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The Fisheries and Aquaculture Advantage

Fostering food security and nutrition,
increasing incomes and empowerment

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Table of contents

Introduction	4
Key challenges	5
IFAD support to fisheries and aquaculture	11
Case studies	20
Brazil: boosting nutritional and economic outcomes	22
Cameroon: aquaculture offers youth a future	26
Djibouti: partnerships to boost sustainable fishing practices	29
Eritrea: expanding options for young people and women	33
India: artificial reefs and insurance innovation	37
Lessons learned and the way forward for IFAD's engagement in fisheries and aquaculture	41
Annex 1. References and documents consulted	43

Boxes

Box 1. IFAD-supported social, economic and environmental outcomes through fisheries and aquaculture	8
Box 2. Small fish ponds promote incomes, nutrition, women's empowerment and pro-poor options	10
Box 3. Nutrition-sensitive fish value chains in Indonesia	13
Box 4. Environmentally and economically sustainable livelihoods in Indonesia	17

Tables

Table 1. Impacts on fisheries and aquaculture by climate change effect	7
Table 2. Case study main themes	21

Abbreviations

FAO	Food and Agriculture Organization of the United Nations
FReMP	Fisheries Resources Management Programme
SIDS	small island developing state(s)



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Introduction

This report presents selected achievements and lessons from the growing portfolio of fisheries and aquaculture investments supported by the International Fund for Agricultural Development (IFAD). The introduction summarizes key issues and gives an overview of IFAD-supported actions and impacts of working with smallholders in developing countries. In keeping with IFAD's drive to bring together and strengthen the key mainstreaming themes of climate and the environment, nutrition, gender, youth and indigenous peoples, the introduction touches upon all of them. A number of "witness statements" present the impacts of IFAD-supported engagement in fisheries and aquaculture on the lives of individual smallholders, and five case studies from the ongoing portfolio (Brazil, Cameroon, Djibouti, Eritrea and India) give concrete examples of how IFAD is working to support smallholders. The final section presents some lessons learned from IFAD's support in the sector and looks ahead to IFAD's eleventh replenishment period and beyond.

The importance of fisheries and aquaculture

Fisheries (also referred to as "capture fisheries") and aquaculture are of critical importance for the food, nutrition and employment of millions of people, many of whom struggle to maintain reasonable livelihoods. The significant growth in fisheries and aquaculture production, especially in the past two decades, has enhanced the world's capacity to consume diverse and nutritious food. Fish and fish products have a crucial role in nutrition and global food security, as they represent a valuable source of nutrients and micronutrients important for diversified and healthy diets. Moreover, in lower-income countries, the importance of fish is enhanced by the fact

that it contains many of the vitamins and minerals required to address some of the most severe and widespread nutritional deficiencies.

In 2015, fish accounted for about 17 per cent of animal protein consumed globally, and provided about 3.2 billion people with almost 20 per cent of their average per capita intake of animal protein. Even small quantities of fish in people's diet can have a significant positive impact on the nutritional status of poor consumers across the world. Aquaculture now provides around half the fish for direct human consumption and is set to grow further; but capture fisheries continue to make essential contributions to the food and nutrition security of poor people and is often their most important source of fish (Belton and Haraksingh Thilsted, 2018). Since 1961, the annual global growth in fish consumption has been twice as high as population growth, demonstrating that the fisheries sector is crucial for a world without hunger and malnutrition (FAO, 2018a).

Many millions of people around the world also find a source of income in the fisheries and aquaculture sectors, which support the livelihoods of between 10 per cent and 12 per cent of the world's population (FAO, 2018b). Around 59.6 million people were engaged in the primary sector of capture fisheries and aquaculture in 2016 and it is estimated that nearly 14 per cent of these workers were women (FAO, 2018a).

Key challenges

Despite the undoubted potential of fisheries and aquaculture, the sector faces serious challenges. While aquaculture production is growing rapidly throughout the world, particularly in Asia and Africa, many of the world's fisheries are at grave risk from human pressures, including overexploitation, pollution and habitat change. Climate change is compounding these pressures, posing very serious challenges and limiting livelihoods opportunities. It is transforming the context in which the world's fishers and fish farmers live and work, posing a major threat to their livelihoods and the ecosystems, especially reefs, on which they depend. For millennia, small-scale fisheries and fish farmers have drawn on their indigenous knowledge and historical observations to manage seasonal and climate variability, but today the speed and intensity of environmental change is accelerating, outpacing the ability of human and aquatic systems to adapt. In many cases, it is the poorest communities in the poorest countries that are most vulnerable to these changes.

Fisheries depend on the health and natural productivity of the ecosystems on which they are based. They are vulnerable to physical and chemical changes in temperature, salinity, acidity, and water levels and flows (IPCC, 2007; FAO, 2008). Aquaculture, as practised on a small scale by the rural poor in developing countries, is also heavily dependent on ecosystem services for feed, seed and adequate supplies of clean water, and is often exposed to extreme weather events, which have increased in recent years (IPCC, 2007). Table 1 summarizes some impacts on fisheries and aquaculture of climate change effects.

Small-scale fishers also face many other challenges. For example, customary practices for the allocation and sharing of resource benefits, which may have been in place for generations, have been changed as a result of non-participatory and often centralized fisheries management systems, rapid technology developments and

demographic changes. Small-scale fishing communities also commonly suffer from unequal power relations. In many places, conflicts with large-scale fishing operations are an issue, and there is increasingly high interdependence or competition between small-scale fisheries and other sectors. These other sectors can often have stronger political or economic influence, and they include tourism, aquaculture, agriculture, energy, mining, industry and infrastructure developments. Furthermore, small-scale fishing communities are commonly located in remote areas and tend to have limited or disadvantaged access to markets, and may have poor access to health, education and other social services. Other characteristics include low levels of formal education, existence of ill health and inadequate organizational structures (FAO, 2015). IFAD also finds that limited access to inputs, technologies and processing/marketing skills are holding back the potential of the sector to improve the lives of small-scale fishers. Without support for more sustainable alternatives, fishers turn to destructive fishing practices, such as dynamite fishing.

Another major problem is the phenomenal amount of litter and plastics that ends up in the sea. An estimated 8 million tons of plastic enters the ocean every year (Jambeck et al., 2015) and around 5 trillion pieces of plastic are afloat on the ocean (Eriksen et al., 2014). This, in turn, ends up in fish and is detrimental to human health.

Gender and youth inequalities in fisheries and aquaculture

Analysed with a gender lens, the men and women in this sector tend to engage in distinct activities that are strongly influenced by their social, cultural and economic contexts. In most regions, fish catching is male-dominated. Ocean-going boats for offshore and deep-sea fishing often have male crews, while in coastal artisanal fishing communities, women often manage smaller boats. Women are mostly responsible for skilled and time-consuming onshore tasks, such as making and mending nets, processing and marketing catches, and providing services to the boats. In western Africa and Asia, as much as 60 per cent of seafood is estimated to be marketed by women, and in many parts of the world they also do a significant amount of shellfish gathering/clam gleaning – an activity that is often under-recognized, or not recognized at all (FAO, 2016). Campaigns such as the “Gender and the Ocean” theme of the 2019 World Oceans Day, and events such as the International Conference of Women in Fisheries in 2018¹ are helping to highlight women’s contribution in the sector, and the United Nations (FAO) is active in promoting guidelines on gender mainstreaming.

In general, there is less literature on the participation of youth in the sector. However, there is general consensus that many young people are deterred by perceptions of declining fish catches, physical labour compared with off-farm work, lack of capacity-development opportunities and lack of adequate income in the sector (Erina, n.d.). In particular, the situation of young women is critical as they face more barriers to participation in fisheries and aquaculture, including lack of access to production inputs.

