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## In this month's issue

- |   |    |  |    |
|---|----|--|----|
| ▶ Adapting to Change  | ii | ▶ Enhancing Social Acceptability and Communication of Aquaculture: Key Drivers for the Development of the Sector | 16 |
| ▶ FAO's Work in Response to COVID-19 Impacts on Aquaculture | 5  | ▶ The Role of Aquaculture in Home-Grown School Feeding Programmes  | 47 |
| ▶ Global Conference on Aquaculture Millennium + 20          | 7  |  |    |



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## Adapting to Change

Dear reader,

A lot has happened since the last edition of FAN in April this year. The world has changed, with a new normal now governing our daily lives. What can I say about the COVID-19 pandemic and this difficult year that has not already been said? I can only join my voice to that of so many others to wish for your safety and well-being in these trying times, and share my hope for the swift end to this terrible disease. But I can also highlight that if aquaculture all over the world has suffered a lot, it has equally demonstrated an incredible adaptive capacity to cope with the new and constantly evolving constraints. In this edition of FAN, we take a

moment to share with you some of these experiences and the work that FAO has been doing in response to the impacts of COVID-19 on aquaculture. We also take a deeper look into the gender dimensions of COVID-19 on women in fisheries and aquaculture, and although it is too early to know the precise magnitude of the impact that the crisis will have over the long term on the sector, we already present a preliminary analysis of the situation in Tunisia.

As you can imagine, FAO's work has also been deeply affected but it has not stopped, as you will also see in this edition. Once again, we will provide you with aquaculture updates from around the world: new developments in the United Arab

Emirates and Bahrain, support to a recirculating aquaculture project in the Kingdom of Saudi Arabia, establishment of demonstration sites in Morocco for marine cage farming, and creation of employment opportunities through sustainable aquaculture development activities targeted at youth in Côte d'Ivoire. The impacts of COVID-19 serve as a stark reminder of the need for aquaculture to be resilient to all types of shocks and to be prepared to manage future disasters. Two articles from the Latin America and Caribbean region highlight FAO's work in rebuilding a prawn hatchery in Dominica and supporting diversification and adaptation in Chile to the impacts of climate change. Relatedly, a thematic article

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focuses on how adaptation of the seaweed sector in Zanzibar holds lessons for us all.

The importance of communication of the positive aspects of aquaculture is examined in an article from the European region, underscoring the importance of social licence and acceptability for the sustainable development of aquaculture. And while many of us are aware of the importance of fish to healthy diets, we also look at a success story of using fish in school feeding programmes, and how improved nutrition can have direct positive impacts on children's education and quality of life. We also take this opportunity to update our readers on the important continuing work towards the Guidelines for Sustainable Aquaculture and the Global Information System on Farmed Types of Aquatic Genetic Resources.

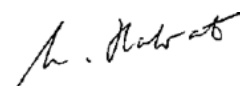
FAO is also planning for the future. While we are preparing for the United Nations Food Systems Summit 2021 ([www.un.org/sustainabledevelopment/food-systems-summit-2021](http://www.un.org/sustainabledevelopment/food-systems-summit-2021)), we are also intensively working on the Global Conference on Aquaculture Millennium +20 (GCA). It will come

as no surprise that the latter had to be postponed, but we are happy to report that the new dates have been agreed for 22-27 September 2021. This and other important updates, notably on the aquaculture regional reviews and global synthesis to be presented virtually<sup>1</sup> from 26-29 October 2020, can be found in the dedicated article and the dedicated website ([www.aquaculture2020.org](http://www.aquaculture2020.org)). We are likewise happy to inform you that 2022 has been declared as the United Nations International Year of Artisanal Fisheries and Aquaculture, and point our readers towards important milestones in the lead up to this highly relevant international year.

On a final note, it is also our sad duty to honour the life and work of former colleagues who passed away with an obituary, as we did for Michel M.J. Vincke in the last edition. In this edition, we pay our last respects to Prof. Sena De Silva, a close ally in our continued quest for responsible and sustainable aquaculture, as well as Oumoulkhairy Ndiaye, often known as "Madame FTT", and honour her legacy through the story of the FAO-Thiaroye processing technique. We do hope that for many of our

readers around the globe these obituaries will not only serve as a remembrance of the achievements of the older generation but also that the recognition of such fulfilled lives may provide stimulus to the new generation of aquaculture development workers around the globe. In FAO and elsewhere we look back to Sena, Oumoulkhairy and Michel and their generation with pride and admiration; their dedication, hard work and achievements serve as a reminder of the obligation we have when aiming to deliver FAO's important mandate.

I now encourage you to discover this new edition of FAN, and please do not hesitate to share your impressions with us: your constructive criticism will help us improve whereas encouragement is always most welcome!



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1. Meeting information and registration can be found here: [www.fao.org/fishery/nems/41262/en](http://www.fao.org/fishery/nems/41262/en)



Early morning fog over an integrated fish farm in Chiang Mai, Thailand

# CONTENTS

## ■ Editorial

Adapting to change

ii

## GLOBAL AQUACULTURE UPDATES

5

FAO's Work in Response to COVID-19 Impacts on Aquaculture

5

## ■ Meetings/events

Global Conference on Aquaculture Millennium + 20

7

African Regional Workshop on the Development of a Global Information System on Farmed Types of Aquatic Genetic Resources

9

Regional Consultation on the Development of Guidelines for Sustainable Aquaculture

11

The International Year of Artisanal Fisheries and Aquaculture is Coming Up in 2022

13

## AQUACULTURE UPDATES BY REGION

16

### ■ Europe

Enhancing Social Acceptability and Communication of Aquaculture: Key Drivers for the Development of the Sector

16

### ■ Latin America and the Caribbean

Diversification of Productive Activities and Innovation: Keys to Reducing Vulnerability of Artisanal Fisheries to Climate Change in Chile

20

Climate Change Adaptation for Prawn Farming in Dominica

23



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## ■ Near East and North Africa

Supporting the National Mariculture Center of Bahrain

25

Recent Developments and Prospects for Recirculating Aquaculture Systems in the Kingdom of Saudi Arabia

27

Supporting Sustainable and Innovative Aquaculture in the United Arab Emirates

30

Aquaculture Capacity Development in Morocco Through the Establishment of an Aquaculture Demonstration Center for the Training of Qualified Personnel

32

Preliminary Analysis of the Impact of COVID-19 on the Fishery and Aquaculture Sectors in Tunisia

34

## ■ Sub-Saharan Africa

TRUEFISH: a true fish-farming story in the Lake Victoria Basin

37

Creating Agribusiness Employment Opportunities for Youth Through Sustainable Aquaculture Systems and Cassava Value Chains in West Africa

38

Strengthening Aquaculture Value Chains While Increasing Employment and Income-Generating Opportunities for Women and Youth in Côte d'Ivoire

40

## THEMATIC ARTICLES

42

Where and How Does the Fisheries and Aquaculture Sector Fit in the Policy Development Agenda? The African Perspective

42

Seaweed Beyond Farming: Development Opportunities Offered by Nature

45

The Role of Aquaculture in Home-Grown School Feeding Programmes

47

Women as Agents of Change in the Response to COVID-19

50

## MISCELLANEOUS

45

The Impacts of the FAO-Thiaroye Processing Technique (FTT) on Well-being: The Legacy of Ms Oumoukhair Ndiaye, "Madame FTT"

53

## OBITUARY

55

Remembering our dear friend and colleague Professor Sena S. De Silva, 1946-2020

55

## COLLEAGUES IN MOTION

56

## NEW PUBLICATIONS

57

## CALENDAR OF EVENTS

63



# GLOBAL AQUACULTURE UPDATES

GLOBAL AQUACULTURE UPDATES • GLOBAL AQUACULTURE UPDATES • GLOBAL AQUACULTURE UPDATES

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## FAO's Work in Response to COVID-19 Impacts on Aquaculture

On 11 March 2020, the World Health Organization declared the coronavirus disease 2019 (COVID-19) outbreak a pandemic. In the meantime, countries all over the world started implementing stringent preventive measures aimed at limiting the spread of the disease. However, these measures did not only affect virus epidemiology, they also heavily affected the movement of people and the transport of goods. As a result, the aquaculture sector was immediately and globally impacted.



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In response to the crisis, the FAO Fisheries Division created a COVID-19 Task Force with the responsibility to coordinate departmental initiatives and provide coordinated support to measures and interventions addressing the impact of COVID-19 on fisheries and aquaculture and preparing the response.

The effects of COVID-19 on aquaculture were immediate and had varying impacts upon regions, species, markets and financial capacity of farms. The primary impact was the sudden impossibility of selling products, whether for export markets, because of the disruption of air transport, or for domestic wholesale and retail markets, as a result of the preventive measures implemented to limit the diffusion of the virus. The outcome was not only a loss of revenue and associated livelihoods, but most farmers also incurred additional expenses as they had to maintain large quantities of unsold live fish.

Species grown for export have been among the most severely affected, whereas aquaculture farms supplying live-fish markets (e.g. for restocking) or high-end food services (i.e. restaurants, tourism and hotels) have been struggling to find alternative commercial outlets.

The reduced availability of the labour force due to the lockdown enforced in many countries has also created difficulties for farmers. The work burden not only increased for remaining staff, but it also induced disruption in production, as for example, some farmers have not been able to complete all necessary seasonal tasks such as fish breeding or pearl grafting, which could have an impact on future restocking and subsequent harvests. The disruption in supply chains does not seem to have yet emerged as a major impact for aquaculture farms, but difficulties in sourcing some inputs such as seed, feed, vaccines, equipment and drugs have been reported, especially for

companies that rely on imports.

Many small and medium-sized enterprises and farms are now struggling with cash-flow issues, and although several government or financial institutions have provided financial support, the risk of bankruptcy remains. However, the sector has also shown its adaptability and capacity to react. Many farms around the globe, whether small, medium or large size, have successfully redirected their sales to new markets, especially supermarkets and domestic retail. One remarkable feature has been the increased use of digitalization tools, which have emerged as a major innovation during the crisis. One promising possibility is the application of digital tools for distant monitoring of water quality, feeding and behaviour observation of aquatic animals in the farm, which would allow managers who are not allowed to visit farms to use mobile apps with sensors and automatic functions.

On the positive side, a few farms located in different areas around the globe, where imports of aquatic products are generally massive, have reported having benefitted from the reduced competition during the lockdown. This highlights the strategic importance of local production for food security.

In the context of fisheries and aquaculture, the response from FAO has been primarily focused on supporting, restarting and strengthening the sector's supply chains and livelihoods while focusing on the most vulnerable groups and regions. To this end, FAO's recent and ongoing actions include:

- developing policy briefs on the impacts of COVID-19 on the sector and policy response, as well as a Q&A to address the most urgent information needs;

- working with Members, industry and civil society representatives, and other stakeholders to monitor the situation and provide policy, management and technical advice, as well as technical support to innovate and adapt practices along the supply chain;
- coordinating information and responses with international and regional partners, such as regional fishery bodies, intergovernmental economic organizations, research centres and civil society organizations;
- continuing to improve its understanding of the impact of COVID-19 and to assess any potential risks to global, regional and national food systems as new information and knowledge become increasingly soundly based and to mobilize resources for coordinated COVID-19 mitigation measures;
- working with international financial institutions and donors to develop comprehensive and coordinated intervention packages to address the most urgent priorities to reactivate

- supply chains; and
- developing the guidelines “Best practices for developing surveys and questionnaires on the impacts of COVID-19”.

These past months have shown that food security cannot be taken for granted, and that the strategies some countries have developed to ensure their food supply will need to be revisited. The COVID-19 crisis also highlights the importance of local production as well as the role of innovation to overcome constraints, in particular for aquatic food value chains. The aquaculture sector has been heavily impacted and many uncertainties remain, especially concerning the global economic slowdown that is predicted to follow the lockdown phase. Further monitoring of the quickly evolving situation will be critical for immediately identifying the most appropriate responses needed to support the sector, in particular in regions and countries already experiencing food insecurity scenarios.



## SEE ALSO

FAO website on *COVID-19 in fisheries and aquaculture*. Rome.

[www.fao.org/fishery/covid19/en](http://www.fao.org/fishery/covid19/en)

FAO website on *Digital innovation is boosting the fisheries supply chain in Oman during COVID-19*. Rome. [www.fao.org/fao-stories/article/en/c/1278611](http://www.fao.org/fao-stories/article/en/c/1278611)

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Bondad-Reantaso, M.G., MacKinnon, B., Hao, B., Huang, J., Tang-Nelson, K., Surachetpong, W., Alday-Sanz, V., Salman, M., Brun, E., Karunasagar, I., Hanson, L., Sumption, K., Barange, M., Lovatelli, A., Sunarto, A., Fejzic, N., Subasinghe, R., Mathiesen, Á.M. & Shariff, M. 2020. Viewpoint: SARS-CoV-2 (the cause of COVID-19 in humans) is not known to infect aquatic food animals nor contaminate their products. *Asian Fisheries Science*, 33: 74–78 [online]. [Cited 22 May 2020]. <https://www.asianfisheriessociety.org/publication/abstract.php?id=1291>

FAO. 2020. *Legal considerations in responses to COVID-19 to mitigate the risk of disruption to fisheries and aquaculture food systems*. [www.fao.org/publications/card/en/c/CA9421EN](http://www.fao.org/publications/card/en/c/CA9421EN)

FAO. 2020. *Best practices for developing surveys and questionnaires on the impacts of COVID-19 on fisheries and aquaculture*. [www.fao.org/fileadmin/user\\_upload/faoweb/FI/COVID19/Surveys\\_and\\_questionnairesCOVID.pdf](http://www.fao.org/fileadmin/user_upload/faoweb/FI/COVID19/Surveys_and_questionnairesCOVID.pdf)



# Global Conference on Aquaculture Millennium + 20

Important updates and revised dates (22–27 September 2021)

## Introduction

Preparations towards the Global Conference on Aquaculture Millennium +20 (GCA) are proceeding it will be held from 22 to 27 September 2021 in Shanghai, China. FAO, the Network of Aquaculture Centres in Asia-Pacific (NACA) and the Ministry of Agriculture and Rural Affairs of the People's Republic of China are working together on revised arrangements of the GCA, which had been postponed earlier this year.

In this article, we provide updated information on revised dates, outline the preparation and presentation of the Regional Aquaculture Reviews and Global Synthesis, discuss the development of the draft Shanghai Declaration (Declaration), and summarize the progress made during the past few months on the Thematic Reviews.

For a comprehensive overview of the GCA, including its background, expected outputs and organizational arrangements, please see the dedicated article in FAN 61 or visit:

[www.aquaculture2020.org](http://www.aquaculture2020.org).

## Revised Dates

Originally planned for October 2020, the conference was postponed by the GCA Secretariat because of the COVID-19 pandemic and its associated impacts. Although there is no time to lose in our common fight

against hunger and poverty, our commitment to the health and safety of GCA participants is paramount. The GCA Secretariat, therefore, engaged with all partners to determine the best possible revised dates, and we are pleased to announce that the GCA will be held from 22 to 27 September 2021 in Shanghai, China.

Ahead of the GCA, a series of webinars will be organized on various topics relevant to the sustainable development of aquaculture. The first of these will be a presentation of advanced (pre-final) versions of six Regional Aquaculture Reviews and a Global Synthesis *The State of World Aquaculture 2020*, which will be held during the week of 26–29 October 2020 – the original dates of the GCA.

## Shanghai Declaration

The Regional Reviews, Global Synthesis and Thematic Reviews are especially relevant to a key output of the GCA – the draft Shanghai Declaration. The Declaration will identify global priorities related to aquaculture's role in implementing and mainstreaming the Sustainable Development Goals and, over the next 10 years, to optimizing the contribution of aquaculture towards achieving the 2030 Agenda for Sustainable Development. The Declaration is also intended to act as a guide to stakeholders working towards sustainable aquaculture development under the Code of Conduct for Responsible Fisheries and underpin future national, regional and global initiatives on

capacity building, partnership and resource mobilization towards promoting food security, poverty alleviation and rural development.

## Regional Reviews and Global Synthesis

Since 1995, the FAO Fisheries and Aquaculture Department has produced Regional Aquaculture Reviews and a Global Synthesis every five years. These reviews provide up-to-date information on the status and trends of the sector at regional and global levels. The reviews pull from national, regional and global data sets and include expert opinions and literature reviews. The reviews can be of pertinent interest and use to national governments, regional organizations, policy-makers, aquaculture farmers and other aquaculture value chain actors, investors, civil society organizations, research and training institutions as well as interested stakeholders. The preparation of the 2020 Regional Reviews and Global Synthesis is well under way, and rather than waiting until the revised dates of the GCA to present these timely documents, we have decided to hold a series of webinars to make this information available. During these webinars, a presentation of key messages followed by a panel discussion among commissioned authors and experts will showcase the reviews. Afterwards, question and answer sessions will provide an opportunity for interested parties to comment on the reviews ahead of their final publication towards the end of 2020.

Everyone is welcome, so we invite you to mark your calendars



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## WEBINAR DATES AND TIMES

(all times in Central European Time CET)

Monday <b>26 OCTOBER</b>	Session 1 10:00–11:00	Regional Review of Aquaculture in <b>Asia and the Pacific</b>
	Session 2 13:00–14:00	Regional Review of Aquaculture in <b>Europe</b>
Tuesday <b>27 OCTOBER</b>	Session 3 13:00–14:00	Regional Review of Aquaculture in <b>North Africa and the Near East</b>
	Session 4 16:00–17:00	Regional Review of Aquaculture in <b>North America</b>
Wednesday <b>28 OCTOBER</b>	Session 5 13:00–14:00	Regional Review of Aquaculture in <b>Sub-Saharan Africa</b>
	Session 6 16:00–17:00	Regional Review of Aquaculture in <b>Latin America and the Caribbean</b>
Thursday <b>29 OCTOBER</b>	Session 7 13:00–14:30	Presentation of <i>The State of World Aquaculture 2020</i>

and forward the forthcoming invitations to any interested contacts in your networks. Registration is required for each session, and registration links can be found on the GCA and FAO Fisheries and Aquaculture websites.

### Thematic Reviews

A set of Thematic Reviews provides a further evidence base for the Shanghai Declaration and will make up a core component of the GCA. The themes, carefully selected by the International Programme Committee and chosen on their current and future relevance for the sector, cover technical topics on production, ranging from innovations in aquaculture systems to developments in feed and feeding practices and from biosecurity to aquatic genetic resources and seed supply. Value chains, market access and consumer perceptions relate directly to social and human dimensions of aquaculture, including gender, nutrition and youth employment. Finally aquaculture policies, planning and governance connect to the needed transformation of aquaculture towards achieving the Sustainable Development Goals. Each Thematic Review will consider a

number of cross-cutting issues including, among other things, biodiversity mainstreaming, climate change and capacity building.

For each theme, a group of technical experts has been convened by FAO and commissioned to produce thematic review articles for dedicated GCA sessions. Key messages emerging from these reviews are the second pillar for the technical basis of the Shanghai Declaration.

