

An Outlook for Aquaculture Development: Major Issues, Opportunities and Challenges¹

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Introduction

Aquaculture is one of the fastest growing food producing sectors of the world and has achieved a reputation as a significant contributor to poverty alleviation, food security and income generation. The decision to establish the Sub-Committee on Aquaculture under the Committee on Fisheries (COFI) reflects the importance that FAO Member Governments attach to aquaculture development. Nevertheless, some forms of production practice have, justifiably, been identified as unsustainable and the cause of negative environmental and socio-economic impacts. This disparity indicates the need to further discuss issues relating to sectoral sustainability, with a view to ensure that the aquaculture sector provides a fair and equitable contribution to humankind. The section examines major issues of sustainability, discusses prospects and challenges for improving aquaculture's contribution towards reducing poverty, improving food security, assisting rural livelihoods and enhancing national income generation.

Aquaculture is an important domestic provider of much needed, high quality, animal protein, generally at prices affordable to the poorer segments of society. It is also a valuable provider of employment, cash income and foreign exchange, with developing countries contributing over 90% of the total global production. When integrated carefully, aquaculture also provides low-risk entry points for rural development and has diverse applications in both inland and coastal areas. While export-oriented, industrial and commercial aquaculture practices bring much needed foreign exchange, revenue and employment, more extensive forms of aquaculture benefit the livelihoods of the poor through improved food supply, reduced vulnerability to uncontrollable natural crashes in aquatic production, employment, and increased income. Fisheries enhancements using appropriate culture techniques also provide important opportunities for resource-poor people to benefit from enhanced use of under-utilized, new or degraded resources. Such culture-based fisheries have considerable potential to increase fish supplies from both freshwater and marine fisheries, with concomitant income generation in rural inland and coastal communities.

The challenge is to create an enabling environment for optimising the potential benefits and contribution that aquaculture and culture-based fisheries can make to rural development, food security and poverty alleviation. Improved participatory farming/production practices within the framework of sustainable, integrated, co-management of natural resources will improve their use. People-centered development and extension management approaches, ensuring capacity building that focuses on culture systems for aquatic species feeding low in the food chain, also provide the low-cost products favored by poorer rural communities.

¹ This section of the Circular 886, Revision 2 has been drawn heavily from the Working Documents 2 of the COFI Sub-Committee on Aquaculture, entitled Aquaculture Development and Management: Status, Issues, and Prospects, prepared for the First Session to be held in Beijing, China from 18-22 April, 2002.

Major Issues of Regional and Global Significance

During the past three decades, aquaculture has expanded, diversified, intensified and advanced technologically. The potential of this development to enhance local food security, poverty alleviation and improve rural livelihoods has been well-recognized. The Bangkok Declaration and Strategy (NACA/FAO, 2000) emphasizes the need for the aquaculture sector to continue development towards its full potential, making a net contribution to global food availability, domestic food security, economic growth, trade and improved living standards. In order to achieve this potential, aquaculture should be pursued as an integral component of community development, contributing to sustainable livelihoods for, promoting human development and enhancing social well-being of poorer sectors. Aquaculture policies and regulations should promote practical and economically viable farming and management practices that are environmentally sustainable and socially acceptable. If aquaculture is to attain its full potential, the sector may require new approaches in the coming decades. These approaches will undoubtedly vary in different regions and countries, and the challenge is to develop approaches that are realistic and achievable within each social, economic, environmental and political circumstance. In an era of globalization and trade liberalization, such approaches should not only focus on increasing production, they should also focus on producing a product that is affordable, acceptable and accessible to all sectors of society.

Considerable political will is required to establish effective, sustainable approaches to aquaculture development. Appropriate mechanisms are needed and institutional capacities must be strengthened to assure better planning and management. This involves the adoption of various policy measures which may include extensive consultation with, and/or participation of, those affected by the proposed policy measures, strict adoption of the principles of inter-generation equity, and recognition of the need to devolve management to the lowest practical level of responsibility. Appropriate legal frameworks, new skills and improved capacities, especially for policy analysis at the sectoral and project levels, as well as new and efficient means of communication, are necessary. Institutional strengthening and local training are also important to enable decentralized management.

The major issues and concerns that need to be addressed to ensure overall sustainability of the aquaculture sector include:

- providing an enabling environment for sectoral sustainability with appropriate, and well-linked, technology, policy, legal and institutional frameworks;
- involvement of stakeholders in the overall process of drafting and reviewing the regulatory processes which govern the aquaculture sector;
- involving all stakeholders in decision making, policy planning, development and management of the sector;
- facilitating access to key resources, including physical, monetary, and information/knowledge;
- achieving responsible management and efficient use of common resources, such as water and land;
- integrating aquaculture into coastal and inland watershed management plans and adoption of integrated planning and co-management of common resources with relevant stakeholders.
- effectively integrating aquaculture into pro-poor national development plans;
- stimulating investments and private-sector participation in commercial and industrial aquaculture development, where appropriate;
- supplying products for specific consumer preferences and complementing the efforts of other food production sectors;
- promoting closer cooperation among stakeholders, countries and regions in the overall development process; and
- investment by both the public and private sector in aquaculture development at both small-scale and commercial/industrial levels, which are aimed at sustainable development.