1 See <https://unworldoceansday.org/gender-and-ocean>.

Table 1. Impacts on fisheries and aquaculture by climate change effect

Climate change effect	Impacts
Warming of oceans and other water bodies	Changes in productivity, with an overall increase in fish production at the global level, but declines of up to 40 per cent in the tropics, as fish are forced to migrate to cooler waters. Localized extinctions where fish cannot migrate, for example, in lake fisheries. Changes in fish migration paths, affecting small-scale fishers who do not have suitable vessels to pursue them. Thermal stratification of freshwater lakes, particularly in the tropics, reducing nutrient cycling and productivity of fisheries. Warmer water increases spread of disease, reduces oxygen and increases risk of toxic algal blooms and fish kills, destroying aquaculture production. Widespread destruction of coral reefs, their associated ecosystems and fisheries due to increased temperatures and more frequent coral “bleaching”. For some farmed species, there is potential for increased growth rates, food conversion efficiency and duration of the growing season.
Sea-level rise	Inundation and more frequent flood and storm damage in megadeltas, small island developing countries and low-lying coastal areas. Damage to wetlands, mangroves, coastal nursery grounds and fish habitats, and accelerated coastal erosion. Increased salinity of groundwater, higher water tables and drainage problems due to saltwater intrusion, damaging agriculture but increasing area available for brackish water aquaculture.
Ocean acidification	A major systemic threat, resulting from the absorption of carbon dioxide, which may be irreversible in terms shorter than millennia. Leads directly to destruction of coral reefs, reduces productivity of shellfish and zooplankton, as they cannot form hard shells, and has run-on impacts throughout the food chain. There are also potential impacts on fin fish, but this is not fully understood.
Changes in rainfall patterns and evaporation rates	Leads to changes in run-off, water levels, water availability and quality, and sedimentation patterns in inland and coastal water bodies. Changes flood risk, water stress and droughts, and alters ecosystems and habitats and the productivity of fisheries in those habitats.
Increase in extreme weather events and their frequency, location and seasonality	Increased storm damage, destruction of assets and ecosystems such as coral reefs and mangroves, and lost earning opportunities. Small-scale fishers and fish farmers in remote areas often lack access to weather forecasts, lack infrastructure to protect boats and other assets, and lack insurance. Damage to ecosystems affects fish nursery and feeding grounds, and reduces coastal protection. Aquaculture equipment will be damaged and crops lost. Fish escapes increase the risk of disease and parasitic infestation of wild stock, and have an impact on biodiversity.

Source: IFAD, 2015.

IFAD support to fisheries and aquaculture

In the past four decades, IFAD has supported over 100 projects addressing aquatic and/or coastal zone resources, which were implemented in at least 36 IFAD Member States between 1979 and 2017. The total cost was US\$3.37 billion, of which IFAD contributed 46.2 per cent, representing 8.1 per cent of all IFAD's loans and grants approved during that period (IFAD, 2018a). IFAD support has always been guided by the objectives of reducing hunger and malnutrition, and providing a livelihoods source for poor rural people. Today, these approaches are aligned with Sustainable Development Goal 2 (SDG 2) (zero hunger) and especially with Target 2.3: *"by 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment"*. More recently, environmental and climate change concerns have also taken on greater importance, with investments contributing to SDGs 13 (climate action)² and 14 (life under water).³ Box 1 summarizes the main social, economic and environmental outcomes promoted by IFAD through investments in fisheries and aquaculture.

Box 1. IFAD-supported social, economic and environmental outcomes through fisheries and aquaculture

IFAD seeks to achieve the following outcomes through investments in fisheries and aquaculture:

- Increase food production (SDG 2).
- Improve nutrition for fishing and fish-farming communities, surrounding communities and extending to the national level (SDG 2).
- Increase incomes and employment opportunities, including for youth and women (SDG 1).
- Improve the health and quality of life in fishing communities.
- Increase national trade and exports of fisheries and aquaculture products.
- Reduce the migration of young fishers to urban areas.
- Provide access to financial services for small-scale fishers and fish farmers (SDGs 1, 2).
- Preserve and strengthen habitats that are important for rejuvenating fish stocks, such as mangroves and coral reefs (SDGs 13, 14).
- Enhance access to knowledge and sustainable fisheries and aquaculture technologies (SDG 14).
- Strengthen policies and institutions for fisheries resource management, tenure and access rights of local people (SDG 14).
- Enhance resilience of coastal communities against climate change and other shocks by incorporating climate change impacts in the design of new fisheries and aquaculture projects (SDG13).

² In particular, target 13.1 to "strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries".

³ Including targets relating to providing access for small-scale artisanal fishers to marine resources and markets (although IFAD also supports freshwater actions), and increasing economic benefits to poor rural people from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism.

In most contexts, IFAD supports fisheries/aquaculture as part of a broader integrated approach incorporating environmentally friendly and inclusive crop and livestock production. For example, integrated homestead food production is a nutrition-sensitive, pro-poor and women-controlled approach to household food production that includes small fish ponds alongside vegetable and fruit gardens, and backyard livestock-raising. It can enhance poor rural people's access to a variety of nutritious fresh foods, grown in close proximity to their households and requiring relatively limited human, financial and productive resources. Within the system, the fish pond provides water for the garden and nutrient-rich mud, the garden and home waste feeds the animals and fish, and animal manure feeds the garden and small water plants that fish feed on (IFAD, 2015a). Box 2 presents an example of such an approach in Bangladesh.

Other IFAD-supported projects have a specific focus on the fisheries and aquaculture sector. The Artisanal Fisheries and Aquaculture Project in Angola is one example. Through this project, IFAD is supporting longer-term fisheries governance in order to tackle the challenges of overexploitation through bad fishing practices, destructive gears and increasing human pressure. Implemented in areas with a large number of lakes, the project's goal is to reduce poverty in artisanal inland fishing and small-scale fish-farming households in target communities. It will improve food security and nutrition among these households while addressing climate change issues that affect the fisheries and aquaculture sectors. The project targets 15,000 people, or about 10,000 fishers and 5,000 processors and small traders. It aims to (i) strengthen institutional capacity (national, provincial, local/extension services); (ii) improve community participation in economic and wider local development processes; (iii) increase the quantity and quality of fish produced and sold on a sustainable basis; and (iv) improve market-related infrastructure.

Since 2004, IFAD has also invested in 17 grants across the world to support the development of fisheries and aquaculture in various ways. Projects range from improving nutrition and sustainable food systems through local food crops and fisheries value chains (Pacific Islands) to improving the technological foundations for sustainable aquaculture (global in scope) and the inclusion of rural youth in poultry and aquaculture value chains (Mali). A recently approved grant (Advancing Technologies and Capacity-Building for Climate-smart Aquaculture) focuses on Egypt, Eritrea and Ethiopia, and aims to further knowledge of technical skills, technologies and good practices that can help IFAD programmes to respond more effectively to climate change and water-related challenges. This grant will support adaptive research, technology transfer and piloting climate-smart aquaculture technologies and good practices. It will also support capacity-building in technologies for national aquaculture research and extension agencies in the targeted countries and produce and disseminate knowledge materials to facilitate learning and uptake of technologies and good practices by farmers.

Box 2. Small fish ponds promote incomes, nutrition, women's empowerment and pro-poor options

The IFAD-supported small grant for the project titled “Linking Fisheries and Nutrition: Promoting Innovative Fish Production Technologies in Ponds and Wetlands with Nutrient-Rich Small Fish Species in Bangladesh” was implemented by WorldFish (formerly known as the International Center for Living Aquatic Resources Management). The project ran for 32 months in collaboration with the national and local Departments of Fisheries and Extension of the Government of Bangladesh and was completed in May 2013. The grant targeted small-scale, poor farming households with small ponds and fishers living in the north-western region and the Haor Basins of Bangladesh, covering the sites of two IFAD-supported ongoing loan projects, namely, the Sunamganj Community-Based Resource Management Project and the National Agricultural Technology Project.

The main goal of the grant was to improve household nutrition through increased production and consumption of nutrient-rich fish and to enhance communities' income. The Bangladeshi diet is dominated by the staple, rice, while vegetables and fish are consumed only in small amounts. Fish in particular is an important source of multiple vitamins, minerals and animal protein but it is not included in complementary feeding of children aged 6 months and above. Surveys show that where small fish is not an adequate part of the diet of poor people, their calcium intake is significantly reduced, as there are no other rich sources of calcium in the diet (e.g. milk).

One of the grant-supported fish production technologies involved the production of carp and the nutrient-rich small fish, *mola*, in small homestead ponds managed individually by households in Rangpur and Dinajpur, in the north-western part of the country. This component spanned two full seasons of fish harvesting/production. The second technology focused on increasing small fish production in wetlands through improved management practices.

