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Committee on Fisheries 30

Eat more fish - a healthy alternative

Farmed fish - a good choice

FAO Aquaculture Newsletter

Rio+20:A quaculturef or sustainable development and its credentials for GREEN GROWTH

GREEN GROWTH = the latest iteration of the concept of sustainable development – has been made the world's development and Earth-saving guide by the United Nations Conference on Sustainable Development, more widely known as the Earth Summit Rio+20 (convened last 20 to 22 June 2012.). The Sustainable Development Goals will replace the Millennium Development Goals after 2015 - some 25 years after the historic 1992 Rio de Janeiro summit (Sustainable Development) and a decade after the 2002 Johannesburg summit (Millennium Development Goals).

A new attempt by the UN in the major transitions of the 21st century - Rio+20 - focuses on three major agenda: (i) strengthening the political commitments to sustainable development; (ii) reviewing the progress and difficulties associated with their implementation; and (iii) responding to the new emerging challenges of societies. At the core of the new global agenda are two major elements: first, a green, sustainable economic development that eradicates poverty; and second, an institutional framework and capacity to achieve this. The second is crucial.

Now that the agenda for food security and sustainable development have been brought together during the Rio+20 summit, two important questions become very relevant: (i) has aquaculture development been sustainable? and (ii) how can aquaculture growth be green?

The aquaculture sector has not been short of instruments of global governance, tools, technologies and initiatives to make it sustainable. For example, the Committee on Fisheries (COFI) and its Sub-Committee on Aquaculture, the Code of Conduct for Responsible Fisheries, the Bangkok Strategy on Aquaculture Development, the Phuket Consensus, the Colombo Declaration - collectively, are an expression of government and other stakeholder's commitment to support the sustainable development of aquaculture. With the same objective, all players in the value chain also made their fair share of responsibility, contribution and innovations.

With its diverse water- and land-based farming systems from subsistence to industrial scales and remembering that it is currently the fastest growing food production sector, providing more fishery products, promoting economic growth and supporting the livelihoods of farmers, especially small-scale farmers in developing countries – the business of aquaculture can grow and stay green.

To do so, it must better resolve the persistent and the new issues among which include, for example, competition for water, land and other resources, decreasing quality and flow of ecosystems services, high cost of feed, objections to feeding fish with fish, biosecurity emergencies, economic crises, natural hazards, trade barriers, and climate variability and its risks. To be sure, these problems have been well recognized and there are individual and collective efforts, using instruments and the tools[1] that have been devised, to address them.

Rio+20 with its gigantic and long-term aspirations, nonetheless is another step forward towards a sustainable global community. To make sure that the aquaculture sector will contribute for the common global good, the Fisheries and Aquaculture Department will continue to build on its sustainability strategies (promote those that worked and achieved success; try to understand those that failed to work); provide a neutral forum for dialogue, and search meaningful ways where private and public sector can work well together to bring about innovations, devise technologies and adopt practices that increase human welfare, sustain economic and social development, and preserve the environment **= GREEN GROWTH.**

Melba B. Reantaso
Chief Editor

[1]Some of the instruments and tools are discussed here in FAN 49

Cover photo: Cages for grouper *(Epinephelus coioides)* and cobia *(Rachycentron canadum)* broodstock at the National Broodstock Center for Mariculture Species in Northern Vietnam (part of Research Institute for Aquaculture No1) in Cat Ba Island, Northern Viet Nam. Courtesy of Kathrin Hett, FAO

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Special thanks to
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Sixth session of the COFI Sub-Committee on Aquaculture (SCA)

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The sixth session of the Sub-Committee on Aquaculture (SCA) of the FAO Committee on Fisheries (COFI) was held in Cape Town, South Africa, from 26 to 30 March 2012 at the kind invitation of the Government of South Africa. It was attended by 47 Members of FAO and by observers from seven intergovernmental and three international non-governmental organizations. Mr Lahsen Ababouch, Director, Fisheries and Aquaculture Policy and Economics Division, expressed, on behalf of the Fisheries and Aquaculture Department and of the Director-General Mr José Graziano da Silva, the Organization´s gratitude to the South African government for hosting the meeting and welcomed all delegates to the meeting. He outlined some of the most important emerging issues in the sector which would be addressed by the Sub-Committee.

Her Excellency, Ms Tina Joemat-Pettersson, Minister for Agriculture, Forestry and Fisheries, South Africa, delivered the welcome address and reaffirmed the commitment of her government to the mission of FAO and its support to efforts geared towards sustainable fisheries and aquaculture. Ms Susan Clare Middleton of South Africa was elected Chairperson of the Sub-Committee. Mr Alexander Okhanov of the Russian Federation was elected first Vice-Chairperson. Oman and the United States of America were elected second and third Vice-Chairs, respectively.

The agenda of the session was comprehensive and covered many issues pertaining to aquaculture development globally. Member countries reaffirmed its support for FAO activities on aquaculture development and management and expressed its satisfaction on the progress achieved, especially considering limited financial resources.

The Sub-Committee emphasizing the importance of aquaculture to human nutrition, food security, poverty alleviation and socio-economic growth, reiterated that sufficient resources need to be allocated to the work of the Secretariat. The Asian Regional Fisheries Ministerial Meeting held in Colombo during July 2011 was recognised as an important milestone and Members encouraged the Secretariat to follow-up on the implementation of the recommendations in order to achieve the desired results. The Sub-Committee stressed the importance of providing more capacity development support in areas such as policy planning and strategy development, aquaculture certification, feeds, marketing, aquatic animal health, aquatic biosecurity, aquaculture statistics, institutional strengthening, environmental issues, genetics and breeding programmes and especially addressing the needs of small-scale producers and developing countries. Regular reporting of the progress made on implementing the provisions of the CCRF was also deemed important.

On aquaculture certification guidelines, while recognizing their importance, increasing usefulness, and the hard work invested in its development, the Sub-Committee reiterated the guidelines' clear recognition of the already existing international standards on animal health by the World Organisation for Animal Health (OIE), food safety by FAO/WHO Codex Alimentarius Commission (CODEX) and the relevant socio-economic issues by theInternational Labour Organization (ILO). The Sub-Committee expressed its appreciation for the financial support provided by the European Union (EU) for the development of an assessment

framework to evaluate the conformity of aquaculture certification schemes with the FAO Guidelines.

Agenda item 5 discussed the importance and salient issues and challenges on assessing and monitoring the performance of aquaculture and the necessity for an assessment framework to measure sectoral performance. However, this will require good quality data which may be a challenge in several countries due to the lack of a data collection mechanism.

Members recognized FAO's work on improving aquaculture statistics and supported the work proposed by the Secretariat regarding the Strategy-STA implementation and finalizing the Aquaculture Statistics Handbook under the Coordinating Working Party on Fishery Statistics (CWP).

The agenda on aquafeeds, particularly the analysis provided in the working document was appreciated by members who also emphasized that meeting the future demand for food from aquaculture will largely depend on the availability of quality feeds in required quantities and highlighted the importance of increasing efforts needed to find alternative feed ingredients, *inter alia*, plant- and animal-based feed ingredients to supplement fishmeal and fish oil. The Sub-Committee discussed opportunities and issues related to the use of agriculture products and byproducts in aquaculture feed.

Agenda item 8 discussed the document "Towards a plan of action for the COFI-Sub-Committee on Aquaculture", and Members encouraged the Secretariat to prepare a draft strategy paper that will include a long-term strategic plan for further discussion at the seventh session of the Sub-Committee, taking into account of regional needs. This document will be distributed to all members of the SCA for comments and inputs before final preparation of a working document for the next Sub-Committee meeting. Furthermore, the Sub-Committee reiterated the importance of making use of the opportunity to discuss the prioritization of the Aquaculture work programme at the thirtieth session of COFI and requested the Secretariat to assist in the process of allowing such discussions to take place during that session.

A Special Event on Genetic Resources and Technologies in Aquaculture Development was also held. The Sub-Committee affirmed that emphasis needs to be placed on the assessment and responsible use of aquatic genetic resources for aquaculture and recognized that, without proper information, management and policies, serious threats to indigenous biodiversity could result, especially in areas where capacity and knowledge are limited. The Sub-Committee suggested the creation of a framework or network for data and information exchange amongst aquaculture/fishery genetic research institutions, development agencies and relevant international organizations and emphasized the regional approach to be employed in the process and also supported the establishment of an Advisory Working Group on Genetic Resources and Technologies, to be coordinated by FAO, that would bring together knowledge and expertise, establish linkages with other networks and agencies and develop a plan of action as part of its activities.

A consultative seminar "Improving the Relevance and Effectiveness of the Committee for Inland Fisheries and Aquaculture of Africa as a Continent-wide Regional Fishery Body" held after the plenary sessions from 26 to 27 March 2012, was attended by a total of 28 participants, including Permanent Secretaries/Secretary Generals, of ministries in-charge of fisheries from 18 Member countries of the Committee for Inland Fisheries and Aquaculture of Africa (CIFAA) and by observers from one FAO Member country and four inter-governmental organizations. The meeting recommended that the ownership of CIFAA should be re-defined, a Vision Statement developed, the CIFFA Secretariat strengthened and its links with its members reinforced and in particular linkages withthe African Union Conference of Ministers of Fisheries and Aquaculture (CAMFA).

The seventh session of the Sub-Committee will be held in St. Petersburg, Russia in late 2013.

Photo collage of SCA VI can be found from pages 22 to 25

Thirteenth Session of the COFI Sub-Committee on Fish Trade

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Background

The thirteenth Session of the Sub-Committee on Fish Trade was held from 20-24 February 2012, Hyderabad, India at the kind invitation of the Government of India[1]. This was the second time the Sub-Committee on Fish Trade was hosted by a developing country. The Thirteenth Session was attended by delegations from 40 Members of FAO, as well as observers from 8 intergovernmental and international non-governmental organizations. Sustainable resource management, food safety, and market access for exports from developing countries are global issues which are becoming more complex and interwoven with international trade of fish and fishery products. Private standards and ecolabels, for example, enable consumers to choose products which they perceive to have desirable characteristics related to sustainable resource use or food quality. These and other fish trade-related topics were presented by FAO to the Sub-Committee for information and decision. The key outcomes of the meeting are outlined in this article.

Key Outcomes

The Sub-Committee expressed its appreciation for the work of FAO and the FISHINFO network[2] in capacity building for developing countries, especially in the areas of market access and value-addition for small-scale producers. The Members encouraged FAO to continue to focus on small-scale fishers and fish farmers and to include the small-scale sector as a separate agenda item at the Fourteenth Session of the Sub-Committee on Fish Trade. The members also recognized the contributions of the GLOBEFISH project[3] in providing quality statistics on international fish markets.

The Sub-Committee reviewed FAO's work related to post-harvest developments, namely market access, value chains, food safety and quality requirements, CITES, traceability, private standards and ecolabelling schemes. The Sub-Committee reached the following decisions and recommendations:

- The Members acknowledged the growing role of aquaculture in seafood production, consumption and trade. They underlined the need to evaluate the aquaculture sector's dependence on fishmeal. They also commended the inclusion of the fishery and aquaculture sector in the Agricultural Outlook of the Organization for Economic Cooperation and Development (OECD) and the Food and Agriculture (FAO) and encouraged further refinement of the model.

- The Sub-Committee reiterated the comparative advantage of FAO's Fisheries Department in the analysis of fish trade issues. FAO was requested to continue collaboration with other international organizations such as the World Trade Organization (WTO), the Organisation for Economic Co-operation and Development (OECD), and the World Bank in providing its specialized technical expertise.

- FAO presented its draft evaluation framework to assess the conformity of public and private ecolabelling schemes with the FAO guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries. The inclusion of inland fisheries in a common evaluation framework with marine capture fisheries was appreciated by some Members,

V. Chomo, FAO

Audun Lem (FAO), Stefania Vannuccini (FAO) and Rudra Gangadharan, Ministry of Agriculture of India

as both marine and inland fisheries guidelines share a large number of indicators. However, a consensus could not be reached on adoption of the draft evaluation framework.

- Members expressed concern about the low response rate to the FAO questionnaire on implementation of Article 11 of the Code of Conduct for Responsible. Measures were suggested to increase the response rate to the questionnaire to improve the accuracy of the results.

- FAO was instructed to prepare a paper on traceability best practice guidelines and submit it to the Fourteenth Session of the Sub-Committee on Fish Trade. The paper will include a compilation and analysis of best practices and existing standards for a range of traceability purposes, including a gap analysis. Traceability schemes should adhere to the principles of equivalence, risk based, reliable, simple, clear and transparent. Furthermore, they should not create unnecessary barriers to trade.

- The Sub-Committee endorsed three project proposals to be submitted for consideration by the Common Fund for Commodities (CFC). These projects will be implemented by the INFOFISH Network. The Members expressed their appreciation for the gender focus of the CFC projects in the fisheries sector and encouraged future project proposals to include gender awareness and decent working conditions, especially in relation to small-scale fisheries.

[1]Decisions and Recommendations of the Thirteenth Session of the COFI Sub-Committee on Fish Trade, COFI/2012/4, March 2012, found at Internet address www.fao.org .
[2]The FISHINFO network consists of seven independent intergovernmental and governmental organizations plus the FAO based GLOBEFISH unit.
[3]GLOBEFISH is responsible for information on international fish trade. GLOBEFISH is jointly financed by FAO and GLOBEFISH Partners.

Eat more fish – a healthy aternative
Farmed fish – a good choice

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Fish and fisheries products play an important role in food and nutrition security around the world. Consumption of fish has unique nutritional and health benefits and is considered a key element of a healthy diet. Increased attention has been given to fish as a source of essential nutrients in our diets, not only as a source of high value proteins, but more importantly also as a unique source of micronutrients and essential omega-3 fatty acids (eicosapentaenoic acid or EPA + docosahexaenoic acid or DHA). The fatty acid DHA and iodine are essential for the development of the brain and neural system in children, and are almost exclusively found in foods from the aquatic environment. It is therefore particularly important to secure a minimum consumption of fish among pregnant and lactating women and young children to assure optimal development of the brain.

Fish consumption is also known to have health benefits among adult population; it is estimated that fish consumption reduces the risk of dying of coronary heart diseases by 36 percent due to the long chained omega-3 fatty acids mainly found in fish and fishery products. The unique nutritional composition of fish derives not only from fatty acids, amino acids, micronutrients (vitamins, minerals), but also other less known nutrients such as taurine and choline. **Fish is an excellent source of protein, but what makes fish a really unique food is all the additional nutrients that can be found in significant amounts.**

With a growing population worldwide, the demand for fisheries products will increase even if the per capita consumption remains at the present world average level of 17 kg/year. This increased demand will mainly be met by an increased production of aquaculture products, and not from wild sources.

Parallel to acknowledging fish as an optimal source of nutrients, there is also an increasing concern on fishery products as a source of contaminants. Consumption of fish, as for any other foods, may lead to ingestion of harmful substances such as heavy metals, dioxins, pesticides and residues of veterinary medicines. For capture fisheries, most contaminants are difficult to control, whereas for aquaculture there is a greater possibility to manage and control the aquatic environment and all inputs such as feed and veterinary medicines.

