



Brussels Policy Briefing no. 32

Fish-farming: the new driver of the blue economy?

3rd July 2013, ACP Secretariat, 451 Avenue Georges Henri, 1200 Brussels
<http://brusselsbriefings.net>

Organised by CTA, the EC/DECVO, the ACP Secretariat and Concord

1. Background

Aquaculture, otherwise known as fish farming, is the controlled cultivation of freshwater and saltwater animals or plants. The aquaculture sector overall is highly diverse and fragmented, ranging from smallholder ponds in Africa providing a few kilos of fish per year to international companies with annual turnover in excess of US\$1 billion. While capture fisheries production remains stable, aquaculture production keeps expanding and is set to remain one of the fastest-growing animal food-producing sectors and, in the next decade, total production from both capture and aquaculture will exceed that of beef, pork or poultry. Much of this development has occurred in Asia, which also has the greatest variety of cultured species and systems. Asia is also perceived as the 'home' of aquaculture, as aquaculture has a long history in several areas of the region and knowledge of traditional systems is most widespread. Its systems can range from the simplest production systems such as small family ponds in tropical countries to high technology systems, such as the intensive indoor closed units used in North America for the rearing of striped bass or the sea cages used in Chile and Europe for growing salmon and bream. With capture fisheries becoming increasingly unsustainable due to overfishing, aquaculture is expected to overtake capture fisheries in supplying the world's protein requirements in the future (FAO 2012). In the recent past, some developing countries in Asia and the Pacific (Myanmar and Papua New Guinea), sub-Saharan Africa (Nigeria, Uganda, Kenya, Zambia and Ghana) and South America (Ecuador, Peru and Brazil) have made rapid progress to become significant or major aquaculture producers in their regions.

Policy processes in support of governance of aquaculture sector

Since 2003, the FAO Committee on Fisheries (COFI) has recommended the development of **international voluntary guidelines to complement the Code of Conduct for Responsible Fisheries** to promote good governance, participation and inclusiveness, social responsibility and solidarity. The **2011 FAO Technical Guidelines on Aquaculture Certification** constitute an additional important tool for good governance of the sector. By setting minimum substantive criteria for developing aquaculture certification standards, these guidelines provide direction for the development, organization and implementation of credible aquaculture certification schemes towards sustainable development of the sector.¹ **Regional fishery bodies (RFBs)** are the primary organizational mechanism through which States work together to ensure the long-term sustainability of shared fishery resources. The term RFB also embraces regional fisheries management organizations (RFMOs), which have the competence to establish binding conservation and management measures. Several countries have adequate national aquaculture development policies, strategies, plans and laws, and use "best management practices" and manuals on farming techniques that have been promoted by industry organizations and development agencies.

2. Aquaculture: the engine driving growth in total fish production

Capture fisheries and aquaculture supplied the world with about 148 million tonnes of fish in 2010 (with a total value of US\$217.5 billion), of which about 128 million tonnes was utilized as food for people. Preliminary data for 2011 indicate increased production of 154 million tonnes, of which 131 million tonnes was destined as food. In the last three decades (1980–2010), world food fish production of aquaculture has expanded by almost 12 times, at an average annual rate of 8.8 percent. Aquaculture enjoyed high

¹ FAO World Review of Fisheries and Aquaculture. 2012

average annual growth rates of 10.8 percent and 9.5 percent in the 1980s and 1990s, respectively, but has since slowed to an annual average of 6.3 percent. Since the mid-1990s, aquaculture has been the engine driving growth in total fish production as global capture production has levelled off. Its contribution to world total fish production climbed steadily from 20.9 percent in 1995 to 32.4 percent in 2005 and 40.3 percent in 2010. Its contribution to world food fish production for human consumption was 47 percent in 2010 compared with only 9 percent in 1980.² The growth rate in farmed food fish production from 1980 to 2010 far outpaced that for the world population (1.5 percent), resulting in average annual per capita consumption of farmed fish rising by almost seven times, from 1.1 kg in 1980 to 8.7 kg in 2010, at an average rate of 7.1 percent per year. When farmed aquatic plants and non-food products are included, world aquaculture production in 2010 was 79 million tonnes, worth US\$125 billion.³ In 2010, global production of farmed food fish was 59.9 million tonnes, up by 7.5 percent from 55.7 million tonnes in 2009 (32.4 million tonnes in 2000). The reported grow-out production from aquaculture is almost entirely destined for human consumption.

