

**Global Conference
on
Aquaculture 2010**

*Farming the Waters for
Food and People*

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**5th Session (FI-702-5)
COFI Sub-Committee on Aquaculture**

27 September to 1 October 2010
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Major Turning Points of Modern Aquaculture

Since the first description of carp culture in earthen ponds during the 5th century B.C. by a Chinese named **Fan Li**, great progress was made not only in monoculture of common carp but polyculture of grass carp, black carp, silver carp and bighead carp during the succeeding periods of the Han Dynasty and the Tan Dynasty until the 12th century. In time and scale, carp culture served well Asia – China, South Asia, most countries in Southeast Asia, certain areas in Central Asia and Eastern Europe – when the rapidly growing population needed the protein food fish. Through time, farmers of such system preserved its best feature, i.e. farming within the limits of nature.

But demand was increasing from a rapidly rising population. Thus, seeing the need to build aquaculture into a full-fledged industry, the first world meeting on aquaculture, The World Symposium on Warm-water Pond Fish Culture, was organized by FAO in May 1966 in Rome, Italy. Subsequent meetings in 1967 (FAO World Scientific Conference on the Biology and Culture of Shrimps and Prawns, Mexico City, Mexico) and 1973 (Technical Conference on Fishery Management and Development, Vancouver, Canada) and the previous 1966 symposium recommended the holding of a World Technical Conference on Aquaculture. Ten years after seeding the idea of a global conference, the **FAO Technical Conference on Aquaculture** was held in Kyoto, Japan from 26 May to 2 June 1976 (“The 1976 Kyoto Conference on Aquaculture”). *This is the first major turning point of modern aquaculture.*

The Kyoto Conference reviewed the status, problems, opportunities and potential for the culture of fish, crustaceans, molluscs and seaweeds and prepared the **Kyoto Declaration on Aquaculture**. The Kyoto Declaration placed aquaculture prominently in national planning. It became recognized as a legitimate user of land and water resources, and worthy of more research investment. Personnel were trained for better planning, management, research and production. The technological component of the Declaration boosted productivity.

Meanwhile, communities prospered, people are stronger and healthier and there came better opportunities to improve livelihoods, more income and better nutrition. Farmers and women are empowered. As well, farmed areas expanded, harvests became more reliable and aquaculture soon emerged as the fastest-growing food production sector. Both small-scale and commercial- and industrial-scale operations supported by an increasingly efficient global trade regime and marketing network, contributed to the success of the sector. To feed a growing world, it has had to push beyond the constraints imposed by nature, at times disorderly and with little restraint. In the late 1980s, it began to show this tendency, subsequently suffering from its unfortunate effects that included pollution, disease and social disapproval.

To bring order to its development and that of fisheries as a whole, FAO and governments, in 1995, promulgated the **Code of Conduct for Responsible Fisheries (FAO CCRF)** which enshrined the principles of environmental and social

responsibility. *This is the second major turning point of aquaculture.* Those who wanted to farm in accord with such principles were assisted with technical guides, and standards and certification schemes; ensuring social and environmental responsibility made the sector busy.

Going into the third millennium, the sector saw the need to translate into a working strategy seven principles: (i) fair reward for farmers; (ii) equitable share of benefits and costs; (iii) societal benefits with minimum harm from its practice or products, (iv) creation of wealth and more jobs; (v) sufficient food is accessible to all, (vi) next generation’s environment is conserved, and (vii) orderly development of the sector. These principles were unified at the Conference on Aquaculture in the Third Millennium (February 2000) into a global strategy to achieve the social, economic and environmental sustainability goals of aquaculture development. **The Bangkok Declaration and Strategy for Aquaculture Development beyond 2000 is the third major turning point of aquaculture.**

Immediately after the aquaculture millennium conference, governments mandated FAO to create the FAO Committee on Fisheries **SubCommittee on Aquaculture (COFI/SCA)**. *This is the fourth major turning point of aquaculture.* COFI/SCA serves as the only inter-governmental forum for consultation and discussion on technical and policy matters related to aquaculture including issues, trends and needs of global importance that require actions to achieve the sustainable contribution of aquaculture to food security, economic development and poverty alleviation.

Since 1966, four watershed events over close to 50 years – enough to nourish aquaculture in the next five decades. But with 78 million more people every year, and the slim growth prospect of capture fishery, aquaculture will need to do more. The sector will have to sharpen its competitiveness against every food industry in an increasingly sophisticated and a modernizing global market and brace itself for a host of persistent and emerging problems and challenges.

Aquaculture is not new to facing these challenges. It has the tools, forged in the Kyoto Declaration, sharpened by the adoption of the FAO CCRF, wielded with increasing confidence by the application of the Bangkok Declaration and Strategy and supported by strong government commitments through the COFI/SCA – the four watershed events of modern aquaculture. The tools have worked with varying degrees of effectiveness amidst diminishing land and freshwater resources, a rising demand for more and safer food, and through energy and financial crises. We will need to make them sharper, more effective and more versatile yet -- in a warming Earth.

The bright view is that aquaculture will continue to grow; this optimism is well-founded, based on its performance during the last few decades - so that aquaculture can serve the people better, nations continue to prosper with wholesome and peaceful communities.

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Fifth Session of the FAO Committee on Fisheries Sub-Committee on Aquaculture (COFI/AQ)

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Aquaculture, still the fastest growing food producing sectors of the world, 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 (SCA) under the Committee on Fisheries (COFI), in 2001, reflects the importance that FAO Member States attach to aquaculture development. Since its' First Session in 2002 April in Beijing, P. R. China, COFI/AQ held four successive sessions: second session in 2003 August in Trondheim, Norway; third session in September 2006 in New Delhi, India; and fourth session in October 2008 in Puerto Varas, Chile. The fifth session will be held from 27 September to 01 October 2010 in Phuket, Thailand. The continuing offers for sponsoring and hosting the SCA sessions by FAO Member States confirm the commitment that they attach to the Sub-Committee.

The fifth session will focus on several key issues pertinent to aquaculture development globally. The technical agenda consists of the following subjects:

FAO Fisheries and Aquaculture Department's efforts in implementing the recommendations of the past sessions of the COFI Sub-Committee on Aquaculture: for discussion and recommendation

As a stand alone agenda item, the Secretariat will present a brief overview of the efforts made by the FAO Fisheries and Aquaculture Department, towards implementing the recommendations of the past sessions of the SCA. The Working Document developed by the Secretariat indicates that significant achievements have been made during the intersessional period on implementing the recommendations of the SCA.

Improving the progress reporting on the implementation of the Code of Conduct for Responsible Fisheries (CCRF), provisions relevant to aquaculture and culture-based fisheries and the proposal for a revised reporting mechanism on CCRF with an interactive questionnaire format: for discussion and decision

The Code of Conduct for Responsible Fisheries (CCRF) was adopted by the FAO Member States in 1995. FAO members are obliged to report to FAO on their efforts in implementing the provisions of the CCRF

on a regular basis. The session will discuss the current status and trends in the reporting of the progress of implementation of the CCRF by FAO members. FAO regularly assists its members to better implement the provisions of the CCRF. As it appears that determining the appropriate assistance required by the members is difficult under the present reporting mechanism, the Secretariat will propose a revised questionnaire and further improvements to the reporting mechanism, following recommendations of the last session of the Sub-Committee.

Guidelines on aquaculture certification: for discussion and decision

Trading of aquaculture commodities are on the rise and expanding globally. People's awareness of how aquatic products are produced is increasing and the demand for sustainably produced, safe-to-eat products are growing. Aquaculture certification, thus, becomes a tool for improving consumer confidence. However, no internationally agreed guidelines or standards on aquaculture certification exist. On the request by FAO members, guidelines on aquaculture certification are being developed by FAO through a lengthy consultative process. COFI/AQ V is expected to finalise the guidelines development process and build consensus on the set of guidelines, which will be presented to next session of COFI in March 2011 in Rome for final agreement.

Aquatic biosecurity: a key for sustainable aquaculture development: for discussion and decision

Biosecurity, as defined by FAO, is a strategic and integrated approach that encompasses policy and regulatory frameworks aimed at analysing and managing risks relevant to human, animal and plant life and health and including associated environmental





risks. It covers food safety, zoonoses, introduction of animal and plant diseases and pests, introduction and release of living modified organisms (LMOs) and their products (e.g. genetically modified organisms or GMOs), and the introduction of invasive alien species. The Secretariat will present an overview of major biosecurity concerns affecting modern aquaculture (e.g. transboundary aquatic animal diseases, food safety, public health risks on the use of veterinary medicinal products, bioinvasions, aquaculture issues pertaining to aquatic GMOs and some aspects of climate change), to the FAO members seeking guidance to meet these biosecurity challenges and advise upon appropriate biosecurity measures to protect the aquaculture sector.

Climate change and aquaculture: opportunities and challenges for adaptation and mitigation: for discussion, recommendations and decision

Climate change is a potential threat to the sustainability of aquaculture development. Impacts can occur as a result of both gradual warming and associated physical changes as well as from frequency, intensity and location of extreme events, and can take place in the context of other global socio-economic pressures on natural resources. Climate change impacts on aquaculture have both direct effects, e.g. through physical and physiological processes, and indirect effects, e.g. through variations in fish meal supplies and trade issues. Urgent adaptation measures are required in response to opportunities and threats to food and livelihood provisions due to climatic variations. During COFI/AQ V, the Secretariat will present a working document to the FAO membership which analyzes some of the evidence on climate change potential impacts to the aquaculture sector at global and regional levels and the Sub-Committee will be invited to discuss the urgent adaptation measures required in response to such issues.

Moving aquaculture further offshore: governance issues and challenges: for discussion and recommendations

The agenda item on moving aquaculture further offshore will share recent salient developments in offshore aquaculture, particularly in offshore mariculture and discusses the major impediments to its development

and some of their possible mitigating strategies whilst highlighting challenges ahead. Most mariculture occurs in coastal sheltered waters. Costly technology and limited coastal space threaten its development. One of the mitigating strategies is to move operations further offshore. Should offshore aquaculture extend to the high seas, there would be a regulatory vacuum. While the latter could be filled by the extension of state regulatory regimes or a treaty, adaptation of existing organizations and practices in fisheries to aquaculture, in combination with the CCRF could be a more viable option. The trend towards moving aquaculture further offshore will require adjustments in aquaculture governance, which will have to reconcile with ecological and human well-being, maintain societal harmony by protecting the interests of vulnerable groups such as small-scale farmers, without destroying entrepreneurial initiatives. The Sub-Committee is invited to advise FAO on the way forward on addressing this issue.

As a tool for improving data, statistics and information on aquaculture, FAO recently established the Coordinating Working Party on Aquaculture, under the purview of the Coordinating Working Party on Fishery Statistics. The Sub-Committee will discuss its functions and advise the Secretariat on the priority issues to be undertaken during the intrasessional period, towards improving aquaculture information, data and statistics.

COFI/AQ Attendance

Since the fifth session of the Sub-Committee on Aquaculture will be held back-to-back with the Global Conference on Aquaculture 2010, it is expected that many FAO members will attend this fifth session and engage in fruitful discussions leading to meaningful decisions and agreements. ■

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Selected Aquaculture Highlights from Sub-Saharan Africa¹

Sub-Saharan Africa (SSA) has made significant progress in aquaculture production in the past years. The most recent aquaculture statistics available from FAO² show that there has been a five-fold increase in production from 1998 to 2008.

Such progress can be attributed to a number of key developments.

- Active involvement of the private sector served as the primary catalyst to the development of aquaculture in several countries which resulted to spectacular advancement in many aspects of the industry.
- NEPAD Fish for All Summit (2005) - raised international awareness of the potential of aquaculture and adopted the Abuja Declaration on Sustainable Aquaculture in Africa; endorsed the NEPAD Action Plan for the Development of African Fisheries and Aquaculture. As a consequence, the AU/NEPAD Food Security Summit (2006) agreed to promote and protect fisheries and aquaculture as strategic commodity alongside rice, maize and other strategic food products.
- FAO Special Programme for Aquaculture Development in Africa (SPADA). Under this programme new approaches to aquaculture aimed at increasing the role of the private sector have been adopted across the region through elaboration and adoption of national aquaculture strategies. With the assistance of FAO and other partners, many countries are now at various stages of formulating and applying these strategies. Several governments have been adopting good governance including the divesting of expensive infrastructure and costly services, zoning of aquaculture areas, adoption of aquaculture specific legislation and policies, framework strategies and plans, and enacting conducive fiscal policies.
- *Aquaculture Network for Africa* (ANAF) - a critical element of SPADA with ten member countries (Cameroon, Ghana, Kenya, Mali, Mozambique, Nigeria, Senegal, Tanzania, Uganda and Zambia) - has established a provisional "hub" with the Lake Victoria Fisheries Organization.

Network expansion to other countries is ongoing, institutional strengthening being promoted as well as ensuring proper governance for aquaculture development.

- FAO assistance through the Technical Cooperation Programme (TCP) to Africa has intensified particularly focussing on development of national aquaculture programmes in many countries; during the past two years alone has included Burundi, Cameroon, Central African Republic, Democratic Republic of Congo, Ghana, Gambia, Kenya, Malawi, Nigeria, Republic of Congo, Senegal, Sierra Leone, Tanzania and Zambia. FAO's South-South cooperation programme has mobilized over 1500 aquaculture and related field technicians and professionals mainly from Asia over the past 10 years to support aquaculture development in many African countries.
- The Committee for Inland Fisheries of Africa (CIFA) was changed to the Committee for Inland Fisheries and Aquaculture of Africa (CIFAA) in 2007, making it possible for the aquaculture sector to have a formal intergovernmental platform. The 16th Session in Maputo, Mozambique, from 16-18 November 2010 will discuss *inter alia* an important topic on the need for a climate change strategy in inland fisheries and aquaculture and its potential impact on African aquatic ecosystems.



Cage culture of tilapia in Ghana

M. Halwart, FAO

- EC-funded Sustainable Aquaculture Research Networks in sub-Saharan Africa (SARNISSA) project plays a significant catalytic role in promoting aquaculture in the region particularly in the area of information flow and better exchange of information and experiences.

A number of projects are also being implemented to address many existing challenges facing the aquaculture sector in the region.

- GCP/INT/053/JPN *Agriculture and rural development through Innovative Rice-Based Farming Systems for food security and poverty reduction in Africa*, during past two years, organized workshops in Burkina Faso, Uganda, Tanzania and Benin on aquaculture in rice-based systems for increased productivity and market development.
- TCP/SIL/3104 *Assistance to fish farmers in Sierra Leone* focused on assisting the Ministry of Fisheries and Marine Resources (MFMR) in establishing sustainable and private-sector-driven fish farming by developing pilot production units, ensuring reliable private supplies of quality fish seed, introducing farmer-friendly aquaculture technologies and identifying appropriate strategic approaches to aquaculture. The MFMR has been supported by a team of specialized TCDC consultants, also providing their assistance for the development of an aquaculture sector national strategic framework.
- TCP/RAF/3111 *Assistance to combat EUS in the Chobe-Zambezi River* and the Aquatic biosecurity project under the FAO Multi-donor Partnership Programme (FMPP). Since the confirmation of the occurrence of epizootic ulcerative syndrome (EUS) in 2007 as an outcome of an FAO international disease investigation task force, FAO continued to intensify its assistance to the region to raise awareness and improve capacity under the above programmes. Several member countries (Angola, Botswana, Kenya, Malawi, Mauritius, Mozambique, Namibia, Tanzania, Uganda, Zambia and Zimbabwe) participated in capacity development opportunities covering areas such as basic aquatic animal health management, EUS diagnosis and surveillance and application of risk analysis to aquaculture development.
- TCP/MAG/3301-*Urban and peri urban agriculture promotion for food and nutrition security improvement in Antananarivo* and GCP/BKF/048/VEN-*Agriculture intensification through sustainable water management in Nord and South Sabel regions* are being started this year.



Seaweed culture in Tanzania

Through both projects, FAO seeks to provide the necessary assistance to promote innovative integrated agriculture-aquaculture technologies and sustainable water management approaches, as a way to improve vulnerable urban and rural populations' food and nutritional security.

- GCP/RAF/417/SPA – *Tilapia Volta Project* (Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali and Togo) - is a pioneering effort to produce and supply better quality tilapia seed. The project is based on a priority programme Better seed for African fish farmers.
- FAO overview of COPs/BMPs in aquaculture: development of a global overview and databank of Codes of Practice, Codes of Conduct, Best (Better) Management Practices and Technical Guidelines in aquaculture - a study is being carried out in Sub-Saharan Africa. Further information can be found on the aquaculture gateway page: <ftp://ftp.fao.org/FI/DOCUMENT/aquaculture/COPBMP/call.pdf>
- Countries such as Kenya, Ghana, Zambia and Nigeria, among others, are developing aqua-business planning and management tools to foster profitable and sustainable investment. ■

¹These selected highlights were compiled by Matthias Halwart based on contributions from several FAO staff and specifically from SPADA, the Regional Review on Aquaculture Development in sub-Saharan Africa (prepared for the Global Conference on Aquaculture 2010), Follow-up actions to the 15th Session of the CIFA and available FPMIS information.

²FAO. 2010. FAO Fisheries and Aquaculture Department, Fishery Information, Data and Statistics Unit. FishStat Plus version 2.3.2 Universal software for fishery statistics time series. Rome. (<http://www.fao.org/fishery/statistics/software/fishstat/en>).

Regional Aquaculture Highlights from Asia

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Promoting aquaculture food security and biosecurity in the Asia-Pacific region

FAO has made great efforts to promote aquaculture food security and biosecurity in the region through implementing a number of national and regional TCP projects and convening regional workshops. These include:

- **TCP/CPR/3203** - Improvement of aquaculture food safety in Hubei Province
- **TCP/THA/3202** - Certification for small-scale aquaculture in Thailand
- **TCP/CPR/3202** - Better management of fresh-water aquaculture in Pingjiang County, Hunan Province
- **TCP/BGD/3101** - Developing a national shrimp seed certification System in Bangladesh
- **TCP/RAS/3203** - Reducing the dependence on the utilization of trash fish/low value fish as feed for aquaculture of marine finfish in the Asian region
- **FAO/NACA** Expert meeting on the use and exchange of aquatic genetic resources relevant for food and agriculture, Chonburi, Thailand, 30 March-2 April 2009
- FAO Expert workshop on improving biosecurity through prudent and responsible use of veterinary medicines in aquatic food production, Bangkok, Thailand, 15-18 December 2009
- FAO Expert workshop on enhancing the contribution of small-scale aquaculture to food security, poverty alleviation and socio-economic development, 21-24 April 2010, Hanoi, Viet Nam.

Since the inception of **TCP/CPR/3203** in July 2009, the project made significant progress in successfully developing good aquaculture practices (GAPs), improving local capacity for disease diagnosis, monitoring of culture environment and preliminary detection of drug residues through various training activities for local technical staff and participating farmers. Better management practices (BMPs) are currently being employed by demonstration farmers during the culture period that is being supported by the project.

Implementation of **TCP/THA/3202** commenced in June 2009. Project implementation strategies and work plans were developed through national consultation. Four farmer groups were well-established in four different provinces covering shrimp and tilapia farming. Training on setting up of farmer groups and their operations, including internal control system and implementation of GAPs was conducted for local technical staff and farmer group managers and members.

TCP/BGD/3101 was successfully implemented in 2008-2009. This project assisted the government of Bangladesh developing a Shrimp Seed Quality Assurance Program (SSQAP), Code of Practice (COP) and Standard Operational Procedure (SOP) for shrimp hatchery operation in the country and strengthened local capacity through relevant training activities and laboratory facility improvement through the support provided by the project.

Implementation of **TCP/RAS/3203** is progressing well participated by four member countries, namely China, Indonesia, Thailand and Viet Nam. Successful farm trials in four countries have well demonstrated the technical and economic feasibility of using pellet to displace direct use of low-value fish in marine finfish culture. Relevant socioeconomic and environmental studies were also conducted.

The FAO/NACA Expert meeting on the use and exchange of aquatic genetic resources relevant for food and agriculture discussed extensively past practices on the use and patterns of exchange of genetic resources of some important aquaculture commodities. A synthesis review paper, which considered the schemes/mechanisms for access and benefit sharing (ABS) of aquatic genetic resources among FAO member countries, was prepared for the FAO Commission on Genetic Resources for Food and Agriculture Conference held in October 2009.

The FAO Expert workshop on enhancing the contribution of small-scale aquaculture (SSA) to food security, poverty alleviation and socio-economic development significantly enhanced the understanding of the contribution of and challenges faced by SSA producers, identified entry points for enhancing its contribution and action plans to protect SSA producers and households from threats, risks, shocks, crises and emergencies. The workshop also identified

principles and key elements that will be included the th FAO CCRF Technical Guideline for promoting the development of SSA.

It is expected that outputs of the above TCP projects and the regional workshops/meeting will significantly promote the sustainable development through improved aquaculture food security, food safety, environmental benefits and biosecurity in the region.