### Looking Forward

Despite the global disruptions caused by the COVID-19 pandemic, the work of FAO and others continues. All aspects of life have been touched, and the importance of sustainable and resilient food systems, and inclusive and equitable value chains, has been cast into stark

light, exposing weaknesses of the status quo and demanding we do better. Against this backdrop, the overall GCA conference theme “Aquaculture for Food and Sustainable Development” will be more relevant than ever during the post-COVID-19 recovery phase. Only through cooperation among all stakeholders, from government, business, academia and civil society, can we collectively identify policy, institutional governance capacity development and technology innovations, investment opportunities, and fruitful areas of collaboration in aquaculture that can drive its sustainable development.

*We hope to see you in Shanghai next year – and online this October!*

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### SEE ALSO

[www.fao.org/fishery/nems/41262/en](http://www.fao.org/fishery/nems/41262/en)

[www.fao.org/fishery/regional-aquaculture-reviews](http://www.fao.org/fishery/regional-aquaculture-reviews)

[www.fao.org/3/a-ad351e.pdf](http://www.fao.org/3/a-ad351e.pdf)

[www.fao.org/fishery/docs/DOCUMENT/aquaculture/aq2010/Phuket\\_Consensus\\_13-12-2010.pdf](http://www.fao.org/fishery/docs/DOCUMENT/aquaculture/aq2010/Phuket_Consensus_13-12-2010.pdf)



# African Regional Workshop on the Development of a Global Information System on Farmed Types of Aquatic Genetic Resources



African regional workshop entitled “Development of a global information system for farmed types of aquatic genetic resources”, Addis Ababa, Ethiopia

In December 2019, FAO held a workshop for African countries entitled “Development of a global information system for farmed types of aquatic genetic resources”. The workshop was held in Addis Ababa, Ethiopia, and was implemented with the support of the FAO Subregional Office for Eastern Africa and two experts from the World Fisheries Trust. Participants included 18 invited National Focal Points on aquatic genetic resources (AqGR)<sup>1</sup>

and representatives of regional organizations, including Lake Tanganyika Authority, East African Community Secretariat, Lake Victoria Fisheries Organization and WorldFish. The meeting was the first in a series of planned regional workshops aiming to guide FAO in two major, ongoing areas of work for the promotion of the sustainable use, conservation and development of AqGR used in the aquaculture sector. These interlinked areas are: (i) the development of an information system for farmed types<sup>2</sup> of AqGR; and (ii) the development of a draft Global Plan of Action (GPA) for AqGR<sup>3</sup>, with the latter being an ambitious policy framework for adoption by countries on a

voluntary basis. The information system will serve as a tool for monitoring progress in the implementation of the GPA at the national, regional and global levels.

The workshop began with initial discussions on the rationale for an information system and the main beneficiary stakeholders. Through a training session, the participants were then introduced to an interim version of the information system that is being developed. This information system takes the form of a Registry, based on the FAO classification of farmed types.<sup>4</sup>



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1. The list of National Focal Points can be found here: [www.fao.org/fishery/static/aqgenres/List\\_of\\_NFPs.pdf](http://www.fao.org/fishery/static/aqgenres/List_of_NFPs.pdf)
2. [www.fao.org/aquatic-genetic-resources/activities/registry/en/](http://www.fao.org/aquatic-genetic-resources/activities/registry/en/)
3. [www.fao.org/aquatic-genetic-resources/activities/global-plan/en/](http://www.fao.org/aquatic-genetic-resources/activities/global-plan/en/)
4. [www.fao.org/3/ca8302en/CA8302EN.pdf#page=40](http://www.fao.org/3/ca8302en/CA8302EN.pdf#page=40)

The second part of the meeting focused on the GPA. To familiarize participants with the GPA, they were provided with an overview on the role of the GPA in the management of AqGR, the standard process for GPA preparation and the structure of the GPA outline prepared by FAO, which will form the basis for the consultation with all FAO Members. For each of the following four pre-agreed GPA Priority Areas, the participants identified long-term goals, strategic priorities, actions and possible indicators appropriate for the African region:

1. establish and strengthen the national and global characterization, monitoring and information system for AqGR;
2. accelerate appropriate development of AqGR for aquaculture;
3. promote sustainable use and conservation of AqGR; and
4. policies, institutions and capacity building.

Among its main outcomes, the meeting identified the regional stakeholders that will benefit most from the information system, identified and recommended changes to the Registry structure, and revised the draft GPA.

The audience also confirmed that most African countries lack an information system dedicated to farmed types and highlighted that such an information system could be applied nationally and regionally and would be crucial for harmonizing the reporting mechanisms on AqGR.

In order to prepare a full draft GPA, the input from this regional workshop will be combined with input from the last sessions of the Committee on Fisheries (COFI) Advisory Working Group on AqGR and Technologies and the COFI Sub-Committee on Aquaculture (both held in August 2019) and from the following additional regional workshops:

- Regional Workshop for Asia and the Pacific (8–12 June 2020 and 22 June 2020);

- Regional Workshop for Latin America and the Caribbean and for North America (21–24 September 2020 and 1 October 2020); and
- Regional Workshop for Europe and Central Asia (5–8 October 2020 and 15 October).

The outline of the GPA will be presented to the next sessions of COFI (1–5 February 2021), with the full draft presented to the Intergovernmental Technical Working Group on Aquatic Genetic Resources, the FAO Commission on Genetic Resources for Food and Agriculture and, lastly, to the next FAO Conference. The series of regional workshops on the information system and the GPA for AqGR, of which this workshop was part, represents a critical opportunity in the dialogue between FAO and its Members in order to continue raising awareness on national, regional and global needs for sustainable management of AqGR and to develop appropriate tools to support FAO Members in addressing those needs.



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An intensive tilapia farm in Kafue, Zambia, using integrated fish-livestock farming practices



# Regional Consultation on the Development of Guidelines for Sustainable Aquaculture



Regional Consultation on the Development of Guidelines for Sustainable Aquaculture (GSA) in Bamako, Mali

Recognizing the need for practical guidance for government authorities and policy-makers in their efforts to promote the implementation of the Code of Conduct for Responsible Fisheries, FAO, as requested by its Members, is developing the Guidelines for Sustainable Aquaculture (GSA – former acronym SAG). By this means, FAO will be engaging and enabling aquaculture to effectively

participate in the implementation of the 2030 Agenda for Sustainable Development. For more background information on GSA, please refer to the article in FAN 61.

Towards this goal, a Global Expert Consultation was held in June 2019, with outcomes presented to the Tenth Session of the Committee on Fisheries Sub-Committee on Aquaculture (SCA). SCA Members recommended FAO to convene regional consultations to further elaborate and develop the GSA. The first of these regional consultations was held for the Africa region in Bamako, Mali, on 29–30 November 2019. Supported by the Government of Mali, the FAO Regional Office for Africa and the Korea Maritime Institute of the Republic of Korea,

this first regional consultation was well attended, with participation from 22 government representatives, the Vice-Chair of the FAO Expert Consultation, the African Development Bank, the Economic and Monetary Community of Central Africa, and FAO staff members and consultants. This consultation aimed to:

1. present current policies and practices related to aquaculture in the African region;
2. review existing regional sustainable aquaculture guidance and assess gaps that GSA could address;
3. consult on the development process of GSA in the African region perspective; and
4. discuss potential regional case study concepts.



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During the two-day consultation, delegates developed a list of existing governance instruments in Africa that were considered useful for the global GSA development. In addition, they identified additional regional priority areas to be covered by the global GSA from the list of thematic modules developed in the 2019 expert consultation. Main strengths and challenges for aquaculture development in Africa were identified that can be used to further refine the list of thematic modules.

The identified priority areas include:

1. certification requirements/ guidelines for service providers (feed, seed, fish farms);
2. guidelines to manage aquaculture farms;
3. access to water and land;
4. carrying capacity in cage aquaculture and water usage, including conflict management;
5. best management practices along the aquaculture value chain;

6. genetic management of strains;
7. usage of supplements;
8. regulation on trade issues;
9. economic and environmental management; and
10. building resilience in aquaculture.

Overall, there was strong consensus among the delegates on the importance of aquaculture in their countries, as well as the need for governance structures to guide the development of the sector. Indeed, during a prioritization exercise, the topics “Governance and planning for aquaculture development” and “Sustainable aquaculture and Agenda 2030” were ranked among the highest priorities.

A list of ideas for relevant study concepts was developed, each concept linking to one or more priority thematic modules. These case studies will present lessons

learned, both positive and negative, and help stakeholders learn from the past as they determine the future direction of aquaculture development.

Overall, the regional consultation met its objectives of gathering guidance on the development of the GSA from the African regional perspective, while also identifying specific focus and thematic areas for the development of case studies. This regional context will help ensure relevance and ownership of the GSA for all key stakeholders. Future regional consultations are planned for Latin America, the Small Island Developing States, and Asia. Although the consultations have been affected by COVID-19, the work continues towards developing Guidelines for Sustainable Aquaculture and is on schedule for review by the next session of the SCA.



#### SEE ALSO

Report of the Regional Consultation on the Development of Guidelines for Sustainable Aquaculture (GSA): [www.fao.org/3/cb0280en/cb0280en.pdf](http://www.fao.org/3/cb0280en/cb0280en.pdf)  
FAO 2019. FAN 61 (April) Guidelines for Sustainable Aquaculture. [www.fao.org/3/ca8302en/CA8302EN.pdf](http://www.fao.org/3/ca8302en/CA8302EN.pdf)



Feeding fish in cage culture in Ghana

©FAO/IM. HALWART



# The International Year of Artisanal Fisheries and Aquaculture is Coming Up in 2022



INTERNATIONAL YEAR OF  
**ARTISANAL FISHERIES  
AND AQUACULTURE**  
2022



Fish farmers in Lira, Uganda, harvesting their pond

The United Nations General Assembly has declared 2022 the *International Year of Artisanal Fisheries and Aquaculture* (IYAFA 2022).<sup>1</sup> FAO is the lead agency for celebrating the Year in collaboration with other relevant organizations and bodies of the United Nations system. IYAFA 2022 is an important recognition of the millions of small-scale fishers, fish farmers and fish workers who provide healthy and nutritious food to billions of people globally and contribute towards the achievement of the Zero Hunger target (SDG 2).



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Plans have commenced for celebrating this Year with an IYAFA 2022 Secretariat set up in FAO, an International Steering Committee formed, a website established, and a visual identity agreed and launched.<sup>2</sup> The next key step is to ensure that the celebration of the Year enters into all national calendars and action plans across the globe to ensure that governments and relevant organizations alike start planning and getting creative on how to give small-scale fish producers the global recognition they deserve!

## WHY IYAFA 2022

The International Year of Artisanal Fisheries and Aquaculture (IYAFA 2022) will be a unique opportunity to:

*Focus world attention on the role of small-scale producers* – artisanal fishers, fish farmers and fish workers play a crucial role in food security and nutrition, and poverty eradication. Yet many of

these small-scale producers remain marginalized and face a myriad of challenges that hinder them from reaching their full potential. Celebrating the Year in 2022 follows a trend of highlighting that fisheries and aquaculture is about people as much as it is about fish. Its objective is to focus world attention on the role that small-scale fishers, fish farmers and fish workers play – thereby increasing global understanding and action to support them.

*Promote partnerships and dialogue* – IYAFA 2022 will provide a concrete opportunity to enhance dialogue between different actors, and not least to strengthen small-scale producers to partner with one another and make their voices heard so they can influence decisions and policies that shape their everyday lives and livelihoods. From local community level to international and global forums, the celebration of IYAFA 2022 sets out to ensure that small-scale fishers, fish farmers and fish workers are seen, heard, empowered and included in policies and programmes to ensure positive change on the ground.

*Support Agenda 2030 and the Decade of Family Farming* – As IYAFA 2022 falls within the UN Decade of Family Farming (UNFF 2019–2028), the two observances will complement one another and provide greater visibility to small-scale producers. Similarly, the Year will stimulate action to achieve the Sustainable Development Goals (SDGs) by 2030, in particular SDG 1 No poverty, SDG 2 Zero hunger, SDG 5 Gender equality,

1. For more information, see [www.undocs.org/A/RES/72/72](http://www.undocs.org/A/RES/72/72)

2. Available at [www.fao.org/artisanal-fisheries-aquaculture-2022/en](http://www.fao.org/artisanal-fisheries-aquaculture-2022/en)





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**Strengthening the adaptation capacity in the Chilean fisheries and aquaculture sector to climate change through small-scale mussel culture in Caleta El Manzano-Hualaihué, Chile**

SDG 14 Life below water – especially SDG 14.b. to “Provide access for small-scale artisanal fishers to marine resources and markets” – SDG 15 Life on land (where the people in fisheries and aquaculture live and work), and SDG 17 Partnerships for the goals.

### SETTING THE SCENE FOR IYafa 2020

AN INTERNATIONAL STEERING COMMITTEE ESTABLISHED  
To date, FAO has established an IYafa 2022 Secretariat and brought together an IYafa 2022 International Steering Committee. The steering committee consists of members from the seven FAO regions, as well as from non-state

actors in small-scale fisheries and aquaculture, and a representative from the International Fund for Agricultural Development (IFAD) and the United Nations Permanent Forum on Indigenous Issues, respectively. It will provide overall guidance and assistance to the preparations and implementation of the Year and facilitate mobilization of political and financial support. Such financial support will be channelled through a trust fund for IYafa 2022, currently under way.

**A VISUAL IDENTITY OF THE YEAR**  
The Year recently gained its visual identity – a “look and feel” that allows it to be distinguished from other global campaigns. The visual identity is composed of two parts: a pictogram and the text “International Year of Artisanal Fisheries and Aquaculture 2022”. The design aspires to show artisanal fisheries and aquaculture as a unity that continuously co-evolves, fulfilling economic, environmental, social and cultural functions of the two small-scale sectors. The pictogram is a symbolic portrait with no specific gender or ethnicity. Wavy lines depict the hair, a fish is also an eye, and the nose and mouth have a boat-like profile.

A comprehensive guide on how to use the visual identity to promote the IYafa 2022 is available online to all interested governments, public institutions, intergovernmental organizations, international and national non-governmental organizations (NGOs), and sector organizations, etc. Furthermore, the guide allows the possibility of downloading the visual identity in the six official



languages of the United Nations (Arabic, Chinese, English, French, Russian and Spanish).<sup>3</sup>

We encourage all partners to use the visual identity and to adapt it to other languages. FAO stands ready to support you in this. For source files or more information, please contact us at [IYafa@fao.org](mailto:IYafa@fao.org).

### CAMPAIGN MATERIAL COMING IN ALL FAO LANGUAGES

To make it easy for all partners to join the IYafa global campaign, FAO will be preparing the communication strategy for IYafa 2020, providing the campaign communication material in all the six official languages of the United Nations. This will include key messages, the visual identity, an IYafa 2022 brochure and website, a promotional video, social media cards, hashtags, videos and templates for making beautiful posters, banners and outdoor promotions and much more.

This will be shared through two guides: The “Get Started” guide, which will include the main material and ideas for the campaign as well as the timeline for producing different campaign material, and the comprehensive “Communication Toolkit”,



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**An aquaculture farmer feeding her fish in a floating cage**

3. <https://digital-assets.fao.org/home/action/browseItems?categoryId=135848&categoryTypeld=2>

**BY THE NUMBERS****SMALL-SCALE FISHERIES**

- In 2018, almost 40 million people directly engaged in capture fisheries worldwide (FAO, 2020a). An earlier study estimated 120 million if indirectly engaged people are also considered (World Bank, 2012).
- 90 percent of the total work force in developing countries are small-scale fishers and fish workers, and almost 50 percent are women (World Bank, 2012).

**AQUACULTURE**

- More than 20 million people directly engage in aquaculture worldwide in 2018 (FAO, 2020a). An earlier study estimated up to 57 million if indirectly engaged people are also considered (FAO 2016).
- Developing countries account for about 95 percent of world aquaculture production (FAO 2020b).

including all the campaign material and suggested activities. All the material will be made available online for download

on the dedicated website, which already has an information flyer<sup>4</sup> and the Visual Identity Guide. Stay tuned for more to come!

**SEE ALSO**

FAO. 2020a. *The State of World Fisheries and Aquaculture 2020. Sustainability in action*. Rome. [www.fao.org/3/ca9229en/CA9229EN.pdf](http://www.fao.org/3/ca9229en/CA9229EN.pdf)

FAO. 2020b. *Fishery and Aquaculture Statistics. Global aquaculture production 1950-2018 (FishstatJ)*. In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 2020. [www.fao.org/fishery/statistics/software/fishstatj/en](http://www.fao.org/fishery/statistics/software/fishstatj/en)

FAO 2016. *Aquaculture big numbers*. FAO Fisheries and Aquaculture Technical Paper No. 601. Rome. [www.fao.org/3/a-i6317e.pdf](http://www.fao.org/3/a-i6317e.pdf)

World Bank. 2012. *Hidden harvest: the global contribution of capture fisheries*. Washington, DC. <http://documents1.worldbank.org/curated/en/515701468152718292/pdf/664690esw0p1210120hiddenharvest0web.pdf>

**FOR MORE INFORMATION**

Website: [www.fao.org/artisanal-fisheries-aquaculture-2022](http://www.fao.org/artisanal-fisheries-aquaculture-2022)

E-mail: [iyafa@fao.org](mailto:iyafa@fao.org)

From now until the end of 2022, FAO will be liaising with policy-makers, development partners, other United Nations agencies, academia, NGOs, civil society organizations, the private sector, small-scale fisheries and aquaculture organizations, and the general public to raise awareness about the Year and encourage promotion and engagement ideas, activities and funding for IYafa 2022. You can help with reaching out – see the links and contact e-mail below.

**PREPARE TO TAKE PART IN THE CELEBRATIONS!**

IYafa 2022 will be an opportunity to showcase the potential of small-scale fisheries and aquaculture, and point to the benefits which can be gained from strengthening these small-scale sectors. To make the most of this opportunity, it is time to think creatively, join hands and start making plans now for how to make IYafa 2022 a memorable year. Let us give small-scale fishers, fish farmers and fish workers the attention they deserve!

4. See [www.fao.org/publications/card/en/c/CA6973EN](http://www.fao.org/publications/card/en/c/CA6973EN)



A fisherman casting a net from the banks of a rice field along the Tonle Sap, Cambodia



# AQUACULTURE UPDATES BY REGION

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## Enhancing Social Acceptability and Communication of Aquaculture: Key Drivers for the Development of the Sector

The FAO flagship publication *State of World Fisheries and Aquaculture 2020* shows that the contribution of world aquaculture to global fish production reached 46.0 percent in 2018, up from 25.7 percent in 2000 (FAO, 2020). While technical challenges continue to be a crucial factor to further aquaculture growth, two interlinked aspects play an increasing key role in sustainable aquaculture development: social



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Workshop on “The Importance of Social Acceptability for Mediterranean Aquaculture Development: Stocktaking and the Way Forward”, 29 August 2019 (Montpellier, France). The workshop was organized as a side event during the World Aquaculture Society’s AQUA 2018. Further to taking stock on current knowledge of social acceptability, the workshop presented and discussed the preliminary results of a study to assess critical factors, local drivers and peculiarities that influence social acceptability, particularly in the Mediterranean region

acceptability of aquaculture, and aquaculture-related communication and information targeted at consumers. These components can influence,

positively or negatively, the market demand for aquaculture products.

