada (CAD)



Scotland (GBP)



Chile (USD)



Source: Marine Harvest

6. Salmon Production and Cost Structure

6.9 Production costs for Marine Harvest in 2015

The figures below illustrate the main cost components and their relative importance in the farming of salmon in the four biggest regions. The cost level is chosen for illustration purposes.

	Norway (NOK)	Canada (CAD)	Scotland (GBP)	Chile (USD)
Feed	13.34	2.41	1.40	1.96
Primary processing	2.67	0.48	0.27	0.67
Smolt	2.67	0.51	0.30	0.82
Salary	1.62	0.53	0.19	0.17
Maintenance	0.94	0.20	0.10	0.17
Well boat	0.95	0.18	0.19	0.22
Depreciation	0.78	0.23	0.13	0.17
Sales & Marketing	0.62	0.01	0.03	0.01
Mortality	0.44	0.07	0.11	0.22
Other	4.47	1.08	0.63	0.67
Total*	28.54	5.73	3.39	5.13

*GWE cost in box delivered at the processing plant including mortality

Feed: As in all animal production, feed makes up the largest share of the total cost. The variation in costs between the countries is based on somewhat different inputs to the feed, logistics and the feed conversion ratio.

Smolt: Smolt production is done in two different ways; In closed/re-circulated systems in tanks on land or in lakes. The smolt is produced in fresh water up to about 100g when the salmon through its smoltification phase gets ready to be placed in sea water. UK has the highest costs as there has been low scale production in both land based systems and tanks. Chile has historically used lakes for this production and has had cheap labour, while in Norway there has been a transfer from production in lakes to large scale production in land-based systems.

Salary: Salary level differs among the production regions but in general the salary cost is low because labour cost is a minor part of the total cost as much of the production is automated.

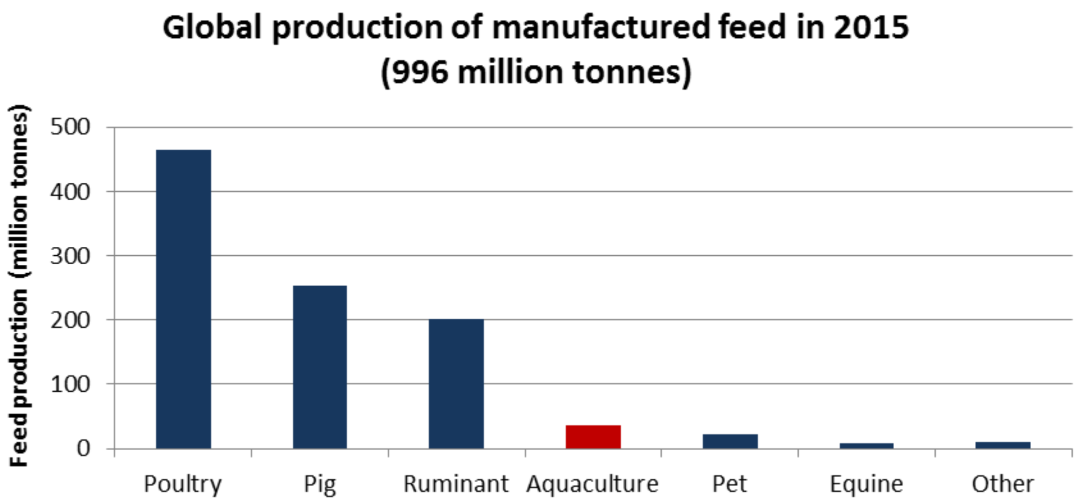
Well boat/processing: Transportation costs of live fish, slaughtering, processing and packing are all heavily dependent on quantity, logistics and automation.

Other operational costs: Other costs include direct and indirect costs, administration, insurance, biological costs (excluding mortality), etc

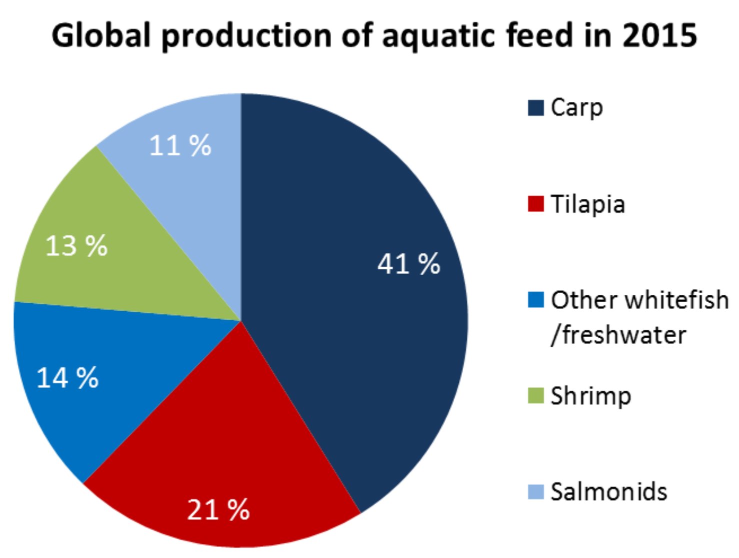
Source: Marine Harvest

7. Feed Production

7.1 Overview of feed market



The global production of manufactured feed was around 996 million tonnes in 2015. The majority is used for land living animals, where more than 90% is used in farming of poultry, pig and ruminant. Only 4%, or 35.5 million tonnes, of the global production of manufactured feed was directed at aquatic farming.

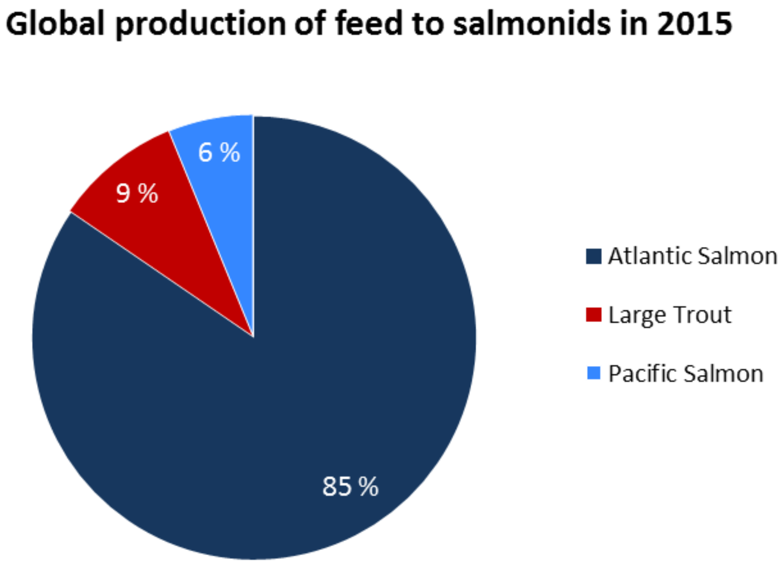


Carp is the largest segment within the global production of aquatic feed, as this is the predominant fish species globally. Feed for salmonids only account for 11% of the total production of aquatic feed.

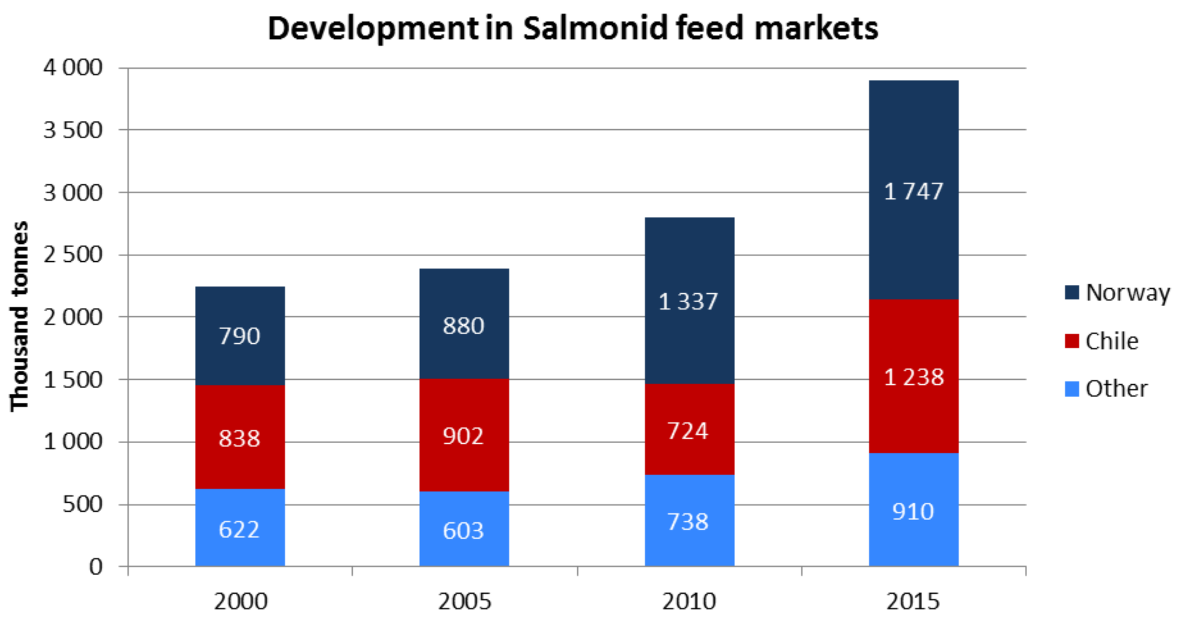
Source: Kontali Analyse

7. Feed Production

7.1 Overview of feed market



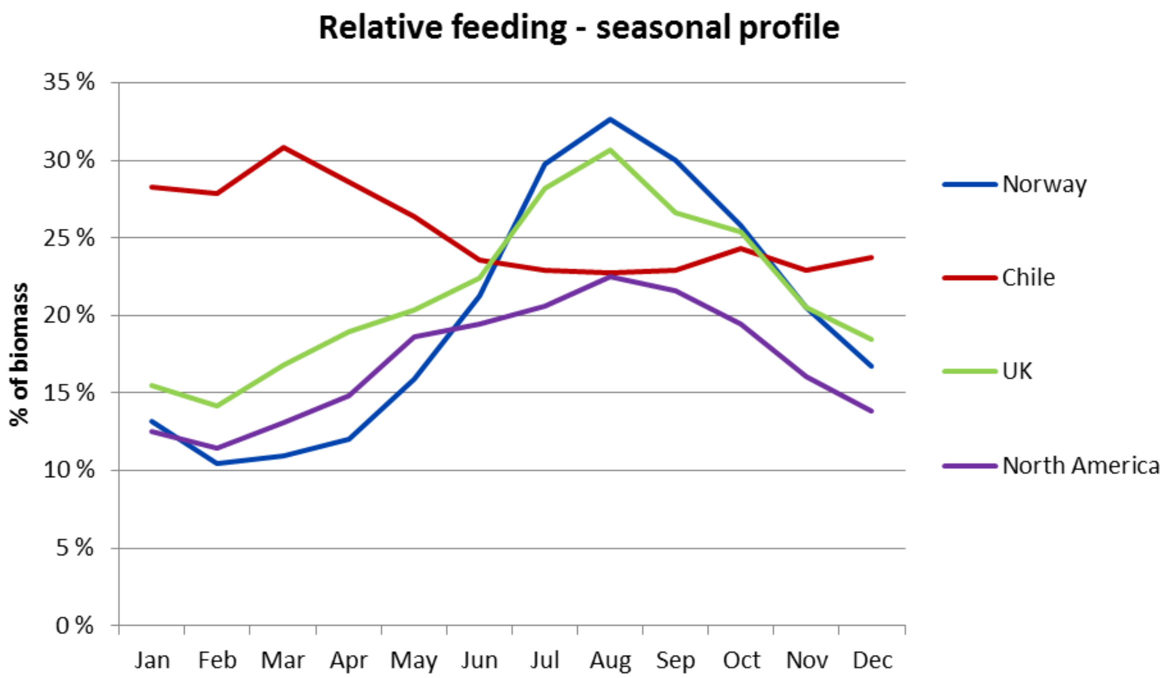
Atlantic salmon is the most farmed species within the salmonids segment, and is therefore the largest consumer of salmonid feed.



Most of the feed used in farming of salmonids is produced close to where it is farmed. Norway used 45% of the global feed directed towards the salmonid segment in 2015 and Chile used 32%.

Source: Kontali

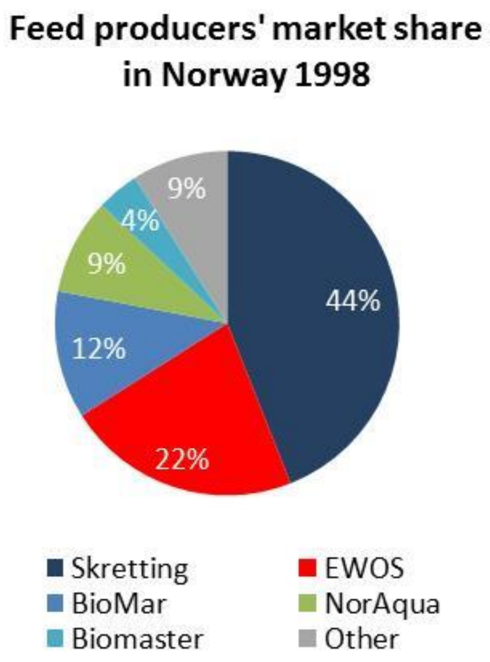
7.2 Relative feeding (*)

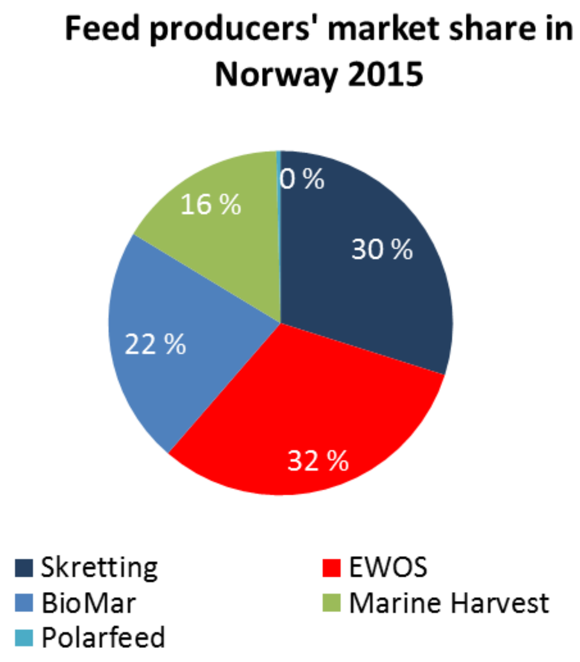


The production of feed around the world varies as there are large deviations in sea temperature. Norway has the largest seasonality in production. The low season is from February to April, the high season is from July to September, and mid season in between. The low season can be as low as only 30% of the high season. The feed is considered a perishable product with shelf life normally up to maximum one year. As the turnover of feed is usually high the shelf life is not considered an issue in large operations.

*Relative feeding: (Feed sold or fed during a month) / (Biomass per primo in month)

Source: Kontali





During the last decade, the salmonid feed industry has become increasingly consolidated. Since 2008, there has essentially been three producers controlling the majority of the salmon feed output; Skretting (subsidiary of Nutreco which has been acquired by SHV), EWOS and BioMar (subsidiary of Schouw). The companies are all operating globally.

In mid-2014, Marine Harvest commenced production of feed from its new feed plant. The plant has a capacity to produce over 310,000 tonnes vs. global salmonid feed production of ~3.9 million tonnes. Marine Harvest's market share has more than doubled between the end of 2014 to 2015.

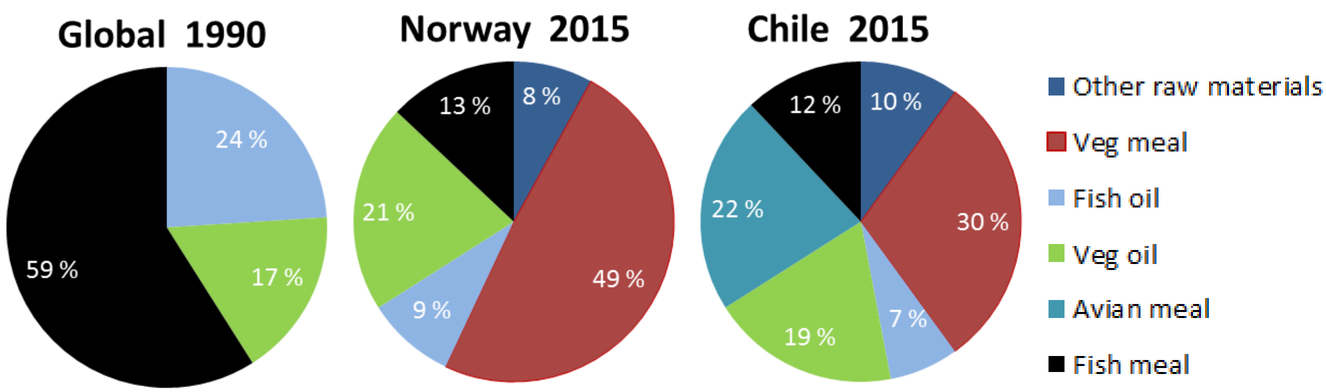
The major cost elements when producing salmonid feed are the raw materials required and production costs.