Promoting the ecosystem approach to fisheries (EAF) and ecosystem approach to aquaculture (EAA) in the Asia-Pacific region

The 2nd Regional Consultative Forum Meeting of the Asia-Pacific Fishery Commission (APFIC) and the 30th Session of APFIC convened in Manado, Indonesia in 2008, recommended that APFIC promote an understanding of how to implement ecosystem approaches to aquaculture and fisheries management. The meeting noted too that such approaches would effectively contribute to the implementation of the FAO Code of Conduct for Responsible Fisheries. The session emphasized the need for guidance on how to apply this management approach to the small-scale production sector, the development of offshore fisheries and in the data-poor situations that prevail in the APFIC region. In response to this recommendation, APFIC and FAO in cooperation with the government of Sri Lanka convened a regional consultative workshop from 18-22 May 2009, in Colombo, Sri Lanka. The workshop brought together 75 participants from APFIC and FAO member countries across Asia and the Pacific region together with representatives of regional fisheries, aquaculture and environmental intergovernmental and non-governmental organizations (IGOs/NGOs), as well as those representing relevant projects and other arrangements. The workshop enabled participants to familiarize themselves with ecosystem approaches to management and explore how these planning and management frameworks can be applied to the complex issues facing fisheries and aquaculture systems that are typical of South Asia, Southeast Asia and East Asia. The workshop also developed recommendations for action directed at APFIC member countries and the regional partners of APFIC for individual or collective actions.

Best practices to support and improve the livelihoods of small-scale fisheries and aquaculture households

The APFIC Regional workshop on best practices to support and improve the livelihoods of small-scale fisheries and aquaculture households was convened during 13-15 October 2009, in Manila, Philippines, and

participated by 58 representing 16 member countries, resource persons and representatives of international and regional NGOs/IGOs, institutions and FAO staff and resource persons drawn from the FAO Regional Office for Asia and the Pacific (RAP), the FAO Fisheries and Aquaculture Department (FI), the FAO Regional Fisheries Livelihoods Programme (RFLP) and the Bay of Bengal Large Marine Ecosystem Project (BOBLME).

The workshop focused on three main themes: (i) building resilient small-scale coastal fisheries and aquaculture through livelihood diversification in the APFIC region; (ii) impact of policies on fishers' livelihoods; and (iii) approaches and best practices for facilitating access to microfinance services for small-scale fishers and aquaculturists. The findings and recommendations of the workshop highlighted those areas of best practice and policies that will support coastal community livelihoods and those aspects that are to be avoided or which can negatively impact coastal livelihoods.

Promoting aquaculture insurance in Asia and the Pacific region

Exploring the possibility of establishing appropriate insurance scheme/s for Thai shrimp farmers has been taken up as a high priority by the Thai Department of Fisheries (DoF). FAO through the RAP office supported the Thai government in convening an FAO/DoF Workshop on the options for a potential insurance scheme for aquaculture in Thailand, held from 23 – 25 September 2009 in Bangkok, Thailand through a TCP Facility. The workshop provided stakeholders with a detailed overview of the benefits of, and requirements for, the successful establishment of a mutual insurance scheme that responds to the needs of the Thai shrimp farming industry and meets the overall objectives of the Royal Thai Government. The workshop was attended by representatives from government agencies, shrimp farmer cooperatives, fish marketing organizations, the academe, the private sector and the media. Resource persons from the global insurance industry - leaders in the fields of mutualisation, reinsurance, claims and loss adjustment, and aquaculture insurance and with over 30 years of experience in their respective fields in different parts of both the developed and developing world - provided their expertise. The workshop participants shared their experiences, perspectives and views during the working group sessions. The workshop recommended a number of immediate follow-up actions. ■

Regional Aquaculture Highlights: Central Asian Region

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Aquaculture production in the Central Asian region continued its downward trend in the last few years. Countries like Kazakhstan, Kyrgyzstan and Tajikistan showed a further decrease in an already very small sector. The combined aquaculture production of the five Central Asian republics is only adding up to some 4 000 tonnes (see Figure 1).

Species produced are silver carp, common carp, grass carp, bighead carp, crucian carp, trout and sturgeon. The countries have improved their investment climate for the aquaculture sector, which started to show some results in 2009.

Moreover, the Tajikistan aquaculture sector showed an impressive recovery after the disastrous winter in 2008; production doubled in 2009 compared to 2007. Unfortunately, in June 2010 flash floods have destroyed some small trout farms and created water quality problems at the largest trout farm in the country. As a consequence, trout production may be reduced again in 2010. The political instability in Kyrgyzstan over the period April to June 2010 caused considerable negative effects for the aquaculture sector in the country. Farmers could not import fish feeds and trout eggs (as borders were closed for some time) and the domestic market for higher priced species like farmed trout declined dramatically. The instability also reduced the availability of cultured-based fisheries produced carp from Kazakhstan in the Bishkek market.

The often high price paid for fish in the domestic markets as well as better land and water ownership and lease legislation have triggered investments in most Central Asian countries. Fish (including species like carp, catfish and snakehead) and other fisheries products are generally more expensive per kg than comparable meat products (poultry meat, lamb and beef). This high price is mainly a consequence of limited supply and high feed

prices for farmed fish. The high market price is constraining local demand in most of the Central Asian countries, but at the same time profit margins for fish farmers are relatively sound.

Although investments in hatcheries, ponds and cage construction are being made, the effects on total production will only be visible in the figures for 2010 and 2011. Inputs such as modern aquaculture equipment and commercial feeds remain unavailable for most aquaculture farmers in the region. The governments in the region continue to stress the needs for aquaculture capacity building and technology transfer from other regions. Some regional level training activities in fish feed technology and feeding management (by FAO) and sturgeon hatchery management (by FAO in collaboration with the World Bank, World Sturgeon Conservation Society and UNDP) have resulted in a better understanding among farmers and experts. However, a recent Regional Workshop to Assess the Fisheries and Aquaculture Sector Education, Training and Research Needs in Central Asia, held in Tashkent, Uzbekistan, 12-14 January 2010, showed that much more training and education in fisheries and aquaculture are required in the region.



A carp hatchery in Khudjand-Tajikistan

O. Altan, FAO

Regional training and education priorities, as determined by authorities and experts from Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey and Uzbekistan, include the following:

1. training in fish nutrition, good hatchery practices and development and use of recirculation systems in aquaculture;
2. training in fish health, cage culture, fishery and aquaculture management;
3. establishment of regional collaborative educational programmes for fisheries and aquaculture; and
4. training in aquatic toxicology.

These priorities cannot be dealt with alone by the sector, as the number of qualified experts in the above-mentioned priority subjects in the Central Asian countries is very low and their knowledge is often outdated. It is clear that the countries will need increased support to build capacity of the private sector fish farmers, aquaculture researchers and policy makers and extensionists and access to modern technologies from elsewhere in Asia and Europe.

Completed policy and strategy development processes in Kyrgyzstan (2008) and Uzbekistan (2009) have led to major support from these governments and donors (e.g. Finland and Turkey) to the aquaculture sector. Currently the approval process of the Policy and strategy for fisheries and aquaculture development for poverty alleviation in Tajikistan

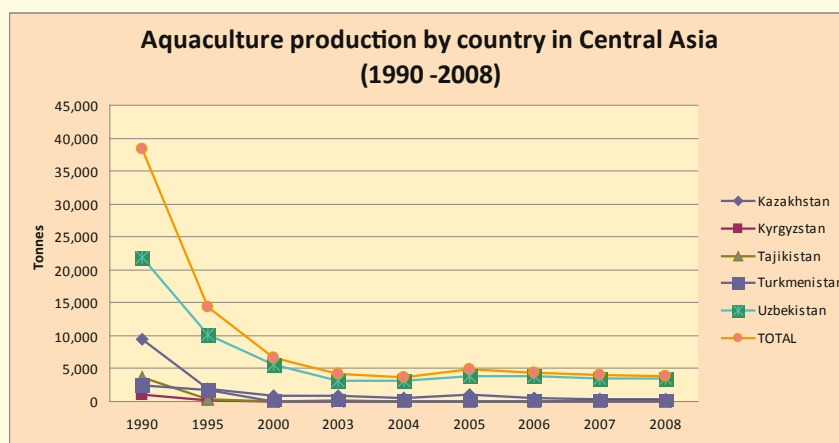


Figure 1. Aquaculture production by country in Central Asia (1990-2008).



O. Altan, FAO

Soviet style net cage platform in Tajikistan

(2010-2025) is in its final stages; a promising sign for the sector in that country. Progress is also made in the establishment of the Central Asian and Caucasus Fisheries and Aquaculture Commission to increase regional collaboration in support of sustainable development of the sector. It is foreseen that the Commission will become active in 2011. ■

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Highlights of Aquaculture Activities in Latin America and the Caribbean

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In Latin America and the Caribbean (LAC), FAO is making efforts to support and assist the sustainable development of aquaculture, especially aimed to contribute to poverty alleviation and food security. Activities in this region are coordinated jointly by the RLC office, the Multidisciplinary team for South America, the Caribbean Sub-Regional Office and the Aquaculture Service (FIRA) in Rome. Activities include implementation of Technical Cooperation Projects (TCPs), TCP Facility projects (TCPF) as well as unilateral trust fund projects (UTF). There are also regional activities funded by donor countries/entities with a wider regional and usually normative scope.

Several projects are intended to develop and implement national strategy for the aquaculture sector; such is the case in Bolivia, Paraguay and Peru. These projects are briefly described below:

Improvement of the Aquaculture and Fisheries Legislation in Bolivia (TCP/BOL/3101). Main targets of this project are to: i) evaluate current legislative framework

covering inland fishing and aquaculture, ii) formulate a new Law for Fisheries and Aquaculture, iii) perform a diagnostic of the fisheries and aquaculture sectors; and iv) formulate a National Strategy for the Sustainable Development of these sectors. The project is now in its second phase looking at the socialization and ratification of the Law and the Strategy.

Formulation of a National Plan for Aquaculture Sustainable Development in Paraguay (TCPF/PAR/3201).

This project considered a diagnosis of the national aquaculture sector and the formulation of

a national policy and strategy for its sustainable development. Planned activities include formulation of a new law to promote aquaculture, national aquaculture programmes for zoning and extension.

Assistance for the Implementation of the Aquaculture National Strategy of Peru (TCPF/PER/3201). This TCP facility project is intended to develop a UTF (self-funded by Peru) to assist the implementation of a national aquaculture strategy. Such strategy had been already developed with previous FAO TCP assistance.



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Small-scale aquaculture in the Amazon area

Some projects also focus on implementing practical measures to support the development of small-scale aquaculture at national level. Such is the case of the project Development of Coastal Communities of the North-East of Brazil (UTF/BRA/066). This project self-funded by Brazil promotes the organization of coastal communities, for the production, processing and commercialization of seaweed as well as other forms of mariculture.

Other activities funded by donor's programmes have a broader regional scope and aimed towards cooperation and integration within the region. These include the following projects: Aquaculture Network of the Americas, the GALAQUA initiative, the Regional Programme for Small-Scale, Resource-Limited Aquaculture and the Climate Change Preliminary Overview project.

The Aquaculture Network of the Americas (Red de Acuicultura de las Americas, RAA). This newly created regional cooperation network is an intergovernmental organization for the sustainable development of the aquaculture in the Americas. It is currently hosted by Brazil for which the country provides initial funding using a UTF mechanism through a project Activation of the Programme, Services and Consolidation of the Network of Aquaculture of the Americas (GCP/RLA/BRA/190), to execute the priority lines of action agreed by the member countries.



Experimental culture of native species in Peru

Small-scale, Resource-limited Aquaculture (SSRLA). This initiative, currently underway, in partnership with the RAA has been a priority as requested by COPESCAL members during the XI session (Manaus, Brazil, September, 2009). It is starting off with a regional workshop to be held in Paraguay in August, 2010, to develop a harmonized methodology for the diagnostic of this sector in all countries of the region. The information will lead to a regional programme aimed at capacity building of SSRLA so that they gradually achieve self-sufficiency both technologically and economically.

The GALAQUA initiative. Within the framework of the Decentralized Cooperation Programme FAO/Galicia, FAO and the "Conselleria de Pesca y Asuntos Marítimos de la Xunta de Galicia" have agreed to collaborate in a project for the development of aquaculture in LAC with the objective of improving rural and small-scale aquaculture, through production and training modules, therefore, contributing to the sustainable development of rural and more needed communities in developing countries of the region (GDCP/INT/002/ SPA). Through a very participatory process the inception phase of this project allowed the development of a programme of work in the region to be implemented in the next 4 years.

Climate change implications for fisheries and aquaculture in the region. A relevant regional activity, partially funded by Japan (GCP/INT/253/JPN), only recently initiated, considers the development of country desk studies and a regional overview to illustrate climate change implications for fisheries and aquaculture and the adaptation potential for the sector. The activity will conduct a regional workshop on the subject to be held in April 2011. ■

Further information can be obtained by email from the authors.

Adapting to Climate Change: The Ecosystem Approach to Fisheries and Aquaculture in the Near East and North Africa Region

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The FAO/WorldFish Center Workshop on Adapting to Climate Change: the Ecosystem Approach to Fisheries and Aquaculture in the Near East and North Africa took place in November, 2009 to identify and address the impacts created by climate change in the region, and how the Ecosystem Approach to Fisheries (EAF) and Aquaculture (EAA) can be utilized for the management and adaptation of fisheries and aquaculture in the face of these impacts. The workshop was attended by 27 participants from 14 countries from the region, and by FAO and WorldFish Center staff.

The impacts of climate change will affect and change the industries of fisheries and aquaculture, therefore affecting food security and livelihoods in the region. The predicted impacts are not standard or consistent across the region as one country's loss may be another country's gain. Regardless of the specific losses and gains, food security, the stability of supply, availability, access and utilization will all be impacted. The workshop was structured through working group sessions divided into three main topic areas, namely: a) identifying climate change impacts on fisheries and aquaculture; b) identifying adaptation/management strategies for priority impacts/issues; and c) understanding regional and sub-regional capacities for the implementation of adaptation strategies. The working group sessions used the EAF and EAA as the framework for discussion, and used the following three categories to act as guidelines throughout the workshop: (i) biophysical well-being; (2) social and economic well-being; and (3) governance and ability to achieve.

Outcome of Working Sessions

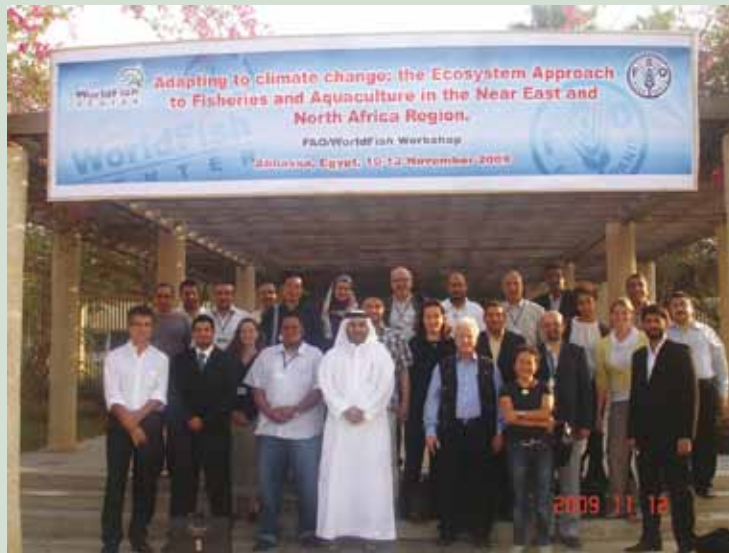
1. Identifying climate change impacts on aquaculture. The selected priority issues revealed a focus primarily on water quality in the ecosystem/

biophysical well-being category, while climate events, red tide, freshwater limitation and fish mortality and fish diseases are all of concern.

The issues prioritized with respect to social and economic well-being reflected a demand-led approach; food security and food safety were raised as key issues, while job losses were considered less important. The issues raised in aquaculture fairly evenly reflected different components of the production process. The issues raised under governance/ability to achieve were of a technical nature for the development of aquaculture (eg. policies, monitoring systems).

2. Identification of adaptation strategies in aquaculture. Possible adaptation strategies were discussed, and a number of strategies were highlighted as effective for implementation at different scales; the appropriate scales for aquaculture determined as farm level, watershed level and country level. Some of the adaptation strategies included: monitoring systems, biosecurity frameworks, standards setting, food safety controls, better management practices (BMPs), increased investment in research, and creating incentives for diversification.

While issues such as costs, ease of institutional change, and availability of technical expertise were raised in the discussion of these options, the overall capacity for the implementation of these strategies was not a primary factor for choosing them and reserved for the final session. Additionally, the discussion also addressed how adaptation strategies could be applied at one level, while being enhanced at further levels, e.g. BMPs applied at farm level, enhanced at the watershed level and again at the national level. Regional cooperation for certain issues such as setting standards was highlighted as key for effective implementation.



M. M. Alzainy

Workshop participants, speakers and organizers at closing of the workshop

3. Regional and sub-regional capacity for adaptation strategies. The final working group session addressed the capacity of the sub-regions (Near East and North Africa) to effectively implement the adaptation strategies from the previous working group session. The working groups considered adaptation strategies and then assessed the sub-regional capacity for implementation of these strategies using the following indicators/criteria: (1) institutional capacity; (2) financial capacity; (3) human capacity; and (4) willingness.

Adaptation strategies were assessed based on each of the above criteria, and then an analysis was undertaken in the plenary discussion to determine where capacity strengths and weaknesses exist in the sub-regions. As aquaculture varies between countries in the same region, it was difficult to cast an overall vote on issues; while initiatives and planning for the integration of aquaculture and other sectors was limited to specific countries and non-existent in others.

Institutional capacity in all regions is quite good, encompassing research, administration, policy and legal framework. However, operational capacity (finance and human) is moderate to low in all regions, and this is something that will pose an important challenge that must be considered when designing adaptation strategies.

Conclusions

While reducing the vulnerability of capture fisheries and aquaculture is an objective of some strategies in the region, it has yet to be effectively implemented. It is clear that the fisheries and aquaculture industries must adopt adaptation strategies on a variety of levels in order to adequately prepare for the impacts of climate change. It is generally acknowledged throughout the region that preparation for climate change is necessary; however, the required capacity to effectively implement appropriate strategies still needs to be developed. Information and experience sharing between countries and sub-regions could reduce the negative impacts of this gap in capacity in certain countries.

A common understanding of the EAF and EAA concepts is developing, and an effort is now made to incorporate the principles of EAF and EAA in policies at national levels, in certain countries. However, there is still much to do to make these principles operational in the practical management of fisheries. Lack of institutional, financial, human and willingness capacity for implementation at the local, national, regional (including watershed) levels must be recognized and addressed in order to successfully implement the concepts of EAF and EAA in the subregions. ■

Regional Aquaculture Highlights from the Pacific Islands

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Development of aquaculture in the Pacific region has intensified during the last couple of years. During biennium 2008-2009, FAO continued to provide support to our members through a number of aquaculture projects (TCP/CKI/3201, TCP/MAS/3101, TCP/MIC/3201 and TCP/NAU/3201) including a new 2010 TCP facility (TCP/RAS/3301) that were implemented by SAP and supported by FAO technical officers from headquarters. They are briefly described below.

Learning lessons from aquaculture developments in Fiji, Kiribati, Marshall Islands, Palau, Samoa, Tonga and Vanuatu

At the 8th Meeting of FAO South West Ministers for Agriculture held in Niue, 20-22 May 2009 (see photo, right), the importance of aquaculture to food security in the Pacific Island countries was stressed. The Meeting urged countries to further strengthen national capacities in the sustainable development and sound management of aquaculture, and became the basis for requesting FAO to undertake this regional overview of aquaculture development. Project TCP/RAS/3301 “Regional overview of aquaculture development in the Pacific – lessons learned” is designed to review aquaculture development and document the lessons learned from past experience as well as on-going aquaculture activities in selected countries in the Pacific region. Although development is relatively slow in the region, most countries are keen to move forward its commercial development. The sector lacks national legal frameworks, development policies and guidelines and have been frequently affected by natural disasters (cyclone/typhoon, drought, floods). Other constraints are related to infrastructure, financial resources, technical capacities, marketing scheme, information and other vital inputs (e.g. seed, feed). While many aquaculture initiatives (i.e. development projects and studies) were implemented and completed as planned, on their completion, the findings and recommendations did not provide the countries with complete and favourable answers for the further development of aquaculture in respective countries. Thus, an overview of sectoral development at national and regional levels are being undertaken to further guide the sustainable development of the aquaculture sector in the region.



D. Schulz, FAO/SAP

8th Meeting of FAO South West Pacific Ministers for Agriculture, Niue, 20-22 May 2009

The immediate focus of this review is to determine the real economic opportunities to be provided by aquaculture development. The draft overview report is expected before end of 2010 and will be reported in future issues of FAN.

Enhancing capacity on understanding and applying risk analysis in aquaculture in the Marshall Islands and in Federated States of Micronesia

The region was first introduced to the basics of risk analysis and its application to aquaculture in 2007 during the Regional Workshop on Implementing the Ecosystem Approach to Coastal Fisheries and Aquaculture and Aquatic Biosecurity organized by the Secretariat of the Pacific Community (SPC) and supported by FAO. Since then, interest in risk analysis came forward from the Republic of the Marshall Islands and the Federated States of Micronesia. Two national workshops held in May 2008 in Majuro (TCP/MAS/3101) and May 2010 in Pohnpei (TCP/MIC/3201), respectively. The Majuro workshop raised awareness on the value of risk analysis as a decision-making tool, the principles and processes involved as well as the different risks affecting aquaculture. The Pohnpei workshop went much further and as part of learning the basics of the risk analysis process used three translocation scenarios as working group exercises which made the learning curve of participants much more practical and efficient. This project is also finalising training tool on risk analysis which can be used by national trainers. On another occasion as



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Newspaper clip of the technical training conducted by FAO in May 2010 under project TCP/CKI/3201, through the Ministry of Marine Resources (MMR)

part of the Project Terminal Workshop (June 2009) of TCP/RAS/3101 “Sustainable aquaculture development on Pacific Micronesia” participating countries from such as Palau, FSM, and Marshall Islands were again given a brief opportunity for further understanding the concepts, principles and application of risk analysis.