In an integrated approach, the promotion of vegetables (e.g. orange sweet potato, which is rich in vitamin A) grown on pond dykes and in homestead gardens was complemented by a strong awareness-raising and training component that aimed to enhance the consumption of nutrient-rich fish and vegetables and to increase dietary diversity. This component included training in nutrition, awareness-raising and cooking demonstrations; training of trainers; and formation of groups of local women promoters. A gender-sensitive approach was adopted in the selection of the target households; the target group consisted largely of women and children, especially pregnant and lactating women, and women with children aged between 6 and 24 months.

Results showed large increases in nutrient-rich small fish production and a 3.5-fold increase in the number of homestead small ponds. This led to the increased consumption of nutrient-rich fish, in terms of both quantity and frequency, especially among pregnant and lactating women and among children, with complementary feeding of the latter starting from 6 months of age. Greater production also led to an increase in household income, which was mainly used for food purchases, school fees and health-related expenses. The training of women as community promoters proved to be an effective mechanism in enhancing the production and consumption of nutritious food. This encouraged households not included in the project to adopt small pond aquaculture and production of orange sweet potato, and translated into women's empowerment, enhanced social status and increased physical mobility.

Source: IFAD, 2015a.

IFAD support in the face of climate and environment challenges

By September 2017, a total of 155 Nationally Determined Contributions to address climate change had been submitted to the United Nations Framework Convention on Climate Change. Out of these, 87 address fisheries and aquaculture, of which 78 include climate change adaptation measures.⁴ IFAD is keenly mindful of the need to minimize environmental impacts and greenhouse gas emissions from fisheries and aquaculture activities, and to increase the resilience of fishers and coastal communities as well as the natural resources they depend upon. IFAD's Social, Environmental and Climate Assessment Procedures (IFAD, 2017) include a guidance statement on interventions including fisheries and aquaculture in order to minimize risks and maximize opportunities for the planet and poor rural people. These include adaptation and mitigation strategies for capture fisheries and aquaculture, and advocate enhancing the capacity of national monitoring systems. IFAD has also invested in research and publications that build on related codes of conduct and voluntary guidelines by the Food and Agriculture Organization of the United Nations (FAO),⁵ and offer guidelines and "how to do" practical advice on climate-smart and responsible fisheries and aquaculture (for example IFAD, 2014, 2015).

The Programme to Reduce Vulnerability in Coastal Fishing Areas in Djibouti is an example of how IFAD is addressing climate change adaptation, mitigation and environmental concerns affecting people whose livelihoods depend on fishing. The project is engaging with communities through participatory natural resource management to restore mangroves and preserve coral reefs, which are vital for fish stocks and help mitigate greenhouse gas emissions.⁶ Fisheries value chains affected by climate change are also benefiting from renewable energy equipment, ice plants and coolers/insulated containers to improve the conservation of fish products. These are expected to benefit fishers and sellers, many of whom are women.

IFAD is exploring innovative ways to raise awareness globally and to channel financing to help deal with climate-induced threats to fish as food for millions of poor rural people. "Recipes for Change" is a series of recipes from IFAD-supported countries. Here, traditional local foods that are under threat from climate change are the focus of adaptation investments by IFAD's Adaptation for Smallholder Agriculture Programme (ASAP). Celebrity chefs spotlight fish-based recipes such as smoked fish with sesame and sorrel sauce from Chad, Cambodian curry, Vai Ika (tuna and taro leaves) from Tonga, and sweet and sour catfish soup from Viet Nam. ASAP-supported solutions in Viet Nam, for example, include taking action on increased salinity, which affects fish-farming by poor rural families, and research on saline-tolerant fish varieties.

IFAD recognizes the importance of an integrated ecosystem management approach because what happens on land directly impacts what happens in oceans.

4 Source: www.fao.org/webcast/home/en/item/4781/icode/.

5 Principally refers to (i) Code of Conduct for Responsible Fisheries, (ii) Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, and (iii) Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries, and Forests in the Context of National Food Security.

6 A study commissioned by IFAD indicated that the "with project" scenario with regard to emissions for the project was a very modest carbon balance, largely due to the restoration of even a limited area of mangroves. See IFAD (2015b).

The inappropriate use of harmful substances to fertilize and protect crops on land results in harmful chemical run-off into coastal waters. Unsustainable land-based agriculture, therefore, undermines fishers' options to diversify livelihoods. The marine coastal ecosystems in the small island developing state (SIDS) of Comoros, for example, are vulnerable to these threats; coastal land erosion and silting of fragile lagoons is threatening the productivity of both agriculture and fisheries. Loss of forest cover increases soil erosion and causes downstream sedimentation, contributing to the loss of critical coastal and marine habitats, such as coral reefs, seagrass beds and mangroves. Dynamite fishing and "reef gleaning", where fishers break down coral beds to collect invertebrate animals, leave behind fields of dead coral rubble. The Integrated Ecological Planning and Sustainable Land Management in Coastal Ecosystems in the Comoros project supported by IFAD and the Global Environment Facility (GEF) aimed to support longer-term ecological restoration, and better controlled and sustainable agricultural and fishing practices. It contributed to the restoration of degraded marine sites, improved soil and water conservation practices and helped to stem the disappearance of reefs.

Contributing to better nutrition outcomes

As outlined above, the potential contribution of fisheries and aquaculture to better nutrition outcomes is immense, and the example from Bangladesh shows how integrated homestead production incorporating small fish ponds can make a difference. Today, however, the majority of IFAD-supported projects are related to value chain development that contributes to *"inclusive and sustainable rural transformation"* (IFAD, 2016) in line with Agenda 2030. IFAD knows that special efforts are needed to make sure that value chain development is indeed inclusive and works for poorer households, women and youth. IFAD has been working in collaboration with the International Food Policy Research Institute and the governments of Canada and Germany to identify entry points to enhance nutrition outcomes along value chains, including fish value chains. Research in Indonesia, for example, has helped to shape IFAD's corporate guidelines on how to design nutrition-sensitive value chains (IFAD, 2018b). Box 3 presents a summary from Indonesia's Smallholder Livelihood Development Project.


Supporting women's and youth empowerment in fisheries and aquaculture

IFAD is committed to SDG 5 on gender equality, and its investments build on FAO guidelines in the sector. In the Philippines, for example, the Fisheries, Coastal Resources and Livelihood Project (FishCORAL), which began in 2016, aims to reduce poverty in the targeted coastal areas by increasing the income of fishing households through livelihood diversification and by supporting coastal households in the adoption of sustainable management of fishery and coastal resources. Specifically, the project targets a 20 per cent increase in the number of women employed in income-generating activities by 2020 and a comprehensive range of actions to empower women.⁷ Similarly, many IFAD-supported investments

⁷ See case study in United Nations Environment Programme and Gender and Water Alliance (2019).

Box 3. Nutrition-sensitive fish value chains in Indonesia

In Indonesia's eastern Maluku and North Maluku provinces, malnutrition levels are high. Nutrition challenges include monotonous diets with inadequate levels of energy, micronutrients and protein. Studies commissioned by IFAD suggest that strengthened value chains for foods such as bananas, cassava, maize, spinach, sweet potatoes and fish could make business sense for smallholders and lay the foundations for a strong local food system that sustainably delivers nutritious foods for healthy diets. These commodities were selected through a rigorous nutrition lens (see below), considering economic, business, gender, environmental and institutional aspects.

Potential commodity	Energy	Protein	Micronutrients	Contributes to further dietary diversity	Availability	Familiarity	Processing potential
 Fish	Very low	Very high	Vitamins A, B1, B6, B12	No	Very available	Very familiar	Can be processed (e.g. canned, salted)

Then the fish value chain was analysed alongside others – the summary is shown below.

Supply

- Various varieties of fresh fish, including tuna; tuna is fished year-round but no cold chain exists
- Catches of anchovies and other fish are apparently declining
- Fishing is the main occupation in many coastal villages – up to 50 per cent of income, mostly from tuna
- Some boats lack motors so must remain in-shore
- Fisherfolk may have limited capacities and lack nets and equipment for some fishing, such as for anchovies
- Federation of fishing groups has links to buyers through company with local presence; purchasers have quality standards; contract fixes prices
- Processed fish also available, including through support by SOLID
- Inland villages access fish via traders but limited supply and higher prices during rainy season

Demand

- Household consumption is mainly of *cakalang* fish, not tuna
- High market demand; in inland communities demand is for fresh *momar*
- Lower consumption of anchovies because of lower availability
- Poor families may eat fish once a day

Finally, potential interventions from a supply and demand perspective were also identified (below) and recommendations across all value chains are presented.