The feed producers have historically operated on cost-plus contracts, leaving the exposure of raw material prices with the aquaculture companies.

Source: Kontali Analyse, Marine Harvest

7. Feed Production

7.4 Salmon feed ingredients



Typical feeding patterns throughout the growth cycle

Growth intervals	0.1 – 0.2 kg	0.2 – 1 kg	1 – 2 kg	2 – 3 kg	3 – 4 kg	4 – 5 kg
Feed consumption (Norway)	0.08 kg	0.75 kg	1.00 kg	1.05 kg	1.10 kg	1.20 kg
Time, months	2	4	4	3	2	2

Atlantic salmon feeds should provide proteins, energy and essential nutrients to ensure high muscle growth, energy metabolism and good health status. Historically, the two most important ingredients in fish feed have been fish meal and fish oil. The use of these two marine raw materials in feed production has been reduced and replaced by agricultural commodities such as soy, sunflower, wheat, corn, beans, peas, poultry by-products (Chile and Canada) and rapeseed oil. This substitution is mainly done because of heavy constraints on availability of fish meal and fish oil.

Atlantic salmon have specific nutrient requirements for amino acids, fatty acids, vitamins, minerals and other lipid- and water soluble components. These essential nutrients can in principle be provided by the range of different raw materials listed above. Fish meal and other raw materials of animal origin have a more complete amino acid profile and have generally a higher protein concentration compared to proteins of vegetable origin. As long as the fish' own amino acid requirements are covered, fish growth and health are secured and the composition of muscle protein is the same irrespective of the feed protein source. Consequently, feeding salmon with non-marine protein sources give a net production of marine fish protein.

During the industry's early phases, salmon feed was moist (high water content) with high levels of marine protein (60%) and low levels of fat/oil (10%). In the 1990s, the feed typically consisted of 45% protein, whereof most of it was marine protein. Today, the marine protein level is lower due to cost optimisation and fish meal availability. However, the most interesting development has been the increasingly higher inclusion of fat. This has been possible through technological development and extruded feeds.

Source: www.nifes.no, Holtermann

7. Feed Production

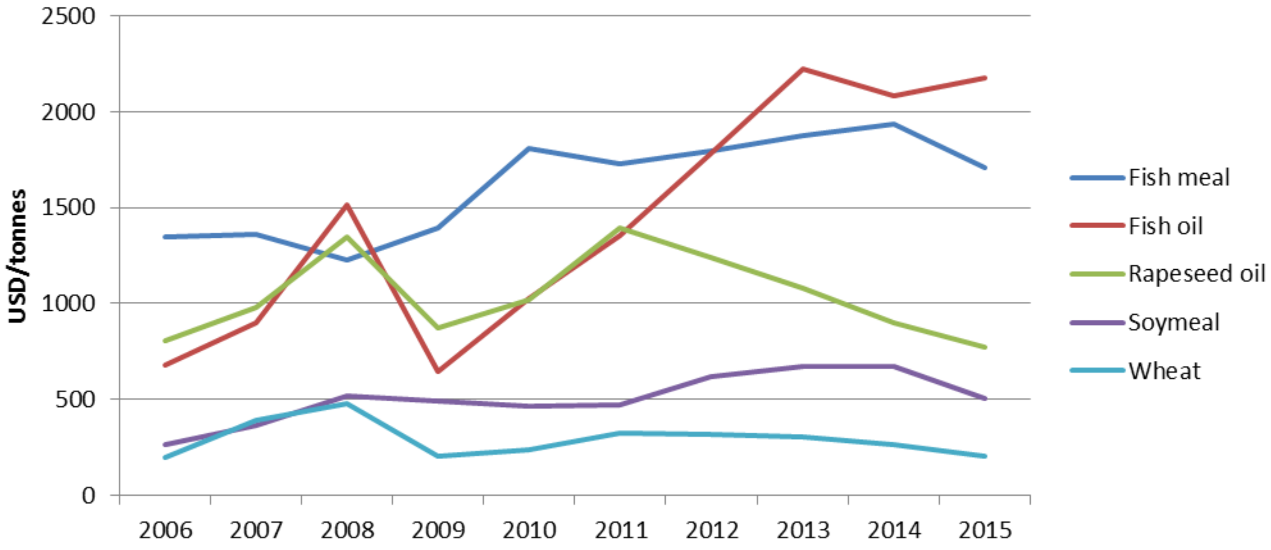
7.4 Salmon feed ingredients

Feed and feeding strategies aim at growing a healthy fish fast at the lowest possible cost. Standard feeds are designed to give the lowest possible production cost rather than maximised growth. Premium diets formulated for best growth rate are available in most countries and are being used in situations where difference between sales price and production cost make these diets profitable.

Feeding control systems are used at all farms to be able to control and optimise feeding. The feeding is monitored for each net pen to ensure that the fish is fed to maximise growth (RGI). At the same time ensure that feeding is stopped immediately when maximum feed intake has been provided to prevent feed waste. The fastest growing fish typically also have the best (i.e. lowest) feed conversion ratio (FCR).

Source: www.nifes.no

7. Feed Production
7.5 Feed raw material market



Fish oil: Since 2009 fish oil prices have steadily increased. The average price of fish oil was about USD 2 300 per tonne in 2014. In the first half year of 2015 the price has dropped.

Fish meal: As fish oil, fish meal has an increasing trend in price. On average, fish meal has been more expensive, but in the last couple of years the prices have been more of less the same.

Rapeseed oil: Up until 2011, rapeseed oil and fish oil had a correlating price development. However, in the last few years there has been a decreasing trend in the price of rapeseed oil.

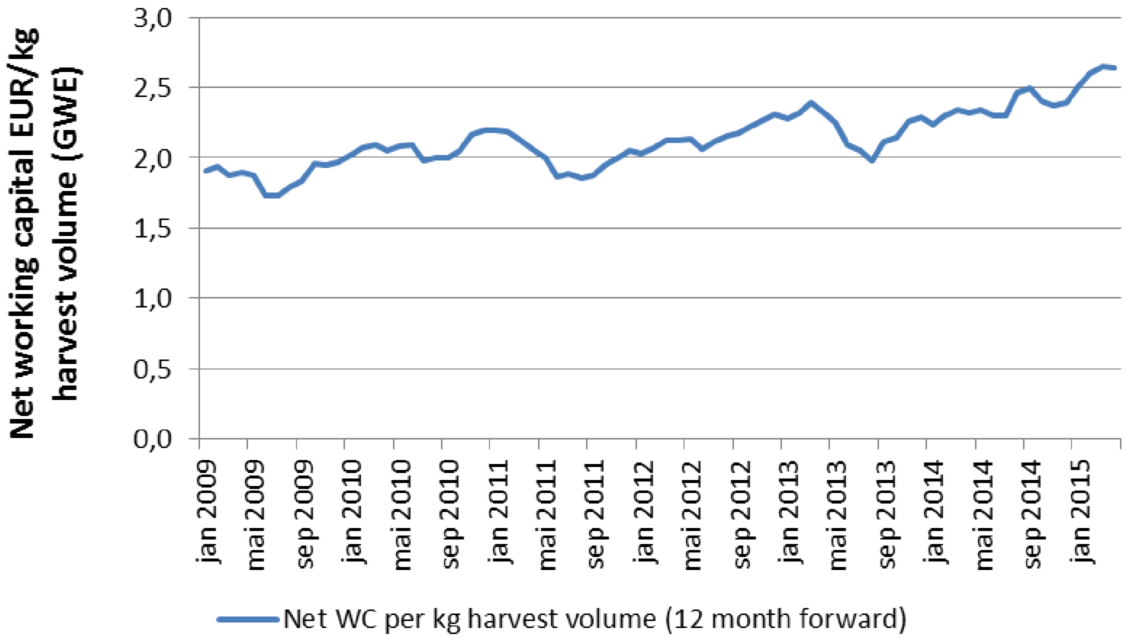
Soy meal: Soy and corn have traditionally been very important vegetable protein sources in fish feed. As a consequence of demand from China increasing faster than the increase in soy production and more corn used for energy purposes, the price for soy meal (and other vegetable proteins) increase. Parallel to this, there has been an increase in genetic modified (GM) production of soy and corn. Non-GM products have been sold with a premium, thus are more expensive. The average price in 2014 was USD 670 per tonne.

Wheat: Price for wheat have remained rather stable over the years. Generally good production and supply/demand in balance.

Source: Holtermann

8. Financial Considerations

8.1 Working capital



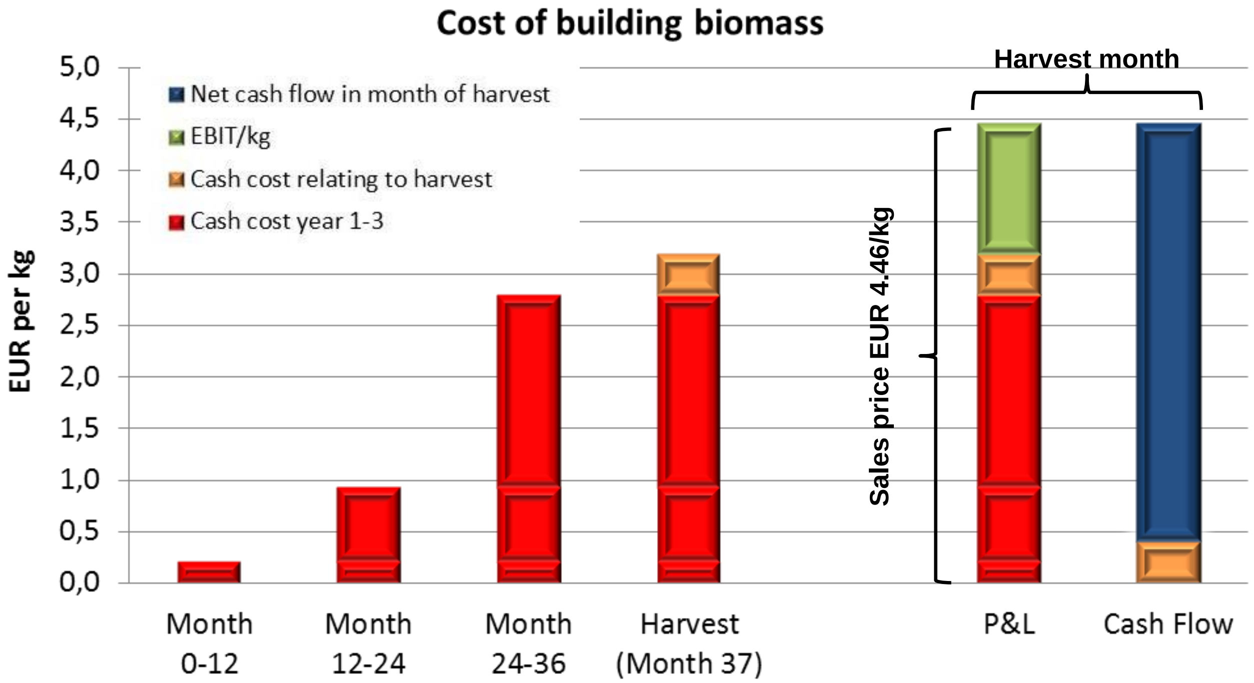
The long production cycle of salmon requires a significant working capital in the form of biomass.

Working capital investments are required to cater for organic growth, as a larger “pipeline” of fish is needed to facilitate larger quantities of harvest. On average, a net working capital investment of approximately EUR 2.1 is required to be invested the year prior to obtaining an increase in harvest volume of 1 kg. This requirement has increased over time, and fluctuate with variations in exchange currencies.

Net working capital varies during the year. Growth of salmon is heavily impacted by changing seawater temperatures. Salmon grows at a higher pace during summer/fall and slower during winter/spring when the water is colder. As the harvest pattern is relatively constant during the year, this leads to a large seasonal variation in net working capital. Studies have shown that a variation of between EUR 0.2-0.4 per kg harvest volume should be expected from peak to bottom within a year. For a global operator, net working capital normally peaks around year end and bottoms around mid-summer.

Source: Marine Harvest

8.1 Working capital



Note: Production cost in NOK has been converted at EURO/NOK = 8.9530 (2015 yearly average)

For illustration purposes, the farming process has been divided into three stages of 12 months. The first 12 month period is production from egg to finished smolt. After this, 24 months of on-growing in sea follows. After the on-growing phase is over, harvest takes place immediately thereafter (illustrated as “Month 37”). In a steady state there will at all times be three different generations at different stages in their life cycle. Capital expenditure is assumed equal to depreciation for illustration purposes. The working capital effects shown above is on a net basis excluding effects from accounts receivables and accounts payables.

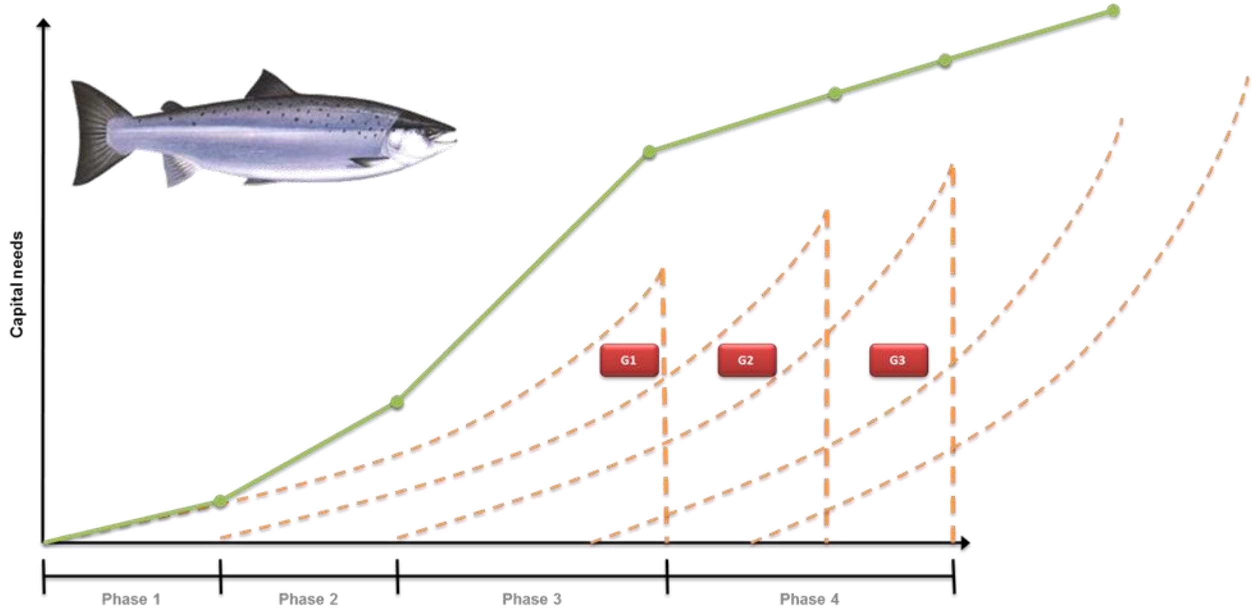
At the point of harvest there have been incurred costs to produce the fish for up to 36 months, where some costs were incurred to produce the smolt two years ago, further costs incurred to grow the fish in seawater and some costs incurred related to harvest (”Month 37”). Sales price should cover the costs and provide a profit margin (represented by the green rectangle).

Cash cost in the period when the fish is harvested is not large compared to sales income, creating a high net cash flow. If production going forward (next generations) follows the same pattern, most of the cash flow will be reinvested into salmon at various growth stages. If the company wishes to grow its future output, the following generations need to be larger requiring even more of the cash flow to be reinvested in working capital.

This is a rolling process and requires substantial amounts of working capital to be tied up, both in a steady state and especially when increasing production

8. Financial Considerations

8.1 Working capital



The illustration above shows how capital requirements develop when one is building production/biomass from ”scratch”. In phase 1, there is only one generation (G) of fish produced and the capital requirement is the production cost of the fish. In phase 2, the next generation is also put into production, while the on-growing of G1 continues, rapidly increasing the capital invested. In phase 3, G1 has reached its last stage, G2 is in its on-growing phase and G3 has begun to increase its cost base.

At the end of phase 3, the harvest starts for G1, reducing the capital tied-up, but the next generations are building up their cost base. If each generation is equally large and everything else is in a steady state, the capital requirement would have peaked at the end of phase 3. With a growing production, the capital requirement will also increase after phase 3 as long as the next generation is larger than the previous (if not, capital base is reduced). We see that salmon farming is a capital intensive industry.

To equip a grow-out facility you need cages (steel or plastic), mooring, nets, cameras, feed barge/automats and boats.

Source: Marine Harvest

Investments and payback time (Norway) - assumptions

Normal site consisting of 4 licenses

Equipment investment: MEUR 3.5 - 4.5
Number of licenses: 4
License cost (second hand market) MEUR: 18 - 27 (~MEUR 4.5 - 7 per license)
Output per generation: ~4 000 tonnes GWE
Number of smolt released: 1 000 000

Smolt cost per unit: EUR 1
Feed price per kg: EUR 1.17 (LW)
Economic feed conversion ratio (FCR): 1.19 (to Live Weight)
Conversion rate from Live Weight to GWE: 0.84
Harvest and processing incl. well boat cost per kg (GWE): EUR 0.4

Average harvest weight (GWE): 4.5kg
Mortality in sea: 10%

Sales price: EUR 4.46

Note: Investments and cost in NOK has been converted at EURO/NOK = 8.9530 (2015 yearly average)

For increased capacity to be established, there are many regulations to fulfil.

