

Seafish summary

FAO World aquaculture 2010 (published 9 November 2011)

Key details

- Global production of fish from aquaculture, (including finfish, crustaceans, molluscs and other aquatic animals for human consumption) has grown substantially in the past decade, reaching 52.5 million tonnes in 2008, compared with 32.4 million tonnes in 2000. For 2009, the corresponding estimated amount is 55.1 million tonnes, and for 2010 the forecast amount is 57.2 million tonnes.
- Aquaculture continues to be the fastest-growing animal food producing sector and currently accounts for nearly half (45.6%) of the world's food fish consumption, compared with 33.8% in 2000.
- The contribution of aquaculture to the total production of capture and aquaculture continued to grow from 34.5% in 2006 to 36.9% in 2008. The contribution is estimated to have increased to 37.9% in 2009 and is forecast to further rise to 38.9% in 2010.

In relation to population growth

- In the period 1970–2008, the production of food fish from aquaculture increased at an average annual growth rate of 8.3%, while the world population grew at an average of 1.6% per year. The combined result of development in aquaculture worldwide and the expansion in global population is that the average annual per capita supply of food fish from aquaculture for human consumption has increased by ten times, from 0.7 kg in 1970 to 7.8 kg in 2008, at an average rate of 6.6% per year. The corresponding estimated amount in 2009 is 8.1 kg, and for 2010 the forecast amount is 8.3 kg.
- In 2008, the world consumed 115.1 million tonnes of fish, including 52.5 million tonnes originating from aquaculture. The earth's population is forecast to reach 8.31 billion in 2030. If capture fisheries production (89.7 million tonnes in 2008) and the non-food uses of fish (27.2 million tonnes in 2008) remain constant, aquaculture needs to produce 79.1 million tonnes by 2030 in order to maintain the current (2008) annual per capita consumption of 17.1 kg. Thus, 24 years from now, aquaculture will need to produce 28.8 million tonnes more per year than current annual production. In meeting this daunting task, in the coming years, the aquaculture sector is expected to contribute more effectively to global food security, nutritional well-being, poverty reduction and economic development.

Regional production

- The Asia–Pacific region continues to dominate the aquaculture sector, accounting for 89.% of global production, with China alone contributing 62.3% of global production. Moreover, of the 15 leading aquaculture producing countries, 11 are in the Asia–Pacific region.
- A few countries dominate the production of some major species, such as carps by China; shrimps and prawns by China, India, Indonesia, Thailand and Viet Nam; and salmon by Chile and Norway.
- Asia has retained its dominant position in world aquaculture, producing 88.8% of global aquaculture production by quantity and 78.7% by value in 2008. China alone accounted for 62.3% of world aquaculture production by quantity and 51.4% by value in the same year.

- The growth patterns in aquaculture production are not uniform among the regions. While China's aquaculture production increased at an average annual rate of 10.4% in the period 1970–2008, in the new millennium its growth rate has declined to 5.4%, which is significantly lower than in the 1980s (17.3%) and 1990s (12.7%). The average annual growth in production in Europe and North America since 2000 has also slowed substantially to 1.7 and 1.2%, respectively. It is anticipated that, while world aquaculture production will continue to grow, the rate of increase in most of the regions will slow in the forthcoming decade.
- With stagnating global capture fishery production and an increasing population, aquaculture is perceived as having the greatest potential to produce more fish in the future to meet the growing demand for safe and quality aquatic food. According to FAO, it is estimated that by 2012 more than 50% of global food fish consumption will originate from aquaculture.