Fish



Supply

- Upgrade fishing boats to enable more offshore fishing and so access more and different varieties of sea fish
 - Reduce ocean pollution and maintain ecosystems for sustainable fish catches through use of environmentally friendly fishing methods and equipment
- Also nutrition value:
- Improve use of by-products and wastes (e.g. to generate fish feed for additional income)
 - Develop a cold chain to reduce waste and loss and improve food safety

Demand

- Further develop processed products that can reach new markets, such as a snack product for neighbourhood/village markets (schools, kiosks, health posts)
- Also nutrition value:
- Integrate awareness of nutrition value and preparation into village and national nutrition programmes (also for other commodities)

Source: IFAD, 2018.

target youth, such as the Aquaculture Entrepreneurship Promotion Project in Cameroon (see case study).

Fisheries and aquaculture as part of an inclusive and sustainable rural transformation agenda

Today, fisheries and aquaculture play a key role in advancing IFAD's drive to make inclusive and sustainable rural transformation a reality on the ground. A key strategy for IFAD is to bring together all its mainstreaming themes in an integrated way, so that climate and the environment, nutrition, gender and youth come together in all IFAD-support projects and programmes in a way that maximizes synergies and manages trade-offs.

The recently approved Aquaculture Business Development Programme in Kenya is an example of the new generation of projects that tackles all of these cross-cutting issues together. Smallholder agriculture and livestock production are under mounting pressure in Kenya from shortages of productive land and the negative effects of climate change, particularly on rainfed crops, pastures and livestock. In response, the mass of subsistence farmers on the margins of markets are seeking ways to adjust their mixed farming systems to minimize risks, make the best use of their scarce resources and earn a living. Despite advances in the national economy, a significant proportion of rural people remain in poverty. In this deteriorating rural economic context, aquaculture has been identified as a key diversification strategy.

The US\$143.3 million project promotes fish production in an economically and environmentally sustainable manner and will enable more than 35,000 rural households to eat better and earn more money. The rapid and continuing expansion of aquaculture in Kenya offers a major opportunity to alleviate rural poverty and malnutrition, and build climate resilience for poor households. The central idea is to assist large numbers of smallholders in becoming profitable fish producers or village-level providers of related services within a secure value chain framework and, in so doing, to promote a step-change in nutritional well-being in the wider communities. Public and private-sector investments in the aquaculture value chain are to back community-wide initiatives for good nutrition and food security through education and better access to affordable and nutritious foods. Particular attention will be given to water needs and water quality, and the suitability of different agroecological zones for climate-smart aquaculture technologies. Technologies that minimize environmental impacts are given priority, such as recirculating aquaculture systems, which are tank-based systems in which fish can be grown at high density under controlled environmental conditions. They use a closed-loop system that retains and treats the water within the tank. This kind of system uses up to 99 per cent less water than other aquaculture systems, reducing the discharge of waste, the need for antibiotics or chemicals to combat disease, and fish and parasite escapes.

Equity is also a priority: while women are engaged in most areas of fish value chains, men receive a larger share of the benefits; youth unemployment is also very high in rural areas. With this in mind, the project is aiming to slow young people's outward migration through attractive and remunerative income opportunities, and to ensure a fairer deal for women.

Special focus on small island developing states

Small island developing states (SIDS) are a distinct and diverse group of countries with specific vulnerabilities. Common traits include small size, abundance of marine resources and remoteness. Traditionally, SIDS are highly dependent on fisheries for food and incomes, especially for the poor. Great distances to major import and export markets and high sensitivity to external shocks, particularly food price volatility, further hamper food and nutrition security. These countries are threatened by sea-level rise, coastal erosion and diminished freshwater availability as a consequence of both climate change and overexploitation of natural resources. IFAD has therefore developed a specific approach for its investments in these countries (IFAD, 2014a) where sustainable small-scale fisheries, including aquaculture and mariculture of nutrition-rich fish, and strengthening fish value chains constitute one of the three strategic priorities. For instance, the Mariculture Enterprise Development Project in Maldives aimed to support development of fish value chains, including an export-oriented mariculture industry, improve fishing infrastructure and build the capacity of the Ministry of Fisheries and Marine Resources. IFAD promotes sustainable aquaculture models that create entrepreneurship and employment opportunities for the rural poor and youth, and that are based on the precautionary principle and integrated ecosystem-based approaches. These models include the culture of fish, shellfish and aquatic plants such as seaweed. Environmental education, together with incentives and disincentives at the community level, also helps reconcile food security with environmental sustainability.

Adding value to nutrition-rich fish is another thrust of the IFAD approach in SIDS. Investment in fisheries has traditionally overlooked high-value and nutrition-rich small fish, which are a source of food and livelihoods for small-scale fishers and make a major contribution to the nutrition of poorer non-fishing households that cannot afford expensive larger fish. IFAD encourages fishers to target small pelagic fish species to reduce pressure on overexploited fisheries and incur lower risks, as smaller species tend to breed faster and earlier in their lives and so recover much faster. In small-scale aquaculture systems, adding micronutrient-rich small fish can have significant impacts on household food and nutrition security. Because of their remoteness, SIDS encounter physical challenges along fish value chains, which IFAD helps to address, for example, through improved fish processing, storage and marketing facilities. IFAD helps small-scale fishers in SIDS obtain higher prices on the market, for example by facilitating access to market information and improving management skills. IFAD encourages a balance between sustainable marine production and business value chain development, and carries out training through community centres to this end. IFAD also emphasizes the empowerment of women's and youth groups along fish value chains. Finally, IFAD recognizes the importance of promoting alternative livelihoods and reducing dependence on fisheries in the longer term for many poor rural women and men.

Achieving impact at project and corporate level

IFAD-supported interventions are about achieving impact. IFAD has embraced an innovative initiative to assess impact not just at the level of individual projects, but also at the corporate level. IFAD's Impact Assessment Initiative uses a critical mass

of project-level assessments that rigorously attribute results to actions in order to determine IFAD's impact at the corporate level. Impact assessment is an approach to evaluate whether observed changes in outcomes among project target groups can be attributed to development projects that goes beyond simply comparing areas with and without projects or comparing indicators before and after projects, which often fails to account for factors that may contribute to observed changes such as economic factors, natural disasters or conflict.

Projects assessed as part of this initiative under IFAD's tenth replenishment period (IFAD10) include some with a strong focus on fisheries/aquaculture, such as the Coastal Community Development Project in Indonesia, FishCORAL in the Philippines, the Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme in Sao Tome and Principe, and other projects that include a focus on the sector as part of an integrated approach.⁸ Box 4 presents selected impacts from an in-depth analysis; the key point is that impact assessments will not only inform future project designs in Indonesia and related projects in the region, but they will also feed into a corporate-level assessment.

Impacts for individuals

At the heart of IFAD-supported interventions are people, and staying in touch with impacts felt by individual women and men is central to gaining insights beyond the statistics. While working at scale is key to making every development dollar count, any transformation agenda has to work for individuals – am I able to help my family climb and stay out of poverty? Can I eat better? Will being a woman or young or older hold me back? Can I cope with climate change? These are some of the pressing questions for individuals, and the snapshots below capture some examples of how people's lives can be changed through fisheries and aquaculture support.



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Women's cooperative leader and entrepreneur, Zeinab Osman, 22 years old.

Zeinab is a shy young woman living in the Northern Red Sea Region in Eritrea. She comes from a family of seven and left school when she reached 10th grade. She was hoping to get a job and help her family, but it was not easy in the small coastal town, where jobs are scarce. Undeterred, she decided to get involved in a cooperative of women established with the support of the Ministry of Marine Resources and IFAD. In preparation, she took part in a month-long training course on mending and making fishing nets.

The project, also expected to be supported by the Global Environment Facility, has a strong focus on ecosystem health, and cooperatives are also engaged in mangrove plantation after efforts to increase awareness of the importance of mangroves for their livelihoods. Within the cooperative of women engaged in net-making, Zeinab found a place where she sees potential to grow in the long run and learn profitable skills. It also offered a social forum for sharing ideas, and helped her to gain confidence in developing business ideas. Within a short time, she was

⁸ For example, the Agricultural Value Chains Support Project (Senegal) and the Coastal Climate Resilient Infrastructure Project (Bangladesh).