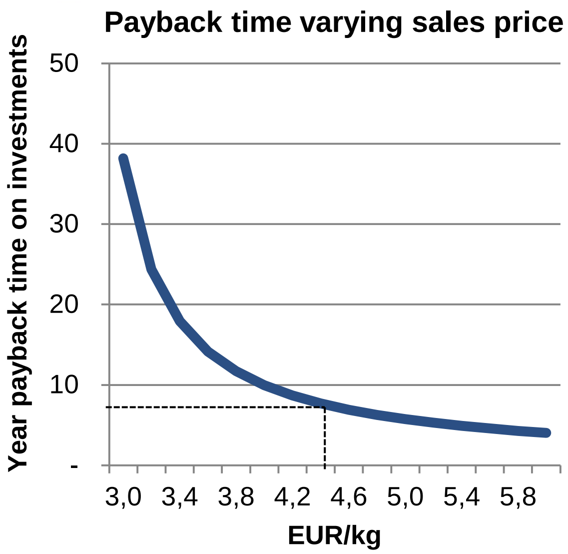
In this model, we have used only one site for simplification purposes as we are looking at a new company entering the industry. Most companies use several sites concurrently, which enables economies of scale and makes the production more flexible and often less costly.

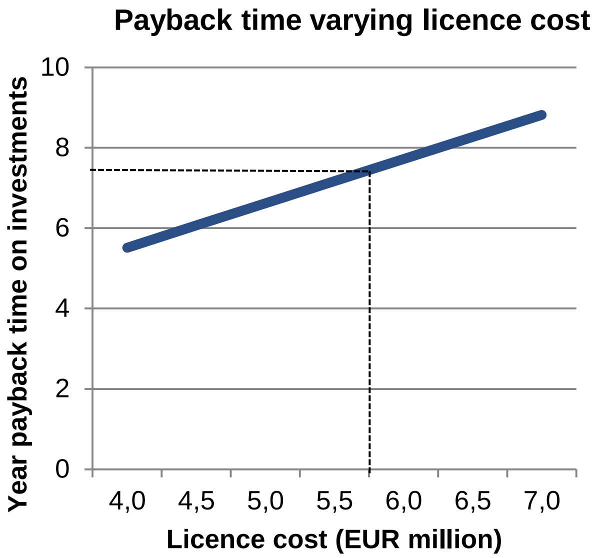
To simplify, smolt is bought externally. Smolt is usually less costly to produce internally, but this depends on production quantity.

The performance of the fish is affected by numerous factors as feeding regime, sea water temperature, disease, oxygen level in water, smolt quality, etc.

Sales price reflects the average sales price from Norway the last five years.

Sources: Marine Harvest, Kontali Analyse, Norges Bank





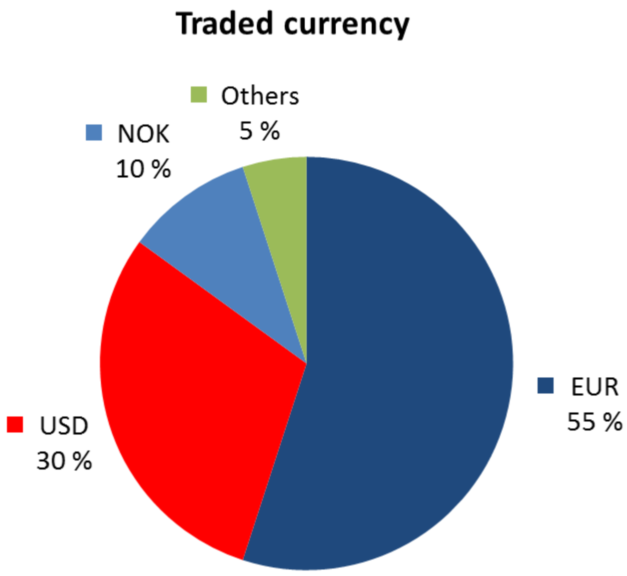
Results

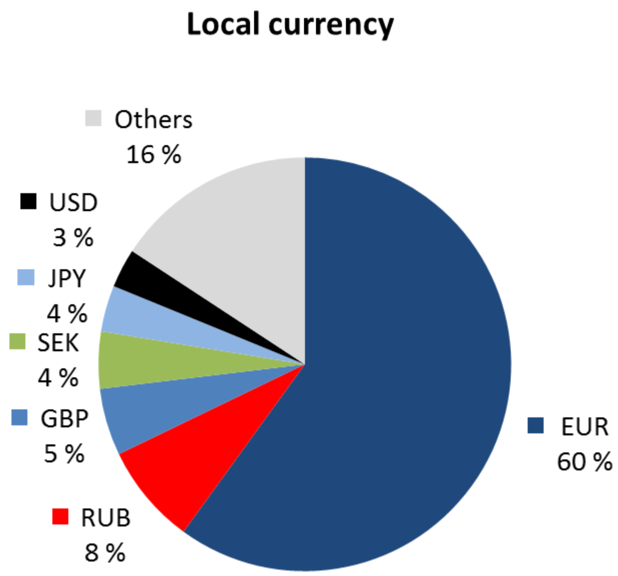
Because of the simplifications in the model and low, non-optimal production regime, production cost is higher than industry average. Due to high entry barriers in terms of capital needs and falling production costs with quantity, new companies in salmon production will experience higher average production costs. During the production of each harvest the working capital needed at this farm, given the assumptions, would be peaking at around MEUR 8.4 (given that the whole harvest is harvested at the same time).

With a sales price at the average level in the period 2011-2015, payback time for the original investments would be around 7 years. This result is very sensitive to sales price, license cost and economic feed conversion ratio (FCR).

Sales price of EUR 4.46 is based on the average price in Norway in the 5-year period 2011-2015.

Norwegian exposure vs foreign currency





There is a difference in traded currency and the local currency. The exporters relate to the traded currency, while the customer has an exposure to both. For example a Russian processor trade the salmon in USD, but they sell their products in the local currency, rubles (RUB).

Most of the Norwegian exporters are exposed to currency fluctuations since the majority of the volumes are exported. The majority of the exported volume is traded in EUR since most of the volume is exported to countries within the EU. The second largest traded currency is USD. Some players in countries in Easter Europe, Middle East and some Asian countries prefer to trade their salmon in USD rather than their local currency.

The price of salmon quoted in traded currency will compete with other imported goods, while the price of salmon quoted in local currency will compete with the price to consumers of products that are produced domestically.

There is a currency risk in operating in different currencies, and therefore many of the largest industry players hedge currencies often with back-to-back contracts. The currency risk arising from salmon sales denominated in the traded currency is usually absorbed by the exporter, while the currency risk in local currency is absorbed by the customer.

Source: Kontali

Exposure against local currency – Developments 2011-2015[1]

Norway	2011	2012	2013	2014	2015
EUR	59 %	58 %	59 %	61 %	64 %
RUB	12 %	13 %	11 %	5 %	0 %
GBP	4 %	4 %	5 %	6 %	7 %
SEK	4 %	4 %	4 %	5 %	5 %
JPY	4 %	4 %	4 %	4 %	4 %
USD	3 %	2 %	2 %	3 %	4 %
CNH / HKD	2 %	3 %	3 %	3 %	3 %
Others	12 %	12 %	13 %	14 %	14 %

** Poland and Denmark classified as EUR (not PLN and DKK) - due to large re-export to EU-mark*

Europe is the largest market for Norwegian produced salmon, hence EUR is the predominant currency for Norwegian salmon producers. Russia is an important salmon market, however, due to the trade sanctions the exposure to the Russian RUB is gone. Other markets have therefore increased its direct exposure recently.

Chile	2011	2012	2013	2014	2015
USD	48 %	48 %	43 %	39 %	40 %
BRL	21 %	21 %	19 %	18 %	19 %
EUR	8 %	8 %	11 %	9 %	7 %
RUB	0 %	2 %	6 %	9 %	11 %
JPY	3 %	4 %	3 %	4 %	2 %
CNH / HKD	2 %	1 %	2 %	4 %	3 %
Others	17 %	16 %	15 %	17 %	17 %

Key markets for Chilean produced salmon are USA and Brazil, hence exposure to USD and BRL (Brazilian real) in local currency terms are followed closely. The exposure to RUB has increased over the years as the Russian market has become more important for Chilean exporters.

Feed production: Currency exposure

The raw materials required to produce feed is as a rule of thumb quoted in USD (approx 70%) and EUR (approx 30%), based on long term average exchange rates. The raw materials generally account for 85% of the cost of producing feed. The remaining costs, including margin for the feed producer, are quoted in local currency.

Secondary Processing: Currency exposure

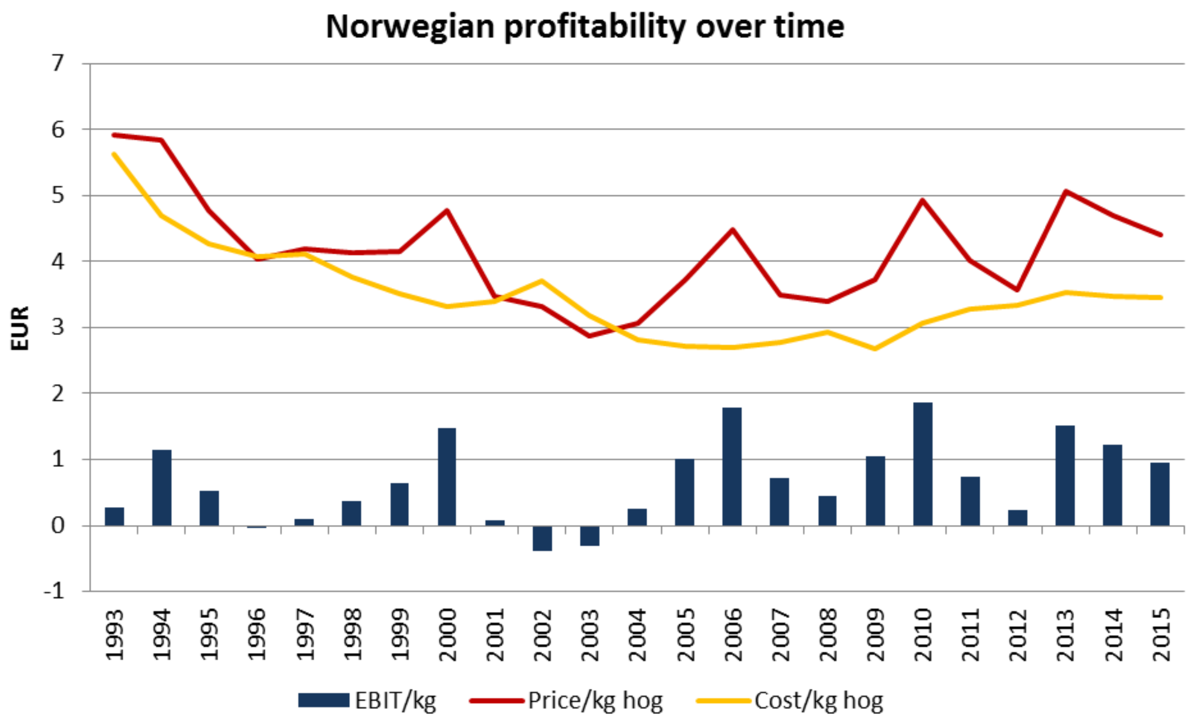
The biggest market for value added products is Europe, hence the vast majority of currency flows are denominated in EUR, both on the revenue and cost side. In the US and Asian processing markets currency flows are denominated largely by USD and EUR on the revenue side whilst costs are denominated in USD, EUR and local currency.

Source: Kontali

Note: (1) The table shows exposure against local currency weighted against total exports

8. Financial Considerations

8.4 Price, cost and EBIT development in Norway



Note: Adjusted according to KPI (2015 = 100)

Due to supply growth being higher than the structural growth in demand in the period 1993-2004 there was a falling trend of the price of salmon.

As a result of cost benefits of industrialisation, consolidation and economies of scale, combined with improvements in the regulatory framework and fish health improvements, the cost curve also had a falling trend in this period.

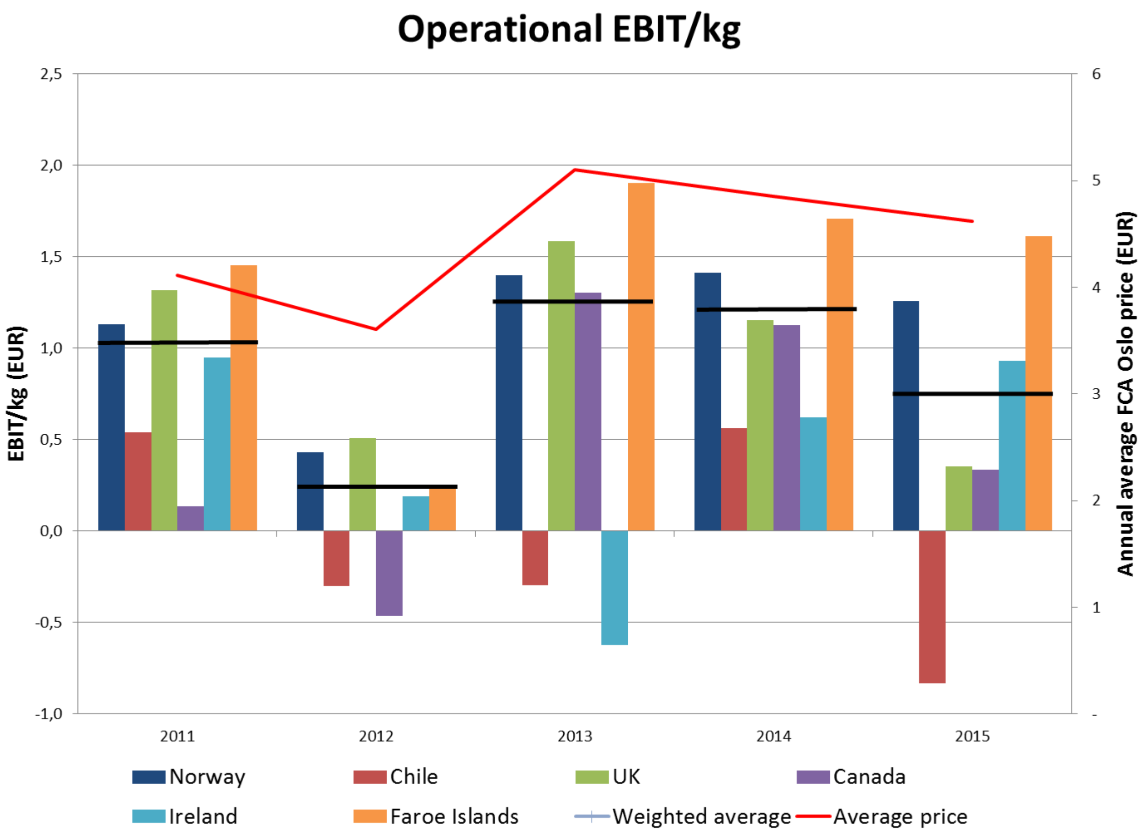
In the last decade product innovation, category management, long term supply contracts, effective logistics and transportation has stimulated strong demand growth for salmon, in particular in the European markets. In recent years, costs have trended upwards due to several factors including rising feed costs, biological costs and more stringent regulatory compliance procedures.

The average EBIT per kg for the Norwegian industry has been positive with the exception of a few shorter periods, and EUR 1.04 per kg in nominal terms the last 10 years (EUR 0.92 per kg last 5 years).

Source: Kontali Analyse, Norges Bank, Bloomberg
NOK has been converted to EUR using the historical yearly foreign exchange rate found in the Appendix

8. Financial Considerations

8.5 Effects of geographical diversification



The illustration above depicts Marine Harvest's performance across different countries the last 5 years. In all regions, the biological risk is high and this impacts cost significantly from period to period. Contracted volumes also impacts This clearly shows that the variance in EBIT per kg is high, however, the geographic specific risk can be diversified with production across regions.

Note: NOK has been converted to EUR using the historical yearly foreign exchange rate found in the Appendix

9. Barriers to Entry - Licenses

Due to biological constraints, seawater temperature requirements and other natural constraints, farmed salmon is only being produced in Norway, Chile, UK, Faroe Islands, Ireland, North America and New Zealand/Tasmania.

Atlantic salmon farming started on an experimental level in the 1960s but became an industry in Norway in the 1980s and in Chile in the 1990s.

In all salmon producing regions, the relevant authorities have a licensing regime in place. In order to operate salmon farming, a license is the key prerequisite. The licenses constrain the maximum production for each company and the industry as a whole. The license regime varies across jurisdictions.

9. Barriers to Entry – Licenses

9.1 Regulations of fish farming in Norway

License and location

Fish farming companies in Norway are subject to a large number of regulations. The Aquaculture Act (17 June 2005) and the Food Safety Act (19 December 2003) are the two most important laws, and there are detailed provisions set out in several regulations emanated from one of the two acts.

In Norway, a salmon farming license allows farming salmon either in freshwater (smolt/fingeling production) or in the sea. The number of licenses for Atlantic salmon and trout in sea water was limited to 974 licenses in 2015. Such limitations does not apply for licenses in fresh water (smolt production), which can be applied for continuously. Farming licenses in sea water can be connected to up to four farming sites (six sites is allowed when all sites are connected with the same licenses). This increases the capacity and efficiency of the sites.