R&D developments

- In the past decade, the Asia–Pacific region has witnessed two significant research and development (R&D) programmes: the development of the genetically improved farmed tilapia strain of Nile tilapia (*Oreochromis niloticus*), which has been hailed as a landmark achievement in the history of genetic improvement of tropical finfish; and the closing of the life cycle of the southern bluefin tuna (*Thunnus maccoyii*), although the commercial production of bluefin tuna seed is still a long way away.
- In line with the increased growth of global aquaculture production, there has been an impressive development of trade in many aquaculture products. Two aquatic products from the Asia–Pacific region stand out: a significant shift from the indigenous giant tiger prawn (*Penaeus monodon*) to the exotic whiteleg shrimp (*Litopenaeus vannamei*) and the explosive growth in production of the striped catfish (*Pangasianodon hypophthalmus*) in Viet Nam.

WORLD PRODUCTION OF FOOD FISH/TRENDS (Pg 17)

World capture fisheries and aquaculture production and consumption

	2008	2009 (estimate) Million tonnes	2010 (forecast)
Total production	142.3	145.1	147.0
Capture fisheries	89.7	90.0	89.8
Aquaculture	52.5	55.1	57.2
Total utilization	142.3	145.1	147.0
Food	115.1	117.8	119.5
Feed	20.2	20.1	20.1
Other uses	7.0	7.2	7.4
Aquaculture's contribution	%		
to total production	36.9	37.9	38.9
to food fish	45.6	46.8	47.9
Per capita food fish consumption (kg/year)	17.1	17.2	17.3
From capture fisheries	9.3	9.2	9.0
From aquaculture	7.8	8.1	8.3

Notes: In the UNSOFIA Report 2008 (FAO, 2009a), world aquaculture production, excluding aquatic plants, was reported to be 51.7 million tonnes in 2006, which included originally reported production by China. In 2009, FAO adjusted downward the aquaculture production statistics for 1997–2006 for China, and consequently the world total production was lowered. The adjustment was made according to the results communicated to FAO in 2008 by Chinese authorities following the Second National Agriculture Census carried out by China in 2007 for its national statistical data (including fisheries and aquaculture sectors) for 2006. source: FAO (2010a, 2010b).

1. Resources, services and technologies (Pg 25)

Major issues are:

- In the case of freshwater aquaculture, which accounts for about 60% of global aquaculture production, concerns have been raised as to whether aquaculture can continue to use large volumes of freshwater, particularly in open or flow-through systems, for production purposes. Today, agriculture uses more than 70% of all water withdrawals, and it is important that this usage is adapted to a future in which water will be reallocated to other users such as aquaculture and human populations (for consumption and other uses).
- Regarding the use of marine water for aquaculture, the competition is typically not for the quality or volume of water itself, but more often for the use of marine or coastal areas that are claimed for other purposes, such as fisheries, navigation, oil exploration, tourism and urban development.
- An adequate supply of quality seed is a major step towards establishing the foundation for sustainable global aquaculture production. Conversely, poor-quality seed, caused by factors such as unsatisfactory genetic management of breeders, accidental hybridization and unsatisfactory hatchery and nursery management could undermine the livelihoods of farmers, particularly poor farmers, and the integrity of the production chain. It is therefore important to ensure that hatchery seed production goes hand in hand with appropriate broodstock management plans and selective breeding programmes. Another related point is that the industry needs to practise the planned movement of broodstock, juveniles and seed, both internationally and domestically, to avoid potential impacts on genetic diversity and the translocation of pathogens.
- Generally, the application of genetic principles to increase production from aquatic animals lags far behind that of the plant and livestock sectors. It has been estimated that less than 1% of the global aquaculture production comes from genetically improved stocks. A significant achievement to this end in the past decade has been the development of the GIFT strain of Nile tilapia, which has been hailed as a landmark development in the history of genetic improvement of tropical finfish.
- Progress has also been made in life cycle manipulations (photoperiod regimes) in trout and salmon that prepare fish for spawning throughout most of the year. Thus, the salmon industry has been transformed from a highly seasonal industry with only wild species available almost exclusively from July/August to November of each year, to one that can supply good quality fish to the market on a year-round basis, thereby meeting the ever-growing demand for fish in the United States of America, European markets and elsewhere.
- There have also been impressive developments in the breeding and domestication of shrimp, the largest single internationally traded fishery product. Specific pathogen free and specific pathogen resistant domesticated stocks of whiteleg shrimp (*Litopenaeus vannamei*) have been widely developed and commercialized. Globally, shrimp farming using domesticated *L. vannamei* expanded from only 10 percent of total shrimp production in 1998 to 75 percent of total world shrimp production in 2006 (Wyban, 2007).