Box 4. Environmentally and economically sustainable livelihoods in Indonesia

Project name and dates: Coastal Community Development Project (CCDP), 2012-2017.

Project goal: Reduced poverty and enhanced, sustainable and replicable economic growth among the active poor in coastal and small island communities. Development objective: Increased household incomes for families involved in fisheries and marine activities in poor coastal and small island communities.

Key issues: Coastal communities, sustainable fisheries, marine ecosystems, sustainable livelihoods.

Financing: IFAD loan and grant, Spanish Food Security Trust Fund, Government of Indonesia, smallholders.

Over half a million coastal community members (503,500) benefited from sustainable livelihoods support, which was designed to help them address the impacts of destructive fishing practices, poor aquaculture management and vulnerability to extreme climatic events – some of the greatest challenges to sustainable development for coastal and small island communities in Indonesia. Project actions included mangrove replanting, establishing sea protection areas and organized community waste removal.

Household incomes increased by 132 per cent, and 94 per cent of the 1,609 enterprise groups established dealing with capture fishing, aquaculture, processing, marketing, environmental protection and ecotourism are reported to be financially viable, exceeding the planned target of 70 per cent. Many of these enterprise groups are related to the fishing industry, which is critical for local livelihoods. Furthermore, 33 community-based marine resource management areas were demarcated and ratified, 180 community-based coastal resources management groups were engaged in ecotourism activities, and 45 community ecotourism investments supported increased incomes alongside environmental rehabilitation and conservation activities such as mangrove replanting, organized rubbish cleaning and raising awareness of climate change and the negative effects of destructive fishing practices. In addition, seaweed-based product development contributed to carbon sequestration.

The project had a significant impact on food security through increased fish consumption, more income to beneficiaries to purchase other nutritious foods and more fish available in the market. It also reduced post-harvest losses. The number of underweight children decreased by 80 per cent, and while in 2013 over a third of households experienced a first hunger season, at the end of the project this had dropped to 2.2 per cent, while a second hunger season was eliminated. In terms of women's empowerment, successes include a reduced workload due to improved access to basic infrastructure and services such as water and energy. Thirty per cent of enterprise group members were women (90 per cent for savings groups and 86 per cent for fish-processing groups).

chosen as secretary of the cooperative, giving her the opportunity to learn some management organizational skills. The cooperative is in its early stages but Zeinab is planning to expand it through microcredit schemes so that women can access the basic assets to start profitable activities. Her parents' support has been important and Zeinab hopes she can be an example to other young girls. *Fisheries Resources Management Programme (FreMP), Eritrea.*



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Aquaculture entrepreneur, Michel Ntomo, 34 years old.

Born into a poor family in Cameroon, Michel abandoned his studies because of a lack of financial means. He began to provide services to fish farmers, in particular the development of ponds. In 2017, he was selected to participate in an IFAD-supported project. He received a start-up kit, training and ongoing technical support, including weekly field visits to follow up on progress, after which he set up his own small farm with two ponds. With the income from his first harvests, he extended his farm to 10 ponds. After just two years he became the owner of a small-scale aquaculture enterprise, which today employs two permanent staff and temporary workers.

The farm produces almost 300 kilograms of fish ready for sale per month. He also grows soya, corn and seeds as fish feed as advised by the project so that he can reduce costs. The project has helped to resolve conflicts over the use of precious water and has put in place a system to allow multiple uses and avoid waste. The income generated by his business, around 500,000 Cameroonian francs a month, means that Michel is now independent. The women who buy his fish for sale in local markets also benefit from a steady supply and good prices. Now Michel can raise a family and send money home to his mother, who needs this for hospital fees when she is sick. He and his family can now eat fresh fish regularly instead of having to rely on frozen fish from time to time, and he can also afford to buy meat, eggs and other nutritious foods more often. But Michel does not want to stop there, and plans to expand, offering more local employment to others. *IFAD grant: Aquaculture Entrepreneurship Promotion Project (PPEA), Cameroon.*



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Fisher, Palani Arumugam, 52 years old.

Married with three children, Palani catches prawns in the lake and not in the sea because he fishes using a traditional practice called *padu*. The practice involves dividing the lakes into eight areas. In one area they can catch only for five days a week and the rest of the days he uses the fish and line system. The system involves using two nets: one for the periphery and another smaller one that allows the prawns to move towards the innerlayered nets. For Palani, one of the most significant changes is in how he accesses markets. Palani would accept a fixed price set by middlemen but today, thanks to the project, he sells his prawns to a fish marketing society established by the project, which auctions them rather than giving a fixed price. Before he would sell at 150 rupees a kilogram but today is earning around double.

The project also trained fishers in accessing finance and saving to help them climb out of debt. The Fish Marketing Society helps him to manage his income prudently. He and his wife no longer have to argue about how to cope with household expenses and she manages her own budget. The innovative and affordable asset insurance he has taken out, brokered by the project, means that he and his family are much less

stressed about bad weather; instead of living from day to day they can plan to keep their children in education. *Post-Tsunami Sustainable Livelihoods Programme for the Coastal Communities of Tamil Nadu, India.*

Fisher and entrepreneur, Userne Herminio, 42 years old.

Userne lives in Zalala, Mozambique, and is in charge of a family of 11, including the children of his brother, who passed away. He has been fishing since he was at school, but he only managed to increase his income after an IFAD-supported project helped him acquire a sturdier boat. He also received a kit with fishing nets and gear, and training in good practices. With the extra income he bought a piece of land and built a house for his children.

He feels that his family nutrition is also improved; he and his wife took part in nutrition capacity-building, and his wife joined a nutrition training group. He explains that he has changed the way they store and cook the fish to make it more nutritious. Before they used to eat cassava flour, but now they can buy rice, chicken and beef. The fish they produce in tanks helps them out when the sea is rough. He is also more aware of the environmental dimension and is passing on what he has learned about the conservation of species and environmental protection to his fellow fishers. He explains that they have an information campaign among fishers. He has been expanding his plans and asking for more cold storage, and can employ young people from time to time. *Artisanal Fisheries Promotion Project (ProPESCA), Mozambique.*



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Fisher and fish processor/vendor, Sawati Silimani, 30 years old.

Sawati is married with four children, and joined a community savings group facilitated by IFAD. She says, "I received two boats which allowed me to become more independent from my husband and to become a fish entrepreneur myself". When the weather is not good they can still consume the small dried fish, and the project has been providing training in improved processing techniques. Through the community savings group and extra income from the fishing boats, Sawati was able to become more independent. In a transformation of gender roles, her husband sometimes works for her on her boats, she says, smiling. She is also able to offer employment to 10 young people. *Artisanal Fisheries Promotion Project (ProPESCA), Mozambique.*



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Fisher, Maria de Fátima Mota Barbosa, 58 years old.

Maria de Fátima is also the president of the Association of Fishers of Camalaú, in rural Paraíba State in Brazil's north-eastern area. Everyone in her family makes a living from fish-farming, and she has developed a technique that is proving a great boost to the livelihoods of her family and others. They used to throw out one of the fish species caught because of its many bones and therefore low market value. Maria de Fátima and several other women in the community developed a technique to process this type of fish, so that they could sell it for a much greater profit. They now produce fillets from the processed *trahira* fish, which are proving popular even beyond her region. These fillets fetch 40 Brazilian real (R\$) per kilogram compared with just R\$6 for the unprocessed fish. Encouraged by this success, they branched into hamburgers, soups and even pâté. "Fish blood runs in my veins ... but since we had



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the idea of adding value to *trahiras*, we have more options for income". *Cariri and Seridó Sustainable Development Project (PROCASE), Brazil.*

Case studies

The following pages present a small selection of IFAD-supported interventions from Brazil, Cameroon, Djibouti, Eritrea and India, covering IFAD's five regional divisions. They represent a small part of IFAD's broader engagement in the sector.