Progress with aquaculture development projects in Cook Islands, Palau, Nauru

Cook Islands: Under the project TCP/CKI/3201, through the Ministry of Marine Resources (MMR), interested farmers were provided with technical training on culture and post-harvest techniques (pond preparation, fertilization, water quality sampling, feed formulation and management, hatchery operations and management for tilapia and milkfish; tilapia sex identification and sex reversal techniques; eradication of unwanted species; and milkfish deboning) that will enhance their knowledge from current existing farming practices to improve productivity using better management practices. Aside from the practical training provided to fishfarmers, market and financial feasibility studies will also be undertaken for both commodities.

Palau: This sub-regional project, TCP/RAS/3101, was completed shortly after the Project Terminal Workshop held in June 2009. A major outcome was a National Aquaculture Strategy for Palau and capacity development for participating nationals of Micronesia countries (Palau, FSM, Marshall Islands) on aspects related to developing national strategy on aquaculture and risk assessment. Further assistance from FAO is requested particularly focussing on small-scale aquaculture and aquatic biosecurity including relevant

legislation. Aquaculture legislation is being addressed through another project, TCP/PAL/3201, which was approved in September 2009. On a more practical perspective, a significant achievement was that through joint efforts of Palau’s Bureau of Marine Resources and FAO, the Ngatpang State Aquaculture Farm, now produces and sells about 3 000 lbs of fresh milkfish and vacuum-packed boneless milkfish (average of 1 lb/pc) at Koror market on a biweekly frequency during Thursdays and delivers 200 lbs of fresh milkfish directly to a local supermarket every Monday.

Nauru: The project TCP/NAU/3201 is looking at two major activities. The first pertains to reestablishing milkfish farms in the country (Buanda lagoon and 21 other lagoons) and the second is an assessment of potential environmental impact of dredging of Buada lagoon and in particular, assessment of capacity of the lagoon to support non-intensive milkfish farming. The Buada lagoon is a very important resource, being the largest freshwater lake in the country. The accomplishment of the first activity include review of existing milkfish farming system, assessment of water quality and potential source of milkfish fry and a stakeholder workshop. The second activity will provide important environmental management input to the GEF Small Grant Programme-funded Buada Lagoon Rehabilitation Project. The scope of the assessment includes both environmental, socio-economics and cultural aspects and will come up with an environmental management plan (impacts, mitigating measures, monitoring programme and responsibilities). The process will necessarily involve consultation with members of the Buada Lagoon Owners Association. ■

Salient Issues for Fish Trade

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There are a number of issues and developments that affect international trade in fish and fishery products and are important for the various stakeholders in the value-chain. In addition, there are emerging issues of relevance, in particular as they relate to producers, processors and exporters in developing countries.

Production

Total world fish production (capture and aquaculture), excluding aquatic plants, have grown to an estimated 143.7 million tonnes in 2009 and is expected to reach 145 million tonnes in 2010. China confirms its role as the principal producer, reporting 48 million tonnes in 2008, of which 33 million tonnes derived from aquaculture¹. Overall, 80 percent of world production of fish and fishery products takes place in developing countries.

Compared with figures a decade ago, the current supply represents an increase of more than 20 million tonnes. This additional supply is entirely due to increases in aquaculture production. Preliminary data for 2009 indicate 54 million tonnes (excluding aquatic plants) or 38 percent of total output. Estimates for 2010 show only a slight new growth in farmed production to 55.5 million tonnes. This is in part a supply response from producers after demand started falling in 2008. The sharp decline in the long-term growth rate of aquaculture production is, however, cause for great concern, not only in terms of future food security, but also from technological and managerial perspectives. It is clear that in many countries, significant challenges remain in order for the aquaculture sector to reach its full potential and become economically, environmentally and socially sustainable.

Consumption

World per capita consumption of fish and fishery products has risen steadily over the past decades. Estimates for 2009 show a stable per capita consumption at 17.1 kg with the contribution of aquaculture to the food fish supply estimated at 47 percent of the total.

A large share of the rise in fish production in the world relates to China, where domestic consumption of fish and fishery products per capita has increased from less than 5 kg in the 1970s to the present 25.8 kg. In the world as a whole, excluding China's domestic consumption, it is about 14.0 kg per capita. In essence, much of the increase in total production of fish in the world has not only taken place in China, but has been consumed in China. Developed countries have a much higher consumption of fish than developing countries, 24.0 kg per caput the first group, 14.4 kg the latter when including China and 10.6 kg when excluding China.

In general, urbanization and the growth of modern distribution channels for food have increased the potential availability of fish to most of the world's consumers. In some markets this has indeed enhanced fish consumption but not in others. It is also evident that economic and cultural factors strongly influence the level of fish consumption, and that availability alone is not the only factor.

Different price developments on capture and farmed products

Fish prices are influenced like those of other products both by demand and supply factors. At the same time, the heterogeneous nature of the sector with hundreds of species entering international trade makes it challenging to estimate price developments for the sector as a whole. FAO has initiated the construction of a fish price index to better illustrate both relative and absolute price movements. The index is being developed in cooperation with the University of Stavanger and with data support from the Norwegian Seafood Export Council.

The aggregate FAO Fish Price Index increased markedly from 81.3 in early 2002 to 126.4 in September 2008 although with strong within-year oscillation. After September 2008, the index fell drastically reaching 110.3 in March 2009, after which it has recovered to 115 in March 2010 (base year 2005 = 100). In addition to the aggregate index, separate indices have been developed for the most important commodities, as well as for capture and farmed species. It is interesting to note that the index shows quite separate price developments over time for captured fisheries and for aquaculture.

The former increased significantly in the 2002–2008 period whereas aquaculture prices, despite some firming during the same period, are indeed lower today than they were ten years ago. The main reason is probably related to the cost of input factors and the difference in production levels over this period; capture fisheries are frequently energy and capital intensive, whereas large-scale commercial aquaculture, although capital intensive, has benefited to a greater degree from technological improvements and economies of scale. This has increased yields in production, and together with improved logistics and distribution systems, permitted a significant increase in farmed output but at lower prices.

Value chain developments

A value-chain contains numerous stakeholders. They are impacted by the factors listed below to a varying degree depending on their position in the value-chain, their contractual relationship and the relative strength of negotiation in their relationship with suppliers and clients. In addition, whereas some of these factors are of a more transitory nature with an immediate market impact, others are of a long-term nature in which the real impact may only be speculative at this stage.

Some of the major issues concerning international trade in fishery products which continue to impact international trade, are:

- introduction of private standards by international retailers, including for environmental and social purposes;
- continuation of trade disputes related to farmed products: catfish species, shrimp and salmon;
- the growing concern of the general public and the retail sector about overexploitation of certain fish stocks, in particular of blue fin tuna;
- widespread concern in exporting countries about the impact on legitimate exports of the new traceability requirements introduced in 2010 in

- major markets to prevent Illegal, Unreported and Unregulated (IUU) fishing;
- the approval by FAO Conference of the Agreement on Port State Measures to prevent, deter and eliminate IUU fishing;
- the proliferation of eco-labels and their uptake by major retailers;
- organic aquaculture and the introduction of new standards in major markets;
- certification of aquaculture in general;
- the multilateral trade negotiations in the World Trade Organization (WTO) including the focus on fisheries subsidies;
- dissipation of economic rent in the fisheries sector due mainly to overcapacity;
- climate change, carbon emissions, food miles and the impact on the fisheries sector;
- energy prices and the impact on fisheries;
- rising commodity prices in general and the impact on producers as well as on consumers;
- the impact on the domestic fisheries sector from a surge in imports of farmed products, in particular of pangasius;
- the role of the small-scale sector in future fish production and trade;
- prices and distribution of margins and benefits throughout the fisheries value-chain;
- the need for competitiveness versus other food products; and
- perceived and real risks and benefits from fish consumption.

Of particular concern is the role of the small-scale producer, whether in capture fisheries or in aquaculture. The fragmentation of production and the vast numbers of operators at the first level of production has always weakened their commercial negotiating position. More recently however, the fragmentation and lack of organizational structures have become a weakness in areas of quality and safety for which more formal structures are required, necessary for new requirements such as traceability. As a response, small-scale producers in some countries, particularly in Asia, have developed producer clusters. This has enabled them to enter the formal economy and the value-chain on their own merit. In addition, it has facilitated transfer of know-how and experience, thereby improving production yields and economic results.

New regulations in major markets on traceability to prevent IUU fishing, will, at least in the initial phase of implementation, place an additional burden upon many developing countries fisheries, whether small-scale or not. From 1 January 2010, the EU's

Regulation (EC) No 1005/2008 requires that imports of wild caught fish and fishery products supplied to EU member states from third countries are accompanied by a Catch Certificate validated by the competent fisheries management authority of the flag state of the vessel that caught the fish.

The fragmentation of fisheries producers continues to hamper their ability to respond proactively to emerging issues and challenges advocated by consumer groups, retailers, civil society through NGOs, and to regulatory initiatives by governments. In particular, the harvesting sector has at times seemed reluctant to engage in a proactive dialogue with civil society and consumers on the legitimate role of modern fisheries and its future. A more active role in the debate involving producers, government, science and civil society would enable industry to address the issue of sustainability from an economic and social perspective, rather than being forced to respond to external pressure on environmental factors alone.

Outsourcing of processing

Over time, processors in developed countries have seen margins decrease mainly due to high labour costs and strong competition from efficient producers in developing and transition countries. As a result, raw material is more frequently being sent to low-cost processing countries. Processors have, through improved processing technology, been able to achieve higher yields and a more profitable product-mix from the raw material. Producers of traditional products, in particular of canned fish, have been losing market share to suppliers of fresh and frozen products as a result of long-term shifts in consumer preferences. Consequently, the price of canned fish products has dropped in most markets.

Increasing market power by retailers

One widely debated issue, especially among producers, is that of the role of the retail sector within the distribution channel. It is often stated that the retail sector takes a disproportionate share of the value created from fish and fishery products. Many studies indicate that their share is indeed large, yet, most of these studies do not include cost or net margin considerations, nor do they consider the intense level of competition at the retail level which normally would bring down any abnormal profit. In fact, industry reports in both Japan and the United States of America (USA) indicate that the retail chains have lower net margins on fish products than on other products. More studies are needed to look further into this relationship, including on how shorter distribution channels between producer and

the consumer can improve efficiency and increase benefits, in particular to the primary producer.

Consumers

Consumers are increasingly concerned about sustainability issues, especially overfishing and global warming. Air transportation of food is increasingly questioned. Health and well-being are other factors influencing consumption decisions; this explains in part the rise of the organic food sector. In the fisheries sector, organic production has been hampered by lack of market-wide standards in the most important markets. New regulations in the EU and the United States have the potential to lower costs of certification and thereby increase the market for organic seafood products. Supply remains a weak point given the narrow range of species and products currently available. However, the principal purchasing parameters among consumers remain price and food safety. The perceived benefit of fish consumption remains strong in most consumers' minds.

Fish and the WTO

The negotiations of the WTO Doha Development Agenda initiated in 2001, are still on-going. The two major issues of relevance to the fisheries sector continue to be 1) fisheries subsidies, discussed in the Negotiating Group on Rules, and 2) market access, discussed in the Negotiating Group on Non-Agricultural Market Access.

After the accession of China in 2001 and Viet Nam in 2007, all major fish producing, importing and exporting countries have become WTO members, with the exception of the Russian Federation. Membership of the WTO is a pre-requisite for having access to its Dispute Settlement Mechanism. Countries that joined WTO in 2008 were Cape Verde and the Ukraine.

Recent developments in fish safety and quality

Developments and implementation of fish safety and quality regimes continue to evolve in order to integrate further the application of scientifically-based risk analysis methods in food safety management and to ensure consumer protection. This evolution is affecting the entire fish and fish products supply chain and requires that the responsibility for the supply of safe, healthy and nutritious seafood is shared by all involved in the production, processing, trade and consumption, from "sea to table".

In the major markets, namely EU, Japan and the USA, which import around 75 percent of the internationally traded fish, implementation of different regulations domestically and in exporting countries continues. These regulations require that fish and fish products be produced and prepared/processed in farms and establishments that have implemented pre-requisite programmes of good practices and HACCP-based quality control programmes. Fish farms and establishments are to be certified as meeting these requirements. Likewise, national surveillance programs of the harvesting areas should be in place to control the threats of biotoxins and other biological and chemical pollutants and residues of veterinary drugs.

The EU has continued its application of the food and feed hygiene legislation and regulations which entered into force on 1 January 2006. Many countries which supply fish and fish products to the EU market have been visited by the Veterinary Commission to verify the degree of conformance with EU requirements and promote further equivalence.

The Food Protection Plan (FPP) of the US Food and Drug Administration (FDA) aims to generalize the use of science and the risk-based approach of prevention, intervention and response to improve the safety of foods consumed in the USA; it has continued to expand the seafood safety requirements set at the point of production and manufacture in exporting countries. For this, the FDA has established agreements with several exporting countries to strengthen collaboration, provide technical assistance to foreign regulators and industry and establish foreign FDA offices. The establishment of such agreements and arrangements include the involvement of China, India, and countries from Latin America, Europe and the Middle East. The FDA is also increasing resources to verify that fish and fish products made or processed overseas conform to FDA safety standards and requirements before they are imported. These voluntary third-party certification programs can include a private certification entity or a non-FDA federal, state, local or foreign regulatory body recognized by the FDA².

In Japan, application of HACCP-based food control regulations is pursued, including sanitary and hygienic requirements for fish handling and processing establishments and conditions for storage and

transport. Incorporation of risk analysis principles continues, but spot checks at the entry border are still prevalent. In this respect, the quarantine offices of the Ministry of Health and Welfare test about 10 percent of cargo for specific chemical residues or indicator/pathogenic microorganisms. When non-compliance is detected, 50 percent of the cargo from that country may be subjected to testing and this can be increased to 100 percent mandatory testing if further non-compliance is detected. Bilateral consultations with exporting countries to clarify the Japanese sanitary requirements and assist in their implementation at the early stages of the food chain continue.

Several exporting countries, especially many developing countries, continue to face difficulties to meet the requirements of the major import markets and experience restricted access to some markets, while others have seen their products rejected or detained at the border. While FAO's technical assistance continues to target these needs, further harmonization and equivalence agreements are needed to increase transparency and promote science-based consumer protection and lessen the disruption of international fish trade flows.

At the international level, the Codex Alimentarius Commission has continued to promote the development of internationally agreed standards that are based on scientific principles and fulfil the objectives of consumer health protection and fair practices in food trade. Implementation of the Commission Strategic Plan 2008–2013 is being reinforced as more Members, including from developing countries, are becoming active in the scientific and technical deliberations of the various Codex committees, in particular those dealing with fish and seafood safety and quality issues, such as the Codex Committee on Fish and Fishery Products, on Food Hygiene, Veterinary Drugs, Additives and Contaminants, etc. ■

¹In 2008, China revised its 2006 production statistics to reduce about 13 percent based on its Second National Agriculture Census conducted in 2007. This implied the downward adjustment of global statistics by about 2 percent in capture production and 8 percent in aquaculture production. Historical statistics of China for the period 1997–2006 were subsequently revised by FAO with the revision process known and acknowledged by the Chinese authorities.

²<http://www.fda.gov/RegulatoryInformation/Guidances/ucm125431.htm>.

Assessing Aquaculture Progress in Complying with the Code of Conduct for Responsible Fisheries (CCRF)

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Every two years, FAO Members as well as regional fishery bodies (RFBs) and the civil society are asked to complete a self-assessment questionnaire on the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF). Information collected from the questionnaires are consolidated and a report is presented to the FAO Committee on Fisheries (COFI). Detailed information on aquaculture, focusing on Article 9 of the Code, is presented to the COFI Subcommittee on Aquaculture (COFI/SCA). The COFI/SCA requested FAO to develop a questionnaire that will specifically assess the status of compliance of States to the aquaculture provisions of CCRF.¹ In response to this request, FAO under the supervision of the Aquaculture Service (FIRA), drafted an aquaculture questionnaire that supplements the aquaculture section of the CCRF compliance questionnaire, and has been carrying out a testing process of such instrument.

The main objective of the “CCRF Aquaculture Questionnaire Testing” process was to produce a new aquaculture-dedicated questionnaire that would enable (a) an effective and comprehensive global assessment of the status of compliance to the aquaculture provisions, (b) the effective identification of the needs of States to develop mechanisms and implement actions for compliance, and (c) for governments to conduct a self-assessment of their capacities for compliance to the aquaculture provisions of the Code. A question on preparedness and capacity to manage and respond to disasters and longer term impacts such as those posed by climate change was also included.

The testing comprised two activities, namely: (i) responding to and evaluating the questionnaire by selected experts from various countries and regions, and (ii) conducting an expert workshop

to reformulate the questionnaire and recommend strategic and technical actions regarding its use. The test and evaluation were carried out during November and December 2009 and the workshop took place in January 2010.

The first activity involved selected experts from Africa, Central America, Europe, Latin America, Near East and Asia-Pacific, coordinating and providing national (regional, in the case of Central America) responses to the draft questionnaire and evaluating the questionnaire using a set criteria. The draft questionnaire was also sent to some Pacific Island nations through the Secretariat of the Pacific Community (SPC) and through the FAO Sub-Regional Office for the Pacific Islands (SAP) for response and, by some of them, for evaluation. The experts were invited to participate according to their experience as national experts or as representative of national and regional institutions responsible for reporting the State’s CCRF compliance.

In this phase, the responses were evaluated for the purpose of demonstrating the analytical tool to process and analyze the returns and exploring methodologies to generate various types of reports for governments and FAO.

Experts from Chile, China, OSPESCA (Organización del Sector Pesquero y Acuicola del Istmo Centroamericano, on behalf of the Central American states), Kenya, Norway, the Philippines, Solomon Islands, Tonga, Turkey and Viet Nam responded to the draft questionnaire. The results of the test and the evaluation were discussed at an expert workshop that took place at the FAO Regional Office for Asia Pacific in Bangkok on 12-15 January 2010. Participants included 13 country/regional experts previously involved in this process, the Network of Aquaculture Centers for Asia and the Pacific (NACA), FAO officers and consultant.

Purpose and design of the questionnaire

Replying to the new CCRF questionnaire on aquaculture – an evaluation tool – would not be the same as replying to a poll. It demands much more mental and physical exertion, and time, but the reward system follows the same principle: an immediate feedback to the one replying to it, with one crucial difference: the information that comes back from responding to questions is a basis for a future action, i.e. to improve on a current situation. How is this accomplished?

The questionnaire is designed to provide a quick assessment to the respondent – the government – of two things: (i) how well, relative to a benchmark, it has complied with the aquaculture provisions of the Code, and (ii) what might explain the level of compliance. The core attribute of the evaluation tool is that it is a means to enable its user – the government – to assess as objectively as possible the State's current level of compliance and present capability to comply with those provisions so that both could be improved and relevant assistance can be provided.

How does this work?

Principles and processes

The key feature of the questionnaire is that it is structured so that one set of questions reveal indications of status of compliance and another set indicates capacity for compliance.

The second feature is that every question is close-ended and the response is made in a short Likert-like² scale, from zero to low to medium to high (level of compliance or capacity for compliance). Here, the issue arises as to what point on the scale applies or corresponds closest to the actual. This issue is addressed as follows:

- **Guideline.** The tool to help the respondent make a judicious and informed response – rather than a guess or an arbitrary tick – is a manual of instruction that would contain explanations, illustrations or clarifications for every question.
- **Strengthened country team.** The other provision, as recommended by the test reviewers and by the workshop, is to organize and strengthen a country team made up of staff from relevant agencies and to designate an institution to serve as a focal point for the survey.

The third feature is that the questionnaire is in excel format in which an analytical protocol is embedded. The analytical protocol allows a rapid generation of means (average), the assignment of weights to each question representing an indicator and setting up a benchmark against which the result can be compared. The overall result then is an immediate picture of how the government has performed and what is the state of its capacity to comply. The individual indicators themselves reveal the weak and strong points in the performance and the strong and weak elements in its capacity for compliance.

Global and regional uses

A major purpose of the questionnaire is to determine priority needs for assistance. Learning from the lessons of previous surveys, the questionnaire refrains from asking for these directly. Instead the questions themselves are so framed as to be able to indicate the major issues, the problems and therefore the priorities for assistance. The analysis of the priority needs can be focused on a country or on a group of countries in a region, which would then signal various types of national and national technical assistance programmes. They could also be used by FAO and regional organizations to develop technical cooperation programmes meant to strengthen the regional capacity for compliance with the aquaculture provisions of the Code.

In sum, the tool is a means of self-assessment for a country to be able to identify key areas for improvement, the second is for a global assessment whose results FAO and regional organizations can use to inform the planning and development of strategic technical assistance programmes for countries. A third use is for regional organizations to focus technical cooperation in training, information and expert exchange among their member states.

