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FAO Aquaculture Newsletter

Nutrition-sensitive aquaculture: a timely initiative

Aquaculture has been growing rapidly — faster than any other food production sector — over the past three decades, and continuing. Considerable social and economic benefits have been provided, documented and felt. It is clear that the bulk of fish required to feed the world in the coming decades will come from aquaculture. It is also time to put "nutrition security" at par with "food security".

Fish, wherever it comes from, is a global commodity of key significance due to its potential to improve human health and nutrition, its accessibility by the poor, and the low environmental impact of its production compared to that of other animal source foods. Fish provides long-chain omega 3 fatty acids, Vitamin A, and several critical micronutrients, which help reduce ischemic heart diseases and improve health during the critical 1000-day window of life opportunity (pregnancy/lactation/infancy).

Demand for fish is growing as a result of population growth, urbanization, and increasing wealth. Research suggests that aquaculture production should double by 2030 to meet the world's growing demand and needs. If it comes up short, per capita fish supplies, for e.g., in sub-Saharan Africa will shrink by 1 percent per annum, from 6.8 kg in 2010 to 5.6 kg in 2030, according to the World Bank. The people of Africa and Asia (excluding China) have the lowest consumption of animal-source foods. But they try to make up for this by having the highest proportion of fish in their diet. Africa and Asia also have the highest levels of poverty and malnutrition. Driven by growth in population, wealth and urbanization, the largest growth in overall requirement for fish will also be in Africa and Asia. These facts clearly indicate the importance of making fish more accessible and affordable to the vulnerable communities in Africa and Asia.

Various solutions are available to enhance the productivity of aquaculture and fisheries in different landscapes. These include community-based fisheries management (for and of poor households that do not own land) and mainstreaming nutrition into key tropical fish species (nutrition-sensitive aquaculture), as well as focused investments around nutrition efforts at subsistence and small- and medium-enterprise levels. Gender is a critical consideration when it comes to thinking about pathways from production to nutrition. In Africa and Asia, issues of intra-household food allocation, control of income, and participation in agriculture/aquaculture have a critical influence on nutrition and must be considered in devising strategies to increase productivity. Aquaculture, an aquatic agricultural system, offers great possibilities for keeping people healthy and hauling them out of poverty. Marked increases in productivity are possible, as are approaches which can help to buffer seasonal swings in dietary diversity and income. Community engagement and nutrition education along with increased productivity and income open new doors for reducing under-nutrition. Let's take these dimensions seriously during our quest to increase aquatic production, embark on more efficient strategies and practices, taking into consideration - and giving it high priority — the need improve nutrition and health. This should certainly be the case, in this post ICN2[1] era, linking fish with nutrition, through investing in "nutrition-sensitive aquaculture".

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[1]Second International Conference on Nutrition (ICN2)
19-21 November 2014, Rome, Italy
www.fao.org/about/meetings/icn2/en/

Cover photos:
top: Small-scale artisanal floating polypipe cages constructed and used in Mauritius for rearing hatchery produced siganids Credits: S. Hanoomanjee
bottom: Gilthead seabream (*Sparus aurata*) harvesting from a floating cage (Monastir, Tunisia) Credits: L. Bigarré

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Second International Conference on Nutrition (ICN2): Contribution of Fish to Human Nutrition

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In preparation for the Second International Conference on Nutrition (ICN2), held on 19-21 November 2014, FAO Headquarters, Rome, Italy the Fisheries and Aquaculture Department prepared a research paper on "*Maximizing the contribution of fish to human nutrition*".[1] The paper highlights the challenges faced by the world community, in providing adequate food and nutrition security for 9 billion people projected to inhabit the planet in 2050. Past efforts on fisheries management have focused on maximizing benefits from capture fisheries to employment, income and exports, while trying to insure sustainability of the resource. More recently, the focus has turned more towards fish as food. This is evidenced by the recent inclusion of "fish and nutrition" as a separate agenda item of the FAO Committee on Fisheries (COFI), during the 7th Session of the Sub-Committee on Aquaculture (St. Petersburg, October 2013) and the 14th Session of the Sub-Committee on Fish Trade (Bergen, February 2014).

Globally, fish accounts for about 17 percent of animal protein intake. This share, however, exceeds 50% in many countries. For example, in West African coastal countries, the proportion of dietary protein that comes from fish is very high: 72% in Sierra Leone, 55% in Chana and Gambia, and 43% in Senegal. For Asia, especially small island states, the rates are even higher: 70% in Maldives, 60% in Cambodia, 57% in Bangladesh, 54% in Indonesia, 55 % in Sri Lanka (FAO, 2012)[2]. However, fish is not only a source of protein, but also provides valuable macro- and micro-nutrients for humans. Micro-nutrient deficiencies affect more than two billion people at the global level. Fish is a micro-nutrient dense food that can play a more important role as a provider of nutrients such as iron, zinc, iodine, calcium and selenium. This is particularly true for small fish traditionally eaten whole.

Conclusions of the paper highlight the risk of price volatility in food markets, which may require dietary adjustments away from high protein sources such as fish to less costly starchy staples. Recommendations from the paper are to place more emphasis on production, access, distribution and utilization of nutrient-rich fish, especially small pelagic species which are currently underutilized for human consumption. This will require changes to government policies, investment in infrastructure and encouragement of research, including finding means of reducing post-harvest losses in fisheries.

The FAO, bilateral agencies such as USAID, through Feed the Future and DFID, the CGIAR through the CGIAR Research Programs, governments, civil society and the private sector have initiated programmes and interventions that provide a platform for fish to make a bigger contribution to human nutrition. These efforts should be further strengthened and coordinated for maximum effect. The ICN2 is an ideal venue to address these important issues.

The full paper can be found at:
http://www.fao.org/3/a-i3963e.pdf

Further information on fish and nutrition can be obtained by writing to:
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[1]S.H. Thilsted, D. James, J. Toppe, R. Subasinghe, and I. Karunasagar, "Maximizing the contribution of fish to human nutrition" www.fao.org/3/a-i3963e.pdf.
[2]FAO. 2012. The State of World Fisheries and Aquaculture 2012, FAO Fisheries and Aquaculture Department. Rome, FAO. 209p. www.fao.org/docrep/016/i2727e/i2727e.pdf.

M. Weimin, FAO

Highlights of FAO supported activities in aquaculture in Asia-Pacific

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Four ongoing aquaculture activities in Asia-Pacific being implemented by FAO are briefly described in this article.

"Sustainable intensification of aquaculture for blue growth in Asia-Pacific": a regional initiative on sustainable intensification of aquaculture under the Blue Growth Initiative as an important vehicle for implementing FAO's new Strategic Framework, 16 regional initiatives targeting different agriculture sectors and areas are currently implemented in Asia, Africa, Central and Eastern Europe and South America. Because of the importance of aquaculture in food security and nutrition, livelihood and economic development and the need for sustainable growth of aquaculture to meet the increase of demand for fish due to population growth and economic development in the coming decades, FAO identified "Sustainable intensification of aquaculture for blue growth in Asia-Pacific" as one of the four FAO regional initiatives to be implemented in the Asia-Pacific.

The regional initiative will be first implemented in six focus countries, i.e. Bangladesh, Indonesia, Philippines, Sri Lanka, Timor Leste and Viet Nam. The regional initiative focuses on the following areas:

(i) support member countries in identifying options for addressing key governance issues in achieving sustainable aquaculture growth through appropriate regional and national consultation process, develop relevant regional and national policy, strategy and action plan;

(ii) reduce negative environmental and social impacts of aquaculture intensification and through establishing effective aquaculture biosecurity and disease surveillance and control system, application of appropriate planning and management tools and responsible use of resources;

(iii) increase farmers' adaptability to climate change impact and resilience to natural disasters and socioeconomic risks through development and promotion of innovative aquaculture management concept and practices;

(iv) support member governments in improving the access of poor rural aquaculture farmers to quality production inputs, sustainable production technology and market for improved productivity and economic efficiency; and

(v) improve management of forestry (mangrove), water, land and tenure that will contribute to sustainable intensification of aquaculture.

The regional initiative will be implemented through joint efforts of focus country governments and FAO. The regional initiative is designed to include the ongoing relevant FAO supported activities in the focus countries and new interventions identified jointly by the governments and FAO in line with the framework of the regional initiative. An Inception Workshop, convened from 2-3 October 2014 in Bangkok, was attended by senior government officials and FAO Representative or Assistant Representatives from the six focus countries. Tentative country workplan for implementing the regional initiative was developed for each selected country.

TCP/MON/3401 "Developing aquaculture for improved fish supply in Mongolia"

Although Mongolia is not a traditional fish eating nation, the economic development and cultural change are gradually shifting peoples' diet habit. More people are increasingly aware of the nutritional importance of fish to human diet. The government has identified diversification of peoples' diet to be supported through increasing fish production as one priority area in its national food and nutritional security programme. Approved in February 2014, TCP/MON/3401 aims to establish pilot aquaculture operations and the needed capacities that will support aquaculture development in the country.

The project Inception Workshop, held on 4-5 April 2014, in Ulan Bator, was opened by a welcome remark from the Vice Minister of Ministry of Industry and Agriculture (MIA) and attended by officials from MIA, representatives of relevant public institutions and private sector, and national consultants and FAO officers from the Aquaculture Branch (FIRA), Regional Office for Asia and the Pacific (RAP) and country office in Mongolia (FAOMN). After the workshop, Honorable Minister of MIA met FAO officers and the key persons of private companies that will undertake the pilot aquaculture production. He emphasized the importance of the project to the country and assured the government's full support to project implementation.

Prior the Inception Workshop, a field survey of pilot fish farm sites was conducted by FAO team and various field data relevant to the project implementation were collected. A three day national training workshop on coldwater fish culture was conducted for key personnel to be involved in the project implementation. Selection of appropriate fish species, culture technologies and technical design of the pilot fish farm facilities are currently in progress. The construction work of the pilot facility and installation of equipment are rescheduled to start in April 2015.

TCP/NEP/3401 "Development of Fisheries Policy and National Aquaculture Development Project in Nepal"

Being a landlocked country, the aquaculture industry in Nepal is lagging behind many Asian countries. Per capita availability of fish is only about 2 kg/year, far below the regional average. Aquaculture development has been hindered by issues and constraints in various related areas, including institutional capacity, enabling environment, aquaculture inputs supply and public services, etc. Above all, there is no inclusive national policy for fisheries and aquaculture development.

The government recognized the urgency to develop an inclusive national fisheries/aquaculture policy and formulate a comprehensive national project for aquaculture development during 2015-2020. A TCP facility, approved by FAO in response to the request of the government in 2013, will assist the government of Nepal in formulating a national fisheries/aquaculture policy and comprehensive National Aquaculture Development Project for 2015-2020.

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Vice Minister addressing the TCP Inception Workshop

M. Weimin, FAO

FAO team work with the local partners planning pilot fish farming activities

Two national consultations and a number of specific stakeholder consultations which took place between February and May 2014 lead to the developmentof draft national fisheries and aquaculture policy and a national aquaculture development project document. These documents have been handed to the government for further processing.

Aquaculture Planning and Management Toolkit

A regional study and a subsequent regional expert workshop on "Application of aquaculture assessment tools in Asia-Pacific" (Pattaya, Thailand, 3-5 July 2012) jointly conducted by FAO, APFIC and the Network of Aquaculture Centres in Asia and the Pacific (NACA) recognized that the lack of appropriate assessment tools has been a key constraint in effective assessment of the performance of the sector and recommended FAO to support the development of an aquaculture planning and management toolkit for informed planning and effective management and assessment of aquaculture sector in Asia-Pacific, which was lately endorsed by the 32nd Session of Asia-Pacific Fishery Commission.

As the follow-up to the recommendation from the 32nd APFIC Session, FAORAP supported the development of an aquaculture planning and management toolkit for Asia-Pacific as an important regular programme work in 2013. A team of six experts from around the world were recruited for developing the draft toolkit, which covered 5 thematic areas, namely i) Site selection and zoning; ii) Biosecurity and health management; iii) Aquaculture food safety; iv) Aquaculture environment and v) Aquaculture Socio-Economics and included 16 tools for aquaculture planning, management and assessment.

An FAO regional technical consultation on development of an aquaculture planning and management toolkit and the strategy promoting its adoption was convened in Bangkok from 27-29 November 2014. The consultation reviewed the draft toolkit developed by the expert team, discussed how the draft toolkit could be modified and mostly importantly recommended strategy to promote the application of the tools developed. The draft toolkit and recommendations from the regional technical consultation were introduced at the 33rd APFIC Session. The Session recommended to develop needed application manual and training materials of selected tools for pilot application in countries of strong interest. Following the recommendation and also as the support to the FAO regional initiative on sustainable intensification aquaculture for blue growth in Asia-Pacific, FAORAP has prioritized a regional TCP for undertaking the recommended activities.

FAO/World Bank Community of Practice Meeting on Green and Inclusive Growth in East Asia and the Pacific

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Background and context

The World Bank employs around 80 professional staff working in East Asia and Pacific regional operations in the fields of agriculture, environment and social development. These professionals mostly based in country offices in the region with smaller teams based at headquarters in Washington D.C. are on day-to-day contact with counterparts in the various countries and also connected to each other through the respective Communities of Practice (COP). The main purpose of the COPs is to promote knowledge sharing and exchanges of experience among the Bank technical experts working in different countries in the region with the aim of bringing to clients the best available knowledge and best practices in the respective fields and as part of the Global Practice Networks that are being rolled out.

Once or twice a year, participants to the COPs gather together to share with counterparts and other development partners their experience and knowledge, an opportunity for face-to-face exchanges between experts from the Bank and partner organizations to strengthen the COPs. Since the annual World Bank Forum takes place in Washington, not everybody from country offices can participate and is not specific to the region or to any specific sector.

The 2014 field event took place in Lombok, Indonesia from May 19 to 23, 2014. It was organized by the East Asia and the Pacific (EAP), Agriculture and Rural Development (ARD)/ Environment (ENV)/Social Development (SDV) networks in cooperation with local partners, and coordinated by the Indonesia Country Office of the World Bank. Some government officials and counterparts also participated. The meeting included two full days of field trips to illustrate and stimulate discussions. The event was organized in collaboration with the FAO.

The challenges and opportunities of "Green and Inclusive Growth in East Asia and the Pacific (EAP)" was examined; a range of economic, environmental and social challenges facing the sector was highlighted. The focus of this particular event was on key issues pertaining to the Social Environment and Rural Sustainable Development agenda in the region.

The meeting was attended by 59 delegates from 12 countries (such as Australia, Cambodia, China, Indonesia, Italy, Laos, Mongolia, Philippines, Samoa, Thailand, United States of America and Viet Nam). Other key participants were from the World Bank, FAO, Center for International Forestry Research (CIFOR), Minister of Maritime

I. Christensen, FAO

Spiny lobster cage culture. Teluk Ekas, in Pemongkong village, Jerowaru sub district, East Lombok Community-based spiny lobster culture started in Ekas in 2000, by 2013, the income of the whole community had increased considerably as a result of profits coming from the sale of adult lobsters. Traditional equipment made from used sack of cement (Pocong), is used to catch lobster seed

Affairs and Fisheries in Indonesia (MMAF), and the World Wildlife Fund (WWF).

FAO actively participated in this conference with the following:

Technical inputs. Officers from the FAO Fisheries and Aquaculture Resources Use and Conservation Division (FIR), Aquaculture Branch (FIRA), and the Asia Pacific Service, Investment Centre Division (TCIB) as contributors and resource persons throughout the event, during all of its sessions and field visits.

Two plenary speeches

- "The Green Economy in the Blue World", delivered by Indroyono Soesilo (Former Director FIR)
- "Status and Trends of Aquaculture Development in the Asia-Pacific Region", delivered by José Aguilar-Manjarrez (Aquaculture Officer, FIRA)

Activities undertaken during the 4-day field event are described below:

Day 1: FAO attended and participated in the discussions of Session 1 on "Challenges and Opportunities of Green Inclusive Growth in EAP" and Session 2 on "Green Inclusive Growth and Agro-forestry Systems". FAO contributed principally to Session 3 on "Green Inclusive Growth in Coastal and Marine Systems", coordinated by Ida Christensen,TCIB) and moderated by Suzanne Raswant (Chief, TCIB). Topics covered in Session 3 came from three different perspectives: 1) the blue growth agenda 2) coastal communities participation in conservation and sustainable blue growth agenda 3) the status, trends and sustainability of coastal fisheries and aquaculture in Asia and the Pacific.

An Indonesian national perspective on green and blue growth was given from the Ministry of Marine Affairs and Fisheries describing the government policies. The idea of green and blue growth was further examined from a global and regional perspective from FAO which presented the green economy in the blue world. The local perspective followed when Lomboks recent blue economy implementation was highlighted with programs in: tuna fisheries, aquaculture, marine tourism, salt industry, pearl industry, eco-friendly sustainable energy and capacity building programs. The Bank also shared its experience working with coastal communities integrating community-driven development

J. Aguilar-Manjarrez, FAO

Traditional small scale fisheries Kuta Beach. There are about 100 members of 5 fishing communities in Kuta village. To improve and sustain fishing activities in Kuta village, fishers have recently established 3 associations for fisheries resources and 1 association for freshwater supply equipment

(CDD) and agriculture development during the Coral Reef Rehabilitation and Management Program (COREMAP) project in Indonesia. The final presentation of day one displayed trends of aquaculture development in the Asia Pacific region. FAO provided information about long and short term, opportunities and challenges based on global and regional experiences.

Session 3 gave the participant an opportunity to explore the management of aquatic resources. The presentations and guided discussions in this session were very well received by participants and added considerable value to the COP event, bringing additional knowledge and experience to the table and giving rise to fruitful discussions

Days 2 and 3: Visits (organized by FAO) to field projects (lobster and seaweed farming, rice-fish/prawn cultivation) including successful projects of: management of forestry resources and agro-forestry; community development and rural livelihoods; small-scale rural infrastructure; value chains development and marketing; and women's empowerment.

Day 4: Discussion of specific technical themes identified through a participant survey prior to the workshop. The six discussion topics that resulted from the merging of experts and interest were:

1. Blue economy. Principles for coastal community development/mainstreaming Green and Inclusive Growth in national and local development planning.
2. Watershed management. Experiences and lessons.
3. Output-based payments for forest and biodiversity protections.
4. Sustainable development of commodity value chains/private sector incentives for green growth.
5. Spatial planning-approaches, options, challenges/land governance/community driven development experiences, challenges, options.
6. Climate-smart agriculture-relevant concept experiences successful cases of extension and advisory services delivery.

To wrap up all of the various knowledge exchanges and learning of the week the final group discussion was country specific. The COP members met with their fellow country representatives to explore two questions: 1) What can we take away from the COP meeting to apply in our home country for the purpose of Green Inclusive Growth? 2) What knowledge do we have to contribute to Indonesia and other COP member countries for the improvement of Green Inclusive Growth globally?

Conclusions

Meeting participants gained background from the plenary sessions, experience from the field visits and learned about Green Inclusive Growth from each other during the multiple facilitated sessions.

On the field the participants were able not only to learn from beneficiaries first hand but also smell, taste and feel the impacts and challenges of the programs for themselves. From the 20 site visits the participants were able to learn about the technical knowledge in Marine, Forestry, Agriculture and National Program for Community Empowerment (PNPM) programs. The eclectic mix of discussions pushed participant to think outside of their typical thematic expertise and share experience knowledge with other country counterparts.

Moving forward the COP members have identified opportunities for knowledge they wish to share across countries to enhance programs of their country counter parts.

The COP event provided ample opportunities for FAO to establish new networks and linkages with the World Bank Task Team Leaders and to strengthen our partnership with the World Bank within the framework of the Cooperative Programme.

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- endorsed the workplan and activities of APFIC in the forthcoming biennium of work (2015-2016) including the 6th RCFM and 34th Session and
- was informed of the work programmes of other regional organizations working in fisheries and aquaculture and how they relate to the work of APFIC.

The 33rd Session agreed on the following:

- recommendations on the development of a strategic action plan for supporting SIA in the region;
- initiation of pilot level application of aquaculture planning and management tools in member countries showing strong interest;
- actions addressing priority issues in fisheries in the region.

The 5th Regional Consultative Forum Meeting and the 33rd Session of the Asia-Pacific Fishery Commission

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The 5th Asia-Pacific Fishery Commission Regional Consultative Forum Meeting (RCFM) "Responsible management of fisheries and aquaculture in the Asia-Pacific" was convened in Hyderabad, India, from 19-21 June 2014, and hosted by the Government of India. This biennial the Asia-Pacific Fishery Commission APFIC event was attended by 85 participants from 17 member governments of the APFIC, various international and regional organizations/partners and the private sector. Unlike previous RCFM's, the 5th meeting had parallel fisheries and aquaculture sessions in addition to the general sessions and was noted for private sector participation.

The aquaculture session "Promoting sustainable intensification of aquaculture (SIA) for food and nutritional security in the Asia-Pacific region" focused on sharing experiences and progress in the areas related to SIA, identifying gaps and recommending policy strategies to promote the SIA in the Asia-Pacific. The meeting specifically discussed the roles of public and private sectors and areas for cooperation and coordination.

Twenty-three speakers from participating governments, regional and international organizations, civil society organizations and private sector made 26 presentations, which covered five themes related to SIA, namely (i) improving control of aquaculture-related biosecurity and transboundary/epizootic diseases; (ii) aquaculture products to meet the market requirements - What do we need to do to improve; (iii) improving aquaculture governance and management practices; (iv) responsible production and use of feed and seed for SIA; and (v) increasing resilience of small farm holders in Asia-Pacific.

Following presentations under each theme, a set of 24 recommendations addressing priority issues concerning the five themes related to SIA was put forward through extensive consultation. The successful convening of the 5th RCFM will contribute to the implementation of FAO Regional initiative on SIA for blue growth in Asia-Pacific.

The 33rd Session of APFIC was held in Hyderabad, India, 23 – 25 June, 2014, hosted by

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Indian Minister of Agriculture addressing the 33rd APFIC Session

the Government of Indiawas and attended by 36 participants from 17 Member countries of APFIC, 4 observers from 3 APFIC partner International and Regional Fisheries organizations and FAO officers. The Session was opened by the Minister of Agriculture, India.