For example, through the *Mujeres de la Amazonía cultivan pez nativo para su seguridad alimentaria y comercialización* project implemented by Fundación Centro Lianas, an IFAD grant enabled indigenous communities in Ecuador to promote the farming of *cachama*, a native fish with a good capacity to adapt and low production costs. *Kitchwa* communities were supported to build ponds for the production of *cachama* and were strengthened through the organization of training, demonstrations and exchange visits and the distribution of material (e.g. on the construction of ponds, production techniques and natural resource management). This project not only enabled a native Amazonian fish to be recovered through the application of environmentally friendly methodologies that contributed to the conservation of ecosystems, but it also improved food security of the communities by ensuring a sufficient intake of protein for families. In addition, it enabled women to gain surpluses, and 30 per cent of their production was sold in the local market, thus increasing their access to capital and boosting their decision-making power in their communities. An IFAD loan in the same country supported drip irrigation systems, where water can be stored in pools for up to two weeks. The pools where families store their excess water can double as fish nurseries. Trout, carp and tilapia keep the water free of insects and are then sold alongside the crops at the local market. The *Buen Vivir* in Rural Territories Programme shows the potential of aquaculture as a supplementary livelihoods and nutrition option in this and other regions.

The projects from which the following case studies are drawn focus on the fisheries and aquaculture dimension in different contexts as set out in Table 2. In some *cases* additional aspects such as nutrition and youth have been integrated as IFAD has reaffirmed corporate commitments in these areas. In Cameroon and Eritrea, fisheries and/or aquaculture are the main focus of IFAD support, whereas in Brazil, Djibouti and India, they are part of a multipronged sustainable livelihoods approach.

While the case studies cannot present the full range of IFAD-supported interventions, they do provide a glimpse of the immense potential that the sector holds to deliver multiple benefits for poor women and men and the environment on which their livelihoods depend.

Table 2. Case study main themes

	Brazil Aquaculture and small-scale river capture fisheries	Cameroon Aquaculture	Djibouti Small-scale marine capture fisheries	Eritrea Small-scale marine fisheries and inland aquaculture	India Small-scale marine capture fisheries
Food production	✓	✓	✓	✓	✓
Nutrition	✓	✓	✓	✓	✓
Income generation	✓	✓	✓	✓	✓
Fishing community quality of life		✓	✓	✓	✓
Knowledge and technologies	✓	✓	✓	✓	✓
Financial services		✓	✓	✓	✓
Reduced youth migration	✓	✓	✓	✓	✓
Women's empowerment	✓	✓	✓	✓	✓
Policies and institutions			✓		✓
National trade and exports		✓	✓	✓	
Habitats			✓		✓
Resilience to climate change and shocks		✓	✓	✓	✓



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Brazil: boosting nutritional and economic outcomes

Key facts

Project name	Rural Business for Small Producers Dom Távora Project
Dates	2012-2019
Target audience	Artisanal fishing communities and freshwater aquaculture producers, including women
Financing	Total US\$37,818,183: IFAD, Government of Brazil and beneficiaries
Project aims	Reduce rural poverty through implementation of business plans in agriculture, livestock, fisheries and aquaculture

Development challenges

The fisheries and aquaculture sector is an important one in Brazil and the country has ambitious plans to expand fish production to meet rapidly growing national demand and also for export. Brazil is endowed with rich freshwater resources, including rivers, estuaries, marshlands, dams and reservoirs across the country and a long coastline of over 8,400 km, which presents plenty of opportunity for fisheries and aquaculture. Artisanal fishing is especially important along the São Francisco River, the longest river that runs entirely in Brazilian territory. The river has abundant fish populations of more than 200 species in its flood-pulse



ecosystems⁹ with seasonally flooded lagoons. Fishing is a significant economic activity that is also culturally important. Historically, São Francisco River has sustained thousands of families in the watershed, who depend on the river's resources for their livelihood. While fishing is typically a male profession, women are involved in some fishing practices, mostly in fish processing and marketing. Fishers with boats and gear tend to have higher net incomes than those who work for intermediaries, and better organization and marketing arrangements are key to improving fishers' incomes. However, there has been a decline in fish stocks and species diversity in the river, which calls for stronger fisheries management practices to ensure better resource conservation and livelihood security.

Although serious commercial aquaculture started relatively recently, production has increased rapidly since the mid-1990s, making Brazil the second biggest aquaculture producer among Latin American and Caribbean countries. The country reached production of 595,000 tons of fish from aquaculture in 2017 (FAO, 2019). Aquaculture started with introduced species such as shrimp, tilapia and carp, but has gradually shifted to native species and now focuses more on the domestic market. Freshwater fish aquaculture is the dominant form, comprising nearly 80 per cent of national aquaculture production, followed by shrimp. This high aquaculture growth has been achieved through increased investment in hatcheries, massive production of fingerlings of improved genetic quality, introduction of net cages, development of higher-quality fish feed, larger reservoirs and a ready market for value-added fisheries products in Brazil.

9 Ecosystems that are considered to be enriched by flooding.

Key barriers for small-scale producers to engage in fisheries and aquaculture include:

- (i) Expensive fish feed: more efficient production and lower feed costs are needed to make aquaculture competitive.
- (ii) Unsustainable fish stocks: declining fish catches in inland rivers due to a combination of factors, including increased use of small mesh nets, reduced water levels and increased salinity in the estuary, call for improved fisheries management to reduce the risks of overfishing.
- (iii) Lack of organization of fishers and fish farmers: artisanal fishers are not organized in strong associations and tend to operate individually, while stronger fishers and fish farmers' organizations can help to strengthen their negotiating power in order to obtain better prices, as well as making high-quality marketing infrastructure more affordable so post-harvest losses can be reduced.

Project response

Under Dom Távora, IFAD is supporting eight artisanal fishers and six aquaculture associations (representing 516 households or approximately 2,580 people) to develop sustainable livelihoods from artisanal fishing and aquaculture. Of these, 233 families belong to associations either entirely composed of women or in which women are the main actors and provide leadership. The project finances economically viable business plans, and aims to increase production from artisanal fishing and aquaculture of fish and shrimp, and improve market access through these associations. Artisanal fishing activities under the project take place in the lower reaches of the São Francisco River, while aquaculture is practised both in the river and in fish ponds.

With regard to fisheries, the project's investment approach is to provide smallholders with the assets needed to improve fishing activity and increase fish production, and in some cases, equipment for fish preservation and processing. Artisanal fishers, through their fishing associations, get new fishing boats, boat engines, fishing gear and navigational safety kits. So far, 101 boats and related equipment have been provided to over 200 fishing households, as each boat is shared by two households. Of these, 54 recipients were women.

Aquaculture interventions target over 185 households, each involved in the production of fish or shrimp either in net cages in the São Francisco River or in land-based fish ponds. The project's approach is to provide aquaculture producers with cages or ponds and inputs (fingerlings and feed) to enable one cycle of production, with the expectation that farmers will reinvest afterwards in continuous profitable production cycles. Farmers also receive training and extension support to develop their skills in aquaculture production.

Results

- Increased incomes: artisanal fishers expect to catch and sell an average of about 100 kg of fish per month (compared with the average of 25-30 kg before the project) at a price of R\$12 per kilogram, earning them R\$1,200 per month. The recurrent costs in artisanal fishing are low, mainly replacement/repair of nets and maintenance of boats, making this a highly profitable activity. The income from artisanal fishing is above the minimum government wage of R\$900 per month.
- Improved household nutrition: On average, in each participating family, each month some 25 kg of fish caught through artisanal fishing is reserved for household consumption, therefore contributing to better nutrition in the project area. This contribution is significant in a region with limited options for access to animal proteins. Fish from aquaculture tends to be sold and the income used to buy other items – nutritional education can help to promote the use of part of the income to buy highly nutritious foods. Another possibility identified is that of raising several species (polyculture) in aquaculture tanks; the species with a lower market value are mainly used for domestic consumption while the higher-value species go to market. There is evidence that tank aquaculture already includes tilapia, tambaqui and other species, and this should be built upon in order to meet both market demand and household nutrition needs.
- More sustainable fishing practices: the project has been placing great emphasis on good fishing practices. For example, it only provides 50-mm mesh nets, while other fishers in the area commonly use smaller, 20-mm mesh nets, which are not sustainable as they catch the immature fish. Aquaculture-related business plans need to obtain a licence from the state environmental agency. However, more comprehensive interventions such as fish stock management are still needed to further tackle this issue.
- Aquaculture activities employed by the project are technically sound – the net cages are properly constructed, and the fish are well stocked and growing healthily. From aquaculture, the yield is about 550 kg per cage per year, worth about R\$3,805. The annual recurrent costs are estimated at about R\$2,580 per cage, so it is clear that the activity is profitable and promises to be financially sustainable after the project closes. Each household has an average of three cages, which bring in a net profit of R\$3,675 per household per year. These are relatively small cages and there is adequate space to expand the investments further without causing significant risk to the environment. Other ways to increase income from aquaculture include reducing the cost of feeds, formulating feed from locally available ingredients, introducing more efficient feeding methods, stocking larger sizes of fingerlings and employing better marketing strategies. For pond aquaculture, smallholders can integrate fish production with other farm systems, including crops and small livestock.
- A learning experience for IFAD in a new sector in the country: the knowledge developed and the networks forged with government agencies, service providers and market linkages put IFAD in a sound position to further assist the smallholders in this sector in support of income, nutrition and environmental outcomes.



