The status and future of **aquaculture**

Aquaculture has been the world's fastest growing food production system for decades, and is now providing more fish than capture fisheries for human consumption. While critical for meeting future demand for protein, such growth does not come without environmental challenges. The industry will have to continue to improve practices and foster innovations if aquaculture is to become truly sustainable and help increase resilience across the global food system.

Overview

Aquaculture refers to the farming of aquatic organisms such as fish, crustaceans, molluscs and plants. The last few decades have seen a dramatic increase in production to keep up with the growing demand for seafood and in response to a stagnating wild fish supply[1]. Since 1970, aquaculture production grew at an average annual rate of 8.4% worldwide[2]; a rate that substantially exceeds that of any other food production system, including poultry, beef, pork, dairy or grains[3]. Although growth has slowed down in the recent years and is expected to continue doing so (Figure 1), aquaculture is likely still the fastest growing animal production sector.

Production volumes and trends

Total animal aquaculture production reached 74 million tonnes in 2014, with an estimated value of US$160 billion. Although aquaculture's contribution to the supply of fish* for human consumption recently exceeded that of wild capture, most of the marine fish consumed still come from capture fisheries since finfish only represent 8.5% of the marine aquaculture production[1]. Although freshwater species such as carp and tilapia represent the largest production volumes, salmon farming is much more valuable and a major driver of expansion in offshore environments.

China alone accounts for more than 60% of global aquaculture production volumes, and is expected to maintain this leadership position, along with other Southeast Asian countries[4]. Increasing production in South America and North Africa indicates that additional opportunities exist, but general resources scarcity (e.g. suitable land and freshwater) along with compounding

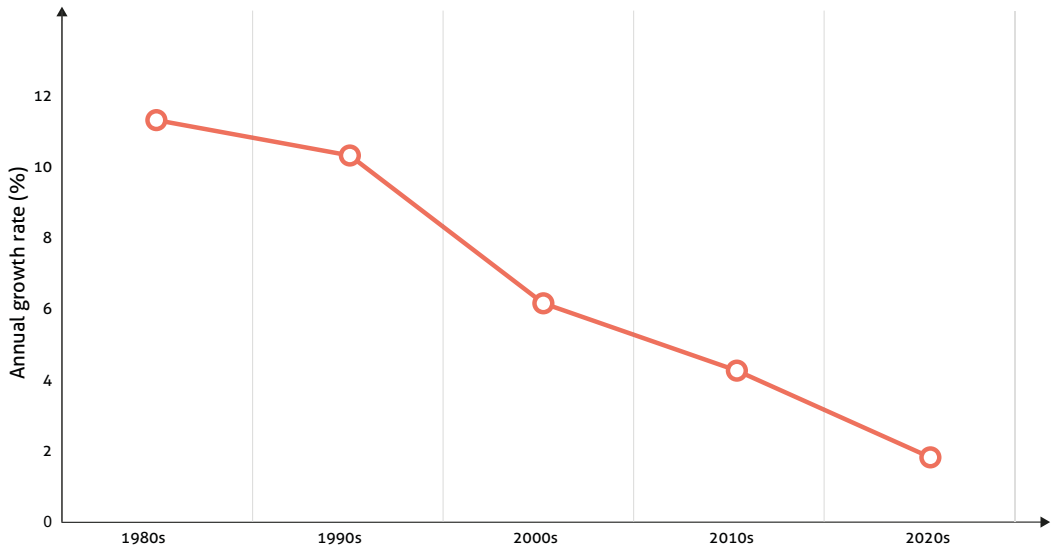

Figure 1: Decreasing growth rate of aquaculture over time.

* Includes both finfish, crustaceans and molluscs (but not seaweeds).