Creating an Enabling Environment

Historically, most aquaculture practices around the world have been pursued with significant social, economic and nutritional benefits, and with minimal environmental costs. However, the sector has been the focus of recent public debate related to negative environmental and social impacts. There is some basis for these accusations - in certain parts of the world and in certain aquaculture sectors, there have been some inadequately-planned and inappropriately managed forms of aquaculture that have created significant social and environmental problems. Typically, these impacts arise from weak regulatory frameworks and increased commercial potential of some high value species.

Globally, aquaculture is still predominantly rural, producing species low in the food chain that require little or no inputs or capital investment (over 80% of total global finfish production is cyprinid fishes). This means aquaculture makes a significant, grass-roots, contribution to improving livelihoods among the poorer sectors of society. Pressure to overexploit resources under such circumstances has been as significant in aquaculture development as it has been historically in capture fisheries. However, it is important to examine the lessons learnt from past experience and develop strategies for improved sustainability of this important sector. Reduction of externalities and negative social and environmental impacts, through consultative planning, and dedicated co-management will ensure sustainable benefits.

Policy and institutional and legal environment

The need to develop and adopt policies and practices that ensure environmental sustainability, requires environmentally sound technologies and farming systems based on solid scientific knowledge. Increasing the efficiency of resource use, and productivity at the farm level, contributes significantly to sectoral sustainability. Adoption of a 'systems approach' to management, improved water management, better feeding strategies, more environmentally friendly feeds, genetically fit stocks, improved health management, integration with agriculture etc., are all important. The Code of Conduct for Responsible Fisheries (CCRF) includes provisions for sustainable development and management of aquaculture. The FAO Technical Guidelines for Responsible Fisheries (FAO, 1997) provides annotations to the principles of Article 9 - *Aquaculture Development* of the CCRF, intended to facilitate its implementation. Development of, and support for, implementation of improved management practices and codes of good practice for aquaculture sectors, supported by enforceable regulations and policy, are essential for sectoral sustainability.

One of the key factors that support creation of an enabling environment is strong institutional capacity, that is, the ability of countries and organizations to strengthen and implement policy and regulatory frameworks that are both transparent and enforceable. The Conference on Aquaculture in the Third Millennium identified several key recommendations that would help develop conducive institutional and policy environments. These include:

- developing clear aquaculture policy with a clearly defined lead agency with adequate organizational stature to play a strong coordinating role;
- developing comprehensive and enforceable laws, regulations and administrative procedures that encourage sustainable aquaculture and promote trade in aquaculture products, with a stakeholder participatory approach;
- targeting organizations and institutions dealing with administration, education, research and development, that represent the private sector, non-governmental organizations (NGOs), consumers and other stakeholders, in addition to government ministries and public-sector agencies;
- developing mechanisms and protocols for the timely collection and reporting of relevant data;

- sharing information on policies and legislation, rules and procedures that encompass good management practices in aquaculture;
- clarifying legal frameworks and policy objectives regarding access and user rights for farmers; and
- improving the capacity of institutions to develop and implement strategies that target the aquaculture development needs of poorer communities.

Technology

Appropriate technologies contribute to aquaculture sustainability with a variety of mechanisms that can meet the needs of the local environment. Delivery of such techniques requires effective communication networks, reliable data and a decision-making process that ensures aquaculture producers choose the best production systems and species for their environment. Science and technology provide ongoing 'new' opportunities for aquaculture development including: techniques for sustainable stock enhancement, ranching programs and open ocean aquaculture; use of aquatic plants and animals for nutrient stabilisation; integrated systems to improve environmental performance, such as, recirculating systems, integrated water use, artificial upwelling and ecosystem food web management. Although considered to be a relatively novel concept, some biotechnologies have a long history of application, e.g. fertilization of ponds to increase feed availability. Others are more modern, based on rapidly evolving knowledge of molecular biology and genetics, e.g., genetic engineering and DNA-probe development for disease diagnostics. The application of gene biotechnology in aquaculture focuses primarily on increasing growth rates, but also addresses enhancement of disease resistance, production of sterile stocks and physiological tolerance of environmental extremes (See Section on *Recent Technological Innovations in Aquaculture* in this volume for details).

Product quality, safety, and trade

Quality, safety and trade of aquaculture products are important aspects of a sustainable industry. It is therefore appropriate to mention that the importance of attaining sustainable aquaculture with negligible/minimal environmental or socio-economic impacts is forcing many exporting countries to adopt and implement more sustainable production practices. This is especially important where aquaculture is perceived to be a non-traditional food-producing sector. Safety assessments, based on risk assessment and the precautionary approach, for example, are now becoming more common, before pursuing production of new or exotic species, or products from modern biotechnology.