The 33rd Session:

- reviewed member countries' progress on the recommendations of the previous session of the Commission and emerging regional policy issues in fisheries and aquaculture;
- considered the status of fisheries and aquaculture in the Asia-Pacific region and the recommendations of the 5th APFIC Regional Consultative Forum Meeting;
- was informed of the work undertaken by APFIC regarding SIA and the promotion of aquaculture planning and management tools for sustainable development;
- reviewed the inter-sessional work of the Commission (2013-2014 biennium) and the Report of the Seventy-fourth Executive Committee Meeting;

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MASA Milestones: update on the Micronesian Network on Sustainable Aquaculture

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This is an update on the TCP/SAP/3403 project to assist the Micronesian countries establish an aquaculture network. The following activities have been completed:

1. Project Inception Workshop (Guam, 29 September - 02 October 2013; refer to FAN-52, page 17). The organization would be an intergovernmental organization (IGO) with the provisional name, Micronesian Association for Sustainable Aquaculture. The Republic of Palau was identified as host government.
2. National stakeholder consultation: Between November 2013 and May 2014 meetings among various stakeholders were held for national consensus, support and suggestions expressed.
3. Sub-regional Consultation Workshop (12-15 May 2014, United States of America Territory of Guam).

Sub-regional Consultation Workshop

The Sub-regional Consultation Workshop, was joined by legal and technical officers from governments and representatives from national, regional and non-government institutions and organizations.

Following the national stakeholder consultation meetings, a founding document for an IGO has been drafted with the assistance of FAO's Development Law Services (LEGN). For the technical complement of the legal action, a draft regional R & D Programme was formulated by the participants.

The Workshop discussed the status of the plan of work agreed at the Inception Workshop, drafted the MASA founding document (i.e. the Agreement), reviewed the Technical Work Programme and proposed projects for formulation, initiated action towards developing a proposal for annual membership contribution to the Association, and started work on the Rules of Procedures of the Association. A set of follow-up actions (e.g. Introduction of MASA to high level meetings in Micronesia, second round of national stakeholder consultations, establishment of an information hub) was recommended to reinforce the initial favorable attitude towards MASA that has been generated among national stakeholders.

The following tasks are planned to be completed on the first half of 2015.

- finalize the MASA Agreement and the administrative documents: rules of procedure, financial;
- regulations, explanatory notes, hosting agreement, terms of employment, terms of references, as well as the Agreement with the host government;
- develop an information paper on the scenarios of resource requirements for MASA and bases for levels of members' contribution;
- develop a schedule of membership fee;
- draft a Micronesian Sub-regional Aquaculture R & D Strategy;
- draft a Structured Micronesian Sub-regional R & D Project based on common aquaculture species among the countries and territories, around which are built personnel, institutional and sector management capacity building, and the outcome of which are social, economic and environmental advancement;
- develop a Micronesian sub-regional aquatic biosecurity strategy.

Further information can be obtained from the FAO Sub-regional Office for the Pacific Islands (FAO SAP) in Samoa. FAO-SAP@fao.org

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National milkfish development strategy in Kiribati

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In Kiribati, a milkfish farm was first established about 40 years ago with the assistance of FAO and other donors for the purpose of supplying baitfish to the tuna fishing industry; it expanded to an 80-hectare farm, now called as 'Teimaku EcoFarm'. If this 80-hectare milkfish farm could be fully operational, it would be supplying 50 000 islanders who like milkfish (notwithstanding their huge resource of tuna and rich fishery of other oceanic species) with more than enough of this fish, regularly and at an easily affordable price. The farm would also be supplying a lot of baitfish to the tuna longliners, and probably exporting some of the production. Following a request from the Government of the Republic of Kiribati and the farm's manager and operator to the FAO Sub-regional Office for the Pacific Islands (SAP), an FAO TCP Facility Project (TCP/KIR/3502: National Milkfish Development Strategy in Kiribati) was formulated.

This TCP facility included a 10-day assessment (in early September by a 3-man mission) of the farm and extensive consultations with national stakeholders to develop a strategy to rehabilitate, improve productivity, and turn this asset into a rural development instrument to serve the higher objectives of food and nutritional security, livelihood and employment generation. The strategy was discussed at a national stakeholders' consultation held on 10th of September 2014 and attended by 16 representatives from the following ministries: Fisheries and Marine Resources Development; Commerce, Industry and Cooperatives; Environment, Land and Agricultural Development; and Internal Affairs. Other key participants were from: the Kiribati Fish Ltd. and the Otta Services Ltd., both are markets for baitfish; the Technical Mission of the Taiwan Province of China, providing assistance in seed production and feed development using the 16-hectare Ambo Milkfish Broodstock and Hatchery Station (the first site, built in 1976, for farming bait-size milkfish); and the FAO Sub-regional Office for the Pacific Islands (FAOSAP). Based on the results of discussions during the national stakeholders' consultation, a regular TCP project proposal is currently under preparation. It has been agreed that the main objective of the TCP project is to demonstrate the technical and economic viability of farming bait-size and table-size milkfish on this farm. The result of 3 to 4 (successful) cropping cycles would then be used to develop a better management practice guide and an area management plan for the entire farm. These two guidelines shall be used to formulate an investment project for the rehabilitation, management and operation of the entire farm complex. A number of ownership structures and management options were recommended for study: (1) EcoFarm remains under the government operations; (2) farm is leased to one private operator; (3) part of the farm is run by the government and part by one private operator; (4) farm is subdivided into several lots leased to different farmers; and (5) part of the farm is retained by the government and part leased out to several farmers. The project will train technicians and farm workers as well as milkfish farmers in the outer islands. It will work out a programme with the Ambo Station for the reliable provision of seed and feed. The project shall assist the government in formulating a national aquaculture development strategy.

The mission also gave a brief seminar on the biological, physical, technical and management requirements of a successful pond aquaculture farm of milkfish, using as a reference point the current status of the EcoFarm. Two production models - for baitfish and for food fish - were worked out based on an improved physical facility and good management practices. The profitability, return on investment and payback periods of the two models, were calculated and presented to further inform the discussion. The project TCP/KIR/3502 was completed in October 2014.

Further information can be obtained from the FAO Sub-regional Office for the Pacific Islands (FAO SAP) in Samoa. FAO-SAP@fao.org

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Cage culture of milkfish in Tagabuli Mariculture Park, Davao, the Philippines

FAO activities to improve aquafeed quality and use in Asia

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This article describes FAO's ongoing technical assistance to improve the quality of aquafeeds and on-farm feed management in countries across South, Southeast and Central Asia. On the request, of the governments of Bangladesh, Kyrgyzstan, the Philippines and Sri Lanka, FAO has initiated in 2014 four in-country TCPs designed to improve feed quality and use. Each project addresses a number of fundamental and practical feed production and use issues: i) enhancing aquaculture production for food security and rural development in Bangladesh through better seed and feed production and management with special focus on public-private partnerships (TCP/BGD/3501); ii) enhancing aquaculture production for food security and rural development through improved feed value chain, production and use (TCP/KYR/3502), iii) improvement of feeding and feed management efficiency in aquaculture production in the Philippines (TCP/PHI/3404); and d) improving seabass (*Lates calcarifer*) aquaculture in Sri Lanka through better feed and health management (TCP/SLR/3502). Collectively their results will provide a regional recommendation.

Intensification of aquaculture, underlines the need to enable farmers to efficiently use the key elements which determine a successful aquaculture production. Seed and feed are key aquaculture inputs to a good yield and good returns. They are linked closely: quality, healthy seed makes for the efficient utilization of nutrients; quality feed and good feeding practices bring the most out of the genetic potential of the farmed organism. Feed can account for 50–70 percent of aquaculture production cost. Poor feed quality or improper feeding practice or both result in poor yield and low returns, even if the seed quality is good. With poor profitability, the farmer is less able to afford good quality feed and seed. This cycle of inefficiency undermines aquaculture intensification.

Small-scale feed producers and farmers

A central tenet of these programmes is to improve the capacity of small- to medium-scale feed manufacturers to produce safe, good quality feed for small resource-poor farmers. Based on existing practices, novel on-farm feed management practices will be developed and tested at a laboratory scale with formulations using local ingredients. Those formulations and feed management practices that show the most promise will be further assessed at a commercial scale, culminating in the development of a series of better feed manufacturing, formulation and on-farm feed management practices.

Many small-scale farmers in the region are unable to afford the feeds produced by the large-scale feed manufacturers and instead rely on farm-made feeds or feeds produced by small- to medium-scale feed manufacturers. Often the quality of these feeds is lower than that required for optimum performance of the farmed species. Result: poor yield and poor returns. Therefore the ongoing FAO projects will introduce novel small-scale feed manufacturing technologies to improve feed quality.

Improving feed supply chain

Another area that the projects are trying to improve pertains to the feed supply chain including the capacity to produce safe and appropriate feeds. This will be achieved through the development of Better Management Practice guidelines, training of small- and medium-scale feed producers in manufacturing and feed formulation, development of economically robust production models, and use of local feed ingredients.

The standard of commercially manufactured feeds can also be less than what is generally expected. Small- and medium-scale farmers usually rely on what the feed manufacturers tell them about the feed quality. Since they have limited or no access to diagnostic facilities they would not know if the proximate composition is right or the feed is not adulterated or feed additives are effective and worth the added expense. Likewise small-scale feed manufactures have limited access to diagnostic facilities making it difficult for them to monitor the quality of the feeds that they produce. While a number of countries in the region, including Bangladesh and the Philippines, have addressed these issues through the development of national feed standards, they have implementation problems. Other countries such as Sri Lanka and the Kyrgyz Republic have yet to develop legislative, policy and management frameworks for aquafeed manufacture and use, and rather rely on generic animal feed regulations. The projects thus also aim at developing and enhancing institutional and regulatory capacity as a means of monitoring and improving the quality of manufactured feed. This requires, among others, strengthening institutional oversight capacity supported by diagnostic facilities (feed analytical laboratories) and protocols to monitor and control feed quality.

Marine finfish culture in several countries is expanding. But the high quality feeds it requires, which are now mostly based on expensive imported fishmeal and fish oil, can be costly for small farmers even as it raises the question of economic and ecological sustainability of marine fish farming. The Sri Lanka project is addressing this issue by looking at the technical and economic viability of substituting high-value fishmeal with low-value fish silage from fish waste/low-value fish in feeds for Asian seabass. In addition to improving the feed quality and management, the Bangladesh project will also focus on improving seed quality and supply (particularly of Indian major carps) through better broodstock management, development of a selective breeding programme, and improving hatchery management practices. Likewise the TCP in Sri Lanka will also focus on improving fish health management in Asian seabass aquaculture.

Target fish species

The target fish species of these TCPs are Indian major carps (rohu, catla and mrigal), Nile tilapia (*Oreochromis niloticus*) and striped catfish (*Pangasianodon hypophthalmus*) in Bangladesh, milkfish (*Chanos chanos*) and Nile tilapia in the Philippines, common carp (*Cyprinus carpio*), Chinese grass carp (*Ctenophrayngodon idellus*) and rainbow trout (*Oncorhynchus mykiss*) in the Kyrgyz Republic and Asian seabass (*Lates calcarifer*) in Sri Lanka.

N. Ahmed, FAO

Drying of semi-commercial/farm-made feed for striped catfish, Mymensingh, Bangladesh. Feed quality assurance has become a major challenge for the country to address

FAO, Kyrgyzstan

Harvest of Chinese grass carp from a fish farm in Tup, Issyk-Kul Province, Kyrgyzstan. Lack of feed is the major constraint for the expansion of aquaculture industry in the country

B. Ceylan

Group photo of participants at the Third Session of CACFish

Third Session of the Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish)

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The Third Session of the Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish) was held in Baku, Azerbaijan from 2 to 4 June 2014. The Session was attended by representatives of four members, namely: Azerbaijan, Kyrgyzstan, Tajikistan and Turkey. The session was also attended by the following invited states, such as: Georgia, Kazakhstan, Mongolia, Ukraine and Uzbekistan.
The Commission adopted the scientific and technical advice and recommendations on the following issues, which were adopted by the Second Session of the Technical Advisory Committee (TAC) (Bishkek, Kyrgyz Republic on 21–23 April 2014) and submitted to the Commission for consideration, namely: i) Inland fisheries stock assessment; (ii) Regional strategic principles for adjusting to climate change; and (iii); Fish breeding and broodstock management. The technical advice and recommendations were valuable with respect of the priority and needs of the Central Asian and Caucasus region. The Commission also underlined the importance of the gradual implementation of the technical and scientific advice of TAC in the CACFish competence area.

It was noted that the region generally lacks reliable and time-bound data for most of the key commercial inland species. The Commission acknowledged the need to promote systematic stock assessment in rivers as well as smaller and large water bodies as a fundamental fisheries management instrument in the CACFish competence area. In this context, creation of enabling conditions for a management regime based on reliable and best available scientific data was seen necessary. However regular surveys and assessments of fish stocks would encounter considerable problems related to weak institutional, technical, financial, and human resources capacity.

The interventions made both by the delegates and observers led to the conclusion that the countries had varying type of stock assessment practices while few countries had no ongoing stock assessment studies or programmes. The countries that conducted partial or regular assessments, generally used combined studies on hydrological, biological, ecological and food web and predator-prey interactions but mostly relied on historical trends and/or direct assessment methods like egg and larval surveys.

Promotion of modern methods and applications of inland stock assessment, i.e. hydroacoustic survey techniques for the estimation of abundance, biomass, species composition and size distribution in large water bodies, was seen as a priority. The Commission also acknowledged the need for more regional cooperation on sampling and standardization of sampling methods and protocols.

With regard to fisheries data and information, a need for improvement of institutional and staff capacity for data collection, analysis and dissemination was noted.

The advice and recommendations of TAC were unanimously accepted by the Commission. In addition, the Commission approved the framework for a regional strategy and associated principles for aquatic animal health management in CACFish area. The Secretariat informed the Session that the Commission had adopted a considerable number of scientific recommendations since the Inaugural Session (2011). However it was stressed that the recommendations had not been adopted by Commission pursuant to the Article V (Recommendations on development and management measures) of the Agreement and thus had no legal effect.

The Commission discussed its 5-year Regional Work Programme (2011–2015) and endorsed 2014 work programme of the TAC.

The Session was informed by the Secretariat of the progress with implementation of the Five-Year Regional Work Programme (2011-2015) (RWP). It was stated that RWP is a rolling programme, reflect the needs and priorities of the region, and is subject to regular progress revisions by TAC and the Commission. The Session generally agreed that the RWP would significantly serve for the strengthening of an overall region-wide institutional capacity upgrade through ad-hoc trainings, workshop, technical assistance and guidance. Appreciation was also expressed for the likely cooperation between FAO regional projects and programmes, and the RWP. Addition of pilot studies to RWP was also suggested, particularly in response to the needs of both CACFish Member and non-Member States. Turkey indicated possibility for financing such initiatives outside the CACFish budget.

The Session acknowledged the considerable contribution of the Central Asia Regional Programme for Fisheries and Aquaculture Development (FishDev) to the RWP. In this regard, the extension of the FishDev for a second phase was regarded as highly important for the continuation of delivery of the expected outcomes. The CACFish Secretariat briefed about the key works and activities that were conducted during the intersessional period. The Commission adopted its 2014 autonomous budget at USD 180 000. With respect to the working module of the TAC, the Commission agreed on the following: (i) re-naming of the existing type of regular gathering type of TAC, called "Session" to "Meeting"; and (ii) organization of the 3rd Meeting of TAC in 2015; (iii) organization of TAC Meetings minimum every two years (biennial) after the 3rd Meeting (2015); and (iv) organization of one or more intermediate meetings, if deemed necessary, by any member and adopted by the Commission.

The Commission agreed to continue providing financial support for attendance of both the Members States and Invited Observer States at the events of the Commission and its subsidiary bodies. In this regard, the Commission decided to financially support the participation of two representatives and one representative from Members and Invited States, respectively.

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M. Kanyilmaz

The session was held with participation from the member states and invited observer states

Building the future of sustainable aquaculture in the Mediterranean and the Black Sea

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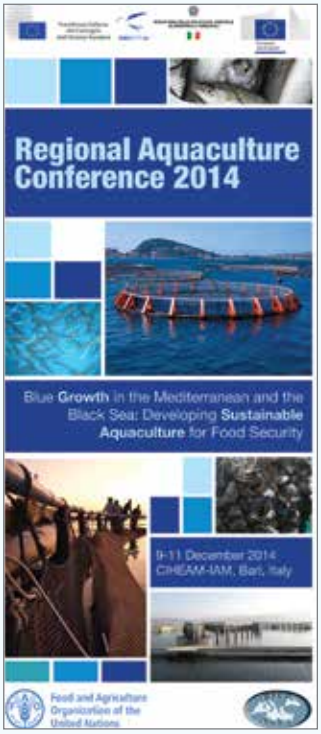


Aquaculture in the Mediterranean and the Black Sea has grown significantly over the past years. However, it is characterised by different levels and stages of development and varying features among the different countries. These are some of the reasons why the sector now faces major challenges.

The development of aquaculture inevitably raises sustainability concerns in terms of its economic, environmental and social dimensions. At a time when this promising and fast-growing sector is at a crossroads and priorities are no longer a matter for a single country, there is a need for coordinated and harmonious growth at the regional level.

Multiple challenges call for the implementation of harmonized strategies to ensure sustainable and responsible growth taking into account the regional and local specificities of Mediterranean and Black Sea countries in the different aquaculture sub-sectors.

GFCM Aquaculture Multi-Stakeholder Platform (AMShP): An innovative tool supporting regional strategies

The Mediterranean and Black Sea countries have acknowledged the crucial need to empower aquaculture farmers' organizations, enhance dialogue and consultation among all stakeholders, as well as foster self-regulation, co-management and collective actions. A new instrument to address these challenges and promote the sustainable development of aquaculture in the entire region has been developed.

Following a consultation process undertaken since May 2013 under the aegis of the General Fisheries Commission for the Mediterranean (GFCM)[1], the GFCM Aquaculture Multi-Stakeholder Platform (AMShP) was launched in December 2013. This regional platform is based upon a common vision and shared objectives and is designed as a tool to propose common solutions for sustainable strategies in the sector. It is open to all interested stakeholders and aims not only to foster better governance, but also offer an innovative forum to share experiences, information and knowledge about aquaculture development.

The potential benefits of this instrument for stakeholders are self-evident. These include: better decision-making between farmers, associations and public administrations; greater compliance to regulations; strengthened capacity in research and development and minimized space competition in coastal zones.

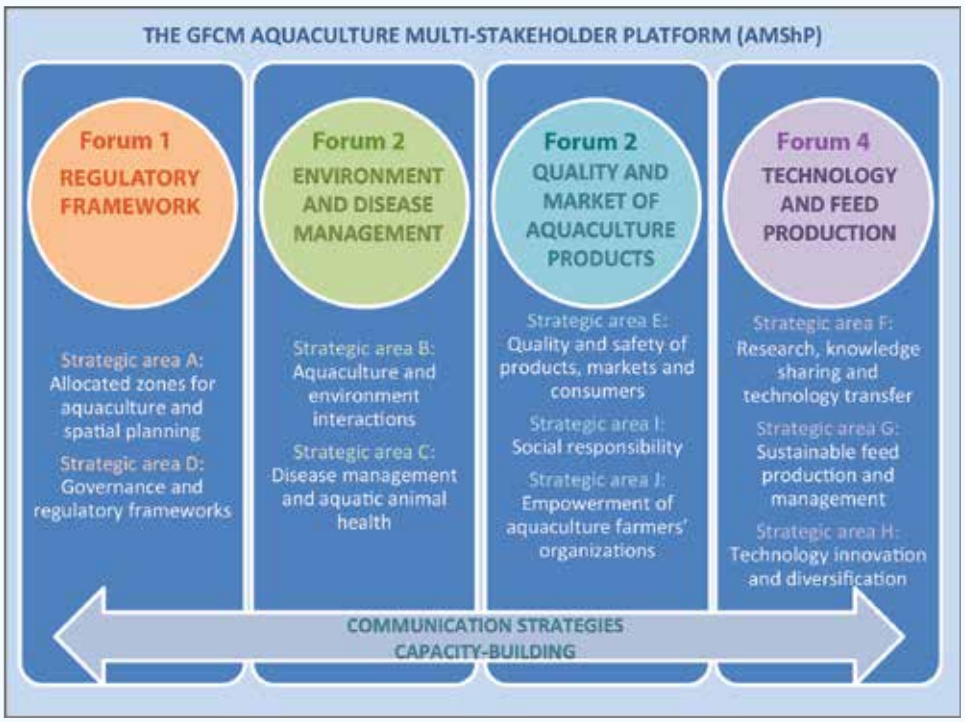
Seizing the momentum: simplification, growth and sustainability towards food security and Blue Growth in the Mediterranean and the Black Sea

There is a growing awareness in the region that, in addition to dialogue and consultation, knowledge-sharing and cooperation (through platforms such as the AMShP), there is a need to take concrete action at the policy level in order to obtain a clear commitment to support the sustainable development of the sector, while fully bearing in mind the current regional and local priorities.

For many years, aquaculture actors and stakeholders in the Mediterranean and the Black Sea have been calling for the commitment of governments towards a coordinated and sustainable growth of aquaculture, and the organisation of a regional event has long been on the agenda of the GFCM.

Now is the time to take action and seize the momentum uniting all the efforts in the region in order to give this sector the attention it deserves.

From 9 to 11 December 2014, a Regional Conference on "Blue Growth in the Mediterranean and the Black Sea: developing sustainable aquaculture for food security" was organized by the Italian Presidency of the Council of the



EU, together with the GFCM of the FAO and in cooperation with the European Commission. It was co-hosted by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) – Mediterranean Agronomic Institute of Bari (MAIB). Other partners such as Eurofish and several other international organizations have offered their collaboration.