New licenses in sea are awarded by the Norwegian Ministry of Trade, Industry and Fisheries and are administered by the Directorate of Fisheries. Licenses can be sold and pledged, with legal security in terms of registration in the Aquaculture Register. Since 1982, new licenses have been awarded only in limited years. In 2013, Norwegian authorities announced its plan to issue 45 new “green” licenses. These were awarded in 2014 and Marine Harvest Norway AS was granted one license. Licenses last in perpetuity, but may be withdrawn in case of material breach of conditions set out in the license or the aquaculture or environmental legislation.

The production limitations in Norway are regulated as "maximum allowed biomass" (MAB), being the defined maximum volume of fish a company can hold at sea at all times. In general, one license is currently set a MAB, of 780 tons (945 tons in the counties of Troms and Finnmark). The sum of all license-MAB in each region is the farming company's total allowed biomass in this region. In addition, each production site has a MAB and the total amount of fish at each site will have to be less than this limitation. Generally, sites have between 2.340 and 4.680 tons allowed MAB.

The Norwegian Parliament discussed and voted on a new white paper on aquaculture in June 2015. The intention of the white paper is to ensure a sustainable growth of the industry. Future growth will be granted based on sustainable indicators, currently sea lice. In addition, the coast will be divided into a number of regions. Growth will be determined based on a traffic light signal based on certain criteria being satisfied. If these criteria are satisfied the region may grow by a maximum of 6% per every two years. However on-going discussions will determine if such criteria should be site-specific, and not only regional. If the criteria are not satisfied the region may not grow (status quo) and if they are breached production should be reduced.

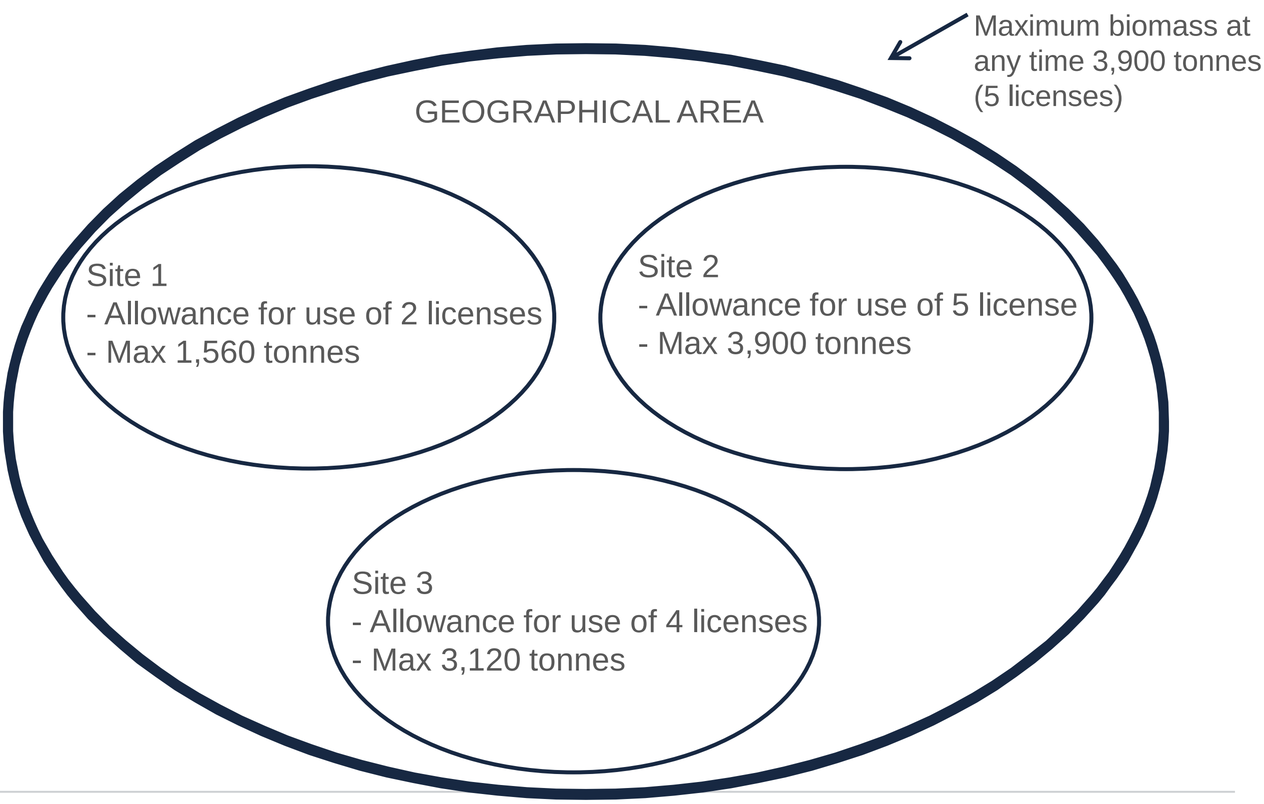
The Parliament has asked for more information before they conclude regarding the modelling of both the indicator and new regions. This process is estimated to be finalized in 2016, and the first growth will probably be granted in 2017. Until then the current regulations will apply.

Access to licenses

Until November 2015, an industry player had to apply for approval from the Government if they got control of more than 15% of the total licenced biomass in Norway. Such approval could be given if specific terms regarding the applicants R&D-activity, fish processing and apprenticeships in coastal regions. This act on ownership limitation was proposed removed in September 2014, but it was first executed in November 2015. However, no industrial player can control more than 50% of the total biomass in any of the regions of the Directorate of Fisheries.

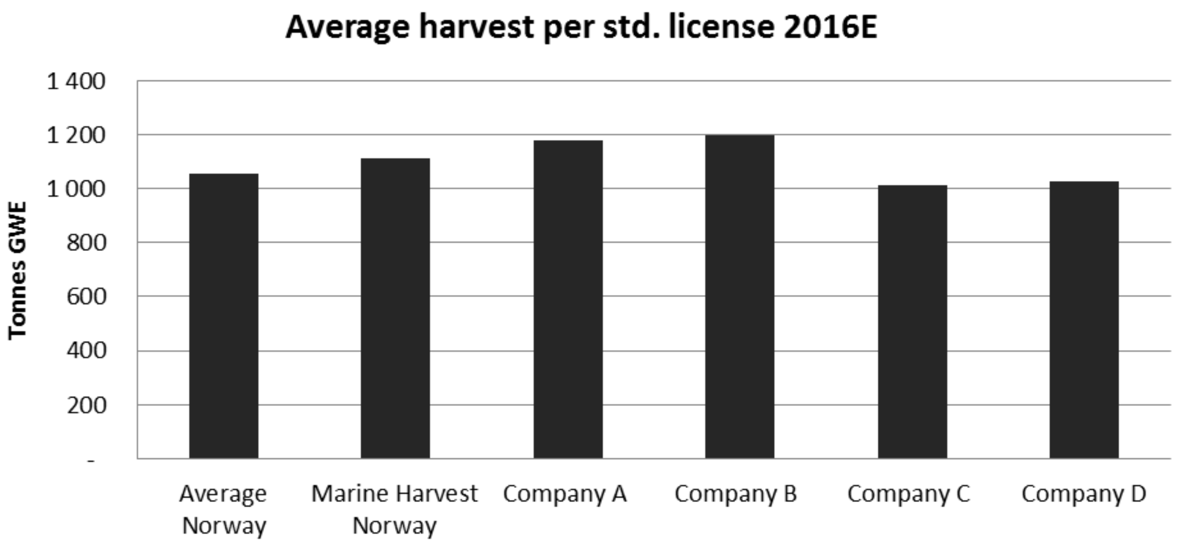
The figure below depicts an example of the regulatory framework in Norway for one company:

- Number of licenses for a defined area: 5
  - Biomass threshold per license: 780 tonnes live weight (LW)
  - Maximum biomass at any time: 3,900 tonnes (LW)
- Number of sites allocated is 3 (each with a specific biomass cap)
  In order to optimise the production and harvest quantity over the generations, the license holder can play within the threshold of the three sites as long as the total biomass in sea never exceeds 3,900 tonnes (LW).
- There are also biomass limitations on the individual production sites. The biomass limitation varies from site to site and is determined by the carrying capacity of the site.



9. Barriers to Entry – Licenses

9.1 Regulations of fish farming in Norway



The graph above shows 2016E utilisation per licenses for the Norwegian industry as a whole and for the largest companies. The graph is organized by highest harvest quantity.

Number of grow-out sea water licenses for salmon and trout in Norway:

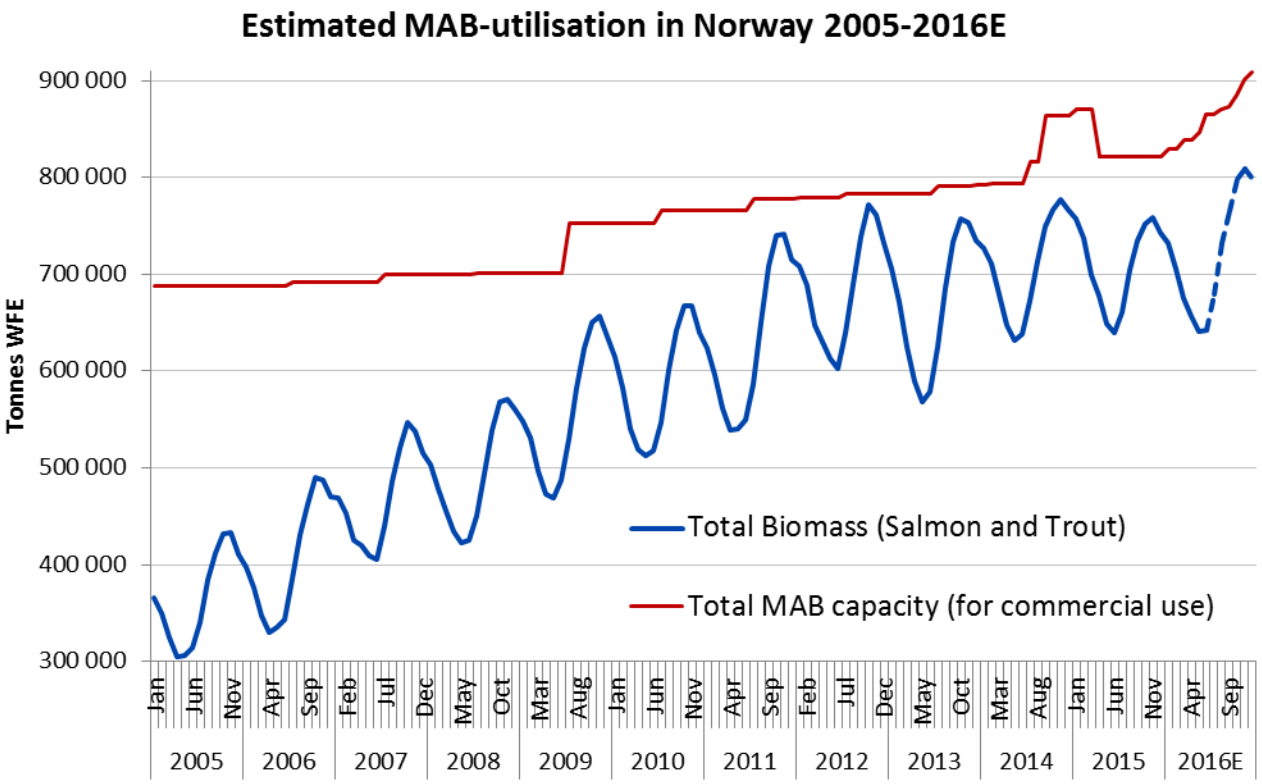
- 2007: 929
- 2008: 916
- 2009: 988
- 2010: 991
- 2011: 990
- 2012: 963
- 2013: 959
- 2014: 973
- 2015: 974

Because of the regulation of standing biomass (maximum allowed biomass - MAB) per licence (780 tonnes LW), the production capacity per licence is limited. Annual harvest quantity per license in Norway is currently at about 1 200 tonnes GWE. Larger players typically have better flexibility to maximise output per license. Hence, the average utilisation for the industry is somewhat lower than the utilisation for the largest companies.

Sources: Marine Harvest, Quarterly reports Q1-16, Directorate of Fisheries

9. Barriers to Entry – Licenses

9.1 Regulations of fish farming in Norway



The maximum production of each industrial player is set by the company's total MAB. However, the production varies due to productivity, fish health, sea temperature and other conditions. The maximum production of each player is a function of the number of licenses held by the player, and these internal and external factors. The total production of salmon and trout in Norway have increased the recent years. Furthermore, new "green" licenses(1), which represent an increase of approximately 4.5% in the total product.

In June 2015 the Norwegian Government announced a five percent growth opportunity for all existing licenses. There are strict conditions related to the offer, and the maximum sea lice level is set to an average of 0.2 sea lice per fish. This growth is priced at NOK 1 million. Marine Harvest has applied for all licences, but it is still not decided where they will use the opportunity to growth.

In 2016 the total MAB capacity is expected to gradually increase mainly due to approvals of development licenses and implementation of previously announced Green licenses.

Note: The primary aim of the new "green" licenses is to stimulate the use of environmentally friendly technology for commercial use

Source: Kontali Analyse

In November 2015 the Norwegian Government announced a new category of licences. These licences are called development licenses, and are meant to fuel investment into major technology shifts in the industry. Development licences allocated are free of charge up to 15 years. If the project is carried out in line with the targets that are set, the licences could be converted into commercial licences for a consideration of NOK 10 million.

Marine Harvest: "The Egg"

By the 1st of June 2016, 26 concept applications had been submitted, out of which one has been approved and one denied. The concepts range from off-shore to in-shore solutions in both closed and open structures. Year to date, Marine Harvest has applied for four different projects with a total of 34 licences.

Marine Harvest: "The Beck-cage"

The projects Marine Harvest has applied for:

- "The Egg" – Closed sea-going units
- "Beck-cage" – Submersible offshore farming cage
- "Marine Donut" – Closed-containment cage
- "Converted bulk ships" – Closed tanks

Marine Harvest: "Marine Donut"

Salmar's off-shore solution "Havmerd" is approved.

SalMar: "Havmerd"

Marine Harvest: "Converted bulk ships"

9. Barriers to Entry – Licenses

9.2 Regulations of fish farming in Scotland

License and location

In Scotland, instead of a formal license, a permission from three institutions is required prior to setting up a fish farming site; Planning Permission from local regional Council, Marine Licence from Marine Scotland and a discharge license from Scottish Environment Protection Agency (SEPA). Maximum Allowed Biomass (MAB) for individual sites is determined based on the environmental concerns, namely the capacity of the local marine environment to accommodate the fish farm. As a consequence, MAB for various sites is not uniform and varies between 100 tons to 2,500 tons depending on site characteristics and its geographic location.

Access to licenses

In Scotland it is legal to trade licenses and although no restriction on number is given, there is a limit on production quantity ascribed to any one company. This limit is determined by the Competition Commission Authorities. Licensing aquaculture operations in the UK is currently in a transitory state; all new applications require planning application for permission to operate, as long as SEPA and Marine Scotland consents. The granting of the planning permission is aligned to the Crown estate lease for a 25 year period. All existing fish farm leases without planning permission in Scotland are currently undergoing a review process which transfers them from the Crown estate to local regional councils. These grants are automatically given a 25 year lease. Any site with Planning Permission is not required to go through this review process.

The environmental license can be revoked in some cases of significant and long-term non-compliance.

Most existing licenses are automatically renewed at the expiration of their lease period.

New license applications take around 6-12 months for the planning permission and around 4-6 months for the environmental discharge license. Expansion of existing facilities is the most efficient route in terms of cost and time, whilst brand new sites will take longer and has to go through an Environmental Impact Assessment (EIA) process. The environmental license is charged annually at GBP 5 338, whilst the standing rent is levied to the crown estate on production basis as follows: GBP 22.50 per tonne harvested for Mainland sites; GBP 20.50 per tonne for Western Isles sites; GBP 1 000 annual charge if no harvesting; GBP 2 000 annual charge if dormant. The applications are also charged at GBP 174 per 0.1 hectare of farm area, while the environmental license costs GBP 2 600 for a new site.

9. Barriers to Entry – Licenses

9.3 Regulations of fish farming in Chile

License and location

In Chile the licensing is based on two authorizations. The first authorization is required to operate an aquaculture facility and specifies certain technical requirements. The authorisation is issued by the Fishery Sub Secretary (Economy Ministry). The authorization is granted for an unlimited time and can be traded. The second authorization relates to the physical area which may be operated (or permission to use national sea areas for aquaculture production). This is issued by the Sub secretary of the Navy (Defence Ministry). The use of the license is restricted to a specific geographic area, to defined species, and to a specified limit of production or stocking density. The production and stocking density limit is specified in the Environmental and Sanitary Resolution involved for any issued license. These limits are subject to regular inspections by authorities, and if breached may lead the operator to forfeit the license.