Communication and information on food products increase consumers’ knowledge and,





**Workshop on “Guidelines in Support of Social Acceptability of Sustainable Aquaculture Development”, 8–10 April 2019 (Monastir, Tunisia). The workshop, attended by participants from 22 countries from the Mediterranean and Black Sea region, helped identify, through a multistakeholder approach, the main requirements for the preparation of guidelines to improve social acceptability of aquaculture in the region**

subsequently, affect attitudes regarding food choices and dietary behaviour. Consumers, and other agents involved in the food system, demand facts regarding food quality, safety and sustainability to make informed decisions. In this regard, media (both traditional and social media), as the most common influential source of information in terms of food-related risks, plays a critical role in the dissemination of information about the food industry, whether positive or negative. Unfortunately, negative news has often produced a higher

impact on consumption than positive news.

In the same line, there is worldwide evidence that public perception of aquaculture, including social acceptability, is a key driver for aquaculture development, in turn affecting industry growth and its economic and social sustainability. Multiple factors influence perceptions of aquaculture,<sup>1</sup> including individual knowledge and experience, demographic characteristics, local and regional context, level of trust in industry and authorities, and perceived risks and benefits.

Furthermore, factors differ greatly between the regions and between developed and developing countries, especially where food security is not assured. There have been several social studies addressing the public acceptance or rejection of aquaculture, as a sector, and that of farmed aquatic products.

Social acceptability is an integral part of sustainability and refers to social licence and the degree to which aquaculture activities are accepted by the local community, various interest groups and the wider society.<sup>2</sup> Social acceptability is influenced by multiple and intertwined critical factors, and also includes aspects of governance. Often, the main arguments against aquaculture include real and perceived conflicts with coastal users, such as the tourism industry, negative impacts on local communities deriving from the competition for space, pressure on wild fishery stocks used to produce feed (pellets, formulated feed, trash fish), risk of transfer of diseases and parasites to wild fish populations, nutrient pollution, environmental contamination with chemical antibiotics, risks to native species from escapees, compromise of the aesthetic beauty of coastlines, perceptions of inferior nutritional value and quality of aquaculture products compared to wild fish, and risks to human health. More recently, there has been concern regarding animal welfare within fish farms. However, often no distinction is made among different aquaculture practices or their inherent sustainability. Therefore, these real and perceived risks can overlook positive externalities provided by

1. Bacher, K. 2015. Perceptions and misconceptions of aquaculture: a global overview. Globefish Research Programme. Vol. 120. Rome, FAO. 35 pp.  
2. Hishamunda, N., Ridler, N. & Martone, E. 2014. Policy and governance in aquaculture: lessons learned and way forward. FAO Fisheries and Aquaculture Technical Paper No. 577. Rome, FAO. 59 pp.

sustainable aquaculture, such as the contribution to livelihoods, provision of nutritious food, increased food security and maintenance of ecological services through low carbon footprint activities.

Enhancing social acceptability and improving public understanding of aquaculture in the Mediterranean region require going beyond mere factors of production and examining the wider role of the sector while improving communication to address social concerns.

Social acceptability of aquaculture products needs to be mainstreamed within aquaculture strategies and development plans. In this context and within the European Union-funded Horizon 2020 project entitled “Mediterranean Aquaculture Integrated Development (MedAID)”,<sup>3</sup> the General Fisheries Commission for the Mediterranean (GFCM) has prepared draft “Guidelines in support of social acceptability for sustainable aquaculture development”. These guidelines are the outcome of several activities with the involvement of regional aquaculture stakeholders within the Mediterranean region, and include two regional workshops, in August 2018 (Montpellier, France) and in April 2019 (Monastir, Tunisia), and a regional survey.

The overall objective of the guidelines is to provide countries with recommendations for better aquaculture governance and communication to improve social acceptability and foster sustainable aquaculture development in the Mediterranean and Black Sea



**MedAID workshop on “Role of mass media and aquaculture markets”, 24 May 2018 (Rome, Italy). The workshop gathered representatives of national governments, producer associations and specialized journalists of the three countries targeted in the fieldwork case studies (Greece, Italy and Spain)**

region. The guidelines rely on the principles of good governance, accountability, transparency, precautionary approach, stakeholders’ participation in decision-making and social responsibility. They address governance, environmental, economic and social and ethical aspects and, for each dimension, the guidelines recommend practical actions and identify the main categories of stakeholders that should be involved.

Cognizant of the risks associated with unilateral decision-making when allocating space, the GFCM acknowledged that the implementation of Allocated Zones for Aquaculture (AZAs) is a powerful instrument to frame aquaculture development in dedicated areas, building upon knowledge sharing, multistakeholder consensus and integrating environmental as well as social aspects. AZAs include specific measures aimed at reinforcing the image of aquaculture and enhancing social acceptability. In particular, the participatory approach

ensures the involvement of local communities in decision-making while improving transparency and enhancing communication.

In addition, FAO is producing a promotional leaflet addressing the public at large and consumers on the positive externalities of sustainable aquaculture and the benefits associated with aquaculture products. Several thematic factsheets are being produced touching key aspects, such as aquaculture in the Mediterranean, aquaculture and food security, social and economic benefits, Mediterranean cultural heritage, aquaculture interactions with the environment, preservation of biodiversity and restoration of fishery resources, aquaculture integration in the coastal zone, aquaculture as a driver for innovation, and technology. The leaflet is expected to be published by the end of 2020 and will contribute to improving the overall perception of aquaculture and aquaculture products by the general public.

3. MedAID (Mediterranean Aquaculture Integrated Development) is a four-year project funded by the European Union in the frame of Horizon 2020, grant agreement number 727315 ([www.medaaid-h2020.eu](http://www.medaaid-h2020.eu)).



## Key facts and FAO implications/actions in the subject

In recent years, FAO has been working on public perceptions and misconceptions of aquaculture to better comprehend the main concerns of the public and diverse stakeholder groups. Additionally, FAO will provide general recommendations for improving the social acceptability of aquaculture that have paved the way for future work aiming to improve the public's understanding and acceptance of the sector.

MedAID's work on consumer perception and image was included as information items during two FAO Sub-Committee sessions: (i) the Committee on Fisheries Sub-Committee on Aquaculture (August 2019), with the report listing overall project objectives of MedAID and specific activities pertaining to improving perceptions of aquaculture and aquaculture products; and (ii) the Committee on Fisheries Sub-Committee on Fish Trade (November 2019), which recognized the importance of communication in aquaculture, as well as fisheries, to address

consumer perceptions and misconceptions.

## Conclusions and/or recommendations

In addressing social acceptability of aquaculture, there is a need to change the perception of sustainable aquaculture underscoring what the sector offers in terms of ecosystem services, food security as well as the social and economic benefits it yields, especially to local communities beyond the production role.

The work undertaken for the development of the guidelines in support of social acceptability has highlighted the need for countries to include in their national strategies and plans for aquaculture specific components to improve social acceptability of aquaculture, including a communication plan targeting key stakeholders and addressing the public at large, particularly consumers, on the positive externalities of sustainable aquaculture and the benefits associated with aquaculture products.

During the Eleventh Session of the GFCM Scientific Advisory Committee on Aquaculture, held

in Malaga, Spain, from 10 to 12 September 2019, the draft guidelines in support of social acceptability for sustainable aquaculture development were presented to representatives of national administrators and observers from international institutions and non-governmental organizations, and the content was discussed. Recognizing that the guidelines represented valuable tools to address various technical aspects of aquaculture development and to prepare aquaculture strategies, the Committee agreed on the need to further work on them. During the Forty-third Session of the GFCM in Athens, Greece, in 2019, the Commission stressed the importance of social acceptability in the development of aquaculture in a sustainable manner and requested to finalize the guidelines during the intersession period.



## SEE ALSO

SOFIA 2020:  
[www.fao.org/fishery/sofia/en](http://www.fao.org/fishery/sofia/en)

FAO. 2018. *FAN Aquaculture Newsletter*. No. 59. Mass Media Communication and Its Impact on Market Behaviour in Mediterranean Aquaculture.



Kyrgyzstan's aquaculture sector has good potential in fish farming, especially in the production of common carp, grass carp, silver carp and rainbow trout



# Diversification of Productive Activities and Innovation: Keys to Reducing Vulnerability of Artisanal Fisheries to Climate Change in Chile

The artisanal fishing and aquaculture sector is among the most vulnerable to climate change. This, added to the overexploitation, illegal fishing and degradation of marine habitats, demands concrete and urgent measures where adaptation will be fundamental to their sustainability. Within this context, the project “Strengthening the Adaptive Capacity to Climate Change in the Fisheries and Aquaculture sector” was initiated, which is being executed by the Undersecretariat of Fisheries and Aquaculture and the Ministry of the Environment, and implemented by the Food and Agriculture Organization of the United Nations, funded by the Global Environment Facility. Its main objective is to reduce vulnerability and increase the adaptive capacity to climate change in Chile’s small-scale fisheries and aquaculture sector. It is being piloted from April 2017 to June 2021 in four coves: Riquelme (Tarapacá), Tongoy (Coquimbo), Coliumo (Biobío) and El Manzano-Hualaihué (Los Lagos).



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González-Gueicha family capturing mussel seeds

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The project is based on four components; each associated with different actions to achieve the expected results. This article showcases human interest stories that illustrate the contribution of the project to the communities and beneficiaries, particularly under Component 2, which focuses on improving the adaptive capacity of fishers and small-scale aquaculturists to climate change.

Erasmus González, a hake fisher, together with Maida Gueicha, his wife for more than 30 years, are natives of El Manzano Cove and have practiced, since their childhood, fishing and harvesting

as a form of subsistence. Today, together with their son Sergio are entering into new activities linked to the sea.

As a family, they actively participated in the initiative to improve the collection of mussel seeds, as an alternative to fishing and with an aim towards product diversification, and as a means to transition from fishing to aquaculture. In addition, they are developing a tourist enterprise that offers lodging and local gastronomy based on fresh fish and seafood, collected by themselves in the cove (Hospedaje Boris). In order to promote it, they

participated in project activities to strengthen tourism in the community, becoming members and guides of the Marine Tourist Route. Along the route, different attractions of the fisheries and aquaculture sector are highlighted through informative panels.

Eric Torres is a fisher from Coliumo. He and his family are dedicated to the harvest of sardines. Over the years, this activity has decreased dramatically: today there are about 60 effective fishing days per year, due to the shortage of fishery resources caused by overfishing and effects of environmental changes and climatic variability. This has forced Eric to diversify his productive activities, looking for new livelihood-generating alternatives.

Thus, he first began to produce artisanal beer, and today, thanks to the project, he is developing two complementary alternatives: special interest tourism and the development of added value for his fisheries products. He is currently President of the Sustainable Tourism Association of Coliumo Cove ([www.turismocoliumo.cl/](http://www.turismocoliumo.cl/)), formed by the community to strengthen sustainable tourism in its cove. In addition, thanks to the added value initiative, he is producing smoked products from Pacific pomfret and other species. This method of adding value to the products is also practiced by many other fishers from the cove who participated in the theoretical and practical workshop on this technique, given by the project.

María García is a young woman dedicated to the harvest of razor clams, and serves as the leader of the Cooperative of Razor Clams from Tongoy Cove. She has dedicated her life around the sea and this resource. Since she was a



Miriam García and other farmers working with Japanese oysters

child, she used to play “heel” (to walk in the sand with the heels of the feet) along the beach to locate razor clams. Little did she suspect that this activity would become her main economic income as an adult, and be used to raise her three daughters. Miriam has been a witness of the high variability of razor clam production, which appears and disappears over time due to its life-history dynamics. This is why the cooperative that she leads will alternately gather together and then disband, according to the presence of the resource. This leads to high economic instability for the more than 40 women dependent on this activity. In this

context, her participation in the experimental Japanese oyster culture promoted by the project has been an opportunity to improve their livelihoods through diversification.

Miriam participated in all of the practical and theoretical activities that were developed, becoming a true ambassador of the tools and practices proposed. Today she is an outstanding leader and faithful representative of the women of the Tongoy seaside community.

The project is unprecedented as the first with concrete interventions linked to climate change in fisheries and aquaculture. It has involved the



Caleta Coliumo fishers innovating with new techniques to add value to their products



development of demonstrative experiences for aquaculture, offering possibilities of productive diversification to small-scale fishers, allowing them to enter a new area, and providing a means of generating complementary income in a highly unstable scenario of fishery resources.

In the same line, the project has promoted the generation of products with added value, which will allow beneficiaries to earn greater income in comparison to the sale of fresh products.

This has been strengthened with proposals of business models, along with the delivery

of equipment (smokers, vacuum sealers), and complimented with technology transfer through theoretical and practical courses.

The innovation inherent within the project's approach and high relevance and alignment with national policies, plans and programmes, give the project a high potential of replicability and coherence in its implementation.

The response to climate change demands new ideas, capable of transforming it into opportunity. This project not only achieves this, but also opens a window to all of Chile's coasts by being highly replicable, thanks to its

affinity with ongoing plans and programmes.

The proposed productive diversification, including adaptation and community engagement, is key to addressing the vulnerability of the sector.

The initiative not only reinforces this aspect, but also proves to be a source of great wealth in terms of knowledge and participation, from all its actors. However, it also exposes challenges: including the need for greater flexibility in current regulations, so that public policies on fisheries and aquaculture can adapt to the new context.



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Bivalve farm in Caleta El Manzano-Hualaihué, Chile



# Climate Change Adaptation for Prawn Farming in Dominica

August 2020 marked a major milestone in prawn production in Dominica: the first batch of home-grown *Macrobrachium rosenbergii* (giant freshwater prawn) postlarvae was produced in a recently refurbished government hatchery, which had been devastated twice, first by Hurricane Erica in 2016 and then by Hurricane Maria in 2017. These extreme storms carried with them a terrible cost, claiming the lives of several thousand people across the Caribbean region and creating colossal economic damage, affecting every aspect of life in Dominica. The aquaculture sector was decimated, with destroyed ponds and ruined structures. As farmers began the long process of rebuilding, the need for high-quality seed became increasingly apparent. The Government of Dominica therefore made the rebuilding of the hatchery a priority for the sustainable development of aquaculture in the country.

The restoration of the government hatchery facility was made possible through the assistance of the FAO project called Climate Change Adaptation of the Eastern Caribbean Fisheries



Refurbished prawn hatchery at the Belfast Aquaculture Facility outside of Roseau, Dominica

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Sector (CC4FISH). The overall objective of CC4FISH is to increase resilience and reduce vulnerability of the fisheries and aquaculture sector in the Eastern Caribbean to climate change impacts. This is done through the introduction of adaptation measures in fisheries management and capacity building of fishers and aquaculturists. The CC4FISH project spans seven countries in the Eastern Caribbean – Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago – all of which depend on the fisheries sector for food security, livelihoods and household income. In the fisheries and aquaculture sector of these countries, the project has empowered various stakeholders with valuable material, and technical and financial resources to strengthen resilience and adaptability.

In Dominica, the CC4FISH project has resulted in the training of fishers in safety at

sea, distributing and training in the use of VHF radios, installing demonstration aquaponics units, and re-establishing the Belfast Aquaculture Facility, which for the first time in over five years is producing aquaculture seed. In restoring the hatchery, special consideration was given to climate change impacts, strengthening the structure's integrity and ability to withstand hurricane winds and floods, such as installing concrete walls around the structure and utilizing hurricane roof ties for the rafters. Through this restoration, the stagnant aquaculture sector in Dominica can be rekindled, thus enhancing the sector through increased local seafood production. This is why the distribution of the first batch of postlarvae by the Fisheries Division was such a major event, and the successful stocking into spring-fed, green-water ponds at several farms across the country marked a significant accomplishment.

Freshwater prawn farming in Dominica is typically carried



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**First batch of prawn postlarvae packaged for delivery from the Belfast Aquaculture Facility**

out in green-water earthen, or sometimes lined, ponds. The heavy clay soil in Dominica makes it possible to establish ponds in almost any location; however, when it proves challenging, some farmers have invested in plastic pond liners or cement in order to ensure water retention. The people of Dominica advertise their island as “home to three hundred sixty-five rivers – one for every day of the year”, underlining the multitude of natural springs and rivers, a treasured natural resource that supplies all existing prawn farms on the island. The majority of the island is hilly terrain, and so farmers have been able to modify mountain sides to build ponds on terraces. This serves the added benefit of ponds being located away from floodplains, which are vulnerable during storm events when floods occur, and eliminates the risk of saltwater intrusion in ponds.

Kurt Hilton, Fisheries Officer and CC4FISH Project National Focal Point, highlighted that this distribution of prawn postlarvae would be the first of many and would not have been possible without the funding and technical support for rehabilitation by FAO under the CC4FISH project.

He says, “These three farmers are now part of a milestone accomplishment and we are hoping to continue supplying postlarvae to interested farmers around the country.”

Freshwater prawns are an exotic, highly valuable commodity. The retail price for prawns in Dominica is USD 20/pound (USD 44/kg), meaning that prawn aquaculture can be a profitable venture for farmers. The prawns are sold primarily to the hospitality industry and secondarily at local fish stalls and supermarkets. In addition, an export market exists with the neighbouring French territories of Guadeloupe and Martinique. There are several single-pond farms scattered around the island, including the Kalinago Territory, home to the majority of the indigenous Kalinago population of Dominica. Notably, at least two of the farms under development are owned and operated by women farmers. At present, there is one operational commercial-sized farm in the north of the island, which was previously stocked with postlarvae imported from Saint Lucia. Upon receiving approximately 30 000 postlarvae, sufficient to stock two of his seven ponds, Marvin Daniel of the Northern Aquaculture Farm was elated, as now he can boast a 78 percent survival rate of his stock, as opposed to the high mortality rates experienced with the imported postlarvae. He says, “I’m excited and very pleased to see what is happening. I want to congratulate the Ministry of Agriculture and Fisheries who did an excellent job.” Additionally, the Fisheries Division is working on research and development on the culture of two local crayfish species (*M. carcinus* and *M. acanthurus*). Though these crayfish are very popular locally and regionally, in some places they have been subject to overfishing, so their substitution



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**Construction of new lined ponds in Saint John’s Parish, Dominica**

with aquaculture is an exciting new opportunity, with several farmers indicating interest in cultivating them.

This first batch of prawn postlarvae was only the beginning; production has already started for the second batch, and the process is expected to continue regularly. Although climate change presents significant challenges to the fisheries and aquaculture sector, this success story illustrates that coordinated efforts among government actors and farmers, with support from FAO and donors, can develop the sector in a sustainable and resilient way.



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**Juvenile prawn produced in Saint John’s Parish, Dominica**



# Supporting the National Mariculture Center of Bahrain

The Kingdom of Bahrain is an archipelago comprised of 40 islands. The contribution of agriculture and fisheries to the gross domestic product is low, and generally less than 0.6 percent. Its contribution to food security remains modest, about 2 percent. Nevertheless, the fishery sector holds a place of special importance to Bahraini people, and is valued for its culture and tradition in addition to its role in providing livelihoods throughout the industry.

The project “Supporting the sustainable development of the aquaculture sector in Bahrain”, officially launched on 28 May 2020, will contribute to developing the sector by supporting the National Mariculture Center’s (NMC) hatchery by focusing on developing a broodstock enhancement programme, on establishing a new hatchery and upgrade of existing facilities, on diversifying aquaculture products, and on delivering a targeted training and capacity-building programme.