The conference started with a two-day technical event comprising Expert Panels on specific topics followed by a one-day High-level Conference addressing strategic issues at stake both in the region and the rest of the world.

This event offered an important opportunity for experts and stakeholders from different countries in the Mediterranean and the Black Sea to sit at the same table, discuss challenges ahead as well as emerging aquaculture issues and share their experiences.

Discussions were centred on crucial issues pertaining to governance, environmental and biosecurity risks management, as well as markets for aquaculture products and innovation. Final conclusions and recommendations identifying the main priorities and commitments to support the sustainable development of aquaculture in the region were adopted at the end of the event The conclusions of the Conference were also endorsed by the GFCM Committee on Aquaculture (CAQ) at its ninth session (Marrakech, Morocco, 24–26 February 2015).

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or visiting the following websites:
www.gfcmonline.org; www.aquaculture2014.org

[1]As a regional fisheries management organization (RFMO) established under the provisions of Article XIV of the FAO Constitution, the GFCM plays a key role in coordinating efforts among its Members to promote the development, conservation, rational management and best use of living marine resources, as well as the sustainable development and responsible management of marine and brackish water aquaculture in the Mediterranean and the Black Sea.
Through its Committee on Aquaculture (CAQ), the GFCM promotes common standards and guidelines on technical, socioeconomic, legal and environmental aspects based on independent advice. It also assesses the information provided by its Members and other stakeholders regarding production, market, culture systems, technologies used, farmed species, and maintains databases including key indicators.

XIII Session of the Committee on Inland Fisheries and Aquaculture in Latin America and the Caribbean (COPESCAALC)

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D. Soto, FAO

From left to right: Mr Mauricio Remes; Fisheries and Aquaculture Department of Argentina; Mr Carlos Casamiquela Minister of Agriculture, livestock and Fisheries of Argentina, Mr Alejandro Flores, FAO-COPESCAALC Secretary and Mr Antonio Porras, Fisheries and Aquaculture Institution of Costa Rica, Chair of the XIII COPESCAALC Session

The Committee on Inland Fisheries and Aquaculture of Latin America and the Caribbean (COPESCAALC) held its XIIIth Session from 19 to 21 March 2014 in Buenos Aires hosted by the Ministry of Agriculture, Livestock and Fisheries of Argentina.

The XIIIth Session was attended by 25 delegates from nine member countries and observers including the Aquaculture Network of the Americas (RAA), the Center for Information and Advice on Marketing of Fishery Products in Latin America and the Caribbean (INFOPESCA), the World Forum of Fish Harvesters and Fish Workers (WFF), and national observers invited by the delegation of Argentina. The meeting was supported by the FAO Secretariat with the assistance of technical officers in the region and from FAO Headquarters in Rome.

In addition to evaluating the progress and activities in response to members requests during the previous session, the XIII Session had the following objectives: i) analyze the situation of inland fisheries and aquaculture in the COPESCAALC region, ii) propose different alternatives to strengthen the role of the Commission, especially under the new FAO Strategic Objectives; iii) discuss actions to consolidate the Aquaculture Network of the Americas (RAA); iv) analyze the role of the Commission in implementing the Blue Growth Initiative and the Global Aquaculture Advancement Programme (GAAP); and v) establish priorities for inland fisheries and aquaculture to be recommended to the attention of the XIII Latin America and the Caribbean FAO Regional Conference.

Significant recommendations of the XIII Session included the following:

- request the Regional Conference to give adequate priority to sustainable development of inland fisheries and aquaculture within the FAO Operational Programme of Work for the 2014-2015 biennium given its relevance in improving food and nutrition security and its contribution to poverty alleviation;
- support the improvement of systems and processes for policy formulation, strategic planning and sustainable management of Resource Limited Aquaculture and Micro and Small Aquaculture Enterprises, to strengthen food security and household economy;
- stimulate the development of aquaculture extension programs within member countries;
- support the assessment of transboundary inland fisheries in international watersheds, particularly regarding the state of fishery resources;
- address the multilateral interest of COPESCAALC member countries to develop an ecosystem approach to a fisheries

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Aquaculture Centre in Iquitos (Peru)

management plan and a strategy for transboundary fishery resources to be funded through extra-budgetary resources or donor mechanism;

- facilitate the dissemination and promotion of the nutritional benefits of fish consumption based on fishery and aquaculture products coming from sustainable practices within the region, thus strengthening regional markets with a special recommendation to include such regional fish products in school feeding programs;
- for the Regional Conference to support the Blue Growth Initiative, reinforcE and complement regional efforts to adopt an ecosystem approach to fisheries and to aquaculture;
- endorse of the Voluntary Guidelines for securing the sustainability of Small-scale fisheries and progressing towards their implementation as soon as possible.

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Fish market in Manaos (Brasil)

As part of the XIII Session, a workshop on "Registry, monitoring and dissemination systems for fisheries and aquaculture statistics (RMEPA) in the region" was also held. From this workshop, the Commission recommended that member countries increase efforts for the development, strengthening and harmonization of systems for the collection and processing of statistical data and information on fisheries and aquaculture products with the quality and frequency required for sustainable management of the resources.

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A glimpse of recent FAO-assisted fisheries and aquaculture activities in Latin America and the Caribbean

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Latin America and the Caribbean (LAC) contribute with approximately 11% of the world´s total capture fisheries production and with only less than 4% of the total global aquaculture production. It is one of the regions with the fastest aquaculture expansion and includes two of the top five capture fisheries producing countries (Peru and Chile) and one of the top ten aquaculture producing countries of the world (Chile).

The expansion of aquaculture and the growing concern for sustainable fisheries practices in the region have stimulated a number of national development strategies, institutional reforms and other efforts to promote the sustainable growth and consolidation of both sectors. These vary among countries depending on the relative degree of sectorial development although a common denominator is the technical assistance of FAO.

Sectorial Planning and Development Strategies

FAO´s assistance to governments of LAC countries in planning of fisheries and aquaculture development ranges from sectorial analysis and diagnostics, policy formulation, strategic planning and implementation of policy instruments. Table 1 presents some recent examples of FAO´s assistance on the aforementioned areas of work.

Country	Sectorial Planning & Development	Status
Argentina	• Formulation of the National Fisheries research Policy	• Underway
Bolivia	• New Fisheries and Aquaculture framework. • National Strategy for Fisheries and Aquaculture Development	• Delivered in 2010
Colombia	• National Aquaculture Sector Diagnostic. • Formulation of the National Sustainable Aquaculture Development Plan • Formulation of the National Fisheries and Aquaculture Policy.	• Delivered in 2013 • Delivered and enacted in 2014 • Underway
Guatemala	• Formulation of the National Strategy to incorporate aquaculture in the Family Farming Program	• Underway
Nicaragua	• Formulation of the National Rural Aquaculture Development Program.	• Delivered and enacted in 2011
Paraguay	• National Aquaculture Sector Diagnostic • Formulation of the National Sustainable Aquaculture Development Plan (NSADP) • Law for the Enhancement of Aquaculture • Implementation of the NSADP	• Delivered in 2009 • Delivered and enacted in 2012 • Enacted in 2012 • Underway
Peru	• National Small-scale fisheries sector diagnostic • Formulation of the National Strategy for Strengthening the SSF Sector • National Aquaculture Development Plan • National Aquaculture R+D+I Program	• Delivered in 2014 • Underway • Delivered and enacted in 2011 • Delivered and enacted in 2012
Uruguay	• Formulation of the National Sustainable Aquaculture Development Plan	• Delivered and enacted in 2009

Strengthening of Regional Fishery and Aquaculture Bodies

The Commission of Inland Fisheries and Aquaculture of Latin America and the Caribbean (COPESCAALC) is one of the two fisheries statutory bodies (the other one is the Western Caribbean Fisheries Commission or WECAFC) of the LAC region and is the only one that deals with inland fisheries. It is also the only inter-governmental forum where recommendations regarding priority areas in fisheries and aquaculture are discussed and agreed upon. Such priority areas are then taken up by the FAO´s Regional Conference which is FAO´s regional governing body.

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View of the Opening ceremony of the First Latin American Fisheries and Aquaculture Parliamentarians Forum, held in Mexico City in May, 2014

A. Flores-Nava, FAO

A Paraguayan agriculture/aquaculture farmer in one of the demonstration farms supported by the Network of Aquaculture of the Americas and FAO

The Aquaculture Network of the Americas (RAA, its acronym in Spanish) was created through a process facilitated by FAO upon request by member countries. It is an inter-governmental mechanism that aims at supporting the sustainable development of aquaculture in the region. It was first created in 2010 and currently has four full member countries (Cuba, Guatemala, Ecuador Panama and Paraguay) and nine other countries under the process of incorporation.

Through an FAO-assisted regional technical cooperation project funded by the Government of Brazil, the RAA carries out a number of activities such as seminars, courses, thematic studies and a regional program to support the development of the resource-limited aquaculture farmers (RLAF) of LAC countries. Some of the major activities of this program include:

- creation of a network of demonstration farms, operated by farmers and rural schools in Antigua and Barbuda, Colombia, Costa Rica, Guatemala, Ecuador and Paraguay, as tools to strengthen the capacities of RLAF;
- exchange of technical information among RLAF through regional for a;
- analysis of existing policies to enhance RLAF and promotion of multi-sectorial policies;
- fostering research thematic groups;
- strengthening institutional capacities, particularly on extension services in aquaculture.

The Network has agreed on five strategic programs on which efforts will be concentrated within the next five years, namely:

1) increase fish consumption in the LAC region;
2) integral support to resource-limited aquaculture farmers; increase aquaculture competitiveness in the region;
3) addressing transboundary aquatic diseases;
4) increase the intra-regional aquaculture products trade and
5) aquaculture diversification with emphasis on marine and native species. FAO is assisting the development of conceptual frameworks for each program.

In line with the new strategic framework of FAO, on May 2014, the first Latin American Fisheries and Aquaculture Parliamentarians Forum was organized in Mexico City. It has been a breakthrough initiative in terms of involvement and political commitment of Parliamentarians in the sector, which resulted in the creation of a permanent mechanism to support fisheries and aquaculture development. It will meet again in 2015 in Brazil.

Activities to promote small-scale aquaculture in Panama

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Panama is the country in Mesoamerica with the highest consumption of fish at 23 kg/year/person[1]. However, consumption levels vary among the population according to geographical, cultural and social factors. Although there are no official data demonstrating such variation, it is well known that there is greater consumption in major cities and among communities in coastal areas that provides easy access to seafood products. In the central part of the country, on the other hand, people rarely eat fish, although they do recognize its nutritional value. This is mainly due to the absence of local production of fish, lack of supply by traders and low purchasing power of the rural population.

The FAO Subregional Office for Mesoamerica (FAO-SLM) has been working to increase access to and consumption of fish through the promotion of aquaculture. The work mainly focused on some of the indigenous communities where malnutrition is prevalent. The Ngäbe-Buglé, for example, has the highest degree of malnutrition in the country[2]. These people base their diet on a limited number of foods such as grains and tubers. A survey made among the Ngäbe-Buglé showed that they consume just 2.2 kg of fish per person per year, and that 47% eat fish less than once a month. The main reason for the low level of fish consumption was attributed to the difficult access to the resource.

In order to increase the variety of food supply and nutritional quality in indigenous communities FAO has approved the "Indigenous Project"[2], which has an aquaculture component that aims at promoting aquaculture as a possibility to increase and diversify food production and reduce poverty by selling surplus-production at the local markets. During discussions with the communities their interest in aquaculture development was assessed, and reasons for successes and failures of earlier attempt to implement aquaculture projects were identified including availability of fingerlings and feed, and access to technical assistance.

Indigenous territories (Comarcas) in Panama

Capacity building

To promote small-scale aquaculture as a potential provider of protein and income in rural area, FAO- SLM and the Aquatic Resources Authority of Panama (ARAP) organized a workshop aimed at extensionists from the ARAP and the Ministry of Agricultural Development (MIDA).

The workshop was attended by experts from Panama, Argentina, Paraguay, Costa Rica, and Colombia, and showcased a number of successful experiences with integrated aquaculture in different parts of Latin America allowing participants to discuss issues such as: alternatives to formulated feed (which represents between 70 to 80% of production costs excl. transportation), and optimization of the use and reuse of nutrients generated in different agricultural production systems.

Presentations included:

- Use of alternative raw materials (eg. waste or by-products) in fish diets (eg. coffee pulp and green bananas).
- Use of wet and dry silage as feed.
- By-products from the aquaculture industry and its potential uses in human or animal feed.
- Periphyton as supplementary feed for tilapia.
- Nile tilapia seed production.
- Artisanal smoked seafood.

C. Pulgarin, FAO

Experts from five countries exchanging experiences at a workshop on integrated aquaculture

- Aquaculture-agriculture demonstration farms.
- The criteria for the selection of demonstration farms for support by the Aquaculture Network of the Americas (RAA).
- Rice fish culture.

During the event, working groups prioritized and developed strategic issues to facilitate the promotion and development of aquaculture in Panama. A database was built containing the names of all by-products and season products that will be used to replace commercial feed in small-scale aquaculture. The workshop concluded that:

- Panama has enough products and by-products in different places and along to the season as will support small aquaculture activities.
- It was recommended a review of the volumes produced from aquaculture and fisheries by-products, quantities available, legal framework and its potential use in human and animal nutrition, and other economic purposes.
- Adaptation and validation of different experiences in integrated aquaculture developed in others countries and Panama, as shown in the workshop
- Promote the interagency working between MIDA, ARAP, universities and other institutions in order to carry out a joint strategy to promote small-scale aquaculture development.
- Improve feedback productive projects and a partnership between MIDA and ARAP and integration of aquaculture activities into the agriculture activities.

C. Pulgarin, FAO

Field visit to a farm with a diversified production including aquaculture ponds

It is expected that the aquaculture sector will be further strengthened now that Panama has formally joined the RAA. The RAA has a program that offers the possibility to get a grant of up to USD 30,000 to support the establishment of integrated aquaculture demonstration farms.

It is currently being planned to repeat the workshop in several other Mesoamerican countries.

[1]FAO 2014. Contribución de la pesca y la acuicultura a la seguridad alimentaria y el ingreso familiar en Centro-américa, Panamá. 91 p.

[2]TCP/PAN/3401 Driver for the development and validation of a proposed comprehensive technical assistance aimed at improving food and nutrition security in the indigenous regions Ngäbe and Guna Yala in Panama ("Indigenous Project").

Strengthening Aquatic Animal Health Protection Systems in Suriname

Suriname, the smallest country in South America, with a population of slightly more than half a million people, has an economy that is dependent on gold, oil and aluminum, constituting 30 percent of the Gross Domestic Product, and 90 percent of exports. The country has an abundant supply of brackish and fresh water, and its climate and other conditions are favorable for aquaculture.

In August 2010, a request for technical assistance for the establishment of a fish disease monitoring system was received. Upon evaluation of the request, the Aquaculture Branch (FIRA), and in consultation with the Government of Suriname, revised the scope of the assistance and expanded it to include aquaculture development. The TCP project TCP/SUR/3401 was approved in May 2012 and the project document was signed in July 2012 by the Minister of Agriculture, Animal Husbandry and Fisheries or LVV (HE Hendrick Setrowidjojo) and FAO Representative (Mr Barton Clarke).

The project has the development goal of ensuring food security and securing livelihoods and foreign exchange earnings through sustainable aquaculture development that supports effective biosecurity governance. The project was implemented from June 2012 until 31 March 2015 by LVV, with the active participation of many national stakeholders including the following: Fish Inspection Institute (VKI), the Ministry of Public Health, the Veterinary Inspection, the Ministry of Trade and Industry, the National Institute for Environmental and Development (NIMOS), the private sector (e.g. COMFISH N.V.) and the Anton the Kom University of Suriname (AdeKUS), small-scale finfish producers and the ornamental fish hobbyists. FAO provided technical backstopping from FIRA, the Legal Office (LEGN), FAOSLC and FAOTT and the services of international and national consultants.

Project Activities. Many activities undertaken during this period included the following, in chronological order:

- Project Inception Workshop (30 August 2012).
- National Aquatic Animal Health Management Strategy (NAAHMS) Workshop 1 (July/August 2012).
- Several meetings of the Aquaculture Task Force (ATF, established in August 2012).
- Aquaculture Strategy Development Workshop 1 (August 2012).
- Aquaculture promotion and awareness raising during World Food Day (October 2012).
- Aquaculture Risk Analysis Workshop (February 2013).
- Aquaculture Strategy Development Workshop 2 (February 2013) .
- Shrimp Pathology Course (June 2013).
- Surveillance training/workshops (August and November 2013).
- Workshop on Aquaculture and Aquatic Animal Health Legislation (July and November 2013).
- Aquaculture sectoral assessment (November 2013).
- National Workshop (March 2014).
- Concept Note Writeshop (March 2014).
- Ornamental Fish Training (September 2014).

Project Achievements. The most significant achievements of the TCP project were:

- **Aquaculture Development Strategy, 2013–2025.** The aquaculture policy and strategy were formulated during two national workshops held in 2012 and 2013 and provided the LVV with a mid-term roadmap for sustainable development of the aquaculture sector. The vision for aquaculture in Suriname is: "To develop and manage a sustainable aquaculture sector that meets the growing demands for aquatic foods and products for current and future generations, that are of high quality, safe, competitively priced and are produced in a socially and environmentally responsible manner with maximum opportunity for profitability in all stages of the aquaculture product chain." And implementation using 10 guiding principles of: sustainability, conflict resolution, food security, empowerment, best knowledge base, monitoring and enforcement, adaptive management, stakeholder coope-ration and feasibility. Within the strategy, 13 operational objectives (3 social objectives, 4 economic objectives, 4 ecological objectives and 2 institutional objectives) were formulated.

- **National Aquatic Animal Health Management Strategy (NAAHM), 2013–2025.** Development of the NAAHM strategy was initiated in a workshop held from 31 July – 1 August 2012; an Aquaculture Task Force (ATF) was established consisting of representatives of the LVV, the private sector, the Fish Inspection Institute (VKI) and FAO experts. The NAAHS has the objective of "*reducing the risk of aquatic animal diseases impacting on the livelihoods of aquaculture farmers, the national economy, trade and human health, as well as the environment*" and is comprised of 12 strategic programmes containing 17 identified priority projects that are defined in order to increase Suriname's ability to prevent and control aquatic animal disease outbreaks, achieve access to regional and international markets, support quality assurance and improve the productivity and sustainability of the nation's aquaculture industry.

- **National Aquatic Animal Health Surveillance and Animal Aquatic Health Information System.** A surveillance program for four serious diseases of aquatic animals (White Spot Syndrome Virus, Taura Syndrome Virus, Infectious Hypodermal and Hematopoietic Necrosis Virus, Koi Herpesvirus) were established. Emphasis was on targeted surveillance, sampling, diagnostic testing, and field visits to farms in the shrimp, finfish and ornamentals subsectors. Two training workshops (in Paramaribo for the shrimp subsector and Nickerie) for the small-scale finfish subsector) were organized on disease surveillance. The information system includes an aquaculture farm and species database, a surveillance database, links to disease information, an aquatic animal health expert database and a list of reference laboratories for sample analyses.

- **Aquaculture and Aquatic Animal Health Legislation**. A Legal Working Group was established to support the review and drafting process. In order for Suriname to be able to export aquatic animals, a legal framework and capacities in line with international aquatic animal health standards (in particular, the OIE Aquatic Animal Health Code), as well as the capacity to meet the legal requirements of main export markets, such as those of the European Union (EU) is indispensable. During the drafting sessions, experts from the Ministry of Public Health, the Fish Inspection Institute, the head of the Veterinary Inspection, the Ministry of Trade and Industry, the National Institute for Environmental and Development (NIMOS), the private sector (e.g. COMFISH N.V.) and the Anton the Kom University of Suriname (AdeKUS) were contacted on specific concerns. These legal instruments were presented to a stakeholder's consultation workshop in November 2013.This consultation also recommended the development of a separate legal instrument on aquaculture licensing; thus a separate draft Ministerial Decree on Aquaculture Licensing.

- **Aquaculture Sector Assessment.** Aqua-culture in Suriname, while in its early stage of development, has the potential to increase its production of food fish, shrimp and ornamental fish for improving food security, alleviating rural poverty, enhancing foreign exchange earnings and creating livelihoods. Experimental aquaculture had been conducted in the country since 1950s and as both public and private sectors invested in aquaculture businesses over the years, results of such endeavours have not been encouraging. Only one company is currently engaged in commercial aquaculture that caters to domestic market and a limited number of small-scale farmers practice fish culture in combination with agriculture and animal husbandry. There is a rapidly growing number of ornamental fish hobbyist. There is an expressed interest from both existing and potential fish producers to venture into commercial operations as long as training, financial and marketing support are made available.

- **Capacity development.** In additional to the knowledge gained from the various Thematic workshops conducted in the development of various policy, strategy and legal documents, three specific training course/workshop, i.e. Risk Analysis (RA) for Aquatic Animal Movement and Ornamental Fish Training, and the Shrimp Pathology Training Course provided great learning opportunities for both public and private aquaculture stakeholder sectors of the country. The RA course, which used the translocation scenarios of introducing to Suriname *Penaeus monodon* (Giant tiger prawn) and *Later calcarifer* (Barramundi) also included Guayanese participants.

A. Chotkan, LVV-Suriname

Colouring contest First Prize, X. Toelsi of Class 1b of the O.S. Gijsbertus School (left) and First Prize of the drawing contest, I. Smit of Class 4b of the Petrus Donders School (right) during World Food Day celebration in Paramaribo in October 2012

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MER SUD Project
Marine Environment Regeneration in the South of Haiti

This initiative is part of one of the thematic programmes of the United Nations (UN) Coalition for the South of Haiti (Côte Sud Initiative) aiming at promoting a "UN Delivering as One" at local level to support the Government in the sustainable and integrated development of this southern coastal region. As such, the Côte Sud Intiative is formed by FAO, United Nations Environment Programme (UNEP), United Nations Office for Project Services (UNOPS), United Nations Development Programme (UNDP) and United Nations Human Settlements Programme (UNHABITAT), and is divided into the following six thematic programmes led by corresponding Ministries with UN support: "Mer Sud, Terre Sud, Route Sud, Ville Sud, Energie Sud, and Gouvernance Sud".

