NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere

SEPTEMBER 2023

# Aquaculture in Norway

MARKET INTELLIGENCE REPORT

# Report

## Aquaculture in Norway - an overview

Norway is a global leader in aquaculture. This is in part thanks to its long coastline of clean, fresh seawater that provides good conditions for the operation of sustainable marine aquaculture activities. In addition to Atlantic salmon and rainbow trout, Norway also farms cod, halibut, char, and certain other fish species, seaweed, mussels, and breeds fry for food fish production.

Aquaculture is a profitable regional industry that provides jobs in rural and coastal Norway. The structure of the Norwegian aquaculture industry is varied, with a few large companies and many small and medium-sized players. The industry is concentrated from the west coast of Norway to Nordland. Since 2010, production has increased most in the North, where access to suitable sites is better and there are fewer biological challenges.

The industry has experienced tremendous growth over the last 20 years and is a significant contributor to the Norwegian economy. This growth has been fuelled by pioneering companies investing in research and development (R&D) and innovation. As the industry has grown however, so have the challenges it faces. While Norway continues to maintain its position as the leading global producer of salmon, the Norwegian salmon industry has experienced limited growth since 2012. This is largely attributed to sea-lice problems and other environmental and fish health issues, in combination with restrictions imposed by the Norwegian government's production regulating traffic light system (introduced in 2017). In 2023 a new resource rent tax was implemented, creating uncertainty for producers and investors, and potentially impacting future investment.

## Facts & Figures

In 2022 there were 218 aquaculture companies with grow out production in Norway (165 salmon and rainbow trout, 53 with other species). The four main grow out systems, either alone or in combination with others, are pond, cage, flow through or recirculating aquaculture systems (RAS). The total value of fish slaughtered from Norwegian aquaculture industry has risen from NOK 8.6 billion (approx. NZD 1.38 billion) in 1998 to NOK 106.5 billion (approx. NZD 17 billion) in 2022. (Further figures from Norway's Fisheries Directorate are available here).

Norwegian seafood exporters recorded their best year ever in 2022, where the value of aquaculture accounted for 73% of total seafood exports measured in value, while

aquaculture made up 45% of the total export volume. In 2022, Norway exported 1.3 million tonnes of seafood from aquaculture with an export value of NOK 111.3 billion. The export volume fell by 2.5% and the value increased by NOK25.7 billion (30%) compared to 2021.

# The regulatory environment

Norwegian **aquaculture is regulated** under the Norwegian Aquaculture Act, which seeks to promote the profitability and competitiveness of the aquaculture industry within the framework of sustainable development, while also contributing to value creation along Norway's coast. In addition to the Aquaculture Act, key rules for the establishment and operation of aquaculture are set out in the Food Act and the Animal Welfare Act. For fish health personnel, the Animal Health Personnel Act also applies.

To ensure a sustainable industry and limit the adverse environmental impact of aquaculture, the Norwegian government introduced a **traffic light system** in 2017. The system divides the coast into production areas and growth in production capacity is permitted or restricted based on the environmental situation in each individual production area. A production area's colour is set on the basis of estimates of high, moderate, or low risk of salmon lice leading to greater mortality among wild salmon in the area: Green if 0–10% of the wild population dies due to sea lice; yellow if 10–30% of the population dies due to sea lice; and red if >30% of the population dies due to sea lice. The traffic light colour determines whether aquaculture managers are permitted to increase their production capacity. If they are given a red light, they must reduce production capacity by six per cent. We understand colour ratings are reviewed on an annual basis.

In 2021, the Norwegian government presented a new **Aquaculture strategy**, "A Sea of Opportunities," (available in Norwegian here), providing a blueprint for the Norwegian aquaculture industry for the coming 10-15 years. The strategy seeks to review and simplify the country's entire licensing and traffic light systems and ensure sustainable growth in order to reach production of 5 million metric tons of salmon and trout per year by 2050, almost five times the current volume. Other aspects of the plan include: assessing whether the current site structure can be changed to reduce issues of infections between sites; facilitating suitable recirculating aquaculture systems (RAS) technology and revising regulations for environmentally friendly inland farming; facilitating the development of new feed raw materials for the aquaculture industry; and customs conditions in the export markets that make Norwegian farmed fish competitive. The strategy targets zero tariffs for farmed fish in all new free trade agreements; and continue the focus on aquaculture research, including research on new species and fish feed/new feed ingredients.

A **resource rent tax on aquaculture** was introduced from 1 January 2023, the effects of which have already started to unfold. Immediately after the proposal was introduced, the

share prices fell for most of the leading fish farming companies. Furthermore, some companies have suggested they may need to scale down future projects, and large investments have been put on hold (mainly land-based investments). Critics of the measure suggest the government has not sufficiently considered the actual obtained market prices in the proposal, (i.e., the risk of being taxed for an income above actual earnings), and point to the resulting approximately 1,400 temporary layoffs in processing, a part of the aquaculture industry which relies heavily on fixed price contracts.