However, farmed fish is often being claimed to be less healthy compared to the wild-caught alternative. Intensive fish farming has lead to outbreaks of diseases difficult to control without using veterinary drugs. Fish might also have been raised in contaminated waters, and given low cost feeds of inferior quality. As a result some environmental and consumer protection groups are advising that aquaculture products should be avoided in a healthy diet because of low nutritional value, elevated levels of contaminants and veterinary medicine residues.

While the above might be true for some forms of aquaculture, the increasing demand to control both feed and fish is significantly limiting the risk of providing unhealthy farmed products to the market. This is particular true for the export market where quality and safety control mechanisms are very rigid, strictly limiting bad products from entering the market. There is also a current trend towards prevention rather treatment of diseases in the aquaculture industry, leading to cleaner and more efficient production.

"...Tell me what you eat and I will tell you what you are..." is a saying true also for farmed fish.

Low quality feeds can result in lower quality fish; this is particularly relevant for the fatty acid composition of the farmed fish, since the use of more costly fish oil is more and more being replaced by cheaper vegetable alternatives. If not carefully monitored, this might produce a fish with a less favorable fatty acid profile.

There is no doubt that there are both positive and negative issues about farmed fish when compared to wild fish. However, in theory, a farming system has the possibility for controlling the environment

		Salmon, farmed	Salmon, wild	Carp	Tilapia	Chicken	Ham
Protein	g/100g	20.4	19.8	17.8	20.1	18.6	20.3
Total lipid (fat)	g/100g	13.4	6.3	5.6	1.7	15.1	10.6
Water	g/100g	65	69	76	78	66	69
Ash	g/100g	1.1	2.5	1.5	0.9	0.8	1.1
DHA + EPA	mg/100g	1966	1436	350	91	40	3

Table 1. Fish is a good source of long chained omega-3 fatty acids. The level of omega-3 fatty acids in carp or tilapia might look low when compared to salmon, but levels are higher than in other meets such as chicken or ham. A minimum daily intake of 250 mg/day of DHA+EPA recommended for coronary heart disease protection among adults. A minimum of 150 mg/day of DHA+EPA is recommended for securing optimal brain/neural development in children. All data from USDA National Nutrient Database.

and all inputs at any stage of the production cycle. In order to e.g. export farmed fish, fish farms and processing plants must be controlled and certified for export in addition to the product itself. A very small number of aquaculture products are rejected due to their potential threat to human health, but these products are stopped before entering the market. These control mechanisms are working; ensuring that only safe products reach the consumers. As a result, farmed fish is not considered to pose a higher health risk to humans compared to wild fish, but is rather an excellent alternative in a healthy diet. Given the state of wild fisheries management systems, aquaculture products are likely to grab an even larger share of the market in the future.

The concern related to the nutritional value of farmed versus wild caught fish is relevant, and has been studied in several cases. From a nutritional point of view, the main difference between farmed fish and their wild counterpart is related to the quality and quantity of fat. Farmed fish seem to have a higher lipid content in general compared to their wild counterpart, while the proportion of omega-3 fatty acids (EPA+DHA) seems to be lower in farmed fish. In some cases, the level of omega-3 is lower, while in others higher than in farmed fish. Table 1 shows a comparison of the levels of omega-3 in farmed versus wild Atlantic salmon. Farmed salmon seems to be a very good, if not a better alternative, to the wild counterpart if judged against the omega-3 (DHA + EPA) content. The main farmed fish species, carps and tilapias, have a much lower level of these essential fatty acids compared to salmon, but should still be considered good sources of the long chained omega-3 fatty acids, as a single meal can cover up to several days requirement of this essential nutrient; a typical meal of carp (150g) will cover two to three days need of these essential fatty acids!

Fish is a healthy and better alternative to almost any other meats such as chicken or ham. Farmed fish also have a more constant nutrient composition compared to their wild counterpart, whose environment, food and access to food varies during the year. The environment of farmed fish can be monitored and managed to secure an optimal product. By controlling the composition of aquaculture feeds and other inputs, fish with good health and healthy fish products with optimal nutritional composition can be produced.

In 2010, FAO and the World Health Organization (WHO) held an expert consultation on the health risks and benefits of fish consumption[1]. The conclusion from the expert consultation was quite clear that the benefits of eating fish clearly outweigh the risks of eating fish, even if consumed more than seven times a week for most species. It was concluded that the consumption of any amount of fish has a positive impact on health. In particular pregnant women and nursing mothers should ensure they eat enough fish. No distinction between farmed or wild caught fish was made. Fish farmed under controlled conditions should be considered a very good and healthy alternative to our diets.

[1]FAO/WHO (2011). Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption. Rome, FAO. 50p. Available at www.fao.org/docrep/014/ba0136e/ba0136e00.pdf

Implementing the Ecosystem Approach to Fisheries and Aquaculture: a case study in the Estero Real, Nicaragua

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The ecosystem approach to fisheries (EAF) and aquaculture (EAA) are holistic strategies for managing capture fisheries and aquaculture that integrate their ecological, socio-economic and institutional dimensions and facilitate sustainable use of natural resources and integration with other users of coastal ecosystems. The EAF and EAA are considered as relevant strategies to enhance adoption and implementation of the Code of Conduct for Responsible Fisheries (CCRF).

Increased interaction between fisheries and aquaculture in the same ecosystems is requiring an integrated management of both sectors, such is the case of aquaculture-based fisheries (stock enhancement programmes), capture-based aquaculture and broader types of interactions such as those resulting from escaped fish from farms affecting local fisheries, fishery products as feeds and the competition of fishery and aquaculture products in common markets or the moving of fishers to fish farming and vice-versa.

In order to enhance the implementation of an ecosystem approach to fish production whether from wild catch or from farming, there is a need for capacity building at national and local levels and it is necessary to develop, access and improve practical tools that are in tune with local needs and capacities to address the key problems

Pilot implementation of EAF and EAA in Estero Real Nicaragua

The estuarine area "Estero Real", located along the north Pacific coast of Nicaragua and forming the southernmost part of the Gulf of Fonseca, is a tropical mangrove estuary. Despite the fact that this was declared as a protected area since 1983, and recognized by RAMSAR[1] as an area of international interest since 2003, there exist the risk of high level degradation due partly to shrimp fisheries and aquaculture. Having some of the poorest communities in the country, the natural resources of Estero Real are used for survival and livelihoods such as fishing with bags and with nets in the channels, harvest of mangroves for lumber, and small scale agriculture. Shrimp farming has also increased significantly in the area generating livelihood opportunities but also generating some social conflicts and environmental concerns. Large-scale shrimp farming coexist with small-scale farmers (cooperatives) and with small-scale fishers including those using unsustainable fishing practices such as cone-shaped fishing bags in the mangrove area. These bags collect not only small shrimp but also all kinds of fish larvae which are mostly discarded.

However, there are other large and relevant impacts to the estuary mainly coming from agriculture practices, urban wastes and deforestation on the higher parts of the basin, and such impacts are likely to be further exacerbated by climate variability and climate change. Often there are fish kills and poor shrimp production in small-scale farms due to bad water quality.

The government of Nicaragua solicited FAO support to address fisheries and aquaculture management issues in this ecosystem focussing on the very poor and marginalized fisheries communities in the hope of finding alternative livelihoods while preserving ecosystem services and increasing community resilience to climate change and other external forces. The activities have been carried through a cooperation agreement between FAO and INPESCA (The Fisheries and Aquaculture Institute of Nicaragua), since November 2009, with the support of multidonor partnership funds (FMPP, FMM) and it is expected to continue through 2012 and further on through this and other donor funds.

The first stage of the pilot implementation has involved the following steps:

1) Scoping the foreseen activities through field visits and participatory workshops with the following goals:

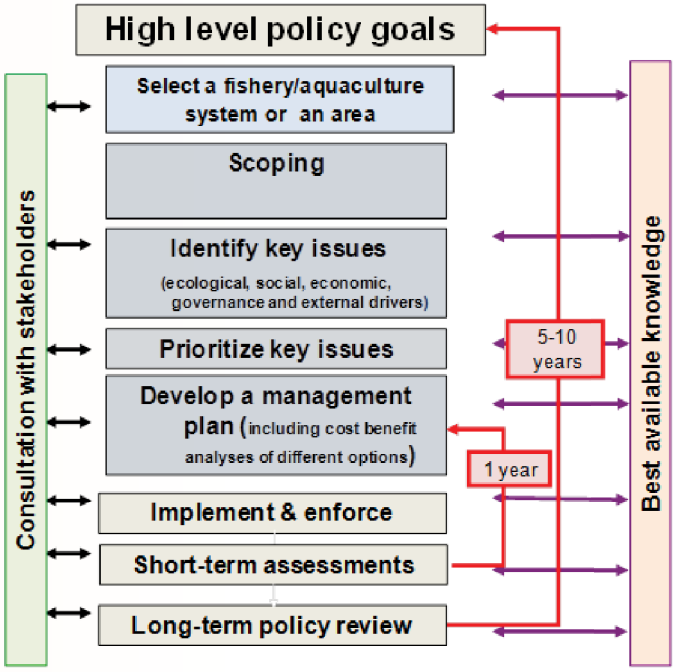
- introducing EAF/EAA concepts and methodology,
- reviewing information and making consensus on the current Estero Real fisheries and aquaculture issues (social, environmental and governance) and other issues external to the sector with all relevant stakeholders, and
- identifying and describing the key issues (relevant to sustainability; ecological well-being, human well-being and governance) and
- prioritizing the most relevant issues through a qualitative risk assessment.

Workshops took place in the closest locality to the Estero Real and have included representatives of fisheries and environment institutions at national and local level plus representatives of fishers, fish farmers, local communities, NGOs, universities, and the RAMSAR area management authority. All activities included active participation of women considered as key actors and beneficiaries of the project.[2]

The second stage involved the gathering of relevant inputs for the development of an EAF/EAA implementation plan including *needed information and resources* to address the issues identified in the workshops and *elaborating support programmes and instruments.* An example was a programme to enable bag-fishers to venture into other economic activities or alternative livelihoods such as a diversified small-scale aquaculture portfolio and other activities outside the sector (e.g. apiculture, mangrove planting, etc). Another relevant activity was a workshop to discuss the current environmental status of the estuary and initiate actions to estimate its carrying capacity to receive nutrients and sediments from aquaculture and other sectors in order to implement a management plan. The design of an integrated environmental monitoring programme is also underway.

The third stage involves the development of a management plan (including cost-benefit analyses for different options) and road map for implementation to be validated broadly with stakeholders (see Figure 1). At this stage, indicators were agreed and monitored and human and economic resources were made available. This stage is the most challenging one because it

Figure 1. EAF/EAA implementation steps and process



requires a profound local engagement, political will and commitment on the part of national and relevant authorities. Negotiation between different institutions and political will to recognize the social value of fisheries and aquaculture became necessary. Often, this stage requires external donor support geared towards capacity building and technical strengthening of relevant stakeholders. The project is currently going through this third stage of pilot implementation.

Involvement of national and local authorities and stakeholders leading to wider ownership of the process and the strengthening of local institutions have been some of the key outcomes of the process so far.

[1]The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

[2]FAO. 2012. *Informe de los Talleres sobre la introducción al enfoque ecosistémico a la pesca y la acuicultura.* FAO Informe de Pesca y Acuicultura No. 994/1. Roma, FAO. 2012. 35p.

Testing and training the new aquaculture CCRF compliance questionnaire: a way to improve country self-evaluation and reporting

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The Code of Conduct for Responsible Fisheries (CCRF) was unanimously adopted by FAO Members on 31 October 1995. Article 4.2 of the Code states that ".. FAO will report to the FAO Committee on Fisheries (COFI) on the application and implementation of the Code using a standard questionnaire". In this regard, the COFI Secretariat biannually reviews the responses received from FAO Members, regional fishery bodies (RFBs), and international non-governmental organizations (INGOs), and reports on the progress to COFI. The questionnaire includes a section on aquaculture, in particular Article 9 and some elements in Articles 5 and 10 of the CCRF. Members also report in greater detail on aquaculture elements of the Code to the COFI Sub Committee on Aquaculture (COFI-SCA).

Although a voluntary instrument, compliance with the Code is one of the most important processes to assess the performance and sustainability of the fisheries and aquaculture sector at global level.

In order to improve the Members reporting rate and implementation of the Code, both COFI and COFI Sub-Committee on Aquaculture (SCA) have requested FAO to develop a specific questionnaire to assess the status of compliance of Members to the aquaculture provisions of the CCRF. In response, FAO, drafted a reporting template (i.e. questionnaire) to supplement the aquaculture section in the current general CCRF questionnaire. This draft questionnaire was presented to COFI/SCA IV in 2008[1]. The Sub-Committee recommended further action on the questionnaire, which was endorsed by the 28th session of COFI.

The recommended actions included the revision of the pilot version of the questionnaire and its testing in different regions to reflect different environmental conditions of the sector and ensure global applicability. To carry out these recommendations, a pilot testing process of the new questionnaire was organized and the results were presented to COFI/SCA V in 2010[2] where it was recommended that the questionnaire be accompanied by an instruction manual and completed on a biennial basis by all Members and that the two consecutive reporting periods could serve as a trial. One of the most important objectives of this new questionnaire is for Members to recognize it as a useful self-assessment tool and way to better target FAO technical support.

In response to the above recommendations, the Secretariat (FAO/FIRA) developed an instruction manual and conducted testing trials, which also served as training, on the process and use of the questionnaire and manual in several countries and regions. The manual contains suggestions for governments regarding the organization and terms of reference of a national team to respond to the questionnaire and guidelines for the team in responding to it. To enable the national team to decide on the most appropriate response, each question has an explanation, elaboration, example, or a brief explanation. For most questions, ratings are suggested for a given degree of implementation of a measure.

Considering the modifications to the questionnaire the Secretariat has also considered this instrument as an opportunity to assess the impact of FAO's direct assistance to member countries as well as normative outputs such as technical publications, guidelines, etc. Therefore there is an additional

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Introducing the new CCRF questionnaire to the China team in Nanjing, China, April 2011

D. Soto, FAO

Discussing scores for the questionnaire with the Viet Nam team in Hanoi, Vietnam, February 2011

cell where for each question or statement related to the code provisions, members can rate FAO assistance.

The specific objectives of the pilot testing and training on the new questionnaire were: i) to assist countries in understanding the relevance of the Code and the importance of the reporting system for FAO member countries as a whole, for FAO and for the country as a self-evaluation tool; ii) to assist the country in consolidating a response team; iii) to test the value of the guiding manual intended to facilitate and clarify the responses; iv) to explore the use of the questionnaire as a self-assessment tool and v) to explore the use of the questionnaire to assess effectiveness of FAO technical assistance to the countries.

The training and testing exercises specifically required countries to nominate a CCRF response team. The team is constituted by the Government which gives the authority to respond to the questionnaire and to enable a reliable, accurate, comprehensive and speedy response. The team shall be composed of middle level management officers and technical specialists working in the government agencies in the key areas of the aquaculture provisions of CCRF including: policy and regulations, aquaculture management and development, aquaculture monitoring and data management, environment and resource use (land, water etc.), biosecurity and health management; food safety, and research and extension.

The testing and training was carried out in countries with a well-established aquaculture sector in different regions, for example, Brazil, Chile, China, Egypt, Nicaragua, Thailand, and Viet Nam, by a team from the Fisheries and Aquaculture Department of FAO.