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Cameroon: aquaculture offers youth a future

Key facts

Project name	Aquaculture Entrepreneurship Promotion Project (PPEA) ¹⁰
Dates	2016-2019
Target audience	300 small-scale farmers, and total indirect outreach of 1,500 farmers, of which 30 per cent are women and 50 per cent youth
Financing	Total US\$1 million IFAD grant

Development challenges

In Cameroon, national demand for fish is booming, but the sector is struggling to keep up. Annual production figures were around 154,000 tons in 2013 and Cameroon had to import over 190,000 tons (FAO, 2017). Artisanal fish production has remained virtually unchanged since 2008 in the absence of adequate technical training for artisanal fishers, sufficient technical equipment and qualified personnel, and access by fishers to financing to buy high-performance equipment. This requires private-sector involvement, the promotion of small-scale fish-farming enterprises, and the removal of institutional and technical constraints. Youth unemployment in Cameroon is of concern at 17.6 per cent in 2017.¹¹ Similarly, nutrition remains a challenge, with only around a fifth of all children having an acceptable diet.¹²

10 PPEA: Projet de Promotion de l'Entreprenariat Aquacole.

11 Source: ILOSTAT Cameroon page. Accessed May 2019.

12 Source: www.unicef.org/cameroon/english/nutrition.html.



Project response

The Aquaculture Entrepreneurship Promotion Project (PPEA) was approved in 2016 to pilot IFAD's first engagement in aquaculture in the country, and has generated results and lessons, leading to a new proposed investment aquaculture project in the pipeline. The Sustainable Aquaculture Development Plan for Cameroon of 2009 suggests that inland aquaculture production could be increased by more than 50 per cent to cover 5 per cent of local fish demand, but the Plan has not yet been implemented. In response to a request by the Ministry of Livestock, Fisheries and Animal Industries, IFAD has been providing technical and financial support to pilot individual and collective private initiatives in fish-farming, in order to assess their contribution to meeting local demand and creating job opportunities in rural and peri-urban areas – especially for young people. These actions can be seen as kick-starting the implementation of the national plan on a pilot scale. Whereas previous projects focused mainly on production, PPEA has been supporting the promotion of enterprises at different points along the value chains including inputs, production, feed and commercialization.

Depending on their chosen activity, young rural people with an interest in exploring aquaculture as a strategy to move out of poverty have been provided with starter kits and extensive technical advice, including ongoing support. Some have chosen to start up a hatchery for fingerlings and others have chosen to grow out these fingerlings to adult fish and sell them onwards. The project has taken on an important facilitation role between the various actors along value chains.

The major innovation of PPEA with respect to previous projects in the sector is to introduce a business incubator approach, in line with the overall approach adopted for projects under IFAD's country programme in Cameroon.

Thérèse from Mbalmayo in Cameroon is 27 years old and an engineer in fisheries science. After graduation, she wanted to specialize in fingerling production. Thanks to the training, technical assistance and start-up support provided by the IFAD-supported Aquaculture Entrepreneurship Promotion Project, she was able to start her business. Today, she has a small farm, which produces between 10,000 and 15,000 fingerlings every month, and she earns up to 300,000 Cameroonian francs a month (around US\$500). With this she is able to provide employment for her brother and support her sister's schooling, and is considering expanding her business to employ more people.

©IFAD/David Paqui



Results

- Just over 300 small aquaculture farms have been set up, achieving the target for the pilot, half of which are headed by young people and just over a third by women. While they took up various activities along the value chain, the vast majority chose to grow out fish. Over 1,000 ponds have been created.
- Capacities in production and value addition have been strengthened, and the nutritional benefits of fresh fish further inland in Cameroon have been promoted through campaigns. To promote sustainability, manuals on production and business management have been produced and disseminated to entrepreneurs.
- Private-sector linkages have been set up to ensure adequate, good quality feed, as this is one of the key limitations. At the same time, locally produced fish feed is helping entrepreneurs to bring down input costs as imported feed is expensive.
- Water management has been improved using closed and raised systems, and various simple techniques have been introduced to combat soil erosion.
- Profits have increased by an average of 15 per cent, but some entrepreneurs have achieved much more (see individual impact story about Michel Ntomo in the introduction).



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Djibouti: partnerships to boost sustainable fishing practices

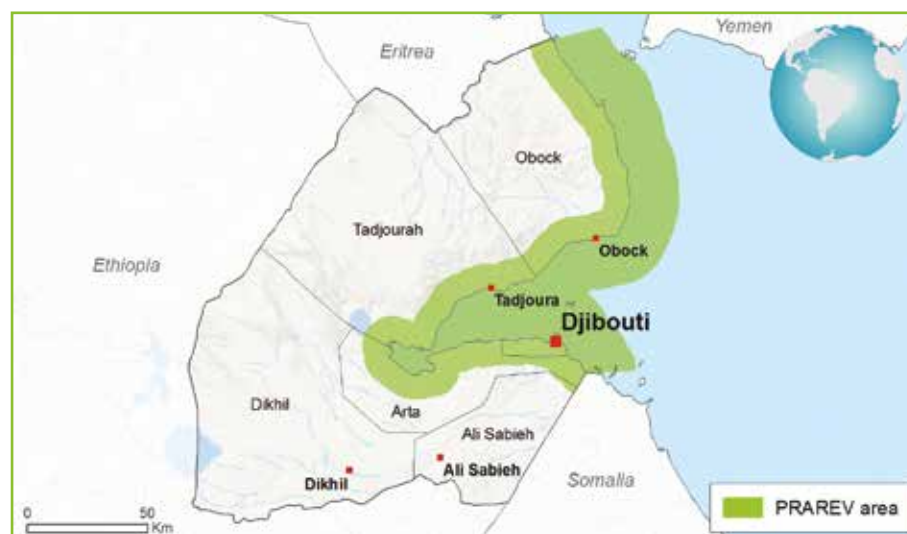
Key facts

Project name	Programme to reduce vulnerability to climate change and poverty of coastal rural communities (PRAREV ¹³)
Dates	2015-2020
Target audience	Coastal communities and fishers, particularly women and young people
Financing	Total US\$13,339,443: IFAD including ASAP, FAO, WFP, domestic financing institutions, Government of Djibouti, smallholders
Project aims	Support coastal communities affected by climate change to boost their resilience and reduce vulnerability, and to sustainably manage coastal resources

Development challenges

The Republic of Djibouti boasts a coastline of more than 350 kilometres on the Red Sea, with biodiverse marine ecosystems in its mangroves, coral reefs and seagrass beds. But things are changing. Key findings of an in-depth assessment indicate that

13 PRAREV: Programme d'appui à la réduction de la vulnérabilité dans les zones de pêche côtière.



large stretches of the coastline face significant ecosystem disruption, mainly related to coral reefs and mangroves. Other stretches are exposed to gradual inundation and saltwater intrusion. Climate change is affecting water temperature and ocean currents, which adversely impact fishery resources. The rise in sea temperature is causing fish migration further from the coast. Fishers do not have the equipment and skills to maintain their incomes from this sector. Ecosystems and coastal habitats such as coral reefs and mangroves, which are vital for fish stocks, show considerable degradation. Furthermore, sea-level rise and extreme weather events, such as storms and floods, are impacting coastal infrastructure, including production and post-production equipment. Extreme erosion of the coast is also a challenge (Appelquist and Balstrøm, 2014).