In particular, the Marine Environment Regeneration in the Southern Part of Haiti (MER SUD) Project was launched in 2014 through an agreement recently signed between UNEP and FAO in the amount of USD 100 000. This Norwegian-funded project implemented by UNEP has the main goal of promoting marine ecosystem regeneration and sustainable development of income generating activities in the South Department of Haiti.

UNEP

Aerial view of Abacou Marine Protected Area (MPA) which is part of the first 9 MPAs of Haiti declared by the Government through Mer Sud support

The UNEP established the work plan and expected outcomes with the national counterparts from the Ministry of Agriculture, the Ministry of Environment and two NGOs, i.e. PADI ("Pêche Artisanale et du Development Intégré") and Yunus Social Business. They are all involved in direct implementation of project activities on the ground in strict collaboration with local communities.

Some activities deal with the improvement of fisheries management, diversifying fisheries products and developing aquaculture in the selected area and will be implemented by FAO.

Specifically FAO will provide assistance on the following areas:

- Design of appropriate regulations in the South Department, aiming at controlling fishing effort and increasing selectivity.
- Development of outreach material on sustainable fisheries and aquaculture to sensitize fishing communities on sustainable practices and disseminate information.
- Assessment of the state of fisheries resources to establish baseline status of fisheries resources and aquaculture production potentials in the area.
- Design and development of a fisheries data collection and management system, to collect baseline information on fleets, gears and catches.
- Design of fishing gears and vessels to assist communities in the rehabilitation of current vessels for increased efficiency.
- Propose suitable post-harvest facilities and good practices in the preservation, processing and marketing of fish and aquaculture products to increase food safety and value.
- Collect socio-economic data and information to support the development of strategic recommendations on alternative livelihoods for existing fisher organizations.
- Propose suitable aquaculture farming systems in the area.
- Develop disaster risk reduction measures for three fishing communities.

Funds have been secured for another phase of this UNEP Project and with possibility of FAO technical assistance. The Project involves a multidisciplinary team from the FAO's Fisheries and Aquaculture Department and the FAO Haiti and FAO Sub-regional office in Barbados.

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UNEP
Fishermen repairing a fishing boat

Reunion of former FI Senior Management during COFI 31 in Rome

Coordinated by the former ADG/FI, Mr Ichiro Nomura, some of the former members of the FAO Fisheries and Aquaculture(FI) Department Senior Management took the opportunity of attending the 31st Session of the Committee on Fisheries (COFI 31) to meet to renew their friendship and update their respective status in recent years. It was regretful not to have all members around; it was anticipated to meet again in future occasions, whenever possible. The photo shows the reunion of the former FI DSSM members with joyful smiles, and starting from the left are: Karin, Jean Francois' wife; AnneMarie DeFendi, the former Secretary of the ADG/FI, retired in 2013 and now a happy touristic pensioner based in Rome; Jean François Pulvenis, the former Director/FIP, retired in 2011 and now the Senior Policy Advisor to Inter-American Tropical Tuna Commission (IATTC) based in San Diego, USA; Ichiro Nomura, the former ADG/FI, retired in 2010 and now Special Advisor to the Minister of Indonesian Ministry of Marine Affairs and Fisheries based in Jakarta, Indonesia; Jeremy Turner, the former Chief of Fishing Operations Service and now the ABNJ Programme Manager of FID/FAO; Serge Garcia, the former Director of FIR/FAO, retired in 2007 and now the Advisor to IUCN based in Rome; Lahsen Ababouch, the former Chief of Fish Products and Trade Service and now the Director of FIP/FAO; Grimur Valdimarson, the former Director FII/FAO, retired in 2009 and now the Advisor to the Icelandic Minister of Fisheries based in Reykjavik, Iceland; Jiansan Jia, the former Chief of Aquaculture Service and now the Deputy Director of FIR/FAO; Ndiaga Gueye, the former Chief of International Liaison Service and now the FAO Representative in Democratic Republic of Congo based in Kinshasa.

INFOSAMAK

Participants and experts attending the FAO regional workshop on WTO in Casablanca June 2014

FAO Regional Workshop on WTO Framework for International Market Access

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The Fisheries and Aquaculture Department of FAO held its 8th capacity-building workshop on "WTO framework for international market access in fisheries and aquaculture", in Casablanca, from 2-4 June 2014. This workshop was jointly organized with INFOSAMAK and provided capacity building for 32 government officials from the Near East and North Africa (NENA) region. The workshop was opened by Ms Lazraq, of the Moroccan Ministry of Agriculture and Fisheries, as well as Mr Hage, the FAO Representative in Morocco. Technical topics were presented by FAO (Dr Chomo, Ms GarridoGamaro, Mr Dent), INFOSAMAK (Ms Bougouss) and international experts from the WTO (Ms Morgan) and University of Stravergas, Norway (Dr Asche).

Fisheries and aquaculture play an important role in the economies of many Near East and North African countries. Fish processing for export in many of these countries represent a significant source of hard-currency earnings and employment. The regulatory framework of the WTO with its various agreements play an important role in governing international fish trade. Thus, awareness of global fish trade policies is imperative for the stakeholders along the seafood value chain, including private producers and policymakers from the NENA region. The topics presented by experts at the workshop were:

- Global supply, demand and trade of fishery products (FAO)
- Trade in the Arab region (INFOSAMAK)
- Overview of WTO and the Bali Ministerial (WTO)
- WTO issues related to fisheries trade (WTO)
- Market mechanisms in fish trade to promote sustainable fisheries (FAO)
- Quality and safety aspects of fish trade (FAO)
- Fish trade and exchange rates (University of Stravergas).

FAO Fish price index (University of Stravergas). Country delegations shared their national experiences, namely challenges and opportunities with regard to factors that influence their fisheries and aquaculture sectors and fish trade. National case studies were presented by 11 countries: Bahrain (Mr Mansoor), Iraq (Mr Rasheed), Libya (Mr Maayuf), Mauritania (Mr Mahjoub), Morocco (Mr Fatih), Oman (Mr Juma), Palestine (Mr Shtaya), Saudi Arabia (Mr Al-Mutlaq), Sudan (Mr El-Shiekh), Tunisia (Mr Hedi), United Arab Emirates (Mr Al-Rayssi) and Yemen (Mr Lahmar). Ample time was allocated during the workshop for questions and to stimulate discussions among country delegates and international experts.
Aquaculture was seen as the future for sustainable fish production by the workshop participants, and is considered a potential growth sector in the NENA region due to increasing fish demand, including opening of new international markets for farmed fish, in face of limited growth for

traditional capture fisheries especially in the Mediterranean Sea. For this reason, it was reported by some participants that aquaculture research centers are emerging in their countries to help introduce potential aquaculture species, as well as to assist the private sector with aquaculture-specific issues like aquatic animal disease occurrence and distribution of scarce water resources. Regarding post-harvest handling of seafood, assuring food safety and quality of farmed fish products through innovative technology is still a challenge for some countries in the NENA region, because of the lack of necessary infrastructure, institutional capacity such as laboratory and testing facilities, and skilled aquaculture personnel.

Three key challenges, identified during the workshop as common for many of the countries, were:

- Difficulties producers face in obtaining market access of their seafood products to the United States of America and the European Union and the need to target non-traditional importers, such as emerging market opportunities in Asia, Eastern Europe and Latin America.
- Weak domestic and regional markets for seafood stemming from low levels of fish consumption in many countries of the NENA and Sub-Saharan Africa regions and limited intra-regional seafood trade networks, and
- The need for human skills and institutional capacity to support development of fisheries and aquaculture sectors. Aquaculture development faces the additional challenges of disease occurrence and water resource availability.

The key workshop recommendations were: requests to encourage more domestic and intra-regional fish trade instead of targeting traditional import markets; offers of regional cooperation to promote aquaculture sector development; and requests for more regional cooperation on WTO negotiations that are of interest to NENA countries, such as market access for fish products.

The workshop concluded that South-South cooperation could be extremely useful in addressing some of identified challenges, in addition to the usual channels of assistance from international organizations such as FAO and WTO, in order to ensure that the countries of the NENA region benefit from both regional and international expertise in the aquaculture field and fish trade related issues. Workshop documents and presentations are available on the GLOBEFISH website, www.GLOBEFISH.org.

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Calendar of events

- ◊ The 8th Session of Regional Commission for Fisheries (RECOFI) will be held in Muscat, Sultanate of Oman, 12-14 May 2015
  Information: Piero.Mannini@fao.org
- ◊ The 8th Session of the Committee on Fisheries (COFI) Sub-Committee on Aquaculture (www.fao.org/cofi/aq/en/) will be held in Brasilia, Brazil from 5-9 October 2015
  Information: Rohana.Subasinghe@fao.org
- ◊ FAO/MoA/SAS Early Mortality Syndrome (EMS)/Acute hepatopancreatic necrosis disease (AHPND) Round Table Discussion, 2 March 2015, Jeddah, KSA
  Information: Melba.Reantaso@fao.org; Francesco.Cardia@fao.org
- ◊ Project Terminal Workshop: FAO TCP/RER/3402 "Assistance to Western Balkan Countries for Improving Compliance to International Standards on Aquatic Animal Health", Sarajevo, Bosnia and Herzegovina, 7-9 April 2015
  Information: Melba.Reantaso@fao.org
- ◊ FAO TCP/INS/3402 "Development of preventive aquatic animal health protection plan and enhancing emergency response capacities to shrimp disease outbreaks in Indonesia" back-to-back workshops in Jakarta, Indonesia
  - ◊ Surveillance and Data Analysis Workshop (6-7 May 2015)
  - ◊ Emergency Preparedness Field Simulation Exercise (8-9 May 2015)
  - ◊ National Workshop (11 May 2015)
  - ◊ Project Terminal Workshop (12 May 2015)

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Zoning and site selection for the sustainable development of fish cage culture in the Kingdom of Saudi Arabia

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Background

The Government of the Kingdom of Saudi Arabia has recently identified aquaculture development as a priority area second to the oil and gas sector. It views the industry as a key contributor to food security, to the generation of employment and to the overall economic development of the country.

An ambitious target of up to one million tonnes of production from aquaculture has been set for 2030 as reflected in the latest Sector Development Plan drafted within the 7th Initiative Programme under the Agriculture Development Fund. Species diversification, Development and introduction of new hatchery and production technologies, and development of Aquatic Animal Health (AAH) management protocols are among the actions being implemented by the Saudi Ministry of Agriculture (MoA).

FAO is currently providing technical support to the MoA through the implementation of a Unilateral Trust Fund (UTF) project entitled "Strengthening and supporting further development of aquaculture in the Kingdom of Saudi Arabia" (UTF/SAU/048/SAU). The project became operational in February 2013 under the current 2012-2016 FAO/KSA programme. The overall objective of the project is the sustainable and responsible development of marine aquaculture through the provision of technical assistance to the Aquaculture Department and the Jeddah Fisheries Research Center (JFRC). The project is working on the following four outputs:

1. Development of marine cage fish culture;
2. Development and expansion of marine hatchery production;
3. Reinforcing national aquaculture research programmes; and
4. Institutional capacity building.

This article focuses on activities so far conducted in support of marine cage aquaculture development. As development of the sub-sector requires appropriate planning and management, the project is in the process of implementing a series of regulatory activities that aims at creating an enabling environment for the private sector; notable is the establishment of a clear and easy licensing system.

F. Cardia, FAO

Tabuk fisheries: floating cage farm, Tabuk, KSA

Zoning and site selection

Practical guidelines on technical and environmental criteria for zoning and site selection for fish cage culture in the Red Sea coast have been drafted under this UTF project.

The site selection criteria proposed in the guidelines have been used in the zoning process for cage aquaculture where areas for commercial ventures can be identified ensuring social acceptability, economic viability and environmental sustainability.

These technical guidelines provide an analysis of the main environmental parameters that may affect both the cage system design and the growout of fish in cages. The guidelines have been used as background document for a training course on zoning and site selection for MoA staff, whose aim was to increase the awareness and understanding of key technical officers involved in the licensing process.

The project also set up a Working Group on Spatial Analysis at the JFRC responsible for undertaking national assessment on the potential for fish cage culture and identifying the most suitable sites for mariculture development in the Red Sea taking in full consideration of factors such as environmental suitability, availability of land-based infrastructure and potential conflicts with other resource users.

Figure 1 illustrates an example of map developed applying the above criteria.

F. Cardia, FAO

Training on spatial tools at the Jeddah Fisheries Research Center, November, 2014

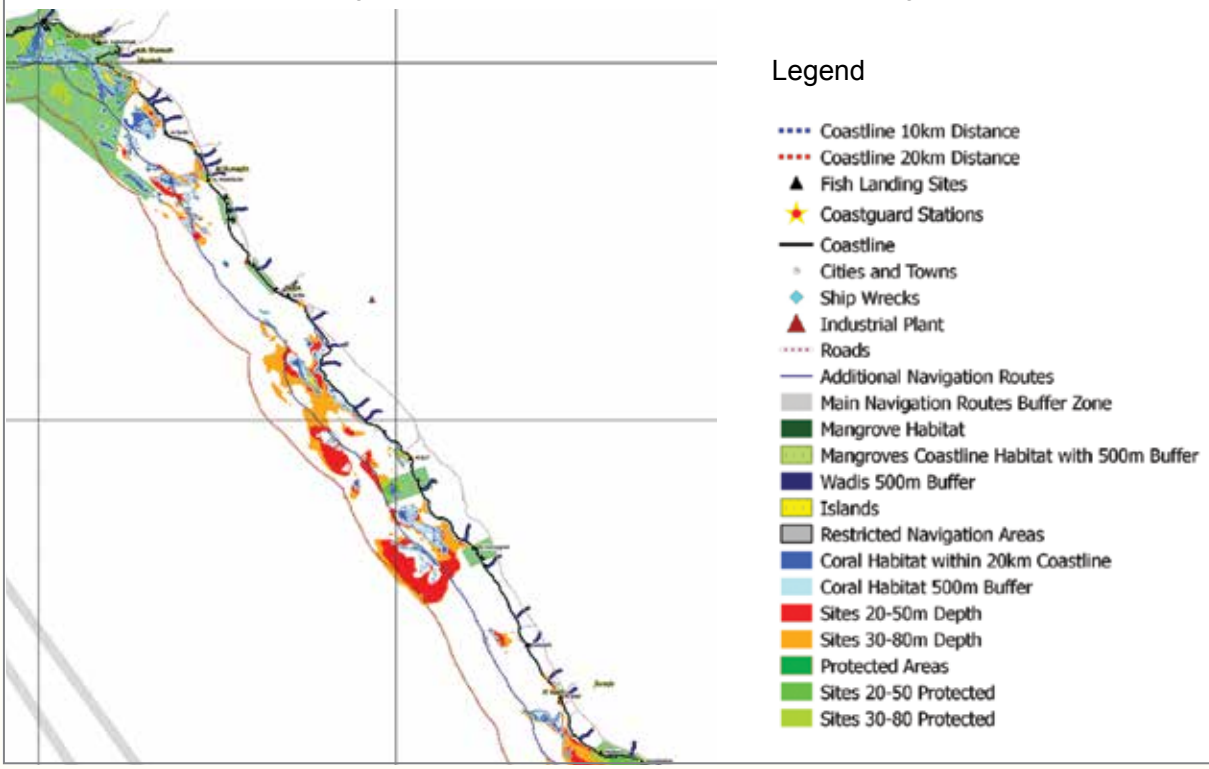
Spatial analysis study

The spatial analysis study is intended as a tool for aquaculture stakeholders and new investors to identify new and suitable sites for development of mariculture projects. This study would empower the Saudi MoA with adequate information for decision-making in terms of government support for the development of the sector.

So far there is a need to include additional new criteria and corresponding datasets. The major difficulty encountered is the availability of datasets needed for spatial analysis to identify zones for fish cage culture. The project is currently working with the General Commission of Survey and other Saudi authorities to collect available data on waves, currents, tides, physicochemical parameters (such as dissolved oxygen, sea surface temperature and salinity), military restricted areas, sea bottom characteristics and traditional

FIGURE 1

Example of map showing site selection criteria and possible zones allocated for cage aquaculture parks



fishing grounds (see **Box 1**). Field surveys of selected areas are planned for 2015 to verify the quality of the datasets.

A detailed inventory of all existing aquaculture farms and production levels, both in marine and freshwater environment, in the Mecca region has been implemented. Satellite imagery investigation, analysed, on a trial basis, the actual surface occupied by the farm, considering the rearing basins and the auxiliary structures. This inventory is part of the map collection under FIRAs National Sector Overview (NASO) maps collection to show the location of aquaculture sites and their characteristics (www.fao.org/fishery/naso-maps/naso-maps/en/).

Draft guidelines on marine spatial planning (MSP)

MSP can be considered as a planning tool, a process or a framework that enables integrated, forward-looking and consistent decision-making on the uses of the sea; MSP extends beyond the concepts behind the Ecosystems Approach to Aquaculture (EAA) and the Ecosystems Approach to Fisheries (EAF) because it considers the social, economic, environmental and governance objectives of sustainable development. Thus, while EAA and EAF are also both concerned with holistic ecosystems, they do this from the aquaculture or fisheries perspectives. On the other hand an MSP approach tackles the whole of marine planning from an "activity neutral" approach. This project will serve as an opportunity to test and implement the MSP framework.

Key benefits

Key benefits achieved so far in this project are:

- production of practical guidelines that describe the main site selection criteria necessary for spatial analysis for fish cage culture;
- use of free and open source software (FOSS)[1] for spatial analysis;
- standardized data and information to be collected for decision making on aquaculture zoning and site selection for fish cage culture in the Red Sea coast;
- promotion and facilitation of multi-sectoral dialogue and collaboration. This project component will share their findings through publications and Web sites to assist in further investigating the overall mariculture potential in the Kingdom and neighbouring countries. The wider dissemination of the outputs and recommendations derived by this project component would mainly be done under the *aegis* of the FAO Regional Commission for Fisheries (RECOFI).

[1]The emergence of FOSS can be viewed as part of a wider movement towards making freely available a much larger range of computing software. This is particularly advantageous for users who are on a limited budget. For a description of FOSS, see pages 43–48 in *FAO Fisheries and Aquaculture Technical Paper* No. 552.

Box 1: Environmental, socioeconomic and governance criteria used in the initial site suitability selection for fish cage farming

Environmental

- Bathymetry: sites from 20 m to 80 m depth
- Marine protected areas: sites outside protected areas
- Corals: sites with a 500 m buffer distance from coral reefs
- Mangroves: sites with a 500 m buffer distance from mangroves
- Rivers: sites with a 500 m buffer distance from rivers (wadis)
- Industrial: sites with 1 km buffer distance from industrial sites

Socioeconomic

- Travelling distance: sites within 20 km distance from shoreline
- Navigation routes, shipwrecks, moorings, etc.: 1.5 km from navigation, 1 km from fixtures
- Urban areas: sites with a minimum 1 km distance from major urban areas
- Coastguard stations: sites with a minimum 1 km buffer distance

Governance

- Maritime boundaries
- Legal state of the site (i.e. license)
- Coastal management plans

FAO projects, activities and meetings in the Near East and North Africa region

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The Regional Office for the Near East and North Africa (RNE) is responsible for a wide and dispersed geographical area extending from the East Central Atlantic Ocean on the west to the large expanse of the Indian Ocean and Arabian Sea including the Mediterranean Sea, Red Sea, Persian Gulf, national and regional rivers, lakes and other bodies of water. The FAO-RNE based in Cairo, Egypt, covers the following African and Asian countries: Algeria, Bahrain, Egypt, Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Syria, Sudan, Tunisia, the United Arab Emirates, and Yemen. It actively promotes and supports the development of regional cooperation for the sustainable management and conservation of the fisheries and aquaculture resources, in coherence with the Code of Conduct for Responsible Fisheries and the Ecosystem Approach to Fisheries and Aquaculture. In the future, the Blue Growth Initiative will be integrated with the three regional initiatives (water scarcity, food security and nutrition, sustainable small-scale agriculture and fisheries) currently being promoted at the country and regional levels.

Fisheries and aquaculture sub-sectoral strategic programme in the Islamic Republic of Iran (Iran IR)

A technical visit to the Islamic Republic of Iran on 10–14 February 2014 at the kind invitation of the Ministry for Jihad-e-Agriculture and the Iran Fisheries Organization focused on national developmental priorities and needs in the capture fisheries and aquaculture industries. The formulation of the fisheries and aquaculture sub-sectoral strategic programme in Iran has been launched and funded through a TCP facility. The draft strategic document, recently completed, will be presented and discussed in Tehran during a validation workshop that will be held within the second quarter of 2015. Representatives of the Iran Fisheries Organization (IFO) and the Iranian Fisheries Research Institute (IFRO) reiterated that marine cage aquaculture remains a top national developmental priority for the fisheries sector.

Policy perspectives regarding the use of water of the Shatt Al-Arab for fisheries and aquaculture to support sustainable food security in Iraq

A workshop held on 7–9 December 2013 in Amman, Jordan, was attended by 10 participants from Basra University, Basra Governorate, the Ministry of Agriculture, Hull University, and FAO officers from FAO Iraq, RNE and FIRA. This workshop was a follow-up to ongoing activities to explore the main challenges facing fisheries and aquaculture in the Shatt Al-Arab, the priority issues in this waterway. A management framework was presented and discussed.

The workshop recognized the importance of an ecosystem approach to the Shatt Al-Arab that would include the economic, social and environmental dimensions of the fisheries and aquaculture systems including information collecting and training as cross-cutting themes. The workshop prioritized the strategic goals into three main pillars: (1) promote sustainable fishing and aquaculture development within the framework of an adaptive management approach; (2) enhance research, information gathering and dissemination on fisheries and aquaculture, and ecosystem services of the Shatt al-Arab Complex to assist in the assessment of the performance of the Management Plan that is being formulated; and (3) adopt integrated development strategies to match the complexities of the Shatt al Arab ecosystem including its fisheries and aquaculture resources.