The teams involved in the training and testing considered the exercise to be most useful. In most cases, the opportunity to form a team to discuss and reach an agreement on each question and provide an objective and participatory assessment of the sector was particularly acknowledged. Some countries specifically requested that due consideration be given to include members belonging to other institutions for their role in aquaculture development, provision of aquaculture permits, reinforcement of regulations, etc. In some countries, a suggestion was made to include a process that will assess the differences in the response at different levels so that a consolidated national response can be attained.

In general, all teams in pilot-tested countries indicated that the joint analysis and discussion on the responses provided an opportunity for a well-structured and critical review of the sector from the government's perspective. In one country, government authorities decided to include, representatives of the private sector within the team, which provided a very unique opportunity for public–private discussion and joint/participatory assessment of the sector. The exercise was reported and obtained full endorsement from the COFI/SCA VI in March 2012[3] and the global implementation of the new questionnaire will start in the next biennium.

[1] ftp://ftp.fao.org/docrep/fao/011/i0615t/i0615t00.pdf
[2] http://www.fao.org/docrep/013/k9426t/k9426t00.pdf
[3] http://www.fao.org/cofi/30793-0d1d5dba3d184480e5ef-0cb9c1bf6526e.pdf ,

Enhancing capacity on risk analysis as a decision-making tool for aquaculture development

Melba B. Reantaso

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Risk analysis (see box on page 15) is now widely applied in many fields that touch our daily lives. Governments and the private sector must often make decisions on a range of hazards, often with incomplete knowledge and thus a high degree of uncertainty. These hazards include, for example:

- chemical and physical stressors (natural disasters, climate change, contaminants in food and water, pollution, etc.),
- biological stressors (human, plant and animal pathogens; plant and animal pests; invasive species, invasive genetic material),
- social and economic stressors (unemployment, financial losses, public security, including risk of terrorism),
- construction and engineering (building safety, fire safety, military applications) and
- business (project operations, insurance, litigation, credit, etc.).

Such decisions may have far-reaching social, environmental and economic consequences. Thus, a pervasive but often unnoticed component of modern society, risk analysis is used by governments, private sector and individuals in the political, scientific, business, financial, social sciences and other communities in making decisions.

Why do we undertake risk analysis and when do we use it?

In simple terms, risk analysis seeks to answer 4 questions:

Risk analysis provides a structured means and consistent guide by which risks to or from a sector can be assessed and communicated in order to guarantee a uniform and transparent process of decision-making or regulatory control. The decision-making process needs to be consistent, repeatable, objective and with clear methodology so that information feeding into the decision making process and its use are transparent to stakeholders. The ultimate use of risk analysis is to identify decision options, including risk management options that may eliminate or ameliorate the adverse effects of that decision.

In aquaculture development, risk analysis is important in national and local planning process and provides useful input to policy development. It can be used in assessing risks to society (human health) or to the environment due to hazards created through the establishment or operation of aquaculture enterprises. Issues important to aquaculture proponents such as site selection (e.g. biological risks of pathogen outbreaks, predator impacts, biological introductions) and operational risks (including financial and social impacts) can be managed through the risk analysis approach.

Question	Component of the risk analysis process
What can go wrong?	Hazard identification Risk communication
How likely is it to go wrong?	Risk assessment (likelihood assessment through release and exposure assessment) Risk communication
What would be the consequence of it going wrong?	Risk assessment (consequence assessment and risk estimation) Risk management (risk evaluation) Risk communication
What can be done to reduce either the likelihood or the consequence of it going wrong?	Risk management (option evaluation; implementation, monitoring and review) Risk communication

The entire process includes risk communication and this is the step provides system integrity.
The first step of the process is a scoping stage where decisions have to be made ***before the analysis*** on the scope of the assessment, the endpoints of the assessment or the acceptable level of risk (ALOR) used to determine management action. These decisions influence the operating environment of the risk analysis.

FAO's efforts in capacity development on the application of risk analysis in aquaculture

While risk analysis can be a complex subject, with each aquaculture risk sector having its own methodologies and requiring its own specialized expertise, its application in aquaculture is gaining attention and receiving increased demand from governments, as expressed though request for TCPs and during session of the COFI Sub-Committee on Aquaculture.

For more than 15 years, FAO through the Aquaculture Service (FIRA) of the Fisheries and Aquaculture Department, has been assisting FAO Member countries in developing capacity to undertake risk analysis for decision making.

FAO was a partner (with APEC, NACA and the Government of Thailand) in introducing the concept and use of risk analysis for aquatic animal movements during the early 2000 with training provided for countries in Asia and Latin America. Since then, FIRA had developed normative programmes and field projects. One of the most significant of these was the FAO/NACA Expert Workshop on Understanding and Applying Risk Analysis in Aquaculture (June 2007, Rayong, Thailand) which produced a practical guidance and a unified overview of the application of risk analysis in seven aquaculture risk sectors (i.e. pathogen, food safety, genetics, ecological, environmental, financial and social risks). Under the technical cooperation programme (TCP) mechanism, a number of completed, ongoing and pipeline TCPs provide direct and indirect capacity development on risk analysis. These include country level training courses undertaken for the Republic of Marshall Islands, Federated States of Micronesia, Palau, Tonga (ongoing) and at the regional level involving southern Africa countries. Country-specific risk analysis was completed for Sri Lanka and most recently Cape Verde (see page 30 this issue of FAN) and FAO has also participated in risk analysis exercises initiated by other organizations (e.g. GIFT tilapia translocation to the Solomon Islands by the Secretariat of the Pacific Community).

Risk analysis is best learned by actual experience. In the conduct of training courses on risk analysis, FIRA's approach is to ask concerned countries to provide a translocation scenario that is then used as case studies during the training course. During the actual training, through a structured step-wise process, trainees are guided throughout the risk analysis process as applied in the analysis of ecological, genetic and pathogen risks using the particular translocation scenario provided by the governments.

Risk analysis is a process that provides a flexible framework within which the risks of adverse consequences resulting from a course of action can be evaluated in a systematic, science-based manner.

The approach permits a defendable decision to be made on whether the risk posed by a particular action or "hazard" is acceptable or not, and provides the means to evaluate possible ways to reduce the risk from an unacceptable level to one that is acceptable.

The concept of "risk" varies somewhat depending on the sector. Most definitions incorporate the concepts of:

- uncertainty of outcome (of an action or situation);
- probability or likelihood (of an unwanted event occurring)
- consequence or impact (if the unwanted event happens)

Risk analysis can be qualitative or quantitative.

Trainees are also encouraged to evaluate their national experiences with introductions and transfers of live aquatic animals, and to assess their current capacity, and any policy, legislative or technical improvements needed to effectively implement risk analysis for the safe movements of live aquatic animals.

FIRA will continue to provide these services as requested by FAO Members. The training courses and the various documentation output produced from both normative and field programmes will assist in facilitating the understanding and application of the risk analysis process in order to support FAO's goal of contributing to food and nutritional security through responsible and sustainable aquaculture development. These resources will also provide guidance to national competent authorities and others involved in the assessment and management of risks associated with the international or domestic moment of live aquatic animals in training professional staff in the planning and supervision of risk analyses and raising awareness and understanding among other stakeholders of the principles and methodology of risk analysis. The ultimate expectations will be that a core group of specialists at national and regional levels with wide experience in the fields of disease, genetics or ecology of aquatic animals should be able to successfully initiate risk analyses in a manner that incorporates best scientific knowledge, is transparent and includes adequate stakeholder consultation.

Emergency response to transboundary aquatic animal disease outbreaks

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The disease situation in aquaculture is changing rapidly in an unpredictable way due to the current period of rapid change in the international trading environment and globalization. Live animals are moved from place to place, country to country and region to region as broodstock, postlarvae, fry and fingerlings. This expanded and occasionally irresponsible global movements of live aquatic animals have been accompanied by the transboundary spread of a wide variety of disease agents that have caused serious damage to aquatic food productivity and resulted in serious pathogens becoming endemic in culture systems and the natural aquatic environment. The movement of aquatic animals has been recognized as a pathway for the introduction and spread of major trans-boundary aquatic animal diseases (TAADs). These TAADS are extremely important, dangerous and have caused serious disease outbreaks in almost all regions of the world during the past few decades with devastating impacts including direct production losses, therefore loss of food availability; direct and indirect impacts on income and livelihoods/employment; increased operating costs; restrictions on trade; impacts on biodiversity; loss of market share or investment; loss of consumer confidence, and in some cases, collapse of the sector.

Asia-Pacific, the dominant aquaculture region in the world has been facing serious threats from aquatic animal disease emergencies during the last few years challenging the sustainability of the sector with old and emerging TAADs. The use of specific pathogen free (SPF) stocks without appropriate risk analysis and stringent biosecurity also resulted to the introduction of exotic pathogens such as Taura syndrome virus (TSV) and Infectious myonecrosis virus (IMNV).

FAO is recognized by its members as having the technical competence to assist in aquatic disease epizootics and also in developing and mobilizing resources to support projects and programmes aimed at harnessing the two lines of defence against diseases: prevention and protection, as well as launching successful partnerships in the field of aquatic animal health, biosecurity governance and aquaculture health management.

FAO's aquatic disease emergency assistance to Members

During the last decades, emergency technical assistance was provided by FAO to many countries in several aquaculture producing regions. During the late 1980s and early 1990s, FAO assisted Asian governments in understanding and managing epizootic ulcerative syndrome (EUS) affecting fresh and brackishwater fishes. The period between 1990 and 2000 saw more assistance provided to Asian and Latin American countries, this time on shrimp disease epizootics (e.g. white spot disease or WSD, Taura syndrome and Yellowhead disease). In 2003, emergency assistance was provided on koi herpesvirus (KHV) in Indonesia and on EUS in Botswana in 2007. As a consequence of the assistance, two technical cooperation programmes (TCPs), i.e., a national TCP (TCP/INS/2905 *Health management in freshwater aquaculture in Indonesia*) and a regional TCP (TCP/RAF/3111 *Emergency assistance to combat EUS in the Chobe-Zambezi River* participated by seven countries bordering the river system) were implemented in affected countries to assist in understanding the disease epidemiology, establishing active surveillance and information systems and reducing the risk of further spread.

The Indonesian TCP resulted to the development of "Preparedness and response to aquatic animal health emergencies in Asia: guidelines". Capacities to implement some elements of these guidelines, e.g., risk analysis (see pages 14-15, FAN 49 this issue) and surveillance (e.g. NACA/FAO/OIE quarterly aquatic animal diseases reporting system[1]) are being established (at various levels) in different countries. The EUS TCP in southern Africa provided training opportunities for fisheries officials of the seven participating countries on EUS identification, field sampling, basic AAH and risk analysis, implemented a targeted surveillance for EUS and helped build

the capacity of a reference laboratory in the region. Countries now have a system for collecting field samples which can then be sent to a regional reference laboratory; awareness on biosecurity risks have been raised at all levels including fishers, fishfarmers and policy makers.

In July 2011, within the Crisis Management Centre – Animal Health (CMC-AH) framework, FAO investigated the 'unknown' shrimp disease mortality in Viet Nam and in December 2011, FAO also investigated the first time WSD outbreak in Mozambique. The recommendations resulting from the emergency response to the unknown shrimp disease in Viet Nam lead to the development of an emergency TCP (TCP/VIE/3303 *Emergency assistance to control the spread of an unknown disease affecting shrimp in Viet Nam*), currently being implemented which now includes resources to carry out systematic diagnostic assessment of this unknown disease and building capacity of Vietnamese officials on emergency response and shrimp farmers on on-farm best management and biosecurity practices. Another recently completed project facility, TCP/INS/3301 *Project formulation on Infectious myonecrosis virus emergency and contingency plan*, developed a national TCP proposal which is now under review and expected to be approved in 2012.

Lessons learned

We are still learning how to deal with aquatic disease emergencies. FAO's[2] emergency response activities to disease epizootics in aquaculture revealed ***the importance of:***

- ***national planning and coordination*** with aquatic animal disease emergencies and emergency preparedness – as a ***core function*** of an appropriately mandated institution with ***advanced financial planning and adequate allocation of other resources***;
- ***operational capability*** in terms of clear responsibilities for aquatic animal disease emergencies, contingency plans, legislation and enforcement;
- ***early warning*** by having advance knowledge of high-risk diseases, broad awareness of current disease situation of a country's trading partners and emerging disease situation world-wide;
- ***early detection*** through ability to rapidly recognize signs of a suspicious disease that has the potential to develop to an epizootic proportions and/or cause serious socio-economic consequences (by trained and experienced aquatic veterinarians, aquatic animal health and aquaculture professionals and practicioners); ability by Competent Authority to launch a rapid and effective disease investigation and access to laboratories with expertise and facilities for disease diagnosis;
- ***risk analysis*** within the context of contingency planning, for determining which aquatic resources are at a particular level of risk from aquatic animal imports for aquaculture and which control options can have the greatest chance for success or failure;
- ***disease surveillance*** on a regular and systematic basis provides a reliable picture of the health status of aquatic animal populations and tracking/traceability information for proactive disease reporting and rapid and effective response to disease emergence;
- ***early response*** which pertains to all actions (eradication, containment, mitigation) targeted at rapid and effective containment of, and possibly elimination of, an emergency disease outbreak aimed at preventing it from further spread and becoming an uncontrollable epizootic;
- ***contingency plans***, a documented work plan (with technical plans, support plans, and operational cazpability) designed to ensure that all needed actions, requirements and resources are provided in order to bring under control outbreaks of infectious diseases of significance to aquatic animal productivity;
- ***recovery from an emergency disease,*** that requires verification and international acceptance of proof of national disease freedom, and rehabilitation of affected farming and fishing communities to help rebuid socio-economic losses and re-establish lost markets;
- ***regional and international cooperation*** – rapid support from development agencies and scientific groups during a call for expert services, expert opinion, disease databases, diagnostic services and other resources for critical quick action to launch a timely and coordinated disease outbreak investigation are essential for a rapid response to an emergency disease situation;

Continued on page 27

[1] www.enaca.org; http://www.enaca.org/modules/wfdownloads/viewcat.php?cid=45

[2] Bondad-Reantaso, M.G., Sunarto, A. and Subasinghe, R.P. 2007. Managing the koi herpesvirus disease outbreak in Indonesia and the lessons learned. In Dodet, B the OIE Scientific and Technical Department (eds.): The OIE Global Conference on Aquatic Animal Health. Dev Biol (Basel), Basel, Karger, Vol. 29: 21-28; http://www.fao.org/docrep/009/a0090e/a0090e00.htm

A success story: establishment of the Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish)

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In the Central Asian and Caucasus Region, agriculture is one of the primary sectors of economic activity and income. National policy goals for fisheries, including aquaculture, are generally set within the context of rural and agricultural development policies. Although the contribution of fisheries to national GDPs is practically negligible, it provides food, income, and livelihoods, particularly at local level.