2. Feed (Pg 31)

- It was estimated that in 2008 about 31.5 million tonnes or 46.1% of global aquaculture production (including aquatic plants) was dependent on the direct use of feed, either as farm-made or home-made formulated aquafeed or industrially manufactured compound aquafeed.

- In terms of quantity, the major consumers of aquafeed are herbivorous and omnivorous fish. In 2008, an estimated 28.8 million tonnes of compound aquafeed were produced, of which about 31% was consumed by carps. On the other hand, while carnivorous fish and shrimps consume relatively less feed, they cannot thrive without fish or other marine proteins as a major component of their diet. Broadly, there are three methods of using fish as fish feed: in raw unprocessed form, mixed with agricultural products and fish by-products, and in the form of fishmeal and fish oil, mainly derived from the reduction of small pelagic fish.

There are four feed-related issues that the aquaculture industry needs to address. They are:

- Reducing dependence on fishmeal and fish oil;
- Ensuring national quality standards for raw materials, feed additives and feeds;
- Facilitating safe and appropriate use of aquafeeds produced by small-scale manufacturers;
- Building the capacity of small-scale farmers to make more effective farm-made feeds.

Fishmeal and fish oil: trends in use and prices

Key issues

- Fishmeal and fish oil are preferred components in the feed of many land-farm animals, including swine, poultry and dairy cattle. In 2002, aquaculture used 45% of the total global annual fishmeal production, and by 2006 its share increased to 57%. This growth was the result of a reduction in the share of fishmeal used for land-farm animals, rather than an increase in the pelagic fish catch that is used for fishmeal. In particular, poultry's share registered a sharp decline from 22% to 14% over the four-year period. In the case of fish oil, aquaculture's share was about 87% of the total global annual production in 2006, with the remaining 13% used for a variety of purposes, including direct human consumption and land-farm animal feed. It has been estimated that, by 2012, 60% of world fishmeal production and 88% of world fish oil production will be used by aquaculture. Moreover, for the last few years, the amount of fishmeal and fish oil has remained static, while output from aquaculture has continued to increase.
- Among the ongoing research activities, Researching Alternatives to Fish Oils in Aquaculture, coordinated by the University of Stirling, the United Kingdom, and Perspectives of Plant Protein Use in Aquaculture, coordinated by the Institut National de la Recherche Agronomique, France, focus on targeted reduction of dependence on fishmeal and fish oil. As an example, salmon's current inclusion of fishmeal of between 35 and 47% is expected to be reduced to 12–16%. Moreover, as a positive impact of research, the FCRs of salmon and trouts are about 1.3 and are likely to remain at this level over the next few years, while FCRs of other fish and crustaceans are expected to be reduced over the next ten years. Among others, FCRs for selected species are: carps: 1.8–1.6, catfish: 1.5–1.3, milkfish: 2.0–1.6, and shrimps: 1.6–1.4.
- The use of trash/low-value fish in aquaculture is another important issue that is being considered by policy-makers. It is estimated that some 5–6 million tonnes of trash/low value fish are used as direct feed in aquaculture worldwide particularly for marine carnivorous fish species (e.g. in China, Indonesia, Thailand and Viet Nam), marine crustaceans (lobsters and crabs) and certain freshwater fish species. To address the issue, successful farm trials in four countries (China, Indonesia, Thailand and Viet Nam) under an ongoing FAO-supported Technical Cooperation Programme have demonstrated the technical and economic feasibility of using pellet feeds to displace direct use of trash/low-value fish in marine finfish culture.