Main farmed species: Aquaculture has pushed the demand for, and consumption of, species that have shifted from being primarily wild-caught to being primarily aquaculture-produced, with a decrease in their prices and a strong increase in their commercialization, such as for shrimps, salmon, bivalves, tilapia, catfish and pangasius.⁴ About 600 aquatic species are raised in captivity in about 190 countries for production in farming systems of varying input intensities and technological sophistication. These include hatcheries producing seeds for stocking to the wild, particularly in inland waters.⁵ Farmed food fish include finfishes, crustaceans, mollusks, amphibians (frogs), aquatic reptiles (except crocodiles) and other aquatic animals (such as sea cucumbers, sea urchins, sea squirts and jellyfishes) that are indicated as fish throughout this document. Carp dominates production in both China and the rest of Asia. In contrast, for Europe and South America it is salmonids; African aquaculture production is almost exclusively of finfish, primarily tilapias. For Oceania, shrimps and prawns dominate while in North America production is more even across the species groups. Supply from aquaculture is now dominant for seaweeds, carps and salmonids.⁶ Oceania is of relatively marginal importance in global aquaculture production. Production from this region consists mainly of marine molluscs (63.5 percent) and finfishes (31.9 percent), while crustaceans (3.7 percent, mostly marine shrimps) and other species (0.9 percent) constitute less than 5 percent of its total production. Marine bivalves accounted for about 95 percent of the total produced in the first half of 1980s but, reflecting the development of the finfish culture sector (especially Atlantic salmon in Australia and chinook salmon in New Zealand), they currently account for less than 65 percent of the region's total production. Freshwater aquaculture accounts for less than 5 percent of the region's production.⁷

3. Socio-economic and ecological contribution of aquaculture

- Sustainable fish farming can ensure food and nutrition security

Fisheries and aquaculture make crucial contributions and constitute an important source of nutritious food and animal protein for much of the world's population. Aquaculture can play a role in ensuring food security through the significant production of some low-value freshwater species, which are mainly destined to domestic production, also through integrated farming. A global study by Conservation International and the World Fish Center⁸ assessed 75 fish farming systems from 18 different countries and has identified aquaculture as key to feeding growing urban populations.

Fish and fishery products represent a very valuable source of protein and essential micronutrients for balanced nutrition and good health. In 2009, fish accounted for 16.6 percent of the world population's intake of animal protein and 6.5 percent of all protein consumed. Globally, fish provides about 3.0 billion

² However, if China is excluded, the average contribution of aquaculture is significantly lower at 17 percent in 2000 and 29 percent in 2010, corresponding to an average annual growth rate of 5.4 percent.

³³ FAO World Review of Fisheries and Aquaculture. 2012

⁴ John Bostock et al. Aquaculture: global status and trends. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2935128/>

⁵ FAO World Review of Fisheries and Aquaculture. 2012

⁶ Hall, S.J., A. Delaporte, M. J. Phillips, M. Beveridge and M. O'Keefe. 2011. Blue Frontiers: Managing the Environmental Costs of Aquaculture. The WorldFish Center, Penang, Malaysia.

⁷ FAO World Review of Fisheries and Aquaculture. 2012

⁸ World Fish center, Aquaculture, Fisheries, Poverty and Food Security World Bank, FAO and WorldFish Center. 2010. The hidden harvests: the global contribution of capture fisheries. Aquaculture, Fisheries, Poverty and Food Security. Working Paper 2011-65

people with almost 20 percent of their intake of animal protein, and 4.3 billion people with about 15 percent of such protein. Differences among developed and developing countries are apparent in the contribution of fish to animal protein intake. Despite the relatively lower levels of fish consumption in developing countries, the share contributed by fish was significant at about 19.2 percent, and for the Low-Income Food-Deficit Countries (LIFDCs) it was 24.0 percent. However, in both developing and developed countries, this share has declined slightly in recent years as consumption of other animal proteins has grown more rapidly.⁹

The dietary contribution of fish is more significant in terms of animal proteins, as a portion of 150 g of fish provides about 50–60 percent of the daily protein requirements for an adult.