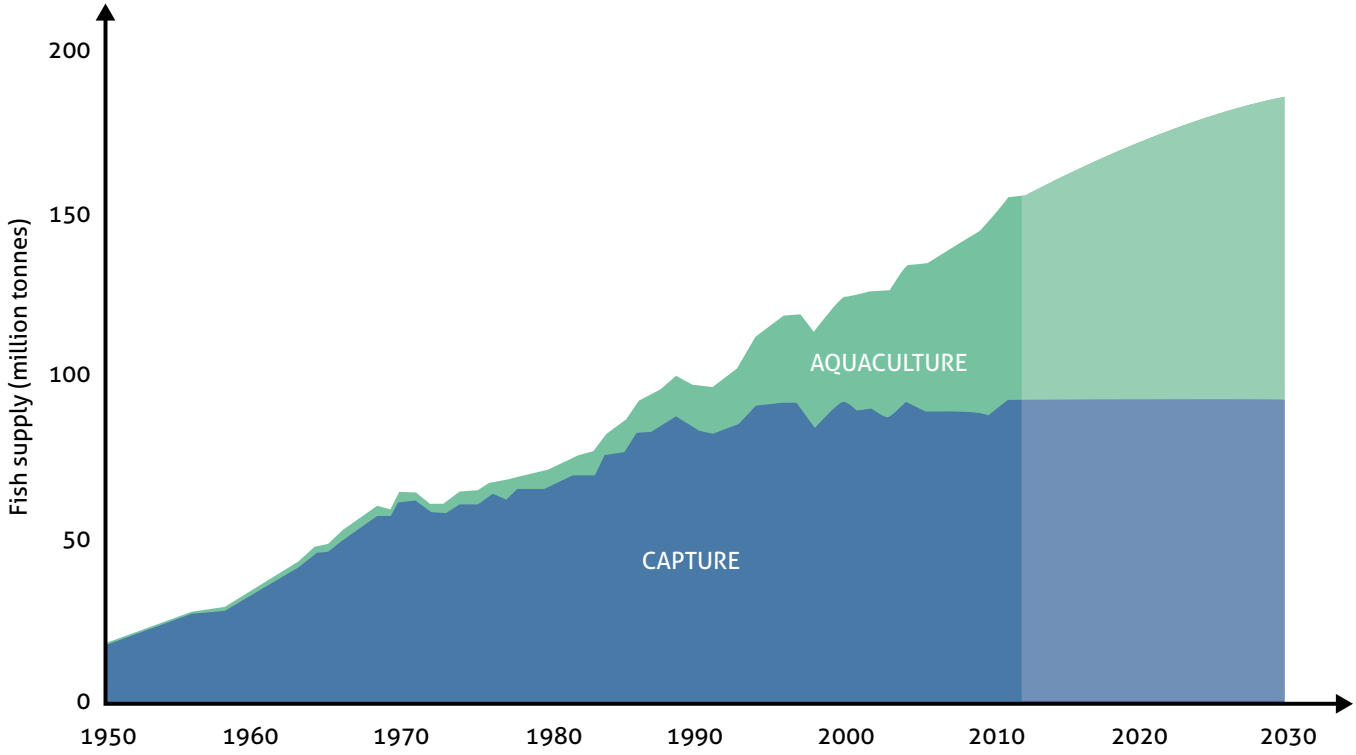

Figure 2: Global fish supply 1950-2030.Source: FishStat and IMPACT model projections. Note: Projection after 2011.

impacts from climate change, might limit the potential to further expand aquaculture in some regions.

Environmental challenges

Like most other animal production systems, aquaculture can result in various environmental impacts, including nutrient and chemical pollution, species introduction, spread of diseases, habitat alteration and overuse of antibiotics. Feed conversion ratios, or the amount of protein needed to produce a certain amount of farmed fish, have improved substantially in recent years and is now relatively effective compared to other land-based animals (beef, pork and poultry). However, the need for higher quality proteins for growth – in salmon for instance, compared to herbivorous species – still constitutes a challenge.

The widespread and unrestricted use of antibiotics in animal farming globally poses a serious concern for human health and the environment[5]. Although the production of aquaculture species still remains a cause of concern in relation to antibiotics use, important segments of the industry have recently improved practices to now offer a source of animal protein with relatively limited antibiotic use[6].

Feed for thought

Arguably, feed remains the main bottleneck for further expansion of aquaculture. Energy, protein, and lipids in aquafeeds are currently derived from wild fisheries, crops, and a range of processing by-products, including from livestock, wild capture fisheries and aquaculture itself.

Dependency on marine protein, primarily small pelagic fish for fishmeal and fish oil, is still challenging for the industry and will continue to be so even if by-products from fish processing plants are progressively used[4]. In addition to rapidly increasing costs, using wild-caught fish as feeds may not only increase pressure on marine ecosystems, but also raise ethical concerns as they represent a primary protein source for many in the developing world[7].

A significant share of aquaculture production still relies on fertilizer inputs and farm-made feeds to enhance fish growth, particularly in developing countries. These patterns are expected to change in the future as demand for high-value aquaculture products that rely on commercial aquafeeds, continues to grow.

Future perspectives

Increasing dependence on terrestrial crops (such as soybean), as a key ingredient in aquaculture feeds, will continue to raise concerns from an environmental perspective (deforestation, nutrient pollution and water consumption) and from a human health aspect, since such feed inputs result in lower nutritional values in the final product[8].

Aquaculture standards, certification schemes, and sustainable initiatives to reduce negative impacts are developing rapidly[9], attracting substantial investments for innovation. Prominent examples where the industry played a key role include the Global Salmon Initiative (GSI) or the Aquaculture Stewardship Council (ASC). As a relatively nascent industry, aquaculture has the potential to mature into one of the most sustainable food production system on the planet.

Photo: M Troell/Azote, N Kautsky/Azote, Nz_willowherb (CC BY-NC 2.0)

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