- A recent global study (Huntington and Hasan, 2009) has recommended a set of measures on sustainable sourcing of raw materials for aquafeed for consideration by policy-makers and other stakeholders. In summary, the study emphasizes improving the management of feed fisheries, including the piloting of innovative approaches such as the certification of responsibly managed fisheries; adopting feed fisheries sustainability criteria and the branding of aquafeeds produced using sustainable raw materials; continuing further development of plant and other substitutes for fishmeal and fish oil; and developing economically competitive food products for direct human consumption from species that are currently reduced to fishmeal and fish oil.

3. Farming technologies (Pg 35)

Essentially, new technologies will be required to make more efficient use of natural resources (e.g. water, land, energy and feed ingredients) and improve the productivity and overall economic efficiency of aquaculture farms. Overall, significant improvements have been achieved in the areas of:

- aquatic animal health management and disease control;
- feed management (e.g. the development of underwater surveillance systems to manage feeding and biomass (especially in salmon cage culture), reduction in fishmeal usage and FCRs);
- the environmental performance of aquaculture systems (including more efficient recirculatory systems);
- energy and labour-efficient cage systems;
- human health and safety;
- and the quality of aquaculture products.

4. Aquaculture and the environment (Pg 47)

The salient issues relate to:

- Addressing value-based environmental concerns as compared with science-based concerns, such as water quality, escapes and disease outbreaks, that can be assessed and acted upon;
- Developing comprehensive and effective zoning and coastal spatial planning that takes into consideration the concerns of the aquaculture industry;
- Making continuous efforts to address the negative image perception by enhancing the sector's credibility based on the application of internationally accepted principles of responsible aquaculture practices;
- Addressing the need to increase aquaculture's production capacity without exceeding the ecosystem's assimilative capacity by providing support to countries that lack the technical capacity to prepare and implement the EAA.

5. Markets and trade (Pg 59)

Certification and organic aquaculture

- Driven by concerns that some forms of aquaculture are environmentally unsustainable and socially inequitable, there have been various attempts in recent years to respond to the consequent public perceptions and market requirements. Policy and regulations governing environmental sustainability have been put in place in many countries, requiring aquaculture producers to comply with more stringent environmental mitigation and protection measures.
- In several countries, aquaculture producers are introducing environmental certification of aquaculture products, either individually or in a coordinated manner, in order to demonstrate credibly that their production practices are non-polluting,

non-disease transmitting and/or non-ecologically threatening. The success of these certification schemes, however, is yet to be demonstrated. Some countries are attempting to introduce State-mediated certification procedures to certify that aquaculture products are safe to consume and farmed in accordance with certain environmental standards. However, most of the work done on improved management leading to better production practices and products has been on salmon and shrimp, mainly because of their high commodity value, cost absorption capacity and the importance attached to them as the most internationally traded products.

- Socially responsible aquaculture is also high on the agenda in certain markets, and certification is one way to verify the effort put into working towards a more socially sustainable aquaculture sector. It is now widely accepted that aquaculture should be conducted in a socially responsible manner, within national rules and regulations that benefit the workers, small-scale farmers, local communities, investors and the country, and in a way that contributes effectively to rural development, poverty alleviation and food security and delivers benefits to the local community and surrounding resource users.
- Another important issue in aquaculture certification is animal health and welfare. In essence, aquaculture should be conducted in a manner that assures the health and welfare of farmed aquatic animals by minimizing stress, optimizing health, reducing aquatic animal disease risks and maintaining a healthy environment at all phases of the culture cycle.

Other areas also covered in the report:

- Contribution of aquaculture to food security and to social and economic development.
- External pressure on the sector: Status and trends; Climate change; Global economic crisis; Political instability and civil unrest; Pandemic diseases.
- The role of shared information: research, training, extension and networking.
- Governance and management of the sector.

The report can be found at:

<http://www.fao.org/news/story/en/item/94232/icode/>