

6. Future challenges

In 2007, the global aquaculture production reached 65.1 million tonnes, worth US\$95 billion and accounting for nearly half (45 percent of world seafood production). It has experienced average annual growth rates of 8.8 percent per year since 1970 (FAO, 2007a, 2007b) and it exceeded wild capture fisheries in Asia in 2002 (FAO, 2008). Aquaculture as an industry now faces significant challenges in its growth and development over the next several decades. In order to meet the growing demand for food products and aquatic-based protein, aquaculture expansion is a real imperative for many economies. The use of risk analysis for decision-making can enhance the ability of decision-makers in the aquaculture sector to identify risks and strategies to meet challenges, particularly at the level of national policy development.

In the short- to medium-term, political governance and institutional capacity present significant challenges to achieving consistency in management of aquaculture across national and regional boundaries. In the longer term, three challenges present themselves as having the propensity to significantly impact on aquaculture sustainability.

Firstly, globalization and trade are increasingly part of the macro-economy. Aquaculture development has largely benefitted from globalization and the ability to create new trading markets for high-quality, highly desirable products. Globalization has also facilitated exchange of technologies, experiences and services and further facilitated development of aquaculture.

Secondly, in both the medium and long term, limitations in natural resources will increasingly challenge human populations and economic growth. Many aquaculture activities compete for natural resources, such as water and land, that are needed by other sectors, and aquaculture will have to adapt and become a more efficient user of increasingly limited resources.

Thirdly, climate change is likely to have significant impacts on aquaculture operations, influencing risk patterns both from and to aquaculture.

In many instances, the risk analysis methods outlined in this manual can assist governments and the private sector in addressing the major challenges the industry faces in trying to realize its full potential as a contributor to world food supplies and national social and economic wellbeing, including poverty alleviation and employment generation in rural areas. In applying risk analysis in aquaculture, the following also need to be considered:

- *Improving governance and planning* – Weak governance at the local or national levels can increase operational risks through poor sectoral planning and integration, as well as fragmented social and community management structures. A lack of harmonization across national boundaries can lead to significant shifts in aquaculture operations to areas of decreased regulatory

management or reduced production costs. Poor sectoral planning can also increase the adverse impacts of aquaculture operations to the environment, or create other social and financial risks if land or coastal allocations are in areas unsuitable for the proposed operation or if the capacities, policies or institutions are not in place for effective sectoral governance.

- *Improving institutional coordination* – At the national level, aquaculture as a sector has rarely been incorporated into the issues of wider economic development. National policies dealing with aquaculture are generally restricted to impacts on human and animal health, fisheries regulation, quarantine and sometimes resource access. Aquaculture is generally overshadowed by capture fisheries and its regulation is commonly subsumed within fisheries legislation. In many nations, the aquaculture industry faces multiple regulatory and management agencies with involvement in risk management to capture its potential environmental, economic and social impacts. As a result, the transactional costs for development of aquaculture are often significant. This perceived overregulation is balanced with significant underregulation in some aspects and in some regions. In order to achieve an appropriate balance, national governments are encouraged to review the interagency responsibilities towards aquaculture development and management with the intent to ensure appropriate lead and cooperating agencies for key regulatory functions.
- *Addressing issues associated with globalization and free trade* – The increasing competition in the global market place creates stronger incentives for both binding and voluntary harmonization of standards. There have been several international trade restrictions based on non-compliance with certain trading standards, particularly those related to fish health and food safety issues. In turn, these restrictions create additional burdens on competent authorities and regulatory pressures in some economies, resulting in an unbalanced market place. This results in increased financial and social risks, and as profit margins are reduced, can result in decreased safety margins in the production line and overcrowding of stocks, which may increase pathogen, food safety and public health and genetic risks through loss of stock and environmental impacts.
- *Improving the use of limited natural resources* – Many of the resources on which aquaculture depends (e.g. water, land, fishmeals and oils) are finite. As aquaculture inevitably expands, competition for these resources – from both within the sector and outside – will increase. This will inevitably increase the level of environmental risk and make risk analysis, both at the national and at the farm level, increasingly necessary and yet more complex. The implications of resource limitations to aquaculture are increased production costs that automatically lead to increased financial and social risks. Aquaculture operations will of necessity seek to make more efficient use of resources, such as reducing the use of scarce resources, increasing production per unit resource or recycling, all of which may have financial, environmental, social and other implications

- *Dealing with the social and biological impacts of climate change* – Climate change is having a steady but profound effect on the riparian and coastal systems in which many aquaculture operations occur. Aquaculture farms in coastal areas may be vulnerable to sea level rise, increased incidence of storm surges and land-based run-off, including extreme weather events that result in flooding and drought, as well as environmental perturbations such as a rise in sea temperature. Climate change remains highly unpredictable; however, the incidence of storm events resulting in loss of stocks and infrastructure is likely to increase, resulting in higher financial, genetic and social risks. Increased temperatures may lead to greater likelihood of pathogen, food safety and public health and ecological risks. Better analysis of risk and climate change in the aquaculture sector would provide a basis for advising industry and governments on appropriate management strategies.

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Aquaculture is a rapidly expanding sector of the global economy with an average growth rate of 8.8 percent per year since 1970. Development of the industry under various national and regional jurisdictions has resulted in a diversity of regulatory frameworks. This manual has been produced in response to a request from FAO Members for guidance on the application of risk analysis with respect to aquaculture production. Aimed at decision-makers and senior managers involved in the sector in FAO Member States, this manual provides an overview of the considerations for risk analysis in decision-making for all types of aquaculture, including the impacts of aquaculture operations on environmental, socio-political, economic and cultural values as well as the impacts to aquaculture from outside influences. This manual is expected to promote wider understanding and acceptance of the applications and benefits of risk analysis in aquaculture.