One final point, the questionnaire is designed to be concise but comprehensive enough to achieve its two basic purposes: provide FAO Members an objective basis for improving their capacities to implement the aquaculture provisions of the Code, and yield information for FAO to better identify areas for technical assistance to countries. ■

¹A similar effort is being carried out for the CCRF's provisions on Trade.

²When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement.

Estimating Employment in World Aquaculture

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Background

As part of its ongoing efforts to evaluate the socio-economic impacts of aquaculture development, the Aquaculture and Management Conservation Service (FIRA) has recently completed a series of estimates of world employment in aquaculture. Despite the important contribution to national economies made by aquaculture over the last three decades, a systematic estimation of employment in the sector at a global scale has yet to be completed. This article presents preliminary results of an *ad hoc* estimation as part of an ongoing project on socio-economic impacts of aquaculture, generated information of which will be fed into the forthcoming “Global Conference on Aquaculture 2010”. The figures presented include direct and indirect jobs.

Most of the data used in this estimation were obtained from FAO employment statistics database. Additional data were obtained from the 2005 FAO Regional Reviews on Aquaculture Development, the National Aquaculture Sector Overview (NASO) fact sheets, and employment databases maintained by national governments.

Although the FAO database covered the period 1970-2008, many of the data were very fragmented for a large number of countries; while most data obtained from other sources, referred only to the period 2000-2005, with 2005 bearing the most complete information. Thus, a global estimate for employment in world aquaculture was attempted only for the year 2005.

Methodology

The FAO database contains information on direct (on-farm) full-time, part-time and occasional employment in aquaculture. Based on the definition of each type of direct employment¹, part-time and occasional employments were converted to

direct full-time-equivalent jobs. Data from other sources were treated in the same way. Countries were grouped in eight major geographical regions (Table 1). They included 88 countries that accounted for 97 percent of world aquaculture production in 2005.

The next step was to estimate labor productivity in each country, which represents tonnes of aquaculture output produced by one full-time equivalent worker. Weighted averages of the labor productivity estimates were then computed within each geographical region. They were used to estimate employment in countries for which this information was lacking. In doing so, the regional weighted average labor productivities were used as proxies for labor productivities in these countries.

Data on employment multipliers (number of indirect jobs² generated by each direct job) were available for a reduced number of countries within each of the eight regions, except Oceania. Following the procedure previously outlined to come up with countries' labor productivity where this indicator was lacking, a weighted average multiplier was produced for each region and was used as a proxy for the multipliers in those countries for which data were not available. The employment multipliers were then used to estimate indirect employment in each country.³

Results

Results of this exercise, presented in Table 1, indicate that aquaculture employs about 23.4 million full-time-equivalent workers worldwide, which includes 16.7 million direct and 6.8 million indirect jobs.

Most employment is generated in Far East (plus India). The region accounts for 92 percent (21 518 099) of total employment (23 411 178),

which matches approximately its world aquaculture production share (91 percent). As expected, labor productivity is highest in North America and Europe (55 and 21 tonnes/man-year, respectively), an indication that the aquaculture sector in these countries is highly industrialized, relying on machinery for production and, as such, has a lower demand for manual labor.

Sub-Saharan Africa, Latin America, and Far East (plus India) exhibited the lowest labour productivities (0.46, 2.54 and 3.36 tonnes/man-year, respectively), an indication of comparatively greater supply of low-cost agricultural labor in these regions. For the

same reason, although Sub-Saharan Africa and Latin America represent only 0.2 and 2.6 percent of world production, respectively, they accounted for 1.5 and 3.6 percent of direct jobs in world aquaculture.

The direct employment in aquaculture represents 1.2 percent of the population employed in agriculture worldwide (about 1.35 billion in 2005). Moreover, assuming an average family size of five members, it can be inferred that in 2005 aquaculture contributed, through employment, to the livelihoods of approximately 117 million people, or 1.8 percent of the world population. ■

Table 1. Estimated total employment (direct and indirect) in world aquaculture, 2005. Numbers may not add up due to rounding.

World region (No. of Countries)	Aquaculture production (tonnes)	Labor productivity (tonnes/man-year)	Direct employment (number of direct, full-time on-farm jobs)	Average employment multiplier ^a	Indirect employment (number of indirect jobs)	Total employment (direct + indirect)
Far East plus India (17)	52 326 782	3.36	15 592 825	0.38	5 925 274	21 518 099
Rest of Asia (8)	305 590	9.49	32 193	1.07	34 325	66 518
North Africa (4)	546 964	8.84	61 873	0.59	36 505	98 377
Sub-Saharan Africa (9)	111 340	0.46	244 435	1.40	342 209	586 643
Latin America (20)	1 519 180	2.54	597 968	0.47	296 500	894 469
North America (2)	667 694	55.41	12 050	1.61	21 117	33 168
Europe (26)	2 131 086	20.70	102 955	0.85	88 724	191 679
Oceania (2)	159 222	11.63	13 694	0.62	8 531	22 225
TOTAL	57 767 858		16 657 993		6 753 185	23 411 178

^a Number of indirect jobs generated by each direct job

¹The definitions used in the FAO employment database are as follows: i) Full-time: individuals receiving at least 90 percent of their livelihood from farming or spending at least 90 percent of their working time in that occupation; ii) Part-time: individuals receiving at least 30 percent but less than 90 percent of their livelihood from farming or spending at least 30 percent but less than 90 percent of their working time in that occupation; and (iii) Occasional: individuals receiving

under 30 percent of their livelihood from farming or spending under 30 percent of their working time in that occupation.

²Indirect jobs are those associated with ancillary activities such as building of infrastructure (ponds, cages, tanks, etc.), feed and seed production, manufacturing of fish processing equipment, packaging, marketing and distribution.

³Indirect employment = direct employment (full-time-equivalent number of jobs) * employment multiplier.

Red de Acuicultura de las Americas (RAA): The Aquaculture Network of the Americas

Launching and Initial Programme

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During the fourth Session of COFI Sub-committee on Aquaculture (COFI/AQ IV) held in Puerto Varas, Chile in October 2008, all participating countries representing the American continent, requested FAO to take actions in order to reactivate this long-aspired aquaculture network. In response to such a demand, the FAO Sub-regional Office for South America (SLS), together with the Aquaculture Service (FIRA) organized a workshop to reactivate the initiative, aimed at creating an aquaculture cooperation network in the Americas. ***“In our continent, lots of people live in poverty, and there is inequity in the distribution of natural and economic resources. The RAA can contribute to reduce poverty and bridge the gap between the rich and the poor”.*** The meeting was held from the 10th to the 12th of June, 2009 in Guayaquil, Ecuador following the kind invitation of the government of this country. Thirteen countries were represented in the meeting and delegates signed a letter of intent to officially ratify their interest to create the RAA, the Spanish acronym for the Aquaculture Network of the Americas.¹

After a number of meetings of a provisional council created in Guayaquil and further consultations with the signing governments, the RAA was formally created on 25th of March 2010 in Brasilia, Brazil, with the participation of 21 countries from Latin America and the Caribbean (LAC). This newly created cooperation network is an intergovernmental organization for the sustainable development of the aquaculture in the Americas. Brazil will host the Secretariat of the network for the next four years, for which the country's recently created Ministry of Fisheries and Aquaculture has

donated USD1 million to execute the priority lines of action agreed by the member countries.

This is also the happy ending of the long effort of FAO (from the region and the headquarters), who sees in this network a new active partner to foster aquaculture growth in the LAC region. During the network launch, FAO Regional Representative for LAC, Mr José Graziano da Silva, reaffirmed the importance of the initiative. *“The idea of an aquaculture network was originated in the area, but we couldn't, until now, organize ourselves to make it a reality”*, said Mr Graziano. Countries from Asia and the Pacific have had their network since 17 years ago. *“Now we have to reach their level of aquaculture cooperation”*, he said.

According to Mr Felipe Matias, the current Network Executive Secretary, this network will contribute to foster the social and developmental role of aquaculture, rather than to its economic character. *“In our continent, lots of people live in poverty, and there is inequity in the distribution of natural and economic resources. The RAA can contribute to reduce poverty and bridge the gap between the rich and the poor”.* Mr Altemir Gregolin, the Fisheries and Aquaculture Minister of Brazil, emphasized the potential of the Americas when it comes to aquaculture, and the importance of cooperation among countries.



U. Marcelino

Country representatives and participants to the formal signature of the agreement and launching of the RAA. Brasilia, Brazil 25 03 2010

“The RAA has been born strong; we count on the participation of the 21 countries which signed the agreement”, he said. He emphasized the importance of this historic moment in which political integration among Latin American countries is becoming stronger.



U. Marcelino

Brazil Fisheries and Aquaculture Minister, Mr. Altemir Gregolin signing the RAA agreement

Priority activities to be developed by the RAA in the next five years include the following:

- review of the status of aquaculture governance in LAC region;
- creation of an aquaculture regional observatory.
- develop the small-scale, resource-limited aquaculture sub-sector of the region in cooperation with FAO;
- expand markets for LAC aquaculture products; and
- publish a directory of aquaculture research and training centers in the region.

The network web page offers additional information on current and future activities <http://www.racua.org/index.php?lang=EN>

Further information can be obtained by email from the authors. ■

¹More information on this meeting can be found in the Meeting Report <http://www.fao.org/docrep/012/i1561b/i1561b00.pdf>



U. Marcelino

Participants in the meeting with FAO officer (left) and with RAA Secretary (right)

Brazil will host the RAA Secretariat and headquarters until 2014, and will handle the infrastructure and its logistic support. For the next four years, the main issue within the action plan will be to contribute to reduce poverty and increase food security in the continent through aquaculture.

Aquaculture and Aquaculture-related Events (International, regional, national)

Biennium 2010-2011

2010

December 2010

FAO Expert workshop on aquaculture site selection and carrying capacity estimates for inland and coastal waterbodies, 6-8 December 2010, Stirling, the United Kingdom of Great Britain and Northern Ireland (Soto/Aguilar-Manjarrez)

FAO Expert workshop on improving the information base for aquatic genetic resources for the State of the World's Aquatic Genetic Resources, December 2010, Venue (TBD) (Halwart)

November 2010

GFCM/CAQ/CMWG Fourth session of the Coordinating Meeting of the Working Groups of the GFCM/CAQ, 27 November 2010, St George's Bay, Malta (Massa/Camilleri)

GFCM/CAQ/WGSA/InDAM Expert meeting: Definition of regional minimum set of indicators for sustainable aquaculture, 25-26 November 2010, St George's Bay, Malta (Massa)

GFCM/WGSC/SHoCMed Meeting on environmental quality standards for marine fish farms, 23-25 November, 2010, St George's Bay, Malta (Massa)

FAO/GFCM-CAQ Twelfth annual meeting of the information system for the promotion of aquaculture in the Mediterranean (SIPAM), 23-25 November, 2010, St George's Bay, Malta (Massa/Camilleri/Lovatelli/Crespi)

GFCM/CAQ/WGMA/SIPAM Joint meeting on marketing scheme and marketing data collection, 22 November 2010, St George's Bay, Malta (Massa/Camilleri)

FAO Workshop on strategies to overcome intrinsic limiting factors for the development of small-scale, resource-limited aquaculture in Latin America, 17-19 November 2010, Santa Cruz, Bolivia (Flores-Nava/Soto)

FAO Committee for Inland Fisheries and Aquaculture for Africa – sixteenth session, 16-18 November 2010, Maputo, Mozambique (Moehl)

FAO Workshop on capacity building for planning and development of fish seed quality assurance, fish disease monitoring and fish feed development programmes under FAO Project OSRO/IRQ/704/UDG, 10 days during second week of November (exact dates to be finalised), Amman, Jordan (Subasinghe/Hasan/Reantaso)

October 2010

FAO/RECOFI Workshop on spatial planning for marine capture fisheries and aquaculture, 24-28 October 2010, Doha, Qatar (Aguilar-Manjarrez/Carocci/Lovatelli)

Regional Terminal Workshop of Regional TCP/RAS/3202 (D) Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 24-28 October 2010, Daya Bay, Guangdong, China (Hasan/Miao)

FAO/RECOFI Fifth meeting of the RECOFI Working Group on Aquaculture (WGA), 27 October 2010, Doha, Qatar (Lovatelli/Crespi)

FAO Workshop on the feasibility of a regional shellfish hatchery in the Caribbean, 18-22 October, Kingston, Jamaica (Lovatelli)

GFCM/CAQ/WGSC/SHoCMed Workshop on allocated zones for aquaculture (AZA), 18-20 October 2010, Seville, Spain (Massa/Aguilar-Manjarrez)

FAO Workshop on carp better management practices, 14-15 October 2010, Izmir, Turkey (Van Anrooy/Altan/Reantaso)

FAO Committee on Fisheries Sub-Committee on Aquaculture fifth session (COFI/SCA V), 27 September-1 October 2010, Bangkok, Thailand (Jia/Subasinghe)

September 2010

FAO Global Conference on Aquaculture 2010 (in cooperation with NACA and Thailand Department of Fisheries), 22-25 September 2010, Phuket, Thailand (Jia and all FIRA staff)

FAO Expert workshop "On-farm feeding and feed management in aquaculture", 13-15 September 2010, Manila, Philippines (Hasan/Miao)

FAO/APFIC 31st session, 6-8 September 2010, Jeju, Republic of Korea (Funge-Smith/Miao)

FAO/APFIC 3rd Regional consultation forum meeting, 1-4 September 2010, Jeju, Republic of Korea (Funge-Smith/Miao)

August 2010

FAO Workshop on harmonization of methods for the assessment of the resource-limited aquaculture sub-sector of Latin America, 18-20, August 2010, Asunción, Paraguay (Flores-Nava)

July 2010

Public consultation of FAO Project TCP/THA/3202 Certification for small-scale aquaculture in Thailand, 28-29 July 2010, Chonburi, Thailand (Subasinghe/Ababuch/Miao)

FAO/NACA/DOF 2nd National stakeholder workshop under Regional TCP/RAS/3202 (D) Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 29-30 July 2010, Lampung, Indonesia (Hasan)

FAO/NACA/RIA3 2nd National stakeholder workshop under Regional TCP/RAS/3202 (D) Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 22-23 July 2010, Nha Trang, Viet Nam (Hasan/Miao)

FAO Expert workshop on aquaculture development in the desert and arid lands, 6-9 July 2010, Hermosillo, Mexico (Crespi/Lovatelli)

FAO/WorldFish Center Workshop on risk assessment methodologies and tools for aquaculture in Sub-Saharan Africa, 28 June to 2 July 2010, Lusaka, Zambia (Reantaso/Subasinghe)

June 2010

FAO/NACA/DOF 2nd National stakeholder workshop under Regional TCP/RAS/3202 (D) Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 29-30 June 2010, Zhanjiang, China (Hasan/Miao)

Farmer group training on cluster certification and GAP of FAO Project TCP/THA/3202, 1-4 June 2010, Chanthaburi and Chonburi, Thailand (Miao)

FAO/NACA/DOF 2nd National stakeholders workshop under Regional TCP/RAS/3202 (D) Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 1-2 June 2010, Crabi, Thailand (Hasan/Miao)

May 2010

FAO TCP/MIC/3201 Risk assessment in aquaculture development in the Federated States of Micronesia (FSM): National workshop, 24-28 May 2010, Pohnpei, FSM (Izumi/Reantaso)

FAO/RECOFI Initiative to promote fisheries management (and aquaculture) cooperation in the northern area of the RECOFI, 13 May 2010, Rome, Italy (Mannini/Lovatelli/Doulman/Poulain)

FAO/RECOFI Special meeting on RECOFI development and consolidation, 11 May 2010, Rome, Italy (Mannini/Lovatelli/Doulman/Poulain)

FAO National workshop on the policy and strategy for fisheries and aquaculture development for poverty alleviation in Tajikistan (under GCP/RER/031/TUR), 10-11 May 2010, Dushanbe, Tajikistan (Van Anrooy/Hasan)

FAO TCP/RER/3205 (D) Advice to Central Asian Governments on the feasibility of commercial fish and livestock feed production - Regional training on fish and livestock nutrition and feed technology, 7-8 May 2010, Sugd, Tajikistan (Van Anrooy/Hasan)

FAO TCP/RER/3205 (D) Advice to Central Asian Governments on the feasibility of commercial fish and livestock feed production - Regional workshop on the feasibility of fish and livestock feed production in Central Asia, 5-6 May 2010, Sugd, Tajikistan (Van Anrooy/Hasan)

April 2010

FAO Expert workshop on enhancing the contribution of small-scale aquaculture to food security, poverty alleviation and socio-economic development, 21-24 April 2010, Hanoi, Viet Nam (Reantaso/Subasinghe/Jia/Soto/Miao)

FAO Training Workshop under TCP/TUR/3202 (D) Recovery of Sturgeon Population in Turkey: Habitat assessment and restocking - sturgeon hatchery techniques and on-farm feed management, 19-22 April 2010, Trabzon, Turkey (Van Anrooy/Hasan)

Farmer training on better management practices (BMP) and aquaculture food safety of FAO Project TCP/CPR/3203, 6-10 April 2010, Songzi, Hubei province, China (Miao)

March 2010

Government of Brazil/FAO meeting for the official adhesion of countries to the Network of Aquaculture of the Americas, 23-25 March 2010, Brasilia, Brazil (Flores-Nava)

FAO Offshore mariculture initiative workshop, 22-25 March 2010, Orbetello, Italy (Lovatelli/Aguilar-Manjarrez/Hishamunda/Soto)

FAO International technical conference on agricultural biotechnologies in developing countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change (ABDC-10) 1-4 March 2010, Guadalajara, Mexico (Halwart)

National workshop of FAO TCP/CPR/3203(D) Improvement of aquaculture food safety in Hubei Province, China, 8-12 March 2010, Songzi, China (Karunasagar/Subasinghe/Miao)

February 2010

FAO Technical consultation of the guidelines on aquaculture certification, 15-19 February 2010, Rome, Italy (Subasinghe/Ababouch/Cochrane/FIRA)

FAO/NACA Regional expert workshop on inland fisheries resource enhancement and conservation in Asia, 8-11 February 2010, Pattaya, Thailand (Miao/Funge-Smith)

January 2010

FAO Expert workshop on status and trends of regional and global aquaculture, 25-28 January 2010, Rome, Italy (Soto/Subasinghe/Jia)

TCP/TUN/3203 FAO Atelier de restitution des études du projet de Coopération Technique "Renforcement du rôle de la femme pêcheur à pied de la palourde en Tunisie", 19 January 2010, Sfax, Tunisia (DiciQuadi/Lovatelli)

FAO Expert workshop on application of biosecurity measures to control *Salmonella* contamination in sustainable aquaculture 19-21 January 2010, Mangalore, India (Karunasagar)

List of Aquaculture and Aquaculture-related Projects (Biennium 2008-2009)

Technical Cooperation Programme (TCP)/TCP Facility (TCPF)

ASIA-PACIFIC

TCP/BGD/3101 Developing a national shrimp seed certification system in Bangladesh (Subasinghe/Miao/Aguilar-Manjarrez)

TCP/CKI/3201 Aquaculture project development in Cook Islands (Izumi)

TCPF/CPR/3203 Improvement of food safety in Hubei Province (Karunasagar/Subasinghe/Miao)

TCP/CPR/3202 Better management of freshwater aquaculture in Pingjiang County, Hunan Province (Subasinghe/Reantaso/Miao)

TCP/DRK/3204 Capacity building in fingerling production and farming of selected marine finfish species (Lovatelli/Miao)

TCPF/MAL/3201 (D) Identification of capacity building needs of the Malaysian fish inspection system to meet international market requirements (Karunasagar/Reantaso)

TCPF/MAS/3101 Risk assessment in aquaculture development in the Republic of Marshall Islands (Izumi/Reantaso)

TCPF/MIC/3201 Risk assessment in aquaculture development in Federated States of Micronesia (FSM) (Izumi/Reantaso)

TCP/NAU/3201 Milkfish farming and environmental impact assessment in Nauru (Izumi)

TCPF/NEP/3203 Project formulation on improving the genetic quality in carp seed production in Nepal (Miao)

TCP/PHI/3203 (D) Strengthening capacities for climate risk management and disaster preparedness in selected provinces of the Philippines (Bicol Region) (NRCB-LTU/Reantaso/Miao)

TCP/THA/3202 (D) Certification for small-scale aquaculture in Thailand (Subasinghe/Ababouch/Miao)

TCP/THA/3201 and 2JA03 Capacity building for aquaculture and small-scale fisheries development: Support to identification of options and potential scheme for aquaculture insurance in Thailand through a joint workshop by FAO and Thai DOF (Siar/Olofsson/Miao/Funge-Smith)

TCPF/THA/3103 TCP Facility: Project formulation on Aquaculture management information system and traceability in Thailand (Funge-Smith/Aguilar-Manjarrez/Miao)

TCP/RAS/3203 (D) Reducing the dependency on the utilization of trash fish/ low value fish as feed for aquaculture of marine finfish in the Asian region (Hasan/Miao)

TCP/RAS/3208 Sustainable aquaculture development in the Pacific Micronesia (Subasinghe/Izumi/Reantaso)

CENTRAL ASIA

TCP/TAJ/3104 Emergency assistance to Tajikistan in the aquaculture sector, livestock sector and comprehensive assessment and programme development (Van Anrooy/Hasan)

