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THE STATE OF WORLD FISHERIES AND AQUACULTURE

MEETING THE SUSTAINABLE DEVELOPMENT GOALS

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ABIDJAN, CÔTE D'IVOIRE. Offloading tunas

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BOX 17
(CONTINUED)

Vulnerability assessments are a key to sound understanding of climate impacts and provide a pathway to the development of robust adaptation actions. Given the multitude of available approaches and methodologies for assessing vulnerability (Brugère and De Young, 2015), the initial phase of each project includes participatory and detailed vulnerability assessments at the regional, national, local and/or community levels to identify the areas and communities that are most at risk, with due consideration for gender and age groups. The next step is to identify suitable adaptation measures and provide a sound technical basis for informing policy changes. Project activities foreseen, specifically targeted to different stakeholder groups, include capacity strengthening to enable all stakeholders to assess the risks posed by climate change to their livelihoods and security and to ensure adaptation to address those risks.

SMALL-SCALE FISHERIES AND AQUACULTURE

Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries – towards delivering results on the ground

Four years after COFI endorsed the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (FAO, 2015a), governments, partners and stakeholders are showing keen interest in small-scale fisheries (Box 18).

Several countries and regional organizations have incorporated reference to the SSF Guidelines in relevant policies and strategies, and new initiatives by NGOs and development partners are increasingly addressing small-scale fisheries issues in new ways and more explicitly. CSOs also continue to create awareness among their member fishers and fish workers of this unique international instrument which is entirely dedicated to small-scale fisheries. But is real change happening on the ground, in the lives and livelihoods of coastal, riverside and lakeshore communities?

The SSF Guidelines follow a human rights–based approach and see small-scale fisheries through a broader lens, looking beyond the fisheries and aquaculture sector. They promote a holistic approach to small-scale fisheries governance and management that takes fishery-based livelihoods into consideration. The thematic areas covered by the SSF Guidelines hence include social development, the post-harvest sector, gender, disaster risks and climate change in addition to responsible fishing and management.

This complexity can appear challenging and could potentially hinder real progress on implementation. FAO is therefore providing guidance to support the uptake of the SSF Guidelines in the hope of motivating change on the ground. For example, two expert workshops organized by FAO in 2016 were dedicated to exploring the human rights–based approach in implementing and monitoring the SSF Guidelines (Yeshanew, Franz and Westlund, 2017) and in gender-equitable small-scale fisheries (Correa, 2017), respectively. The latter was the culmination of a participatory process to develop a handbook on gender-equitable small-scale fisheries in support of the implementation of the SSF Guidelines (Biswas, 2017). A legal guide in support of implementation of the guidelines is currently under development. Through the Too Big To Ignore research network, in which FAO is a partner, over 90 researchers, practitioners and civil society representatives contributed to the book *The Small-Scale Fisheries Guidelines: global implementation* (Jentoft *et al.*, 2017), which contains case studies identifying entry points on how the SSF Guidelines can contribute to securing sustainable small-scale fisheries.

While advice is being developed, concrete actions are already taking place on the ground, although not yet on a large scale. Costa Rica, for example, has developed a draft law on small-scale fisheries

BOX 18

2022 ANNOUNCED AS THE INTERNATIONAL YEAR OF ARTISANAL FISHERIES AND AQUACULTURE

On 22 November 2017, the seventy-second session of the General Assembly of the United Nations proclaimed 2022 as the International Year of Artisanal Fisheries and Aquaculture (IYAFA) and invited FAO to serve as lead agency for celebration of the year, in collaboration with other relevant organizations and bodies of the United Nations system (UN, 2017c). The year was first proposed by the FAO Regional Conference for Latin America and the Caribbean in 2016, to affirm the role of artisanal fisheries and aquaculture in the eradication of hunger, food insecurity, malnutrition, poverty and the sustainable use of fisheries resources and hence their contribution to achieving SDGs 1, 2 and 14. The proposal was then endorsed by COFI; the Council of FAO endorsed a draft resolution to declare the year, and the fortieth Conference of FAO endorsed the resolution.