Bahrain has strong potential for fish farming, considering the

advantages offered by the climate, location, coastal area and a strong internal market demand. Many types of aquaculture farming systems are feasible, and a wide range of aquatic species can be cultured. Bahrain, by virtue of its location, possesses rich finfish and shellfish resources; some of these have already been identified as potentially suitable for aquaculture development by the NMC within the Directorate of Fisheries, an affiliate of the Ministry of Municipalities Affairs and Urban Planning.

National fish production statistics indicate a significant deficit in fish supply as a result of strong local demand. This is due primarily to increased public awareness regarding the health benefits of fish consumption. Wild fishery resources in surrounding waters are unlikely to meet the steadily increasing demand for fresh and processed fish products. In the long term, investment in aquaculture will almost certainly contribute in partially satisfying such demand as well as contributing to the alleviation of national food security concerns.

The NMC has played a key role in both laying the foundations of the aquaculture sector and establishing a solid national cadre through its unique technical and scientific expertise in marine fish breeding. Indeed, the NMC successfully achieved the mass seed propagation of various



A monument in Manama that illustrates the importance of fish and fisheries for Bahrain

commercially important local species, which peaked in 2008 with the production of 5 million fingerlings. These include rabbitfish (*Siganus canaliculatus*), sobaity seabream (*Sparidentex hasta*), gilthead seabream (*Sparus aurata*), mangrove red snapper (*Lutjanus argentimaculatus*) and the orange-spotted grouper (*Epinephelus coioides*). The NMC has also become a regional hub of finfish seed supply for all Gulf Cooperation Council countries and other Regional Commission for Fisheries member countries.

Not only will the project contribute to the upgrading of some facilities, but it will also improve existing management and technical fish production protocols, critical in ensuring its continuing support to the aquaculture industry and guaranteeing that Bahrain maintains competitive advantage by producing high-quality and disease-free fingerlings of commercially important native species. Genetic improvement programmes and improved



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technological packages are expected to further assist private entrepreneurs in their commercial endeavors.

Overall, the Government of Bahrain intends to develop its aquaculture sector by building up its existing assets and making use of lessons learned from other countries and regions. In line with international codes and practices, this project will modernize the facilities and infrastructure of

the NMC, allowing it to pursue its leading role in the provision of aquaculture seed and local capacity development. A virtual project inception workshop was convened in May 2020, in the presence of Dr Nabeel Mohamed Abul-Fateh, Undersecretary of Agriculture and Marine Resources, Stefano Pettinato, United Nations Resident Coordinator a.i. and Dino Francescutti, Subregional Coordinator for the Gulf Cooperation Council

States and Yemen. It was well attended with representation from the government, research organizations and industry. Among the conclusions from this meeting were recommendations on how to restructure project activities in response to the impacts of COVID-19 while maintaining an overall objective of supporting the sustainable development of aquaculture in Bahrain.



The current facilities of the National Mariculture Center



Desert pond stocked with tilapia



# Recent Developments and Prospects for Recirculating Aquaculture Systems in the Kingdom of Saudi Arabia

In its "Vision 2030" strategy, the Kingdom of Saudi Arabia (KSA) identified its aquaculture sector as a key contributor to national food security. A "Healthy Food Strategy" was further launched in 2018 by the national Food and Drug Authority, acknowledging the health attributes of fresh seafood and marine products. This includes a commitment to double the per capita fish consumption from 9 kg in 2019 to 20 kg by 2030.

The National Fisheries Development Program of the Ministry of Environment, Water and Agriculture has set an ambitious seafood production target of 530 000 tonnes by 2030, representing a compound annual growth rate of 18 percent over the next 12 years starting from 2018. Aquaculture production is expected to account for most of this growth. Notably, the sector rose from 25 000 to 75 000 tonnes between



Saudi Arabia's first commercial grow-out RAS under construction on an irrigated farm located in a wadi near Riyadh. Background: two subunits each with a design annual capacity for 250 tonnes of tilapia. Foreground R-L: Mr Philippos Papageorgiou (National Fisheries Development Program), Dr Francis Murray (FAO Consultant) and prospective franchisees accompanied by RAS owner and entrepreneur Dr Saud Al-Otaibi

2015 and 2018. Supporting actions are being implemented through the flagship Sustainable Rural Agriculture Development Programme and through technical assistance provided by FAO.

Commercial application of recirculating aquaculture system (RAS) technologies for growing food fish to market size has had a chequered investment history. However, a recent global wave in start-ups has been stimulated by technical advances, shifting environmental attitudes and market fundamentals with greatest investment in upscaled salmon RAS (Murray, Bostock and Fletcher, 2014; Bostock *et al.*, 2018). Design capacities have increased from hundreds to thousands of tonnes per year, although few RAS have yet to exceed the 1 000 tonne output mark. Farmed seafood commodity floor prices are set by the higher volume marine cage and pond farming sectors. Thus,

to be commercially sustainable, grow-out RAS with their higher production costs must compete through a combination of scale economies, market co-location, reduced transport and import-tariff costs and premium pricing – exploiting RAS attributes of fresh year-round supply, safe, local provenance and sustainability to target value-added niche markets. Feed and energy cost and efficiencies are the major operational determinants of RAS profitability.

However, its relatively high production costs also make the RAS sector particularly vulnerable to price shocks. The COVID-19 outbreak has, so far, reduced farmgate spot prices for many imported farmed seafood commodities. In the longer term, price rises induced by supply chain disruption and post-pandemic prioritization of food security in national policy agendas could conceivably increase demand



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for RAS, particularly by high food importing countries where resource conditions preclude open pond and cage systems. Furthermore, precise environmental control, biosecurity and many sustainability attributes of RAS are enabling factors for certification under a range of voluntary accredited quality standards required to access an increasing number of value-added markets. In order to ensure high standards of production and promote the image of the local aquaculture industry and its products in the domestic market, the Ministry of Environment, Water and Agriculture has developed a national certification and labelling scheme under the acronym SAMAQ (Saudi Mark of Aquaculture Quality). SAMAQ is based on internationally acknowledged guidelines and responsible aquaculture practice requirements. The objective is that ultimately all KSA aquaculture products will be certified to support consumption of locally farmed produce.

Construction of the first grow-out RAS in KSA began earlier this year. Located 35 km south of Riyadh, the farm has a design annual output of 500 tonnes of Nile tilapia (*Oreochromis niloticus*). RAS advantages include shortened grow-out time and potential for off-season (winter) production, low local energy costs and high water productivity, and lower biosecurity risks. Challenges include the relatively low retail price of tilapia, currently 57 percent of that for Atlantic salmon. RAS products must also compete with local pond-farmed tilapia already sold fresh or live in Riyadh.

As with all RAS, success also depends on maximizing return to capital through efficient production scheduling based on sequential stocking and



**Recirculating Aquaculture System under construction with trickling-bio-filter foreground and four rows of circular rearing concrete tanks (9 to 15 m diameter and total production volume of 2 032 m<sup>3</sup>)**

harvesting. Although the design stocking density limit of 65 kg/m<sup>3</sup> for the KSA tilapia RAS is comparable to many salmon RAS, higher temperature and size specific growth-rates of tilapia relative to salmon facilitate accelerated production cycles. A design daily water replacement rate of 2 percent corresponds with a water productivity rate of just 57 litres/kg live weight. This extremely low consumption compares well with other livestock production systems heavily reliant on intensively irrigated fodder and grain crops cultivated in the country.

Labour accounts for a minor part of RAS total and operational costs, with day-to-day operation managed by just four full-time, but highly skilled, staff in this 500-tonne facility. Therefore, rather than supporting primary employment, RAS investments are more likely to contribute downstream labour opportunities in logistics, processing and value-added marketing.

The Norwegian company “Vikings Label”, a salmon import and distribution business, also plans to construct a 5 000-tonne (3.3 hectares, USD 80–90 million)

Atlantic salmon RAS in Jeddah. The RAS design and construction will be implemented by the Danish company Gråkjær and will include separate hatchery, first feeding, fry, pre-smolt, smolt, post-smolt and harvest-depuration units.

RAS operations in KSA certainly benefit from highly subsidized energy markets. The tariff for agricultural electricity in the KSA was only USD 0.026/kWh rising to USD 0.046–0.53/kWh in 2019. While the scale of these subsidies and their environmental impacts are the focus of policy debate, ongoing reforms may unlock the region's comparative advantage in renewable energy, particularly solar photovoltaic generation.

This leaves feed as, by far, the largest single RAS operational cost in KSA with the relative dependency on imports of finished diets versus raw materials (local or imported) for local formulation contingent on the scale of sectoral demand (Arasco KSA already manufactures quality tilapia feeds). Although only 5 percent of water used for agriculture in the KSA is directly for livestock, 31 percent of extracted groundwater is used to cultivate alfalfa and other fodder crops for the meat and



dairy sectors. Clearly, the amount and source water (and energy) embedded in the production of aquafeeds must be considered in any crop substitution calculus. Set against these challenges, the intrinsic capacity for precise environmental control in RAS offers potential to reduce feed conversion ratios to industry leading levels achieved by broiler producers.

These factors also point to strategic social-licence and marketing opportunities around the sustainability attributes of localized RAS. However, RAS remains a high-risk business; lessons must be learned from earlier start-ups and potential for catastrophic losses priced into profit and loss models. Despite their capital-intensive nature, RAS have a relatively low capital expenditure to operating cash ratio, a corollary of which is that turnkey RAS with proven performance provenance supplied

by a relatively small number of experienced providers globally are likely to be a more prudent long-term investment than a lower cost budget do-it-yourself approach.

High RAS operating costs compared to conventional systems (ponds and cages) require producers to place equal emphasis on (i) maximizing production efficiency; and (ii) securing premium price through niche market strategies exploiting RAS production and sustainability attributes.

RAS have high operating to capital expenditure ratios. Investors should carefully consider trade-offs between capital investment savings and feed, energy and labour efficiency. Reduced risk of catastrophic loss and marginal feed conversion ratio improvements achievable from proven and reproducible turnkey RAS designs can be the difference between profit and loss over a typical 10–15 year depreciation period.



## SEE ALSO

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# Supporting Sustainable and Innovative Aquaculture in the United Arab Emirates



Rabbitfish in a recirculating aquaculture system in the United Arab Emirates

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With an average consumption of 25.3 kg/capita per year, the population of the United Arab Emirates eats more seafood than the global average, but the imports largely outpace the national production from fisheries and aquaculture in the supply of the domestic market (82 percent versus 18 percent). In 2017, total aquaculture production in the United Arab Emirates was

3 255 tonnes of various finfish and crustacean species, with gilthead seabream the most produced species (1 810 tonnes). Although modest, this is a major increase over 2015, when the total production was less than 500 tonnes (FAO, 2020).

Achieving food security is indeed one of the current priorities of the Government of the United Arab Emirates, and the development of local production is a central objective. To maintain momentum with regard to aquaculture, the United Arab Emirates Food and Water Security Office has requested FAO to provide assistance in several areas identified to respond to the country's current aquaculture sector needs, which the article describes.

This achievement is essentially the result of strong political will that has included such actions as the renovation and upgrading of the Sheikh Khalifa hatchery in Umm Al Quwain to triple its production

capacity (from 10 million to 30 million fry/year) under a private company operation; the establishment of the Marine Innovation Park on the same site, which will serve as a research base on aquaculture but also as an enabler for the local community and as a tool for the raising social acceptability and image of aquaculture; the operation of five commercial farms, the largest one producing over 2 000 tonnes; a plan to build a feed factory; and the development of a Sustainable Aquaculture Policy for the country.

The United Arab Emirates now wishes to build on its successful achievements. Aquaculture is one of the sectors that the Government will support in the coming years through its National Food Security Strategy, including an initiative to launch a National Aquaculture Roadmap, to which the FAO Subregional Office for the Gulf Cooperation Council States and Yemen is contributing through the implementation of a project titled "Supporting



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sustainable and innovative aquaculture in the United Arab Emirates” with the Food and Water Security Office.

The project will contribute to the priorities established by the United Arab Emirates Government. The main outcome is to fill the gaps in the knowledge required for the launching of the National Aquaculture Roadmap in several critical areas identified by the Food and Water Security Office, namely, the species to be farmed, technologies to be used, markets to be supplied, biosecurity to be implemented, and data to be collected for assessing the progress and the impacts of the sector. It will also provide inputs on the following objectives:

1. implementation of a Progressive Management Pathway for Aquaculture Biosecurity by assessing the sector and developing guidelines at the farm level;
2. development of a database on seafood consumption;
3. identification of consumers’ and markets’ expectations with

regard to locally farmed fish species;

4. improvement of the profitability and competitiveness of the recirculated aquaculture systems (RAS) companies; and
5. determination of the potential of offshore aquaculture in selected marine areas identified in the Gulf.

The project was officially launched on 24 June 2020 through a virtual meeting, in the presence of Her Excellency Mariam Bint Mohammed Saeed Hareb Almheiri, United Arab Emirates Minister of State for Food Security, and Dino Francescutti, Subregional Coordinator for the Gulf Cooperation Council States and Yemen.

Attendance was very high, with over 110 participants from the private sector, government and

academia. Much information was exchanged with a fruitful debate. During the event, the Food and Water Security Office also launched the “United Arab Emirates Aquaculture Pulse 2020”, a document that describes the current state of the sector and the opportunities it presents for investors: current public and private farms, markets and species.

Once its objectives are achieved, the project will have created a strong baseline for the future development of aquaculture in the country. In the meantime, the country will be able to develop its National Aquaculture Roadmap by implementing an enabling environment for the private sector to safely and massively invest in the potential of aquaculture in the United Arab Emirates.



#### SEE ALSO

United Arab Emirates Food and Water Security: [www.foodsecurity.gov.ae](http://www.foodsecurity.gov.ae)

Food Research Platform: [www.foodsecurity.gov.ae/foodresearchplatform/en](http://www.foodsecurity.gov.ae/foodresearchplatform/en)



Cobia produced by the Aquaculture and Marine Studies Center at Abu Al Abyad island, Abu Dhabi, United Arab Emirates

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# Aquaculture Capacity Development in Morocco Through the Establishment of an Aquaculture Demonstration Center for the Training of Qualified Personnel

Despite the restrictive measures adopted by the Kingdom of Morocco as part of the fight against the spread of the COVID-19, the Moroccan Fisheries Department, the National Aquaculture Development Agency, the FAO Representation, and the Royal Norwegian and Netherlands Embassies, launched a marine aquaculture project on 30 April 2020 through a virtual kick-off meeting.

In a global context of declining fishery resources and growth of the world population, sustainable aquaculture is emerging as both a means of limiting overexploitation of fish stocks as well as a lever to enhance socio-economic development for several countries of North Africa. Such is the case in the Kingdom of Morocco, which is positioned as one of the leading fishery producers on the African continent. The country has shown a strong will for the development of fishery

and aquaculture sectors, reflected in the integration of national plans and the establishment of new dedicated institutions. In particular, the government created the National Agency for the Development of Aquaculture which laid the foundations of the aquaculture sector through the elaboration of development plans, the establishment of a legal framework as well as support mechanisms for potential aquaculture investors.

In order for the aquaculture sector to be able to reach its full potential, the availability of qualified human resources to ensure reliable production is considered a crucial issue. It is in this sense that this innovative project was developed, which is worth USD 2.5 million, and which should be completed in 2023. The aims of the project are to respond to a growing demand for technical assistance from Moroccan aquaculture operators and to develop a skilled aquaculture workforce.

Through a public-private partnership, this project will assist the government for the installation of a fish and shellfish demonstration / training center off Sidi Ifni, a town in the Guelmim-Oued Noun region located along the coastline of the Atlantic Ocean. This center will be used for practical training in marine aquaculture techniques and will be combined with

theoretical and practical training in the Maritime Professional Qualification Center of Sidi Ifni, which will be rehabilitated under the framework of this project. Specific aquaculture training programs and modules will be developed for this purpose. They will enable beneficiaries to acquire the necessary skills to manage fish and shellfish aquaculture from production to marketing.

Gaining of technical skills and knowledge in aquaculture for the benefit of the staff involved, promoters of local projects will contribute to the improvement of employability, including of women, youths and migrants. These key actors will be integrated into professional aquaculture training courses during and after the project. The project will take the necessary steps to integrate gender equitably throughout the whole project cycle. This will result in the involvement of existing organizations in the region such as farmer associations and cooperatives with particular focus on gender issues, as well as the identification of training staff and consideration of the specific needs of national stakeholders.

Financial support from Norway and the Netherlands will help develop Moroccan expertise in the field of marine aquaculture by bringing together different national and foreign actors. Therefore, the project plans to build a network made up



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Floating cages off the Moroccan coast

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of private actors with their international counterparts and to connect Moroccan and foreign training and research institutions. As a result, the recognized expertise of the different partners will help support the

development of the aquaculture sector and particularly, offshore aquaculture, as well as promote the employment and inclusion

of youth, thus contributing to the decreasing of migration from remote areas of the country.



#### SEE ALSO

[www.fao.org/maroc/actualites/detail-events/fr/c/1279168/](http://www.fao.org/maroc/actualites/detail-events/fr/c/1279168/)



Marine aquaculture includes species such as gilthead seabream (*Sparus aurata*)

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# Preliminary Analysis of the Impact of COVID-19 on the Fishery and Aquaculture Sectors in Tunisia

The COVID-19 crisis has caused many impacts, including social and economic ones, in the North African countries. The full extent of these consequences and their duration are still unknown, which exacerbates the problem. In particular, the Tunisian government is facing repercussions on poverty rates, unemployment rates and food security. The poverty rate for Tunisia was 15.2 percent in 2019. Due to the COVID-19 crisis, the unemployment rate significantly increased to reach 18 percent in the second quarter of 2020 (INS, 2020). Finally, the Gross Domestic Product for the first quarter of 2020 declined by 1.7 percent as compared to the same quarter of 2019, and by 2 percent as compared to the fourth quarter of 2019 (FAO, 2020). According to the International Labor Office (ILO), it seems inevitable that the decrease in employment and the constraints of the social distancing measures imposed on the workforce will cause a reduction in the number of agricultural workers (ILO, 2020). In addition, several other sectors



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Floating cages for gilthead seabream (*Sparus aurata*) aquaculture in Monastir bay, Tunisia

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are being affected with impacts cascading through the entire food chain, including the fishery and aquaculture sectors.

## Measures taken by the Tunisian government

During the crisis, measures taken to curb the spread of the virus required the implementation of various measures to restrict movement, including lockdown and travel restrictions. Bans on gatherings and interurban travel (i.e. travel between cities) have also been imposed to limit the risks of infection. Other gradual and temporary measures have also been applied, some of which had a noticeable impact on aquaculture. These include the establishment of a curfew, restrictions on trade and transport as well as the closing of borders. As for deep-sea fishing, the activity was suspended for two weeks before being re-authorized

by exceptional commissions requiring fishing vessels to implement enhanced health and safety measures on board.

## COVID-19 puts pressure on supply chains

Measures taken to prevent and limit the spread of the COVID-19 pandemic have affected the supply of inputs needed by fisheries and aquaculture. Most marine fish farming companies in Tunisia import all of their inputs (fingerlings, feed and equipment), which was disrupted following the closure of the borders. In particular, the main fry stocking campaign for 2020, which coincided with the period of the spread of the disease, was severely disrupted. Post-restriction effects are also starting to be felt, and could continue next year by affecting the farming cycle of aquaculture species. Finally, these measures have reduced Tunisian



aquaculturists' access to local and international markets.