A TCP facility on the formulation of a fisheries and aquaculture project to address these issues and endorsed activities was launched. The strategic document, currently under preparation, will be presented and discussed in an upcoming validation workshop.

Sixth meeting of the Working Group on Aquaculture (WGA) of the Regional Commission for Fisheries (RECOFI).

The Sixth meeting held in Muscat, Oman, from 21–23 October 2014, was attended by seven RECOFI Members, the FAO Secretariat and several observers from national aquaculture institutions. Participants unanimously elected Mr Dawood Suleiman Al-Yahyai from Oman as the new WGA Chairperson and Mr Adly Abdel Rahman Al-Ansari from Bahrain as Vice-Chairperson. The Focal Points presented the main achievements since the previous WGA meeting, discussed regional aquaculture emerging issues and elaborated a draft work plan and budget proposal for submission and consideration by the Seventh meeting of RECOFI (May 2015).[1]

The main summary outputs of the meeting were:

- Regional Aquaculture Information System - RAIS (www.raisaquaculture.net) – the meeting agreed that: (1) more efforts should be carried out by WGA Focal Points (FP) to secure a regular data updating into the system and additional initiatives should be organized in order to promote the system at the national and regional level; and (2) make use of social media, such us Facebook and WhatsApp to streamline communication and information sharing between FPs and others regional aquaculture stakeholders.

- Current FAO initiatives – the meeting agreed to: (1) revise/update the National Aquaculture Sector Overviews (NASO) (www.fao.org/fishery/naso/search) for each RECOFI member country; (2) prepare NASO maps for aquaculture sites monitoring and inventory at national level; (3) assist FAO in the identification of regional aquaculture priorities for strengthening the role of the COFI Sub-Committee on Aquaculture in advancing aquaculture development; (4) consider the adoption of recommendation for reporting a minimum set of aquaculture data to the Commission (for discussion and endorsement at the next RECOFI session).

- The WGA recognized that the Commission, based on its current level of financial contribution, might require extra-budgetary funding to implement a comprehensive aquaculture programme for the Region. Main proposed activities for 2015–2016 are listed below.

UNDP/FAO/Ministry of Fishery and Fisheries Resources Project. Algiers, Algeria the 2-3 December 2014

A 2-day workshop of the UNDP/FAO/Ministry of Fishery and Fisheries Resources Project o was held in Algiers, Algeria on 2-3 December 2014 where the national strategy for the development of fisheries and aquaculture with particular emphasis on small-scale fisheries was presented. In January 2014, an agreement was signed between FAO and UNDP describing the modalities for implementation of this UNDP funded project. The technical assistance provided by UNDP/FAO consisted of 11 experts (national and international) who conducted studies highlighting the current situation of the fisheries and aquaculture sectors, main constraints, appropriate solutions and evaluated the human and financial resources needed for the implementation of the strategy. The final expected results of this tripartite collaboration will be a National Strategy for the development of fisheries and aquaculture and a program of work and budget for its future implementation during 2015.

[1]All RECOFI publication are available from the following link: www.fao.org/fishery/rfb/recofi/en

Priority	Activity	Location	Period
1	GIS applications to aquaculture (Training)	Oman/Saudi Arabia	2015
2	Introductory Training Course on Risk Analysis for Movement of Live Aquatic Animals	Oman	April 2015
3	Aquaponics farming systems (Training)	Oman	TBD
4	Development of action plans of the RECOFI Regional Biosecurity Programme	Oman	April 2015
5	Regional Marine Fish Reproduction and fingerlings production (Training)	Bahrain	March 2016
6	Regional Aquaculture Information System (RAIS)–development and consolidation	Kuwait	Continuing

Projects on fisheries and aquaculture in East Africa

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The FAO Sub-Regional Office for East Africa (SFE) based in Addis Ababa, Ethiopia covers the following eastern African countries: Burundi, Djibouti, Ethiopia, Kenya, Rwanda, South Sudan, Somalia, and Uganda. In line with FAO's new regional initiatives and organizational outcomes, SFE works to build sustainable aquaculture development programmes across the region. Due to the importance of aquaculture for food security, food nutrition, livelihood, markets and the overall socio-economic growth in Sub-Saharan Africa (SSA), the SFE has also been assisting other sub-regions in Africa to develop aquaculture programmes. Fish is a vital source of dietary protein in Sub-Saharan Africa, providing an estimated 22 percent of protein intake and plays a critical role in maintaining livelihoods.

Nile crocodile fish farm in Adjumani

During the last six months of 2014, SFE developed and launched numerous programmes aimed at mainstreaming fisheries and aquaculture capacity development to enhance Sub-Saharan Africa's abilities to manage its vast and rich aquatic resources. Some of these programmes are briefly described below:

TCP/DJ/3501: Formulation of the Legal Fisheries and Aquaculture Policy Framework for Djibouti

After 6 months of intensive work, the validation workshop occurred between from 8-9 December 2014 at the Palais du Peuple in Djibouti. The event was participated by 46 stakeholders including government officials, extension services, fishers and traders, representatives of communities and fisheries associations, research and academic institutions, naval forces and donors. The elaboration of the legal framework, particularly of the Aquaculture and the Small-Scale Fisheries Strategies and Action Plans, is an important tool for the systematic development of the sector that will allow government, donor partners as well as private sector and communities to be involved in the decision-making process. The legal component of the Fisheries Policy, Aquaculture Strategy and Small-Scale Fisheries Policy with respective Actions Plans, was validated by the government and all stakeholders during the workshop and is now awaiting full endorsement by the Council of Ministers. Stakeholders also benefitted from several training activities during the process of building the legal framework. The main objective of those training sessions was to better inform stakeholders on issues relevant to the Legal Framework so they could have an educated view and meaningful participation. Relevant topics included: (1) Code of Conduct for Responsible Fisheries, (2) Small-Scale Fisheries Guidelines and its implementation, (3) The Ecosystem Approach to Fisheries and Aquaculture (EAF/EAA), (4) National Action Plan against IUU, (5) Fisheries Statistics, (6) Good Practices on Post- Harvest: Fish handling, Hygiene fish trading, and (7) Fisheries Technologies.

TCP/UGA/3501: Enhance the development of commercial aquaculture in Uganda

In this context, the "Inception and Training Workshop: Doing Aquaculture as a Business" was held on 4 July 2014 in Kampala. A 3-day training course held from 4-7 July, consisted of modular aquaculture business themes relevant to the TCP objectives and involved active discussions and

V. Crespi, FAO

Small-scale fish pond in Zanzibar

learning between FAO officers and the participants. The modular themes consisted of the following: (1) basic principles of conducting aquaculture as a business, (2) basic accounting and applying key terminologies, (3) assessment of economic profitability and financial feasibility of aquaculture farms, (4) investment tools for assessing economic profitability and financial feasibility on aquaculture farms, and (5) preparation of an aquaculture business plan.

TCP/URT/3401: Support to aquaculture sub-sector development in Zanzibar

Specifically, this TCP project is providing technical assistance in: (i) formulating a national strategy and plan for aquaculture development and initiating key actions to strengthen management capacity for the aquaculture sector, and (ii) developing a production systems-focused model for improving farmers' capacity to manage their farm sustainably and with a profitable outcome. The project takes into account the implementation of the EAA and aquaculture zoning, site selection and design of aquaculture management areas, to strike a balance that will benefit the various stakeholders of the archipelago's aquatic resources. The project will look into market issues of the seaweed value chain in Zanzibar and produce policy briefs to advise decision makers on the future of the seaweed enterprise in the country.

The Inception Workshop conducted from 2-3 June 2014 was participated by 80 stakeholders from farmers organizations, government institutions, higher learning institutions, and NGOs. The workshop achieved its objectives, i.e, (i) provided partners and key stakeholders with information on the objectives and activities of the project and an opportunity to guide project implementation; and (ii) involved stakeholders in the participatory formulation of the National Aquaculture Development Strategy and Action Plan (ZADSAP). The workshop concluded with five main issues to be addressed: (1) policy and strategies, (2) market and value addition, (3) research and technology, (4) training and awareness and (5) environment. The workplan, terms of reference for consultants and national assistants as well as budgets were revisited and agreed. Several actions have been taken including preparation of the draft ZADSAP, and the research and training manual for Better Management and Business Practices (BMBP) for Zanzibar Seaweed Farming Communities, among others.

A. Menezes, FAO

Nursing tilapia ponds (mixed sex)

A. Menezes, FAO

Women tilapia fish farm in Adjumani

GCP/SFE/001/MUL: Promoting Agricultural Diversification to Reduce Poverty, Fight Malnutrition and Enhance Youth Employment Opportunities in Eastern Africa

SFE is involved in a project funded by the African Solidarity Trust Fund (ASTF), a mechanism using the principle of "by African's for Africans" and participated by Burundi, Kenya, Rwanda and Uganda. The project has two sectoral components, i.e poultry and aquaculture. The aquaculture development component will be implemented in Kenya and Uganda and it is expected to be up-scaled in other countries based on the results and lessons that will be derived. The project was launched at the national level by each participating country and a regional launch chaired by the ADG of FAORAF.

The project aims at creating decent employment opportunities for young women and men in the agricultural sector in order to: (i) improve their income and their own access to food; (ii) increase the availability of locally produced eggs and fish, and improve their access for vulnerable children through school feeding programmes; and (iii) increase the overall productive capacities of both the poultry and aquaculture value chains.

The project is aligned with FAO's commitment for a Hunger Free Horn of Africa, and contributes directly to FAO's Strategic Objectives SO3/OO1 "*The rural poor have enhanced and equitable access to productive resources, services, organizations and markets, and can manage their resources more sustainably*" and SO3/OO2 "*The rural poor have greater opportunities to access decent farm and non-farm employment*" under *SO3 "Reduce Rural Poverty"*. It is also linked with SO4 and directly supports the implementation of the Regional Initiative RI2 on "*Sustainable production intensification and commercialization through integrated management of agricultural landscapes*".

The ultimate beneficiaries are the rural young women and men (15-35 years old) unemployed or underemployed. In total, the programme will target directly around 400 young farmers (aquaculture and poultry), transforming them as rural and peri-urban entrepreneurs. A multiplying factor of 6 (household size) will also directly or indirectly benefit from these activities. Other direct beneficiaries will be the feed and seed producers, the market chain actors and consumers. The project will operate in the production and marketing segments of the value chain by supporting business opportunities for young women and men to produce seeds for poultry and aquaculture. It will set up well-trained young grow-out farmer groups to shorten the production cycle and reduce the associated risks for small farmers; assist small-scale producers to sustainably increase their production; and organize producers' groups to develop into commercial organizations (e.g. cooperatives and producers/traders associations) for effective market linkages. As such, the project is expected to benefit about 10 000 people in each country, nearly 20 000 people in total.

Small-scale cage aquaculture in Mauritius

Satish Hanoomanjee[1], Davide Signa[2], Fabrizio Piccolotti[3] and Alessandro Lovatelli[4]
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Some 2 200 artisanal fishers grouped into 32 fishing associations/cooperatives are engaged in small-scale fishing activities within the lagoons of Mauritius. The constant decline in their catches over the past decade (from 1 360 tonnes in 2000 to 831 tonnes in 2010) stimulated the government to explore other production opportunities such as fish farming.

The development of aquaculture is seen as a good alternative to fishing for these cooperatives and for younger members of coastal communities. Aquaculture can open new job opportunities, generate additional income and help raise the standard of living. However, a number of constraints have impeded the success of earlier rural aquaculture projects, mainly due to the lack of technical capacities, incorrect selection of beneficiaries and insufficient attention to the financial planning of these activities.

S. Hanoomanjee, Mauritius

The Cordonier (*Siganus sutor*) packed on ice

A recent project titled "*Support for sustainable aquaculture development through the promotion of small-scale cage culture in the lagoon of Mauritius*" was supported by the European Union/Indian Ocean Commission/Food and Agriculture Organization (EU/IOC/FAO) SmartFish Programme and developed in close collaboration with the Fishermen Investment Trust (FIT). The aim of the project was to promote aquaculture development for the fisher's communities and investors interested in diversifying their production activities.

As part of this project, two cooperatives and one fishermen association were selected as beneficiaries and recipients of hands-on training session. During the first phase of the project, held in July 2013, the beneficiaries actively participated in the construction of wooden and polypipe fish cages which were subsequently installaed at two pre-identified sites on the South East coast of Mauritius, namely at Poste de Flacq and Quatre Soeurs.

The training also included a theoretical session on topics such as assessment of the potential farming site, cage design, most suitable species for aquaculture, considerations regarding the main biotechnical parameters involved in farming (e.g. volume and farming density, biomass, feed conversion ratio, growth rate). Technical sessions on farm management included topics such as cage stocking, feed strategy/ administration, periodic sampling, nets change, structural maintenance of cages, farm data collection and recording); while planning and financial management sessions covered the preparation of business plans, market analysis and adoption of marketing strategies.

Following the set-up of the cages at sea, juveniles of a local herbivorous species the Cordonnier (shoemaker spinefoot - *Siganus sutor*) were stocked in the cages and the progress monitored.

A second practical training session on management practices was held in January 2014 to better support the beneficiaries on good management practices with a view to increase efficiency and enable fish farmers to act independently. Good management and proper maintenance are prerequisites for good harvest and successful aquaculture operations. Throughout the training courses, emphasis was given to good cage management and maintenance. During the initial faming stages of the pilot project, the beneficiaries faced various constraints and challenges, but these were promptly addressed with the collaboration of the Fishermen Investment Trust.

The establishment of small-scale cage culture units at Poste de Flacq and Quatre Soeurs represented a good opportunity for the targeted fishermen communities to be introduced to a new and innovative fish farming system. During a first phase, management of the cages will be complementary to their fishing activities; however, once the business becomes profitable, aquaculture may well become a full-time occupation, including the addition of new cages. Small-scale fish culture, if properly sited and operated, may well contribute to the lagoon conservation thus protecting the island natural heritage, an important economic resource based on the tourism sector.

The "Samuel Corporative Society Limited" carried out a partial harvest in July 2014 at Quatre Soeurs, eight months after SmartFish had launched the small-scale cage culture project. The harvest, carried out in presence of the Hon. Minister of Fisheries Mr Nicolas Von Mally and the FAO/SmartFish Representative Ms Clotilde Bodiguel, yielded some 1 000 kg of fish, which were sold within the hour, confirming the market demand and the preference of Mauritians for fresh fish. The event was largely covered by local press and television.

The first project product, a training video on cage culture construction and fish value addition (150 DVDs distributed) showed fishers demonstrating how to build a cage, how to manage it and explained to their colleagues and future potential producers the fish value addition. The second project product was an illustrated manual for field operators; 500 copies were printed and distributed. Pamphlets and flyers were also produced and disseminated widely to inform the public on aquaculture activities in Mauritius.

The outcome of the SmartFish Programme generated considerable interest among the fishing communities in Mauritius with numerous requests for technical assistance subsequently received by the FIT Office and the Ministry of Fisheries at Port Louis. As a result, the Ministry ordered the construction and installation of ten new polypipe cages (10 m Ø) for free distribution to fisher's cooperatives out of some 42 cooperative societies and associations currently requesting assistance from the Government to set up similar project in their localities. There is a growing interest for marine aquaculture in the country.

S. Hanoomanjee, Mauritius

Two beneficiaries at work feeding the fish in floating cages

These initial results are encouraging considering that this first cycle has been a hands-on learning experience for the beneficiaries, and supporting the initial plan that each cage could produce some 2 000 kg of shoemaker spinefoot under optimal management conditions. Based on the success of the initial pilot phase and results obtained so far, it is expected that more fishermen will in the future move to the more profitable and sustainable aquaculture business whilst reducing fishing pressure in the overfished lagoon and thus preserving the vulnerable ecosystem around the island.

Financing from the SmartFish Programme has been pivotal to the success of the present project. This Programme on the implementation of a regional fisheries strategy for the Eastern and Southern Africa and Indian Ocean region, is a regional fisheries programme managed by the Indian Ocean Commission (IOC), funded by the EU and co-implemented by FAO. The programme, which operates in 20 countries throughout the Indian Ocean Region, Southern and Eastern Africa, focuses on fisheries governance, management, monitoring control and surveillance, trade, and food security.

Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa

Three Cities – The Square Boutique Hotel (Umhlanga)
Durban, South Africa, 5 – 7 November 2014

A Regional Workshop on Improving Aquatic Animal Health Management and Strengthening Biosecurity Governance in Africa was organized by the Food and Agriculture Organization of the United Nations (FAO) in co-operation with the Department of Agriculture, Forestry and Fisheries of South Africa (DAFF) (under the auspices of the FAO/DAFF Capacity Building Programme) and Africa Union Inter-African Bureau for Animal Resources (AU-IBAR), in partnership with the European Union (EU), the Southern African Development Community (SADC), the World Organisation for Animal Health (OIE) and the Standards and Trade Development Facility (STDF) of the World Trade Organization (WTO).

The three-day Workshop was officially opened by Mr Mortmer Mannya, DAFF Deputy Director General (DDG) responsible for Fisheries Management, Dr Tobias Takavarasha, FAO Country Representative for South Africa, and Dr Mohamed Seisay, Senior Fisheries Officer, AU-IBAR.

Purpose. The general objective of the regional Workshop was to support sustainable aquatic food security for dietary animal protein and livelihoods in SADC and the African continent in general, through responsible aquaculture that is supported by effective biosecurity governance and aquatic animal health management. A specific objective of the Workshop was to develop the building block for the Trade and Improved Livelihoods in Aquatic Production in Africa (TILAPIA) project by addressing issues, in consultative manner, of animal health in the emerging aquaculture sector in Africa by improving animal health and biosecurity management in aquaculture operations and (inland) fisheries systems.

Participants. Some 117 participants from 27 countries attended the Workshop. All the 15 SADC countries were represented, with three delegates; a policy/decision-maker, a technical officer responsible for aquaculture or fish health, and a veterinarian (having knowledge on aquatic animal health). Experts, Regional Fisheries Bodies and Delegates from nine other African states under the AU-IBAR auspice also attended, including representatives from Burkina-Faso, Cameroon, Egypt, Gabon, Ghana, Ivory Coast, Kenya, Nigeria and Senegal. There was strong representation from partner organizations (AU/IBAR, FAO, OIE, SADC, WorldFish Center), as well as the private sector.

Products

Draft Framework for the SADC Regional Aquatic Biosecurity Strategy

Fourteen 14 SADC countries (Botswana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe) completed the FAO Aquatic Animal Health Performance and Capacity Survey that was carried out in October 2014. The results of this self-assessment survey served as a gap analysis, facilitating the development of the SADC aquatic biosecurity strategy. The session participants agreed on a draft framework for a broad yet comprehensive strategy to build and enhance capacity for the management of regional aquatic biosecurity and aquatic animal health. It contains the regional action plans at the short, medium and long term using phased implementation based on regional needs and priorities. It also outlines the programmes and activities/projects that will assist in developing a regional approach to overall management of aquatic animal health in SADC.

The framework for the draft strategy includes the following sections: Summary, Background, Current status of aquaculture development and aquatic animal health management in SADC, Purpose, Vision, Guiding Principles and Programme Components and Implementation.

The purpose of the strategy is to:
"*Support the improvement of aquatic biosecurity; the development of aquatic animal health management capacity; the preservation of aquatic biodiversity; the improvement of food security,*

M. Reantaso, FAO

nutrition and safety; and sustainable management of aquatic resources in the SADC region, through such actions as improved awareness of and risk mitigation for OIE-listed and other serious diseases transmitted in live aquatic animals and their products and enhanced coordination between key role players involved in aquatic animal health"

The strategy contains ten Guiding Principles that provide guidance in all circumstances, irrespective of changes in goals, strategies, work plan, structure or management. The strategy accepts and incorporates relevant international aquatic animal health standards to ensure harmonization, transparency and equivalence in the region so that the region will be internationally recognized with respect to aquatic animal health status.

The Programme Components consist of 12 broad thematic areas:

1. Policy, legislation and institutional framework.
2. Risk analysis.
3. Diagnostics and health certification.
4. Import controls and quarantine.
5. Pathogen list.
6. Surveillance, monitoring and reporting.
7. Emergency preparedness, contingency planning and zoning.
8. Capacity building and human resources.
9. Research and development.
10. Infrastructure.
11. Regional and international cooperation.
12. Information and communication.

The Programme Components are in no particular order and are all inter-related. Each Programme Component contains a brief description, the current status (based on the FAO self-assessment survey/gap analysis), objectives and two to five key activities (or projects) that are prioritized as low, medium or high; an implementation time-frame targeted at the short, medium, or long term; and identified responsibilities at the national and/or regional levels.

Trade and Improved Livelihoods in Aquatic Production in Africa (TILAPIA) Project Way Forward Plan

The Working Group Session on the TILAPIA Project Way Forward Plan discussed the overall goal, specific objectives, and expected outcomes and outputs of the TILAPIA Project, followed by three working group discussions which tackled major issues and discussed current status, future needs and actions under three major output headings: (i) capacity building, (ii) policy and regulatory frameworks; and (iii) private sector investments.

The overall goal of the TILAPIA Project is to secure rural livelihoods and increase commercial production for regional food security through improved public and private-sector management of, and investment in aquaculture and fisheries production in the African region; and to contribute to: Millennium Development Goals (MDGs, eradicate extreme poverty and hunger, ensure environmental sustainability, develop a global partnership for development) and relevant New Partnership for Africa's Development (NEPAD) Comprehensive Africa Agriculture Development Programme (CAADP) pillars (land and water management, market access, improved food supply and reduction of hunger). The project has the following specific objectives: (i) to increase the output of the market-oriented aquaculture sector and foster regional trade of aquatic animals and their products through improved animal health management, biosecurity and food safety; (ii) to improve rural livelihoods of fishing communities and fish farmers through public-sector interventions in animal health, aquatic biosecurity and policy and legal frameworks; and (iii) to provide an enabling environment in the

aquatic sector through appropriate policy and legal frameworks.