The IYAFA is intended to sensitize public opinion and governments about the importance of adopting specific public policies and programmes to promote sustainable artisanal fisheries and aquaculture, paying particular attention to the most vulnerable rural areas, constrained by poor governance and low capacity for sustainable resource use. The IYAFA will also provide a unique opportunity to promote the objectives of the SSF Guidelines. The five years leading to 2022 provide ample opportunity to chart a road map for action.

to provide a regulatory framework that recognizes the contribution of the sector to food security and poverty eradication. This law is complemented by specific activities to empower communities, for example the granting of harvesting permits to a cooperative, comprising mainly women, whose activities were previously informal. The United Republic of Tanzania is also embarking on the process of developing a National Plan of Action to implement the SSF Guidelines.

At the regional level, the incorporation of the SSF Guidelines in relevant policies, strategies and initiatives provides an enabling policy environment for change. Regions are using different entry points to put those policies and strategies into action, as shown in the following examples.

- SEAFDEC organized a workshop on the human rights–based approach and gender equity in regional implementation of the SSF Guidelines in September 2017 in Bangkok.
- The Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish) second regional expert group meeting on small-scale fisheries in Turkey in 2017 drew conclusions from a small-scale fisheries survey and developed recommendations in support of effective implementation of the SSF Guidelines in the subregion.
- The first meeting of the new permanent Working Group on Small-Scale and Recreational Fisheries of GFCM agreed in September 2017 to carry out a socio-economic survey and to establish a regional platform of small-scale fisheries organizations to strengthen the capacity of these actors to participate directly in decision-making and management processes.
- The Indian Ocean Commission (IOC), in collaboration with the Southern African Development Community (SADC) and FAO, organized a regional consultation on the implementation of the SSF Guidelines for the Indian Ocean and Southern African region in Mauritius in December 2016. Participants discussed modalities and identified priorities for the region, taking into account existing regional frameworks of the African Union, SADC and IOC.
- In June 2016, OSPESCA and the Confederation of Artisanal Fisherfolk of Central America convened a workshop on the new guidelines for small-scale fisheries in Nicaragua, as well as the first meeting of the OSPESCA small-scale fisheries working group.
- The adoption of a model law on small-scale fisheries through the Latin American Parliament (Parlatino) provides concrete guidance on improving regulatory frameworks in support of small-scale fisheries.

BOX 19

HIDDEN HARVEST 2: EXPANDING MEASURES OF THE SOCIO-ECONOMIC CONTRIBUTIONS OF SMALL-SCALE FISHERIES

The SSF Guidelines provide a policy framework for how to move small-scale fisheries into sustainability through a holistic and integrated approach. However, this transformation needs substantial support, including better data and information on the contributions of small-scale fisheries to the three dimensions of sustainable development: social, economic and environmental. For this reason, FAO has proposed a new study to build on the World Bank (2012) *Hidden harvest* report, to deepen empirically verifiable information on small-scale fisheries and their socio-economic contributions, as well as to identify the key threats to these contributions and/or opportunities to enhance them. To elaborate plans for the study, FAO organized the Workshop on Improving our Knowledge on Small-Scale Fisheries: Data Needs and Methodologies from 27 to 29 June 2017 in Rome (Basurto *et al.*, 2017), supported by World Fish and Duke University, which are partnering with FAO in this effort.

The study will be conducted throughout 2018 and 2019 and is expected to be the most extensive compilation to date of information available on the diverse contributions of small-scale fisheries to communities and countries around the world. The backbone of the effort will be national-level case studies from coastal and island States, where most of the world's small-scale fishers live and work. Since the publication of the 2012 study, additional regional and global data sets have become available, including household surveys and census information, nutritional information on fish species, consumption among coastal indigenous peoples and location-based catch estimates, among others. Worldwide estimates will be generated to the extent possible using a mixed-methods approach, with data drawn from both the available global datasets and the national case studies. The study may also provide a framework for continual monitoring of the socio-economic contributions from small-scale fisheries, so that this information will remain available to policy-makers and support the tracking of progress in the implementation of the SSF Guidelines.

In these initiatives, better understanding of the specific characteristics of small-scale fisheries and capacity development for key State and non-State actors are commonly perceived needs.

Stakeholder empowerment remains a key pillar of SSF Guidelines implementation. Fisher organizations continue to take an active role in raising awareness and supporting organizational strengthening. In particular, member organizations of the International Planning Committee for Food Sovereignty (IPC) Fisheries Working Group organized five national and two regional consultations in support of SSF Guidelines implementation in 2016–2017. They, as well as other partners, are also responsible for translating the SSF Guidelines into non-FAO languages, including Bengali, Kannada, Portuguese and Tamil. FAO partnered with the Fund for the Development of the Indigenous Peoples of Latin America and the Caribbean to develop capacities of indigenous peoples' representatives, and with governments and OSPESCA in Central America to use the SSF Guidelines as a constructive tool for empowerment.