### Production and marketing

The fishing and aquaculture industries have been affected by disrupted production and obstacles to marketing. Following the suspension of certain activities, the production volumes of fisheries and aquaculture declined. In Tunisia, fishery production reached 36 000 tonnes in May 2020, compared to 54 000 tonnes for the same period of 2019; a drop of 33 percent according to the Directorate General of Fisheries and Aquaculture (the May report of the Directorate General of Fisheries and Aquaculture). The reopening of fishing during the month of April, and the gradual resumption of activities, have improved the situation to some extent. The agriculture and fishing sector has managed to remain afloat in spite of the situation. With a 3.6 percent growth in

production during the second quarter of 2020, the trade balance in May 2020 showed a positive difference of 4 101 million Tunisian dinars compared to a positive difference of 7 120 million Tunisian dinars during the same period of the year 2019 (1 TND = 0.36 USD).

Respondents to a survey on the impact of COVID-19 launched by the FAO Sub-regional Office for North Africa estimated that the demand for fishery and aquaculture products has decreased by 60 percent. According to the preliminary results of the same survey, the causes of this decrease are likely multifactorial, but also illustrate the problem of consumers' access to fishery products for both monetary and physical reasons. For the aquaculture sector, the sales were also affected by the temporary closure of restaurants and hotels, which represent the bulk of the local market.

### Preliminary estimate of the economic impact

The crisis affected jobs and exports. Following the suspension of certain activities, certain fishing crews and workers of some aquaculture farms or processing factories suddenly found themselves unemployed.

Several methods of assessing the effects of COVID-19 have been considered to determine the impact of initiatives taken by the public and private sectors on human health and the economy. The Tunisian export of fishery products reached just under 28 000 tonnes for a total value of 557 million Tunisian dinars in 2019, or 11 percent of the country's food exports (National Agricultural Observatory, 2019). The exports from January to the end of May 2020 decreased by 4 275 tonnes (8 percent) or 48.8 million dinars (20.3 percent) compared to the same period in 2019. This decline was



People at work in floating cages for gilthead seabream (*Sparus aurata*) aquaculture in Monastir bay, Tunisia

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mainly due to the reduction in the quantities of exported fishery products, notably octopus (-41.3 percent by value) and cuttlefish (-61.8 percent by value). Aquaculture production, mainly sea bream, fell from 1 596 tonnes in May 2019 to 565 tonnes in May 2020, a decrease of 64.6 percent which resulted in economic losses estimated of around 3.5 million Tunisian dinars, according to the Directorate General of Fisheries and Aquaculture. This was mainly explained by the reduction of harvest operations due to the decrease in demand, which in turn is expected to lead to additional costs resulting from the extension of the breeding cycle to maintain the stock alive until breeding operations resume. In addition to these losses, there is a context of uncertainty in global markets for aquaculture exporting companies.

**In order to support the fishery and aquaculture sectors, ambitious new measures must be put in place to address the post-COVID-19 problems**

The high unemployment rate and the weakness of social protection systems have amplified the impact of COVID-19 on the socio-economic system in Tunisia. Following the slowdown in exports of fishery products to Europe, the Tunisian Union of Industry, Trade and Handicraft and the Tunisian Union of Agriculture and Fisheries asked the Tunisian government to setup a crisis unit in order to deal with these constraints. For its part, the FAO Subregional Office for North Africa launched a survey to assess the impact of COVID-19 on the fishing and aquaculture sectors, in order to propose appropriate measures. The results of the survey will be available by the end of this year. However, preliminary



Two fish farmers tend to their cages in Tunisia

results from interviews with national aquaculture stakeholders revealed the following suggestions:

- Compensation for additional costs borne by producers, as well as solutions for the storage of fishery and aquaculture products.
- Market-driven alternatives for processing fishery and aquaculture products.
- A more equitable distribution of financial resources and social protection assistance dedicated to the fishery and aquaculture sectors.
- Support the diversification of sales channels, such as fish markets, home delivery and online sales.
- Increase the investments in the aquaculture sector to promote the trade of processed and/or frozen products.
- Strengthen the social status of fishery and aquaculture workers to alleviate employment problems.
- Support trade and export during times of crisis, emphasizing the importance of fishery and aquaculture products for human health.
- Strengthen the cooperation in North-South and South-North fishery and aquaculture products trade.

**Recommendations following the preliminary analysis of the situation in Tunisia**



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## TRUEFISH: a true fish-farming story in the Lake Victoria Basin

The overall objective of the TRUEFISH project is to contribute to the development of competitive, gender equitable and sustainable commercial aquaculture in order to support economic development and sustainable management of natural resources in Lake Victoria basin. Lake Victoria has undergone many changes over the past decades and one of them is the depletion of fish stocks, which has affected the incomes of governments from royalties and influenced the fish availability to riparian communities. Strengthening aquaculture in general and floating-cage culture in particular could turn the tide. Further development of cage culture requires guidance from authorities for appropriate spatial distribution and aquatic animal health.

The project has a total budget of EUR 10.15 million for a period of five years. Interestingly, the project is subdivided into three components with three collaborative implementing institutions. The European Union signed a Financing Agreement with the East African Community; the Lake Victoria Fisheries Organization (LVFO) will represent the latter. The LVFO is the fruit of the FAO/Committee for Inland Fisheries and Aquaculture of Africa (CIFA) Sub-Committee for Lake Victoria, and since then FAO and LVFO have continued to collaborate in fisheries and aquaculture development and management. The LVFO will implement the first component and strengthen commercial networks for competitive aquaculture-related businesses. In the second component, FAO will concentrate on improving skills through vocational training centres in the three countries around the lake, fostering sustainability of monitoring and surveillance of aquatic animal health conditions, and instituting zoning, particularly for cage culture in Lake Victoria. The third component consists of improving the protection of biodiversity, and WorldFish will ensure its implementation.

The preparation of TRUEFISH started in late 2017, but since then it has experienced a number of hurdles. The European Union (EU) approved the Action Document in May 2018 after a stakeholders'



Cage fish farm in Uganda

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workshop endorsed the TRUEFISH proposal; subsequently, the EU signed the Financing Agreement in August 2019 and FAO followed suit in September 2019. The project will bring African, Chinese and European institutions on board to assist in the implementation of training programmes, the setting up of aquatic animal health laboratories and the establishment of spatial distribution infrastructure. LVFO and FAO intended to start the project in November 2019, but the recruitment of two international staff members took longer than expected. All stakeholders are hopeful that all impediments will soon be resolved so that LVFO, with EU funding and FAO technical assistance, can implement this important project for aquaculture businesses, youth employment, aquatic animal health, biodiversity and, of course, for food security and nutrition.

The results of TRUEFISH will be important for the development of guidelines and policies on other African Great Lakes and waterbodies where cage culture has been introduced. In particular, the zoning and carrying capacity experiences of the lakes will guide future interventions for sustainable aquaculture development and management.

The take-home message of this project is that the beneficiaries of the interventions should be involved in project preparation from the beginning. Furthermore, more flexibility should be incorporated in the agreements between the different parties.



Cage fish farm and floating guard platform, Jinja, Uganda

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# Creating Agribusiness Employment Opportunities for Youth Through Sustainable Aquaculture Systems and Cassava Value Chains in West Africa

The Africa Solidarity Trust Fund (ASTF) funded two aquaculture projects, one in East Africa and the other in West Africa. The western project comprised six countries – Burkina Faso, Côte d'Ivoire, Ghana, Guinea-Bissau, Nigeria and Senegal – and concentrated on developing aquaculture-related employment for youth as well as on cassava value chains.

Although processed cassava sometimes ends up in fish feeds, the purpose of the project was to select two different and independent value chains for the creation of jobs. The project's objective was decent job creation in rural areas of the beneficiary countries through the generation of small and medium enterprises and cooperatives for fish production, pond digging, cassava production and marketing. Where possible, FAO's Ecosystem Approach to Aquaculture was applied, which concentrated on socially acceptable, environmentally friendly and profitable outcomes. The project set an ambitious goal of creating employment opportunities for 300 youth, which it easily achieved, although the distribution of new jobs per country deviated from the original plan. In particular, the rate of generated employment in the cassava sector in Côte d'Ivoire was much higher than expected because of close collaboration with an experienced

non-governmental organization (NGO) in this domain – the Association for Development and Renaissance (ADR). The project supported more than 500 youths, who nowadays earn their living from cassava planting, processing and marketing. Interestingly, the implementation speed in the different countries varied considerably. At a certain point, one country had spent practically all the allocated funds before another country had hardly begun appointing the national project coordinator. This led to certain delays in implementing the entire programme, which was remedied by a project extension without budgetary implications.

In two of the six countries (Ghana and Nigeria), aquaculture was already well developed and there was access to fish feed and fish fingerlings. In the remaining project countries, people faced constraints in the supply of feed and fingerlings. Cassava production was practically non-existent in Guinea-Bissau, but well developed in Côte d'Ivoire, Ghana and Nigeria. Burkina Faso and Senegal preferred concentrating on aquaculture instead of cassava.

At the end of the project in September 2019, it became clear that it had positively contributed to a number of Sustainable Development Goals (SDGs), by reducing poverty and improving food security and nutrition through intensification of production and value chain development. There is no SDG that specifically addresses issues in inland fisheries and aquaculture, although SDG 14 *Life Under Water* does address issues in marine fisheries.



Members of the youth cooperative build a tilapia hatchery from locally available materials to increase control over tilapia seed supply

The selection of young beneficiaries appeared to yield several problems for the project managers, for instance, the expected level of education for each youth involved in the project. In the end, young academics in one country and uneducated youth in another country became the targets of project activities. The majority of them developed enthusiasm for the activities, although there were some who mistakenly believed that participation in the project would put them on the project payroll.

Young men at the border between Conakry, in Guinea, and Guinea-Bissau underwent training in building floating fish cages to be put into the river separating the two countries. An international consultant taught them how to stock the cages and feed the fish, especially how much to feed and the feeding frequency. When it was time to harvest the tilapia from the cages, the villagers jubilated, as they had not seen fresh fish for a long time. "Thank you, FAO, thank you" could be heard, particularly from the village elders.

The elders emphasized this unexpected outcome of the project because, aside from decent



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work and job opportunities for youths, many of those youths found reasons to stay in the village instead of migrating to the Mediterranean coast by crossing the Sahara Desert. This aspect was subsequently confirmed in other countries where youth became involved in aquaculture projects and decided to stay put. In Côte d'Ivoire, one young man had spent all his savings in an attempt to reach Europe. The funds he lost would have been sufficient to start a business, but he decided to try his luck. Six months later, he returned home without a penny in his pocket. By chance, he found access to the ASTF project and started again from scratch. He appeared to be a great ambassador for convincing project beneficiaries to stay home, learn skills and start a business.

With respect to the objective to contribute to the youth employment policy dialogue, six national consultants were recruited to describe the situations in their countries, which eventually led to two workshops, resulting in "A regional level strategy model for decent youth employment in aquaculture and related value chains". The project shared this strategy model with the Economic Community of West African States for further elaboration into a full-fledged youth employment policy for the entire West African region.

The project generated awareness, shared results and produced manuals in most of the six countries to show the advantages of including fish in the diet, fish and cassava marketing possibilities, the contribution to food security, and having a bank account.

In Nigeria, the results did not bear the expected fruits. Selected youth in peri-urban areas received one fish tank each to grow catfish. One tank, however, was not sufficient to make a living, and the plan had

to be changed. Learning from this experience, the approach was revised and tested in another FAO project, which through a tank-cluster and horticulture approach, took northeast Nigeria by surprise. The project aimed at internally displaced persons and host communities and resulted in an extraordinary increase in fish and crop production. This approach was then also applied in Ghana with similar results; thus, the ASTF project led to scaling up and replication.

The number of beneficiaries varied per country: Burkina Faso had 40+ sustainable jobs, Côte d'Ivoire 500+, Ghana 100+, Guinea-Bissau 50, with some insecure cases, Nigeria 150+, of which approximately 70 abandoned the project, and Senegal 50+. The project introduced social media to the beneficiaries for exchange of experiences, distribution of data, and showing of anomalies in fish and cassava nodules as well as for ordering fish feed and fingerlings.

The project contributed to the following: it formed youth fisheries cooperatives and fish production associations (with bylaws, statutes and bank accounts) as well as two WhatsApp groups. Additionally, through an NGO, it contracted cassava producer groups. Some of the effects were stabilization of youth groups (reduced migration), increased incomes of youth, fresh fish access, taking pride in real jobs, commercial hatcheries, fish feed plants, and a young women's group that formed a cassava marketing association.

The project also contributed to improved health by making fresh and safe fish available in rural communities as well as reducing poverty through income and employment. Fish production increased locally, as did integrated agricultural products since fish farmers started to grow crops next to fish farms, and cassava farmers



Blue liners make these locally produced painted wooden tanks waterproof and ready to receive fish

traded with merchants from neighbouring countries.

During implementation, the project procured fish farms – floating cages, ponds, circular tanks, raceways – fish hatcheries, fish feed manufacturing units and a fish processing building. A cassava processing centre and improved means of transport (tricycles) were also important outputs of the project. The project also established youth fisheries cooperatives and fish processing associations.

The project management unit is proud that additional external funding had been obtained in Nigeria through FAO and that several project proposals are in the pipeline in project countries and other countries. Thus, the project had a catalytic effect to generate youth employment while contributing to food security and nutrition.



Many hands make light work as members of the Debiso farming cooperative unload plastic fish tanks

# Strengthening Aquaculture Value Chains While Increasing Employment and Income-Generating Opportunities for Women and Youth in Côte d'Ivoire

A new project in the Montagnes District in western Côte d'Ivoire aims to improve the income of women and young people through the production, processing and marketing of agricultural products, including fish. Implemented by the national company of electricity CI-Energies and funded by the African Development Bank as part of a large electrification programme "Strengthening of Electricity Transmission and Distribution Networks", the project recognizes that sustainable development is multifaceted, and by supporting small business development at the same time as improving accessibility and reliability of electricity, the communities are empowered in more ways than one.

With an eye towards sustainability and long-term anchorage for projects, FAO Côte d'Ivoire often engages with national public and private sectors for funding, and this time was no different. In this case, the funding comes as part of a large national project to improve the coverage of available and good quality energy. In rural areas such as the Montagnes



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**Aquaculture training group**

District, electricity is a precious resource, and a weak financial situation exacerbates problems of access for many in the community. Therefore, by supporting small-business development and encouraging income-generating activities for women and youth, the agriculture development components of the project strengthen the electrification activities and vice versa. The improved livelihoods allow people to pay their electricity bills, thereby enhancing their overall well-being, and the electrification allows them to develop small processing and conservation units to increase the value of agriculture activities.

The gender component is led by FAO Côte d'Ivoire and consists of supervising and supporting groups or associations of women and young people in income-generating activities, including the processing and marketing of

agricultural products. Specifically, this project targets widening the employment and income creation for women and young people in aquaculture value chains through the processing, packaging and marketing of aquaculture products. Additionally, the project will support the rehabilitation of the Dompleu tilapia hatchery and aquaculture station. Access and availability of quality fish seed and fish feed is a significant blocking issue for aquaculture development, so by reinvigorating this station new fish farmer associations have greater access to these critical inputs.

The project has already been presented to relevant national authorities, beneficiaries and neighbouring local communities. During the launching ceremony of the project on 11 March 2020 in Man, Mr Samy Gaiji, representative of FAO Côte d'Ivoire, encouraged the



various stakeholders, especially the beneficiaries, to take ownership of the project to ensure the sustainability of the actions that will be carried out. The first training workshop has already been held with 31 beneficiaries (comprising 10 women) to increase their knowledge on the different fish farming practices, including seed production and good business management and financial skills. Also, value chain strengthening through post-harvest processing and better awareness of marketing opportunities further increase the value for the farmers. Though the project is just getting started, rehabilitation works of the Dompleu nursery station and some existing fish farms are ongoing, consisting principally on setting up ponds, cleaning pipes and renovating the storage areas of the station.

According to the National Institute of Statistics, the Ivorian economy is heavily based on agriculture. Within the sector, 67 percent of the workforce is women, particularly in small-scale

farming. Indeed, estimates show that 60 to 80 percent of food production is carried out by women, who are involved in activities such as fish farming and raising livestock such as cattle, sheep, poultry and pigs. Lamentably, there are significant disparities between men and women; in many cases, women benefit neither from the fruits of their labour (production, transport, distribution) nor from the control and management of their resources. In fact, the average income of women in Côte d'Ivoire is 59 percent lower than that of men.

Overall, this innovative and cross-cutting project, connecting aquaculture and electrification, takes

a holistic view to sustainable development while working to ensure that the progress of the community is fair and equitable across the genders.



Distribution of aquaculture kits in Kiloué

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Dompleu hatchery station

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Aquaculture farm of the Kwalou Association (80% female members) in Danané, Côte d'Ivoire

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# THEMATIC ARTICLES



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## Where and How Does the Fisheries and Aquaculture Sector Fit in the Policy Development Agenda? The African Perspective

### Introduction

Fish, fish products and aquatic plants play an important role in the contribution of food security and nutrition, poverty eradication and economic development. However, limited attention has been given so far to fisheries and aquaculture, particularly the latter, as key sectors in African policies. In this context, the Fisheries and Aquaculture Department realized the need to conduct practical hands-on policy-oriented research to derive recommendations for the mainstreaming of sustainable aquaculture development within wider policy frameworks. With the collaboration of the FAO

Regional Office for Africa and the Regional Economic Communities in Africa (RECs), FAO called upon stakeholders from all sub-Saharan African countries, who gathered in different consultative meetings (Addis Ababa, Kigali and Windhoek), to analyse de facto integration of aquaculture into development policy.

These meetings not only served as a wake-up call for the importance of mainstreaming sustainable aquaculture development within wider policy frameworks, but also raised awareness for the level of engagement of aquaculture government officials on the formulation of such broader policy. Their engagement or dismissal are determining factors for the formulation and implementation of aquaculture programmes at the country and regional levels and may or may not result in public budget allocations and development agendas in Africa. More than 60 stakeholders from across sub-Saharan Africa participated, including directors



of fisheries and aquaculture departments and national policy officers from Burkina Faso, Burundi, Cameroon, Côte d'Ivoire, the Democratic Republic of the Congo, Ghana, Kenya, Madagascar, Mali, Namibia, the Niger, Nigeria, Rwanda, Senegal, South Africa, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe; regional policy officers from the RECs, such as the Southern African Development Community (SADC), the Common Market for Eastern



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and Southern Africa (COMESA), the East African Community (EAC), and the Economic Community of West African States (ECOWAS); the African Union Inter-African Bureau for Animal Resources; FAO regional officers; and fish farmers and traders, among others.

Existing policy documents from 54 African countries and 8 RECs dealing with poverty alleviation, foreign currency generation, food security and nutrition, ecosystem approach to fisheries and aquaculture, and gender mainstreaming were reviewed by all participants. Stakeholders assisted the FAO researchers in analysing and determining the adequacy or fragility of the integration and relevance of the fisheries and aquaculture sector into such policy documents at the country and regional levels. The researchers used a Multi-Criteria Analysis as a policy analysis tool to compare two options: "relevance" and "inclusion" across several performance dimensions, and to the determination of the "integration" and "discrepancy" variables used as new ground for policy research.

