Aquaculture: Status and Prospects

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Introduction

Global production of fish from aquaculture has grown rapidly during the past four decades, contributing significant quantities to the world's supply of fish for human consumption. Aquaculture now accounts for nearly half (45 percent) of the world's food fish[1] and this increase is expected to reach 50 percent in 2015 (see Figure 2, page 21). Started as primarily an Asian freshwater food production system, aquaculture has now spread to all continents, encompassing all aquatic environments and utilizing a range of aquatic species. From an activity that was principally small-scale, non-commercial and family-based, aquaculture now includes large-scale commercial or industrial production of high value species that are traded at the national, regional and international levels. Although production remains predominantly Asian and still largely based on small-scale operations, there is a wide consensus among many that aquaculture has the potential to meet the growing global demand for nutritious food fish and to contribute to the growth of national economies, while supporting sustainable livelihoods of many communities.

Contribution to social well-being

Aquaculture plays an important role in global efforts to eliminate hunger and malnutrition through supplying fish and other aquatic products rich in protein, essential fatty acids, vitamins and minerals. Aquaculture can also make significant contributions to development by improving incomes, providing employment opportunities and increasing the returns on resource use. According to FAO figures, aquaculture directly created 12 million full-time employment in Asia in 2004. It significantly contributes to the national GDPs in many developing countries in Asia and Latin America. With appropriate management, the sector appears ready to meet the expected shortfalls in fish supplies for the coming decades and to improve global food security.

Availability of sufficient and good quality food, access to this food by households and individuals and its utilization for nutritious diets and good health are inter-dependent dimensions of food security. With respect to food availability, aquaculture contributes to food quantity through the supply of aquatic products from domestic farming and supply of food purchased using foreign exchanges. Aquaculture contributes to food quality by providing nutritious and energetic aquatic food products which are high in protein, essential fatty acids, vitamins and minerals. Health benefits associated with the consumption of fish products are particularly important for the prevention of heart-related diseases and for many vulnerable groups such as pregnant and lactating women, infants and pre-school children. In this respect, aquaculture contributes to nutritional well-being.

With existing resources and technological advances, food fish production from aquaculture can be further expanded in a more sustainable manner. This is only possible if the sector's socio-economic benefits accrue to a large social spectrum. The main challenge for policy makers and development agents is thus to create an "enabling environment" for the aquaculture sector to maintain its growth whilst meeting societal needs and preserving the natural resource base it needs. This enabling environment is multi-faceted and requires significant political will, sustained policy, public sector support and investment.

Addressing environmental and social issues and other risks

The environmental impacts of aquaculture development have received a high degree of attention in the past two decades, typically in cases where societal benefits were negatively affected by unregulated aquaculture development. With the increasing demand for products and services in a situation of diminishing land, water and feed resources, this attention is likely to become more pronounced in the coming decades.

As a result of strong public scrutiny on the environmental impacts of some forms of inconsiderate aquaculture development, starting about a decade ago and gathering considerable momentum over the past five years, significant progress in addressing many of the key concerns in the environmental management of aquaculture has been made. This public pressure and continued commercial necessity have led the aquaculture sector to reduce its environmental impacts and the governments to increasingly recognize that aquaculture, when well planned and well managed, can yield broad societal benefits without concomitant environmental degradation.

Indeed, it is now increasingly recognized that aquaculture can make a positive contribution to the environment or where it can help reduce the negative impacts of other industries and activities. There are aquaculture systems that contribute to environmental rehabilitation or which mitigate the impacts of effluents from other agricultural and even industrial operations. The most well-known are integrated farming systems such as rice-fish farming and fish farming in irrigated systems and rehabilitation of endangered populations through stocking. The use of mollusc culture to improve carbon sequestering and seaweed culture in coastal areas to reduce aquatic nutrients loading are also good examples of where aquaculture practices can serve as environmental sentinels and at the same time contributors to socio-economic development.

Coping with globalization, food safety, trade and markets

In 2005, about 40 percent (live weight equivalent) of world food fish production was internationally traded, with a value of US$78.4 billion. New markets are emerging worldwide. As high value species are increasingly exported (intra- or inter-regionally) and low-value products are imported (a particular trend in Asia), there is a clear need by aquaculture farmers to improve the quality and safety of their products in order to gain wider access to export markets. However, with the more stringent requirements of export markets, small-scale farmers are facing difficulties in producing for export. As they strive to meet export consumer requirements, they become uncompetitive. The lack of competitiveness could drive them out of the sector. Empowering small farmers to become competitive in global trade is becoming urgent, and, perhaps, a significant corporate social responsibility.

Through trade and market access, globalization is significantly playing an important role in aquaculture development. Its requirements are two-fold: (a) strengthening of national, inter-provincial or inter-state, as well as regional and international biosecurity and food safety measures and (b) enhancing ability, through training, legislation, codes of practice, certification, traceability schemes of governments and producers, to comply with trade and market access requirements for safe and quality products.