The interest in the SSF Guidelines by a wide variety of partners confirms their value as a tool for triggering change. An important task for FAO will be to support partners further in their efforts to apply and mainstream the SSF Guidelines, and to facilitate a learning and experience sharing process that can inform future implementation. A key requirement for application of the SSF Guidelines is to improve information on small-scale fisheries (see Box 19). New information and communication technology (ICT) provides opportunities for small-scale fisheries in areas such as safety, governance, efficiency, capacity building, networking and sharing of local knowledge (Box 20).

Assessing small-scale aquaculture

Small-scale aquaculture contributes to global aquaculture production and to rural livelihood development through provision of food, livelihoods and income-generating opportunities, improving social equity and enhancing the quality of life of poor rural communities. In the »

BOX 20
INFORMATION AND COMMUNICATION TECHNOLOGY IN SUPPORT OF SMALL-SCALE FISHERIES AND AQUACULTURE

The rapid spread of ICT has already revolutionized the fisheries and aquaculture sector, whether for identifying fishing resources, planning and monitoring or providing market information (electronic catch documentation and traceability systems, price information) (see also "Disruptive technologies" in Part 4). ICT has also become more personal through affordable mobile devices that facilitate safety at sea, spatial planning, co-management and social networking. It can also benefit resource-poor stakeholders.

Safety first and early warning
Fishers' safety during operations or rescue relies on ICT. Electronic beacons, optionally combined with automatic identification systems (AIS) or vessel monitoring systems (VMS), can serve as safety devices and at the same time provide vessel activity information.

Mobile phone advisory services provide early warning information on weather and extreme events and allow fishers to call for assistance. Social networks can also be an early warning source for emergencies such as disease outbreak. Epizootic Ulcerative Syndrome in the Democratic Republic of the Congo, for example, was first mentioned on SARNISSA (Sustainable Aquaculture Research Networks in Sub-Saharan Africa), an African aquaculture stakeholders' mailing list (FAO, 2017q).

Governance
Social media and other Internet-based applications, which can be accessed using mobile phones and tablets, can improve access to and sharing of reliable data such as catch and effort and fisheries management rules and regulations, thus helping to empower stakeholders, especially during negotiation of co-management partnerships. An example is ABALOBI, an information-management system and mobile application suite co-developed by academics, the government and fisher communities in South Africa to empower small-scale fishers by providing them with access to and control over information and resource networks in areas from fishery monitoring and maritime safety to local development and market opportunities (Figure 42).

ICTs also support efforts to combat IUU fishing. The use of global positioning systems (GPS), for example, is increasing in monitoring, control and surveillance of fishing through VMS on larger vessels and smaller tracking devices such as SPOT trackers.

Efficiency
Aquaculture management software allows farmers to optimize production. New developments include air-based and aquatic sensors and drones for inspecting equipment and moorings, monitoring the environment and fish, and assisting in the optimization of farm operations.

In fisheries, navigation aids such as GPS make it possible to mark fishing areas, log trips and plan fuel-efficient trips. Some vessels use ICT to combine information from sonar, used to locate fish, sea beds and underwater debris, with trip reports, providing new datasets for improved efficiency.