Inland fisheries and aquaculture production in the Central Asian countries (i.e. Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) experienced a dramatic decline since independence of these countries from the former Union of the Soviet Socialist Republics in the early 1990s, a transition period during which national economies and policies changed greatly. Despite the on-going efforts by the Central Asian countries to develop sustainable fisheries, a number of constraints and substantial restrictions still remain today. Governments from the region requested FAO, in 2008. to support enhancement of regional fisheries cooperation through the establishment of a regional fisheries management organization or other arrangement in the region. In response, the FAO Sub-regional Office for Central Asia (SEC) technically assisted a first intergovernmental meeting (November 2008) on this subject in Dushanbe and hosted by the Government of Tajikistan. The Dushanbe Meeting received follow-up from three Regional Intergovernmental Meetings (Trabzon, Turkey, June 2009 and November 2010 and in Cholpon Ata, Kyrgyzstan June 2011) and two Steering Committee meetings (Ankara, Turkey, March 2009 and Istanbul, Turkey, February 2010). Each meeting was attended by 7 to 12 official delegations representing the following States: Afghanistan, Armenia, Azerbaijan, People's Republic China, Georgia, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Mongolia, Russian Federation, Tajikistan, Turkey, Ukraine and Uzbekistan.

Having evaluated the various options for regional collaboration available, the countries requested in July 2009 the FAO Director-General to support the establishment of a new article XIV body under the FAO Constitution. The eighty-eighth session of the Committee on Constitutional and Legal Matters (CCLM) reviewed in September 2009 the draft Agreement on the Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish) as endorsed by the Trabzon meeting (June 2009) and forwarded it for approval by the FAO Council at its Hundred and Thirty Seventh Session. The Agreement was approved by the FAO Council on 1st October 2009 and was sent by the Director General in December 2009 to the above mentioned countries and Turkmenistan. CACFish is the first Regional Fisheries Management Organization in the region dealing with both Regional "Fisheries and Aquaculture" issues.

In 2010, the Governments of Tajikistan, Kyrgyzstan and Armenia have deposited their instruments of acceptance of the Agreement with the Director-General of FAO. The Agreement on the Central Asian and Caucasus Regional Fisheries and Aquaculture Commission came into force on 3 December 2010. Following Turkey's membership to the Commission in December 2011, the number of CACFish Member States has increased to four.

The Inaugural Session, held in Istanbul, Turkey from 19 to 21 December 2011, encouraged Afghanistan, Azerbaijan, China, Georgia, Islamic Republic of Iran, Kazakhstan, Mongolia, Russian Federation, Turkmenistan, Ukraine and Uzbekistan to expedite their national processes of acceptance.

The following factors played a great part in the notable success of establishment of the CACFish:

- well-designed and well-managed establishment process;
- active involvement of the future member States in that process and the functional and synchronized cooperation between FAO and States during the initiative;
- the strong support provided by the Central Asia Regional Programme for Fisheries and Aquaculture Development" (FishDev-Central Asia), an on-going programme under the FAO-Turkey Partnership Programme;
- backstopping assistance and guidance provided by FAO to governments involved in the establishment process with regard to establishment process of the Commission, including the drafting of basic legal texts and a 5-year work programme of the Commission, and
- awareness raised, on the importance of regional fisheries and aquaculture management, through capacity building activities during the preparatory works for the establishment of the Commission.

At its Inaugural Session, held in Istanbul, Turkey, from 19th to 21st December 2011, CACFish adopted the Rules of Procedure of the Commission, the Financial Regulations of the Commission, the administrative budget for the first financial period, the scheme and scale of contributions to the administrative budget, a Five-year Regional Work Programme (2011 - 2015) and the acronym and logo of the Commission.

CACFish also adopted the following scientific and technical recommendations: 1) Guidelines for Sturgeon Hatchery Practices and Hatchery Management for Release; 2) Recommendations of the Regional Study on the "Feasibility of Restocking and Culture-based Fisheries in Central Asia"; 3) Better Management Practices for Carp Production in Central and Eastern Europe, the Caucasus and Central Asia; and 4) Conclusions and Recommendations of the Regional Workshop on Fishery and Aquaculture Statistics, Information, and Trends: Improving Data Collection, Analyses and Dissemination.

CACFish aims to build and strengthen regional capacity for inland fisheries and aquaculture development in its competence area, relying on regional cooperation. Regional fisheries cooperation in the Central Asian and Caucasus region is becoming more visible through the strengthened cooperation. CACFish is expected to increase its positive role in the development of regional governance frameworks for fisheries and aquaculture in the Central Asian and Caucasus region.

H. Fersoy, FAO

The Inaugural Session had high participation from 15 States, FAO and invited regional organizations

At present CACFish experts are working with FAO on the following technical recommendations for endorsement by the 2nd Session in 2012.

1) Strategy for responsible introductions and transfers of fish in Central Asia and the Caucasus
2) Procedures for Environmental Impact Assessment (EIA) for aquaculture in Central Asia and the Caucasus;
3) Guidelines for the construction of fish passages for dams on fish migration routes; and
4) Sturgeon Manual(s).

More information about CACFish can be found at the website: http://www.fao.org/fishery/rfb/cacfish/en) and can be obtained from:

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Sustainable development of the aquaculture sector from a postharvest perspective with focus on quality, traceability and safety TCP/RER/3301 (D)

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The major goal of this regional TCP/RER/3301 project involving Albania, Croatia, Montenegro and Turkey, is to improve the capacity of aquaculture and fish processing sectors in these countries to meet international market requirements. The project was taken up in response to the request from these countries and in recognition of the increasing contribution of aquaculture to fish production in the region. Considering the varying levels of sectoral development in these countries with respect of meeting international market requirements, a regional project was formulated to provide opportunities for sharing experiences. EUROFISH, an intergovernmental organization in the region, is a partner in the implementation and responsible for organizing regional and national training workshops and disseminating the project outputs.

I. Karunasagar, FAO

Seabream processing, Turkey

The Project Inception Workshop, held in Zagreb, Croatia, during March 3-4, 2011 and attended by National Project Coordinators from the participating countries and representatives of EUROFISH, reviewed the work programme of the project and identified, action points, responsibilities, timelines. The next step in the implementation was the assessment of the current status of aquaculture, fish processing and marketing in the countries where two national consultants (one on fish quality, safety and another on fish marketing) from each of the participating countries performed this assessment and identified the training needs. The national assessment reports are important outputs of the project, useful for not only this project, but also to guide other interventions by government or donors to improve this sector in the countries involved in this project.

Based on the training needs identified in national assessment reports, two national training workshops each were organised in Croatia and Turkey.

The first national workshop in Croatia on "Food safety management in carp farms and processing" held in Daruvar, the region with highest production of freshwater fish in Croatia, in October 26-28, 2011, was jointly organised by FAO, EUROFISH and Ministry of Agriculture, Fisheries and Rural Development (MAFRD) of Croatia. There were 34 participants representing farmers, processing companies, and local veterinary inspectors. The main topics discussed were the EU hygiene package, general requirements for export of fish to the EU with a focus on live fish and market for carps in Europe, good aquaculture practices,

use of veterinary drugs, principles of HACCP and application in fish processing. The training included practical visits to a carp farm and a fish processing plant.

The second workshop, held in Zadar from 8-10 May 2012, and organised by FAO, EUROFISH and MAFRD focussed on fish produced by marine aquaculture, mainly seabass and seabream to support Croatia's desire to promote this sector with a view of reaching the EU market. This was attended by 23 participants representiing fish farmers, processing companies, universities, local government and administration, the workshop provided the Croatian marine aquaculture industry sector with the latest information on the aquaculture status in Europe, communication and promotion of fish in the European market, new products and niche markets for seabass and seabream; the requirements for export of fish and fishery products to the EU; certification, traceability, health management and food safety; best aquaculture practices in seabream and seabass, Croatian fish consumer preferences, labelling of fish products and importance of producer organizations.

A visit to "Cromaris" the leading Croatian company specialized in farming and processing of seabass and seabream as well as farming of shellfish was also made. Cromaris (http://cromaris.hr), is a group of companies, that offers gutted fish, smoked and marinated seabass and seabream deli fillets as an exclusive range of delicacies, and Mediterranean equivalent to the Norwegian smoked salmon and the Japanese sushi. Over half part of the production is exported to the European markets, while the rest is distributed to the Croatian market.

In Turkey, two workshops were organized: one held in Bodrum, 13-16 February 2012, and attended by 59 participants representing farmers, processing companies, national universities, local inspection services, promotional authorities and co-organized by EUROFISH and the Ministry of Food, Agriculture and Livestock (MFAL) of Turkey. In addition to exposing participants to EU market requirements for aquaculture products, the presentations covered EU hygiene package, traceability, regulatory and non-regulatory certification requirements and an overview of the Turkish Government and industry response to these requirements for EU market. The field visit covered the following enterprises: Skretting Feed Producing Factory, Marenostro Fish Processing,

I. Karunasagar, FAO

Marine fish-hatchery, Croatia

Fjord Marine Packing House, Nordzee Fish Processing & Packing House, Gümüsdoga Fish Farming and Kilic Holding. The second workshop, held in Cesme during 17-19 April 2012 and was attended by 37 participants from both government and private sector. Presentations included aquaculture certification standards and case studies form the EU, compliance with EU regulations and implementation of traceability in aquaculture, good hygiene practices and HACCP application in the seafood supply chain, diseases and use of veterinary drugs in compliance with EU regulations and sanitary control management. EU market perspectives were presented by EUROFISH. Two interesting field visits were made to a blue fin tuna farm which is part of the Akua Group (www.akua-group.com) and a state-of-the-art seabss/seabream processing facility (www.moreaquaculture.com) both located in the Izmir Region .

All presentations made during the above workshops have been posted in the EUROFISH website: http://www.eurofish.dk/.

Forthcoming activities in the project include a joint training workshop for Albania and Montenegro on bivalve mollusc marketing requirements, to be held in Sarande, Albania towards the last week of June, 2012. There will be regional workshop in Turkey during the last quarter of 2012 to enable countries to share experiences and the lessons learnt.

Sixth Session of the Committee on Fisheries Sub-Committee on Aquaculture

Opening ceremony

Honourable Minister of DAFF South Africa, T.M. Joemat-Pettersson

Dr Ababouch, FIP director

Sri Lanka

Cameroon

India, Guinea

Malaysia, Ecuador, Madagascar

Cape Town, South Africa, 26-30 March 2012

Plenary hall 1

Plenary hall 2

Thailand

Chile, Brazil

Session on assessing and monitoring the aquaculture sector performance

Special event on genetic resources and technologies in aquaculture development

Session of the Commission on Inland Fisheries of Africa (CIFA)

Plenary hall during the CIFA

Honourable ministers of Bangladesh, Sri Lanka, and deputy minister of Namibia

Dinner table

South Africa

Abalone farm

Trout hatchery

Trout fingerlings

Panorama from the top of Table Mountain

France, Germany, Chile

Côte d'Ivoire

Bangladesh

Giving a toast at dinner

Thailand, Indonesia, South Korea

China

Secretariat (FAO and South African government)

Pacific Aquaculture Project Updates: TCP/PAL/3301 Project and New TCP/TON/3401 Project

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M. Izumi, FAO

Stakeholder consultation meeting in Palau on 28 February 2012

TCP/PAL/3301: National consultation on the establishment of a Sub-Regional Aquaculture Network in Micronesia

A series of events and activities lead to the development of the above TCP. These include the informal meeting on aquaculture in the Pacific on 23 September 2010 (FAN 46, pp. 4-7) held in conjunction with the Global Conference on Aquaculture 2010 in Phuket, Thailand, the 9th Meeting of the FAO South West Pacific Ministers for Agriculture in Va'vau, Tonga, in April 2011 (FAN 47, pp. 30-31), the Regional Scoping Workshop which developed a Pacific Aquaculture Regional Cooperative Programme, in Nadi, Fiji, 11-14 October 2011 (FAN 48, pp. 22-23), the informal consultation among delegates from the Micronesian countries and Guam immediately after the Regional Scoping Workshop, and a mission to Nauru under the TCP/NAU/3301, 17-21 October 2011, to consult with the concerned Government authority regarding the subject (FAN 48, pp. 24-25).

Under the project, the Palau and Guam missions were carried out by FAO between 24 February - 03 March 2011. The last of a series of regional and national activities directly related to or associated with the proposal to establish a sub-regional aquaculture network in Micronesia of the Pacific, the missions accomplished the following:

- The Palau mission reported on the progress of the initiative to establish the sub-regional aquaculture network, and consulted with the stakeholders on the establishment of the sub-regional aquaculture network and the Government on the possibility of Palau hosting the coordinating unit (Secretariat) of the network. The Government of Palau indicated strong interest in hosting the Secretariat;

- The Guam mission also reported on the progress and conducted stakeholder consultations. In addition, the mission consulted with the Government on the feasibility of hosting the Inception Workshop of a regional TCP project, for which the government and stakeholders had shown strong interest. The visit to R&D facilities, projects and farms revealed the good technical assets and capacities that Palau and Guam could be shared through technical cooperation and networking under this future sub-regional aquaculture network.

The above findings reinforced the results of the questionnaire survey, including the outcomes of the above-mentioned associated activities. Overall, there is now a strong justification for a regional TCP project to initially support the establishment of a functional and autonomous sub-regional aquaculture network in Micronesia is now in place.

TCP/TON/3401: Risk assessment in aquaculture Development in Tonga

The above TCP facility project on risk assessment in aquaculture development, formulated and approved in March 2012, is the latest addition to the series of FAO field activities in the Pacific aimed at further strengthening national capacities on risk analysis and risk management for movements of live aquatic animals. Similar activities have been undertaken in Palau (TCP/RAS/3208) in 2007, in Marshall Islands in 2008 (TCP/MAS/3201) and in the Federated States of Micronesia in 2010 (TCP/MIC/3201) in 2010. The current project will assess the current status of national aquaculture development, particularly with regards to species introductions and transfers and the movement of aquatic species in Tonga, and improve national capacities through a national training/workshop on risk assessment. It is intended that the national training/workshop, to be implemented during the second half of 2012, will make use of a training manual entitled "Introductory Training Course on Risk Analysis for Movements of Live Aquatic Animals" recently published under TCP/MIC/3201 (FAN 48, p. 25).

M. Izumi, FAO

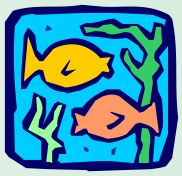
Stakeholder consultation meeting in Guam on 1 March 2012

Further information can be obtained by e-mail to Masanami.Izumi@fao.org.

Continued from page 17

- ***detailed documentation*** through a thorough "post-mortem" review while events are still fresh in people's minds;
- ***empowering farmers to manage disease and other risks*** – fish farmer's ability to deal with day-to-day situations in farms is crucial to preventing, controlling and even eradicating serious disease. Empowering them with information and tools such as better aquaculture management practices or simple and practical biosecurity measures at farm level are all essential in understanding the disease situation at the farm level. Education of farmers and hobbyists on good health management is the key to disease prevention and early warning/reporting is the key to minimize disease spread;
- ***strong national commitment from concerned authorities.*** Diseases do matter and it requires major response by the government. The credibility of the government/country is at stake and failure to control will be a major risk. Maintaining alertness and vigilance are essential.

Diseases can disrupt the sector, international trade and food supply but the impacts go beyond these as it has social and financial consequences as well, and in some cases, may have human health issues. No amount of effort can eliminate the risk of danger from diseases. Aside from the technical challenge, the other challenges in dealing with disease control are resource management, public relations, communication, information management and endurance challenge. Dealing with disease emergencies, as experienced from major terrestrial animal disease emergencies require the following: (a) speed of response, decision-making and action; (b) systems of management, of information and of communication; and (c) good science. These are all applicable to aquatic animal disease emergencies.