### Analysis<sup>1</sup>

All performance indicators for relevance, inclusion and integration of fisheries and aquaculture into development policy were analysed at both the country and REC level. The following results are highlighted.

For the analysis on relevance, an indicator of relevance of fisheries and aquaculture (IRFA) was built to assist the quantification of the sector's importance on food security and economic growth: per capita consumption of fish and fishery products, fish share in animal protein, and agriculture, forestry and value added.

TABLE 1

Scoring methodology to assess the relevance of fisheries and aquaculture by indicator

Score	Symbol	Level	Criteria	
0		Na	Country level (CL) indicator not available	
1		Low	CL indicator below half of African average level (AAL):	CL < 0.5 AAL
2		Medium	CL indicator between half of AAL and AAL:	0.5 AAL ≤ CL < AAL
3		High	CL indicator between AAL and 1.5 times AAL:	AAL ≤ CL < 1.5 AAL
4		Very high	CL indicator above 1.5 times AAL:	CL ≥ 1.5 AAL

Notes: AAL = African average level; CL = country level; Na = not available.

TABLE 2

Scoring methodology to assess the inclusion of fisheries and aquaculture in the policy documents by theme

Score	Symbol	Level	Criteria
0		Negligible	No importance or mention of the fisheries and aquaculture sector in policy documents in promoting the theme.
1		Low	Policy documents mention the contribution of the fisheries and aquaculture sector to the theme but no further analysis is provided.
2		Medium	Policy documents mention the contribution of the fisheries and aquaculture sector to the theme and analyse the likely impacts.
3		High	Policy documents attempt to quantify the contribution of the fisheries and aquaculture sector to the theme and compare it to other sectors.
4		Very high	The policy documents quantify the contribution of the fisheries and aquaculture sector to the theme, compare it to other sectors and take into consideration the fishery and aquaculture sector with clear proposals, e.g. goals, priorities and outcomes.

For the analysis on inclusion, an indicator of inclusion of fisheries and aquaculture in the policy documents (IIFA) was constructed and a total of 224 policy documents were reviewed for all African countries and 12 for the RECs. The policy documents were used to assess to what extent the policy-makers had valued the fisheries and aquaculture sector in promoting five themes: poverty eradication (POV), foreign exchange generation (FEG), food security (FOOD), sustainable ecosystem (SUST) and gender mainstreaming (GEN).

For each country, the IIFA in the policy documents was calculated by adding the scores assigned to each theme, as shown in the following equation: poverty eradication (POVSCORE), foreign

exchange generation (FEGSCORE), food security (FOODSCORE), sustainable ecosystem (SUSTSCORE) and gender mainstreaming (GENSCORE). Identical numerical weights have been assigned to all themes.

$$\text{IIFA} = \text{POVSCORE} + \text{FEGSCORE} + \text{FOODSCORE} + \text{SUSTSCORE} + \text{GENSCORE}$$

In terms of inclusion of fisheries and aquaculture in the policy documents, the countries and RECs were then ranked into five categories. If no scores were assigned to all the themes (i.e. POV, FEG, FOOD, SUST and GEN), the inclusion results reported as negligible. The ranking levels were assigned to the upper end of the IIFA interval as follows: If the scores of POV, FEG, FOOD, SUST and GEN are all negligible, then IIFA is negligible; if the scores of POV, FEG, FOOD, SUST and GEN are all low (i.e. each indicator score equal to 1), then IIFA is low

1. The details of the approach can be found in the FAO publication: FAO. 2020. Murekezi, P., Martone, E. & Menezes, A. *Assessment of the integration of fisheries and aquaculture in policy development: Framework and application in Africa*. FAO Fisheries and Aquaculture Technical Paper No. 663. Rome, FAO. Available at [www.fao.org/documents/card/en/c/ca9322en/](http://www.fao.org/documents/card/en/c/ca9322en/)

(i.e. upper end of the IIFA interval less than or equal to 5) and so forth, for a maximum rank of 20. A high rank indicates that at least one document of the country or REC fully acknowledged that the fisheries and aquaculture sector contributed to the themes and had robust policy proposals.

For the analysis on integration, the meetings compared the relevance (IRFA) and inclusion (IIFA) to indicate the relationship between the relevance of the fisheries and aquaculture sector at the country and regional level and the inclusion of the sector in the policy documents into each of the analysed themes (IINFA). The IINFA was calculated by adding the scores for IRFA and IIFA.

### Results and the way forward

In general, for most of the 54 African countries assessed, there was a low connection between the relevance and the inclusion of the fisheries and aquaculture sector within national policies across the themes surveyed. Countries with higher relevance presented also a high level of inclusion into policy documents, and fisheries and/or aquaculture is considered as a “consolidated” sector. This is the case of Morocco, Uganda, Senegal and South Africa, which reported high values of integration (IINFA between 20 and 23), while countries such as Botswana, Guinea-Bissau, Lesotho, the Niger and Zimbabwe had low values of integration, i.e. an IINFA between 3 and 5. There were some exceptions, e.g. Cameroon and Sao Tome and Principe, where although the relevance of fisheries and/or aquaculture ranked “high”, the inclusion into policy documents resulted “low”.

The Democratic Republic of the Congo ranked “high” in terms of relevance, while none of the documents afforded the necessary incidental inclusion or even considered/mentioned the fisheries

and aquaculture sector; two policy documents were found to be available in relation to the themes surveyed, and none of them made any reference to the fisheries and aquaculture sector, either in form or substance. The same finding applies to Egypt, where the relevance indicator ranked “high”, but had a surprisingly “negligible” inclusion across all the thematic areas in national policies. In some countries, fisheries and aquaculture are not particularly important in terms of IRFA, but their national policies greatly included the studied themes, e.g. Djibouti ranked a “low” relevance but “medium” inclusion.

Even if there is a general connection between high levels of relevance of the fisheries and aquaculture sector and its inclusion into national policy documents, and particularly, policies that adequately treat the thematic areas of this analysis, two exceptions to this trend are evident. First, there are instances of high relevance of fisheries and aquaculture, yet low or no specific inclusion of fisheries and aquaculture into policy documents. Conversely, while some countries reflect low relevance of fisheries and aquaculture, they yield high degrees of incorporation into policy documents.

Despite reporting high values of integration of fisheries and aquaculture in national policy documents, countries could still improve their policies regarding food security, poverty eradication, gender mainstreaming, generation of foreign exchange and the ecosystem approach. Perhaps one area of improvement is capacity building through a public education campaign to raise awareness on the importance and potential of fisheries and aquaculture to contribute to social and economic development across the main thematic areas. In this scenario, priority could be given, for

example, to the 42 countries that have reported values less than half of the highest possible IINFA. In particular, the highest priority could be given to the 12 countries with total integration of the fisheries and aquaculture sector scoring lower than 25 percent of the highest possible IINFA, namely, Algeria, Botswana, Ethiopia, Guinea-Bissau, Lesotho, Mali, the Niger, Somalia, South Sudan, the Sudan, Tunisia and Zimbabwe. In these countries, advocacy efforts should be geared towards the development of fisheries and aquaculture in order to contribute to each of the five thematic areas.

In relation to the integration of fisheries and aquaculture with the REC policy documents, the analysis for each theme shows that few RECs have included fisheries and/or aquaculture in policies addressing food security, poverty eradication, gender mainstreaming, generation of foreign exchange and the ecosystem approach. In instances, where the policy documents included these themes, they obtained, at best, a low score. It is therefore safe to conclude that the inclusion of fisheries and aquaculture into policy documents shows a very low connection with the relevance of the sector. However, the assessment showed that, despite RECs having generally “low” inclusion levels, the SADC, EAC and the Economic Community of Central African States have several of the thematic areas included in their policies. The SADC recorded the highest level of integration.

The ECOWAS, COMESA, the Community of Sahel-Saharan States, the Intergovernmental Authority on Development and the Arab Maghreb Union are the RECs that could require the greatest efforts to improve or to implement policies treating with and supportive of the themes.



## Seaweed Beyond Farming - Development Opportunities Offered by Nature

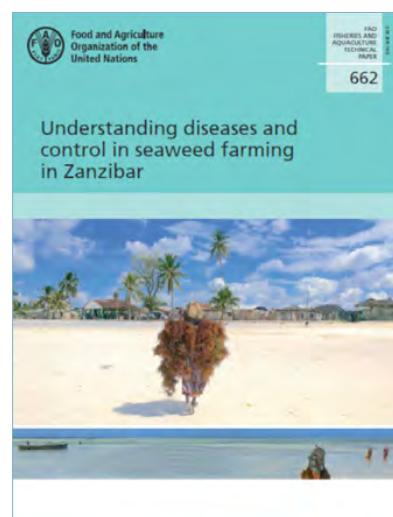
After the Philippines and Indonesia, Zanzibar is the third largest seaweed exporter in the world. Exports for spinosum (*Eucheuma denticulatum*) reached 15 000 tonnes in 2012. However, starting in mid-2011, seaweed farmers and traders in the Zanzibar archipelago (Unguja and Pemba) began to experience a serious decline in production and income. Between 2013 and 2016, production of spinosum dropped from 15 000 tonnes to a low of 11 000 tonnes, and production of cottonii (common name for *E. cottonii*, *Kappaphycus striatum* and *K. alvarezii*) dropped from around 500 tonnes to below 100 tonnes. The price per kilogram of dried seaweed also saw a significant drop. In 2014, the price of dry seaweed was USD 300/tonne, and had dropped to USD 190/tonne by 2016 (Department of Fisheries and Marine Resources, Zanzibar, 2016).

FAO undertook field research (Largo, Msuya and Menezes, 2020) in affected villages and farms to

understand the causes of the decline, including the underlying cause of the seaweed diseases and seaweed die-off in Zanzibar. Assessments at the farm level identified some causes of the seaweed die-off of both spinosum and cottonii, which was mainly caused by severe epiphyte infestation coupled with a high incidence of *ice-ice* disease, which has been observed by farmers to intensify during the hot-dry season and diminish during the wet season. High temperature in the farming sites (from 29.5 to 35.5 °C) has been determined as one of the main triggers of the *ice-ice* occurrence as well as the bloom of epiphyte infestation. Another factor is high light intensity/irradiance. In Zanzibar, the seaweed is mainly grown in shallow intertidal lagoons, with seaweeds almost in direct contact with the bottom substrate during low tides and therefore exposed to higher levels of temperature and light intensity. This combination predisposes seaweed to opportunistic pathogens, manifesting as whitening of the thalli, eventually becoming nearly transparent like ice and giving rise to the common name *ice-ice*. Secondary bacterial infection leads to softening of the thalli and to their eventual fragmentation.

These changes force what used to be an annual seaweed farming system with harvest cycles of 30–45 days to turn into a highly seasonal production system, creating disruptions on what used to be steady income for seaweed farmers (of whom 90 percent are women) to unpredictable and irregular income throughout the year.

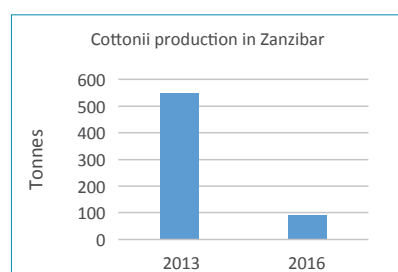
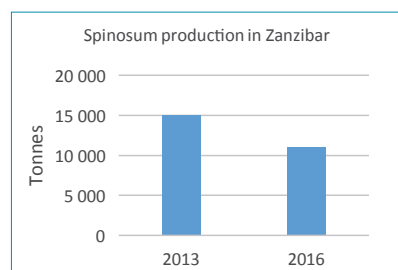
In view of the situation – and especially because these infestations and diseases are continuing to threaten commercially farmed seaweed and has heavily impacted the farmers and local traders income generation, employment and well-being – some recommendations are worth looking at by the farmers, local and national governments, as



well as researchers and development agencies.

Short- and long-term remedy and adaption strategies include: i) implementation of strict quarantine procedures; ii) transfer the farming of *E. denticulatum* and *K. striatum* to deeper waters (2–5 m) using longlines or raft method, where practical; iii) use of a “freshwater shock” or of a commercially available anti-fouling agent to eliminate epiphytes if lagoon farming is continued during the hot-dry season; iv) promote the farming of a variety of *E. denticulatum*, called “million-million”, which is resistant to the disease; v) improve the genetic stock with alternative local farmed types; vi) promote income-generating activities for farmers, such as value addition using harvested seaweed; vii) develop multitrophic sustainable aquaculture by integrating seaweed aquaculture with other high-value species; and (viii) create livelihood opportunities other than farming by exploring the potential of harvesting/farming other seaweeds with other uses that are abundant in Zanzibar.

To tackle the climate variability impact on seaweed production and productivity during the year, and the need to specially adapt the surface lagoon type of cultivation to a new seasonal mode of production from one with an annual base with harvest cycle periods each 30–45 days to a more seasonal base (from March to October), there is a need to invest in different income-generating activities within and outside farming.



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One of the strategies is the promotion of integrated multitrophic aquaculture (IMTA) – an ecosystem-based concept – in Zanzibar and other coastal countries as an environmentally responsible and sustainable form of aquaculture. IMTA is done by integrating fed species (e.g. milkfish, pompano) with an extractive species, such as seaweed chosen for their bioremediation efficiency for absorbing inorganic wastes (e.g. *Gracilaria*, *Eucheuma/Kappaphycus*, *Ulva*, *Sargassum*), and bottom and filter-feeding invertebrates, such as sea cucumbers (e.g. *Holothuria scabra*), sea urchins (e.g. *Tripneustes gratilla*), mussels (e.g. *Mytilus mytilus*) and various oysters (*Pinctada*), that remove suspended organic wastes.

Ideally, IMTA should integrate high-value species, such as the ones mentioned, to recover the cost of investments and to earn more income for farmers. Sea cucumbers (*H. scabra*), for instance, can be introduced in existing shallow lagoon seaweed farms, as has been done experimentally in Unguja by Beltran-Gutierrez *et al.* (2014) with *K. striatum* and Namukose *et al.* (2016) with *E. denticulatum*. Both found better growth performance in seaweeds grown over sea cucumbers at low density. In deeper waters, fed species (e.g. milkfish) can be farmed in floating cages, together with seaweeds and sea cucumber or other bottom feeders. This concept addresses not only the problem of pollution associated with fed aquaculture, but also creates opportunities for farmers since the species involved must be high-value crops that can be harvested for additional income. Synergies using the hatchery project in Zanzibar

dedicated to the production of sea cucumber and milkfish could be beneficial to all farmers and the island at large. IMTA also comes with its own set of challenges, including competition between the species, balancing of feed and oxygen requirements, complex construction and installation of structures, and more complex biosecurity issues. Moreover, there is no specific guiding framework for IMTA systems, so IMTA interventions and investments should be carefully considered.

Beyond farming, seaweed offers many other types of opportunities for livelihoods. As in Zanzibar, many coastal countries enjoy a rich diversity of naturally occurring seaweeds that can be sustainably harvested from nature and used either for direct human consumption (fresh, dried, powdered and used as condiment), or as sources of important chemical extracts that have many domestic and industrial applications. Some red seaweeds have a special use because they contain unique biochemicals, either carrageenan or agar, which can be extracted and used for thickening (gelling) of beverages, desserts and personal care products, such as lotions, shampoos and toothpaste. These are also used on a large-scale in the food and beverage industry as an emulsifying and thickening agent in food, pharmaceutical, and industrial products. On the other hand, certain brown seaweed (e.g. *Sargassum* spp.) are abundant in rocky shallow water areas and serve as a habitat for fish and invertebrates, and can be transformed into fertilizer, animal feed supplement and insect repellent. Likewise, certain green seaweeds that occur seasonally and abundantly in polluted waters (called

“green tides”) can be used as soil conditioner and fertilizer.

If it is true that in some coastal areas the abundance of the brown seaweed (*Sargassum*), which in tropical regions is the equivalent of the cold-water kelp, can become an annoyance to the tourist industry and the day-to-day life of the local citizens, these impacts can be significant. At the same time, it is possible to turn this challenge into opportunity if investments are made to collect the seaweed and transform it into fertilizer, animal feed supplements or for industrial (bioplastic) applications. If such public and private investments were realized, they could compensate for the lack of income, trade and employment during the non-farming period.

A simple summary of this field research is that the impact of global warming to cultivated seaweeds, particularly *Eucheuma* and *Kappaphycus*, have been reported in many places including Zanzibar. The rise in water temperatures could have further harmful effects on the farmed seaweeds, including the increasing occurrence of diseases and epiphyte infestations. That calls for adaption and innovative strategies through private and public investment, which also means considering activities beyond simple monoculture of seaweed. Let those coastal areas be the place where harvesting and farming the sea are in harmony with nature, and we can realize the existing potential by diversifying the traditional farming and ingrained types of income-generating activities. Nature is full of options for all of us who want to think outside the box.



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# The Role of Aquaculture in Home-Grown School Feeding Programmes

Health and nutrition have a direct impact on education: children who are well nourished have a higher chance to excel academically and are more productive as adults. School feeding programmes consider this intimate relationship between nutrition, healthy diet and education; and, in addition to providing a healthy meal, school feeding programmes can increase school attendance and encourage healthy eating habits. Recognizing the positive impacts of school feeding programmes, some governments have taken further actions to launch intersectoral policies and legal frameworks for the inclusion of food purchased locally from smallholder producers into their school feeding programmes. This kind of programme is called home-grown school feeding (HGSF). HGSF constitutes a school feeding model that is designed to



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provide children in schools with safe, diverse and nutritious food, sourced locally from smallholders, while also boosting local food production and strengthening local food systems and the economy.

A diversified diet is recommended for home-grown school feeding programmes, and fish is a great addition as it has a rich supply of nutrients required by growing children. Therefore, an uninterrupted supply and access to fish that meets quality standards and consumer acceptance is key to ensuring that fish can be included in the feeding programme that fish be included in the HGSF programmes.

There are examples of aquaculture supplying fish within the school feeding network, but uncertainty remains as to whether aquaculture can be redirected to meet the needs of home-grown school feeding programmes in terms of both quantity and

quality, while also being profitable for producers and affordable for public procurement. While aquaculture could contribute to HGSF programmes by providing nutritious fish products that have potential to support the local economy, it is worthwhile to examine the current trend and future prospect in positioning aquaculture to meet the demand for fish in HGSF programmes.

Fish for HGSF programmes can be locally sourced from fisheries and/or aquaculture sources; however, these programmes require a steady and stable supply of fish. Inconsistencies in supply, from either source, could be caused by seasonality, supply chain inadequacies leading to food loss and food safety issues as a result of improper handling, processing, preservation and storage procedures, which can discourage the inclusion of fish in HGSF programmes. Other issues include cash-flow challenges/budget gaps and cultural/consumer preference



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for a particular type of fish, among others. HGSF creates a stable demand, but local farmers need to adapt their production to supply food according to the school schedule. Considering the current trend in global fisheries production, which has plateaued in recent years, aquaculture is well positioned to directly address the supply-demand gap. This is especially relevant for HGSF programmes, where, by learning from the experiences drawn from successful programmes, aquaculture can enhance the consistent supply of fish.

