

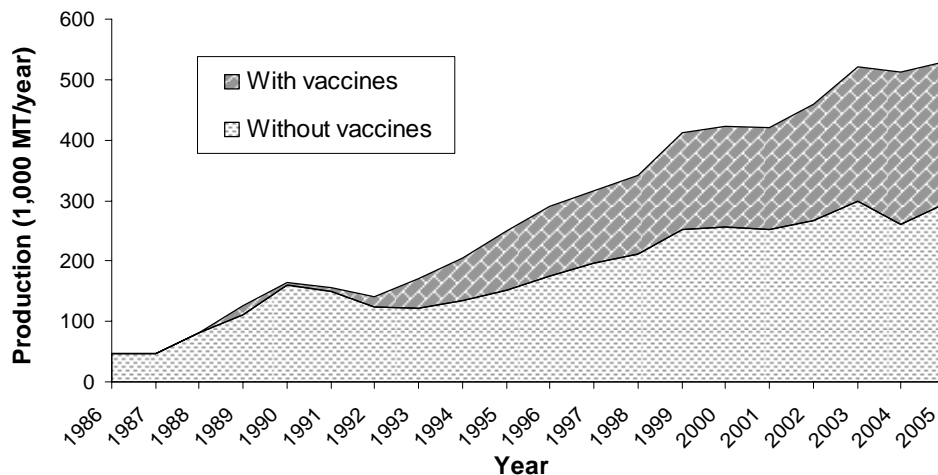
A GLOBAL SUCCESS STORY OF CAGE-BASED AQUACULTURE – SALMON FARMING AND THE TECHNOLOGY OF VACCINATION, KEY TO SUSTAINABILITY

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It is over 30 years since a pilot salmon farm in Scotland harvested the first 34 tonnes of salmon. This industry has developed dramatically and now produces nearly 1.5 million tonnes annually, spread across the two powerhouses of salmon farming, Norway and Chile, contributing 73% between them, with the remaining 27% coming from the UK, Canada and other countries.

In 1988, less than 50,000 tonnes of salmon were produced in Norway but more than 50,000 kg of pure antibiotics were used for disease control. Since then, salmon production has increased to more than 500,000 tonnes per annum and the use of antibiotics within the industry is virtually non-existent. Vaccination has contributed hugely to this success. All Norwegian salmon and trout are now vaccinated by injection, the vast majority with oil-based vaccines, the most popular vaccine protecting against five different bacterial pathogens and one viral pathogen. This year, over 180 million salmon and trout juveniles will be vaccinated in Norway alone.

The first commercial vaccine was developed for the salmon farming industry in Norway about two decades ago. Over the years, vaccines have had an enormous effect on the Norwegian fish farming industry. In 1985, only 2 kg of salmon were harvested for each smolt transferred to seawater and this was mainly due to losses through diseases. In 2004, it is estimated that, for every fish transferred to sea, 3.8 kg will be harvested. It is estimated (adapted from Kontali Analyse) that Norway has produced 5.6 million tonnes of salmon between 1986 and 2005; without vaccines, this figure would probably only have been about 3.6 million tonnes (see figure). The value of these extra 2 million tonnes, based on today's prices, is approximately US\$ 8 billion.



While the success of the Norwegian salmon industry is directly linked to advances in culture techniques, feeding strategies, processing technology, marketing and general health management, vaccination has certainly played a key role in the financial as well as environmental success.