Building trade capacity of small-scale shrimp and prawn farmers in Bangladesh: investing in 'bottom of the pyramid' approach

Rohana Subasinghe and Koji Yamamoto

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The Standard Trade Development Facility (STDF)-funded project "Building trade capacity of small-scale shrimp and prawn farmers in Bangladesh: investing in 'bottom of the pyramid' approach" is aimed at filling the gaps in existing assistance to the Government of Bangladesh related to sanitary and phytosanitary measures, and particularly in developing effective "bottom of the pyramid" solutions for enhanced compliance with the World Trade Organization's Sanitary and Physosanitary Agreement (WTO/SPS Agreement) and related Codex Alimentarius and OIE (World Animal Health Organisation) standards. The project will build on lessons learnt from India and Indonesia and help facilitate the transfer of relevant experiences to Bangladesh to reduce the risks of antimicrobial contaminants in cultured shrimp and prawn products and empower small-scale farmers and the farming sector towards better management practices (BMPs).

Shrimp aquaculture in Bangladesh

China being the biggest producer and along with seven other countries in the Asian region are among the top ten-ranked aquaculture producers in volume and value. Bangladesh is one of six countries in the region that have attained a production level of more than 1 million tonnes a year.

Shrimp and prawn are high-value global export commodities and significant to Bangladesh, being the second most important export commodity of the country next to textiles. In 2009 (see Figure 1), Bangladesh produced 71 607 tonnes of shrimp and prawn products, with 58 163 tonnes, valued at 440 million USD exported mainly to the European Union (EU) and the United States of America (USA) (FishStats Plus 2010[1]). Only a small volume of shrimp and prawn products are consumed in the country.

The shrimp sector provides employment for approximately 600 000 people of which 36 percent are female. In the processing segment of the shrimp value chain, 62 percent are female, and 90 percent of casual workers are female as well. Given these figures of women participating in the farming sector, the project can be expected to have positive impact through women empowerment that could lead to growth in rural household incomes and prosperity.

The majority of Bangladesh shrimp and prawn production exported to the EU and the USA comes from small-scale farmers who are unorganised, not well informed and vulnerable. Individually they do not have the capacity to implement good biosecurity measures and BMPs that are needed to sustain good harvests. Farmers regularly encounter disease and health-related problems. Because of the above situation, farmers tend to find quick-fix solutions, using antimicrobial treatment. As a consequence, residues of banned antimicrobials and other substances accumulate in the shrimp and prawn products and get rejected at importing country borders, resulting in loss revenue and livelihoods for a large number of small-scale farming communities.

F. Corsin

Small-scale shrimp farming in Bangladesh

Bangladesh is a member of the FAO, the OIE, the World Health Organization (WHO) and the World Trade Organization (WTO). Bangladesh is obliged to report to OIE on the occurrence of aquatic diseases listed in the OIE Aquatic Animal Health Code. Bangladesh is also obliged to have measures in place to comply with the FAO/WHO Codex Alimentarius food safety, consumer protection and fair trade practices and guidelines as well as other requirements by its trading partners. Under the WTO SPS Agreement, Member countries are encouraged to use international standards, guidelines and recommendations where they exist.

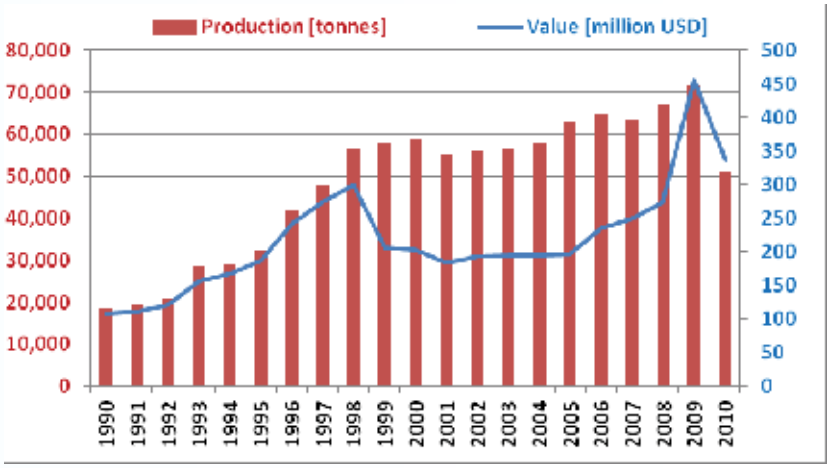
While not a standard-setting organization, FAO develops technical guidelines in its areas of competence (e.g. Code of Conduct for Responsible Fisheries and the supporting technical guidelines) and provides technical assistance to its Members in complying with obligatory treaties and their implementation including voluntary guidelines.

Project goals

The government of Bangladesh is committed to improve food safety standards of aquatic products destined for domestic and international markets and considerable measures have been taken to improve policy, legal frameworks and laboratory testing and monitoring procedures. To support this commitment, the project has the following outputs:

- detailed value chain analysis is completed;
- small-scale shrimp and prawn farmers organized into registered clusters;
- BMPs for reducing the risks of diseases in shrimp and prawn aquaculture developed;
- web-based traceability system developed and pilot tested;

Figure 1. Shrimp aquaculture production and value in Bangladesh



- clusters of small-scale farmers gained skills and knowledge to apply BMPs; and
- project results and lessons learnt disseminated.

This STDF project will attempt to primarily improve the farm management knowledge-base at the grass-roots level targeting thousands of small-scale aquaculture farmers through training on better farm management, better shrimp health management and responsible use of veterinary medicines.

The project also has a strong policy component that will assist the Competent Authority to improve and enhance compliance capacities to WTO SPS Agreement, Codex Alimentarius food safety guidelines and OIE aquatic animal health standards. The project is also designed to improve the sustainability of the shrimp production sector by linking farmers with policy makers and all players in the value chain and strengthening public-private-partnerships (PPPs) for productive and long lasting outcomes.

This three year project is expected to be operational in July 2012.

F. Corsin

Small-scale shrimp farming in Bangladesh

[1]FAO Statistics and Information Service of the Fisheries and Aquaculture Department. 2012. Aquaculture production 1950-2010. FISHSTAT Plus - Universal software for fishery statistical time series. Food and Agriculture Organization of the United Nations. Available at: http://www.fao.org/fishery/statistics/software/fishstat/en

Tilapia and tuna: risk analysis of introducing tilapia into Cape Verde

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Background

The Technical Cooperation Programme project (TCP/CVI/3302), Aquaculture Planning and Piloting in Cape Verde (CV) seeks *inter alia* to develop pilot initiatives and support the development of aquaculture projects. One potential area is producing juvenile tilapia to be used as live bait in the pole and line tuna fishery. During the tuna season in CV (April to November) a shortage of locally available live bait forces fishing boats to travel 800 km to Senegal to purchase live fish to use as bait. Tuna boats spend ~50 percent of their time buying bait instead of fishing. This practice burns fossil fuel, targets juveniles, reduces fishers' safety at sea and introduces fish of unknown species and health status into the waters of CV. Thus, local culture of juvenile tilapia could be one alternative.

However, there are risks of introducing tilapia. Although there are very limited freshwater resources in CV (Figure 1) and a limited continental shelf, there are abundant marine fisheries that support the people of CV. The tilapia used for tuna bait need to be salt-tolerant so they can survive in salt-water bait-wells on board the fishing boats. Therefore, there is a risk of salt-tolerant tilapia escaping and adversely impacting the living marine resources that support the people of CV.

Risk analysis

To conduct a risk analysis, a six person team (composed of specialists in the field of aquaculture, genetics, pathogens, aquatic ecology and socio-economics) visited CV, conducted consultations and followed the guidance of the ICES Code of Practice on Introduction and Transfers into the Marine Environment and elements of the FAO Precautionary Approach. The specific use of tilapia to be assessed was as bait in the pole and line tuna fishery; farmed tilapia of ~12 g would be used as bait. In presenting the risk analysis to the Government of CV, it was important that a common terminology was used. The team provided the following definitions and concepts:

- ***Hazard*** *refers to an event that has the potential to produce harm.*
- ***Harm*** *refers to undesirable consequences to humans and the things that they value.*
- ***Risk*** *refers to the likelihood of harm occurring from a specified hazard or set of hazards.*
- A useful conceptual example is air travel: the **hazard** is an airplane crashing; the **harm** is loss of human life; however the **risk** is low and very acceptable because the **likelihood of harm occurring**, i.e. crashing, is very low due to risk mitigation and reduction measures taken by airlines and governments.

The team determined that introducing a salt-tolerant strain of tilapia presented a 'medium' level of risk to the environment of CV. It is certain that tilapia will enter the marine environment, however the chance of them breeding and spreading is very low, although it is not 0. Medium risk indicates significant risk and mitigation should be pursued.

Figure 1. Cape Verde is extremely arid with limited freshwater and limited coastal shelf area where tilapia could survive

Table 1. Ecological Risk Mitigation – reducing the chance of harm

Risk mitigation actions – pre-border	Monitoring	Reference point	Contingency plan if reference point is passed
Import all male juveniles	Check sex ratio on fish to be imported	>95% male	Contact supplier; change supplier
Health certification from supplier	Check for presence of pathogens; check on status of supplier	0 occurrence of 'notifiable' diseases from OIE standards	Contact supplier; change supplier; notify authorities that supplier has pathogen
Risk mitigation actions – post-border at aquaculture facility			
Hormone treatment to sex reverse females	Check sex ratio of fish in culture	99% males	Improve hormone treatment
Biosecure facility at University or National Institute for Fishery Development	Establish baseline of species composition in marine environments	n.a.	n.a.
Produce guidelines and educate farmers on better management practices (BMPs)	Establish routine fish health programme and management	0 level of 'notifiable' pathogens – specifically EUS	Stop importation; kill all fish; quarantine facility
Improve capacity for environmental monitoring and assessment	Water quality of aquaculture effluent assessment of hormone, antibiotic residue	Levels based on national legislation and BMP	Review and change management or water treatment practices to achieve desired levels;
	Assess carrying capacity (K) of reservoirs to support tilapia culture by modeling studies and field sampling	Inputs from all sources > K (carrying capacity of environment)	Reduce inputs to < K
Establish and/or make known relevant legislation and policies	Talk to fishers and aquaculturists	Stakeholders aware of legislation	Increase education and awareness programme
Risk mitigation actions – post-border on tuna boats			
Educate fishers and produce guidelines	Check for presence of tilapia in artisanal fish catch	0 adult tilapia in catch	Stop programme
Identify responsible fishers for project	Check for presence of tilapia in local oceanic environment	0 tilapia <12g in catch Any tilapia >12g	Stop programme Review procedures, improve containment and increase monitoring
Establish or make known relevant legislation and policies	Talk to fishers and aquaculturists throughout fishing season	Majority of stakeholders aware of legislation	Increase education and awareness programme

Several mitigation measures, target and limit reference points, monitoring and contingency measures, i.e. elements of the precautionary approach were identified (Table 1) that were judged by the team and those who participated in the discussions as providing an acceptable level of risk. Reference points and contingency plans are crucial elements of realistic risk analyses, and necessary for the implementation of pilot programmes such as the development of tilapia culture in CV.

The above analysis only considered *ecological risk analysis*. Economic analyses indicated that farmed tilapia would be economically attractive to tuna fishers. The cost of purchasing live bait from Senegal was reported to be ~€8.21/kg. The industry requires 600 tons of live bait for the fishery and a fully operational aquaculture enterprise is expected to meet 50 percent of this demand.

C. Ferreira Santos, PPI/INDP Cape Verde

Tuna boats would use juvenile tilapia as live bait in a pole and line fishery

Bangladesh: Seed and feed production and management

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In 2012, FAO has started implementing a TCP facility project (TCP/BGD/3301) on identification and understanding of key technical, economic and social constraints to seed and feed production and management in Bangladesh. As a part of this project, an FAO field mission was undertaken in the country during 16-29 April 2012. Prior to this field mission, two field surveys on the status and constraints of the aquaculture seed and aquafeed sub-sectors were conducted during January – March 2012. The purpose of the FAO mission was to collect further evidence of and verification for the information revealed by the two surveys through in depth unstructured interviews and focus group discussions with the different players in the seed and feed supply chain, through site visits to projects, facilities and farms in the aquaculture-rich districts of Mymensingh, Jessore, Khulna and Bagerhat. The mission identified or confirmed technical, economic and policy related constraints in both industries. These impacted in various ways on the quality of the products – seed and feed – and their efficient utilization by farmers. Inefficiencies along seed and feed supply chains were identified. The provisional recommendations of the mission are as follows:

a. To improve seed quality

- A selective breeding programme for the important farmed species/species groups to be developed and implemented that will entail the collection and maintenance of pure lines, genetic quality assessment, maintenance of pedigree records.
- The Fish and Shrimp Hatchery Act provides for hatchery registration and certification which should be accompanied by a certification standard for processes and a Hatchery Best Management Practice Guidelines.

b. To improve aquafeed quality

- Necessary guidelines and technical support to be provided to implement the Fish Feed Act. The guidelines could be developed through a national consultation process lead by Bangladesh Department of Fisheries (DOF).
- The registration of farm-made feed producers and small-scale commercial feed manufacturers, as the Feed Act provides, should be accompanied by a programme to help them improve their production efficiency and improve quality of their product. The supporting public utilities to improve operational efficiency include a reliable power supply and better transport system.

c. To improve capacities of farmers to efficiently utilize feed

- Develop and promote the adoption of better management practices that include proper storage and handling to preserve quality of feed, better feeding and feed management.
- Linked strongly to efficient use of feed is quality and healthy seed, which supply should be assured.
- Farmers should be encouraged to organize in clusters or associations for better uptake of better management practices.

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M.Hasan, FAO

Carp fry are being transported in a drum, Jessore, Bangladesh

Mongolia: Diversifying people's diet through developing aquaculture and improving fisheries management

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Mongolia is a land-locked country with harsh natural environment and limited inland water resource. Traditionally, the Mongolian people entirely depend on livestock, dairy and poultry for their animal protein food. With economic development, the diet habit of Mongolians changed gradually. More and more people start to eat fish. The Mongolian Government has envisaged the importance of providing more fish to the people as a way to diversify their diet for better health. However, due to very limited production (entirely based on natural catch from declining resources), the average fish consumption is only 0.2-0.3 kg per capita. Diversification of people's diet, particularly increasing people's fish consumption, is one of the national priorities on food security and nutrition. The government is eager to boost its domestic fish production through developing aquaculture and improving fisheries management in the country.

On the occasion of a meeting with the Director-General of FAO during a visit to Rome in September 2011, the Mongolian President made a request for FAO assistance to help in starting aquaculture and improving inland capture fisheries management. During the visit of FAO Assistant Director-General for Asia and the Pacific to Mongolia in November 2011, the Prime Minister and Minister of Food, Agriculture and Light Industry (MoFALI) reiterated the request for timely FAO technical assistance to the country.