TCP/TUR/3101 Developing a roadmap for Turkish marine aquaculture site selection and zoning using an ecosystem approach to management (Soto)

TCP/TUR/3202 Recovery of sturgeon population in Turkey: habitat assessment and restocking (Van Anrooy/Hasan/Marmulla)

TCP/RER/3205 Advice to Central Asian Governments on the feasibility of commercial fish and livestock feed production (Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan) (Hasan/Van Anrooy)

EASTERN EUROPE (WESTERN BALKAN COUNTRIES)

TCP/BiH/3101 Strengthening aquaculture health management in Bosnia and Herzegovina (Reantaso/Subasinghe/Karunasagar/Van Anrooy)

TCPF/RER/3206 Assistance to Western Balkan Countries for improving compliance with international standards on aquatic animal (Bosnia & Herzegovina, Croatia, Macedonia, Monte Negro, Serbia) (Reantaso/Mothpoulsen)

LATIN AMERICA AND THE CARIBBEAN

TCP/BEL/3203 Short-, medium- and long-term national strategy and action plan for the development of freshwater aquaculture in Belize (Chakallal¹/Soto)

TCP/BOL/3102 Fisheries and aquaculture legislation of Bolivia (Morguera/Flores-Nava)

TCPF/PAR/3201 Diagnostic of the national aquaculture sector of Paraguay, as a basis for the development of a national aquaculture plan (Flores-Nava)

TCP/PAR/3201 National sustainable aquaculture development plan of Paraguay (Flores-Nava)

TCP/PER/3201 National strategy for aquaculture development of Peru (De la Rocha/Soto)

NEAR EAST AND NORTH AFRICA

TCP/ALG/3103 Support to the development of desert aquaculture and management of the brackishwater lakes in Algeria (Crespi)

TCP/DJI/3202 Formulation of aquaculture project – Djibouti (Lovatelli)

TCP/DJI/3301 (D) Project in support of the development of marine aquaculture in the Republic of Djibouti (Lovatelli)

SUB-SAHARAN AFRICA

TCP/CHD/3204 (D) Support to aquaculture sector in Chad (Hishamunda/Brugère)

TCP/CMR/3103 Formulation of a plan for the sustainable development of aquaculture in Cameroon (Brugere/Halwart/Aguilar-Manjarrez/Valderrama/Hishamunda)

TCP/DJI/3203 (D) Reinforcement of the role of women in the hand collection fisheries of Manila clam – Tunisia (DieiQuadi/Lovatelli)

TCP/DRC/3102 (A) Support in elaboration of a strategy and a plan for aquaculture development (Hishamunda/Skonhoft/Mulonda)

TCP/MAU/3103 (D) Formulation of a strategic and legal framework, and a development plan for sustainable inland fisheries and aquaculture in Mauritania (Hishamunda/Aguilar-Manjarrez)

TCP/PRC/3201 (D) Support in elaboration of a strategy for sustainable fisheries and aquaculture development (Horemans/Dasilva/Hishamunda/Skonhoft/DieiQuadi)

TCP/RAF/3101 Emergency assistance to combat epizootic ulcerative syndrome (EUS) in the Chobe-Zambezi River System (Angola, Botswana, Malawi, Mozambique, Namibia, Zambia, Zimbabwe) (Reantaso/Subasinghe)

TCP/SEN/3102 (D) Support in elaboration of technical guidelines and investment plan for small- and medium-scale fish farmers (Hishamunda/Mulonda)

TCP/SEN/3103 (D) Mission for the formulation of an implementation strategy and legal, financial and incentive frameworks in aquaculture (Hishamunda/Skonhoft)

TCP/SIL/3104 (D) Project assistance to fish farmers in Sierra Leone (Moehl/Halwart/Valderrama)

¹Mr Biessesar Chakallal passed away on 13 April 2010.

Extra-Budgetary Funds (EBF)/Unilateral Trust Fund (UTF)/FAO Multi-donor Partnership Programme (FMPP)

FMPP/GLO/004/MUL (Norway) Improving aquatic biosecurity project (Reantaso/Subasinghe)

GCP/HAI/022/OPF Promotion of small-scale poultry farming and aquaculture for the improvement of food security in Haiti (Crespi/Thieme)

GCP/INT/920/JPN Capacity-building for an ecosystem approach to fisheries: Course on “the Use of geographic information systems in fisheries and aquaculture” (Aguilar-Manjarrez/Carocci).

GCP/INT/936/JPN Towards sustainable aquaculture: selected issues and guidelines

Component 1. Food safety of aquaculture fish (Subasinghe/Ababouch)

Component 2. Environmental impact assessment and monitoring in aquaculture (Barg/Soto/Aguilar-Manjarrez)

Component 3. Use of wild fish/fishery resources for aquaculture production (Lovatelli)

Component 4. Use of wild fish and other aquatic species to feed cultured fish and its implications for food security and poverty alleviation (Hasan)

Component 5. Ecosystem approach to Aquaculture (Soto/Aguilar-Manjarrez)

GCP/KYR/003/FIN Support to fishery and aquaculture management in the Kyrgyz Republic (Van Anrooy)

GCP/RAS/237/SPA Improved livelihoods and reduced vulnerability for fishing communities in participating countries (FIR/FIP/RAP)

GCP/RER/031/TUR Central Asia regional programme for fisheries and aquaculture development (FishDev – Central Asia) (Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan and Uzbekistan) (Van Anrooy/Hasan)

OSRO/INS/601/ARC (TRP-06-16) Rehabilitation and sustainable development of fisheries and aquaculture affected by the tsunami in Aceh Province, Indonesia (Subasinghe)

OSRO/IRQ/704/UDG Towards sustainable development of inland fisheries in Iraq (Subasinghe/Hasan/Reantaso)

UTF/IRA/061 Establishment of Western and Central Asian Artemia Reference Centre, Iran (Hasan)

UTF/MEX/071 Support to the Secretariat of Rural Development for the preparation of an aquaculture and fisheries master plan for the State of Puebla in Mexico (Aguilar-Manjarrez)

UTF/SAU/017/SAU Support to the Fish Farming Center, Jeddah, Kingdom of Saudi Arabia (Lovatelli/Ayson)

UTF/URU/025 Management programme for the fisheries sector of Uruguay (Bahri/Toppe/Soto)



M. Reantaso, FAO

Delegates to the FAO/OIE/MFMR Aquatic Biosecurity Framework for Southern Africa: a Scoping Meeting of Regional Fisheries and Veterinary Authorities, held in Windhoek, Namibia from 13-14 October 2009, including the Honorable Fred Douglas Mwanja Mukisa of Uganda (seated right).

Aquaculture and Aquaculture-related Events, (international, regional, national)

Biennium 2008-2009

DECEMBER 2009

FAO/AAHRI Expert workshop on improving biosecurity through prudent and responsible use of veterinary medicine in aquaculture, 15-18 December 2009, Bangkok, Thailand
(Reantaso/Subasinghe/Karunasagar/Miao)

FAO/NACA Regional workshop on methods for aquaculture policy analysis, formulation and implementation in selected Southeast Asian countries, 9-11 December 2009, Bangkok, Thailand
(Brugere/Funge-Smith/Miao)

FAO/GFCM-CAQ Eleventh annual meeting of the information system for the promotion of aquaculture in the Mediterranean (SIPAM), 9-10 December 2009, Trabzon, Turkey (Massa/Lovatelli/Crespi)

Terminal Workshop of FAO TCP/BGD/3101 Developing a national shrimp seed certification system in Bangladesh, 8-10 December, 2009, Dhaka and Cox's Bazaar, Bangladesh (Subasinghe/Miao)

NOVEMBER 2009

FAO Expert workshop on the state of the cultivation of native freshwater species of South America, 26-28 November, 2009, Macas, Ecuador (Flores-Nava)

FAO/GFCM Workshop on guidelines and application of indicators for sustainable development of aquaculture (InDAM), 19-20 November 2009, Salammbô, Tunisia (Massa/Lovatelli)

FAO Expert workshop for drafting CWP Handbook on standards of aquaculture statistics and FAO Regional workshop on capacity building needs for improving aquaculture statistics and data collection in Asia, 10-17 November 2009, Halong city, Vietnam (Jia/Subasinghe/Sachiko/Miao)

FAO/WorldFish Centre Regional workshop on adapting to climate change: the Ecosystem Approach to Fisheries and Aquaculture in the Near East and North Africa Region, 10-12 November 2009, Abassa, Cairo, Egypt (Mannini/Soto/De Young)

2009

OCTOBER 2009

Inception workshop of the FAO extra-budgetary programme on fisheries and aquaculture for poverty alleviation and food security, 27-30 October 2009, Rome, Italy (Subasinghe/Soto/Reantaso)

FAO Training course on "Use of geographic information systems for aquaculture planning and management" as part of TCP/BGD/3101 Developing a national shrimp seed certification system in Bangladesh, 25-29 October, 2009, Dhaka, Bangladesh (Aguilar-Manjarrez/Carocci)

FAO/WSCS/IUCN/IHE/ISS6 Workshop on technical guidelines on sturgeon hatchery practices and management, 25 October 2009, Wuhan, China (Van Anrooy/Marmulla)

FAO TCP/DPRK/3204 Capacity building in fingerling production and farming of selected marine finfish species - training on breeding and farming of selected commercially important finfish species, 24 October - 4 December, 2009, Qingdao and Yantai, China (Lovatelli)

FAO/OIE/MFMR Training/Workshop on aquatic biosecurity, 16-19 October 2009, Kamutjonga Inland Fisheries Institute, Divundu, Kavango Region, Namibia (Subasinghe/Reantaso)

FAO/OIE/MFMR Aquatic biosecurity framework for Southern Africa: a scoping meeting of fisheries and veterinary authorities, 13-14 October 2009, Windhoek, Namibia (Subasinghe/Reantaso)

FAO/APFIC Regional workshop on best practices for supporting and improving livelihoods of small-scale fisheries and aquaculture households, 13-15 October 2009, Manila, Philippines (Funge-Smith/Miao)

SEPTEMBER 2009

FAO/DoF Thailand Workshop on the options for a potential insurance scheme for aquaculture in Thailand, 23-25 September 2009, Bangkok, Thailand (Siar/Miao/Funge-Smith)

First public consultation of FAO/TCP/3202 Certification for small-scale aquaculture, 18-19 September 2009, Bangkok, Thailand (Subasinghe/Miao)

FAO TCP/RER 3206 Regional proposal development workshop "Assistance to Western Balkan Countries for improving compliance with international standards on aquatic animal health", 7-9 September 2009, Zagreb, Croatia (Reantaso/Mothpoulsen)

AUGUST 2009

FAO Expert workshop on indicators for assessing the contribution of small-scale aquaculture (SSA) to sustainable rural development, 6-8 August 2009, Tagaytay City, Philippines (Reantaso/Zhou/Miao)

Inception workshop of FAO TCP/CPR/3203, Songzi County of Hubei Province, 31 July-3 August 2009 (Karunasagara/Subasinghe/Miao)

JUNE 2009

FAO TCP/RER/3205 Inception planning workshop: advice to Central Asian governments on the feasibility of commercial fish and livestock feed production, 24-26 June 2009, Tashkent, Uzbekistan (Hasan/Van Anrooy)

FAO Workshop to reactivate the initiative on the creation of the Aquaculture Network of the Americas, 16-18, June, 2009, Guayaquil, Ecuador (Flores-Nava/Soto)

FAO Seminar on the "Use of geographic information systems for fisheries and aquaculture planning and management" at the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), 11-12 June, 2009, Zaragoza, Spain (Aguilar-Manjarrez/Carocci)

Project Terminal Workshop of FAO TCP/RAS/3208 Sustainable aquaculture development in Pacific Micronesia and Training/Workshop on risk assessment in aquaculture, 8-15 June 2009, Kosrae, Palau (Subasinghe/Izumi/Reantaso)

Second inter-governmental meeting on the establishment of a Central Asian and Caucasus Regional Fisheries Organization, 3-5 June 2009, Trabzon, Turkey (Van Anrooy/Poulain/Kuemplangan/Mothpoulsen)

MAY 2009

FAO/APFIC Regional consultative workshop on practical implementation of the Ecosystem Approach to Fisheries and Aquaculture in the APFIC Region, 18-22 May 2009, Colombo, Sri Lanka (Funge-Smith/Soto/Bianch/De Young/Miao)

FAO/RECOFI Fifth session of the Regional Commission for Fisheries. 12-14 May 2009, Dubai, United Arab Emirates (Mannini/Lovatelli/Doulman)

APRIL 2009

Inception workshop of FAO TCP/CPR/3202 Better management of freshwater aquaculture in Pingjiang County, Hunan Province, 3 April 2009, Beijing, China (Reantaso/Subasinghe)

FAO/UNDP-GEF/WSCS Regional training workshop on sturgeon hatchery practices and management, 14-19 April 2009, Atyrau, Kazakhstan (Hasan/Van Anrooy/Marmulla)

Terminal Workshop of FAO Project TCP/BGD/3101, 8-10 December 2009, Dhaka and Coxes Bazaar, Bangladesh (Subasinghe/Miao)

National Workshop of FAO Project TCP/BGD/3101 Developing a national shrimp seed certification system in Bangladesh, Dhaka, Bangladesh, 24-30 April 2009 (Subasinghe/Miao)

MARCH 2009

FAO/NACA Expert meeting on the use and exchange of aquatic genetic resources relevant for food and agriculture, Chonburi, Thailand 30 Mar - 02 Apr 2009, Chonburi, Thailand (Bartley/Halwart/Miao)

FAO First Joint Programme Committee (JPC) meeting between the Ministry of Agriculture (MoA), Kingdom of Saudi Arabia and FAO, 29 March - 1 April, Riyadh and Al-Hassa, Kingdom of Saudi Arabia (Oihabi/Lovatelli/Ayson)

FAO/NACA/DoF 1st National stakeholders workshop/training of the Regional TCP/RAS/3202 Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 24-26 March, 2009, Zhanjiang, China (Miao)

FAO Steering committee meeting to prepare for the second regional inter-governmental meeting on the establishment of a Central Asian and Caucasus Regional Fisheries Arrangement, 24-26 March 2009, Ankara, Turkey (Van Anrooy/Poulain/Kuemplangan/Mothpoulsen)

2008

DECEMBER 2008

FAO/GFCM-CAQ Tenth annual meeting of the information system for the promotion of aquaculture in the Mediterranean (SIPAM), 15-16 December 2008, Tirana, Albania (Massa/Lovatelli/Crespi)

FAO/GFCM-CAQ Sixth session of the Committee on Aquaculture (CAQ), 17-19 December 2008, Tirana, Albania (Massa/Bonzon/Lovatelli)

NOVEMBER 2008

FAO/NACA/RIA3 1st National stakeholders workshop/training of the Regional TCP/RAS/3202 Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 24-27 November 2008, Nha Trang, Viet Nam (FAO/NACA/RIA3)

FAO Expert workshop on methods and indicators for evaluating the contribution of small-scale aquaculture to sustainable rural development, 24-28 November 2008, Nha Trang, Viet Nam (Reantaso/Hishamunda/Siar)

FAO Expert workshop on the potential of spatial planning tools to support the Ecosystem Approach to Aquaculture, Rome 19-21 November 2008, Rome, Italy (Aguilar-Manjarrez/Soto)

FAO Expert workshop on developing guidelines for the implementation of an Ecosystem Approach to Aquaculture, 24-28 November 2008, Rome, Italy (Soto/ Aguilar-Manjarrez)

OCTOBER 2008

FAO Committee on Fisheries Sub-Committee on Aquaculture fourth session (COFI/SCA IV), 6-10 October 2008, Puerto Varas, Chile (Jia/Subasinghe)

FAO Expert meeting on capacity building to implement good animal welfare practices, 30 September – 3 October 2008, Rome, Italy (Reantaso)

Training course fish health management as part of UTF/SAU/017/SAU entitled “Support to the Fish Farming Centre in Jeddah, Kingdom of Saudi Arabia”, 3 October - 2 November 2008, Tigbauan, Iloilo, Philippines (conducted by SEAFDEC-AQD) (Ayson/Lovatelli)

Training course on the culture of natural food organisms as part of UTF/SAU/017/SAU entitled “Support to the Fish Farming Centre in Jeddah, Kingdom of Saudi Arabia”, 3 October - 2 November 2008, Tigbauan, Iloilo, Philippines (conducted by SEAFDEC-AQD) (Ayson/Lovatelli)

FEBRUARY 2009

FAO TCP/RAF/3111 Training/Workshop on basic aquatic animal health management and introduction to risk assessment in aquaculture, 9-15 February 2009, School of Veterinary Medicine, University of Zambia, Lusaka, Zambia (Reantaso/Subasinghe)

FAO/NACA Workshop on market chains and issues associated with biosecurity of low-valued cultured commodities in Asia, 23–26 February 2009, Siem Reap, Cambodia (Karunasagar/Lem/Toppe)

FAO/NACA/DoF Indonesia 1st National stakeholders workshop/training of the Regional TCP/RAS/3202 (D) Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 2-4 February 2009, Indrapuri Hotel, Bandar Lampung, Indonesia (Hasan)

FAO/NACA/DoF Thailand 1st National stakeholders workshop/training of the Regional TCP/RAS/3202 (D) Reducing the dependence on the utilization of trash fish/low-value fish as Feed for aquaculture of marine finfish in the Asian region, 12-14 February 2009, Phuket CFRDC, Phuket, Thailand (Hasan/Miao)

JANUARY 2009

FAO Training course on the “Use of geographic information systems in fisheries and aquaculture” at the Federal University of Rio Grande do Sul (FURG) as part of the project GCP/INT/920/JPN “Capacity-building for an ecosystem approach to fisheries”, 27 January to 6 February 2009, Rio Grande do Sul, Brazil (Aguilar-Manjarrez/Carocci)

FAO/RECOFI Fourth meeting of the Working Group on Aquaculture, 27-28 January 2009, Muscat, Sultanate of Oman (Lovatelli/Crespi)

FAO/RECOFI Regional technical workshop on sustainable marine cage aquaculture development, 25-26 January 2009, Muscat, Sultanate of Oman (Lovatelli)

SEPTEMBER 2008

FAO Workshop on traceability for aquaculture products from Aceh: design and implementation planning, 8-11 September 2008, Banda Aceh, Indonesia (Subasinghe)

FAO/NACA Inception planning workshop of the Regional TCP/RAS/3203 Reducing the dependence on the utilization of trash fish/low-value fish as feed for aquaculture of marine finfish in the Asian region, 8-10 September 2008, Krabi, Thailand (Hasan/Miao)

AUGUST 2008

FAO TCP/TUR/3101 Developing a roadmap for Turkish marine aquaculture site selection and zoning using an ecosystem approach to management, 10-11 August 2008, Izmir, Turkey (Soto)

FAO/APFIC 30th session, 10-13 August 2008, Manado, Indonesia (Funge-Smith/Miao)

FAO/APFIC 2nd Regional consultation forum meeting, 5-8 August 2008, Manado, Indonesia (Funge-Smith/Miao)

JULY 2008

FAO TCP/TUR/3101 Developing a roadmap for Turkish marine aquaculture site selection and zoning using an ecosystem approach to management, 16-17 July 2008, Izmir, Turkey (Soto)

Inception workshop of FAO TCP/BGD/3101 Developing a national shrimp seed certification system in Bangladesh, 16-17 July 2008, Dhaka, Bangladesh (Subasinghe)

MAY 2008

FAO Western Balkan Regional Seminar/Workshop on aquatic animal health and Project Terminal Workshop of FAO TCP/BiH/3101, 20-23 May 2008, Sarajevo, Bosnia and Herzegovina (Reantaso)

Training course on marine fish hatchery as part of UTF/SAU/017/SAU entitled "Support to the Fish Farming Centre in Jeddah, Kingdom of Saudi Arabia", 20 May - 25 June 2008, Tigbauan, Iloilo, Philippines (conducted by SEAFDEC-AQD) (Ayson/Lovatelli)

APRIL 2008

FAO Expert workshop on the development of an aquatic biosecurity framework for Southern Africa, 22-24 April 2008, Lilongwe, Malawi (Subasinghe/Reantaso)

Regional Commission for Fisheries (RECOFI) Regional technical workshop on aquatic animal health, 5-10 April 2008, Jeddah, Kingdom of Saudi Arabia (Lovatelli/Mannini/Ayson/Reantaso)

MARCH 2008

FAO TCP/BIH/3101 Strengthening aquaculture health management in Bosnia and Herzegovina – Training/Workshop No. 5 on Diagnostics, surveillance and reporting of aquatic animal diseases, 18-21 March 2008, Fojnica, Bosnia and Herzegovina (Reantaso)

FEBRUARY 2008

FAO Expert meeting: climate-related transboundary pests and diseases including relevant aquatic species, 25-27 February, Rome, Italy (Soto/Reantaso)

FAO Expert consultation on improving planning and policy development in aquaculture, 26-29 February 2008, Rome, Italy (Brugere/Hishamunda)

FAO Expert workshop on guidelines for aquaculture certification, held at the Department for International Development (DFID), 28-29 February 2008, London (Subasinghe)

FAO Expert consultation on assessment of socio-economic impacts of aquaculture, 4-8 February 2008, Ankara, Turkey (Hishamunda/Van Anrooy/Reantaso)

JANUARY 2008

On-the-job training on diagnosis of fish viral diseases conducted by the European Community Reference Laboratory for Fish Diseases (National Veterinary Institute) under FAO TCP/BiH/3101 Strengthening aquaculture health management in Bosnia and Herzegovina, Aarhus, Denmark, 28 January to 15 February 2008 (Reantaso)

Inception workshop of UTF/SAU/017/SAU Support to the Fish Farming Centre in Jeddah, Kingdom of Saudi Arabia, 15 January 2008, Jeddah, Kingdom of Saudi Arabia (Ayson/Lovatelli)

Small-scale Aquaculture: Organization, Clusters and Business

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Aquaculture now contributes nearly half of the global food fish production and, by the year 2030, estimates are that an additional 27 million tonnes, or over 50 percent from the current production, will be needed to meet the growing demand for food fish. Globally, aquaculture provides key social and economic services, such as through:

- contributing to global and regional food supplies;
- national food security, including meeting demands of growing urban populations;
- providing direct self and paid employment for rural and peri-urban communities;
- creating upstream and downstream employment through services, supplies and trading activities;
- contributing increasingly to national and international trade; and
- generating household and national income.