The project has the following expected outcomes:

- Policy framework that creates an enabling environment.
- Protect investments from aquatic diseases and pests.
- Safe aquatic commodities for human consumption.
- Improved market access and trade in aquatic commodities.
- Improved systems capacity for the prevention, early detection and response to aquatic threats including diseases.
- Increased and effective participation of African Member Countries/States in the international standard-setting process.

The Working Group Session on TILAPIA Project Way Forward tackled major issues and discussed current status, future needs and actions under three major output headings:

1. *Improved institutional and human resources capacity to prevent, early detect and respond to aquatic animal diseases of economic or public health importance*. The Working Group identified the following areas of aquatic animal health that require attention: awareness, human capacity building, infrastructure development, disease surveillance, research and coordination.

2. *Developed/improved policy/legal frameworks aimed at promoting good governance of fisheries and aquaculture through trade-related measures which address unregulated international trade and encourage investments in domestic production of safe aquatic commodities for human consumption.* The Working Group identified the following activities that require specific attention: support empowerment of small and medium-sized enterprises (SMEs) (incentives, investment promotion council and credit facilities), elaborate harmonized trade policies and legal frameworks, support establishment of a single window (one-stop shop) for trade formalities, conduct value chain analysis for aquaculture products, and support establishment of regional market and trade information system.

3. *Enhanced private-sector investment in aquaculture, with support services being developed along the value chain (animal health practitioners, feed suppliers, transporters, processors, cold chain, HACCP, etc.), leading to spill-over effects benefiting the small-scale producers*. The Working Group identified a number of key activities under nine areas that require attention: production inputs, marketing, producer associations, aquaculture zones, processing, infrastructure, legislation and policy, finance and biosecurity.

Conclusions

The Workshop successfully achieved its two main objectives: (1) to prepare a SADC Regional Framework for Aquatic Biosecurity Strategy; and (2) to build consensus on the TILAPIA Project Way Forward Plan.

There was strong consensus on the need to work together at all levels and to involve all players (competent authorities, producers, researchers and academia, input/service providers, development partners, donors, etc.) in the value chain in supporting aquaculture development in Africa. The Workshop provided a strong neutral platform for initiating and strengthening networking among the different stakeholders and decision-makers involved in aquaculture development and aquatic animal health management, particularly in SADC and other regional economic communities (RECs) in the African continent. This Workshop also proved how cooperation by different stakeholders, coordination and alignment of approaches and rationalization of resources can improve development in Africa to sustain efforts to find solutions to support food production, livelihoods support and economic development in the continent.

The outcomes of the two parallel sessions identified a number of important elements and considerations required to support enabling policies for aquaculture development and robust aquatic animal health protection programmes and systems for Africa, an essential pillar to healthy aquaculture production that protects producers and the emerging aquaculture sector from the risks of aquatic pathogens and diseases. There are a lot of synergies, a good indication that although different processes are involved, the final outcomes and aspirations are complementary and there are great opportunities to build on each other. The systematic approach that SADC used in developing a regional biosecurity strategy, in particular, is a process that can be used by the other four RECs.

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Sharing some recent efforts for aquaculture development in Sub-Saharan Africa

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Policy makers in many countries in Sub-Saharan Africa have shown unprecedented willingness and commitment to develop aquaculture. The main goal is food and nutrition security. It is also aimed at employment creation, especially for the rural poor, the youth and women. Examples of countries where such political commitment have materialized are discussed in this paper. Having understood the strategic role of aquaculture in the development of their economies and their countries' social life, governments of these countries have taken decisive actions for the sustainable development of the sector. In this context, the FAO Technical Cooperation Programme (TCP) played a catalytic role by providing technical expertise and advice through low-cost, targeted- and short-term projects, and at their request. Other non-country specific efforts in support of aquaculture growth in this region are also discussed.

Among FAO TCP projects, the **TCP/SEN/3305** "Support on enhancing input production capacity for a sustainable development of freshwater aquaculture" and **TCP/SEN/3307** "Support on enhancing input production capacity for a sustainable development of brackishwater aquaculture" in Senegal accomplished encouraging achievements.

The two projects established four public hatcheries, four private fingerling-producing small- and medium-scale enterprises (SME), 42 grow-out SME ponds capable of producing about 355 tonnes of fish annually. Three reservoirs were also stocked, which now enables surrounding populations to fish between 30 to 50 kg of fish per reservoir per day or about 11 tonnes to 18 tonnes of fish per year. More than 100 farmers were also trained in aquaculture production techniques including in seed and feed production. As a result, aquaculture production in the country has nearly doubled during the period 2012 to 2013.

These are laudable achievements, but, there are still more to be done. A workshop organized to validate and share achievements of the projects, and in the presence of the Minister of Environment and Sustainable Development and the donor community in Dakar, noted the need to:

- continue supporting the establishment of a private, profitable and sustainable fish feed industry in the country and the expansion of private fingerling production SME;
- increase production of quality fry to supply private and community private fingerling production SME;
- initiate certification of fingerling production; and
- further strengthen and extend sustainable aquaculture development in the country.

A second example is the **TCPf/ZAM/3402** in Zambia**.** The goal of this project was to update the National Aquaculture Development Strategy and Plan of Zambia. In May 2014, a mission was carried out to discuss with the team of local experts on the way forward. In addition to discussing the draft of the updated Strategy and producing the outline of the National Aquaculture Development Plan (NADP), the mission visited the newly created Rufunsa District and met some officials. The mission noted the population's high enthusiasm, especially of women and youth, to engage in fish farming. The District's officials highlighted the population's weak capacity to conduct aquaculture correctly and expressed the pressing need for FAO's assistance in enhancing farmers' capacity

A. T. Camara

Fish harvesting in a private farm in Richard Toll area, Senegal

through hands-on, on-farm training. The expected Strategy and Plan shall indicate ways and means of addressing these challenges.

The **TCP/UGA/3501** "Support to enhancing development of commercial aquaculture" in Uganda was launched in July 2014 by the State Minister in charge of fisheries and aquaculture. After the launching ceremonies, an "Inception and training workshop: doing aquaculture as a business", a core activity of the TCP, was held to set the foundation for enhancing the development of aquaculture as a business.

The training workshop was organized around modular aquaculture themes: basic principles of conducting aquaculture as a business; basic accounting and applying key terminologies; assessment of economic profitability and financial feasibility of aquaculture farms; investment tools for assessing economic profitability and financial feasibility on aquaculture farms; and preparation of an aquaculture business plan. Workshop outcomes include identification of six focus districts and training of 17 officers on aquaculture business tools. Activities of the project are still on-going.

Other FAO-sponsored or implemented projects have just started or have been approved and are about to start in the region. Examples include the GCP/RAF/254/MUL *"Creating Decent Employment Opportunities for Youth through Sustainable Aquaculture Systems and Cassava Value Chains in West Africa"*. This project, funded by the Africa Solidarity Trust Fund (ASTF) with financial budget of USD

A. T. Camara

Earthen ponds of the fingerlings production center in Ziguinchor, Senegal

4 million, is being participated by Burkina Faso, Côte d'Ivoire, Ghana, Guinea-Bissau, Nigeria and Senegal. Another ASTF-funded project GCP/SFE/001/MUL *"Promoting Nutrition Sensitive Agricultural Diversification to Fight Malnutrition and Enhance Youth Employment Opportunities in Eastern Africa"*, at USD 4 million covers Burundi, Kenya, Rwanda and Uganda.

The recently approved and 3-year and USD 5.7 million GEF-funded project (GCP-MLW-053-LDF PPG) *"Building climate change resilience in the fisheries sector in Malawi"*, is aimed at improving Lake Malawi and coastal area community resilience to climate change through the development of an early warning system, and sustainable fisheries and aquaculture, in order to ensure food and livelihood security. The beneficiaries of this project are the most vulnerable communities and their governance as well as institutions. The project has three components including mainstreaming climate change adaptation into fisheries sector policies and capacity building of key fisheries and aquaculture actors; building local level adaptive capacities for fisheries and aquaculture; and climate monitoring and early warning system in pilot areas in southern Lake Malawi on Lake Malombe.

At the regional level, efforts have also gained momentum. The Fifth Annual Meeting of the Aquaculture Network for Africa (ANAF) was held in Dakar, Senegal, from 11 to 13 September 2013 (see article on page 46) as a part of activities of the SIDA[1]-funded NEPAD-FAO Fish Programme (NFFP). The meeting reviewed the process of establishing ANAF as an intergovernmental organization which set forth measures that ANAF member countries shall take in order to turn the ANAF into an IGO and agree on the criteria for host country selection. The meeting also defined the obligations for and recognized the benefits to host country, developed the general and specific objectives and functions of ANAF, and agreed to complete the task of elaborating a regional work plan based on common priorities included in the national plans of ANAF Member countries and to determine a budget estimate and options for funding. With respect to the IGO legal framework, the meeting agreed to draft the ANAF founding agreement. The process is in progress.

The NFFP has also funded several aquaculture activities at the regional level. They focused on training farmers and trainers on conducting aquaculture as a business, doing aquaculture following an ecosystem approach, aquaculture governance and aquaculture

and climate change. A report on these activities can be obtained from the authors through emails listed at the end of this paper.

Another important FAO-led regional effort is the EU[2]-funded **SmartFish** Programme. In addition to a number of training activities on doing aquaculture as a business in some countries in Rwanda, Kenya and Uganda, SmartFish's main accomplishments in aquaculture are in the field of governance. In this regard, the project developed:

- A Protocol for the development of aquaculture in Lake Victoria in collaboration with the Lake Victoria Fisheries Organization (Lake Victoria Aquaculture Protocol);
- A Protocol on aquaculture for the sustainable management and development of aquaculture in Lake Tanganyika and its Basin (Lake Tanganyika Aquaculture Protocol);
- The "East African Community Regional strategy and implementation plan for sustainable aquaculture".

The high interest of the countries in the East African Community (EAC) in aquaculture led the EU to demand and sponsor the development of a stand-alone full regional project whose objective is to support the commercial value chain of aquaculture and clusters in the EAC. The project is under analysis.

Perhaps the most recent significant impetus to aquaculture development in the region is the political support to the sector. The Second Conference of African Ministers of Fisheries and Aquaculture (CAMFA), in Addis Ababa, Ethiopia from 28 April–2 May 2014, was organized by the Department of Rural Economy and Agriculture of the African Union Commission (AUC) in collaboration with the NEPAD Planning and Coordinating Agency (NPCA), with FAO's support especially in the context of the NFFP). Its main theme was "Transforming Africa's Agriculture for Shared Prosperity and Improved Livelihoods through Harnessing Opportunities for Inclusive Growth and Sustainable Development".

One of the main objectives of CAMFA was to consider the endorsement of the African Union (AU) policy framework and reform strategy for fisheries and aquaculture in Africa and to formulate recommendations for future work. The final Draft Resolutions acknowledged the potential of the aquaculture sector to generate wealth, social benefits and contribute to the development of the African economy, and the importance of fish and fish products in food and nutrition security and livelihoods. Among others, resolutions were adopted on harnessing the potentials of fisheries and aquaculture resources[3]. These resolutions are intended to endorse the AU Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa in:

- undertaking reforms to address governance of fisheries and aquaculture and develop institutions that lead to sustainable fisheries and aquaculture in line with the AU policy framework and reform strategy for fisheries and aquaculture;
- developing fisheries and aquaculture as an integral component of sustaining the Comprehensive Africa Agriculture Development Programme (CAADP) momentum results framework; and
- accelerating trade by promoting responsible and equitable fish trade and marketing in order to significantly harness the benefits of Africa's fisheries and aquaculture endowments.

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[1]Swedish Agency for International Development
[2]European Union Commission
[3]For more reading, please refer to the following link <http://rea.au.int/en/sites/default/files/Final%20Report%20of%20the%20AUC%20Joint%20Conf%20Ministers_AgriRuralDevFisheriesAquaculture_20_05_2014.pdf >

5th Annual Meeting of the Aquaculture Network for Africa

The Aquaculture Network for Africa (ANAF) aims to optimize the utilization of available resources in order to foster sustainable aquaculture development in Africa, as means to fight poverty, ensure food and nutritional security, create wealth, provide employment and ensure rural development. The definition of the general objectives and functions of ANAF was one of the results of this meeting.

ANAF is currently composed of twelve African countries: Cameroon, Ghana, Kenya, Mali, Mozambique, Namibia, Nigeria, Republic of South Africa, Senegal, Tanzania, Uganda and Zambia.

The Fifth ANAF Annual Meeting was held at the Ndiambour Hotel in Dakar, Senegal, from 11 to 13 September 2013. The purpose was to review the process of establishing ANAF as an Intergovernmental organization (IGO) and define the work plan for 2014.

The meeting was attended by the ANAF National Focal Points (NFPs) from ten member countries, one representative from the New Partnership for Africa's Development (NEPAD), one representative from AU-IBAR, one consultant from the ANAF Hub, one representative from FAO Sub Regional Office for Eastern Africa, two FAO Aquaculture Officers and two FAO consultants.

The Meeting was conducted under the guidance of FAO and African Union - Interafrican Bureau for Animal Resources (AU-IBAR). It was funded by the NEPAD-FAO Fish Programme (NFFP).

During the opening ceremonies, the ad interim FAO Representative in Senegal, Mr Jose Luis Fernandez, delivered a welcome address. The Meeting was officially opened by the Honourable Minister for Environment and Sustainable Development in Senegal, Mr Mor Ngom. The opening ceremonies noted the presence of several ambassadors from different countries and multilateral partners.

The meeting conducted over three days, consisted of presentations by the NFPs, the FAO team and ANAF IT consultant, one and a half-day of working groups on how to strengthening institutional capacities of the ANAF network, and a final plenary discussion for the preparation of the work plan and the adoption of the main outputs of the meeting.

The presentation of the ANAF IT consultant, Bright Onapito, showed the progress report on the structure of the ANAF website (www.anafaquaculture.org). The FAO consultant, Elisabetta Martone, presented the prototype of the instrument developed by FAO: "Investment Decision Making in Aquaculture: a User-Friendly Tool". The main scope of the Tool is to assist small- and medium scale farmers in their decision to invest or not in aquaculture. The FAO senior aquaculture officer, Nathanael Hishamunda, presented the prototype of the FAO instrument "World Aquaculture Performance Indicators (WAPI): A User-Friendly Tool". FAO has initiated the development of this Tool to compile, generate and provide easy access to quantitative information on aquaculture sector performance at national, regional and global levels.

The NFPs presented the mid-terms reports prepared by the three ANAF task forces created during the Fourth ANAF Annual Meeting (Entebbe, Uganda 4–6 December 2012). The three task forces have been created to undertake the following tasks: (i) Task force 1: to identify prospective host governments and developing a proposed schedule of mandatory annual contribution; (ii) Task force 2: to develop a three to five year ANAF work programme; (iii) Task force 3: to elaborate the ANAF Agreement and to identify the legal steps for ANAF to become an IGO.

During the session, two working groups have been established and finalized their results. These results described the measures that ANAF member countries shall take in order to turn the ANAF into an IGO. The participants agreed on the criteria for host country selection. Among others, they defined the obligations for and recognized the benefits to host country. They developed the general and specific objectives and functions of ANAF. Moreover, they agreed to complete the task of elaborating a regional work plan based on common priorities included in the national plans of ANAF Member countries, and to determine a budget estimate and options for funding. With respect to the IGO legal framework, the participants agreed to propose a draft ANAF founding agreement to be presented to the Conference of African Ministers of Fisheries and Aquaculture (CAMFA) meeting in March 2014 for consideration and endorsement.

Furthermore, the meeting appreciated the tools for the assessment of economic, financial, social and environmental performance of aquaculture at farm and national levels prepared by FAO, and requested training on using these tools for ANAF members. Cameroon offered to host the sixth ANAF Annual Meeting in 2014.

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2015 OFFSHORE MARICULTURE CONFERENCE MEXICO

The 6th Offshore Mariculture Conference will take place at Ensenada, Baja California, Mexico, 21-24 September 2015


Neil Sims

This international technical conference will focus on practical solutions and development opportunities around offshore farming in Mexico. It will include the latest legislation, investment and financing opportunities together with the day to day practicalities of running an offshore business.

FAO will be organizing a special session at the conference with 5-6 speakers as an integral part of the conference programme where mariculture development in Mexico and the region will be presented and discussed focusing on current policy and technical issues through real case studies. This particular session will be open to all interested parties at no cost.

For information on the FAO session please contact:
Alessandro Lovatelli or José Aguilar-Manjarrez
Aquaculture Officers
Food and Agriculture Organization of the United Nations (FAO)
Emails: alessandro.lovatelli@fao.org and jose.aguilarmanjarrez@fao.org

Visit the Web site for more information on the conference or contact:
www.offshoremariculture.com/
Email: iroberts@mercatormedia.com

Support to sustainable aquaculture development through the smart use of water in desert and arid lands

Valerio Crespi
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Valerio.Crespi @fao.org

The increasing competition for land and particularly water use for a wide range of economic activities is driving the expansion of aquaculture operations towards new frontiers such as in exposed and offshore sea areas or in desert and arid lands which can now be better exploited through the use of modern technologies and responsible aquaculture practices.

Current and future developments of inland aquaculture in desert and arid lands will rely greatly on the appropriate use of subsurface waters using farming practices which ensure the smart use of this limited resource. The constant growth of the human population and the continuous exploitation of land and water resources particularly in arid lands will require the application of new strategies to ensure adequate food production (animal protein and vegetables) by populations living in remote and isolated areas. The integration of aquaculture with agriculture is becoming progressively more attractive in areas where water is a limited resource. In fact, such systems can reduce water requirement for the production of quality protein and fresh vegetable products. There is a growing interest by national farmers leaving in arid regions in starting aquaculture as an additional business to their agriculture activities. However, the lack of technical competences and availability of inputs (feed and fingerlings) represent the main obstacles to the development of this sector. The environment in desert and arid lands seems to have a great potential for aquaculture development due to favourable weather conditions, presence of high quality underground water and a high variety of agricultural crops and products.

V. Crespi, FAO

Fish pond in the wilaya of Ouargla, Algeria

In recent years, for example, through the technical assistance of FAO, the Ministry of Fishery and Fisheries Resources (MPRH) of Algeria carried out a pilot project and several expert missions were undertaken to assess the development constraints and opportunities for the expansion of aquaculture in the arid areas of the country. The main result which came out from Algerian experience was that the most suitable aquaculture practice in desert and arid lands is an aquaculture system fully integrated with agriculture. This system allows the production of different crops (fish, agriculture and livestock) using the same quantity of water.

Through the assistance of FAO, the Addis Ababa University in Ethiopia recently initiated a research programme on the applicability of aquaponics system (integration of recirculating aquaculture with hydroponic vegetable production) in the country and formed a team of trained professionals in order to introduce this technology to the private sector. Aquaponics does not necessarily require significant investments and can be used for self-subsistence as well as small-scale commercial purposes.

Developing aquaculture in harsh environmental physical conditions, typical of deserts and arid lands, requires the adoption of production strategies focused on good water management which includes the use of water saving and recycling practices, but also protection against strong solar radiations and the introduction of modern aquaculture technologies such as recirculation systems particularly if high density fish farming is technically and economically feasible.

FAO is fully engaged in investigating and promoting the best practices that can significantly improve aquaculture production and food security in desert and arid lands by strengthening the capacity of Governments in improving water management efficiency through the adoption of integrated water saving fish production systems. FAO has recently launched several regional initiatives such as the Water Scarcity Initiative; the Sustainable Small-scale Agriculture for Inclusive Development; and Building Resilience to Enhance Food Security and Nutrition for the Near East and North Africa that will look among others, into the smart use of water for the development of aquaculture in arid lands.

A. Lovatelli, FAO

Establishment of Aquaponics system in Ethiopia

For more reading:

Crespi, V.; Lovatelli, A. Aquaculture in desert and arid lands: development constraints and opportunities. FAO Technical Workshop. 6–9 July 2010, Hermosillo, Mexico. *FAO Fisheries and Aquaculture Proceedings* No. 20. Rome, FAO. 2011. 202 pp.
www.fao.org/docrep/015/ba0114e/ba0114e00.htm

Announcement

The questionnaire to assess aquaculture compliance with the Code of Conduct for Responsible Fisheries (CCRF) by Member countries has been recently launched through the new interactive web system www.fao.org/fishery/code/codequest. Each member country has received a letter from FI ADG together with specific credentials to be able to produce one national report. The results of this global assessment of aquaculture compliance with the Code will be presented to the VIII session of the COFI Sub-Committee on Aquaculture in Brazil in October 2015.
Information: Doris.Soto@fao.org

AQUAPONICS
Integrating Aquaculture and Hydroponics

Austin Stankus and Alessandro Lovatelli
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Aquaponics is a symbiotic integration of two mature food production disciplines, i.e. aquaculture, the science of fish farming and hydroponics, the science of growing plants without soil, within a closed recirculating system. In a standard recirculating aquaculture system (RAS), the organic matter ("waste") that builds up in the water needs to be filtered and removed so that the water is clean for the fish. In an aquaponic system, the nutrient-rich effluent is filtered through an inert substrate containing plants. Here, bacteria metabolize the fish waste, and plants assimilate the resulting nutrients. The purified water is then returned to the fish tanks.

H. Noam

Livingreen Systems

Photo above: Curly kale grown in an aquaponic system showing healthy roots
bottom: Juvenile tilapia in an aquaponic system

An innovative system to increase local food production in a sustainable way, aquaponics uses the nutrients from the fish culture water to fertilize the plants, thereby yielding a value-added product, while at the same time reducing nutrient pollution into the watersheds. It has demonstrated higher yields of local produce and protein with less labour, less land, less energy, fewer chemicals and a fraction of the water usage. Moreover, it is a potentially useful tool to overcome some of the challenges of traditional agriculture in the face of climate change.

There are three common methods of aquaponics. The "Media Bed" method, best suited for small households, consist of a grow bed with hydroponic media, such as volcanic gravel, and a fish tank. The water is circulated from the fish tank directly to the grow bed using a water pump; no external filters are needed. The "Nutrient Film Technique" (NFT), suitable for small-scale commercial environments, often utilized in vertical growing systems with limited floor space, uses a thin layer of nutrient-rich water that is circulated through horizontal pipes. Plants grow within net pots that are suspended in holes at the top of the pipes so that the roots are in contact with the water and the plants grow up from the pipes. The "Deep Water Culture" (DWC), often used in large and commercial aquaponic systems, utilizes nutrient-rich water that is circulated through long canals with rafts (usually polystyrene) floating on top. Plants are supported within holes in the rafts by net pots, and the roots drape down into the water.