As an immediate response to the above request, a joint aquaculture and fisheries project feasibility study mission by FAO officers from FAO/RAP and FAO/HQ was carried out between 28 November and 3 December 201. The mission had extensive meetings and discussions with the different authorities and private stakeholders in the country, including high level government officers (Parliament Member, MoFALI and Ministry of Natural Environment and Tourism (MNET), educational and research institutions (Academy of Agriculture Sciences and State University of Agriculture (SUA)), NOGs (Water Association and Taimen Conservation Foundation), and the United Nations Development Programme. The mission was much impressed by the strong government political will and commitment and public interest to increase the fish production in the country that will improve the diet composition of the people. The information collected from visits to potential aquaculture sites and fish market and received from the relevant stakeholders, the mission concluded that it is necessary and possible to increase the fish production in the country. It was agreed that the Mongolian government would request a FAO TCPF to assist the country in developing a full TCP project and a framework of UTF/donor-unded project for establishing infrastructures and facilities for aquaculture and improving fisheries management and building capacities in the country.

Through a TCP facility, FAO fielded a project development mission in May 2012, composed of two FAO aquaculture/fisheries resource officers and two consultants. The mission had a number of meetings and in depth discussion with MoFALI, MNET, SUA, Institute of Geoecology, NGOs and private entrepreneurs concerning the aquaculture /fisheries projects to be developed and visited a number of potential aquaculture sites and small hatcheries for fish stock enhancement purpose.

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M. Weimin, FAORAP

The mission visiting the potential aquaculture site near Ulan Bator

Oman: Sustainable aquaculture development

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With their extensive coastline and rich marine resources, the Sultanate of Oman is now embarking on an ambitious programme of sustainable aquaculture development. FAO has provided strategy and technical assistance in the past years, mainly in the field of aquaculture. As part of their development programme, an international conference on "Sustainable Aquaculture Development in the Sultanate of Oman – Investment Opportunities" was held in Muscat in December 2011 with the main purpose of alerting would-be investors of the investment opportunities for aquaculture in the country and providing the legal and support framework for aquaculture development. Thirteen key speakers, many of which recommended by FAO, were invited and fully sponsored to attend the 2-day conference.

The presentations covered: Oman's marine resources and biodiversity; Global demand for seafood; Regional status of aquaculture; International case studies of aquaculture development; Site availability, candidate species and faring systems; Application of best management practices; Training, research and support services; The legal and regulatory framework; Proposal submission and appraisal methods; and Oman's investment climate, agencies and incentives.

The overall message was one of optimism for the development of the sector. However, a significant sense of realism was evident, recognizing the inherent risks associated with aquaculture investments around the globe. Discussions with some investors indicated their desire to invest in the sector, but also expressed a need for more technical understanding of aquaculture so that they could quantify the risks particularly related to finfish cage aquaculture rather than shrimp or tilapia farming. For many investors from Oman and the region, this was a new direction for their investment portfolios.

At the event, the Ministry and Agriculture and Fisheries Wealth presented and released the official "Investment Guidelines for Aquaculture in the Sultanate of Oman" (these can be downloaded from the Web site of the Ministry http://www.mofw.gov.om/LinkClick.aspx?fileticket=s%2fZxo7oICu0%3d&tabid=630). There is, however, an expressed recognition that the Ministry needs further support to help drive this aquaculture development initiative to fruition and hence the development of a unilateral trust fund agreement on fisheries and aquaculture is under discussion and consideration.

V. Crespi, FAO

Lined earthen pond for Nile tilapia on-growing in the Jordan Valley (see article page 36)

Jordan: Project formulation mission for the improvement of fish aquaculture production TCP/JOR/3401

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Following an official request for technical assistance by the Ministry of Agriculture of the Kingdom of Jordan, Mr A. Lovatelli and Mr V. Crespi undertook a field mission last April to identify the developmental constraints affecting the aquaculture sector. The objective of the mission was to gather information on the status and potential of the sector, meet the relevant authorities and visit potential farming areas and ongoing commercial projects. The mission engaged a wide range of stakeholders including government officials, researchers and entrepreneurs to identify and agree on actions needed to strengthen the aquaculture sector and to increase fish supply.

Several critical factors limiting inland aquaculture development were identified. These included limited water resources, irregular supply of high quality fingerling, poorly performing carp and tilapia breeds, high costs of imported feed and low quality of locally-produced feed, poor fish farm management and inadequate extension activities. Also the typically dry and arid conditions throughout much of year with high temperature fluctuations and sandy soils further restrains the development of the sector. In terms of marine aquaculture, the developmental opportunities are limited due to the short coastline in Aqaba and general environmental concerns regarding possible negative effects on the coral reefs.

V. Crespi, FAO

Valerio Crespi (left) and Alessandro Lovatelli (right) are interviewing a fish farmer, Mr Ziad Atalla at his fish farm

Jordan's annual per capita fish consumption is at 4.6 kg, low compared to the rest of the world and in the region as a whole. The capture fisheries sector supplies an annual production of 200 tonnes (2010). The fishing fleet includes 60 small-sized fibreglass or wooden boats with a length ranging from 2.5 to 9 meters fitted with outboard engines. The annual production from inland fisheries, mainly from the Jordan River, is estimated at around 350 tonnes (2010).

The first commercial aquaculture projects started in the 1980s mainly along the Jordan Valley, but the limited water resources and lack of know-how have restricted the development of the sector. Freshwater aquaculture, based on tilapia and the common carp, is carried out by 24 aquaculture farms producing annually 550 tonnes of fish (2010). In addition, along the Jordan Valley there are an estimated 5 000 irrigation ponds that could also be used for farming fish.

Currently, the yearly fish production does not satisfy the national demand and hence approximately 20 000 tonnes of mainly fresh and frozen marine fish are imported annually. At the national level, the lack of quality seed and feed impedes the supply of additional fish from farming operations with poor know-how on farm management, fish reproduction and feeding affecting the overall efficiency of current aquaculture operations. On the positive side, much of Jordanian water resources including irrigation ponds, dams, perennial rivers and groundwater are underexploited in term of fish production and offer great potential for the development of the sector.

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Chad: Support to the elaboration of an Aquaculture Development Plan TCP/CHD/3302

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This TCP supports the implementation of the National Strategy for Aquaculture Development adopted by the country in 2010. The project, under the responsibility of the Ministry of Environment and Aquatic Resources (MERH), is seeking to demonstrate the potential of aquaculture and to elaborate an Aquaculture Development Plan that will guide all stakeholders' actions to capitalize on the country's resources and bring about the benefits of fish farming to its citizens over the next few years.

Although aquaculture is in its infancy in Chad, the project has the strong support of the Minister himself. High potential zones have been identified and a small group of motivated farmers is currently supported by the project to pilot three fish production systems: integrated rice-fish, pond rearing of clarias and tilapia, and enhanced management of the fisheries of a quarry (mix of species) through stocking. Enhancement of spirulina production (locally known as *dihé*) through culture around Lake Chad is also targeted and aims to strengthen the results of a recent European project that had focused on the marketing of the collected algae.

The project has built synergies with national institutions involved in aquaculture such as the Special Programme for Food Security (SPFS/PNSA) and the Economic Community for Livestock, Meat and Aquatic Resources (CEBEVIRHA), notably regarding the production of fingerlings. Strong emphasis is also being placed on capacity building: numerous workshops involving farmers and government agents have taken place with the support of national consultants and South-South experts, raising awareness and improving knowledge on production and business management practices.

C. Brugere, FAO

Women fishing in a natural quarry targeted for fisheries enhancement

The project is due to end in the autumn 2012.

Further information on the project may be obtained from Mr Germain Dasylva, FAO Representative in Chad (germain.dasylva@fao.org).

Nicaragua: Environmental monitoring system for climatic variability and climate change related preparedness in aquaculture and fishing communities

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The estuarine area "Estero Real" is located along the north Pacific coast of Nicaragua and forms the southern-most part of the Gulf of Fonseca. Its ecological resources are essential to Nicaragua's economy and livelihoods. In general, the impacts of climate variability and climate change to fisheries and aquaculture, and the coastal communities in particular, such as the Estero Real, can be significant. For example, the Estero Real and the Gulf of Fonseca are threatened by different natural phenomena of both meteorological and geological origins. Climate change-related risks in the Estero Real include increased prevalence of aquatic animal disease, higher mortalitities of aquatic animals due to higher sediment content in the water, increases in salinity, lower oxygen concentrations, and increased presence of red tides. Water pollution due to increase fertilizer and pesticide use in the higher parts of the estuarine basin used as adaptation measures in agriculture is possible.

J. Aguilar-Manjarrez, FAO

Workshop group identifying locations for environmental data collection

Unfortunately, the status of Estero's Real environmental condition is not fully documented and current practices for monitoring water quality in the estuary need improvements for more quantitative assessment of where resources may be degrading, the rate of degradation, and the level that this degradation may likely be further exacerbated by climate variability and climate change. The Central America University (UCA) represented by the Training Institute for Environmental Research and Development (CIDEA) in Nicaragua and INPESCA (Nicaragua Fisheries Institute) recognized this deficiency and recommended the creation of an environmental monitoring system with the technical assistance of FAO. Funding is provided by Norway; GCP/GLO/322/NOR.

A cooperation agreement between FAO, CIDEA and INPESCA was established to develop an "Environmental monitoring system for climate change preparedness in the Estero Real and to initiate the implementation of the system together with local stakeholders (aquaculturists and fishers)". Activities include a design and validation of an improved environmental monitoring system, design and implementatiion of an early warning system, and preparation of an implementation manual including data collection and analysis. These will be used to disseminate and communicate risk information. As part of the first phase of this cooperation, a workshop on "Technical validation of an environmental monitoring system for the Estero Real, Nicaragua" was held in Chinandega, Nicaragua, from 3–4 May 2012. The workshop identified key indicators and monitoring locations, assessed vulnerabilities, discussed adaptation approaches and early warning systems; and conducted a SWOT (strength, weakness, opportunity, threats) analysis of the monitoring system as basis for its implementation. This workshop strengthened local knowledge and understanding and enabled a participatory process in designing the monitoring system. The exercise is expected to be completed at the end of 2012 and the operational implementation of the system per se will be the responsibility of CIDEA and INPESCA together with local stakeholders.

This technical assistance from FAO serves as a pilot testing opportunity which, if successful, may serve as a model for establishing similar systems in other strategic locations in Nicaragua, other countries in Latin America, and elsewhere around the globe with same needs and environments.

Regional training on broodstock management and sex determination by ultrasound method in sturgeons

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Sturgeons have inhabited the earth for more than 200 million years but in the last century have suffered a devastating population decline. Highly valued for their prized caviar eggs, sturgeons have been decimated by overfishing, water pollution, and the construction of dams that block their spawning routes. At present, most existing sturgeon hatcheries in the region especially Azerbaijan, Kazakhstan and Turkey have been constructed on the basis of traditional designs and are intended for the collection of a considerable quantity (several thousands) of wild breeders and simultaneous large-scale release (millions) of fingerlings of equal weight and age.

One of the limiting factors for the development of hatchery-reared sturgeon broodstocks was the lack of appropriate methods for early non-invasive sex identification for increased efficiency in the creation and use of sturgeon pedigrees and broodstock selection. The ultrasound diagnostic method is a highly informative and useful non-invasive rapid technique for sexing and maturity staging for optimizing management control of farmed broodstock. It is important to note that even today, this method may enable early selection of not only males intended for sale, but also of early mature females destined for broodstock and caviar production.

At the 4th Intergovernmental Meeting on 22-24 June 2011 in Issyk-Kul, Kyrgyzstan, the Azerbaijan delegation requested a training on broodstock management in sturgeons under GCP/RER/031/TUR (FISHDEV Central Asia) and again stressed about it during the Second Tri-partite meeting on 21 December 2011 in Istanbul. They declared their very deep interest to the subject and invited FISHDEV organization to Azerbaijan.

After a long organization and preparation steps, the regional training was successfully held in Baku, Azerbaijan on 11-13 April 2012 with two days of theoretical and one day practical work through a field visit. It was attended by 15 participants from Azerbaijan, Kazakhstan, Kyrgyzstan and Turkey. The main trainers were Dr Mikhail Chebanov and Dr Elena Galich from South Branch Federal Centre of Selection and Genetics for Aquaculture, Krasnodar-Russia and Dr Ozgur Altan from FAOSEC, Ankara-Turkey. Two participants from Kyrgyzstan and their expenses were supported by GCP/KYR/003/FIN - another good example of the cooperation between fisheries and aquaculture projects in the region. A key point in the training was consideration of the gender balance during the nomination of candidates.

The theoretical part of the training was conducted with the power point presentations and active participations of the delegates during the questions/answers and discussion sessions. For the practical part of the training, participants travelled to Khilli Sturgeon Hatchery, located about 170 km away from Baku and which belonged to the Ministry of Ecology and Natural Resources of Azerbaijan, Department for Reproduction and Protection of Aquatic Bio resources. . The hatchery Director gave technical information about the hatchery; pointed that the hatchery has been working for ten years to enrich the natural sturgeon resources in Azerbaijan waters, constructed with a financial support from the World Bank and have more than 100 employees. Participants visited the different sections of the hatchery (*Daphnia sp.* and *Artemia sp.* - live food production, artificial feed production, egg incubation, larval and fry production and broodstock units).

The practical part of the training was initiated with general information on ultrasound method for the sex determination and its importance on the hatchery management provided by Dr Chebanov and Dr Galich. They showed the participants the differences between the ultrasound view of male and female, checking some broodstocks. Participant learned and then put into practice the use of the ultrasound device, checked the broodstocks and determined if the treated individuals were male or female. During four hours practicals, at least 30 broodstocks were checked by the experts and the participants after which they were stocked in different pools according to their sex. The practical part of the training was conducted very productively by all participants. They had the information about sex determination in sturgeons and learned how to manage their broodstocks in their own breeding stations.

Further information can be obtained from the author.

Training workshop on spatial planning for aquaculture site selection, zoning[1] and ecological carrying capacity[2]

José Aguilar-Manjarrez[1] and Weimin Miao[2]

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The TCP project "Aquaculture Information Management System (AIMS) in Thailand" (TCP/THA/3304), approved in early 2011 and ends in February 2013, is aimed at upgrading and strengthening AIMS for informed sectoral policy-making, planning and effective management to support the sustainable development of aquaculture in Thailand. An important part of the project, is the application of modelling tools of varying degrees of complexity, with a particular focus on ecological carrying capacity, which will provide information of importance in addressing sustainability for various types of aquaculture.

Two training/workshops carried out from 27 April to 3 May 2012, introduced, discussed and provided feedback on important and emerging issues concerning site selection, zoning and ecological carrying capacity issues in two selected provinces, Songkhla and Chiang Rai. The training/workshop also enhanced knowledge of participants on principles, methodologies and applications of geographic information systems (GIS) modelling, and ecological carrying capacity modelling for aquaculture site selection and zoning and drafted recommendations for the use of these models in aquaculture.

Key recommendations derived from these training/workshops include keeping the modelling tools/outputs simple and in tune with the Department of Fisheries (DOF) of Thailand needs and capacities, and ensuring easy understanding by the different stakeholders in Thailand. In the same vein, AIMS should be developed in separate "modules" (e.g. one module specific to ecological carrying capacity) following standards for their integration with other modules. As experience is gained, AIMS would be expanded and further developed in close consultation with different/relevant experts and stakeholders.

The project output would eventually serve as a "model" for the operational use of a comprehensive AIMS for all provinces in Thailand with responsibility for wider implementation and ownership by the National Project Team. This will also enable the DOF to be in a better position to make recommendations on how aquaculture could be planned and zoned to enable the local government to protect its environmental quality and to ensure that aquaculture development does not end up creating problems for itself and other ecosystem services. FAO and NACA could play a catalytic role in establishing similar projects in other countries in Asia with similar capacities and/or needs.