Small-scale producers – characterised by a low-asset base and low productivity – dominate the agriculture landscape throughout the developing world, and similarly play an important part in aquaculture in many countries, sometimes through livelihoods which integrate aquaculture, livestock, farm crops and other on- or off-farm activities, and sometimes through increasingly more specialisation in aquaculture as a household-

managed enterprise. Small farms are characterized as largely owned and operated by households with limited access to assets – land, water, finance and material inputs (seed, feed, etc.) – and consequently, farm production volumes tend to be low. Small-scale producers face varying degrees of financial, knowledge, market access and other constraints, and therefore commonly face difficulties in raising productivity and incomes – moving up the “enterprise ladder” to become more competitive micro- and small enterprises.

Aquaculture’s importance as a source of income, food, and employment for many poor people is widely recognized – indeed some figures in this edition of FAN (see pages 24–25) place a global employment figure of over 23 million full-time employment – yet its true social and economic significance – now and in the future – is not easily estimated.

Aquaculture will continue to grow, but faces a host of challenges in sustaining let alone increasing the provision of social and economic services to rural and urban populations worldwide. A number of over-arching external drivers influence the sector, such as increasing competition for ecosystem services, the use of available land and water resources for aquaculture expansion, pollution, climate change, natural disasters and biosecurity emergencies, HIV/AIDS epidemics, governance challenges, and local risks associated with increasing globalization and others. Internal sectoral dynamics, related to globalization drivers are strongly influencing the sector’s growth, with increasing integration of supply chains for many internationally-traded commodities, now merging into domestic markets in Asia, ever higher market standards, and competitive forces driving



M.Phillips, WfC

Grouper hatchery in Bali, Indonesia

investors and buyers to most efficient and reliable producing countries.

Within this generally dynamic picture of growth and change, small-scale aquaculture farmers, in common with agriculture farmers, face significant challenges. Limitations related to infrastructure, producer capacity, access to finance, public sector servicing capacity and other factors often create a cycle in which low productivity depresses income and thus a “vicious cycle” of deepening problems. They are also among the most vulnerable to external drivers such as climate change, market demands and other factors which are largely out of their control. Coordinated engagement by private and public stakeholders, including the business sector, can help address such dynamics.

While globalization has opened new markets for aquaculture products, it has also required stricter standards related to food safety, traceability and other non-tariff requirements. Thus, smaller producers face major constraints, especially with respect to the export market. They find it increasingly difficult to participate in the modern value chains. Those who are able to access markets can find themselves disadvantaged due to their weak bargaining position. Requirements being driven by retailers and public concerns for certification of the safety and quality of aquaculture products along with the social and environmental impacts of aquaculture production can add further hurdles to market access, with small farmers set to face particular difficulties. Suitable equivalence mechanisms among the various emerging certification schemes as yet do not exist.

Fish and shrimp farming are important livelihood activities for many poor people living in the coastal areas of the Indonesian province of Aceh. Nearly 100 000 households, mainly along the north-east coast districts, depend on aquaculture for income, although productivity is very low and poverty remains endemic. Shrimp and milkfish are the major aquaculture products from Aceh, a mix that contributes to export earnings and food security, along with growing volumes of tilapia, and minor species such as catfish, crabs, seabass and grouper. A coalition of partners* has worked together in Aceh since 2005 to assist coastal fish and shrimp farmers and communities recover from the December 2004 earthquake and tsunami, and to build better livelihoods. Good progress has been made in physical rehabilitation of ponds and canals, introducing improvements in farming practices – so-called “Better management practices or BMPs” which have been well accepted by farmers – and rebuilding a traditional system of village farmer groups supported by innovative Aquaculture Livelihoods Service Centers (ALSCs). This approach - helping farmers to organize themselves and development of community services – run on business lines by local people for the local farming community – has worked well. In 2010, over 2600 poor households from 82 villages joined a voluntary BMP program, supported by the four ALSCs, generating increased household incomes of USD 600-800/farmer – a substantial improvement in a poor province. The approach is becoming exceedingly popular, with an estimated 6 000 farmers now showing interest and other farming communities wishing to establish ALSCs in their areas. The opportunities for creating efficiencies through an expanded network of ALSCs in Aceh, to sustain these services through a business approach, and to deliver development benefits to poor farmers are growing.

*Asian Development Bank/Earthquake and Tsunami Emergency Support Project, OISCA/Japanese Fund for Poverty Reduction, BRR, MMAF, FAO/American Red Cross, WorldFish Center, Network of Aquaculture Centres in Asia and the Pacific, and World Wildlife Fund

The aquaculture sector is also changing, with notable growing importance in some regions and countries of larger enterprises, and multi-national corporations. Indeed, in some developing countries, medium and larger enterprises comprise increasingly significant contributions to aquaculture production. Larger buyers risk management strategies and the need for large and regular supplies of aquaculture product reinforce the trend towards larger operations. This trend can have positive implications for food supplies, such as supplying growing urban populations with low cost product, and creating employment, but can have negative implications for small-scale farmers, who face difficulties in competing and accessing the necessary services, finance and markets to remain competitive. The reality in many countries is the presence of a spectrum of aquaculture farmers and systems –

from subsistence level through to highly industrialized operations. This raises important questions around future direction for aquaculture development. What are the necessary investment and policy interventions for creating optimal development impact? In what ways can aquaculture optimize its social and economic contributions? How can small-scale farmers best benefit from the continued rapid growth of the aquaculture sector, and demand being created for food fish as populations grow and capture fisheries production stagnates? What synergies between small-scale producers and larger enterprises can best benefit poor rural and urban households in terms of employment, food supply and better livelihoods? How can the required technical and financial services be provided to small-scale farmers to improve and remain competitive in modern markets?

Some new approaches are emerging. Investing in better organization of smaller producers and improved technical and financial services can pay dividends. Small business-oriented services are emerging in several rural areas in Asia, leading to significant improvements in profitability of small aquaculture enterprises. An important opportunity to improve governance and management of the aquaculture sector and thus increase the social and economic benefits to small-scale producers lies in promoting and developing collective action in the form of farmer organizations or “clusters”. Clustering of smaller producers can create economies of scale and volumes that attract business, sellers of fish feed and fry, buyers of aquaculture products, and build social capital.

Farmer cooperatives have been widely promoted mechanisms in agriculture, but there is little well documented information on cluster farming by commercially-oriented small-scale aquaculture producers. Recent experiences in the field show that promotion of cluster farming in aquaculture and managing these clusters with technical improvement, such as through application of better management practices (BMPs), can yield benefits. Such approaches can be successful tools for improving aquaculture governance and management of small-scale producers to work together, improve production, develop sufficient economies of scale and enhance knowledge that allows participation in modern market chains and thus reduce vulnerability. Such governance and management approaches can lead to improved economic performance of the aquaculture sector, better farm incomes and improve resilience of farm production systems and households. Whilst more studies are needed, economic



M.Phililips, WFC

Women sorting black tiger shrimp juveniles at a shrimp nursery in Andhra Pradesh, India

analysis also suggests that investments in services can yield substantial social and economic benefits – investments of the MPEDA/NACA project in India for the period of 2004-2006 showed that for each one Indian Rupee invested in the technical assistance program, a profit of nearly 16 Rupees was provided for coastal shrimp farmers (Umesh *et al.*, 2010).

At the same time, the establishment, maintenance and enforcement of appropriate legal, regulatory and administrative frameworks in developing countries (producers of majority of aquaculture products) are key requirements towards responsible and sustainable aquaculture sector. These frameworks should cover all aspects of aquaculture and its value chain and provide economic incentives that encourage best practices, thus, prompting and assisting farmers to elaborate, support and enforce self-regulating management codes and promote sustainability-

conductive production systems. In an increasingly globalised and market-oriented economy, we also need to find ways in which the larger private sector players can contribute more effectively - business solutions that work for small-scale farmers, organizations and small-scale farm services are required. Commonly, small projects investing in farmer organizations and improved practices can work well, but sustaining these beyond the subsidy of the project requires more business-oriented approaches and solutions. The challenge today is to help build the capacity of smallholders and their organizations so that they can deliver what the market requires, and in turn encourage businesses to adapt their models to be inclusive and supportive of small-scale producers (Vorley *et al.*, 2008). It also means bringing together different players and skills along the value chain for sustainable enterprise development. ■

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Supporting Disaster Response and Preparedness in Aquaculture

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The aquaculture sector is particularly vulnerable to natural and human induced rapid- or slow- onset disasters. This is due to the risks associated with the location of fish farm production facilities and other infrastructure, the type of activities associated with fish farming, the nature of fish in specific development stages (fry, fingerling, larvae), and the limited capacity of the sector to reduce and cope with the potential consequences of a disaster. This complexity presents unique challenges in terms of preparing for and responding to disasters.¹

The sector is impacted by a wide range of disasters (and emergencies) including, for example, droughts, earthquakes, floods, landslides, storms, tsunami and tidal surges, transboundary aquatic animal disease (TAAD) and pest outbreaks, complex emergencies and protracted crises (such as conflict), chemical hazards (such as oil spills), nuclear release and radioactivity and food insecurity. The impacts of these disasters on the aquaculture sector can be direct, on individuals households and production systems or indirect, affecting the entire sector and beyond. The immediate damage from disasters can be loss of livelihoods, assets (e.g. cages, ponds, bunds and water supply systems, nurseries, hatcheries, feedmills, broodstock), post-harvest and processing facilities and both private and public sector service and support providers (including research facilities) (Box 1²). Other slow onset disasters, such as fish disease outbreaks, build up over time and significantly affect production, as with the salmon diseases which halved 2009 Atlantic salmon output in Chile. Other factors can exacerbate these effects on vulnerable communities. Climate change impacts, poverty, weak institutions, HIV/AIDS epidemics, overfishing and ecosystem degradation can increase underlying vulnerability. Disaster impacts can be compounded by the vulnerability of poor and marginalised groups and communities (usually coastal) who can be disproportionately affected. The number of disasters has been increasing in recent years and as a consequence strengthening resilience and reducing vulnerability to disasters are seen as increasingly important³.

On-going reform to improve the effectiveness of humanitarian aid has led to the development of the cluster approach and FAO is now the UN emergency lead technical agency⁴ for the Agriculture Cluster (which includes the aquaculture and fisheries sectors). The work of FAO in emergency response and disaster preparedness is coordinated by its emergency department (TCE)⁵. In 2006, FAO established the Crisis Management Centre for the Food

Box 1: FAO supported damage and needs assessment of the aquaculture sector in Aceh Province, Indonesia, following the 2004 Asian tsunami. These showed at least 20 000 ha of tambaks (ponds) were damaged, with another 5 000 ha out of production due to damaged water supplies. A significant source of income and employment for the province was lost with at least 40 000 people directly employed in aquaculture affected. Knock-on effects were felt on households dependent on aquaculture. Public services lost staff and facilities severely affecting their capacity to support rehabilitation. Aquaculture was effectively stopped in the major farming areas of the east coast, and disappeared from the severely impacted west coast. The main causes of damage were debris and silt causing sedimentation in ponds and irrigation canals. The damage to brackishwater irrigation canals disrupted water supplies which in turn stopped farming in other areas. Extensive damage occurred to 193 of the 223 shrimp hatcheries. There were loss of marine fish cages in Simeulue and Nias islands.

Chain Crises (CMC-FC) which serves as the organization's framework for assessing, managing and communicating risks along the food chain in the areas of agriculture, fisheries and aquaculture and forestry. It also covers FAO's responsibilities in the area of nuclear emergencies. The CMC-FC demonstrates FAO's determination to address these in a comprehensive, systematic, inter-disciplinary, institution-wide collaborative approach. Recent external evaluations of FAO have highlighted the organization's comparative advantage in this domain. Working with partners at national regional and global level in the sector (and beyond) is a key part of preparedness and response to emergencies. Currently, the Fisheries and Aquaculture Department (FI Department) is supporting emergency response projects in 37 countries globally.

The FI Department provides a broad range of support following a disaster involving the aquaculture sector. The first priority is to work with local and national partners on damage and needs assessments. This assessment is used for short-, medium- and long-term recovery planning and the phasing of activities back into normal development. During rehabilitation and recovery, FAO provides support to sector coordination, technical advice, capacity building, communication and information sharing, partnership development, livelihood recovery inputs and the mobilisation of resources (Box 2). Priority is given to getting production systems and food chains working to avoid food security problems and restore livelihoods. The recovery efforts of FAO are guided by international

agreements such as Hyogo Framework for Action, the Code of Conduct for Responsible Fisheries (CCRF) and aligned to the Millennium Development Goals with the aim of “building back better” (Box 2).

Box 2: In response to the food security emergency in Timor Leste, FAO provided support to improve aquaculture production in the province and to help diversify livelihoods. Support for grouper nursery activities included the provision of tiger grouper seed, fish feed and treatments and laboratory equipment for a government fish hatchery. Capacity building was carried for government staff in hatchery operation, seaweed seedling bank technology and seed selection, maintaining quality of seeds and prevention of disease, seaweed processing and marketing. These activities helped increase the capacity of government and NGO staff to provide extension services to the farmers in coastal areas in Kupang Bay. Capacity building was also provided to participants from fish farming groups.

Disaster prevention and preparedness are integrated into the cycle to ensure that impacts of future disasters are reduced.⁶

The FI Department also provides support to the aquaculture sector in prevention and preparedness for fish disease outbreaks. Examples of past and recent actions by the FI Department to effectively respond to biosecurity emergencies include the following: (i) technical assistance in the investigation of epizootic ulcerative syndrome (EUS) incursion in southern Africa (2007)⁷ and emergency response to koi herpesvirus (KHV) in Asia (2003)⁸, (ii) pioneering work in promoting the application of risk analysis to aquaculture production⁹ in Asia which has now expanded to other regions (e.g. Western Balkan region¹⁰, the Gulf region¹¹, the Pacific Islands), (iii) organization, in December 2009, of an expert workshop, supported by EU, OIE, WHO and FAO Member states, on improving aquatic biosecurity through prudent and judicious use of veterinary medicinal products, and (iv) preparation of a number of guidelines on risk analysis, emergency preparedness, better management practices and aquaculture insurance. All these actions support the development of knowledge base and enhance human and technical capacities on biosecurity.

Early warning of TAADs is provided through the FAO interdepartmental Food Chain Crisis Management Centre and EMPRES (Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases¹²) system. With recent increases in the number of outbreaks of transboundary animal diseases, plant pests and diseases and food safety emergencies, there has become an increase in public awareness of their potential impact on human health as well as on livelihoods, food security, national economies and to the global markets. These outbreaks have enhanced the recognition of the need to address such threats in a comprehensive approach, oriented to the entire food chain. Changing agro-ecological conditions, intensification of the food production systems and the expansion of global trade supplied by these systems increase the likelihood of animal and plant diseases and pests emerging and spreading farther and faster than ever before, and unsafe food reaching numerous consumers in distant markets. With

the advent and spread of instant mass communication, news of outbreaks can cause generalized consumer panic, market collapse and serious economic damage in regions well beyond affected areas. EMPRES, was established in 1994, is thus mainstreamed into the overall framework of FAO's Food Chain Emergency Management as the technical core element for risk assessment and advice on risk management and risk communication.

FAO is in the process of reform and has developed organizational objectives aimed to support reducing the vulnerability of fishing and fish farming communities to the impacts of natural disasters and climate change. The Department is developing partnerships at global, regional and national levels for improved preparedness and response to disasters.

At the same time, the Department continues its efforts to reduce disaster risks through good aquaculture management practices, application of risk analysis to aquatic animal movements and approaches such as the ecosystem approach to fisheries and aquaculture and community-based management. One of the current challenges at policy level is to link the disaster risk reduction/management (DRR/DRM) and climate change adaptation into aquaculture planning and to mainstream aquaculture into DRM planning. ■

¹The Centre for Research on the Epidemiology of Disasters (CRED, 2010) defines a disaster as “a situation or event which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering”. Disasters result from a combination of vulnerability and exposure of the community or society to hazards and *insufficient capacity or measures to reduce or cope with the potential negative consequences* (UNISDR, 2010).

²FAO, 2005. An assessment of the impacts of the 26th December 2004 earthquake and tsunami on aquaculture in the Provinces of Aceh and North Sumatra, Indonesia. FAO and Dinas Kelautan dan Perikanan (DKP). Michael Phillips and Agus Budhiman.

³www.humanitarianreform.org

⁴See www.humanitarianreform.org for details of the UNcluster approach to emergencies

⁵www.fao.org/emergencies/

⁶FAO 2007. Disaster response and risk management in the fisheries sector. Westlund, Poulain, Båge and Raymon van Anrooy. Rome 2007.

⁷FAO. 2009. Report of the International Emergency Disease Investigation Task Force on a Serious Finfish Disease in Southern Africa, 18-26 May 2007. Rome, FAO. 2009. 70p. (head of FAO International Emergency Disease Investigation Task Force).

⁸Bondad-Reantaso, M.G., Sunarto, A. & Subasinghe, R.P. 2007. Managing koi herpesvirus disease outbreak in Indonesia and the lessons learned, pp. 21-28. In Dodet, B. and OIE Scientific and Technical Department (eds.). The OIE Global Conference on Aquatic Animal Health. Dev. Biol. (Basel). Basel, Karger. 2007. Vol. 129: 21-28.

⁹Bondad-Reantaso, M.G., Arthur, J.R. and Subasinghe, R.P. (eds.). 2008. Understanding and applying risk analysis in aquaculture. FAO Fisheries and Aquaculture Technical Paper No. 519. Rome. FAO. 304p.

¹⁰Bondad-Reantaso, M.G., Arthur, J.R. and Subasinghe, R.P. (eds.). 2009. Strengthening aquaculture health management in Bosnia and Herzegovina. FAO Fisheries and Aquaculture Technical Paper. No. 524. Rome, FAO. 83p.

¹¹FAO./Regional Commission for Fisheries. Report of the Regional Technical Workshop on Aquatic Animal Health. Jeddah, Kingdom of Saudi Arabia, 6-10 April 2008. FAO Fisheries and Aquaculture Report. No. 876. Rome. FAO. 119p.

¹²For details of the EMPRES system see: <http://www.fao.org/ag/againfo/programmes/en/empres/home.asp>

One Health – Integrating Aquatic Biosecurity into the Way Forward - A Natural Progression

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In the past decade, 60 percent of emerging infectious disease (EID) events are caused by zoonoses and of those, 72 percent originate from wildlife - a source of EIDs that has increased significantly over the past 50 years. Recent pathogens that have invaded human populations from wildlife sources include Nipah Virus, Severe Acute Respiratory Syndrome (SARS), West Nile Virus and Rift Valley Fever and at the same time, there are a series of important pathogens (Rinderpest, Foot and Mouth Disease, Swine Fever, Peste des Petits Ruminants) that are significant at the livestock-wildlife interface that can affect production, livelihoods, and conservation of wildlife species. Most recently, public and animal health emergencies caused by highly pathogenic avian influenza (HPAI) and pandemic influenza A (H1N1) have led to human sickness and death, and threatened livestock industries, food safety and security. These diseases are highly infectious in nature, and can potentially travel large distances rapidly. Moreover, they demonstrate the link between human, domestic animal and wildlife health, and underline the need for a broader understanding of the ecological settings which are creating the opportunity for these pathogens to emerge, re-emerge, or jump into new hosts.

A set of global factors, including demographic pressure, the availability, use and management of natural resources, climate

change, globalization, increased demand for protein by a growing global middle-income class, and intensification of farming systems and changes in farming practices highlight the two most important pathogen niches - changing natural ecosystems and changing farming ecosystems - where pathogens are evolving and adapting to new opportunities. Unraveling the complexity of these pathogen-host relationships, defining the epidemiology of transmission among livestock, wildlife and people within an ecological context, and identifying the drivers of disease emergence are the foundation of the “One Health” approach. Ultimately, the goal is to prevent disease emergence, or minimize impacts when they do emerge.