GCP/INT/936/JPN: Towards Sustainable Aquaculture: Selected Issues and Guidelines – Component 2: Environmental Impact Assessment (EIA) and Monitoring in Aquaculture. Desk studies and reviews are being conducted to compile, review and synthesize available information of existing EIA are being conducted to compile, review and synthesize available information of existing EIA and monitoring procedures and practices in aquaculture. Special consideration is given to four areas related to EIA and monitoring in aquaculture including: (1) the requirements, (2) the practice, (3) the effectiveness and (4) suggestions for improvements. Four regional case studies are covering the compilation and review of existing EIS and environmental monitoring procedures and practices in aquaculture as far as information is available in selected countries, as follows: (1) Africa: Egypt, Nigeria, Mozzambique, South Africa, Uganda, Madagascar, Tanzania, Zambia; (2) Asia-Pacific: China, Australia, India, Indonesia, Japan, Malaysia, Philippines, Thailand, Viet Nam; (3) Europe/North America: Czech Republic. France, Greece, Hungary, Italy, Netherlands, Poland, Spain, Turkey, UK and Canada and USA and (4) Latin America: Brazil, Colombia, Cuba, Ecuador, Honduras, Mexico. A fifth special case study is focusing on EIA issues in cage aquaculture of salmon in Canada, Chile, New Zealand, Norway and United Kingdom. A synthesis overview report will be prepared once these four regional case studies and the special salmon cage aquaculture study are finalized. The overview as well as the five studies will serve for discussion during a technical workshop in 2008 which will target an analytical comparison and scoping of environmental assessment approaches and methodologies most suitable to different production systems, commodities and environments. [Responsible Officer: U Barg (FIMA)].

Shrimp farm in Thailand

These requirements are creating a considerable drive for importing and exporting countries to collectively harmonize standards and protocols as well as addressing issues of certification of products and processors.

Future prospects and challenges

The aquaculture sector is expected to contribute more effectively to global food security, nutritional well-being, poverty reduction and economic development by producing - with minimum impact on the environment and maximum benefit to society - 85 million tonnes of aquatic food by 2030, an increase of 37 million tonnes over the 2005 level.

Identifiable trends in development of the aquaculture sector are the following: (a) continuing intensification of aquaculture production; (b) continuing diversification of species use; (c) continuing diversification of production systems and practices; (d) increasing influence of markets, trade and consumers; (e) enhancing regulation and improving governance of the sector and (f) increasing attention on better management of the sector. These trends do not apply equally to all the regions due to intra- and inter-regional differences in the stages of aquaculture development, but do reflect the behaviour of the sector in those countries where aquaculture is well established.

Even with expected increases in aquaculture production, the question remains whether the industry can grow in a sustainable manner and fast enough to meet the projected levels necessary to maintain fish supply while preserving the natural resource base it needs to thrive. Assuming sustained demand for fish (the world is prepared to pay for fish as a desirable food product) there are plenty of unexplored opportunities which could enable aquaculture to significantly contribute to countries' sustainable development. These include: (a) application of innovative capacity enhancement programs by producers; (b) search for new production systems and technologies and (c) development of new aquatic products and markets and integration into the eco-tourism sector. Although some of the areas are not strictly unexplored, considerable support is required to realize their full potential.

Although there are indications that aquaculture could cover the gap between the expected demand and food fish supply from the wild, there are many constraints which could dampen or even stall production increases, thereby preventing aquaculture supply from meeting expected demand in decades to come.

There is a concern that the available marine resources (e.g. fishmeal and fish oil) may not be sufficient to meet the demand of projected aquaculture production. Even though the production of these resources from capture fisheries have remained stagnant over the last decade and any significant increase is not anticipated in the foreseeable future, there will be substantial decrease in the amount of fishmeal use by the animal production sector and the proportion of fishmeal and fish oil use in aquafeeds. Under these scenarios, it is unlikely that the supply of fishmeal and fish oil will be a major limiting factor in aquaculture feeding.

One of the greatest constraints could be the unpredictable and uncharacterized impact of climate change on aquaculture. Climate change presents unquantifiable threats of temperatures, weather and water supply. There is a need for the aquaculture sector to join other economic sectors in preparing to address the potential impacts of the planet's warming. One of the practical responses to climate change in aquaculture could be to strengthen the adaptive capacity and resilience of the sector, particularly that of small farmers and aquatic resources users.

Science can be useful in understanding and reducing risks, uncertainties and vulnerabilities, but unwavering government will and support are the essential elements in enhancing aquaculture development. Whilst the level of commitment will inevitably vary within and among regions, according to the importance of aquaculture in national economies, it is expected that in countries where aquaculture contributes or has the potential to contribute substantially to food security, nutritional well-being, poverty reduction and economic growth, the commitment will hold and the level of support is expected to increase.

[1] "Food fish" or simply "fish" in this document refers to the production of aquatic animals (fish, crustaceans, molluscs, amphibians). Aquatic plants are excluded or are considered separately.