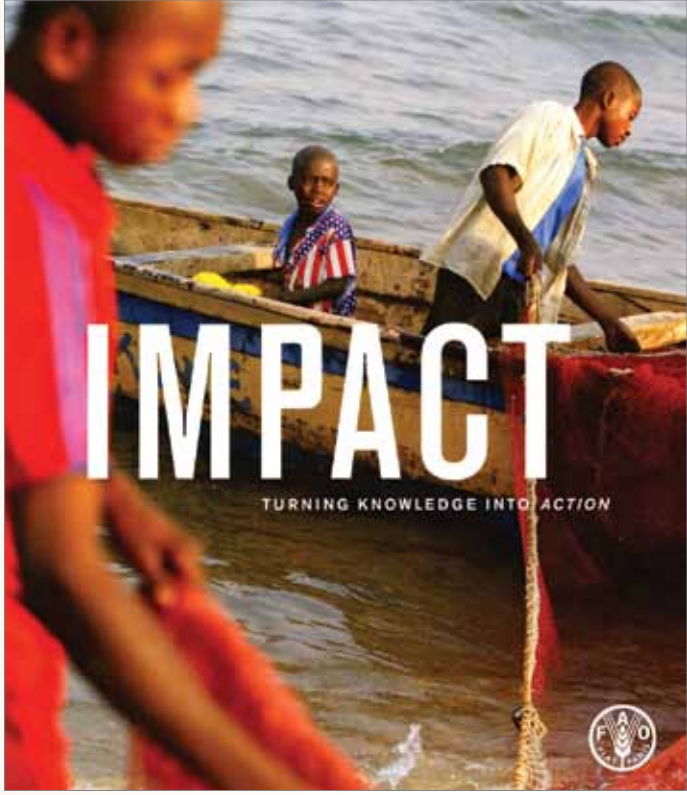
W. Miao, FAO

Training workshop conducted in Chiang Rai

[1]Zoning: Zoning or allocation of space is a mechanism for more integrated planning of aquaculture development, as well as its better regulation. It may be used either in planning to identify potential areas for aquaculture or a regulatory measure to control the development of aquaculture. *Source:* **GESAMP**. 2001. Planning and management for sustainable coastal aquaculture development. Reports and Studies GESAMP No. 68. Rome, FAO, 90 pp. (also available at www.fao.org/docrep/005/y1818e/y1818e00.htm).

[2]Ecological carrying capacity. Defined as the magnitude of aquaculture production that can be supported without leading to significant changes to ecological processes, species, populations, or communities in the environment. *Source:* **McKindsey, C.W., Thetmeyer, H., Landry, T., & Silvert, W.** 2006. Review of recent carrying capacity models for bivalve culture and recommendations for research and management. *Aquaculture*., 261 (2): 451–462.

IMPACT: Turning knowledge into action



During the FAO Council 144th session (June 11-15, 2012), a Council Side Event was held on 12 June 2012 (13.00-14.00) and launched the **"IMPACT: Turning knowledge into action"**. FAO's work builds on the overarching role of eradicating hunger through sustainable food consumption and production systems, promoting grater fairness in the global and management of food systems, expanding South-South Cooperation and speeding decentralization to allow FAO to bring its expertise closer to the field.

The IMPACT folder introduces FAO focus areas through impact and success stories ranging from local projects to global strategies, offering snapshots of what FAO has introduced, what it has improved and most of all, what it has left behind in terms of its contribution to food and nutrition security and sustainable natural resource management. These demonstrate FAO's role in connecting the field to national, regional and global initiatives. By turning knowledge into action, FAO identifies and works with different partners with established expertise and serves as a knowledge broker - facilitating dialogue between knowledge providers and knowledge users.

Seven Focus Areas where FAO's comparative advantage contributes to impact include:

- providing early warning of food crises
- detecting and preventing transboundary threats to production, health and the environment
- promoting sustainable forest management
- controlling biosecurity risks related to fisheries and aquaculture
- establishing global entities for dealing with scarcity of water and land resources
- developing capacity to improve agricultural information and statistics
- contributing to global standard setting and implementation into national policies and legislation

Two TCP projects, TCP/RAF/3111 Emergency assistance to combat epizootic ulcerative syndrome (EUS) in Chobe-Zambesi River and TCP/BiH/3101 Strengthening aquaculture health management in Bosnia and Herzegovina (FAN 47, p. 23) were examples of impact under controlling biosecurity risks related to fisheries and aquaculture. The latter project was also a recipient of FAO's 2010-2011 Edouard Saouma Award.

Twelve Success Stories were also featured and included two on fisheries, i.e.

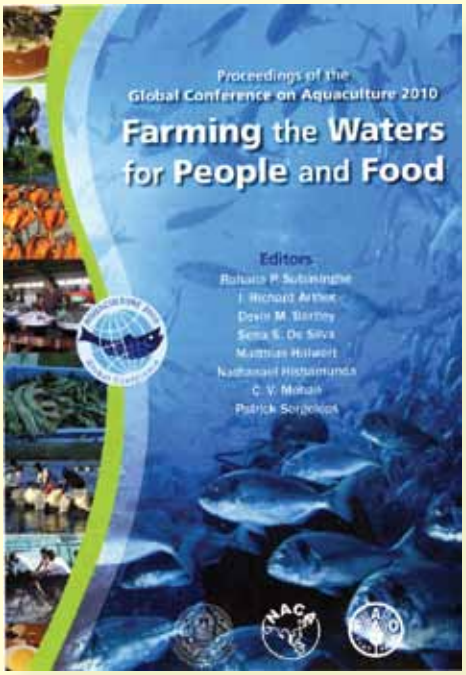
- Fisheries Associations: Congolese fighters become fishers
- Promoting Ecosystem Approach: Research vessel promotes ecosystem approach

The IMPACT stories are available at the FAO Web site[1], distributed both at headquarters and in the decentralized offices. IMPACT will be used at Rio + 20 and will be given as much visibility as possible through, in addition to the FAO Web site, an information note to the global media lists (in all official languages) and promoted through social media channels.

[1] http://www.fao.org/docrep/015/i2763e/I2763E00.htm; http://www.fao.org/about/en/

Forthcoming Publications

- Bondad-Reantaso, M.G., Bueno, P. and Pongthanapanich. T. 2012. Indicators for measuring the contribution of small-scale aquaculture to sustainable rural development: selected case studies. *FAO Fisheries and Aquaculture Technical Paper* No. 545.
- Bondad-Reantaso, M.G., Lavilla-Pitogo, C., Hine, M. and Subasinghe, R.P. 2012. Diagnostic Guide to Aquatic Animal Diseases. *FAO Fisheries and Aquaculture Technical Paper* No. 546. FAO and SEAFDEC-AQD.
- Bondad-Reantaso, M.G., Arthur, J.R. and Subasinghe. 2012. Improving biosecurity through prudent and responsible use of veterinary medicines in aquatic food production. *FAO Fisheries and Aquaculture Technical Paper* No. 547. Rome, FAO.
- FAO. 2012. Report of the FAO Workshop on Future Directions for Gender in Aquaculture and Fisheries Action, Research and Development, Shanghai, China, 23-24 April 2011.
- FAO. 2012. Report of the stock-taking and planning exercise on mainstreaming gender in fisheries and aquaculture development and management.
- Kapetsky, J.M., Aguilar-Manjarrez, J. & Jenness, J. A spatial assessment of potential for offshore mariculture development from a global perspective. 2012. *FAO Fisheries and Aquaculture Technical Paper.* No. 549. Rome, FAO.
- Lovatelli, A., Aguilar-Manjarrez,J. & Soto, D. 2012., eds. Expanding mariculture further offshore: technical, environmental, spatial and governance challenges. FAO Technical Workshop. 22–25 March 2010, Orbetello, Italy. *FAO Fisheries and aquaculture Proceedings* No. 24. Rome, FAO.
- Meaden, G.J.; Aguilar-Manjarrez, J.; eds. Advances in geographic information systems and remote sensing for fisheries and aquaculture. *FAO Fisheries and Aquaculture Technical Paper* No. 552. Rome, FAO.
- Ross., L.G., Telfer, T.C., Soto, D., Aguilar-Manjarrez, J. & L. Falconer, eds. Site selection and carrying capacity for inland and coastal aquaculture. FAO/Institute of Aquaculture, University of Stirling Expert Workshop. 6–8 December 2010, Stirling, United Kingdom of Great Britain and Northern Ireland. *FAO Fisheries and Aquaculture Proceedings*, No. 21. Rome, FAO.



FAO/NACA. 2012. Farming the Waters for People and Food. R.P. Subasinghe, J.R. Arthur, D.M. Bartley, S.S. De Silva, M. Halwart, N. Hishamunda, C.V. Mohan & P. Sorgeloos. (Eds.) Proceedings of the Global Conference on Aquaculture 2010, Phuket, Thailand. 22–25 September 2010. FAO, Rome and NACA, Bangkok. 896 pp.

The Global Conference on Aquaculture 2010 brought together a wide-range of experts and important stakeholders and reviewed the present status and trends in aquaculture development, evaluated the progress made in the implementation of the 2000 Bangkok Declaration and Strategy, addressed emerging issues relevant to aquaculture development, assessed opportunities and challenges for future aquaculture development and built consensus on advancing aquaculture as a global, sustainable and competitive food production sector. This volume, a yet another joint effort of FAO and NACA, brings you the outcome of the Global Conference on Aquaculture 2010, the much needed clear and comprehensive technical information on how aquaculture could be mobilized to alleviate global poverty and improve food and nutrition security in the coming decades.

Cochrane, K.; De Young, C.; Soto, D. y Bahri, T. (eds). 2012. Consecuencias del cambio climático para la pesca y la acuicultura: visión de conjunto del estado actual de los conocimientos científicos. *FAO Documento Técnico de Pesca y Acuicultura*. No 530. Roma. FAO. 237pp.

Esta publicación ofrece una visión de conjunto del conocimiento científico actualmente disponible sobre las consecuencias del cambio climático para la pesca y la acuicultura. El documento contiene tres estudios técnicos que fueron presentados y debatidos en el Taller de expertos de la FAO «Consecuencias del cambio climático para la pesca y la acuicultura» (Roma, 7-9 de abril de 2008). Un resumen de los resultados del taller y los mensajes clave relacionados con las repercusiones del cambio climático en los ecosistemas acuáticos y en los medios de vida basados en la pesca y la acuicultura se presentan en la introducción. El primer estudio aborda la variabilidad y el cambio climático y sus consecuencias físicas y ecológicas para los ambientes marinos y de aguas dulces. El segundo se ocupa de las repercusiones del cambio climático en los pescadores y comunidades pesqueras y examina las medidas de adaptación y mitigación que podrían ponerse en ejecución. Por último, el tercer estudio examina de manera específica las repercusiones del cambio climático en la acuicultura y propone las posibles medidas de adaptación y mitigación.

The English version is also available under: http://www.fao.org/docrep/012/i0994e/i0994e00.htm

FAO. 2012. FAO aquaculture information products - 2010—2011. Rome, FAO, 2012. CD-ROM.

This CD ROM is the third issue prepared by the Aquaculture Service of the FAO Fisheries and Aquaculture Department, which provides a list of FAO aquaculture information products published during the biennium 2010-2011. This product is produced on a biannual basis.

More than ninety products related to aquaculture, including CD-ROMs and newsletters have been published and distributed worldwide during that time, in both hard and electronic versions. FAO most popular publications include FAO Fisheries Technical Papers, reports of workshops and technical consultations, regional reviews and FAN (FAO Aquaculture Newsletters). Fact sheets and CD-ROM collections have also proven successful among users. All titles listed in this publication are available either on the CD-ROM (ftp://ftp.fao.org/FI/DOCUMENT/aquaculture/aq2010_11/index.htm) or through the FAO Aquaculture gateway page at: www.fao.org/fishery/aquaculture

Readers can download documents listed in the CD-ROM by clicking on the title. The publications are all available as PDF (Portable Document Format) and many of them are also available in other FAO official languages.

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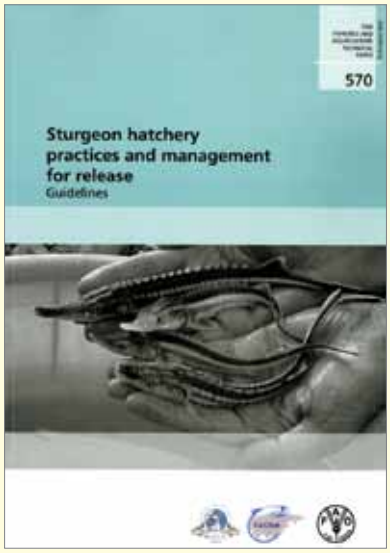

Chebanov, M; Rosenthal, H.; Gessner, J.; Van Anrooy, R.; Doukakis, P.; Pourkazemi, M.; Williot, P. 2011. Sturgeon hatchery practices and management for release-guidelines. *FAO Fisheries and Aquaculture Technical Paper* No. 570. Ankara, FAO. 110pp.

Sturgeon hatcheries play an important role in the rehabilitation of the sturgeon stocks in the Caspian Sea and elsewhere. This publication aims to increase global awareness and to guide capacity building on the best practices currently available by providing sturgeon hatchery staff with a practical tool for modern sturgeon hatchery management. The guidelines focus on hatchery practices that are aimed at reproduction and growth of fry and fingerlings for release. They address a wide range of issues, including: hatchery design and location; collection and transportation of wild broodstock; selection and maintenance of broodstock; tagging of sturgeon; water quality and supply; feeding and feed quality; selection of broodstock for controlled reproduction; spawning and gamete processing; rearing of larvae and juveniles in tanks; rearing of juveniles in ponds; release of fingerlings; sanitary and hygiene measures; hatchery documentation; hatchery maintenance and repair; staff and labour issues; monitoring and research; social and environmental responsibility; international regulations and conventions on sturgeons. They provide specific guidance, background and justifications, and make suggestions to support their implementation. The guidance provided is based on the FAO Code of Conduct for Responsible Fisheries and contributes to the implementation of the Ramsar Declaration on Global Sturgeon Conservation.

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FAO. 2012. Report on the FAO Workshop on Sea Cucumber Fisheries: An Ecosystem Approach to Management in the Pacific (SCEAM Pacific). Nadi, Fiji, 15–18 November 2011. *FAO Fisheries and Aquaculture Report.* No. 1003. Rome, FAO. 44pp.

Widespread overfishing threatens the sustainability of sea cucumber fisheries and the important role they play in the livelihoods of coastal fishers. The SCEAM Pacific workshop was jointly funded and coordinated by FAO, the Australian Centre for International Agricultural Research (ACIAR), the Secretariat of the Pacific Community (SPC) and Southern Cross University (SCU) in November 2011. The workshop brought together fishery managers from 13 Pacific island countries to foster improved management plans for Pacific sea cucumber fisheries. Seminars by the workshop facilitators presented contemporary fisheries science and new paradigms for management. Pre-workshop questionnaires, workgroup sessions and plenary discussions were used to help participants decide on appropriate objectives, regulatory measures and management actions for each fishery. The workshop outputs given in this report reveal the constraints and issues facing Pacific sea cucumber fisheries, and the proposed management changes and research priorities of the fishery managers.