Access to licenses

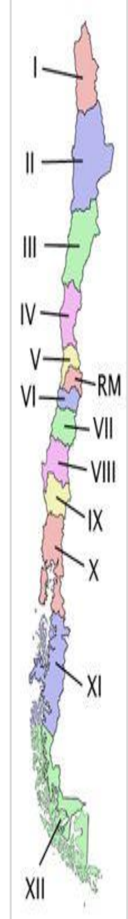
The trading of licenses in Chile is regulated by the General Law on Fisheries and Aquaculture (LGPA), in charge of Ministry of Economy and Defense. The aquaculture activities are subject to different governmental authorizations depending on whether they are developed in private fresh water inland facilities (i.e. hatcheries) or in facilities built on public assets such as lakes or rivers (freshwater licenses) or sea portions (sea water licenses).

Operation of private freshwater aquaculture requires ownership of the water use rights and holding of environmental permits. Environmental permits are issued when operators demonstrating that their facilities comply with the applicable environmental regulations.

Licenses for aquaculture activities in lakes, rivers and seawater are granted based on an application, which must contain description of the proposed operations, including a plan for complying with environmental and other applicable regulations. Licenses granted after April, 2010 are granted for 25 years and are renewable for additional 25-year terms. Licenses granted before April, 2010 were granted for indefinite periods. License holders must begin operation within one year of receiving a license and once the operation has started, the license holder cannot stop or suspend production for a period exceeding two consecutive years. Subject to certain exceptions, license holders must maintain minimum operational levels of not less than 5% of the yearly production specified in the RCA (*Resolución de Calificación Ambiental*).

License holders must pay annual license fees to the Chilean government and may sell, encumber or otherwise dispose of their license. During a five-year period between April 2015 and April 2020, no additional aquaculture licenses may be granted in Regions X and XI in Chile (administratively, Chile consists of 15 Regions, with most salmon production concentrated in Regions X, XI and XII). After April, 2015, new aquaculture licenses in Regions X and XI can only be granted in areas newly designated as suitable for aquaculture or in lieu of previously abandoned or revoked licenses.

Chile



License and location

In British Columbia, both Federal and Provincial authorizations are required to operate a marine fish farm site. The Federal Government regulates the activity and operations of aquaculture and the Provincial Government administers the Crown lands where fish farms are located. The Province grants a tenure license to occupy an area of the ocean associated with the individual fish farming site. A tenure area encompasses the rearing pens, ancillary infrastructure and moorings. Individual site tenures have a specific timeline ranging from five to twenty years. The term of tenure is based upon the provincial policy at the time of offer. In 2016, the annual fee for typical 30 hectares tenure is $12,000.00 cad. This rental fee is calculated based on the tenure size and a provincially indexed land value. Each tenure license contains a renewal provision once expired. It is uncommon for a tenure to not be renewed, however breaches to a tenure agreement can fetter the renewal processes.

The Federal Governments grants an Aquaculture License that incorporates several conditions to which a farm must observe. The Aquaculture license conditions are linked and conform to The Federal Fisheries Act. Aquaculture license conditions regulate production parameters including the specie cultured, the Maximum Allowable Biomass (MAB) on the site, the use of rearing equipment and the allowable environmental impact. Production or “MAB” is specific to each Aquaculture licensed facility. Smaller farms are typically licensed for 2,200mt. MAB with larger capacity facilities licensed to produce 5,000 mt. per cycle. Starting December 2016, Federal Licenses will be issued for a six year period. The annual Federal Aquaculture License fee is calculated at $2.50 cad per licensed metric ton of MAB for operational sites - facilities that are fallow pay a $100.00cad licensing fee. All Aquaculture licenses are renewable but may be lost or suspended for non-compliance issues and non-payment of fees.

9. Barriers to Entry – Licenses

9.4 Regulations of fish farming in BC, Canada

Access to licenses

All acquisitions of authorizations and licenses require consultation with First Nations and local stakeholders. Timelines to acquire licenses for a new farm vary from one to several years. The cost for preparing a new site license application can range from $200,000.00 - $300,000 cad. Recently the Provincial government instituted a moratorium on new site applications but has allowed existing sites to amend their tenure size and infrastructure based upon specific conditions. Companies can still obtain new tenures by relocating existing tenures to locations “more suitable for safety or matters of public interest.” The Federal Government has harmonized its licensing process with the Province thus offering amendments to existing licenses in lieu of new licenses.

Provincial tenures and Federal licenses can be assigned to a different operator through a government assignment process. A company may transfer licenses to another company providing the rationales for the assignment are supported by the government processes. Several licenses and tenures have been transferred by companies in British Columbia siting changes to specie production, distance to market, processing or company ownership.

Maximising survival and maintaining healthy fish stocks are primarily achieved through good husbandry and health management practices and policies. Such practices, in addition, reduce exposure to pathogens and the risk of health challenges. The success of good health management practices has been demonstrated on many occasions and has contributed to an overall improvement in the survival of farmed salmonids.

Fish health management plans, veterinary health plans, biosecurity plans, risk mitigation plans, contingency plans, disinfection procedures, surveillance schemes as well as coordinated and synchronised zone/area management approaches, all support healthy stocks with emphasis on disease prevention.

Prevention of many diseases is achieved through vaccination at an early stage and during freshwater. Vaccines are widely used commercially to reduce the risk of health challenges. With the introduction of vaccines a considerable number of bacterial health challenges have been effectively controlled, with the additional benefit that the quantity of medicine prescribed in the industry has been reduced.

In some instances however medicinal treatment is required to maximise survival and even the best managed farms may use medicines from time to time. For several viral diseases, no effective vaccines are currently available.

10. Risk Factors

10.2 Most important health risks for the salmon

Sea lice: There are several species of sea lice, which are naturally occurring seawater parasites. They can infect the salmon skin and if not controlled they can cause lesions and secondary infection. Sea lice are controlled through good husbandry and management practices, cleaner fish (different wrasse species and lumpsuckers, which eat the lice off the salmon) and when necessary licensed medicines.

Pancreas Disease (PD): PD is caused by the Salmonid Alphavirus and is present in Europe. It is a contagious virus that can cause reduced appetite, muscle and pancreas lesions, lethargy, and if not appropriately managed, elevated mortality. PD affects Atlantic salmon and Rainbow trout in seawater and control is achieved mainly by management and mitigation practices. Combined with these measures, vaccination is also used where PD represents a risk and which provides some additional level of protection.

Salmonid Rickettsial Septicaemia (SRS): SRS is caused by an intracellular bacteria. It occurs mainly in Chile but has also been observed, but to a much lesser extent, in Norway, Ireland and the UK. It causes lethargy, appetite loss and can result in elevated mortality. SRS is to some extent controlled by vaccination, but medicinal intervention (licensed antibiotics) may also be required.

Infectious Pancreatic Necrosis (IPN): IPN is caused by the IPN virus and is widely reported. It is a contagious virus that can cause mortality if not managed appropriately. IPN can affect Atlantic salmon fry, smolts and larger fish post-transfer. Available vaccines can protect against IPN and good results are obtained by optimizing husbandry and biosecurity measures. In addition, selection of IPN resistant fish (QTL-based fish selection) has contributed significantly to reducing the incidents of IPN.

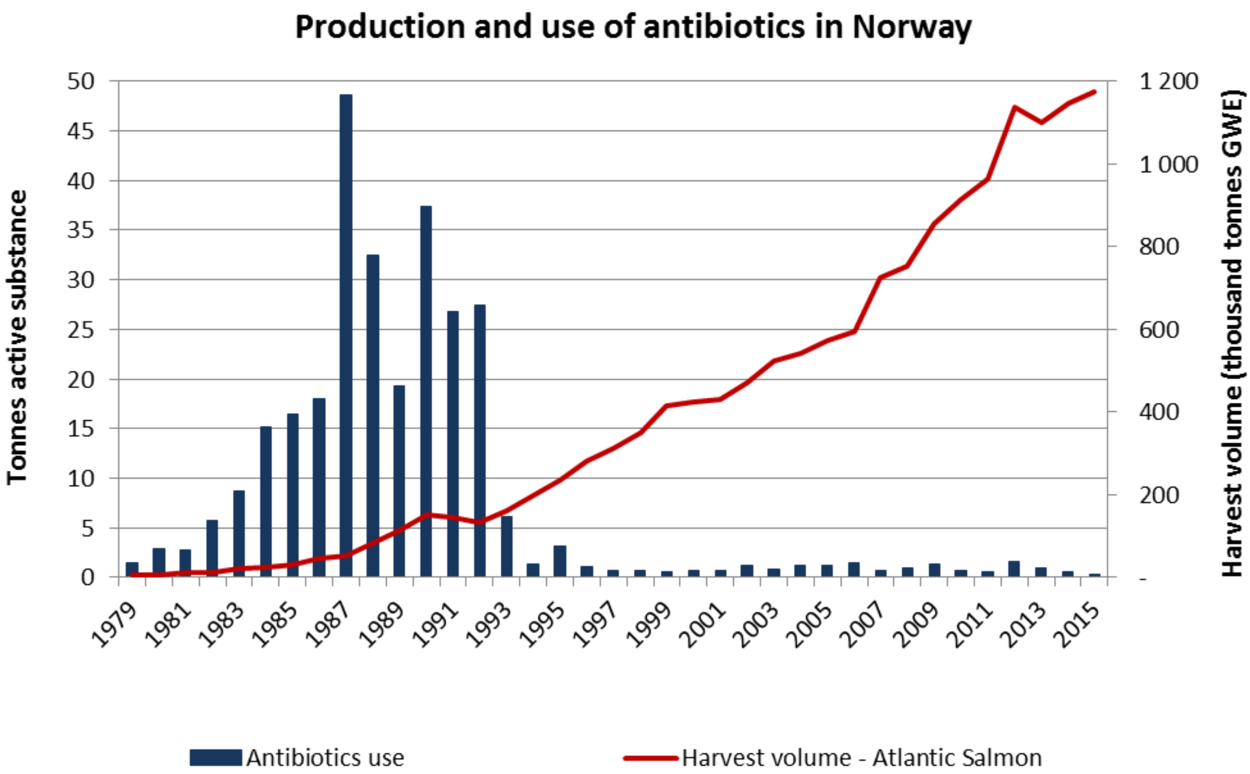
Heart and Skeletal Muscle Inflammation (HSMI): HSMI is currently reported in Norway and Scotland. Symptoms of HSMI are reduced appetite, abnormal behaviour and in most cases low mortality. HSMI generally affects fish the first year in seawater and control is achieved mainly by good husbandry and management practices.

Infectious Salmon Anaemia (ISA): ISA is caused by the ISA virus and is widely reported. It is a contagious disease that causes lethargy, anaemia and may lead to significant mortality in seawater if not appropriately managed. Control of an ISA outbreak is achieved through culling or harvesting of affected fish in addition to other biosecurity and mitigation measures. Vaccines are available and in use where ISA is regarded to represent a risk.

Gill Disease (GD): GD is a general term used to describe gill conditions occurring in seawater. The changes may be caused by different infectious agents; amoeba, virus or bacteria, as well as environmental factors including algae or jelly-fish blooms. Little is known about the cause of many of the gill conditions and to what extent infectious or environmental factors are primary or secondary causes of disease.

10. Risk Factors

10.3 Fish health and vaccination (Norway)



The increase in production of Atlantic salmon in Norway in the 1980s resulted in an increase of disease outbreaks. In the absence of effective vaccines, the use of antibiotics reached a maximum of almost 50 tonnes in 1987. With the introduction of effective vaccines against the main health challenges at that time, the quantities of antibiotics used in the industry declined significantly to less than 1.4 tonnes by 1994 and has since then continued to be very low. These developments, along with the introduction of more strict biosecurity and health management strategies, allowed for further expansion of the industry and respective production.

During the last two decades there has been a general stabilisation of mortality in Norway, Scotland and Canada, which has been achieved principally through good husbandry, management practices and vaccination. The trend in Chile in recent years stems from infection pressure from SRS in the industry and insufficient protection offered by today's vaccines against SRS.

Sources: Kontali Analyse, Norsk medisinaldepot, Norwegian Institute of Public Health

Fish Welfare and Robustness

- Development of better solutions for prevention and control of infectious diseases
- Minimization of production-related disorders
- Optimization of smolt quality

Product Quality and Safety

- Maintaining and further improving listeria control
- Understanding the causes and preventive measures needed to minimize melanin spots

New Growth

- Development of methods to reduce production time at sea
- Learning more about farming in exposed areas
- Production in closed sea-going units

Production Efficiency

- Development of cost effective, sustainable and healthy salmon diets which ensure production of robust fish
- Understanding density and farming conditions impact on feed intake, fish growth and fish health

Footprint

- Validate and implement novel methods for sea lice control
- Reduce dependence on medicines and limit the discharge of medicinal residues
- Escape management and control
- ASC implementation; Undertake R&D projects that will facilitate and make ASC implementation more effective

According to Zacco (Norwegian patenting office), patenting intensity in the salmon farming industry has grown rapidly in the last two decades. Considerable R&D is undertaken in several areas and the most important developments have been seen in the feed and vaccine sectors, done by large global players. In this industry the majority of producers are small and do not have the capital to undertake and supervise major R&D activities. This is expected to change as consolidation of the industry continues.

Smolt, on-growing production and processing

The technology used in these phases can be bought ”off the shelf”. Very few patents are granted. Technology and respective operators are becoming increasingly more advanced and skilled.

11. Indicators Determining Harvest Volumes

11.1 Projecting future harvest quantities

Standing Biomass
Source of information: Kontali Analyse

Feed Sales
Source of information:
Feed companies

Smolt Release
Source of information:
Producing companies

Seawater Temperature
Source of information:
Meteorological institutes

Disease Outbreaks
Source of information: Media

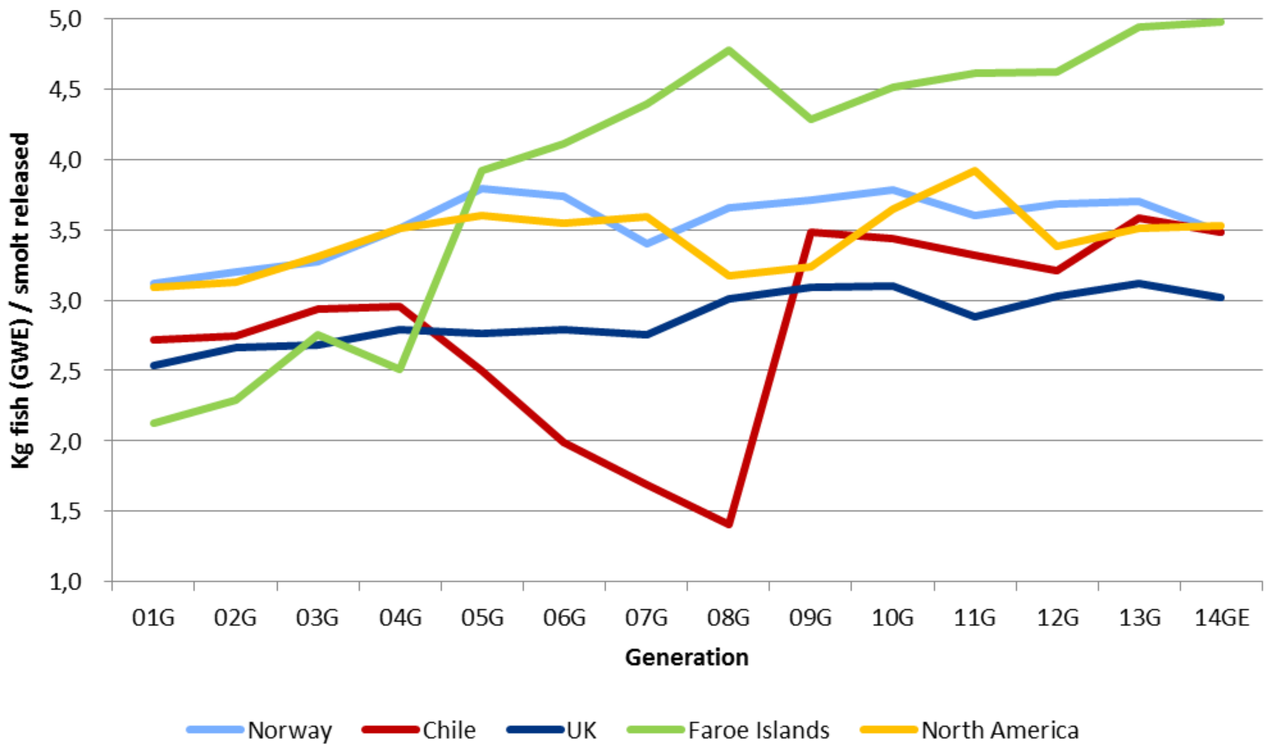
Vaccine Sales
Source of information:
e.g. ScanVacc

The three most important indicators on future harvest quantities are standing biomass, feed sales and smolt release. These three are good indicators on medium term and long term harvest, while the best short term indicator is standing biomass categorized by size. As harvested size is normally above 4 kg, the available quantity of this size class is therefore the best estimate of short term supply.

If no actual numbers on smolt releases are available, vaccine sales could be a good indicator of number of smolt releases and when the smolt is put to sea. This is a good indicator on long term harvest as it takes up to 2 years before the fish is harvested after smolt release.

Variation in seawater temperature can materially impact the length of the production cycle. A warmer winter can for example increase harvest quantities for the relevant year, partly at the expense of the subsequent year.

Disease outbreaks can also impact the harvest quantity due to mortality and slowdown of growth.