Recently, FAO and the Government of Honduras implemented a project aimed at developing a strategy for the inclusion of fish in the existing school feeding programme in order to support government initiatives to improve the diets of schoolchildren. Honduras is one of the main producers and exporters of farmed tilapia in Central America, which implies a local availability of fish. As part of the project, a pilot study on developing and testing fish products, including tilapia, as part of school meals was carried out. When asked if they liked the meals, most children responded positively, with one child disappointed because the portion was too small and wanted more, while another child did not eat the meal because he wanted to bring it home to share it with his family. All participating schools reflected this high level of appreciation and acceptance of fish.

Overall, the fish was well accepted by children, highly nutritious and also cost-efficient. Buying directly from the local fish farmers helped to keep costs at a reasonable level with short supply chains. This procurement also provides a regular market for local fish

farmers, contributing to the local economy. Some of the dishes tested in the meals used non-marketable size fish, which further lowered the price. In addition, the whole fish was used rather than only the fillets, meaning that each fish could provide twice as many meals, reducing the cost of the fish for each meal by around 50 percent. Fillets were served as traditional dishes, and the heads and small-sized fish were used for preparing soup. The non-fillet parts were also minced and used for fish cakes. By improving the utilization of the fish, the cost was reduced significantly, indeed reaching a lower cost than other animal proteins. At the same time, the nutritional value of the meal was improved significantly.

Paradoxically, the parts of the fish often not utilized are the most nutritious ones. The head, skin and bones are rich in micronutrients, particularly minerals such as calcium, iron and zinc, with levels 10–100 times higher than in the fillets. Small fish eaten whole are known to be highly nutritious, not because they are small, but because they are often eaten whole. This case study from Honduras highlights that this can be true for larger species of farmed fish as well – resulting in fish products of lower cost, with significantly higher nutrient content and highly accepted by the schoolchildren.

There are several successful examples of including fish in school feeding programmes. In Brazil, a legal framework was created to institutionalize the National Home Grown School Feeding Programme and established that 30 percent of the total budget may be designated to purchase food from local farmers and producers. Following this, fresh tilapia sourced from local

fish farms was included in some municipalities and schools. An agreement between the Ministry of Fisheries and the Ministry of Education was established to provide training to agents involved in the process, such as nutritionists, food handlers and caterers, for the use of fish. Additionally, a booklet on the importance of fish for food was produced, among other actions.<sup>1</sup>

In Kadimu Bay, a remote bay in the Kenyan part of Lake Victoria, a retired woman running a guesthouse started fish farming activities when the lake stopped producing fish due to severe depletion of the fisheries resources. The woman used four small cages measuring 2.5 × 2.5 metres, which were kept afloat by waterproof drums tied to a square metallic frame. A pouch of small-meshed netting material was fixed to the frame with a depth of approximately 2 metres. Fingerlings and some fish feed yielded an attractive harvest after six months. Noticing the results, the villagers started investing in cages, which were managed by the woman and her team. One investor, a local member of parliament, started a school feeding programme for pupils in primary schools in the constituency of Kadimu Bay and decided to invest in 150 cages to grow tilapia. The entrepreneurial woman and her group of 18 full-time employees took responsibility for the management of these additional units. The investor received considerable revenues from the sale of tilapia. The profit was used to provide daily meals for all schoolchildren in the entire district adjacent to Lake Victoria; however, instead of feeding the children with tilapia, he used the revenues to purchase the much more nutritious small-sized “dagaa”,

1. Available in Portuguese at [www.fnpe.gov.br/programas/pnae](http://www.fnpe.gov.br/programas/pnae)



caught from the lake during dark nights (storm lamps attract this species to fishing canoes to be scooped up). Two spoonfuls of these dried fish per week in the diet of children provide sufficient nutrition for proper brain development, as this product is full of vitamins, essential fatty acids, micronutrients, minerals and proteins.

As countries look towards strengthening their school feeding programmes, innovations in aquaculture technology and efficient supply chain management have the potential to drive the necessary changes that will sustain the provision of quality fish in school feeding programmes.

FAO is poised to continue to assist countries to revamp, strengthen or build home-grown school feeding programmes, including supporting policies and legal frameworks. This FAO complementary intervention also includes support to countries for the most effective programmatic implementation strategy. Ideally, this will create an enabling environment within food systems for the provision of safe and nutritious fish and fish-based products for home-grown school feeding.

Farmed fish contributes to a healthy diet and nutrition, and when produced and marketed for school feeding purposes, the economic benefit could be far reaching to local producers and supply chain actors, and enhance their livelihoods. Lessons learned thus far, and the experiences in FAO's support to countries in implementing HGSP programmes, both show that fish can play a significant role as a nutritious food as part of dietary diversity for schoolchildren while also benefiting local aquaculture producers. Countries and other relevant stakeholders are



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Floating fish cages on the Kenyan part of Lake Victoria

encouraged to further explore the possibilities of harnessing the potential of aquaculture in providing nutrient-rich fish

and fish products to fulfil the mandate of safe and quality food provision for their school feeding programmes.



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# Women as Agents of Change in the Response to COVID-19



Women make up an essential, but often overlooked, portion of the workforce engaged in fisheries and aquaculture, predominantly involved in post-harvest activities and are thus particularly vulnerable to disruptions by COVID-19

For decades, evidence, studies and testimonials have accumulated concerning the inability of the seafood industry and its dominant players to address the power relationships between men and women which plague it. While the first step would be to recognize that this key aspect – theorized through the concept of gender – shapes global fisheries and aquaculture, the tools available for understanding, analyzing and overcoming it are severely hampered at all levels. However, not only is it essential to adopt a gender lens for the study of those

sectors, but it is also crucial that such a gender lens becomes an integral part of “the new normal” imposed by the COVID-19 pandemic.

## COVID-19, vector and revealer of inequalities

Already a reality, gender inequalities were persistent in fisheries and aquaculture when COVID-19 entered our world in December 2019. The gendered division of labour and the informality of women's status, leading to a lack of social protection, were deeply rooted, established issues. Women's lack of access to resources, credit, information, education, economic opportunities, decision-making and leadership have proven to be severe constraints to their empowerment and future prospects. As schools have closed

and health systems have been heavily depleted to contain the pandemic, the gendered division of unpaid care and domestic work binding women and girls as caregivers has intensified. In a further complication, women and girls have been facing constraints in accessing health care and sexual and reproductive health services. Moreover, an increase of gender-based violence, intimate partner violence, domestic violence, sexual abuse and exploitation has been observed around the world.<sup>1</sup> As the UN Secretary General, António Guterres, has stated in the opening of the policy brief: *The impact of COVID-19 on women*, the crisis resultant from COVID-19 threatens to reverse decades of slow progress made for women. The policy brief affirmed the



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1. [https://care.org/wp-content/uploads/2020/07/gendered\\_implications\\_of\\_covid-19\\_-\\_full\\_paper.pdf](https://care.org/wp-content/uploads/2020/07/gendered_implications_of_covid-19_-_full_paper.pdf)
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above points by stating that, *"Across every sphere, from health to the economy, security to social protection, the impacts of COVID-19 are exacerbated for women and girls simply by virtue of their sex"*<sup>2</sup>.

Thus, this alarming list of increasing inequalities and constraints concerns half of the workers in the seafood industry (FAO, 2020b), a sector that has been hit particularly hard by the COVID-19 pandemic. Indeed, the measures implemented to contain the spread of the virus have impacted each segment of the domestic and international supply chains. Limited supplies and labour shortages only compound the issue of decreasing fishing activities in both the artisanal and industrial sectors. Depending on the region, aquaculture production has experienced different disruptions; the inability of farmers to sell their stocks and perform seasonal tasks such as fish breeding are just two examples. Small and medium-sized enterprises and farms particularly experienced hardships when confronted with new expenses associated with the cost of maintaining live stocks in production facilities, leading to cash-flow issues. Additionally, producers supplying the food service sector have been severely affected by decreased demand for fish and fish products. The decline in demand has put more pressure on storage facilities which has exacerbated food losses and waste. Finally, fish processors and marketers are particularly at risk of contracting the disease and are severely affected by restrictions, especially since markets are overcrowded and the security and

safety measures are difficult to apply (FAO, 2020b).

Women are a vulnerable and at-risk population because they are traditionally and predominantly involved in post-harvest sectors, including in the downstream activities such as fish and plant processing, fresh-fish mongering, storage, packaging and marketing. Their vulnerability is reinforced by the need to continue their activities in order to maintain their income and to provide nutrition for their families. Nevertheless, women in the seafood industry once again emerge as leaders in the COVID-19 response and agents of change within their community and on the international scene.

### **Women as fundamental agents of change during the COVID-19 crisis**

In Senegal, women rose up against the granting of fishing licences that put pressure on their fish processing work. Fatou Samba, president of the female fish processors (Khlecom processing site, Bargny), denounced the lack of support in ensuring food security during this health crisis. On the other hand, the coordinator of the National Coalition of Female Fish Processors against Fishmeal, Jaba Diop, had recalled the need for supporting the cleaning and disinfection of fish processing sites<sup>3</sup> rather than focusing on the secondary matter of fishing licences. In Mbour, the Economic Interest Grouping operating on the Mballing fish processing site also called for funding to better cope with the COVID-19 impacts.<sup>4</sup> Similarly, women processors of Côte d'Ivoire, organized via the

Union of Cooperatives (USCOFEP-CI), raised their voices to warn how the decline of artisanal fisheries will lead to a food crisis. Indeed, the closure of markets and restaurants, the disruption in distribution and social distancing in Ivorian artisanal fisheries resulted in stocks of processed fish that remain unsold. This is particularly the case for the *"garbadrômes"* restaurants that serve processed tuna called *"garba"*. Moreover, women are particularly constrained in accessing resources and raw materials for processing, as a rotation system has been implemented to access the port. Senegalese and Ivorian women processors are united in the solutions they propose to respond to this crisis, particularly by suggesting collaboration between the government and cooperatives to ensure better redistribution.<sup>5</sup> USCOFEP-CI also took the pandemic as an opportunity to raise awareness and address postponed issues in artisanal fisheries, such as the lack of decent working conditions. They participated in consultations with the fisheries ministry, produced a series of recommendations including responses to COVID-19, and established a long-term plan to improve their working conditions.<sup>6</sup> At landing sites, women have been sensitizing customers on social distancing and hygiene measures, forcing them to wash their hands, while also investing in sanitary kits.<sup>7</sup>

### **The fundamental need for sex-disaggregated data**

Initiatives to urge governments to support men and women fishers and farmers are thus multiplying. These must be reinforced by

3. [www.greenpeace.org/international/story/43333/fishing-licences-senegal-africa-covid-19-fishmeal-women/](http://www.greenpeace.org/international/story/43333/fishing-licences-senegal-africa-covid-19-fishmeal-women/)

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incorporating a *gender lens* in data collection. Gender statistics, including sex-disaggregated data, are key to capturing the reality of the impacts of the pandemic and to inform appropriate gender-responsive mitigation strategies. In this regard, the International Organisation for Women in the Seafood Industry, which is an official observer to the Committee on Fisheries, is setting up a data collection programme and will “*organize a watch on the local and regional impact of the pandemic*”.<sup>8</sup> FAO has also engaged in the fight against COVID-19 through the production of analyses and solutions across food value chains and sectorial and cross-sectoral policy briefs. The Fisheries Division established a COVID-19 Task Force to support, restart and strengthen the sector’s supply chains and livelihoods, with a strong emphasis on the most vulnerable groups and regions. Coordinating departmental initiatives and providing coordinated support to measures and interventions in the response to the pandemic have been at the core of the Task Force. FAO is also actively working

with Member States and the various stakeholders in the supply chain to monitor the situation and provide policy, management and technical advice, as well as coordinating information and responses with international and regional partners (FAO, 2020b). Finally, the Fisheries Division is developing recommendations for gender mainstreaming in the COVID-19 response and is closely collaborating with the FAO Gender Team to develop its work on gender in fisheries and aquaculture worldwide.

While the COVID-19 crisis has had a terrible impact on women, at the same time it can make room for women to act as agents of change in the aquaculture sector, as throughout the seafood sector. Indeed, it presents opportunities to disrupt old and restrictive

norms but also harmful power relationships between women and men. If taken, this could be the beginning of a profound transformation of the sectors, free from discrimination based on sex or gender. However, this can only happen with a truthful intention of improving women’s access and control over resources, inclusion and active participation in the decision-making processes with effective access to social protection and more stable positions. Women and women’s organizations should be at the heart of the response to COVID-19, based on substantial work to transform the inequities of unpaid care work into a new inclusive care economy that works for everyone and has an intentional focus on the lives and future of women and girls.



#### SEE ALSO

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FAO. 2015. *The role of women in the seafood industry*. 2015. GLOBEFISH Research Programme. Vol. 119. Rome, FAO. 67 pp. [www.fao.org/3/a-bc014e.pdf](http://www.fao.org/3/a-bc014e.pdf)

8. [www.womeninseafood.org/why-using-a-gender-lens-to-analyse-covid-19-impacts-on-the-seafood-industry/](http://www.womeninseafood.org/why-using-a-gender-lens-to-analyse-covid-19-impacts-on-the-seafood-industry/)



Women work at a fish production centre in the Kyrgyz Republic and contribute towards sustainable management of ecosystem services of Issyk-Kul lake to increase national fish production and strengthen Right to Food



# The Impacts of the FAO-Thiaroye Processing Technique (FTT) on Well-being: The Legacy of Ms Oumoulkhairy Ndiaye, “Madame FTT”

Fish is an important contribution to healthy diets, as is well known, and the production and processing of farmed fish can generate income at multiple nodes in the value chains. However, fish needs to be preserved, which is to say, processed in such a way as to prevent spoilage. Fish can spoil quickly, posing food safety risks to consumers and losing value for processors. Although preservation methods such as freezing, pickling and canning are commonly used, a popular traditional method is smoking the fish, which unfortunately has some significant drawbacks. One of FAO's success stories is the introduction and adoption of an innovative technology called the FAO-Thiaroye processing technique (FTT) to improve fish-smoking practices. To tell the story of FTT, one must tell the story of its champion and tireless advocate, Ms Oumoulkhairy Ndiaye, known affectionately as Madame FTT. With her tragic passing in May of 2020, this brief article intends to share the entwined stories and celebrate the legacy of Ms Ndiaye and her contributions to the development and widespread

adoption of FTT.

In 2009, FTT was developed as a response to the identified limitations of the existing improved kiln models. This innovative technique of fish drying and smoking, designed to leverage strengths and traditional knowledge, was created through a collaborative research approach between FAO and the National Training Centre for Fish and Aquaculture Technicians (CNFTP) in Senegal. Ms Ndiaye who had started teaching fish technology at CNFTP in 1988 was central to the initial design, research and testing of the FTT.

The issues inherent to traditional fish-smoking methods involve the health and safety of both the processors as well as the consumers. Incomplete combustion from traditional kilns creates compounds called polycyclic aromatic hydrocarbons, known toxins, which reside not only on the food itself but can also be inhaled by the people running the kilns. Moreover, inefficient kilns create a huge amount of smoke pollution and unsafe working conditions. FTT works by enclosing the firebox and exhausting the smoke through taller chimneys, thereby improving the conditions for workers while also producing a superior quality product that can meet international food safety standards.

Additionally, FTT kilns are built with durable materials that reduce replacement costs, prevent sporadic fires, and function regardless of weather conditions. With better working conditions, more efficient

fuel consumption and faster processing time, processors can decrease their operating costs and utilize time savings for other productive and reproductive activities for other productive and reproductive activities (e.g. domestic work and (unpaid) care work). The reduced fuel consumption lowers pressure on local environmental resources and further decreases the amount of time spent by processors to fetch wood. Finally, a tray that catches the drippings provides an opportunity for additional revenue from processing the gathered fat, which can be used in soap or as cooking or frying oil.

FAO has been promoting the development of integrated agri-aquaculture in isolated, and even conflict areas, to enhance food security, livelihood opportunities and well-being of the most vulnerable and marginalized populations. However, with these initiatives, the difficulty of conserving the fish products once harvested become imperative. With the addition of an FTT infrastructure in aquaculture projects, at harvest time the fish that cannot be immediately sold fresh can be smoked or dried, increasing shelf life and providing market opportunities thanks to its excellent quality.



"Regional Capacity Building Workshop to Empower African Women and Youth on the use of the FAO-Thiaroye Fish Processing Technique (FTT)" in Elmina, Ghana, in September 2019



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Importantly, FTT is a gender-responsive technology and activity, given that women are predominantly in charge of fish processing. Improving the safety of working conditions, while at the same time increasing revenue and decreasing the work burden, has had significant impacts on women's empowerment in the fish value chain and the wider community. At the household level, a decrease in tensions between men and women – and the related domestic violence and intimate partner violence – has also been observed, as the smell of smoke on women's bodies and clothing is reduced. Recognizing these benefits, FTT technologies have been introduced and adopted in 16 countries across Africa. Indeed, West Africa alone has at least 13 projects in 11 countries that include FTT activities, focused on building capacities on their construction, maintenance and use. Women fish processors, fishing communities, local authorities and governments are continuously requesting FAO's support to introduce this climate-smart and gender-responsive technology in their countries. Most of these initiatives were supported, either directly or indirectly, by Ms Ndiaye. Ranging from on-the-ground training in the community

to training of trainers, and ranging from basic research to participation in policy dialogue and stakeholder consultations, Ms Ndiaye's contributions helped FTT mature from merely a "good idea" into a major element of transformative fisheries and aquaculture interventions.

*"With the passing of Ms Ndiaye, the development community lost a selfless and committed professional, who was generous and open in sharing her knowledge, a remarkable communicator, and a woman of an indisputably high sense of ethical principles. And many of us lost a dear friend."*  
Yvette Diei Ouadi

The legacy of Madame FTT will undeniably inspire us to continue the fight for the empowerment of women fish processors and the poorest and marginalized groups in the aquaculture and fisheries sectors. Her strength, leadership



Regional training of fisheries officers in the construction and use of FTT, in the framework of an FAO-implemented SmartFish Project



Design of FTT processing equipment

and expertise will be missed as FTT kilns are gradually being successfully introduced in other regions, including some countries in Asia and the Pacific. She would certainly be proud to know that her hard and dedicated work to improve the livelihoods of young women and men fish farmers and their surrounding communities continues to grow and be visible, both in FAO and around the world.



## SEE ALSO

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*The FAO-Thiaroye processing technique. How to construct it and assemble its components*. Series TECA – Technologies and Practices for Small Agricultural Producers. ([www.fao.org/3/CA2559EN/ca2559en.pdf](http://www.fao.org/3/CA2559EN/ca2559en.pdf))

Mentioned in FAN 60 article "Aquaculture integrated with horticulture takes northeast Nigeria by surprise," p. 36 ([www.fao.org/3/ca5223en/ca5223en.pdf](http://www.fao.org/3/ca5223en/ca5223en.pdf))

Mentioned in FAN 61 article "Use of social media by youth fish-farming groups in Ghana," pp. 37–38 ([www.fao.org/3/ca8302en/CA8302EN.pdf](http://www.fao.org/3/ca8302en/CA8302EN.pdf))



## Remembering our dear friend and colleague Professor Sena S. De Silva (1946–2020)

Professor Sena S. De Silva passed away on 6 May 2020. He was a dear colleague and friend to many of us here at FAO, working on the various dimensions of fisheries, aquaculture and food security, and we join the global aquaculture community in mourning the loss of a great teacher, successful researcher and strong champion for aquaculture.