Fish proteins can represent a crucial component in some densely populated countries where total protein intake levels may be low. In fact, many populations, more those in developing countries than developed ones, depend on fish as part of their daily diet. For them, fish and fishery products often represent an affordable source of animal protein that may not only be cheaper than other animal protein sources, but preferred and part of local and traditional recipes. For example, fish contributes to, or exceeds, 50 percent of total animal protein intake in some small island developing States, as well as in Bangladesh, Cambodia, Ghana, the Gambia, Indonesia, Sierra Leone and Sri Lanka.

- **Integrating agriculture and fish farming**

There appears to be considerable scope for improving farming systems to integrate better fish production with agriculture. Integrated fish-rice systems are common in China, as well as some integrated farming with pigs and chickens. The capture and culture of aquatic organisms from rice fields has a long history and tradition especially in Asia. Rice–fish farming provides additional food and income by diversifying farm activities and increasing yields of both the rice and fish crops and has great potential at the rural small-scale farmer level to contribute towards sustainable livelihoods by strengthening the ability of farmers to respond to threats in their environment, improve their resilience and reduce vulnerability to shocks, as well as increasing food security.

- **Contribution to employment**

Fisheries and aquaculture provided livelihoods and income for an estimated 54.8 million people engaged in the primary sector of fish production in 2010, of which an estimated 7 million were occasional fishers and fish farmers. Asia accounts for more than 87 percent of the world total with China alone having almost 14 million people (26 percent of the world total) engaged as fishers and fish farmers. Asia is followed by Africa (more than 7 percent), and Latin America and the Caribbean (3.6 percent).¹⁰

It is increasingly a means to increase domestic fish supply to low-income consumers, develop opportunities for employment, support local economic multipliers, and to generate revenue from trade. Impact assessment studies in Malawi, Bangladesh and the Philippines demonstrate positive income employment and consumption effects for poor households adopting small-pond or cage aquaculture systems. Overall, however, greater gains for wider food security can be expected from SME development of specialist aquaculture. About 16.6 million people (about 30 percent of the world total) were engaged in fish farming, and they were even more concentrated in Asia (97 percent), followed by Latin America and the Caribbean (1.5 percent), and Africa (about 1 percent). Employment in the fisheries and aquaculture primary sector has continued to grow faster than employment in agriculture, so that by 2010 it represented 4.2 percent of the 1.3 billion people economically active in the broad agriculture sector worldwide, compared with 2.7 percent in 1990. Apart from the primary production sector, fisheries and aquaculture provide numerous jobs in ancillary activities such as processing, packaging, marketing and distribution, manufacturing of fish-processing equipment, net and gear making, ice production and supply, boat construction and maintenance, research and administration.¹¹ In many places, these employment opportunities have enabled young people to stay in their communities and have strengthened the economic viability of isolated areas. However, unfair employment practices in aquaculture, including exploitation of local labour, gender discrimination and child employment, can undermine trust in the sector, threaten the credibility of policy-makers and jeopardize markets for farmed seafood.¹²

⁹ FAO World Review of Fisheries and Aquaculture. 2012.

¹⁰ Ibid.

¹¹ Aquaculture, Fisheries, Poverty and Food Security World Bank, FAO and WorldFish Center. 2010. The hidden harvests: the global contribution of capture fisheries. Aquaculture, Fisheries, Poverty and Food Security. Working Paper 2011-65

¹² FAO World Review of Fisheries and Aquaculture. 2012.

4. Challenges affecting fish-farming and new opportunities

The vital contributions from fisheries and aquaculture to global food security and economic growth are constrained by an array of problems such as poor governance, overexploitation and environmental disasters, weak fisheries management regimes, conflicts over the use of natural resources, the persistent use of poor fishery and aquaculture practices, a failure to incorporate the priorities and rights of small-scale fishing communities, and injustices relating to gender discrimination and child labour. The environmental costs of aquaculture can include water pollution, spread of disease to wild fish populations, the overuse of antibiotics, and harmful effects on biodiversity. Natural disasters can cause the loss of livelihood assets such as boats, gear, cages, aquaculture ponds and broodstock, postharvest and processing facilities, and landing sites.¹³ In general the main challenge faced by the aquaculture sector is to develop in a socially, economically and environmentally sustainable manner.