Many species of freshwater fish are used for aquaponic systems, most commonly tilapia, and less commonly barramundi, white bass, perch, sturgeon, catfish and Koi carps. The species choice varies depending on conditions such as species availability, climate, system type, fishmeal cost, harvest frequency and economic value. Aquaponic systems have successfully grown more than 300 types of crops such as lettuce, basil, cabbage, chives, strawberries and tomatoes.

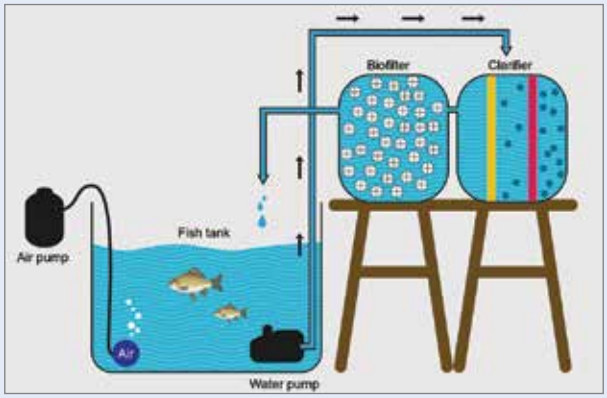

Diagram showing the major components of an aquaponic system

Successfully used in many countries, such as Barbados, Brazil, Botswana, Ethiopia, Ghana, Guatemala, Haiti, India, Israel, Jamaica, Malaysia, Mexico, Nigeria, Palestine, Panama, the Philippines, Thailand and Zimbabwe, aquaponics work well in places where the soil is poor and water is scarce, for example on rooftops or balconies in developed areas as a type of urban gardening. This farming technique is very efficient with water usage and aquaponics is most appropriate in arid regions (see also article on page 48). Also, it can be used where saltwater has intruded into the freshwater aquifer, as it has on several low-lying Pacific islands.

Aquaponics is also used at many different scales. Small-scale units can be used for demonstration and teaching applications. Family size units can provide fresh vegetables for a family with minimal initial investment and very low daily maintenance. Village size systems can significantly supplement the diet of several families, who can share the initial costs and labour. Some aquaponic systems are very large, and have become commercially feasible. Overall, aquaponics can be scaled to the size that is appropriate for the location and for the need of the farmers. By putting the food production in the hands of local people, this method can improve local food security by providing fresh, healthy and nutritious food while at the same time creating jobs through the farming, harvesting, processing and sales.

Major benefits of aquaponic food production:

- sustainable and intensive food production system;
- two agricultural products (fish and vegetables) are produced from one nitrogen source (fish food);
- extremely water-efficient;
- does not require soil;
- does not use fertilizers or chemical pesticides;
- higher yields and qualitative production;
- organic-like management and production;
- higher level of biosecurity and lower risks from outer contaminants;
- higher control on production leading to lower losses;
- can be used on non-arable land such as deserts, degraded soil or salty, sandy islands;
- creates little waste;
- daily tasks, harvesting and planting are labour-saving and therefore can include all genders and ages;
- economical production of either family food production or cash crops in many locations;
- construction materials and information base are widely available.

Major weaknesses of aquaponic food production:

- expensive initial start-up costs compared with soil vegetable production or hydroponics;
- knowledge of fish, bacteria and plant production is needed for each farmer to be successful;
- fish and plant requirements do not always match perfectly;
- not recommended in places where cultured fish and plants cannot meet their optimal temperature ranges;
- reduced management choices compared with stand-alone aquaculture or hydroponic systems;
- mistakes or accidents can cause catastrophic collapse of system;
- daily management is mandatory;
- energy demanding;
- requires reliable access to electricity, fish seed and plant seeds;
- alone, aquaponics will not provide a complete diet.

The FAO commenced work supporting aquaponic development. A technical manual on "Small-scale Aquaponic Food Production" has been recently published (see page 67). During the Thirty-first Session of the Committee on Fisheries held in Rome this year from 9-13 June, aquaponics was raised by several Member countries (Indonesia, Kenya, Cook Islands and Mexico) as an issue that deserves increased attention. Furthermore, a COFI side event included a presentation by the Indonesian on YuMina, a form of aquaponics being used in homesteads across the country. Translated from Indonesian as "Vegetable/Fish", YuMina encompasses the integrated nature of aquaponics and highlights this technique's role

F. Ibrahim, Oman

Dr F. Ibrahim showing a mature cantaloupe harvested from an aquaponic facility in Muscat

C. Somerville, FAO

Woman harvesting tomatoes from an aquaponic system on a rooftop, Gaza

in modern agriculture providing safe food and poverty alleviation to the struggling poor.
In the future, the agriculture sector will need to do more, with less. In the face of population growth, climate change and dwindling supplies of water and arable land worldwide, developing efficient and integrated agriculture techniques, such as aquaponics, will support economic development and enhance food security. Aquaponics supports the integration of separate agricultural systems. The synergistic effects reduce inputs, pollution and waste, while increasing efficiency, earning potential and sustainability.

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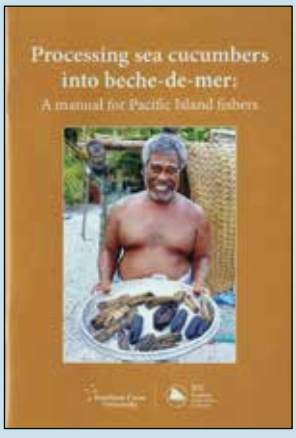

Processing sea cucumbers into beche-de-mer
A manual for Pacific Island fishers

Text: Steven W. Purcell. Illustrations: Jipé Le-Bars

A highly practical manual has recently been released by the Southern Cross University and the Secretariat of the Pacific Community (SPC) with the financial support of the Australian Centre for International Agricultural Research (ACIAR) on best practice methods for processing sea cucumbers for species commonly fished in the Pacific. "Processing" is used in this manual to mean all of the steps to transform the fresh sea cucumbers into the dried form, which is called "beche-de-mer". Processing includes cutting, salting, cooking, smoking and drying the sea cucumbers.

The manual can be freely downloaded from:
www.spc.int/coastfish/index.php?option=com_content&Itemid=30&id=422

Global sea cucumber fisheries and aquaculture FAO's inputs over the past few years

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Sea cucumbers are a traditional delicacy prized by Chinese and other Asian consumers for their dietary and curative properties. In the international seafood trade, the processed body wall, known as bêche-de-mer or trepang, has been a globally important trade commodity since the 16th century. Since the 1950s, in response to strong market demand and increasing prices, sea cucumber fisheries have undergone a rapid global expansion. The collapse of stocks in traditional Indo-Pacific fishing grounds adjacent to the main market in Hong Kong SAR catalysed the search for new regions and species to exploit to satisfy the ever growing market demand. Sea cucumber fisheries are currently exploited in over 70 countries, stretching from polar to temperate and tropical zones, in industrial, semi-industrial and small-scale fisheries, however, exploitation in new regions is currently being documented.

G. Clayden

Bêche de mer at the dried sea food market in Hong Kong

The recent fast-paced, export-driven overexploitation of sea cucumber fisheries has been unsustainable and in many cases too rapid for an effective management response. Sea cucumber fisheries have under gone rapid boom-and-bust cycles, such that currently more than half of global sea cucumber fisheries are considered depleted or overexploited. The collapse of sea cucumber stocks has forced moratoria on fishing or exports in 39 percent of sea cucumber fisheries globally, causing hardship to all actors in the value chain with no guarantee that stocks will recover in the future. Overexploitation is driving the risk of extinction of the most commercially valuable species, with 16 species now classified as "vulnerable" or "endangered" on the IUCN[1] red list. Overexploitation of sea cucumber resources therefore poses a threat to livelihoods, biodiversity and ecosystem functioning.

Over the past decade, FAO has supported the development of improved sea cucumber fisheries management and aquaculture globally through the organisation of technical workshops and the publication of technical reviews, manuals and information guides. In 2003, FAO held a large workshop on the advances in sea cucumber aquaculture and management in Dalian, China — the first of its kind in this field. Today, China remains the world leader in sea cucumber aquaculture with aquaculture production of their temperate species, *Apostichopus japonicus* (see FAO cultured aquatic species information fact sheet at www.fao.org/fishery/culturedspecies/Stichopus_japonicus/en) exceeding 170 000 tonnes, surpassing production from capture fisheries. Juvenile *A. japonicus* are mass produced in hatcheries under controlled conditions and farmed to market size in a wide range of production systems including sea ranching, pond farming, intensive production in recirculating aquaculture systems (RAS), as well as in floating cages[2]. Aquaculture production of tropical sea cucumbers has primarily focused on the most valuable species *Holothuria scabra,* commonly known as sandfish, which has an average market price of USD303 kg^{-1} with prices reaching as high as USD1 668 kg^{-1} for a premium grade-A product. Sandfish are an ideal culture species in low-cost simple production systems in nearshore seagrass beds as they are relatively sedentary, require no additional feed and can be reared to market size in approximately 12 months. Following more than two decades of research, the hatchery,

nursery and grow-out technology is rather well developed, however aquaculture production has only recently emerged in the past five years, with current production limited to 130 tonnes per annum. While commercial production is gaining momentum, the majority of global aquaculture production is derived from extensive production systems including sea ranching, sea pen farming and pond culture in countries ranging from Madagascar to Fiji providing an alternative and/or supplementary livelihood for coastal communities. Sea cucumbers are excellent candidate extractive organisms for co-culture or integrated multi-trophic aquaculture as they feed principally on organically rich substrates, including waste from other species. Consequently, research is currently focusing on how sea cucumbers can be integrated into existing land-based and open-ocean culture systems to improve the sustainability of current aquaculture practices and reduce waste discharges.

While aquaculture is considered as the only viable means of meeting future market demand, the importance of managing existing fisheries should not be underestimated. Sea cucumber fisheries are inherently difficult to manage due to their open-access, artisanal nature compounded by key biological life-history characteristics that renders sea cucumbers vulnerable to overexploitation and unsuited to traditional management techniques. In recognition of this, FAO published a technical manual in 2010 based on an ecosystem approach to managing sea cucumbers, accompanied by a condensed guidebook containing prescriptive advice and guidelines on putting the approach into action. To compliment the manuals and assist fisheries agencies to design practical management plans for sea cucumber fisheries, FAO organised a workshop series on Sea Cucumber Fisheries: an Ecosystem Approach to Management (SCEAM). The first workshop for the Pacific region was held in Fiji Islands in 2011, followed by a second workshop for the Indian Ocean region held at Zanzibar (Tanzania) in 2012.

G. Robinson

Sea pen farming in Madagascar

K. Al-Rashdi

Freshly fished *Holothuria scabra* from Oman

In the Caribbean region, there is very little information pertaining to the current status of sea cucumber fisheries. In a global FAO review of sea cucumber fisheries and trade, the majority of the Caribbean countries were classified as having no known fishery or no available information. In light of the recent serial overexploitation of sea cucumber resources and the globalisation of sea cucumber trade, there is a very real risk that fisheries will become depleted before management interventions can be implemented. In some Latin American countries, sea cucumber fisheries have already undergone boom-and-bust cycles, and moratoria are currently in place in Costa Rica, Ecuador, Panama and Venezuela and unregulated and unreported (IUU) fishing in the region is rife. In order to address these knowledge gaps, a workshop on Lionfish and Sea Cucumber management was held on April 2014 in Havana, Cuba. The workshop was organised by INFOPESCA, in conjunction with FAO, the Western Central Atlantic Fisheries Commission (COPACO) and the Ministry of Food Industry of Cuba (MINAL). The objective of the workshop was to analyse the status of the sea cucumber fisheries by country, share experiences in resource management and aquaculture, and provide a perspective of the world market for this product. It was generally agreed that the high value of sea cucumber species is the key driver behind overexploitation and illegal fishing, which in some cases is significant. While some countries already have management schemes in place, the problems implementing sound sea cucumber management regimes in situations of illegal, unreported and

unregulated (IUU) fishing from neighbouring countries was noted.

At the conclusion of the workshop a resolution on sea cucumber fisheries management and aquaculture was made. Such resolution, that calls for a series of coordinated actions, along with information relating to the workshop, including copies of all the presentations and information relating to the management of sea cucumber fisheries, can be downloaded from the INFOPESCA web site at: www.infopesca.org/content/taller-sobre-pez-le%C3%B3n-y-pepino-de-mar-0.

Sea cucumber aquaculture in the Caribbean is currently underdeveloped, however the potential exists for the development of sea cucumber aquaculture as an alternative livelihood for coastal communities and co-culture of with other target species that are currently produced such as mangrove oysters. The four-sided sea cucumber, Isostichopus badionotus has been evaluated as the most promising candidate for aquaculture in the Caribbean given its high market value (USD203–402 dry kg^{-1}; FAO 2012), natural densities in the wild and the wide range of habitats it occupies. In addition, its reproductive biology has already been studied and hatchery-reared juveniles have been consistently produced under controlled conditions in Mexico.

A number of positive outcomes have already emerged from the workshop stemming from increased awareness among participants of the precarious nature of sea cucumber stocks and interest in the potential for aquaculture production of high value indigenous species. In Bermuda, research and development to optimise larval rearing and nursery culture of *I. badionotus* is underway following the completion of three successful spawning trials during the past reproductive season (July-November). Following lobbying from the University of West Indies, the Fisheries Division in Barbados plans to introduce a moratorium on sea cucumber harvesting under new fishing regulations and finally FAO is assisting the Jamaican Government to draft a Technical Cooperation Project which will provide technical assistance for the development of stock assessment methodologies, a national management plan for sea cucumbers and technology transfer for sea cucumber aquaculture.

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[1]International Union for Conservation of Nature

[2]Elsevier has just published the following book "The Sea Cucumber, Apostichopus japonicus: History, Biology and Aquaculture".

List of FAO publications on sea cucumbers

Advances in sea cucumber aquaculture and management
http://www.fao.org/docrep/007/y5501e/y5501e00.htm

Sea cucumbers A global review of fisheries and trade
http://www.fao.org/docrep/011/i0375e/i0375e00.htm

Managing sea cucumber fisheries with an ecosystem approach
English - http://www.fao.org/docrep/012/i1384e/i1384e00.htm

Spanish - http://www.fao.org/docrep/013/i1384s/i1384s00.htm

Putting into practice an ecosystem approach to managing sea cucumber fisheries
http://www.fao.org/docrep/013/i1780e/i1780e.pdf

Commercially important sea cucumbers of the world
http://www.fao.org/docrep/017/i1918e/i1918e.pdf

An Ecosystem Approach to Management in the Indian Ocean (SCEAM Pacific)
http://www.fao.org/docrep/015/i2658e/i2658e.pdf

An Ecosystem Approach to Management in the Indian Ocean (SCEAM Indian Ocean)
http://www.fao.org/docrep/018/i3223e/i3223e.pdf

A regional shellfish hatchery for the Wider Caribbean
http://www.fao.org/docrep/014/i2179e/i2179e00.htm

Decent rural employment in aquaculture

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Decent rural employment is one of the outcomes under FAO's new Strategic Objectives, Strategic Objective 3 – *Reducing rural poverty*. What is decent rural employment? Colleagues in the Economic and Social (ES) Department just published their applied definition:

Decent rural employment refers to any activity, occupation, work, business or service performed by women and men, adults and youth, in rural areas that:

- respects the core labour standards as defined in International Labour Organization (ILO) Conventions, and therefore is not child labour; is not forced labour; guarantees freedom of association and the right to collective bargaining and promotes organization of rural workers; does not entail discrimination at work on the basis of race, colour, sex, religion, political opinion, national extraction, social origin or other.
- provides an adequate living income;
- entails an adequate degree of employment security and stability;
- adopts minimum occupational safety and health (OSH) measures, which are adapted to address sector-specific risks and hazards;
- avoids excessive working hours and allows sufficient time for rest; and
- promotes access to adapted technical and vocational training.

How does decent employment relate to aquaculture?

As part of a comprehensive consultative process aimed at informing the formulation of a work programme on decent employment in fisheries and aquaculture a side-event on "*Working for blue growth - Why decent employment in fisheries and aquaculture matters*" was held during the 31st Session of the Committee on Fisheries (COFI). Issues like human trafficking, child labour and good labour practices in processing were discussed by FAO staff, representatives of the ILO, government and civil society. Specific emphasis was given to child labour, as the side-event took place on World Day Against Child Labour.

According to the latest figures, over 98 million girls and boys between 5 and 17 years are working in fisheries, aquaculture, forestry, crop and livestock production – making agriculture the sector with the largest share of child labourers.

N. Franz, FAO

Children disentangling nets

In aquaculture, children are often involved in nearshore collection of fish fry used in aquaculture, in feeding and harvesting fish in aquaculture ponds, and in post-harvest activities like sorting, processing and selling fish. Not all work children undertake is considered harmful. Child labour is defined as work that interferes with compulsory schooling or damages children's health and personal development. There are a number of occupational safety and health risks in aquaculture, e.g. musculoskeletal injury due to, for example, heavy lifting or long hours of repetitive hand feeding; physical injuries caused by slips or falls on wet and slippery surfaces; burns, skin irritation or allergies from direct contact with chemicals used for disease control, to fertilize fish ponds or others (e.g. hormones, pesticide, feed additives, anaesthetics).

The way forward

The FAO Guidelines for Aquaculture Certification include a section on socio-economic aspects which call for socially responsible aquaculture production which takes into account International Labour Conventions, including legislation on child labour. In addition, the Fisheries and Aquaculture Department (FI) and the Economic and Social Development Department (ES) of FAO in collaboration with ILO published the document *Guidance on addressing child labour in fisheries and aquaculture* which supports stakeholders in the prevention and elimination of child labour. In order to further explore decent work deficits and identify opportunities to address them, FI has commissioned a scoping study on the issue.

[1] www.fao.org/docrep/018/i3318e/i3318e.pdf

AFSPAN Project ends!

Rohana Subasinghe and Elena Irde
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The European Union-funded Framework Programme 7 (FP7) project titled "Aquaculture for Food Security, Poverty Alleviation and Nutrition – AFSPAN", which was coordinated by the Aquaculture Branch (FIRA) of FAO and implemented in collaboration with six technical partners and 11 country partners ended on 31st December 2014. The following is the short summary of the major findings of the project.

The objectives of the AFSPAN project were to strengthen the knowledge base and develop new and more rigorous methodologies of quantifying the contribution of aquaculture to combat hunger and poverty, thus providing the evidence upon which sound strategies, policies and research programs can be developed to support the sustainable expansion of aquaculture to maximize its impact on food and nutrition security and poverty alleviation.

The three-year project was implemented by 18 partners in 11 Asian, African and South American developing and Low Income, Food Deficit Countries (LIFDCs), encompassing the spectrum of development conditions and role of aquaculture in national economies. The partnership also included EU partners and international organizations.

A theory of change was elaborated and range of analytical frameworks, economic models and indicators, complemented by surveys and case studies developed. The contribution of aquaculture to national GDP, excluding multiplier effects, was found to vary from negligible in countries with emergent aquaculture sectors up to 5% or more of national GDP in countries where the sector is very dynamic. Aquaculture was shown to have helped lower global fish prices, increasing economic access for all but the very poorest consumers. Although households engaging in aquaculture were found less likely to be poor than those that did not, poor households too benefitted from engaging in fish farming, irrespective of scale of operation. Fish consumption rates of households engaged in fish farming were typically higher than national averages.

Both immanent (e.g. economic growth) and interventionist (the implementation of policies promoting aquaculture development, improving governance and capacity) factors, as well as institutional arrangements, public-private partnerships and pioneering companies and individuals, were found to be capable of creating enabling conditions for aquaculture growth. Socio-cultural factors, especially gender and ethnicity, were also important: interventions tailored to match given specific socio-cultural contexts were most likely to lead to successful adoption and retention and delivery of equitable development outcomes, thereby producing lasting impact on livelihoods.

The volumes of seafood exported from developing to developed countries were found to approximate those of seafood imported by developing from developed countries. While expensive seafood may be being exchanged for cheaper but not necessarily less nutritious seafood, thereby minimizing threats to food security, there remains a lack of supporting evidence that this is the case. With the exception of Bangladesh no policies or interventions linking fish, aquaculture and nutrition were found in the study countries and little is included in nutrition education on aquatic animal foods.

Project outputs are being disseminated among the development community to help improve efficiency and coordination of development initiatives focused on aquaculture that promotes food and nutrition security and alleviates poverty and helps focus research on addressing researchable gaps. The development of science outputs has also begun.

A detailed account of the project's achievements and inferences including some policy guidance will be published in the next issue of FAN. Further details about the project can be found at the project website: www.afspan.eu.

GLOBEFISH Celebrates its 30th Anniversary

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GLOBEFISH, a project within the FAO Fisheries and Aquaculture Department (FAO/FI), celebrated its 30th anniversary in 2014. The primary function of GLOBEFISH is to accumulate and disseminate statistics, market information and trend analysis on internationally traded seafood commodities. GLOBEFISH also coordinates the FISH INFONetwork (FIN) which consists of 7 independent intergovernmental and governmental organizations. The FIN was created to assist the fisheries and aquaculture sector in developing countries and countries in transition. An example of a joint activity between GLOBEFISH and a FIN partner (INFOSAMAK) can be found in this FAN issue (Casablanca workshop, see page 28).