Sena was a highly respected scientist and prolific writer, authoring several hundred publications in which he explored aquaculture, inland fisheries, fish nutrition, introduced species, aquatic biodiversity and environmental issues as well as their cross-cutting dimensions. He was a fierce advocate for sustainable aquaculture in general, and for the needs and rights of small-scale producers in particular.

At FAO, we associate Sena's name mostly with the numerous field projects, workshops, and studies and analyses that helped aquaculture development on the ground and also guided its development. Many personal interactions with Sena since the 1990s come to my mind when writing this, starting with the 2000 FAO/NACA Conference on Aquaculture in the Third Millennium in Bangkok, Thailand, our discussions when preparing the global review on cage aquaculture, the joint work with experts on the use and exchange of genetic resources of cultured aquatic organisms, and the list continues.

One period in Sena's long professional career of over 40 years particularly closely connected with FAO was when he joined the Network of Aquaculture Centres in Asia-Pacific (NACA) in



2006 as the elected Director General, a position he would serve for five years. During his term, NACA was awarded the prestigious FAO Margarita Lizárraga Medal as a recognition of NACA's significant contribution to sustainable aquaculture development in the Asia and Pacific region. Sena's term at NACA culminated in the highly successful FAO/NACA Global Conference on Aquaculture 2010, held in Phuket, Thailand.

Sena continued to work closely with us until this year since he was preparing the updated review of aquaculture development in the Asia-Pacific region, in anticipation of the forthcoming FAO/NACA Global Conference on Aquaculture Millennium +20 to be held in Shanghai, China, under the theme "Aquaculture for food and sustainable development".

We will remember Sena fondly as our close ally in the continued quest to help make the fast-growing aquaculture sector become ever more responsible and sustainable.

*Matthias Halwart*

# COLLEAGUES IN MOTION

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## Dr Brett MacKinnon

*Consultant, Aquaculture Branch*

Dr Brett MacKinnon, a Canadian national, joined the FAO Aquaculture Branch in February 2020 as an aquaculture biosecurity consultant. She holds a B.Sc. degree in biology from the University of New Brunswick, and a DVM degree and a M.Sc. degree in epidemiology from the Atlantic Veterinary College, University of Prince Edward Island. Her research focused on investigating the epidemiology of ulcer disease in Atlantic salmon in Atlantic Canada to develop sustainable disease management strategies for the industry. Prior to joining FAO, she served as a veterinary epidemiologist with the Animal Health Risk Assessment Unit of the Canadian Food Inspection Agency (CFIA), primarily conducting risk analyses and

scientific evaluations related to aquatic animal health. Brett also served as an aquatic animal health veterinarian with the CFIA's Import/Export Aquatic Section, where she provided expertise to facilitate international trade and contributed to the development of Canada's National Aquatic Animal Health Program. Over the past five years, Brett has been a consultant providing veterinary expertise and aquatic animal health training within Canada and internationally. She is pleased to be working under the direction of Dr Melba Reantaso in furthering the development of the Progressive Management Pathway for Improving Aquaculture Biosecurity and its supporting tools, as well as assisting in the implementation of a number of aquaculture biosecurity-related projects of FAO.

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## Amedea Nigro

*Intern, Aquaculture Branch*

Amedea Nigro, a German-Italian national, joined FAO's Aquaculture Branch in March 2020 for a seven-month internship. She studied at the Free University of Berlin, Germany, and Sciences Po Paris, France, and recently obtained a Bachelor's degree in political science. At FAO, Amedea supports the Aquaculture Policy Review by identifying and analysing policies crucial for sustainable aquaculture, as well as policy-related contributions to sustainable development, food security and poverty eradication. In preparation for the Global Conference on Aquaculture (GCA) 2020, postponed to 2021, she also provides communication support. Amedea is particularly interested in gender issues as a prerequisite for sustainable development.

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# NEW PUBLICATIONS

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## Flagship publications



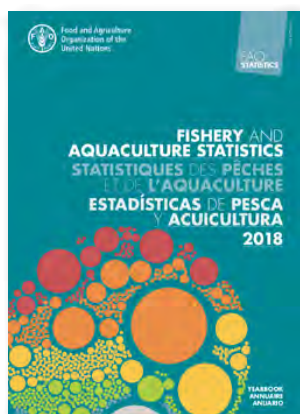
FAO 2020

**The State of World Fisheries and Aquaculture 2020. Sustainability in Action**  
Rome.

The 2020 edition of The State of World Fisheries and Aquaculture has a particular focus on sustainability. This reflects a number of specific considerations. First, 2020 marks the twenty-fifth anniversary of the Code of Conduct for Responsible Fisheries (the Code). Second, several Sustainable Development Goal indicators mature in 2020. Third, FAO hosted the International Symposium on Fisheries Sustainability in late 2019, and fourth, 2020 sees the development of specific FAO guidelines on sustainable aquaculture growth, and on social sustainability along value chains.

*The PDF can be accessed directly at:* [www.fao.org/3/ca9229en/CA9229EN.pdf](http://www.fao.org/3/ca9229en/CA9229EN.pdf)

*The document card can be found here:* [www.fao.org/publications/card/en/c/CA9229EN](http://www.fao.org/publications/card/en/c/CA9229EN)



FAO 2020

**FAO yearbook. Fishery and Aquaculture Statistics 2018**  
**FAO annuaire. Statistiques des pêches et de l'aquaculture 2018**  
**FAO anuario. Estadísticas de pesca y acuicultura 2018**  
Rome/Roma.

The FAO Yearbook of fishery and aquaculture statistics is a compilation of statistical data on capture fisheries and aquaculture production, employment, commodities, production and trade, apparent fish consumption and fishing fleets. It is structured into a booklet (containing summary tables, notes on major trends, concepts, classifications and a map of FAO major fishing areas) and a USB card presenting the full yearbook package with all the key information and the complete set of statistical tables.

*The PDF can be accessed directly at:* [www.fao.org/3/cb1213t/CB1213T.pdf](http://www.fao.org/3/cb1213t/CB1213T.pdf)

*The document card can be found here:* [www.fao.org/publications/card/en/c/CB1213T](http://www.fao.org/publications/card/en/c/CB1213T)



FAO 2020

**Understanding diseases and control in seaweed farming in Zanzibar**

Largo, D.B., Msuya, F.E. & Menezes, A. FAO Fisheries and Aquaculture Technical Paper No. 662. Rome, FAO.

In view of all production and productivity problems the seaweed aquaculture industry has been facing as well as the impact of the seaweed die-off on the Island economy with sharp decline of income and revenues for thousands of farmers and traders and, recognizing the compounded problems that about 20,000 seaweed farmers' livelihood are based on a single aquaculture system affecting mostly women and youth, the FAO-funded Technical Cooperation Programme "Support to the Aquaculture Subsector of Zanzibar" (TCP/URT/3401) recognized and recommended the Biological and Economic Research on Seaweed as a relevant pillar of the Aquaculture Development Strategy Plan. This technical report is part of the FAO-TZ project "Support to Seaweed Diseases and Die-off Understanding and Eradication in Zanzibar" TCP/URT/3601/C1, and covers an initial analysis of the die-offs due to epiphyte infestation and ice-ice disease in Zanzibar. The assessment is mainly based on site visits to the seaweed farms in Unguja and Pemba and laboratorial analysis of collected seaweed samples conducted by the authors between February and June 2017. Findings were cross-checked with a literature review on the topic and presented during stakeholders' meetings in both Islands.

The PDF can be accessed directly at: [www.fao.org/3/ca9004en/CA9004EN.pdf](http://www.fao.org/3/ca9004en/CA9004EN.pdf)

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FAO 2020

**Assessment of the integration of fisheries and aquaculture in policy development – Framework and application in Africa**

Murekezi, P., Martone, E. & Menezes, A. FAO Fisheries and Aquaculture Technical Paper No. 663. Rome, FAO.

This document was prepared within the framework of the FAO's Strategic Objective 1 (SO1): Help eliminate hunger, food insecurity and malnutrition. This document served as a background paper to present the status of policy mainstreaming and policy research for the improvement of policy development in aquaculture in support of food security, nutrition and poverty eradication. The document was presented in various African fora and received the validation of the stakeholders for its publication as part of policy research. Specifically, the paper was presented and included the inputs from the Consultative Meeting on Aquaculture Policy Development in Addis Ababa, Ethiopia, from 3 to 4 December 2018, 37th SADC Fisheries and Aquaculture technical meeting in Windhoek and the Consultative meeting on "improving policy development in aquaculture in support of food security, nutrition and poverty eradication" held in Kigali, Rwanda, from 10 to 14 June 2019.

This research report includes recommendations by the stakeholders to guide the mainstreaming of fisheries and aquaculture within wider policy frameworks, for the formulation and implementation of technical programmes for enhanced food security and nutrition at country and regional level in Africa.

The PDF can be accessed directly at: [www.fao.org/3/ca9322en/CA9322EN.pdf](http://www.fao.org/3/ca9322en/CA9322EN.pdf)

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FAO 2020

### Report of Regional Consultation on the development of Guidelines of Sustainable Aquaculture (GSA)

Bamako, Mali, 29–30 November 2019. Fisheries and Aquaculture Report No. 1319. Rome, Italy.

The regional consultation held in Mali, Bamako, on 29–30 November 2019, was organized as a series of regional consultations of the project entitled “Support to global consultations to developing guidelines for Sustainable Aquaculture”, which was supported by the Government of the Republic of Mali, FAO Regional Office for Africa and the Korea Maritime Institute of the Republic of Korea. This consultation was the first of a series of regional consultations on the Development of “Guidelines for Sustainable Aquaculture (GSA)”. It aimed to: 1. Share current policies and practices related to aquaculture in the region and inform the African region of the development process of GSA. 2. Review existing regional sustainable aquaculture guidance, and assess potential gaps that GSA could help fill. 3. Develop a list of priority thematic modules, including regional strengths and challenges. 4. Discuss regional case study concepts proposed at the FAO Tenth Session of the COFI Sub-Committee on Aquaculture (SCA) held in Trondheim, Norway on 23–27 August 2019, and identify additional case study topics associated with one or more thematic Guidelines for Sustainable Aquaculture modules, as outlined by the expert consultation on the development of the Guidelines for Sustainable Aquaculture, held at FAO Headquarters in Rome, Italy on 17–20 June 2019.

The PDF can be accessed directly at: [www.fao.org/3/cb0280en/CB0280EN.pdf](http://www.fao.org/3/cb0280en/CB0280EN.pdf)

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FAO 2020

### Rapport de la cinquième édition des journées maghrébines de l'aquaculture - Aquaculture continentale, situation et perspectives

Ifrane, Maroc, 02–04 Juillet 2019. Tunis, Tunisie

Le présent document est le rapport final de la cinquième édition des journées maghrébines de l'aquaculture tenue du 02 au 04 Juillet 2019 à Ifrane, Maroc. Il a été préparé dans le cadre des activités du programme régulier de l'unité des pêches et de l'aquaculture du bureau sous-régional de la FAO pour l'Afrique du Nord afin de soutenir le développement des capacités des pays de la sous-région concernant le développement durable de l'aquaculture continentale.

The PDF can be accessed directly at: [www.fao.org/3/ca9260fr/ca9260fr.pdf](http://www.fao.org/3/ca9260fr/ca9260fr.pdf)

The document card can be found here: [www.fao.org/documents/card/en/c/ca9260fr](http://www.fao.org/documents/card/en/c/ca9260fr)



FAO 2020

## Report of the Second Multi-Stakeholder Consultation on the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB)

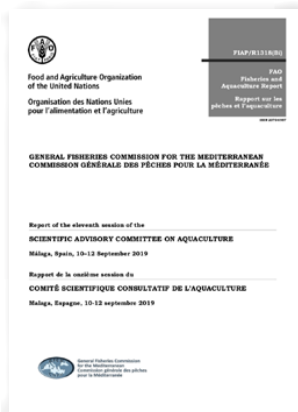
Paris, France, 29-31 January 2019. FAO Fisheries and Aquaculture Report No. 1321, Rome.

This report presents the results of a second multi-stakeholder consultation on the Progressive Management Pathway for Improving Aquaculture Biosecurity (PMP/AB), where 41 participants from government, the private sector, academe, and international agencies and donors took stock of the drivers of aquatic animal disease emergence and shared experiences in dealing with aquaculture biosecurity challenges.

The four stages of the PMP/AB focus on building aquaculture biosecurity capacity through both bottom-up and top-down approaches with strong stakeholder engagement to promote application of risk management at the producer level as part of a national approach. The PMP/AB initiative is not intended to be prescriptive, and it will be possible to achieve the key outcomes through different combinations of activities. It is essential to address all key outcomes to fully complete a stage and progress to the subsequent stage.

The PDF can be accessed directly at: [www.fao.org/3/cb0745en/CB0745EN.pdf](http://www.fao.org/3/cb0745en/CB0745EN.pdf)

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FAO 2020

## General Fisheries Commission for the Mediterranean. Report of the Eleventh Session of the Scientific Advisory Committee on Aquaculture

Málaga, Spain, 10–12 September 2019.

## Commission générale des pêches pour la Méditerranée. Rapport de la onzième session du Comité scientifique consultatif de l'aquaculture

Malaga, Espagne, 10-12 septembre 2019.

## FAO Fisheries and Aquaculture Report/FAO Rapport sur les pêches et l'aquaculture. No./no 1318. Rome

The Scientific Advisory Committee on Aquaculture (CAQ) of the General Fisheries Commission for the Mediterranean (GFCM) held its eleventh session in Málaga, Spain, from 10 to 12 September 2019. The session was attended by delegates and representatives from 18 contracting parties, three cooperating non-contracting parties, seven observers from intergovernmental and non-governmental organizations and representatives from the Food and Agriculture Organization of the United Nations (FAO) and the GFCM Secretariat. The agenda also included a special session of the Information System for the Promotion of Aquaculture in the Mediterranean (SIPAM), which was organized concomitantly.

The PDF can be accessed directly at: [www.fao.org/publications/card/en/c/CA9789B](http://www.fao.org/publications/card/en/c/CA9789B)

The document card can be found here: [www.fao.org/3/ca9789b/CA9789B.pdf](http://www.fao.org/3/ca9789b/CA9789B.pdf)





FAO 2020

### **The impact of COVID-19 on fisheries and aquaculture – A global assessment from the perspective of regional fishery bodies: Initial assessment, May 2020. No. 1**

Rome.

The objective of this paper was to provide a timely and indicative global overview of the impacts of COVID-19 on fisheries and aquaculture as well as to share examples of good practice and collate suggestions for interventions that may inform and guide the development of mitigation measures. This was achieved through prompt responses to questionnaires distributed to the secretariats of the RFBs' network.

However, the situation is constantly evolving. As such, in order to understand the full impact of COVID-19 on fisheries and aquaculture, further assessments both at a regional and country level will be required.

*The PDF can be accessed directly at:* [www.fao.org/3/ca9279en/CA9279EN.pdf](http://www.fao.org/3/ca9279en/CA9279EN.pdf)

*The document card can be found here:* [www.fao.org/publications/card/en/c/CA9279EN](http://www.fao.org/publications/card/en/c/CA9279EN)



FAO 2020

### **Integrated agri-aquaculture in desert and arid lands: Learning from case studies from Algeria, Egypt and Oman**

Corner, R., Fersoy, H. and Crespi, V (eds). Fisheries and Aquaculture Circular No. 1195. Cairo, FAO.

The publication reflects the outcomes of a study conducted by the FAO Regional Water Scarcity Initiative in the Near East and North Africa with the aim of building broad partnerships to support greater understanding in implementation and use of non-conventional water resource in integrated agriculture-aquaculture (IAA) systems. The study was also partially funded by FAO Global Knowledge Product on water. Work was undertaken to summarize current approaches using three selected countries: Algeria, Egypt and Oman, identified to be representative of cross-regional differences in non-conventional water use for integrated agriculture and aquaculture across the NENA region. Three country National Task Forces were set up and with support from national partners country-based reviews were undertaken, which evaluated current activity in each country through questionnaire surveys and interviews with farmers and other stakeholders. Farmer-to-farmer visits provided a key component of the activity that enabled sharing of best management practices on IAA. Activity was concluded with a regional workshop held in Cairo, Egypt on 25-26 June 2019 that aimed to finalize a broad roadmap for further development activity.

*The PDF can be accessed directly at:* [www.fao.org/documents/card/en/c/ca8610en](http://www.fao.org/documents/card/en/c/ca8610en)

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FAO 2020

## Top 10 species groups in global aquaculture, 2018

Rome.

The latest FAO global aquaculture production statistics record 608 species items (under the ASFIS – This factsheet presents the top 10 species groups in global aquaculture 2018 and features one of the fastest growing species groups: crayfishes. The ranking of all 63 species groups in global aquaculture 2018 is illustrated on the back cover. More information about the top 10 species groups at regional and national level can be found in a more comprehensive factsheet as the supplementary materials.

*The PDF can be accessed directly at: [www.fao.org/3/ca9383en/ca9383en.pdf](http://www.fao.org/3/ca9383en/ca9383en.pdf)*

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OCT 2020

**Presentation of Regional Aquaculture Reviews and the State of World Aquaculture 2020**

*Zoom Webinar Series. 26-29 October 2020 – [GCA@fao.org](mailto:GCA@fao.org) – More information and registration here:*

***[www.fao.org/3/cb0994en/cb0994en.pdf](http://www.fao.org/3/cb0994en/cb0994en.pdf)***

FEB 2021

**Committee on Fisheries, Thirty-fourth Session**

*Rome, Italy. 1-5 February 2021 – [FAO-COFI@fao.org](mailto:FAO-COFI@fao.org)*



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## Aquaculture Branch

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**REVISED DATES**



## GLOBAL CONFERENCE ON AQUACULTURE

AQUACULTURE FOR FOOD AND  
SUSTAINABLE DEVELOPMENT

22-27 September 2021  
Shanghai, China



Food and Agriculture  
Organization of the  
United Nations



中华人民共和国农业农村部  
Ministry of Agriculture and Rural Affairs of the People's Republic of China



Network of  
Aquaculture  
Centres in  
Asia-Pacific

### MESSAGE FROM THE GCA SECRETARIAT REGARDING THE CORONAVIRUS (COVID-19) OUTBREAK

Originally planned for October 2020, the conference was postponed by the GCA Secretariat because of the COVID-19 pandemic and its associated impacts. Although there is no time to lose in our communal fight against hunger and poverty, our commitment to the health and safety of GCA participants is paramount. The GCA Secretariat, therefore, engaged with all partners to determine the best possible revised dates, and we are pleased to announce that the GCA will be held from 22 to 27 September 2021 in Shanghai, China.

The FAO Aquaculture Newsletter (FAN) is issued twice a year by the Aquaculture Branch of the FAO Fisheries Division, 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 FAO Fisheries Division, 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 webpage: [www.fao.org/fishery/publications/fan](http://www.fao.org/fishery/publications/fan)

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