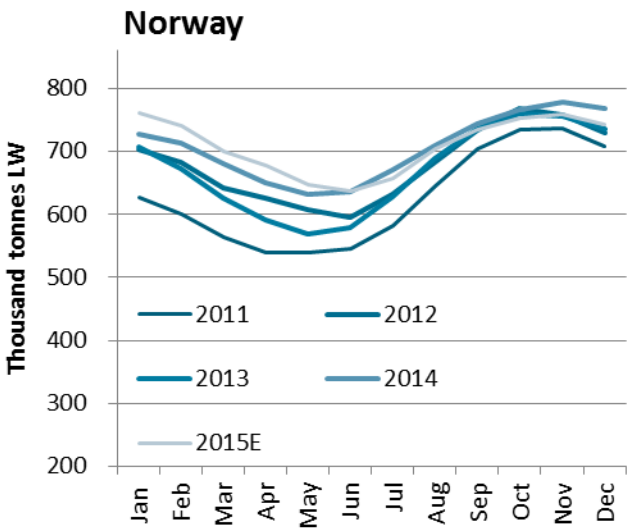
Yield per smolt is an important indicator of production efficiency. Due to the falling cost curve and the discounted price of small fish, the economic optimal harvest weight is in the area of 4-5 kg (GWE). The number of harvested kilograms yielded from each smolt is impacted by diseases, mortality, temperatures, growth attributes and commercial decisions.

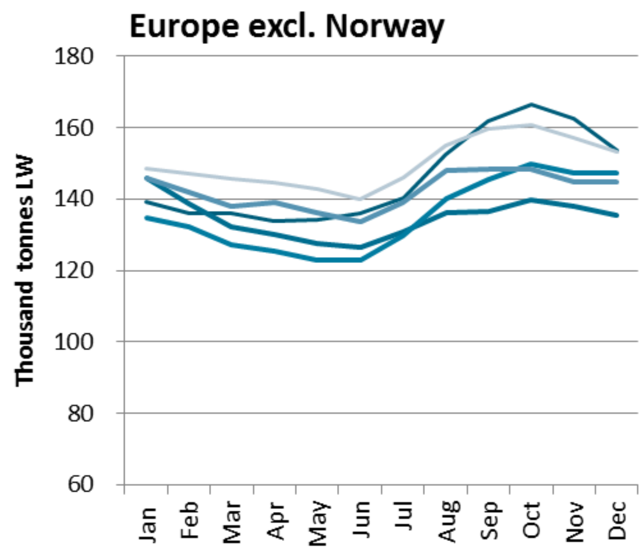
The average yield per smolt in Norway is estimated to 3.48 kg (GWE) for the 14 Generation.

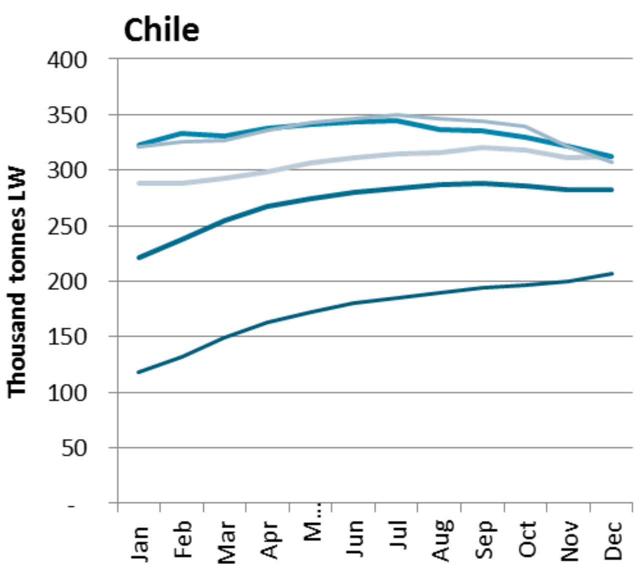
Since 2010, the Chilean salmon industry has been rebuilding its biomass after the depletion caused by the ISA crisis commencing in 2007. In 2010/11, the Chilean salmon industry showed a very good performance on fish harvested due to the low density of production (improved yield per smolt). In line with the increased density, biological indicators have deteriorated significantly in 2012-14. Average yield per smolt for 14G is estimated to 3.48 kg (GWE).

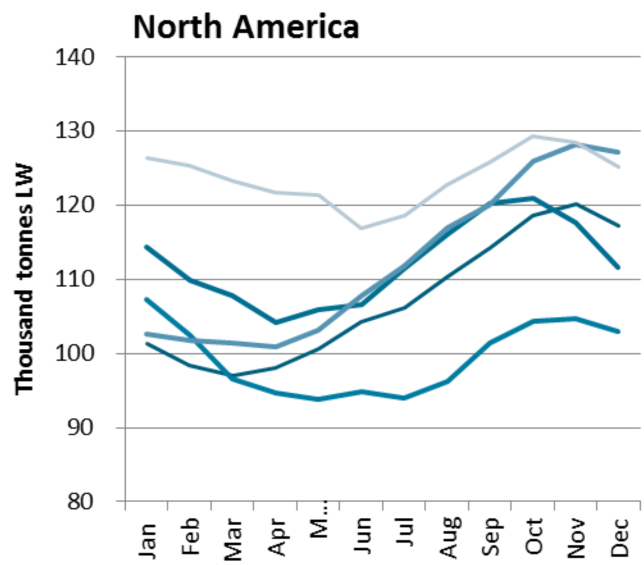
Average yield in the UK, North America and Faroe Islands for 14G is estimated to 3.02kg, 3.53g and 4.97kg, respectively.

Sources: Kontali Analyse, Marine Harvest









Due of variations in sea water temperature during the year, the total standing biomass in Europe has a S-curve, which is at its lowest in May and at its peak in October. The Norwegian industry is focused on minimising the natural fluctuations as license constraints put a limit to how much biomass can be in sea at the peak of the year.

In Chile the situation is different due to more stable seawater temperatures and opposite seasons (being in the Southern hemisphere). A more steady water temperature gives the possibility to release smolt during the whole year and gives a more uniform utilization of the facilities. The relatively low standing biomass in Chile in 2010 and 2011 is due to the impact of the ISA disease.

Source: Kontali Analyse

12.Secondary Processing (VAP)

In processing we divide between primary and secondary processing.

Primary processing is slaughtering and gutting. This is the point in the value chain in which standard price indexes for farmed salmon are related.

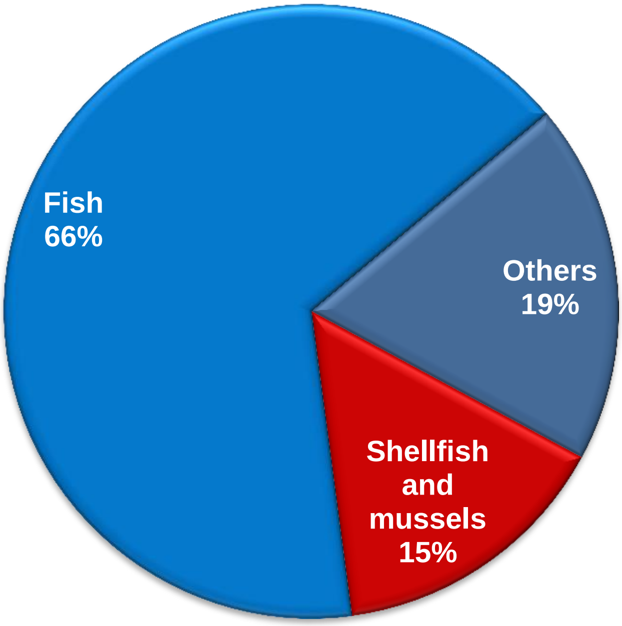
Secondary processing is filleting, fillet trimming, portioning, different cuttings like cutlets, smoking, making ready meal or Packing with Modified Atmosphere (MAP).

The products that have been secondary processed are called value-added products (VAP).

12.Secondary Processing (VAP)

12.1 European value-added processing (VAP) industry

- A total value of > EUR 25 billion
- Employees > 135,000
- Extremely fragmented – more than 4,000 companies
- About 50% of all companies have less than 20 employees
- Traditionally the EBIT-margins have been between 2% and 5%
- The average company employs 33 people and has a turnover of EUR 4.2 million



The seafood industry in Europe is fragmented with more than 4,000 players. Most of the companies are fairly small, but there are also several companies of significant size involved in the secondary processing industry: Marine Harvest, Icelandic Group, Young's Seafood, Deutsche See, Caladero, Royal Greenland, Labeyrie, and Lerøy Seafood.

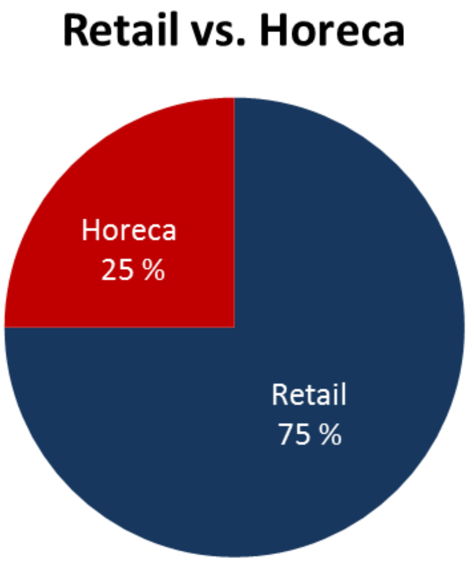
Most of the largest players are basing their processing on Atlantic salmon, producing smoked salmon, portions or ready meals with different packing as vacuum or modified atmosphere (MAP).

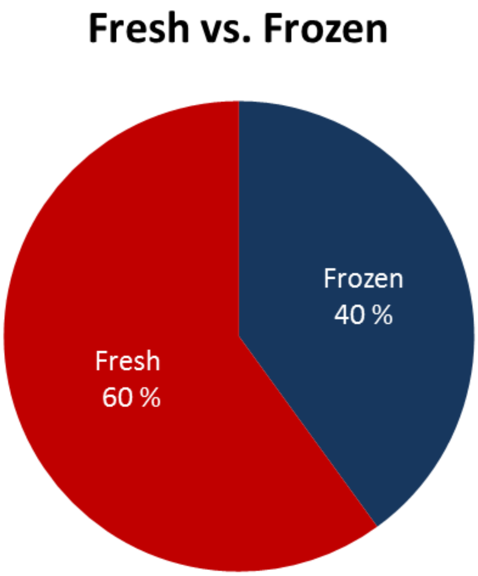
Consumers are willing to pay for quality and value added. This means that we are expecting to see an increase in demand for convenience products such as ready-to-cook fish, together with a packing trend towards MAP as this maintains the freshness of the product longer than fish sold in bulk.

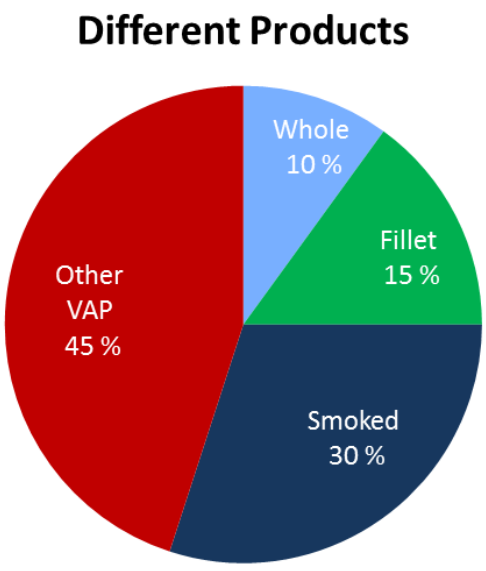
Sources: Marine Harvest, Intrafish, EU

12.Secondary Processing (VAP)

12.2 Market segment in the EU (2015)





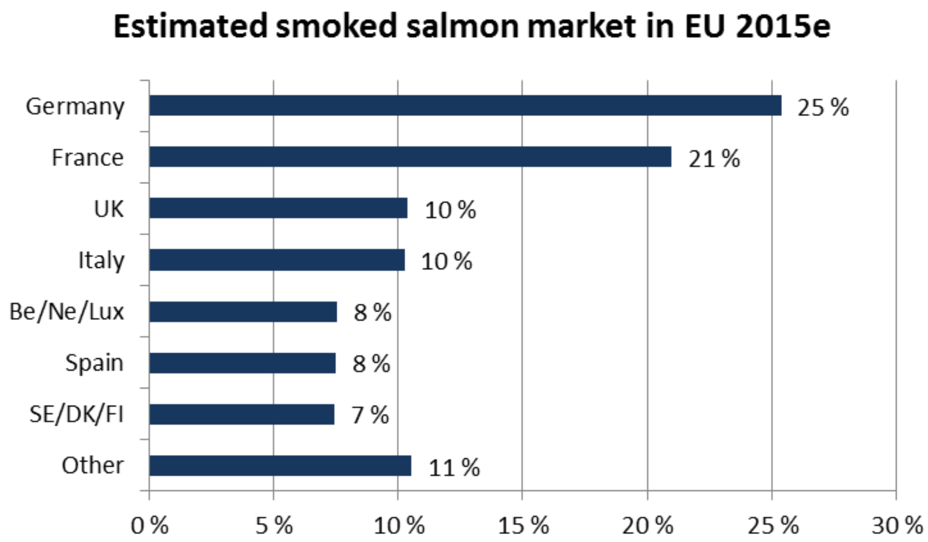


In the EU, more than half of the Atlantic salmon supply went to retailers and just over half was sold fresh. Of the different products, smoked have the largest market share of 30% followed by Fillet. Other VAP consists of all value added processed products, except smoked salmon.

Note: Horeca = Hotel, restaurants and café (or establishments which prepare and serve food and beverages)
Source: Kontali Analyse

12.Secondary Processing (VAP)

12.3 The European market for smoked salmon



Smoked salmon is the most common secondary processed product based on Atlantic salmon. The European market for smoked salmon was estimated to 291,420 tonnes GWE in 2015, in which Germany and France are the largest markets. The amount of raw material needed for this production was around 306,810 tonnes GWE.

European smoked salmon producers (2015E)
The ten largest producers of smoked salmon in Europe are estimated to have a joint market share of more 60%. The production is mainly done in Poland, France, UK, Baltic states and the Netherlands.

Marine Harvest has its smoked salmon production in Poland (Morpol), UK (Rosyth), France (Kritsen) and Belgium (La Couronne), and its main markets are Germany, France, Italy and Belgium. After the acquisition of Morpol in 2013, Marine Harvest became the largest producer of smoked salmon. Labeyrie is the second largest and sells most of its products to France, and has also significant sales to UK, Spain, Italy and Belgium.

Estimated Annual Raw Material - Tonnes HOG			
70 - 90 000	20 - 40 000	10 - 20 000	5 - 10 000
MH Consumer Products (PL-FR-UK)	Labeyrie (FR-UK)	Norvelita (LT)	Martiko (ES)
		Young's Seafood (UK)	Friedrichs (DE)
		Mer Alliance (FR)	Neptune Intnl. (DE)
		Suempol (PL)	Intermarché (FR)
		Delpeyrat (FR)	Foppen (NL)
		Lerøy (NL-SE-NO)	Ubago (ES)

Source: Kontali Analyse

Appendix

In the appendix you can find explanation of key words, as well as information about the Marine Harvest group such as key financial numbers, the company's history together with information about our operations upstream and downstream.

Appendix

Weight conversion ratios and key words

	Atlantic salmon
Live fish	100%
Loss of blood/starving	7%
Harvest weight / Round bled fish (WFE)	93%
Offal	9%
Gutted fish, approx. (GWE)	84%
Head, approx.	7%
Head off, gutted	77%
Fillet (skin on)	56 - 64 %
C-trim (skin on)	60%
Fillet (skin off)	47 - 56 %

Net weight: Weight of a product at any stage (GWE, fillet, portions). Only the weight of the fish part of the product (excl. ice or packaging), but incl. other ingredients in VAP

Primary processing: Gutted Weight Equivalent (GWE) / Head on Gutted (HOG)

Secondary processing: Any value added processing beyond GWE

Biomass: The total weight of live fish, where number of fish is multiplied with an average weight

Ensilage: Salmon waste from processing added acid

BFCR:

$$\frac{\text{IB feed stock + feed purchase – UB feed stock}}{\text{Kg produced – weight on smolt release}}$$

EFCR:

$$\frac{\text{IB feed stock + feed purchase – UB feed stock}}{\text{Kg produced – mortality in Kg – weight on smolt release}}$$

Price Notifications: Nasdaq (FCA Oslo) - Head on gutted from Norway (4-5 kg)
FOB Miami - fillets from Chile (2-3 lb)
FOB Seattle - whole fish from Canada (8-10 lb)

Source: Kontali Analyse

Appendix

Price indices vs. FOB packing plant

Norwegian NASDAQ-Index - Selling price for superior gutted, fresh salmon iced and packed in boxes - FCA Oslo

NASDAQ Index	
- General sales and administration expences	~ 0,75 NOK
= Former NOS/FHL-index	
- Freight to Oslo	~ 0,70 NOK
- Terminal Cost	
= Selling price farmers FOB packing plant	

Norwegian SSB custom statistics - all sizes, all qualities and included contract sales

SSB	
- Freight to border	~ 1,50 NOK*
- Duty and taxes	
- Adjusted to sizes and quality	
- Freight to Oslo	
- Terminal cost	
= Selling price farmers FOB packing plant	

Urner Barry FOB Miami - Chilean atlantic salmon fillets, PBO, c-trim delivered FOB Miami

UB
- See text below

= Selling price farmers FOB packing plant

Urner Barry FOB Seattle - West Coast atlantic salmon - whole - fresh delivered FOB Seattle

FOB Seattle
- Freight (~6 cent/lb)

= Selling price farmers FOB packing plant

Several price indices for salmon are publicly available. The two most important providers of such statistics for Norwegian salmon are Nasdaq/Fish Pool and Statistics Norway (SSB). Urner Barry in the US provides a reference price for Chilean salmon in Miami and Canadian salmon in Seattle.