Driven by growing concerns about the epidemic nature of such diseases and their pandemic potential, FAO in collaboration with its international partners – the World Organisation for Animal Health (OIE), the World Health Organization (WHO), the United Nations System Influenza Coordination (UNSIC), the United Nations Children’s Fund (UNICEF) and the World Bank (WB) – developed a *Strategic Framework for Reducing Risks of Infectious Diseases at the Animal-Human-Ecosystems Interface* based on the concept of ‘One World, One Health’. This framework was presented and well-received at the inter-ministerial conference in Sharm El Sheik, Egypt in October 2008. It has been further discussed at a series of meetings organized by international agencies and their partners in order to operationalize the strategic framework; and furthermore, develop a coordinated global action plan to monitor pathogens transmissible from animals to humans and vice-versa. These agencies committed to further strengthen this collaboration during the Inter-Ministerial Conference on Animal and Pandemic Influenza (IMCAPI) in April 2010, in Hanoi, Viet Nam and are based on collaborative principles that facilitate the FAO/OIE/WHO Global Early Warning System (GLEWS), the FAO/OIE Network of Expertise on Animal Influenza (OFFLU), Global Framework for Transboundary Animal Diseases (GF-TADs), and Regional Animal Health Centres (RAHCs).

Most recently, within the Food Chain Crisis Management Framework – Animal Health, FAO has created a strategic document entitled “The FAO One Health Programme - A Comprehensive Approach to Health: People, Animals and the Environment.” The *Vision* is improved public and animal health, enhanced food safety and food security, improved livelihoods of poor smallholder farming communities, while protecting ecosystems and the *Goal* is to minimize the local and global impact of epidemics and pandemics caused by highly infectious human and animal diseases, by enhancing disease intelligence and emergency response systems at the national, regional and international levels, supported by strong and



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Integrated duck-fish farming, Viet Nam

stable veterinary and public health services, inter-sectoral collaboration, public-private partnerships, and effective communication strategies. While this strategy is heavily focused on animal diseases, it is clear that the future of “One Health” lies in the integration of multidisciplinary teams to contribute to the larger FAO vision of improving public and animal health, enhancing food safety and food security, and the livelihoods of poor smallholder farming communities, and conservation of natural resources through improved management and protection.

Contributing to One Health Goals by Improving Biosecurity Capacity in Aquaculture

Aquaculture’s importance as a source of protein food fish, livelihoods and foreign earnings is widely recognized. It bridges the gap between stagnating yields from many capture fisheries and an increasing demand for fish and fishery products. One of two food fish consumed in the world is farmed. Farmed or wild, fish is good for the health. One-sixth of humanity derive one-fourth of their animal protein from fish, giving them a wealth of health benefits. Recent estimates place a global aquaculture employment figure of over 23 M full-time employment (see pages 24-25); for every person employed in the primary sector, there could be four in the support services. It also offers opportunities to alleviate poverty, develop communities and reduce overexploitation of natural resources, thus creating social and generational equity, particularly in developing countries. From a production of 3 M tonnes during the 1970s, production in 2009 exceeded 50 M tonnes, placing aquaculture as the fastest growing food producing sector. While aquaculture offers a solution to many of the food security issues facing the growing human population, the sector is also in direct conflict with other users of the aquatic habitat and the adjacent coastal and riparian ecosystems, including economic, environmental and social interests. An effective and integrated way to manage the various business, environmental and social risks will be a necessity for its sustainable growth. These include both risks to the environment and society from aquaculture and to aquaculture from the environmental, social, and economic settings in which it operates¹.

A number of major biosecurity concerns affecting modern aquaculture² have important relevance and implications to the One Health programme. **Trans-boundary aquatic animal diseases (TAADs)** are now recognized as an important aquaculture sustainability issue where domestic and international trade, are considered as important pathways. If done in a haphazard manner, trade increases pathogen and disease introduction and spread to new areas, associated with host movements. Many examples

of pathogens exist, demonstrating different goals for aquatic animal movements involving different pathways – and thus, presenting different levels of risks of pathogen transfers. Three good examples are that of OIE-listed pathogens, e.g., epizootic ulcerative syndrome (EUS) affecting more than 50 species of fresh and brackish water finfish, white spot syndrome virus (WSSV) of shrimp, and koi herpesvirus (KHV) affecting the important food fish, common carp and the high value ornamental fish, koi carp. These pathogens affect both farmed and wild species, causing significant mortalities of up to 100 percent, now with wide geographic distribution and no possibility for treatment.

The **use of veterinary medicines in aquaculture**, while recognized as having important benefits to a wide range of applications in aquaculture (e.g. treatment of ongoing/emerging/re-emerging diseases, new species culture development, alternative to other failed preventative strategy, development of culture technology and animal welfare) also have limitations. Use of these substances/agents can lead to bacterial resistance, antimicrobial agent residues in products or run-off into natural ecosystems, potential transfer of resistance genes and possibility of these genes reaching human pathogens. In some cases, chemotherapy may trigger toxicity, and occasionally cause public health and environmental consequences. In addition, their efficacy under certain aquatic environments is questionable, both with regard to treatment goals and the potential cost of untargeted effects. There are also ongoing concerns on the perceived widespread and irresponsible use (e.g. use of banned products and misuse based on incorrect diagnosis) of antimicrobial agents in aquaculture, the lack of approved antimicrobial agents for certain aquaculture species and diseases, and significant variations in regulatory frameworks and enforcement in different countries.

These could have implications for the environment, ecosystem health, human food safety, and the development of antimicrobial resistance; and these can have further impact on free trade. Concurrently, the concern is likely to be higher when regulatory processes for aquatic veterinary medicinal products are not well developed (see also pages 46-47).

The **threat of biological invasions or bioinvasions**, one of the top five drivers of global biodiversity loss, is increasing due to tourism and globalization. Risks to aquaculture from both freshwater and marine bioinvasions from other sources (including other aquaculture operators) include pathogens, parasites, biofouling and harmful algal blooms. The global spread of many marine organisms by shipping has been one of the major biosecurity concerns during the last decade. Accidental widespread movements occurred internationally, from the hulls of large ships and vessels of all sizes. Ballast water may transport all groups of marine organisms, whereas hull fouling is by encrusting organisms, such as macro-algae, bivalve molluscs, barnacles, bryozoans, sponges and tunicates. The apparent transport of toxic algae in ballast water has had a profound effect on aquaculture activities because of the necessity of farm closures during blooms. Encrusting organisms may also introduce novel pathogens; however, their biggest impact is fouling of ports, coasts and aquaculture facilities. Invasive alien species are a multi-faceted problem in the importation and culture of aquatic species for commercial, recreational and hobby pursuits. Just as many intended introductions have had economically beneficial outcomes, a number of species introductions have contributed to ecosystem disruption from escapes and establishment of exotic species in the wild. In addition, environmental disturbances can also weaken aquatic ecosystems making them vulnerable to invasions.



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VAC system in Hai Dong Province in Viet Nam (VAC in Vietnamese language is *vuon, ao, chuong* which means garden/pond/livestock pen)

Salmonella contamination of aquaculture products, while accounting for less than 5 percent of food-borne salmonellosis, is still a major problem resulting in a large number of import rejections in some major markets. Human sewage is an important source of *Salmonella*; however, domestic and wild animals (e.g. birds, frogs, rodents and reptiles), may also bring in *Salmonella* into aquaculture systems. **Zoonotic aquatic pathogens**, e.g. liver fluke *Opisthorchis viverrini*, affect 10 million people in Thailand and Lao PDR alone. The parasite enters the aquaculture environment through fecal contamination of waters and even in areas where human infections are very rare; the parasite's life cycle can be maintained in fish eating animals such as cats, dogs and pigs.

Riparian and coastal ecosystems in which many aquaculture operations occur will be vulnerable to **climate change scenarios** such as sea level rise, increased incidence of storm surges and land-based run-offs, as well as extreme weather events resulting in flooding and drought and perturbations such as rise in sea temperature. Land-based run-off provides a mechanism by which nutrients, pollutants and pathogens are flushed into waterways and eventually end up in coastal ecosystems. Increased run-off can precipitate harmful algal blooms that can be toxic to invertebrates,

fish, birds, mammals and humans as well as increasing the emergence of water-borne diseases such as *Cryptosporidium* infection and cholera (*Vibrio cholerae*).

In the tropics, warmer global temperatures and rising water levels may mean increased evaporation that will increase coastal salinity, thus posing particular difficulty to coastal shrimp farming. Furthermore, climate change will lead to new habitat becoming available for species from tropical regions to move into historically sub-tropical regions. Such species movement has the potential to cause **range extension of diseases, especially of relatively non-host-specific pathogens**. This expansion will also likely expose many immunologically naïve species to new pathogens making the ensuing relationship between hosts and pathogens difficult to anticipate, but likely, severe. While climate change remains highly unpredictable, 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, public health risks and the impacts are likely to be greatest on ecosystems and poor people in developing countries where health care, access to food, water, and other resources are somewhat limited.**

The Department of Fisheries and Aquaculture (FI) has a number of ongoing work (both normative and field programmes) and interdepartmental cooperation with other FAO departments (Agriculture and Consumer Protection Department, Natural Resources Management and Environment Department, Technical Cooperation Department, the Legal Office as well as regional and sub-regional offices) to assist FAO members improve their capacities in dealing with biosecurity risks

(Sustainable management and use of fisheries and aquaculture resources) and Strategic Objective B02 (Reduced animal disease and associated human health risks). The Fourth session of the COFI Sub-Committee on Aquaculture (COFI/SCA IV, Chile, 6-10 October 2008) (para 54) emphasized the need for a regional approach concerning disease outbreaks and the need to establish an aquatic biosecurity framework and requested FAO to provide technical assistance through a regional technical cooperation

reporting, emergency preparedness and response, development of national strategies on aquatic animal health and biosecurity, risk analysis, etc. targeting various groups, e.g. farmers, extension officers, laboratory personnel, researchers/students and policy-makers; (b) laboratory capacity support through practical training and provision of small laboratory equipment; (2) organization of expert consultations to support the preparation of technical guidelines, disease diagnostic guides, quarantine manuals, surveillance manuals, risk analysis manual, veterinary inspector's manuals, parasite checklists, etc.; (3) various technical publications as in (2); (4) technical assistance to members in investigation of disease epizootics, improving compliance to international standards on aquatic animal health, etc. and (5) support to continuing professional educational programmes (e.g. distance/online courses, scientific conferences/symposia, etc.).



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VAC system in Hai Dong Province in Viet Nam

and emergencies in aquaculture. FI also supports aquatic animal health and biosecurity initiatives by other relevant regional and international organizations.

Aquatic biosecurity is one of the agenda items in the forthcoming Fifth session of the Committee on Fisheries Sub-Committee in Aquaculture (27 September-1 October 2010). Biosecurity is also one of 18 themes that will be elaborated during the FAO Global Conference on Aquaculture 2010 (22-25 September 2010). Under the Medium-Term Programme 2010-2013/Programme of Work and Budget 2010-2011, aquatic animal health management, biosecurity frameworks and risk assessments are among the primary tools under Organizational Result C04 of Strategic Objective C

programme. The Twenty-eighth Session of COFI (COFI 28, Rome, 2-6 March 2009) under Global Policy and Regulatory Matters for the Attention of the Conference, para (xviii) considered as a priority the establishment of a regional programme towards improving aquatic biosecurity in southern Africa (para 40). It is refreshing to note the increasing attention and recognition given to aquaculture biosecurity as a sustainability issue that will further affect the further growth of this vital food producing sector³.

The range of activities being implemented by the FI Department include: (1) capacity development activities through training course/workshops on areas such as basic aquatic animal health management, surveillance and

The FI Department has also been active in promoting good governance frameworks such as ecosystem approach to aquaculture (EAA) and the application of risk analysis to aquaculture. The ecosystem approach to aquaculture is a strategy for the integration of the activity within the wider ecosystem in such a way that it promotes sustainable development, equity, and resilience of interlinked social and ecological systems⁴. Risk analysis can be an important decision-making tool for assessing the potential impacts of all types of aquaculture, including impacts of aquaculture operations on environmental, socio-political, economic and cultural values as well as the impacts to aquaculture from outside influences. Assessing risks to society (human health) or to the environment due to hazards created through the establishment or operation of aquaculture enterprises are some of the practical application of risk analysis to aquaculture⁵. ■

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Improving Biosecurity through Prudent and Responsible Use of Veterinary Medicines¹ in Aquatic Food Production²

Rama Gardens Hotel, Bangkok, 15 to 18 December 2009

The international situation regarding aquaculture and the use of veterinary medicines have changed dramatically during the past few decades. Trade globalization of aquatic animal products and the rise in prominence of aquaculture as a primary supplier of the world's aquatic food supply have been associated with the culture of new aquatic species, the movement of aquatic organisms to new countries and continents and a general trend towards intensification of production methods and the industrialization of the sector. While sector globalization has created new market opportunities for farmed aquatic animals, it has simultaneously facilitated the spread of their pathogens and diseases. These trends have all lead towards increased reliance on veterinary medicines to ensure successful production through prevention and treatment of disease outbreaks due to pathogens, assuring healthy stocks and maximizing production. Diseases are a primary constraint to the culture of many aquatic species. Although the capability to manage aquaculture health issues has increased tremendously in the last 30 years, the rapid development of the aquaculture sector continues to generate new challenges. This is particularly apparent with increased interest in species diversification and new grow-out techniques. In addition to the obvious effects of large-scale aquaculture losses on rural communities, diseases (particularly those causing mass mortalities) also cause considerable impacts on investor confidence.

Use of veterinary medicines in aquaculture

As in the commercial livestock and poultry production sectors, prudent and responsible use of veterinary medicines allows the development of intensive, industrial-scale food production systems that support increased food outputs for society and the most financial gains for investors while increasing production efficiency by minimizing the resources (land, water, feeds, etc.) required to produce a unit of aquatic food. The use of veterinary medicines is essential to modern agricultural production (including aquaculture), through improved on-farm biosecurity and husbandry (e.g. via the use of vaccines and disinfectants) and for the prevention and treatment of both chronic diseases that lead to decreased production (through reduced growth, food conversion rates (FCRs) and survival) and the treatment of epizootic disease outbreaks that have potential to cause mass mortalities, failure of individual aquaculture enterprises and the occasional collapse of entire industries.

As the understanding of their role in aquaculture health management and biosecurity has improved, the use of veterinary medicines has been taken up progressively by the industry.

Currently, there is a general perception that veterinary medicines (and in particular, antibiotics) have not always been used in a responsible manner. The misuse of veterinary medicines can have potential negative implications for the environment and human food safety, and could impact free trade. A number of veterinary medicinal products used in aquaculture have been shown to have potential harmful effects on human health (e.g. chloramphenicol, malachite green, florfenicals), leading to bans on their use, thus reducing the already limited arsenal of drugs that are available for disease treatment. During the last few years, detection of the antimicrobial chloramphenicol in internationally-traded shrimp has caused much concern resulting to a slowdown of imports, causing economic losses among producers and their governments. As a consequence, governments have introduced changes or tightened national regulations on the use of antibiotics in order to comply with food safety export requirements.

The lack of approved drugs for certain aquaculture species and diseases and the significant variations in regulatory frameworks and enforcement in different countries have the potential to seriously impede the continued growth of the sector. When regulatory processes for aquatic veterinary medicines are not well developed, the concern is likely higher.

The limitation of chemotherapy is also increasingly recognized. In some cases, rather than providing a solution, chemotherapy may complicate health management by triggering toxicity, resistance, residues and occasionally, public health and environmental consequences. In addition to unpredicted side effects on the environment, the efficacy of some veterinary medicines under the conditions found in some aquatic environments is uncertain, both with respect to meeting treatment goals and with regard to the potential environmental and socio-economic costs of untargeted effects. Other environmental/ecological issues relating to the use and misuse of veterinary medicines into the aquatic environment include that of leaching from unconsumed feeds, intentional/unintentional release of effluent waters from aquaculture facilities and presence of residues in faecal materials. Other examples of impacts pertains to the accumulation of residues in sediments



L. Grisez, Intervet

Fish vaccination

and impacts of drugs and chemicals on natural biota. These areas are generally poorly studied thus causing important concerns.

Another important issue concerns disease diagnosis. Rapid and accurate diagnosis of pathogens or an outbreak prior to initiating treatment is necessary. For antimicrobials in particular, promotion of susceptibility testing to ensure that the antibiotic applied will be effective against the strain of pathogen causing the disease outbreak.

The above perceptions and concerns often cast aquaculture in a negative light and have implications for its continued expansion of the sector and its role in addressing the increasing need for food fish protein for an expanding global population. However, without the use of veterinary medicines, aquaculture food production would be impaired.

Prudent and responsible use of veterinary medicines

In general, it can be stated that the global trend is toward more stringent and uniform standards and a more prudent and responsible use of veterinary medicines by the aquaculture sector.

Improved technology has also significantly increased the capacity to detect trace amounts of residue of banned or restricted substances, leading to ever decreasing detection levels. Consumer awareness and concern over the possible health and environmental hazards posed by the use and misuse of veterinary medicines in aquaculture has also grown. The result of these trends has been more stringent testing and inspection standards by importing countries and difficulties in some developing countries meeting importing country requirements (leading to occasional product bans

and also, due to lack of capacity, to some developing countries having different standards for aquaculture products directed to export and domestic markets).

The maturation of some aquaculture sectors, such as the salmon industry in Norway and yellowtail culture in Japan has shown the great potential that preventative methods (vaccines and improved husbandry) have towards reducing the aquaculture sector's reliance on veterinary medicines to achieve improved production and profitability. Additionally, aquatic animal health professionals are increasingly aware of the need to use veterinary medicines responsibly and to not prescribe antibiotics essential to human medicine for use in aquaculture species.

While governments have a key role to play in promoting the sustainability of aquaculture production and protecting public health, ensuring the judicious use of veterinary medicines does not rest with them alone, but is a shared responsibility of all stakeholders involved in sector development, including aquaculture producers, aquatic animal health professionals/practitioners, feed, drug and chemical manufacturers and sales persons, and the general public.

There is a current opinion that advocates further restrictions on the use of antimicrobials in food animal production and even promotes a complete ban on the use of certain veterinary medicines in aquaculture. However, as the World Health Organization (WHO) has stated: "*Antimicrobials are vital medicines for the treatment of bacterial infections in both human and animals*". Animal rearing, just as with "human rearing" needs the availability of effective antimicrobials to increase population survival rates, reduce sequelae from infections, and improve food conversion rates and growth. ■

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T. Telfer

Feed distribution using automatic feeder for cage culture of Atlantic salmon near Bodo, Norway

On-Farm Feeding And Feed Management In Aquaculture

Manila, the Philippines
13-15 September 2010

in collaboration with the Aquaculture Department, Southeast Asian Fisheries Development Center (SEAFDEC/AQD), Iloilo city, the Philippines

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It is generally accepted that the highest recurring cost in aquaculture comes from feeds. Alone, feed accounts for about 60-80 percent of operational costs in intensive aquaculture, while feed and fertilizers represent about 30-60 percent of the total cost of aquaculture production in semi-intensive aquaculture system. A recent study (Rola and Hasan, 2007¹) carried out in Viet Nam and Thailand in 2006 showed that proportion of the break-even price with the actual price on catfish farms are 85 percent and 69 percent, respectively, while the respective feed costs are about 86 and 81 percent, respectively, of total production costs.

Cultured fish are often overfed because of farmers' perception that more feed will produce more fish without looking at its proper utilization. In many instances, these wrong perceptions are created by feed manufacturers inducing use of more feed than needed. Often high quality feeds (high protein content) are provided to aquaculture system without

assessing the real need and eventually these practices lead to feed wastage. Factors affecting poor utilization of feed resulting in high food conversion ratios (FCR) include the inappropriate selection of feed quality and the feeding strategy. The quality of the dry feeds is influenced by the digestibility of the ingredients, suitability of the formulation to individual cultured species and season, stability of the feed in water, storage and handling of the feed and whether the feed is extruded or pelleted. However, the most important factor that may lead to the wastage of feed is through poor feeding strategy by the farmer leading to overfeeding. The farmer can improve FCR by providing the appropriate amount of feed, maintaining the proper feeding duration, feeding frequency and timing of the feeds. Further, farmers are often influenced by commercial feed manufacturers to use the high quality extruded floating feed without assessing the need and economics of their use. There has been inclination by farmers to use extruded floating pellet probably without attempting to use other management options to best utilize the sinking pellet or farm-made aquafeed. Appropriate feed management techniques and/or improving feed quality may contribute to the appropriate utilization of feed without increasing the cost of production. There has been many studies which indicated that high quality feed may not necessarily provide high return; better feed management does. It has been reported that better feed management can reduce the feed cost to the extent of 15-20 percent.

With the above considerations, the Aquaculture Service (FIRA) have initiated a work programme "On-farm feeding and feed management in aquaculture". The objectives of this work programme is to evaluate the mechanisms available for introducing cost- and ingredient-saving feed management strategies for finfish and crustacean

aquaculture and to develop suitable guidelines for their dissemination to farmers with an ultimate objective of overall reduction in feed use through better feed management. The following activities have been proposed under this work programme: a) a desk study on available scientific information and concepts related to on-farm feeding and feed management, and a synthesis outlining strategies that could lead to feed costs and ingredient saving; b) reviews and country-specific case studies on feed management in selected species/species-groups that are widely cultured; c) an expert workshop to discuss the findings of a and b; and d) technical manuals/guidelines and a regional workshop to disseminate the manuals/guidelines. The species/species-group included in the work programme are Nile tilapia, Indian major carps, striped catfish, whiteleg shrimp, tiger shrimp and freshwater prawn. Country coverage for the case studies are Bangladesh, China, India, Philippines, Thailand and Viet Nam from Asia and Egypt and Ghana from Africa with the anticipation that country coverage may be expanded as appropriate.