The role of aquaculture in international trade is increasing, both in the relative and absolute sense. This is a result of increasing aquacultural production in general and of high-value commercial export-directed production in particular. As international trade statistics do not denote production methods of fishery products (capture or aquaculture), it is not possible to determine the exact share of aquaculture products in most commodity trade. However, recent legislative initiatives, such as new labeling requirements to distinguish farmed and wild products, introduced in 2002 by the European Community, coupled with increased demands for traceability of food products for food safety reasons, should improve the quality of international trade data and facilitate better and more accurate aquaculture trade analysis. While the pros and cons of labeling and certification schemes are still under debate in many international fora, some governments and several industry organizations and NGOs are pursuing the establishment of procedures based on good management practices, codes of conduct and farm-level management practices.

A trend towards consumer preference for organically produced aquatic products is increasing. The aquaculture sector lags behind agriculture in terms of the quantities and diversity of certified "organic" produce - reflecting a lack of accepted international/regional/national standards

and accreditation criteria for organic aquaculture produce. Existing certifying bodies and organic aquaculturists are, primarily, restricted to a handful of organizations in developed countries of Europe, Oceania and North America, all of which contributed less than 10% to the global aquaculture production in 1999. Although no official statistics are available for global production of certified organic aquaculture products, it is estimated that such production in 2000 was only about 5,000 mt, primarily from European countries. This represents a mere 0.01% of total global aquaculture production and 0.25% of European aquaculture production. The total volume of organic aquaculture products marketed in Europe in 2000 is estimated at between 4,400 and 4,700 mt. Negligible production data is available for countries outside Europe. Organic certification and other “eco-certification” programs are being discussed and established by various agencies and groups. These empower consumers to choose aquaculture products with perceived higher quality or health attributes and grown in an environmentally sound manner. Price premiums for organically grown food products generally range between 10 to 50 percent above conventional products. Higher prices give aquaculturists incentives to produce organic products, but incur higher production costs associated with environmental protection measures. Where certification is non-discriminatory and based on sound science-based technical standards, it can help consumers use their purchasing power to encourage environmentally sound production practices. The issue is to ensure the process is based on sound scientific evidence, is fair and non-discriminatory.

Awareness of, and sensitivity to, environmental and welfare issues is increasing, particularly in developed countries where purchase decisions can be influenced by adverse publicity or a lack of information. As livestock farmers, aquaculture producers are increasingly required to act in line with standards expected of the livestock industry. At a national level, safety and quality management systems should be put into place to ensure production, distribution and sale of aquaculture products are safe and of high quality. Such measures require competent professional associations that work in close association with the legal authority, in order to be successful.

Information

Access to, and effective dissemination of, reliable information is needed for informed decision-making and responsible actions at all levels. High-quality information supports policy and planning, improves application of research results, increases farmers’ capabilities to address sustainable development and public awareness of achievements. Establishing effective national and regional information systems, with clear understanding of the role of the information for management of the sector is vital. Effective tools and methods to manage and analyze data (disciplinary, interdisciplinary and inter-sectoral) and information systems, are required. Examples of the requisite information systems include: i) The FAO World Fisheries and Aquaculture Atlas (ATLAS)² and ii) the Fisheries Global Information System (FIGIS)³.

At present, limited statistical information exists on the scale and extent of rural or small-scale aquaculture development within most developing countries and LIFDCs. Likewise there is little data concerning the direct/indirect social and economic impacts of aquaculture development, in these sectors. Due to the limitations of conventional methods of assessment, the reliability of this information is also questionable. As a result, the role of small-scale aquaculture and aquatic resources management in rural livelihoods is generally underestimated. Quantitative and qualitative information on the impacts of more commercial-scale farming activities and assistance projects on food security and poverty alleviation is also missing. These shortfalls need urgent rectification.

Considerable information on various aspects of aquaculture exists, however, much of this is in the grey literature. Although some information for sustainable development and management of aquaculture requires research investigation, priority should be given to the collation and

² http://www.fao.org/fi/atlas/w_fi_aq/w_fi_aq.asp

³ http://www.fao.org/fi/atlas/w_fi_aq/w_fi_aq.asp

assessment of existing information and, where necessary, repackaging into more accessible formats. In the short term, it is important to collect available national information on economic and social aspects of aquaculture, resource use and efficiency, employment benefits, beneficiaries and other attributes of major aquaculture production. This is needed to enable rational decision-making on aquaculture integration into resource management plans, agriculture and rural development. This information should be packaged in a form of direct use to decision-makers (e.g., in the form of quantifiable indicators). The specific nature and amount of information to be collected, the frequency of updating, and cost-effective methods for doing this, also require special attention.

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