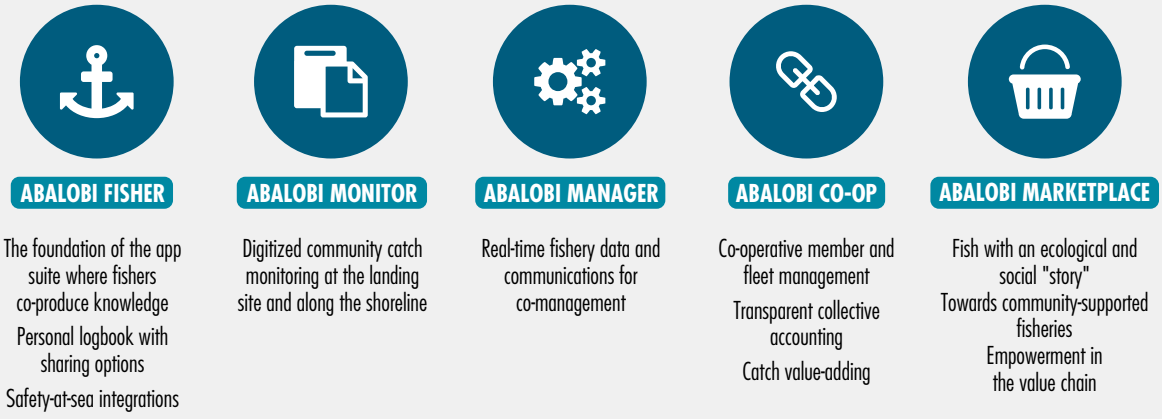
Capacity building and social networking
ICTs have broadened the tools available for capacity building, especially for isolated or remote communities. The electronic delivery of extension services, for example, may complement traditional fisheries and aquaculture extension systems, allowing those involved in the sector to obtain information more easily on modern and sustainable practices along the supply chain. An example is the Philippines e-Extension Portal for agriculture, fisheries and natural resource sectors (http://e-extension.gov.ph). Social networking can offer workers in small-scale fisheries and aquaculture opportunities for sharing knowledge and staying connected to families and social groups, which is of particular importance when they are out at sea or need to migrate for fishing/farming activities.

Local knowledge for monitoring change
Easily accessible ICTs offer potential for harnessing local knowledge of fishing and fish-farming communities through, for example, citizen science platforms that enable stakeholders to use smartphones and websites to share information on changes in their aquatic environments, such as new species sightings or habitat loss (see, for example, www.redmap.org.au).

BOX 20
(CONTINUED)

Lessons learned
As experience in the use of ICT for small-scale fisheries and aquaculture grows, so does knowledge on the benefits and risks associated with different ICTs and on good practices in their development and implementation. For example, recent experiences of the Regional Fisheries Livelihood Programme for South and Southeast Asia (RFLP) are shared through lessons learned notes on the potential uses and users' benefits, tips, issues to consider and potential pitfalls, as well as critical questions to ask before committing to the use of any information or communication technology (FAO, 2012c).

FIGURE 42
ABALOBI – A RANGE OF INTEGRATED MOBILE PHONE APPLICATIONS FOR SOUTH AFRICAN SMALL-SCALE FISHERS



SOURCE: ABALOBI, 2017

» past, the status, potential, limitations and constraints of small-scale aquaculture at the country level could only be evaluated through case studies or the use of methods such as rapid rural appraisal, participatory rural appraisal or impact assessment to evaluate its role in poverty alleviation and food security. These approaches were useful for sectoral planning and development; however, they did not permit systematic assessment of the contribution of small-scale aquaculture to aquaculture overall or to rural livelihood development. In 2008, at an expert workshop in Nha Trang, Viet Nam, FAO and partners launched the development of assessment indicators to measure the performance of the sector and to support local, regional and national policy-makers in accounting its contributions (Bondad-Reantaso and Prein, 2009). The Nha Trang indicator system is intended to enhance understanding of the risks and threats to small-scale aquaculture as a basis for designing appropriate interventions, setting

BOX 21
NHA TRANG INDICATORS TO MEASURE THE CONTRIBUTION OF SMALL-SCALE AQUACULTURE TO SUSTAINABLE RURAL DEVELOPMENT

Natural capital
- **1** Types and number of nutrient flows
- **2** Number of farm production uses of water

Physical capital
- **3** Number of small-scale aquaculture (SSA) farms and farm areas increased over three years in the study area
- **4** Types and number of rural infrastructure investments induced by SSA
- **5** Types and number of rural infrastructure investments induced not purposely for SSA but benefiting SSA

Human capital
- **6** Per capita annual consumption of fish in SSA household (only fish for their own SSA harvest)
- **7** Season of the year when the household relies more on its own harvest than on fish from other sources

Financial capital
- **8** Percentage of cash income from SSA to total household cash income
- **9** Economic return from SSA to households
- **10** Percentage of economic value from SSA production to production from all aquaculture in the province

Social capital
- **11** Percentage of farm households that are active members of SSA programmes/associations/organizations
- **12** Percentage of number of SSA farm activities in which women take the major decision-making role
- **13.1** Number of SSA households that share fish products and other farm resources
- **13.2** Number of activities in which farmers work together to improve the shared resources in the community (e.g. water system, road, reservoir)
- **14** Ratio of family labour who previously worked solely or mainly in non-SSA (including off-farm jobs) but now work in SSA to total family labour

SOURCE: Bondad-Reantaso and Prein, 2009

priorities and allocating resources. Pilot tests of the indicators have been carried out in a number of Asian countries.