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FAO. 2012. Informe de los Talleres sobre la introducción al enfoque ecosistémico a la pesca y la acuicultura. *FAO Informe de Pesca y Acuicultura* No. 994/1. Roma, FAO. 35 pp.

Dada la complejidad de problemas relacionados con la pesca y la acuicultura en el Estero Real en Nicaragua, INPESCA, ha solicitado el apoyo técnico de FAO para implementar en esta localidad el enfoque ecosistémico a la pesca y acuicultura (EEPA) como un caso de estudio piloto. La parte 1 de este documento describe el Taller introductorio a este enfoque que se realizó en Managua, Nicaragua, los días 26 y 27 de noviembre del 2009 contando con la participación principalmente de autoridades e instituciones del sector. En este primer taller los participantes recibieron información sobre el marco teórico del EEPA, sobre los distintos pasos y etapas de implementación y se abocaron a una identificación preliminar de los principales problemas ambientales, socioeconómicos y de gobernanza en el Estero Real e hicieron un primer ejercicio simple de priorización de los mismos. La parte 2 de este documento describe el segundo taller que se realizó del 24 al 26 de febrero del 2010 en Chinandega, en las cercanías del Estero Real y contando con una amplia participación de grupos interesados y actores locales. En esa oportunidad los participantes revisaron y reafirmaron los principales problemas identificados en el primer taller y discutieron una estrategia y un plan de acción con los elementos prácticos más relevantes en este enfoque y con aplicación a los asuntos y problemas identificados. Ambos talleres revelaron un gran interés por parte de las instituciones y entidades involucradas en el uso de recursos y manejo del Estero, en coordinar esfuerzos y trabajar arduamente en la búsqueda de soluciones a las problemáticas identificadas, que incluyen entre otras una pesca local destructiva, algunos impactos al ambiente y a los mangles por parte de la camaronicultura y de otras actividades productivas, pobreza, falta de equidad y ausencia de alternativas de vida para las comunidades locales.

FAO. 2012. Informe del Taller sobre la evaluación ambiental del estero real y estimación de su capacidad de carga. *FAO Informe de Pesca y Acuicultura* No. 994/2. Roma, FAO 19 pp.

El Taller de Consulta "Evaluación Ambiental del Estero Real y estimación de la capacidad de carga es parte de las acciones que contempla el Proyecto "Implementando un Enfoque Ecosistémico a la Pesca y la Acuicultura (EEP/EEA) en el estero real Nicaragua" con el apoyo de FAO y en coordinación con el Instituto Nacional de Pesca (INPESCA) y el Ministerio del Ambiente y los Recursos Naturales de Nicaragua (MARENA). El taller se llevó a cabo en Chinandega, Nicaragua, los días del 25 al 27 de agosto del 2010 y fue precedido por dos días de visita de campo al Estero Real. El objetivo del taller fue discutir la condición ambiental actual del Estero y en particular analizar indicadores y opciones para estimar su capacidad para recibir nutrientes y materia orgánica albergando asi una acuicultura sustentable.
El Taller analizó distintos aspectos de la situación ambiental y se informó sobre los conceptos fundamentales de hidrodinámica y oceanografía costera y sobre la información necesaria para estimar la capacidad de carga del Estero. Se concluyó que este ecosistema puede beneficiarse de una estimación aproximada de su capacidad de carga que permita tomar medidas precautoria en cuanto a la producción acuícola y a los aportes de otras actividades productivas al Estero. Por otra parte se estimó la necesidad de contar con un programa de monitoreo ambiental mejorado que permita evaluar en forma permanente la situación ambiental y que sea de utilidad a todos los usuarios incluyendo pescadores y cooperativas de acuicultores. Existe gran interés y voluntad por parte de las instituciones y personas presentes en el Taller en coordinar esfuerzos y trabajar con todos los sectores productivos del Estero para lograra hacer de este un ecosistema saludable y sustentable.

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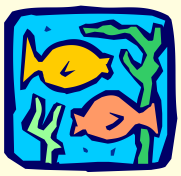
FAO. 2007. *Aquaculture development. 2. Health management for responsible movement of live aquatic aanimals.* FAO Technical Guidelines for Responsible Fisheries. No. 5. Suppl. 2. Rome, FAO. 31 pp. This publication is now available in Arabic, Chinese, French, Spanish and Russian.

These technical guidelines on Health management for responsible movement of live aquatic animals have been developed to support sections of FAO's Code of Conduct for Responsible Fisheries addressing responsible fisheries management (Article 7), aquaculture development (Article 9), international trade (Article 11) and fisheries research (Article 12). The objective of these guidelines is to assist countries in reducing the risk of introduction and spread of serious transboundary aquatic animal diseases.

Although they deal primarily with safe transboundary movement at the international level, they are also applicable to domestic movements between different provinces, geographical areas or zones of differing disease status.



Arthur, J.R.; Bondad-Reantaso, M.G.; Subasinghe, R.P. 2008. Procedures for the quarantine of live aquatic animals: a manual. *FAO Fisheries Technical Paper.* No. 502. Rome, FAO. 74 pp. This publication is now available in French and Spanish.

Quarantine is an important risk management measure and a key activity that should be considered when developing national strategies on aquatic animal health management. This manual outlines the technical requirements for setting up quarantine facilities at three levels, based on the general level of risk (as determined by risk analysis) represented by the specific consignment of aquatic animals being moved: (i) the quarantine of "high risk" species (e.g. aquatic animals being moved either internationally [introductions and transfers] or domestically between regions of different health status) that are destined for use in aquaculture, capture fishery development or other applications where release or escape of animals or any pathogens they may be carrying into the natural environment is likely to occur; (ii) the quarantine of "lower risk" species (e.g. aquatic animals destined for the ornamental trade) to improve biosecurity for aquatic animals whose trade is an established practice; and (iii) the routine quarantine of aquatic animals at production facilities (e.g. new, domestically produced or locally captured broodstock or juveniles or animals whose movement has been contingent upon additional, more stringent, risk management measures, such as the use of specific pathogen free stocks, international health certification and pre-border and/or border quarantine).

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FAO. 2011. Regional workshop on fishery and aquaculture statistics, information, and trends: improving data collection, analysis and dissemination, Antalya, Turkey, 12 - 14 April 2011. *FAO Fisheries and Aquaculture Report*. No. 977. Rome, FAO. 2011. 61pp.

This document is the main work of the regional workshop on fishery and aquaculture statistics, information and trends: improving data collection, analysis and dissemination, Antalya, Turkey, 12-14 April 2011. Major topics were:

a) existing fishery information and data collection systems in the region were reviewed;
b) issues related to fishery information and data collection with regard to fisheries were identified;
c) the way to improve the quality of fishery information and data was discussed;
d) national knowledge and experiences in designing and developing.

FAO. 2011. Fersoy, H.; Siar, S.; and Van Anrooy, R. (eds).Report of the Regional Workshop on Promoting and Strengthening Fisheries and Aquaculture Organizations in Central Asia. Izmir, Turkey, 1–4 November 2010. *FAO Fisheries and Aquaculture Report.* No. 968. Roma, FAO. 95 pp.

The Regional Workshop on Promoting and Strengthening Fisheries and Aquaculture Organizations in Central Asia was organized within the framework of the Central Asia Regional Programme for Fisheries and Aquaculture Development (FishDev–Central Asia), financed by the FAO–Turkey Partnership Programme (FTPP). The workshop received assistance from the Support to Fisheries and Aquaculture Management in the Kyrgyz Republic project and took place in Izmir, Turkey, from 1 to 4 November 2010. The workshop, hosted by the Aegean Exporters' Association, was attended by 20 participants, representing fishers, fish farmers, fisheries authorities, non-governmental organizations (NGOs) and fisheries experts from Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan and Turkey, the FAO Fisheries and Aquaculture Department, and the FAO Subregional Office for Central Asia.

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FAO 2012. Report of FAO Workshop on Future Directions for Gender in Aquaculture and Fisheries Action, Research and Development. Shanghai, China, 23-24 April 2011. *FAO Fisheries and Aquaculture Report.* No. 998, Rome, FAO. 30 pp.

The FAO Workshop on Future Directions for Gender in Aquaculture and Fisheries Action, Research and Development was held at the Shanghai Ocean University, Shanghai, China on 23-24 April 2011. The Workshop was attended by 24 experts from 14 countries in Africa, Asia, Europe, North America, South America and Oceania, and FAO. The Workshop built on United Nations and FAO commitments that heighten attention to the gender dimension in development. It was convened with a goal to generate strategic ideas and actions that could be used to develop a 'road map' for future directions on gender in aquaculture and fisheries. To this end, the Shanghai statement was drafted as a starting point to guide actions on the path to understanding the implications of roles, experiences and contributions of women and men in aquaculture and fisheries.

The workshop showed differences in expert opinions relative to three major issues: (1) whether gender issues in aquaculture and fisheries should be considered broadly as gender issues or more specifically focused on women; (2) who are the most vulnerable types of people in the sector; and (3) what areas and to what extent gender issues in aquaculture and fisheries should or can be considered together or treated separately.

Experts agreed that direct advocacy to focus attention on gender in the fish sector is needed to achieve the level of understanding and awareness needed to stimulate actions. Political will is needed to implement and practice gender mainstreaming. Policy makers must be convinced of the need for change, and prerequisites for well-developed policies should be put in place. Such policies must rest on the principles of economic empowerment of women throughout the value chain. Policy priorities should include the needs of marginalized and vulnerable women's and children's groups. They also recognized the value of gender training, education and extension using gender lens concepts and theory when developing gender training modules relevant for aquaculture and fisheries. Gender should be added to courses which educate and train decision-makers and officials. The workshop identified a number of important key gender concepts and how they relate to research, required tools and data.

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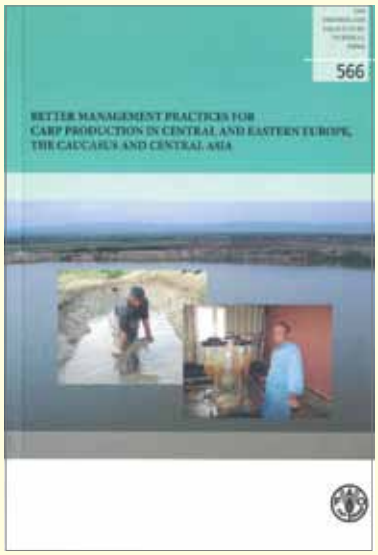

Woynarovich, A.; Bueno, P.B.; Altan, Ö.; Jeney, Zs.; Reantaso, M.; Xinhua, Y.; Van Anrooy, R. 2011. Better Management Practices for Carp Production in Central and Eastern Europe, the Caucasus and Central Asia. *FAO Fisheries and Aquaculture Technical Paper.* No 566. Ankara, FAO. 134 pp.

This guide describes and explains the key biological, technical, economic, social and environmental aspects of Better Management Practices (BMPs) of carp production. The topics have been chosen because there are many benefits to the aquaculture sector and its stakeholders in adopting BMPs. Reduced public cost of managing the sector, higher production efficiency, better access to markets, increased profitability, and improved image and reputation of the fish farms and their representation are among them.

The establishment and maintenance of efficient fish farm facilities and infrastructure and the optimum utilization of feeds and other production inputs require skilled and knowledgeable farm managers and workers. These create the preconditions for a successful and sustainable carp aquaculture.

Natural culture of carp and the biological control of water weeds with carps are special polyculture production systems. Their BMPs are also discussed. Although at present the production of common carp is feasible only in pond polyculture, this document also presents useful and practical information about monoculture and intensive culture of carp in tanks and cages.

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Continued from page 32

d. To improve technical efficiencies of small aquafeed producers

- Assure a reliable supply of quality ingredients and stabilize the cost of the key ingredients.
- Provide technical and financial resources to assist upgrading the feed manufacturing equipment for production farm-made feed.
- Provide technical advice and training on good feed manufacturing practice.
- Assure a reliable power supply.
- A credit facility for small aquafeed producers would enable upgrades.

Continued from page 33

Following the internal consultation, the mission developed the framework (outcome, outputs and related activities) of a FAO TCP project to start pilot aquaculture operations near Ulan Bator and to improve fisheries management in selected lakes and rivers in Mongolia. The mission also identified key components for a UTF/donor-funded development project that will support the needed aquaculture and fisheries infrastructure and facilities and other capacity building activities. The mission findings were reported to the Director General of Department of Strategic Planning of MoFALI, who in turn, expressed his endorsement of the proposed TCP framework and the major components of the UTF/donor-funded project. He reiterated again the priority of developing aquaculture given by the government and wished that the TCP project could be developed, approved and implemented soon. He also affirmed the commitment of the government in mobilizing the funding for supporting the UTF/donor funded project.

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The FAO project aims at increasing fish production through technology, proper farm management and the sustainable use of the available resources. Among the foreseen activities include the upgrading of the state-owned hatchery located in Wadi Al-Rayan (Jordan Valley) into a national broodstock centre. The centre will focus on the improvement of seed quality of tilapia and common carp as well as improvement of locally manufactured feed using as much as possible local ingredients through the establishment of a small-scale feed processing plant. Furthermore, aquaculture practices will be improved through the identification and introduction of suitable farming techniques adapted to local conditions. Technical abilities of farmers and extension workers will be increased through targeted trainings in the country and abroad covering key aspects in fish production. The project will engage all stakeholders particularly those from the private sector to ensure the long-term impact of the activities supported under the various project activities.

FAO Aquaculture Newsletter

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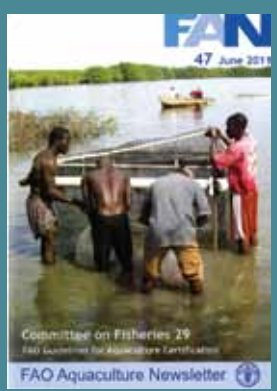

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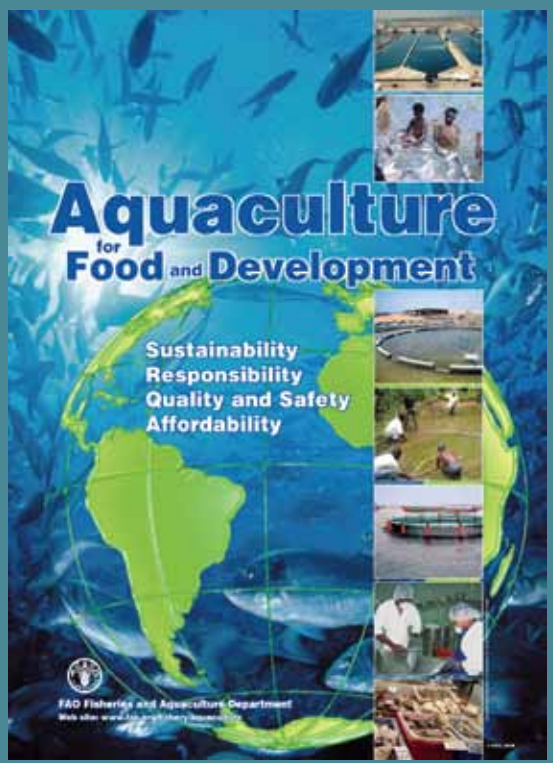
FAN 48, December 2011



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