In support of the above work programme, FIRA is organizing an expert workshop “On-farm feeding and feed management in aquaculture”, to be held in Manila, the Philippines, from 13-15 September 2010, in collaboration with the Aquaculture Department of Southeast Asian Fisheries Development Center (SEAFDEC/AQD). Experts from FAO member countries, regional organizations and FAO



Feeding striped catfish (Pangasianodon hypophthalmus) with farm-made aquafeed, Mekong Delta, Viet Nam

headquarters and regional offices are expected to participate. The results of the country case studies, invited review papers and synthesis of case studies will be presented at the workshop. Results drawn from these presentations will be examined as basis for drawing future course of action. The workshop will also attempt to review and analyze how lessons from successful feed management practices in salmonid aquaculture may be taken up in tropical aquaculture. Broad thematic areas to be addressed are: a) current feed use and feed management practices; b) selection/choice of feed including information on feed procurement, transportation and storage; c) review of existing feeding strategies; and d) overall assessment of feed management and utilization including identification of research needs and needs for regulatory and legal frameworks. It is expected that workshop proceedings, country case studies, invited review papers, synthesis of the case studies will be published as an FAO Fisheries and Aquaculture Technical Paper “On-farm feeding and feed management in aquaculture”.

Further details of the workshop can be obtained from the author. ■



Preparation of farm-made supplemental feed using locally available feed ingredients, Mymensingh, Bangladesh

¹Rola, W.R. & Hasan, M.R. 2007. Economics of aquaculture feeding practices: a synthesis of case studies undertaken in six Asian countries, pp. 1-31. In M.R. Hasan (ed.). *Economics of aquaculture feeding practices in selected Asian countries*. FAO Fisheries Technical Paper No. 505. Rome, FAO. 205 pp.

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Rather than further restrictions, more judicious use of veterinary medicines by aquaculturists, better enforcement of current regulations by government and improved health extension support to the farmers would result in a more prudent and responsible use of veterinary medicines in aquaculture development.

In view of the above, the FAO Expert Workshop on Improving Biosecurity through Prudent and Responsible Use of Veterinary Medicine in Aquatic Food Production, was convened at the Rama Gardens Hotel, Bangkok, from 15 to 18 December 2009 and hosted by the Aquatic Animal Health Research Institute (AAHRI) of Thailand's Department of Fisheries. Thirty nine experts from 14 countries (Canada, Chile, China, Croatia, India, Indonesia, Ireland, Norway, the Philippines, Spain, Thailand, United States of America (USA), United Kingdom and Viet Nam) as well as experts from the Association of Southeast Asian Nations, the World Organisation for Animal Health (OIE) and the World Health Organization participated in the expert workshop.

The workshop highlighted the importance of aquaculture; a key feature for its success is improving sustainability; disease and health are major sustainability issues; and aquaculture concerns and the way they are addressed differs from country to country. The veterinary medicine sector is complex and diverse and is governed by such factors as knowledge, research, capacity and policy. Major concerns identified during the expert workshop include: firstly, authorization system of veterinary medicines and related issues; secondly, technical assistance (e.g. capacity, environmental and human impact evaluation capacity, trading compliance); and thirdly, harmonization of international standards.

The responsible use of veterinary medicines is an essential component to ensure successful and sustainable commercial aquaculture production. Safe and effective veterinary medicines need to be available for efficient aquaculture production, and their use should be in line with established principles on prudent use of veterinary medicines to safeguard public and animal health. The use of such medicines should be part of national and on-farm biosecurity plans and in accordance with an overall national policy for aquatic animal health management and sustainable aquaculture.

The detailed outcomes of the workshop will be contained in a workshop proceedings which will also include technical papers presented during the workshop: (i) public health and trade impact of antimicrobial use in aquaculture, (ii) environmental impacts and management of veterinary medicines in aquaculture: the case of salmon aquaculture in Chile, (iii) good

aquaculture practices to minimize bacterial resistance, (iv) antimicrobial resistance: complexities and difficulties of determination; (v) legislation and regulatory efforts in the USA relevant to the use of antimicrobials in aquaculture; (vi) oral delivery of veterinary medicines through aquafeed in Mediterranean aquaculture; (vii) disease prevention as a basis for sustainable aquaculture; (viii) health management tools from a manufacturing point of view; and (ix) alternatives to antibiotics in aquaculture; and (x) antimicrobial use and resistance in selected zoonotic bacteria in aquaculture: preliminary findings of a survey of aquaculture-allied professionals. The outcomes of the international survey on the use of veterinary medicines in aquaculture and the current status on the use of veterinary medicines in Chinese, Philippine, Thai and Vietnamese aquaculture conducted by FAO are also included.

The above proceedings will serve as background document to support the preparation of the FAO Code of Conduct for Responsible Fisheries (CCRF) Technical Guidelines on Prudent and Responsible Use of Veterinary Medicines in Aquaculture. Their objective is to assist countries in encouraging the proper use of veterinary medicines in aquaculture production through appropriate government regulation and the promotion and encouragement of awareness and responsible use by government agencies, private sector aquaculture producers and aquatic animal health professionals/practitioners. ■

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¹Veterinary medicines – any substance or combination of substances presented for treating or preventing disease in animals or which may be administered to animals with a view to making a medical diagnosis or to restoring, correcting or modifying physiological functions in animals (EU, 2004). EU (European Union). 2004. Directive 2001/82/EC of the European Parliament and of the Council of 6 November 2001 on the Community Code relating to Veterinary Medicinal Products. Official Journal L -311, 28/11/2004, pp. 1– 66. as amended by Directive 2004/28/EC of the European Parliament and the Council of the 31 March 2004 amending Directive 2001/82/EC on the Community code relating to veterinary medicinal products. *Official Journal L - 136, 30/04/2004, pp. 58–84.*

²Excerpts from unpublished workshop proceedings and draft FAO Code of Conduct for Responsible Fisheries (CCRF) Technical Guidelines on Prudent and Responsible Use of Veterinary Medicines in Aquaculture (both documents currently in preparation).

Ruth García Gómez

Ruth García Gómez has joined the Aquaculture Management and Conservation Service (FIRA) within the Fisheries and Aquaculture Resource Use and Conservation Division (FIR) at FAO headquarters in Rome as an APO funded by the Spanish Government in January 2010.



She graduated in Veterinary Science-Animal Husbandry from the University Complutense of Madrid, Spain in 2002, with a specialisation in Aquaculture Science. In 2005 she finalized the Ph.D. courses

from the Veterinary Science Branch at the same University. She conducted her Ph.D. work as part of a research team at the “Complutense Institute of Epidemiology Surveillance”, which is one of the most prominent centres dealing with aquatic animal health in the Mediterranean context. She also obtained a Master’s Degree in International Cooperation Policies and Strategies from HEGOA Institute, in 2004.

Prior to joining FAO she worked for more than 7 years in a number of countries such as Uganda, RDC, Cambodia, Morocco, Egypt, Ecuador, Colombia and France, being involved in development and research projects dealing with aquaculture and fisheries production, aquatic animal health and aquatic genetic resources. In her last position prior to joining FAO she coordinated a four-year development programme in Cambodia, which focused on the promotion and development of small-scale rural aquaculture for food security improvement. She provided direct technical assistance to the Fisheries Administration officers and collaborated in the development and implementation of the Aquaculture Sector National Action Plan, including the design of a series of Good Aquaculture Practices for the Cambodian context.

In the Aquaculture Management and Conservation Service (FIRA), she has responsibilities for the provision of technical support in normative and field activities regarding aquaculture farming systems, aquatic biodiversity sustainable use and conservation, aquatic animal health management, and aquaculture feed and nutrient resources.

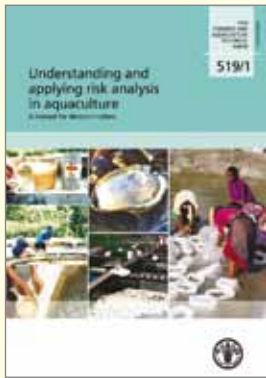
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Brugère, C.; Ridler, N.; Haylor, G.; Macfadyen, G. & Hishamunda, N. Aquaculture planning: policy formulation and implementation for sustainable development. *FAO Fisheries and Aquaculture Technical Paper*. No. 542. Rome, FAO. 2010. 70p.

With the dramatic recent growth of aquaculture, the planning of its development has become increasingly important. Proper planning will stimulate and guide the evolution of the sector by providing incentives and safeguards, attracting investment and boosting development. Moreover, it will help to ensure the long-term economic, environmental and social sustainability of the sector, and its ultimate contribution to economic growth and poverty alleviation. This paper provides practical guidance to aquaculture policy-makers and implementers on policy formulation and processes. It starts by reviewing governance concepts and international policy agendas relevant to aquaculture development and proceeds by defining “policy”, “strategy” and “plan” while explaining common planning terminology. The paper proposes practical steps for improving policy formulation processes. These include: recognizing a timely opportunity for change; ensuring coordination and communication among stakeholders; adopting a participatory approach; learning lessons from elsewhere; and accepting that conflicts may arise and lead to hard choices. It highlights means for implementing aquaculture policies, notes the benefits of an ecosystem approach and proposes a range of instruments which, if implemented at various levels, will help progress towards the development goals for the sector. However, the successful implementation of aquaculture policies depends on overcoming challenges related to weak human capacity, institutions and monitoring systems and to inadequate financial resources. Therefore, the paper also suggests the means to do so. Central to successful planning in the aquaculture sector are coherence in the planning process and an emphasis on interdisciplinarity beyond sectoral remit through institutional collaboration, human capacity development and participation. It is also necessary to embed the chosen approaches and instruments in the principles of good governance. Together, these key elements will ensure the soundness and effectiveness of aquaculture development policies and the positive contribution of the sector.

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Arthur, J.R.; Bondad-Reantaso, M.G.; Campbell, M.L.; Hewitt, C.L.; Phillips, M.J. & Subasinghe, R.P. Understanding and applying risk analysis in aquaculture: a manual for decision-makers *FAO Fisheries and Aquaculture Technical Paper*. No. 519/1. Rome, FAO. 2009. 113p.

Abstract: This manual aimed to promote wider understanding and acceptance of the applications and benefits of risk analysis in aquaculture development and management, provides an overview of the process as applied to aquaculture and demonstrates the variety of ways in which risk can manifest in aquaculture operations. Section 1 provides a background to the aquaculture sector and an introduction to the concepts of risk analysis. Section 2 presents the operating environment, i.e. relevant international framework, for risk analysis for the aquaculture sector. Section 3 discusses a general risk analysis process for aquaculture. Section 4 provides brief overviews of the process as applied in each of the seven risk categories. Section 5 briefly summarizes actions that need to be taken by FAO Members to promote the wider use of risk analysis for aquaculture development. Section 6 discusses future challenges to aquaculture and the role risk analysis might play in addressing them.

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Bondad-Reantaso M.G. & Prein, M. (eds). Measuring the contribution of small-scale aquaculture: an assessment. *FAO Fisheries and Aquaculture Technical Paper* No.534. Rome, FAO. 2009. 180p.

An “FAO Expert Workshop on Methods and Indicators for Evaluating the Contribution of Small-Scale Aquaculture to Sustainable Rural Development”, held in Nha Trang, Viet Nam from 24 to 28 November 2008, attempted to develop an indicator system which can measure the contribution of small-scale aquaculture (SSA) to sustainable rural development (SRD). The major outcome was the development, through an iterative process, of an indicator system thought to provide a good measure of the contribution of SSA using an analytical framework (i.e. the Sustainable Livelihood Approach or SLA) and agreed criteria (accuracy, measurability and efficiency or AME). This publication contains two parts: Part 1 contains the report of the above expert workshop; Part 2 contains 10 technical papers presented during the expert workshop and an additional paper which provides a detailed account of the processes undertaken in the development of an indicator system to measure the contribution of SSA to SRD.

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Report of the FAO Western Balkan Regional Seminar/Workshop on Aquatic Animal Health. Sarajevo, Bosnia and Herzegovina, 19–21 May 2008. *FAO Fisheries and Aquaculture Report*. No. 879. Rome, FAO. 2009. 25p.

The Western Balkan Regional Seminar/Workshop on Aquatic Animal Health (TCP/BiH/3101) held in Sarajevo, Bosnia and Herzegovina, from 19 to 22 May 2008 was participated by a total of forty representing fisheries and veterinary authorities and the private sector from Western Balkan countries (Bosnia and Herzegovina, Croatia, Montenegro, Serbia and The Former Yugoslav Republic of Macedonia) including representatives from the FAO and OIE. The regional seminar/workshop successfully disseminated the outcomes of TCP/BiH/3101 (Strengthening Aquaculture Health Management in Bosnia and Herzegovina); exchanged information on the status of aquaculture and aquatic animal health, diseases affecting aquaculture, and programmes for disease diagnosis and prevention in Western Balkan countries; and identified opportunities for seeking solutions to common problems related to pathogen issues affecting regional trade between Balkan states and other key European Union trading partners; and discussed and formulated a possible programme for regional cooperation.



Cai, J.; Leung, P. & Hishamunda, N.
Assessment of comparative advantage in aquaculture: framework and application on selected species in developing countries. *FAO Fisheries and Aquaculture Technical Paper*. No. 528. Rome, FAO. 2009. 73p. Available in French.

How successful a country is in competing against other producers depends in part on transport and on satisfying food standards, but also on its production costs. Comparative advantage is a means of assessing relative costs and indicating the species and markets where there is the greatest likelihood of success. This paper discusses this concept and two methods that can be used for its assessment, namely the “Domestic Resource Cost” (DRC) method, which relies on production cost data to compare efficiency, and the “Revealed Comparative Advantage” (RCA) method, whereby comparative advantage is inferred from an ex post assessment of actual trade and specialization. Through two case studies (the shrimp exports and the freshwater aquaculture production of carp, catfish and tilapia) the paper illustrates how this concept can be assessed and discusses some of its policy implications. The RCA method is used for this purpose.

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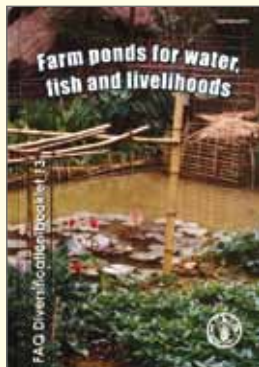


Halwart, M.; Soto, D. & Arthur, J.R.
Aquaculture en cage: Études regionales et aperçu mondial. *FAO Document technique sur les pêches* No. 498. Rome, FAO. 2009 259p. Also available in Spanish.

The FAO Fisheries and Aquaculture technical paper “Cage aquaculture - regional reviews and global review” highlight the tremendous importance of cage aquaculture today and its key role for the future growth of the aquaculture sector. The document includes all the papers presented during the FAO Special Session on Cage Aquaculture at the Asian Fisheries Society Second International Symposium on Cage Aquaculture in Asia in July 2006. Each review, by geographic region, includes information on the current situation, major regional issues and challenges. The global overview discusses trends in cage aquaculture, summarizes information on cultured species, culture systems and environments and explores the way forward for cage aquaculture, which offers especially promising options for multitrophic integration of current coastal aquaculture systems as well as expansion and further intensification at increasingly offshore sites.

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Miller, J.W. Farm ponds for water, fish and livelihoods. FAO Diversification booklet number 13. 2009. 62p.

The booklet provides basic and practical information on multiple use smallholder farm ponds. Information is provided on the role of development organisations, opportunities for and pitfalls of providing assistance, direct and indirect support required, and the strategic and technical challenges of making farmers self-reliant. It suggests ways by which smallholder farmers can participate in the market economy through better market access and outlines strategies to attract the private sector to do a business with smallholders.



Halwart, M. & Settle W. (eds). 2008. Participatory training and curriculum development for Farmer Field Schools in Guyana and Suriname. A field guide on Integrated Pest Management and aquaculture in rice. Rome, FAO. 116p.

In Guyana, approximately 140,000 hectares of arable land is under rice cultivation and the industry is the largest private sector activity. It employs over 100,000 people directly and indirectly. In Suriname, about 42,000 ha is under rice cultivation. Nieuw Nickerie is the main rice growing area in the country. The rice industry is the major economic activity and employer in the area. However, profitability from rice farming in both countries has been declining with the increasing cost of cultivation and declining international prices for rice. The increasing use of chemicals over time has resulted in additional costs, as well as increased costs to the environment and human health, with questionable corresponding returns in yield increases. In view of this situation, rice farmers have been looking for ways to reduce input costs in paddy cultivation and to introduce other crops into the farming system. Aquaculture has been recognized as one of the diversification crops for inclusion in the rice farming systems. The field guide on Integrated Pest Management and aquaculture in rice aimed to provide technical support to address these constraints.



Ce qu'il faut savoir sur le syndrome ulcératif épizootique (SUE): brochure de vulgarisation. FAO, Rome, 2010. (French version)

This extension brochure – What you need to know about epizootic ulcerative syndrome (EUS) – provides simple facts or frequently asked questions about EUS such as: What is EUS?; Why it is a problem today?; What does it do to the fish; When does it occur?; How is it diagnosed?; Which species are susceptible or affected?; How is it spread?; What factors cause the fish to be infected with EUS?; Safety concerning eating EUS affected fish, simple biosecurity measures to prevent EUS?; What can be done in the event of an outbreak and simple procedures for collecting EUS samples for laboratory examination. This brochure is intended to a wide range of audience from fishfarmers and fishermen to extension officers as well as policy makers as a public information campaign to make available factual information about the disease so that awareness may be raised and for better understanding of the potential impact of the disease.

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Better understanding of the sector, dynamics among different components, small and large, and analysis of costs, risks and benefits of investments along the value chain can help in developing the right mix of financial and policy support for the sector to grow, and provide the social and economic services possible through responsible development – for the many small-scale producers in the sector, as well as the increasing numbers of consumers – poor and wealthy – that depend on aquaculture as a provider of fish for food. ■

Additional Reading:

Umesh, N.R., Mohan, A.B.C., Ravibabu, G., Padiyar, P.A., Phillips, M.J., Mohan, C.V. & Bhat, B.V. 2009. In S.S. De Silva and F.B. Davy (eds.). *Success Stories in Asian Aquaculture*, Springer Science+Business Media B.V. 2009.

Vorley, B., Lundy, M. & MacGregor, J. 2008. Business models that are inclusive of small farmers. Paper prepared for FAO and UNIDO as background to the Global Agro-Industries Forum, New Delhi, 8 - 11 April 2008.

Continued from page 45

This integrated, multidisciplinary approach is fostering closer collaboration within FAO, across departments and programmes, and among international partners, national governments, regional economic organizations, NGO's, universities, local communities, and farmers. It is recognised that anthropogenic-driven disease emergence is one of the most salient global health challenges of the future, but the solution also lies in innovative approaches of people. Research alone will not change people but education and innovative approaches to managing development, food and water security and safety, and livestock, wildlife, environmental, and public health will require social and cultural sensitivity. The way forward is through collaboration and integration - the approach being supported and fostered through the **“The FAO One Health Programme - A Comprehensive Approach to Health: People, Animals and the Environment”**. ■

¹Arthur, J.R., Bondad-Reantaso, M.G., Campbell, M.L., Hewitt, C.L., Phillips, M.J. & Subasinghe, R.P. 2010. Understanding and applying risk analysis in aquaculture: a manual for decision-makers. *FAO Fisheries and Aquaculture Technical Paper*. No. 519/1. Rome, FAO. 2009. 113p.

²Working Document COFI/AQ/V/2010/5 – Aquatic biosecurity: a key for sustainable aquaculture development (prepared for the Fifth Session of the COFI/SCA, 27 September – 1 October 2010 (<http://www.fao.org/docrep/meeting/019/k7580e.pdf>))

³Charles, H., Godfray, J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Pretty, J., Robinson, S., Thomas, S.M. & Toulmin, C. 2010. Food security: the challenge of feeding 9 billion people. *Science* 327: 812-817; Smith, M.D., Roheim, C.A., Crowder, L.B., Alpern, B.S., Turnipseed, M., Anderson, J.L., Asche, F., Bourillón, L., Guttormsen, A.G., Khan, A., Liguori, L.A., McNevin, A., O'Connor, M.I., Squires, D., Tyedmers, P., Brownstein, C., Carden, K., Klinger, D.H., Sagarin, R. & Selkoe, K.A. 2010. Sustainability and global seafood. *Science* 327: 784-786. (accessed from www.sciencemag.org on 18 August 2010).

⁴Soto, D., Aguilar-Manjarrez, J. & Hishamunda, N. (eds). 2008. Building an ecosystem approach to aquaculture. FAO/Universitat de les Illes Balears Expert Workshop. 7–11 May 2007, Palma de Mallorca, Spain. *FAO Fisheries and Aquaculture Proceedings*. No. 14. Rome, FAO. 2008. 221p.

⁵Arthur, J.R., Bondad-Reantaso, M.G., Campbell, M.L., Hewitt, C.L., Phillips, M.J. & Subasinghe, R.P. 2010. Understanding and applying risk analysis in aquaculture: a manual for decision-makers. *FAO Fisheries and Aquaculture Technical Paper*. No. 519/1. Rome, FAO. 2009. 113p.

**Global Conference
on
Aquaculture 2010**

*Farming the Waters for
Food and People*

22-25 September 2010
Phuket, Thailand



**5th Session (FI-702-5)
COFI Sub-Committee on Aquaculture**

27 September to 1 October 2010
Phuket, Thailand