The indicator system (Box 21) is based on a definition in which small-scale aquaculture is characterized as a continuum of:
- systems involving limited investment in assets and small investment in operational costs, including largely family labour and in which aquaculture is just one of several enterprises (known in earlier classifications as Type 1 or rural aquaculture);
- systems in which aquaculture is the principal source of livelihood, in which the operator has invested substantial livelihood assets in terms of time, labour, infrastructure and capital (also known as Type 2 aquaculture).

The system was developed through the following steps (FAO, 2010c): understanding the subject of measurement; identifying an analytical framework and setting criteria; developing a list of small-scale aquaculture contributions; categorizing the contributions based on the analytical framework and agreed criteria; devising and organizing indicators of the contributions; and measuring the indicators. The sustainable livelihood approach was used as the conceptual framework and accuracy, measurability and efficiency as the agreed criteria. The sustainable livelihood approach reflects the primary objective of a small-scale aquaculture system, i.e. to balance the use and/or development of the five types of livelihood capital or assets (natural, physical, human, financial and social).

Examining the impacts of small-scale aquaculture on households, communities and the environment: testing the Nha Trang indicators

A set of case studies (FAO, forthcoming) used the Nha Trang indicators to examine the contribution of small-scale aquaculture to the five livelihood assets for different small-scale systems in China (pond freshwater polyculture, integrated fish farming system), the Philippines (seaweed, tilapia in cages), Thailand (freshwater pond finfish polyculture, catfish in plastic-lined ponds) and Viet Nam (tiger shrimp ponds, lobster in cages, shrimp–finfish ponds). Results revealed the complex, multi-faceted impact of small-scale aquaculture on households, communities and the environment.

The impacts on natural capital were mixed. Some aquaculture systems (in China, Thailand and Viet Nam) adopted sustainability-enhancing practices such as reuse of water and material flows, while others (in Viet Nam and the Philippines) contributed to nutrient loading, threatening environmental harm.

The impacts on on-farm physical capital formation were likewise mixed, with growth seen in some study sites and contraction in others. Most of the systems studied, except those in Viet Nam, showed negligible changes in farms and farm areas. Small-scale aquaculture did not usually develop infrastructure, but the sector benefited from existing infrastructure.

In terms of human capital, some but not all small-scale aquaculture systems contributed to seasonal food security.

The financial capital indicators formed a clear pattern. Intensive (Type 2) aquaculture systems generated the highest cash income and net returns, but these were highly variable (and the systems therefore more risky). These systems showed profitability (although small) and improvement in household cash flow.

The studies also showed that small-scale aquaculture encourages formation of community farmer organizations, women's empowerment and voice in economic enterprise, networks and collective action. Small-scale aquaculture fosters social harmony through the sharing of harvest and technical knowledge and expertise. Concerning indicator 12, related to the role of women, some small-scale aquaculture systems provided an opportunity for women to assume major decision-making roles, for example in obtaining loans, managing household expenses, farm record keeping and sale and allocation of fish harvest.

As a whole, the results showed the tremendous diversity of small-scale aquaculture activities across commodities, production systems and locations, which makes measuring the contributions to sustainable rural development often challenging. The Nha Trang indicators are a useful step in this direction, but further refinements are needed to make the system more adaptable to the intricacies of diverse small-scale aquaculture systems. ■

REALIZING AQUACULTURE'S POTENTIAL

With most fishery stocks expected to remain maximally sustainably fished or overfished for at least the next decade, aquaculture must bridge the growing gap between supplies of aquatic food and demand from a growing and wealthier global population. Aquaculture has the potential to address the gap between aquatic food demand and supply and to help countries achieve their economic, social and environmental goals, thus contributing to the 2030 Agenda (Hambrey, 2017; FAO, 2017c).However, the growth of aquaculture raises a number of questions in relation to the resources that it consumes (e.g. space, feedstuffs), its products (see "Fish for food security and human nutrition" in Part 2) and the threats that the sector faces from external factors such as climate change and disease.

Aquaculture spatial planning and area management

The ability of aquaculture to meet future demand for food will to some extent depend on the availability of space. Common space-related problems that limit aquaculture development include: introduction and spread of aquatic