Aquaculture feedstuffs

Aquaculture production is still derived from extensive and semi-intensive aquaculture of omnivores and herbivores. The bulk of aquaculture feedstuffs are of crop origin—maize, soya, wheat—and crop production makes substantial demands on ecosystem services and may lead to competition bio-fuels, with consequent implications for prices and affordability. It may also lead to changes in crop production. Other important aquaculture feedstuffs include ‘trash’ fish, fishmeal and fish oil widely used to sustain shrimp and carnivorous fish production. There are concerns that these ‘feedfish fisheries’ aggravate food security in parts of the world by diverting fish from direct human consumption to aquaculture.

Various strategies to reduce feed current constraints will have to be envisaged such as locally sourced feedstuffs; develop pre-treatment and processing methods to increase digestibility and nutrient availability; better use of scarce and costly fishmeal and fish oil supplies by restricting their use to when it is a dietary essential; breed fish with more limited demand for high quality marine lipids and protein; develop high quality protein and lipid sources from plants and microorganisms; develop feeding technologies to optimize the conversion of feeds into aquatic animal biomass.¹⁴

Disease outbreaks

Aquaculture production methods are increasingly intensifying and farms are getting larger and more spatially concentrated. Because of this, there is a growing concern about increasing risks from the spread of pathogens and infectious aquatic animal diseases and the increased movement of aquatic animals. Inter-regional trade and the introduction of new species and strains to meet economic and market demands both pose significant risks. The use of trash fish is also a risk factor in the transfer of pathogens. Current estimates suggest that between one third to a half of fish and shrimps put into cages or ponds are lost to poor health management before they reach marketable size (Tan et al., 2006). Abuse of antimicrobials and other veterinary drugs and associated environmental and human health risks remain a major concern as well as increase in antimicrobial resistance in farmed fish. Developing vaccines is one route to reducing use of veterinary drugs, but research in this area is currently restricted to relatively few species (e.g., salmon, trout, grouper) and vaccines are only effective against certain types of disease.¹⁵ Disease outbreaks in recent years have affected farmed Atlantic salmon in Chile, oysters in Europe and marine shrimp farming in several countries in Asia, South America and Africa, resulting in partial or sometimes total loss of production. In 2010, aquaculture in China suffered production losses of 1.7 million tonnes caused by natural disasters, diseases and pollution. Disease outbreaks virtually wiped out marine shrimp farming production in Mozambique in 2011.¹⁶

The epidemiological issues associated with aquaculture will also be exacerbated by climate change (Karvonen et al. 2010). Extreme weather events are predicted to become more severe and more frequent in the future (IPCC 2007) favouring pathogen outbreaks following seasonal periods associated with changes in temperature and precipitation (Altizer et al. 2006). Baseline epidemiological patterns will aid

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Hall, S.J., A. Delaporte, M. J. Phillips, M. Beveridge and M. O’Keefe. 2011. Blue Frontiers: Managing the Environmental Costs of Aquaculture. The WorldFish Center, Penang, Malaysia.

¹⁶ FAO World Review of Fisheries and Aquaculture. 2012.

predictions of future outbreak patterns and contribute to building forward-thinking aquaculture infrastructure and adaptive management strategies.

Small-scale sector is the largest aquaculture producer

In the medium term, increased output is likely to require expansion in new environments, further intensification and efficiency gains for more sustainable and cost-effective production. Trends towards industrialization and consolidation are strong for some species, especially commodity products that are internationally marketed. For instance, four companies now account for 70 per cent of Scottish salmon production and two for over 50 per cent of industry value.¹⁷ There is increased private sector involvement in the production and delivery of inputs (seed and feeds) and the manufacture and supply of aquaculture equipment in some countries. However, the small-scale sector is the largest aquaculture producer and mainstay of communities in many parts of the world. Small-scale farmers are major global producers of farmed “fish”. They make up to 80% of more of the 12 million aquaculture farmers in Asia, contributing significantly to global aquaculture production and trade.¹⁸

There are measures that policy makers can take for a sustainable development of aquaculture which include providing support to **innovative and technological developments**, ensuring a suitable regulatory framework that captures environmental costs within aquaculture processes, building capacity for monitoring and compliance, and encouraging research on the supply and demand for fish and fish products. There is an urgent need to improve and expand national and international aquaculture statistics collection and reporting schemes.¹⁹ At present, **genetic improvement programs** are underway for a dozen or so widely farmed species, including both marine shrimps and freshwater prawns, common and Indian major carps, tilapias, African and channel catfish, rainbow trout and Atlantic salmon.²⁰ The increasing influence of consumers and markets towards sustainability will contribute to enhanced regulation and improved governance and traceability systems.