The core of GLOBEFISH is the GLOBEFISH Databank with monthly, quarterly and yearly statistics on prices, production, and trade. The key service of GLOBEFISH is to provide accurate and timely fisheries news worldwide, in-depth market studies and analysis, and continually updated price and trend reports for stakeholders, which include governments, academia, and the private sector. Using the data collected by GLOBEFISH, FAO/FI produces a number of periodic publications on fish prices (European Price Report), trend analysis (GLOBEFISH Highlights), statistics (Commodity Update) and market studies on a variety of relevant topics (GLOBEFISH Research Programme). These publications are provided electronically to GLOBEFISH partners, subscribers and correspondents and are available to any interested party upon request. Monthly commodity market reports are available free of charge on the GLOBEFISH website for: tilapia, tuna, shrimp, fish oil and fishmeal, pangasius, groundfish, seabass and seabream, salmon, cephalopods, small pelagics, bivalves and Nile perch.

Research and market analysis relevant for aquaculture can be found on the GLOBEFISH website. To name a few:

- "The new investment wave into aquaculture in Middle East countries: Opportunities and challenges", Gemsheer Mon Chalil, 2014. www.globefish.org/markets-in-the-middle-east-market-trade-and-consumption.html

- "Aquaculture growth opportunities in North Africa - a station in a global journey", Izzat H. Feidi, Global Aquaculture Alliance Goal 2013 Conference.

- "Role of fish and aquaculture products in human nutrition and global food security", Albert G.J. Tacon and Marc Metian, VI AQUASUR Conference, 2012.

- "The European market for bivalves other than mussels, Marie-Christine Monfort, GLOBEFISH Research Programme (GRP), Vol. 116, May 2014.

- "The European market for mussels", Marie-Christine Monfort, GRP. Vol. 115, April 2014. www.globefish.org/the-european-market-for-mussels.html

- "Seafood markets in Southern Africa: potential of regional trade and aquaculture development", Blessing Mapfumo, GRP, Vol. 109, January 2013 www.globefish.org/vol109.html

- "Importance of APEC in world fisheries and aquaculture", GRP, Vol. 100, March 2010 www.globefish.org/vol-100-importance-of-apec-in-world-fisheries-and-aqualculture.html

GLOBEFISH is jointly financed by FAO and its partners. Current GLOBEFISH partners are: European Commission (DG MARE), Belgium; Alaska Seafood Marketing Institute (ASMI), USA; Norwegian Seafood Council, Norway; FranceAgriMer, France; and Ministerio de Agricultura, Alimentacion y Medio Ambiente, Spain and Seafish, the Authority, UK.

GLOBEFISH also has numerous associate members. For more information on GLOBEFISH products and how to become a GLOBEFISH partner or associate member please write at globefish@fao.org.

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• **Concept Notes:** Seven concept notes, intended to be submitted to potential donors, were prepared during a Writeshop held in March 2014, consisted of : (1) Biodiversity of freshwater fishes and fish parasites of Suriname; (2) Establishment of Emergency Preparedness Procedures for Aquatic Animal Disease Outbreaks, (3) Development of Legislation for Veterinary Drugs for Aquatic Animals, (4) Strengthening Human Capacities of the Competent Authority for Enforcement of the Law on Aquaculture and the Aquatic Animal Health Regulation, (5) An Assessment of Labour Availability and Feasibility of Labour Import for Development of the Aquaculture Sector, (6) Collaborative Development, Testing and Production of Aquafeeds using Locally Available Raw Materials, and (7) Marketing Study Research for Aquaculture in Suriname.

The Government of Suriname now has the essential policy, strategy and legal framework to move the aquaculture sector to the next level. This includes increased production and diversification of marine and freshwater finfish and shellfish for domestic consumption and international markets and the development of an ornamental fish culture subsector. At the moment, Suriname is still facing some obstacles to achieving its aquaculture potential and to establish an effective aquatic animal health and biosecurity system. To overcome these will require continued strong support to the sector from key policy-makers, continued development of technical staff and associated infrastructure, and targeted support from regional and international donor agencies. Further information can be obtained by writing to Melba.Reantaso@fao.org

Continued from page 44

These two parallel initiatives represent a strong road map for building aquatic animal health infrastructure to support responsible aquaculture development in Africa. There is a good momentum for this road map to be effectively achieved with strong political will of Member States and complementary technical support from partner organizations. There are also indications of immediate positive support from partner organizations in implementing a number of identified activities.

The active participation of all country delegates, experts and partner organizations was instrumental in the success of the Workshop. Further information can be obtained by writing to: Melba.Reantaso@fao.org

JEAN-BAPTISTE LUCE (FIRA Intern)

Mr Jean-Baptiste Luce, a French national is working with the Aquaculture Branch and FIPS under the Internship Programme on a 6 month assignment through August 2015.

Jean-Baptiste commenced his Bachelor of Arts in Marine Biology at the Skema Business School in France and subsequently transferred to Florida Institute of Technology where he completed his degree. During his time in Florida, he volunteered at the University of Miami Experimental Hatchery (UMEH). He is presently undertaking a MSC in Marine Affairs and Policy - Aquaculture at the University of Miami. Jean-Baptiste's current interests are mainly area based options for addressing overlapping management considerations to promote aquaculture growth, and the implementation of policies and legal frameworks to address area management scenarios taking into account socio-economic considerations.

At FAO, Jean-Baptiste will contribute to the enhancement and development of FAOs NASO maps collection Web site (www.fao.org/fishery/naso-maps/naso-home/en/) and in the compilation and analysis of land and water area use in aquaculture data. As part of his tasks Jean-Baptiste will spatially analyse and categorize aquaculture site locations around the globe compiled by FIPS and will also contribute to a draft paper for a journal on "managing aquaculture from space". Jean-Baptiste will give a seminar at the end of his volunteer period to present and discuss relevant issues and recommendations derived from his work. Jean-Baptiste will mainly work with José Aguilar-Manjarrez (FIRA) and Xiaowei Zhou (FIPS).

JIAE LEE (FIRA Intern)

Ms Jiae Lee, a national of the Republic of Korea, who graduated from Pukyong National University with Bachelor's of Science in Aquatic Life Medicine in 2012. Also, she holds a Master of Science in the same major (2015). Her background is aquatic life diseases and aquaculture system, and during the Masters course she conducted research on the DNA vaccine against Viral hemorrhagic septicemia virus (VHSV), an important fish virus that has caused large mortality. Before she came to Rome, she volunteered and took a part in some international conference and symposium concerning marine fields in Korea.

Ms Lee's current interests are prevention of aquatic animal disease outbreak and aquatic animal health management in the aquaculture system. She is presently working as a volunteer with the Aquaculture Branch for 6 months (from December 2014 to June 2015). During her stay at FAO, she is under the overall supervision of Dr Rohana Subasinghe, Chief of FIRA and under the direct supervision of Dr Melba Reantaso (Aquaculture Officer/Aquatic Animal Health). Ms Lee will contribute to research on aquaculture losses due to diseases and farm level biosecurity practices and on emergency preparedness and contingency plan for aquatic animal disease outbreaks.

KENDRA BAKER (FIRA Intern)

Dr Kendra Baker is a United States citizen from the state of Colorado. She obtained her Bachelor of Science in Biology from Colorado State University in 2010, and is currently in her final year of veterinary school through St. George's University in Grenada, West Indies. She passed her professional licensure exam and will receive her Doctor of Veterinary Medicine (DVM) diploma in June 2015. Throughout her undergraduate veterinary studies she has volunteered and worked in aquarium settings including Denver Aquarium in Colorado, Coral World Ocean Park in St. Thomas, USVI and Mystic Aquarium in Connecticut.

During her short six week internship at FAO she worked under the supervision of Dr Melba Reantaso to gain further understanding of the global aquaculture side of fish medicine as her previous experience was limited to the ornamental sector. While most veterinary interns are placed in Animal Health, Kendra has a special interest in fish medicine and requested to be placed in fisheries. Melba and Kendra are co-writing a review paper on the global impact of the ornamental fish trade including trade value, trade amount, major countries, diseases of concern and how to mitigate the risks involved. When she returns to the United States she will be working in the Washington, DC area at Columbia Pike Animal Hospital for one year before she applies for a residency to specialize in aquatic animal medicine.

PHOEBE RACINE (FIRA Intern)

Ms Phoebe Racine, a citizen of the U.S.A, obtained her Bachelor of Arts in Environmental Studies and Anthropology from Dartmouth College in New Hampshire, U.S.A. (2014). During her first year of undergraduate study, she helped develop Fishscape, a socio-economic model of the Eastern Pacific Ocean's tuna fishery. The following summer she interned at La Larva Azul, an organic shrimp laboratory and farm in Pedernales, Ecuador. To pursue continued education in aquaculture, Phoebe aided in Mexican Gulf species' research at Mote Marine Aquaculture Park (2012), conducted research on seafood communication at the Harvard Center for Health and the Global Environment (2013), did an extensive study of Recirculating Aquaculture Systems of the Eastern United States (2013), developed a range of commercial aquaculture policy options for the New Hampshire Department of Environmental Services, and most recently co-wrote two manuscripts on Integrated Food Energy Systems with Dr Anne Kapuscinski of Dartmouth College.

For the next year and a half, Phoebe will be working to define her thesis before entering an interdisciplinary doctoral program. She believes working in FIRA will help to do that by allowing her a better understanding of global aquaculture and her place within the field. She worked at FAO as an intern, from September to December 2014, working under the supervision of Dr Doris Soto and other FI officers. Phoebe will contribute to research on diversification of aquaculture under climate change and other relevant subjects.

PAULA ANTON
Junior Professional Officer (Fisheries and Aquaculture)

Ms Paula Anton, has a Bachelor of Science in Marine Biology (2010), a Master of Science (M.Sc.) in International Cooperation, specializing in food security and natural resources (2012) and an M.Sc. in Fisheries and Aquaculture, specializing in marine resources and sustainability (2014). She has been working since 2008 in fisheries, aquaculture and marine conservation development projects in Africa for organizations such as Wildlife Conservation Society, Instituto Español de Oceanografía, UNDP, National Parks and Marine Reserves, on diverse activities such as recovery of fisheries, environmental awareness, small-scale aquaculture establishment, marine reserves creation, fisheries and aquaculture research, etc. She joined FAO as Junior Fisheries and Aquaculture Officer in Somalia in 2013 and as Junior Professional Officer (Fisheries and Aquaculture) at the Regional Office for the Near East and North Africa in 2014.

As a JPO (Fisheries and Aquaculture), she will be engaged in supporting the RECOFI Secretariat and on the implementation of the RECOFI Fisheries Production Data Base; supporting the implementation of the Red Sea and Gulf of Aden RFMO/A; providing technical assistance to the Blue Growth projects in Morocco, Algeria, Tunisia and the regional project; supporting the Sustainable Fisheries and Aquaculture, Stock assessment and Statistics projects in Sudan, Jordan, Iran, Libya, Yemen, Qatar, UAE and Egypt and the Inland Fisheries in Iraq IR and Egypt; providing support on the Water Scarcity regional initiative; assisting the execution of the capacity development workshop on Port State Measures; and assisting the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication in the region.

Paula Anton can be reached by Email: Paula.Anton@fao.org

CARLOS E. PULGARIN
Junior Professional Officer (Aquaculture)

Mr Carlos E Pulgarin joined the Sub-regional office for Mesoamerica (SLM) as Junior Professional Officer for Fisheries and Aquaculture in September 2013.

Carlos obtained a Bachelor´s of Science degree in Zootechnology (2005) and a Master of Science degree in Animal Health and Animal Production (2012) from the Universidad Nacional de Colombia, with a focus on quantitative genetics in aquaculture species.

From 2005-2013 he worked at the Colombian Research Center for Aquaculture (CENIACUA) initially as a researcher and then as Director of the Breeding Program for Shrimp and Tilapia, optimizing traits such as growth, survival, disease resistance, fillet yield and colour through using family and individual selection. He also developed research projects focused on improving the productivity, competitiveness, and sustainability of aquaculture projects.

Carlos is very experienced with aquaculture production systems ranging from super-intensive to extensive. He is familiar with water recirculation systems and floc technology. He has worked with mono- as well as poly-culture systems using shrimp-tilapia. He is very knowledgeable about nutrition and formulation of diets and has strong statistical and data analysis skills.

In SLM, he has supported work with indigenous people in Panama, production of alternative feed in El Salvador, development of an aquaculture strategy for Guatemala and participated in a mission related to shrimp disease in Mexico, and he will be providing support to a TCP on genetic management of tilapia in Cuba.

Carlos can be reached by Email: Carlos.Pulgarin@fao.org

VASCO SCHMIDT
Junior Professional Officer (Aquaculture)

Born in Lisbon, Portugal, first generation Belgian, Vasco Schmidt has just joined the FAO Representation in Zimbabwe as a Junior Professional Officer (JPO) in Aquaculture with the Sub-regional Office for Southern Africa (SFS) team. French and English are his main working languages.

He has a Master of Science degree in Aquaculture (University of Plymouth, UK), and Management and Policy Advice (private sector and Université Catholique de Louvain, Belgium). Vasco has worked in the aquaculture and forestry-biomass sectors (private sector), fisheries and education projects (NGOs and development organizations) as well as in the EU and Pacific regions.

With industry experience, Vasco started working on projects with NGOs before deciding to cross over to development organizations, teaming up with the German Cooperation in Suva, Fiji. As JPO at FAO, Vasco is now extending his experience to the African continent. He enjoys most working with people of different countries and cultures.

Vasco can be reached by Email: Vasco.Schmidt@fao.org

Gumy, A., Soto, D. y Morales, R. 2014. Implementación práctica del enfoque ecosistémico a la pesca y la acuicultura del camarón en los países del sistema de integración centroamericana (SICA/OSPESCA) Taller FAO/OSPESCA, San Salvador, El Salvador, 18 al 21 de junio de 2012. *FAO Actas de Pesca y Acuicultura.* No. 33. Roma, FAO. 372 pp.

This FAO Proceedings contains the training aspects, discussions, base line studies and recommendations of the "Workshop on practical implementation of the ecosystem approach to shrimp fisheries and aquaculture in the countries of the Central American Integration System (OSPESCA/SICA) "held in San Salvador, El Salvador, from 18 to 21 June 2012. The workshop's main objectives were: 1) To familiarize participants with the principles and practices of the ecosystem approach to fisheries and aquaculture; 2) Review the status of national and regional implementation of EAF and EAA in the OSPESCA region based on national and regional baseline documents presented to the workshop; 3) Review the practical implementation steps using a toolbox especially designed for the event; and 4) Develop a roadmap setting out goals, using agreed indicators and describing a prioritized list of actions and recommendations for OSPESCA and its member countries focusing on improving the implementation of EAF and EAA to shrimp fisheries and aquaculture. The Proceedings also contains a management plan and follow-up steps proposed by OSPESCA as a regional strategy and analysis of the main regional issues and challenges for implementation of the ecosystem approach this ensuring a more sustainable shrimp production from fisheries and aquaculture.

For further information please contact:
Doris.Soto@fao.org

Government of Bangladesh & FAO. 2014. National Aquaculture Development Strategy and Action Plan of Bangladesh 2013–2020 FAO Non-Serial Publication. Rome, FAO. 42 pp.

The National Aquaculture Development Strategy and Action Plan of Bangladesh 2013–2020 was formulated through a series of stakeholders' consultations that spanned a year between 2012 and 2013. It was reviewed and endorsed by the National Working Committee for the Sustainable Development of Aquaculture Industry at its first meeting held on 4 September 2013 and was approved by the Ministry of Fisheries and Livestock in November 2013.
It constitutes 16 outputs under four objectives geared towards "improving the welfare of the resource-poor people depending on aquatic resources for livelihood, reducing poverty by stimulating employment and improving income, conserving and enhancing the natural resources on which livelihoods are based, promoting the sustainable development of rural communities, increasing export earnings, and contributing to the creation of wealth for the nation". Its formulation, with FAO's technical assistance, was informed by the National Fisheries Policy of 1998, the Country Investment Plan 2011–2015, the National Fisheries and Livestock Sector Development Plan, the FAO TCPF project "Identification and understanding of key technical, economic and social constraints to seed and feed production and management in Bangladesh", and the preceding national fisheries strategy and action plan of 2006–2012.
Can be downloaded from following link:
http://www.fao.org/3/a-i3903e.pdf

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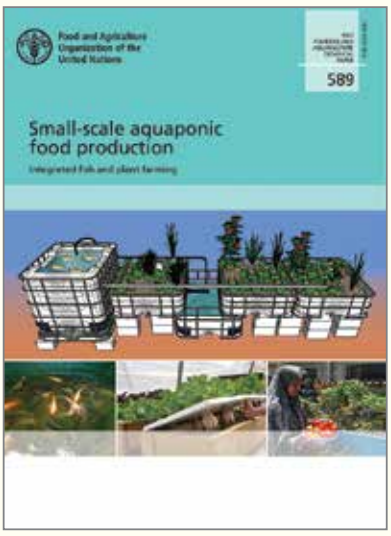

Somerville, C., Cohen, M., Pantanella, E., Stankus, A. & Lovatelli, A. 2014. Small-scale aquaponic food production. Integrated fish and plant farming. *FAO Fisheries and Aquaculture Technical Paper* No. 589. Rome, FAO. 262 pp.

Aquaponics is a symbiotic integration of two mature disciplines – aquaculture and hydroponics. This technical paper discusses the three groups of living organisms (bacteria, plants and fish) that make up the aquaponic ecosystem. It presents management strategies and troubleshooting practices, as well as related topics, specifically highlighting the advantages and disadvantages of this method of food production. This publication discusses the main theoretical concepts of aquaponics, including the nitrogen cycle, the role of bacteria, and the concept of balancing an aquaponic unit. It considers water quality, testing and sourcing for aquaponics, as well as methods and theories of unit design, including the three main methods of aquaponic systems: media beds, nutrient film technique, and deep water culture. The publication includes other key topics: ideal conditions for common plants grown in aquaponics; chemical and biological controls of common pests and diseases including a compatible planting guide; common fish diseases and related symptoms, causes and remedies; tools to calculate the ammonia produced and biofiltration media required for a certain amount of fish feed; production of homemade fish food; guidelines and considerations for establishing aquaponic units; a cost–benefit analysis of a small-scale, media bed aquaponic unit; a comprehensive guide to building small-scale versions of each of the three aquaponic methods; and a brief summary of this publication designed as a supplemental handout for outreach, extension and education. Aquaponics is an integrated approach to efficient and sustainable intensification of agriculture that meets the needs of water scarcity initiatives. Globally, improved agricultural practices are needed to alleviate rural poverty and enhance food security. Aquaponics is residue-free, and avoids the use of chemical fertilizers and pesticides. Aquaponics is a labour-saving technique, and can be inclusive of many gender and age categories. In the face of population growth, climate change and dwindling supplies of water and arable land worldwide, developing efficient and integrated agriculture techniques will support economic development. The manual is currently available in English as an e-manual from the FAO web site. Hard copies in English and Arabic will be available in mid-2015.

FAO/Regional Commission for Fisheries. 2015. Report of the sixth meeting of the Working Group on Aquaculture, Muscat, Oman, 21–23 October 2014. *FAO Fisheries and Aquaculture Report* No. 1094. Rome, FAO. 50 pp.

The sixth meeting of the Working Group on Aquaculture (WGA) of the Regional Commission for Fisheries (RECOFI) was held in Muscat, Oman, from 21-23 October 2014 and attended by seven member countries. The WGA reviewed the outcome and recommendations of the sixth and seventh RECOFI sessions. The WGA noted the importance of the timely collection, submission and sharing of accurate aquaculture statistics and other information. A draft recommendation on the minimum reporting of aquaculture data and information was discussed. The meeting agreed that RECOFI members would provide their comments at their next session, when the recommendation will be presented for adoption. The meeting discussed the Regional Aquaculture Information System (RAIS) following the presentation of the web analysis report, which indicated a steady regional interest in the information system. Actions to further consolidate and expand the system were discussed. The WGA finalized its proposed programme of work for the next intersessional period, based also on the WGA programme adopted by the Commission at its seventh session. The WGA recognized that the Commission, based on its current level of financial contribution, might not have the required budget to_implement a comprehensive aquaculture programme, and it recommended that some activities could be implemented with extra-budgetary funds. The WGA Alternate Focal Point of Oman was nominated as the new WGA Chairperson.

For info on both publications please contact: Alessandro.Lovatelli@fao.org

FAO Aquaculture Newsletter

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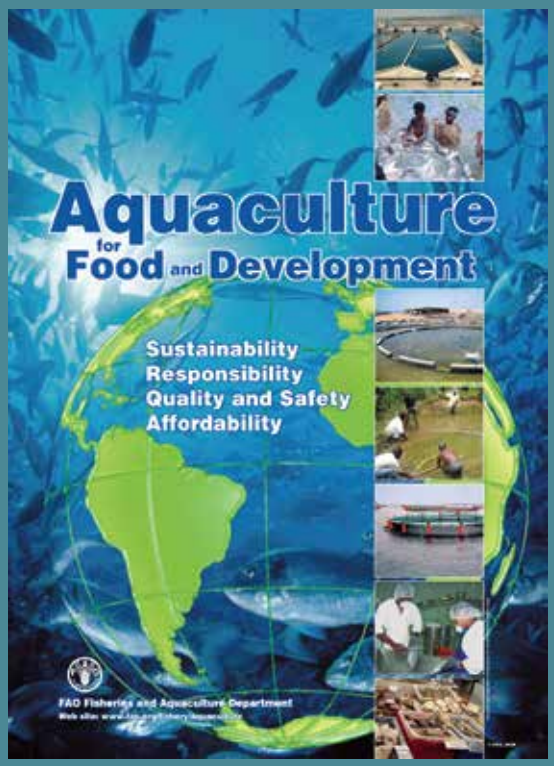

The FAO Aquaculture Newsletter (FAN) is issued two times a year by the Aquaculture Branch (FIRA) of the FAO Fisheries and Aquaculture Department, Rome, Italy. It presents articles and views from the FAO aquaculture programme and discusses various aspects of aquaculture as seen from the perspective of both headquarters and the field programme. Articles are contributed by FAO staff from within and outside the Fisheries and Aquaculture Department, from FAO regional offices and field projects, by FAO consultants and, occasionally, by invitation from other sources. FAN is distributed free of charge to various institutions, scientists, planners and managers in member countries and has a current circulation of about 1 300 copies.
It is also available on the FAO Web page: www.fao.org/fishery/publications/fan/en

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