# Innovations and challenges

The Norwegian industry has embraced **technological advancements** such as automated feeding systems, underwater monitoring sensors, and data analytics for optimised growth. For example, increasingly advanced systems for monitoring of the fish and the water column include sonar and computer-vision technology, in which video from subsea cameras and sensors are fed into computer-vision algorithms to gauge variables such as fish size and sea-lice infestation. The development of advanced fish vaccines and disease management techniques has improved overall fish health. Land-based facilities are increasingly utilising RAS to reduce environmental impact and improve biosecurity.

However, the **industry still faces challenges** related to disease outbreaks, environmental impact, and sustainability. Sea lice infestations can impact fish health, leading to increased health treatment costs. Escapes from sea cages and potential genetic interactions between farmed and wild fish are also cause for concern. Due to the introduction of oil vaccines, the industry's antibiotics consumption was reduced drastically in the 1990s. The development of vaccines has been one of the most crucial research-driven innovations in the Norwegian aquaculture industry as it enabled the industry to prevent dramatic outbreaks of damaging diseases.

A number of approaches have also been developed to treat against salmon lice, including chemical treatments, feed additives, and ‘cleaner fish’. The mix of approaches largely controls the salmon lice levels at considerable cost, but as the impact of lice on wild salmon stocks is considered unsustainable, the largest cost is most likely the foregone growth caused by strict regulations. (Salmon lice levels are now the main indicator being used in the “traffic light” system.)

Feed is another costly factor in aquaculture, and one where the potential value of innovations is significant. An early environmental challenge for the industry that also created economic waste was the fact that uneaten feed sunk through the pens and amassed nutrients at the bottom of the sea. By changing the physical composition of the pellets, the industry was able to create slower sinking feed that reduced the pollution significantly, and also improved the feed conversion ratio.

The industry's dependence on marine ingredients became both an economic and

environmental concern in the mid-1990s. However, with improved nutritional knowledge marine ingredients have been mostly substituted with plant-based ingredients. Today, marine ingredients constitute approximately 25% of the average salmon feed, and some researchers argue that salmon aquaculture is now a net contributor of marine protein.

Increased knowledge about **nutrition** may further change the feed composition. For instance, there is potential in using micro- and macro-algae as well as insect meal as replacements for fish meal. Furthermore, plant oils such as palm and rapeseed have emerged as candidates to replace fish oil, though so far these ingredients are not competitive on cost. With sufficient nutritional knowledge, aquafeed is likely to develop to resemble the production of most animal feeds where modelling is used to find the mix of ingredients that gives a feed of a given performance at the lowest cost.

# Opportunities and learnings for New Zealand

A number of important factors in Norway's position creates a cluster effect, or knowledge accumulation in the aquaculture industry. With the exception of the proximity to European markets, New Zealand shares many of Norway's success factors, and given the likemindedness on climate, environment, and sustainability, there may be opportunities for cooperation and exchange particularly on developments in research, technology and regulation to ensure that growth is achieved while limiting adverse environmental impacts. If companies are interested in this, they would need to engage with Norwegian counterparts to identify possible partnerships or areas for knowledge exchange or collaboration.

Factors that influence Norway's aquaculture cluster are a long coast with clean, cold water, a skilled work force, well-developed infrastructure including necessary roads, bridges, ferries and airports, and local business communities that can supply support services. In addition Norway has a competent, efficient bureaucracy with low corruption and a clear regulatory regime; schools that educate fish farmers, veterinarians, biologists, fish health specialists; research environments with extensive expertise in fish health, ecology and water quality; and finally, reasonable proximity to important markets in Europe and free market access into the EU in particular.

As the Norwegian industry has grown, several organisational innovations have fundamentally changed their structure. More specifically, the farming technology segment became increasingly specialised leading to the emergence of specialised equipment (e.g. fishnets), technology and services (e.g. maintenance and logistics). In particular, companies such as Akva Group, Scale AQ and Fiizk have significantly contributed to the development of farming technology and production practices, in collaboration with fish farmers and researchers.

In the 2010s many of the traditionally labour-intensive maintenance activities in the production processes have been outsourced to independent companies, making each

function more specialised. Recently, the larger firms have started to move the control functions on land to centralised locations that are monitoring feeding and the fish at a number of locations. As such, several tasks have been moved away from the farms. The increased specialisation and centralisation also presents opportunities for businesses providing relevant technologies and services within each function.

# More info

## More reports

View full list of market reports from MFAT at www.mfat.govt.nz/market-reports

If you would like to request a topic for reporting please email exports@mfat.net

To get email alerts when new reports are published, go to our subscription page.

To learn more about exporting to this market, New Zealand Trade & Enterprise's comprehensive market guides cover export regulations, business culture, market-entry strategies and more.

## To contact the Export Helpdesk

**email** exports@mfat.net

**call** 0800 824 605

**visit** Tradebarriers.govt.nz