Objectives of the Briefing

To improve information sharing and promote networking, CTA, the DG DEVCO from the European Commission, the ACP Secretariat, Concord organize bimonthly briefings on key issues and challenges for rural development in the context of ACP-EU cooperation. The Briefing on 3rd July 2013 will address issues related to aquaculture development in the context of ACP countries and in particular, it will: (i) raise awareness on the key challenges and opportunities posed to aquaculture development; (ii) increase exchange of information and expertise on proven successes on aquaculture; and (iii) facilitate networking among development partners.

Target group

Around 150 ACP-EU policy-makers and representatives of EU Member States, civil society groups, research networks and development practitioners, and international organizations based in Brussels.

Available material

Input and comments before, during and after the meetings will be included in the Briefings blog: <http://brusselsbriefings.net>. A Reader and Highlights in printed and electronic format will be produced shortly after the meeting.

¹⁷ John Bostock et al. Aquaculture: global status and trends . <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2935128/>

¹⁸ M. Phillips WorldFish. *Social responsibility in farmed seafood: supporting change and sharing responsibilities*Seafood Summit, San Diego, 1-3 February 2009.

¹⁹ FAO World Review of Fisheries and Aquaculture. 2012.

²⁰ Hall, S.J., A. Delaporte, M. J. Phillips, M. Beveridge and M. O’Keefe. 2011. *Blue Frontiers: Managing the Environmental Costs of Aquaculture*. The WorldFish Center, Penang, Malaysia.



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8h30-9h00 Registration
9h00-9h15 Introduction and Opening of the Briefing: *Isolina Boto, Manager, CTA Brussels Office*

Introductory remarks: *Achille Bassilekin Assistant Secretary General in charge of Sustainable Economic Development and Trade, ACP Secretariat; Denis Salord, Head of Unit, Regional Programmes Sub-Saharan Africa and ACP wide, European Commission; Michael Hailu, Director of CTA*

9h15-11h00 **Panel 1: Fish-farming: the pathway towards a blue revolution?**

This panel will provide an overview of the key concepts, existing systems and challenges and opportunities in aquaculture, especially for ACP countries. It will address the main issues involved in the aquaculture sector in terms of food and nutrition security, health management and sustainability of the sector.

Chair: *H.E. Felix Edozor Awanbor, Ambassador of Nigeria*

Panellists:

- Overview of the significance of fish-farming sector: challenges and opportunities
David Little, Professor of Aquatic Resources and Development, University of Stirling, UK
- Aquaculture nutrition: addressing the long-term sustainability of the sector
Patrick Sorgeloos, Professor of Aquaculture, Ghent University, Belgium
- Risk analysis and health management in aquaculture
Rohana Subasinghe, Senior Aquaculture Officer, FAO
- Organic aquaculture and sustainable fisheries - ecolabelling and aquaculture certification
Marc Prein, Advisor for the Promotion of Sustainable Fisheries and Aquaculture, GIZ

11h00-11h15 Coffee Break

11h15-13h00 **Panel 2: Proven successes in fish-farming and lessons learned from the field**

This panel will present proven actions in fish-farming in the various regions along with lessons learned and best practices which could be upscaled or replicated in areas related to regulatory frameworks, national and regional trade regimes and innovation systems.

Chair: *H.E. Fatumanava III Dr. Pa'olelei Luteru, Ambassador of Samoa*

Panellists:

- Drivers of success in aquaculture across Africa
Sloans Chimatiro, Senior Fisheries Advisor, NEPAD
- Opportunities for aquaculture development in the Caribbean
Milton Haughton, Executive Director, Caribbean Regional Fisheries Mechanism (CRFM)
- Aquaculture development: trends and successes in the Pacific
Tim Pickering, Inland Aquaculture Specialist, Secretariat of the Pacific Community (SPC)

Concluding remarks

Networking lunch