In Norway the price is found by deducting freight cost from the farm to Oslo and the terminal cost from the Nasdaq price (~0.70 NOK). If using the SSB custom statistics, you need to adjust for freight to border, duty and taxes, and for quality and contract sales to get the achieved spot price back to producer. Average difference between SSB price and FCA Oslo is ~1 NOK, which gives the average difference between SSB price and back to plant at NOK 2.00 (historically this difference fluctuates from week to week and will normally be observed in the range of -2 to +4).

Calculating Urner Barry – Chilean fillets, back to GWE plant is more extensive. It is necessary to use UB prices for both 2/3lb and 3/4lb and adjust for quantity share, market handling (4 cent), and market commission (4.5%). In addition there are some adjustments which varies over time; premium fish share (~92%), reduced price on downgraded fish (~30%), airfreight (~USD 1.50/kg) and GWE to fillet yield (~70%).

*10 year Average difference between SSB and return to packing plant

Source: Fishpool, Nasdaq, SSB, Norwegian Seafood Council, Urner Barry, Kontali Analyse

Appendix

Some historic acquisitions and divestments

In Norway there has been 'countless' mergers between companies the last decade. The list below only shows some of the larger ones in transaction value. In Scotland the consolidation has also been very strong. In Chile, there has been limited transaction activity over the last two years. However, several companies have been listed on the Santiago Stock Exchange. Canada's industry has been extensively consolidated with a few large players and some small companies.

Norway					
1999	Hydro Seafoods - Sold from Norsk Hydro to Nutreco Aquaculture	2005	Skjervøyfisk - Sold to Nordlaks	2009	65 new licenses granted
2001	Gjølaks - Sold to PanFish	2006	Fossen AS - Sold to Lerøy Seafood Group	2010	Espevær Fiskeoppdrett - Sold to Bremnes Fryseri
2001	Vest Laks - Sold to Austevoll Havfiske	2006	Marine Harvest N.V. - Acquired by Pan Fish ASA	2010	AL Nordsjø - Sold to Alsaker Fjordbruk
2001	Torris Products - Sold from Torris to Seafarm Invest	2006	Fjord Seafood ASA. - Acquired by Pan Fish ASA	2010	Nord Senja Fiskeindustri - Sold to Norway Royal Salmon
2001	Gjølanger Havbruk - Sold to Aqua Farms	2006	Marine Harvest Finnmark - Sold from Marine Harvest to Volden Group	2010	Marøy Salmon - Sold to Blom Fiskeoppdrett
2001	Alf Lone - Sold to Sjøtroll	2006	Troika Seafarms/North Salmon - Sold to Villa Gruppen	2010	Fjord Drift - Sold to Tombre Fiskeanlegg
2001	Sandvoll Havbruk - Sold to Nutreco Aquaculture	2006	Aakvik - Sold to Hydrotech	2010	Hennco Laks - Sold to Haugland Group
2001	Fosen Edelfisk - Sold to Salmar	2006	Hydrotech - Sold to Lerøy Seafood Group	2010	Raumagruppen - Sold to Salmar
2001	Langsteinfisk - Sold to Salmar	2006	Senja Sjøfarm - Sold to Salmar ASA	2010	Sjøtroll Havbruk - Sold to Lerøy Seafood Group
2001	Tveit Gård - Sold to Alsaker Fjordbruk	2006	Halsa Fiskeoppdrett - Sold to Salmar ASA	2010	Stettefisk / Marius Eikremsvik - Sold to Salmar
2001	Petter Laks - Sold to Senja Sjøfarm	2006	Langfjordlaks - Sold to Mainstream	2010	Lund Fiskeoppdrett - Sold to Vikna Sjøfarm (Salmonor)
2001	Kråkøyfisk - Sold to Salmar	2006	Polarlaks - Sold to Mainstream	2011	R. Lernes - Sold to Måsøval Fiskeoppdrett
2002	Amulaks - Sold to Follalaks	2007	Veststar - Sold to Lerøy Seafood Group	2011	Erfjord Stamfisk - Sold to Grieg Seafood
2002	Kvamsdal Fiskeoppdrett - Sold to Rong Laks	2007	Volden Group - Sold to Grieg Seafood	2011	Jøkelfjord Laks - Sold to Morpol
2002	Matland Fisk - Sold to Bolaks	2007	Artic Seafood Troms - Sold to Salmar ASA	2011	Krifo Havbruk - Sold to Salmar
2002	Sanden Fiskeoppdrett - Sold to Aqua Farms	2007	Arctic Seafood - Sold to Mainstream	2011	Straume Fiskeoppdrett - Sold to Marine Harvest Norway
2002	Ørsnes Fiskeoppdrett - Sold to Aqua Farms	2007	Fiskekultur - Sold to Haugland Group	2011	Bringsvor Laks - Sold to Salmar
2002	Toftøysund Laks - Sold to Alsaker Fjordbruk	2007	UFO Laks - Sold to Haugland Group	2011	Nordfjord Havbruk - Changed name to Nordfjord Laks
2003	Nye Midnor - Sold from Sparebank1MidtNorge to Lerøy Seafood Group	2007	Anton Misund - Sold to Rauma Gruppen	2011	Villa Miljølaks - Sold to Salmar
2003	Ishavslaks - Sold to Aurora to Volden Group	2007	Mico Fiskeoppdrett - Sold to Rauma Gruppen	2011	Karma Havbruk - Sold to E. Karstensen Fiskeoppdrett (50 %) and Marø Havbruk (50 %)
2003	Loden Laks - Sold to Grieg Seafood	2008	Hamneidet - Sold to Eidsfjord Sjøfarm	2012	Skottneslaks - Sold to Eidsfjord Laks
2003	Finnmark Seafood - Sold to Follalaks	2008	Misundfisk - Sold to Lerøy Seafood Group	2012	Villa Arctic - 10 licenses, etc. sold to Salmar
2003	Ullsfjord Fisk - Sold to Nordlaks	2008	Henden Fiskeoppdrett - Sold to Salmar ASA	2012	Salmon Brands - Sold to Bremnes Fryseri
2003	Henningsværfisk - Sold to Nordlaks	2008	AS Tri - Sold to Norway Royal Salmon (NRS)	2012	Pundslett Laks - Sold to Nordlaks Holding
2004	Flatanger Akva - Sold to Salmar	2008	Feøy Fiskeopprett - Sold to Norway Royal Salmon	2012	Strømsnes Akvakultur – Sold to Blom Fiskeoppdrett
2004	Naustdal Fiskefarm/Bremanger Fiskefarm - Sold to Firda Sjøfarm	2008	Salmo Arctica - Sold to Norway Royal Salmon	2012	Ilsvåg Matfisk – Sold to Bremnes Seashore
2004	Fjordfisk - Sold to Firda Sjøfarm	2008	Åmøy Fiskeoppdrett - Sold to Norway Royal Salmon	2012	The granting of 45 new green licenses announced
2004	Snekvik Salmon - Sold to Lerøy Seafood Group	2008	Nor Seafood - Sold to Norway Royal Salmon	2013	Morpol – sold to Marine Harvest
2004	Aure Havbruk / M. Ulfsnes - Sold from Sjøfor to Salmar	2008	Altafjord Laks - Sold to Norway Royal Salmon	2013	Villa Organic – 47,8% of shares sold to Lerøy Seafood Group
2005	Follalaks - Sold to Cermaq	2008	Lerøy Seafood Group - Purchased by Austevoll Seafood	2013	Villa Organic – 50,4% of shares sold to SalMar
2005	Aqua Farms - Sold to PanFish	2009	Skjærgårdsfisk - Sold to Lingalaks	2013	Salmus Akva - Sold to Nova Sea
2005	Aurora Salmon (Part of company) - Sold from DNB Nor to Lerøy Seafood Group	2009	Brilliant Fiskeoppdrett - Sold to Norway Royal Salmon	2014	Skarven (Sømna Fiskeoppdrett and Vik Fiskeoppdrett) - Sold to Nova Sea
2005	Marine Harvest Bolga - Sold to Seafarm Invest	2009	Polarlaks II - Sold to Nova Sea	2014	Cermaq – sold to Mitsubishi
2005	Aurora Salmon (Part of company) - Sold from DNB Nor to Polarlaks	2009	Fjordfarm - Sold to Blom Fiskeoppdrett	2014	The granting of 5% voluntary green capacity (MAB) expansion announced
2005	Sjølaks - Sold from Marine Farms to Northern Lights Salmon	2009	Fyllingsnes Fisk - Sold to Eide Fjordbruk	2015	EWOS - 2 licenses, sold to Bolaks
2005	Bolstad Fjordbruk - Sold to Haugland Group	2009	Salaks merged with Rølaks	2015	Senja Akvakultursenter - Sold to Lerøy Aurora

Source: Kontali Analyse

Appendix
Some historic acquisitions and divestments

	UK		Chile		North America
1996	Shetland Salmon products - Sold to HSF GSP	1999	Chisal - Sold to Salmones Multiexport	1989	Cale Bay Hatchery - Sold to Kelly Cove Salmon
1996	Straithaird Salmon to MH	2000	Salmo America - Sold to Fjord Seafood	1994	Anchor Seafarms Ltd., Saga Seafarms Ltd., 387106 British Columbia Ltd., and United hatcheries merged into Omega Salmon Group (PanFish)
1996	Gigha, Mainland, Tayinlaoan, Mull Salmon - All sold to Aquascot	2000	Salmones Tecmar - Sold to Fjord Seafood	1997	ScanAm / NorAm - Sold to Pan Fish
1997	Summer Isles Salmon - Sold to HSF GSP	2000	Salmones Mainstream - Sold to Cermaq	2001	Scandic - Sold to Grieg Seafoods
1997	Atlantic West - Sold to West Minch	2001	Pesquera Eicosal - Sold to Stolt Nielsen	2004	Stolt Sea Farm - merged with Marine Harvest
1998	Marine Harvest Scotland - Sold from BP Nutrition to Nutreco	2003	Marine Farms - Sold to Salmones Mainstream	2004	Atlantic salmon of Maine (Fjord Seafood)- Sold to Cooke Aquaculture
1998	Gaelic Seafood UK - Sold to Stolt Seafarms	2004	Salmones Andes - Sold to Salmones Mainstream	2004	Golden Sea Products (Pan Fish) - Sold to Smokey Foods
1998	Mainland Salmon - Sold to Aquascot	2004	Stolt Seafarm - Merged with Marine Harvest	2005	Heritage (East) - Sold to Cooke Aqua
1999	Hydro Seafood GSP - Initially sold to Nutreco as part of Hydro Seafood deal	2004	Pesquera Chillehue - Sold to GM Tornegaleones	2005	Heritage (West) - Sold to EWOS/Mainstream
1999	Joseph Johnston & Sons - Sold to Loch Duart	2005	Aguas Claras - Sold to Acua Chile	2006	Marine Harvest - Sold to Pan Fish
2000	Aquascot Farming - Sold from Aquascot to Cermaq	2005	Salmones Chiloè - Sold to Aqua Chile	2007	Target Marine - Sold to Grieg Seafoods
2000	Shetland Norse - Sold to EWOS	2005	Robinson Crusoe - Sold to Aqua Chile	2007	Shur-Gain (feed plant in Truro)- Sold to Cooke Aqua culture
2000	Hydro Seafood GSP - Sold to Norskott Havbruk (Salmar & Lerøy Seafood Group) from Nutreco	2006	GM Tornegaleones - change name to Marine Farm GMT	2008	Smokey Foods - Sold to Icicle Seafoods
2001	Laschinger UK - Sold to Hjaltland	2006	Merger Pan Fish - Marine Harvest - Fjord Seafood	2011	Vernon Watkins' Salmon Farming (NFL - Canada East) - Sold to Cooke Aquaculture
2001	Wisco - Sold to Fjord Seafood	2007	Pacific Star - Sold to Andrè Navarro	2012	Ocean Legacy/Atlantic Sea Smolt (NS - Canada East) - Sold to Loch Duart
2002	Wester Sound / Hoganess - Sold to Lakeland Marine	2007	Salmones Cupquelan - Sold to Cooke Aqua	2016	Cooke Aquaculture signs agreement to buy Icicle Seafoods
2004	Ardvar Salmon - Sold to Loch Duart	2009	Patagonia Salmon Farm - Sold to Marine Farm GMT		
2004	Hennover Salmon - Sold to Johnson Seafarms Ltd.	2010	Camanchaca (salmon division) - Sold to Luksic Group		
2004	Bressay Salmon - Sold to Foraness Fish (from adm. Receivership)	2011	Salmones Humboldt - Sold to Mitsubishi		
2004	Johnson Seafarms sold to city investors	2011	Pesquera Itata+Pesquero El Golfo - merged into Blumar		
2005	Unst Salmon Company - Sold from Biomar to Marine Farms	2011	Landcatch Chile - Sold to Australis Mar		
2005	Kinloch Damph - Sold to Scottish Seafarms	2012	Salmones Frioaysen & Pesquera Landes' freshwater fish cultivation sold to Salmones Friosur		
2005	Murray Seafood Ltd. - Sold from Austevoll Havfiske to PanFish	2012	Cultivos Marinos Chilé – Sold to Cermaq		
2005	Corrie Mohr - Sold to PanFish	2013	Pacific Seafood Aquaculture – Prod rights&permits for 20 licenses sold to Salmone Friosur		
2006	Wester Ross Salmon - MBO	2013	Salmones Multiexport divest parts of coho and trout prod. Into joint venture with Mitsui		
2006	Hjaltland Seafarm - Sold to Grieg Seafood ASA	2013	Trusal sold to/merged with Salmones Pacific Star, with new name Salmones Austral		
2006	Orkney Seafarms - Sold to Scottish Seafarms	2013	Congelados Pacifico sold to Ventisqueros		
2007	Lighthouse Caledonia - Spin-off from Marine Harvest	2014	Nova Austral sold to EWOS		
2010	Northern Aquaculture Ltd - Sold to Grieg Seafood	2014	Acuinova sold to Marine Harvest Chile		
2010	Lighthouse Caledonia - changed name to Scottish Salmon Company	2014	Cermaq – sold to Mitsubishi		
2010	West Minch Salmon - Sold to Scottish Salmon Company	2014	Comercial Mirasol – sold to Salmones Humboldt (Mitsubishi)		
2010	Meridian Salmon Group - Sold to Morpol				
2011	Skelda Salmon Farms Limited - Sold to Grieg Seafood				
2011	Duncan Salmon Limited - Sold to Grieg Seafood				
2012	Uyesound Salmon Comp – Sold to Lakeland Unst (Morpol)				
2013	Lewis Salmon – Sold to Marine Harvest Scotland				
2013	Morpol sold to Marine Harvest				
2014	Part of Morpol/Meridian sold to Cooke Aquaculture				
2015	Thompson Bros Salmon - Sold to Cooke Aquaculture				

Source: Kontali Analyse

Appendix
Atlantic salmon production cycle

Breeding

Broodstock Bred on selected characteristics eg. growth, disease resistance, maturation, colour

Spawning and fertilisation: Eggs stripped from females and mixed with milt

Eyed eggs: After 25-30 days fertilized eggs show "eyes". The development is depending on temp. 5000 eggs/ litre

Alevins: Small (<2.5 cm). Yolk sack providing first stage nutrition. When absorbed the fish start feeding

Fry/Parr: Start feeding of small fish. Temp 12-14 ºC. Fish is growing in FW sites to around 60-100g. Vaccination and grading important. Adaptation to life in seawater (smoltification)

Growing

Transfer to seawater sites by wellboat or trucks

On-growing in sea-water sites to around 4.5-5,5 kg (ca 16-22 months depending on temperature). Transport to packing station.

Harvesting

Slaughter, gutting and packing

Processing

The total production cycle takes approx. 10-16 months in freshwater plus 14-22 months in seawater = In sum 24-36 months (in Norway)

In the last two decades, there has been a global trend of growing awareness about the economic, social and environmental aspects of optimal use of fishery by-products, and of the importance of reducing discards. Nowadays, more and more by-products are being used in feed, and a growing percentage of fishmeal is being obtained from trimmings and other residues from the preparation of fish fillets.

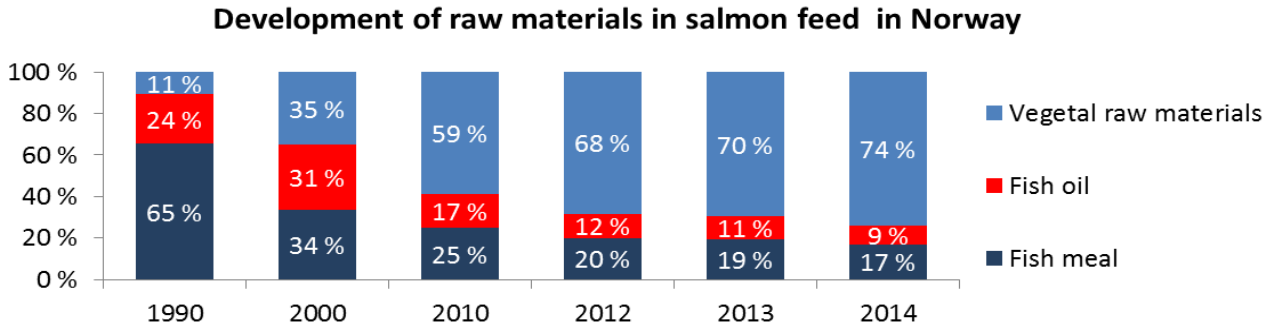
According to UN, 7 million tonnes of wild catch are destroyed/discarded as non-commercial harvest annually by commercial fisheries. This figure could have been converted into an annual fish oil quantity of 0.5 million tonnes, i.e. close to 80% of the tonnage used in salmon and trout farming (UN, 2010).

In FAO's State of World Fisheries and Aquaculture report (2014) it states that in 2012, more than 86% of world fish production was utilised for direct human consumption. The remaining 14% was destined for non-food uses, of which 75% was reduced to fishmeal and fish oil. Although the FAO encourages using more fish directly to human consumption, they are of the opinion that it is more efficient, in a protein-hungry world, to harvest the unmarketable species for animal feed, subsequently consumed by man, than to not harvest the fish at all.

Nonetheless, we have seen a significant decline in the use of fish meal and fish oil in salmon feed due to changes in recipes. While fish meal and fish oil have traditionally been the main ingredients, reduced availability and increased prices, it is common practice to substitute this with cheaper and more available non-marine raw materials. Fish meal protein is being substituted with plant proteins, such as soya concentrates and sunflower meal or with poultry by-products, such as feather meal (not used in Europe).

A report from Nofima (Ytrestøyl et. al., 2014) shows that the average Norwegian salmon diet in 1990 contained 65% fish meal and 24% fish oil and that it had come down to 19% and 11% respectively in 2013. Holtermann has estimated the same numbers to be 17% and 9% in 2014. At these low levels, salmon farming is a net producer of marine protein, in others words more fish protein is produced than what is used to make the feed.

Substitution of marine raw materials has not been found to have any negative effect on growth, susceptibility to disease, or quality of the fish as long as the fish' own nutrient requirements are being covered. The downward trend in the use of marine ingredients continues and with the ability of Atlantic salmon to utilise alternative feed ingredients, lack of feed raw materials should not be a threat to the growth of the industry. However, there will be increased competition for the best quality raw materials and feed prices may therefore be affected.



Sources: *Ytrestøyl T., Aas T.S., Åsgård T. (2014) Resource utilisation of Norwegian salmon farming in 2012 and 2013. Nofima report 36/2014 pp. 35, NOFIMA, FAO (2012) World Fisheries and Aquaculture, UN (2010), FAO (2014) World Fisheries and Aquaculture, Holtermann*

Appendix
The Global Salmon Initiative & the ASC

GSI GLOBAL SALMON INITIATIVE

A healthy, sustainable source of nutrition for a growing global population

The Global Salmon Initiative (GSI) is a leadership initiative by global farmed salmon producers, focused on making significant progress towards fully realising a shared goal of providing a highly sustainable source of healthy protein to feed a growing global population, whilst minimising our environmental footprint, and continuing to improve our social contribution.

GSI's focus areas are biosecurity (priority is sea lice), standards (ASC), and feed and nutrition (fish meal and oil).

The Aquaculture Stewardship Council (ASC), founded in 2010 by WWF and IDH (Dutch Sustainable Trade Initiative), is an independent non-profit organisation with global influence. ASC aims to be the world's leading certification and labelling programme for sustainably farmed seafood. The ASC's primary role is to manage the global standards for responsible aquaculture.

ASC works with aquaculture producers, seafood processors, retail and foodservice companies, scientists, conservation groups and consumers. The ASC logo sends a strong message to consumers about the environmental and social integrity of the product they are purchasing. The chart below shows the areas of focus for the ASC.

ASC - NUMBER OF REQUIREMENTS WITHIN EACH PRINCIPLE

Sources: Marine Harvest, www.asc-aqua.org, www.globalsalmoninitiative.org

From Mowi to Marine Harvest

2014	Marine Harvest listed at New York Stock Exchange
2013	Marine Harvest acquires Morpol
2012	Feed division established
2007	Company name is changed to Marine Harvest
2006	PanFish acquires Marine Harvest
2005	Marine Harvest and Stolt Sea Farm merge PanFish acquires Fjord Seafood John Fredriksen acquires PanFish
2000	Nutreco acquires Hydro Seafood. New company name: Marine Harvest
1999	Nutreco acquires the Scottish farming operations started by Unilever
1998	Mowi is discontinued as a company name Hydro Seafood has sites in Norway, Scotland and Ireland
1996	Hydro Seafood acquires Frøya holding
1990	Hydro Seafood registered 25 June Restructuring and consolidation of the industry starts
1985	Hydro increases its holding to 100%
1983	Mowi buys GSP in Scotland and Fanad in Ireland
1975	Mowi becomes a recognised brand
1969	Hydro increases its holding to 50%
1965	Mowi starts working with Salmon in Norway Unilever starts working with Salmon in Scotland under the name Marine Harvest

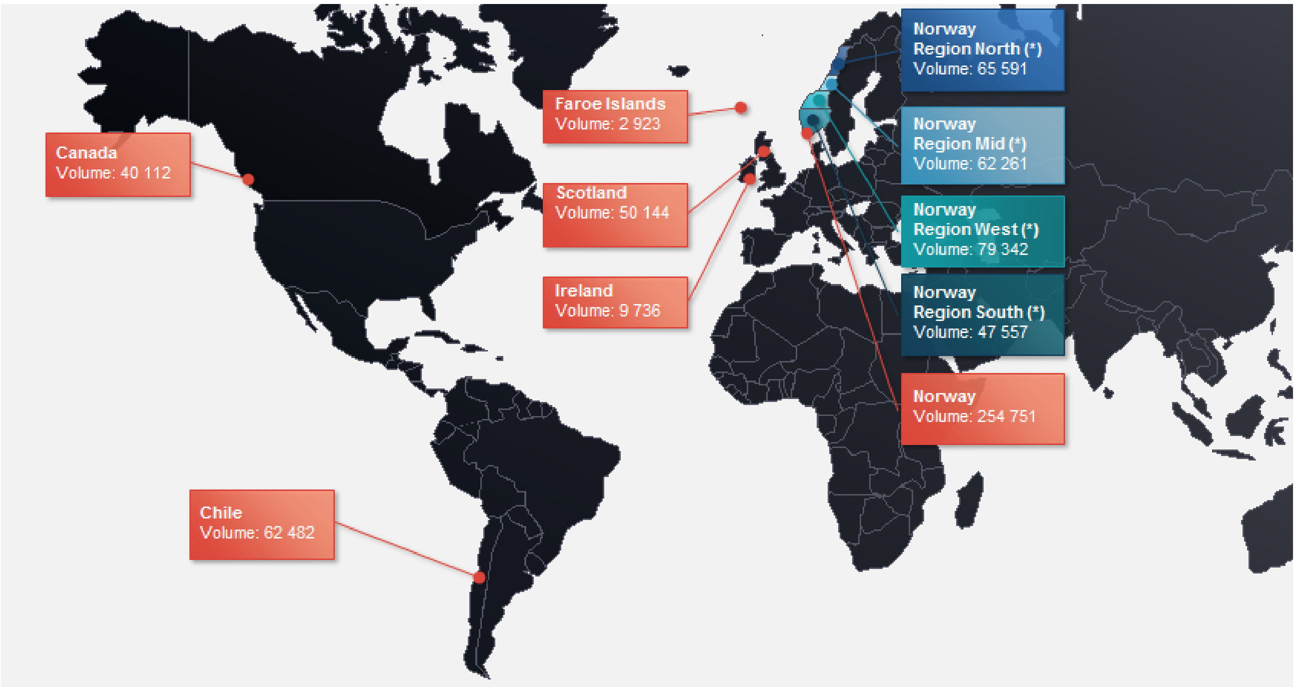
Appendix
MHG has a leading position across the value chain

Marine Harvest business areas



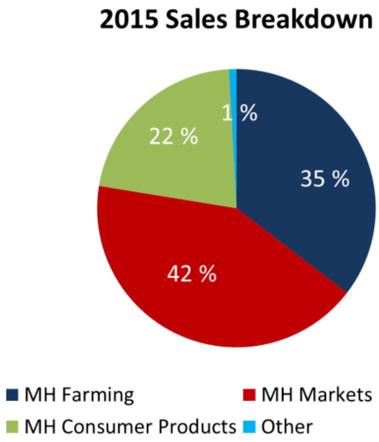
#4	#1	#1
Position: 281.655 tonnes vs. global salmonid feed production of ~3.9m tonnes	420.148 tonnes vs. global production of ~2.07m tonnes (20%)	Global sales network Leading position in Consumer Products
Focus areas: Efficiency of operations	Acquisitive growth in Norway and Chile	Organic growth in Consumer Products

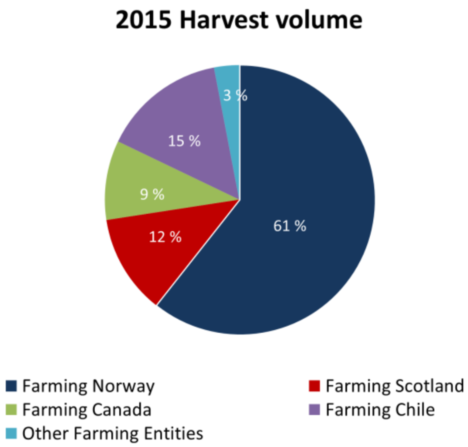
Appendix
Marine Harvest farming



Marine Harvest farms salmon in six countries; Norway, Scotland, Canada, Chile, Ireland and Faroe Islands. In total, the company is present in 23 countries and sell to more than 70 countries worldwide. Marine Harvest is listed on Oslo Stock Exchange (:MHG) and New York Stock Exchange and have more than 18 000 shareholders. The head office is located in Bergen, Norway. At the end of 2015, the group had 12 454 employees worldwide, including temporary employees.

Total revenue for Marine Harvest in 2015 was MNOK 27 900 and Atlantic salmon harvest quantity was 420 100 tonnes (GWE), which was 20% of total industry output.





*Norway: Actual harvest volume 2015. Other harvest figures on the map is guided harvest volumes for 2015. Actual harvest volumes will be affected by e.g. water temperatures, development in biological growth, biological challenges such as diseases, algae blooms etc. and market developments.

Appendix
Marine Harvest sales network

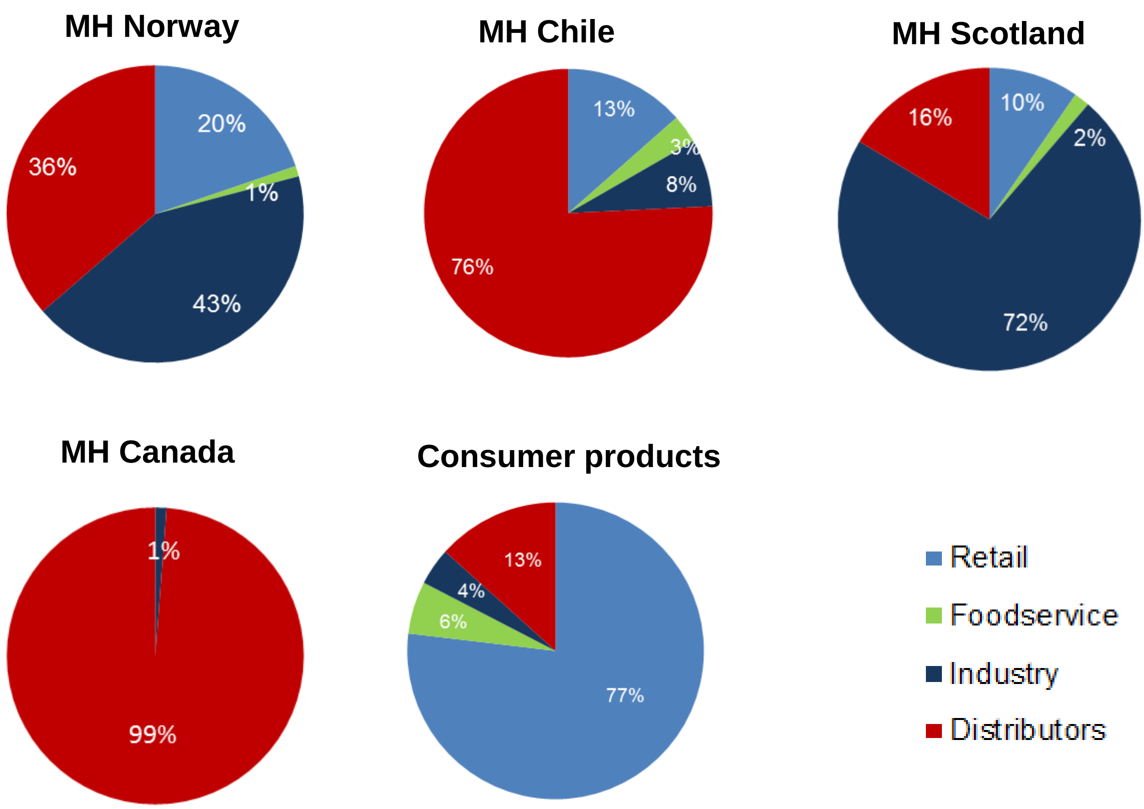
Marine Harvest have an extensive sales network on a global basis, and sells to more than 70 countries around the world. Finished products are sold to retail, food service, industry and distributors.

America, Sales & Marketing:
- Sales 536 M EUR – 93,000 tonnes product weight
- VAP Processing: USA (Ducktrap) & Chile 42,400 tonnes finished products
- 461 FTE

Europe, Sales & Marketing:
- Sales 2.6 BN EUR – 417,000 tonnes product weight
- VAP Processing: France, Belgium, Holland, UK, Poland, Germany, Czech Rep, Spain.
- 6,670 FTE

Asia, Sales & Marketing:
- Sales 301 M EUR – 39,500 tonnes product weight
- VAP Processing: Japan, South Korea, Taiwan, China and Vietnam.
- 1,189 FTE

Marine Harvest's main secondary processed product is smoked salmon, and the largest factory is found in Poland. We also process several other species as whitefish and flatfish to ready meals or packed in modified atmosphere (MAP).



Marine Harvest sells its products to several categories of purchasers. We divide them into; Retail, Food Service (Horeca(1)), Industry, Distributors and others. Each business unit has their own sales profile. MH Canada sells almost the whole production to distributors, and MH Chile sells most of their production to distributors. In Norway and Scotland, most of the production is head-on-gutted (HOG, equivalent to GWE) and is therefore sold to industrial customers, who further process the salmon into other products such as filets, portions, smoked salmon or ready-meal products.

MH Consumer Products is processing fish from raw material to value-added products and sells 82% of the production to final sales points met by end consumer (retail + food service).

Note: (1) Horeca = Hotel, restaurants and café (or establishments which prepare and serve food and beverages)
Source: Marine Harvest

Appendix
Historical average foreign exchange rate

Year	EURO/NOK
2015	8.9530
2014	8.3534
2013	7.8087
2012	7.4744
2011	7.7926
2010	8.0068
2009	8.7285
2008	8.2194
2007	8.0153
2006	8.0510
2005	8.0073
2004	8.3715
2003	8.0039
2002	7.5073
2001	8.0492
2000	8.1109
1999	8.3101
1998	8.4135
1997	8.0030
1996	8.3351
1995	8.3954
1994	8.4825
1993	8.4596

In chapter 8, cost and investments in NOK has occasionally been converted to Euro. The same is true for NOK prices in chapter 2.6.

The reason for this conversion is the international nature of the salmon industry. As the European Union is the biggest market for Atlantic Salmon, it's often more appropriate to use Euro as the quoted currency.

The table to the left show the EURO/NOK rate used for this purpose.

Source: Norges Bank, Bloomberg

Appendix

Sources for industry and market information

Marine Harvest:	www.marineharvest.com
Other	
Kontali Analyse:	www.kontali.no
Intrafish:	www.intrafish.no
Norwegian directorate of Fisheries:	www.fiskeridirektoratet.no
Norwegian Ministry of Trade, Industry and Fisheries:	www.fkd.dep.no
Norwegian Seafood Council:	www.seafood.no
Norwegian Seafood Federation:	www.norsksjomat.no
Chilean Fish Directorate:	www.sernapersca.cl
FAO:	www.fao.org
International fishmeal and fish oil org.:	www.iffo.net
Laks er viktig for Norge:	www.laks.no
Price statistics	
Fish Pool Index:	www.fishpool.eu
Kontali Analyse (subscription based):	www.kontali.no
Urner Barry (subscription based):	www.urnerbarry.com
Statistics Norway (SSB):	www.ssb.no/laks_en/
NASDAQ:	www.salmonprice.nasdaqomxtrader.com

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Marine Harvest ASA
www.marineharvest.com/investor