Malnutrition was also identified as a problem, and the baseline study for this project examined the accessibility and quality of household food consumption, including dietary diversity. This was done by looking at the number of food groups consumed in the previous seven days and also the number of days that a particular food group was consumed. Diets were found to be lacking in diversity, and families were mainly eating cereals, with few other food groups such as vegetables and animal proteins consumed in the previous seven days. The Tadjourah Region fared worst, with the lowest prevalence of households with adequate diets.

Women are key stakeholders within fishing value chains; they are in charge of 80 per cent of fish sales and support production by making small loans to fishers who, in turn, provide them with fish.

Project responses

The objectives of PRAREV are to improve climate-compatible livelihoods and incomes of coastal communities through strengthening cooperatives, and to improve fish catches without harming the environment and longer-term sustainability. Support to fish-based value chains goes alongside coastal zone management actions, and the project director is also the director of fisheries in the relevant ministry, thereby bringing important technical expertise to bear. Vulnerable people relying

on degraded coastal resources are supported through climate-resilient infrastructure, including for fishing. Renewable energy equipment, ice plants and coolers/insulated containers improve the conservation of fish products and help to protect fisheries value chains affected by climate change, as does an improved supply of freshwater. Regular information campaigns for fishers about responsible fishing are helping to spread awareness of the serious impacts of overfishing.

With regard to longer-term sustainability, the project is supporting the integration of climate change into the national policy framework, including providing technical support to update policies related to the national Fishing Code. The project is also providing institutional support to the Fisheries Directorate. A key innovation is the collaboration between the Rome-based agencies (RBAs) of FAO, IFAD and WFP. The RBA interventions encourage sustainable fishing practices, ensure the availability of marine resources, and contribute to climate-resilient activities and natural resource management.

PRAREV is helping to increase the availability of fish as a nutritious food, increase incomes so that people can afford better foods more regularly and empower women through the income obtained from selling the fish. The project is extending credit for fishers and fish sellers to buy low-impact fishing boats to reach fish stocks, and supporting women to buy tricycle carts with cooling equipment. These actions are helping to make fish more accessible to local communities and increasing local demand. In order to further strengthen the link between project actions and nutritional outcomes, the project is integrating nutrition education into capacity-development initiatives, so that women selling fish understand the importance of also consuming some of the fish they sell as part of a healthy diet for their families.

The project has a strong focus on women, including (i) provision of drinking water, (ii) support for women's fish marketing organizations and income-generation activities specifically for women, and (iii) a partnership with the ministry responsible for gender to deliver some activities.

Results

- PRAREV is working to reach 29,000 household members to improve their resilience to climate impacts, and the capacities of 13 rural organizations along various points of fish value chains have been strengthened.
- Nutritional outcomes have been improving in the project area as a result of project actions, including awareness-raising campaigns for households that focus on the optimal conservation conditions of seafood, appropriate hygiene in the preparation and consumption of food, and the repair or acquisition of cold storage equipment.
- Fisheries facilities are being constructed at Tadjourah and Obock, which will contain a combination of market, processing and storage facilities.
- A background study on the Djibouti fisheries sector by the FAO, studies on the state of coral reefs and mangroves to guide the rehabilitation of the Godoria mangrove, and studies on the availability and quality of fisheries-related resources, are all examples of the extensive evidence base supported by the project. These have been shared with the relevant ministry to support their future policy development.

- The first and only marine biology laboratory in Djibouti was supported by the project; there are now plans to create a nursery for mangrove species, independently of project funding.
- The project aims to bring 100 hectares under climate-resilient practices and to ensure that at least 2,500 households adopt environmentally sustainable and climate-resilient practices. The emphasis on responsible and sustainable fishing practices has led to much greater awareness among local communities, and local authorities feel that even modest payments could be asked of fishers to finance the restoration and protection of mangroves on which their livelihoods depend.
- The RBA collaboration is enabling a holistic approach through the project. The WFP delivers “food for work” for local communities engaged in the conservation of mangroves. Collaboration with FAO is focused on establishing a monitoring and evaluation system for fishing resources and the natural resources co-management mechanisms. Interventions through the RBA partnership have also promoted sustainable fishing practices among almost 1,300 fishers and ensured the availability of marine resources, thus improving access to a nutritious, healthy and sufficient diet for about 9,000 vulnerable people so far.



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Eritrea: expanding options for young people and women

Key facts

Project name	Fisheries Resources Management Programme (FReMP)
Dates	2017-2023
Target audience	87,500 people including small-scale fishers; rural smallholders (non-fishers mainly involved in subsistence agriculture and keeping small livestock) living around the target water reservoirs in inland zobas (regions) and interested in economic activities along the inland fisheries supply chain; youth entrepreneurs (fishers and non-fishers) interested in establishing business enterprises/cooperatives to respond to market demand for fishery products and services; women, and especially women-headed households, accounting for at least 30 per cent of target groups; and internally displaced people
Financing	Total US\$37,708,000: IFAD, Government of Germany, Government of Eritrea, smallholders
Project aims	To contribute to household food and nutrition security and the alleviation of rural poverty, through increased incomes, better nutrition and sustainable management of natural resources

Development challenges

Since independence, the Government of Eritrea has made efforts to improve socio-economic conditions for its people but there are challenges ahead.



Sixty-five per cent of the population lives in rural areas and depends mainly on rainfed crops, livestock and fisheries, affected by frequent droughts and environmental degradation. Eritrea's semi-arid climate negatively impacts agricultural production, making access to adequate food a challenge, especially for the poor. On the other hand, Eritrean coastal waters for fishing are endowed with a large number of species, with an estimated annual sustainable yield of between 80,000 and 100,000 tonnes, meaning there is significant potential to develop the fisheries and aquaculture sectors (FAO, 2016a). For a number of reasons, including conflict, it is estimated that the country is exploiting only around 15 per cent of its fishery resources, and fish-based protein was estimated to form a much smaller part of people's diet in Eritrea compared with other African countries. Sustainable development of the sector is believed to hold good potential to contribute to food security and nutrition, as well as to the national economy (Breuil and Grima, 2014).

Young people represent about a third of the population and their migration to urban areas is of great concern. Women's socio-economic activities are constrained by local traditions, remaining largely confined to home-bound caring roles – though change is under way.

Project response

FReMP supports the Ministry of Marine Resources to ensure marine fisheries resources are utilized in a sustainable manner to improve the livelihoods of coastal communities through the precautionary approach. Specifically, the project aims to (i) support increased fish production while ensuring this does not exceed prudent levels; (ii) support the Ministry's monitoring and enforcement capacities; (iii) update official estimates/adjusting targets as needed; and, importantly, (iv) invest in protecting the ecosystem, including community sensitisation and mobilisation events, and training on mangrove plantation, conservation and protection in various sub-zones, including at Massawa, Dahlak and Hirgigo. Suitable sites have been identified for planting new mangroves at Dahlak Island, Gonforor and Hakamango.



Abdu, standing in front of his boat, has already been a fisher for more than 20 years, following in the family tradition. He comes from Dissei Island. He is now able to go fishing at least 10 times a year thanks to the engine and nets he receives from the project via a micro-credit scheme as a member of the cooperative of fishers. Abdu doesn't see himself doing anything else: "I will be lost if someone takes me to work somewhere else". He is now thinking about even better technology, such as GPS for improved navigation and better quality nets.

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In marine areas, the project is designed to address limitations including lack of appropriate fishing boats and equipment to support small-scale fishers and subsistence "foot fishers", predominantly women and youth. Despite government investments in water reservoirs, inland fisheries resources are barely exploited as communities are not aware of the nutritional benefits and lack fishing skills and equipment – fishing is not part of their tradition. The project therefore aims to create awareness, build skills and enable especially youth and women to acquire equipment for fishing, processing and marketing.

FreMP is exploring the potential of aquaculture using cages within water reservoirs, or external ponds that draw water from them. The project is piloting approaches to demonstrate good practices and fine-tune models for replication. An environmental lens is built in as inland fisheries are potentially vulnerable to the deterioration of ecosystems in the watersheds above the reservoirs. The project will therefore assist in developing climate-resilient conservation plans, which will also



Amna and Fatna have been trained in making and mending nets. Amna is a single mother and has become the chair of a women's cooperative. She has also been trained in planting mangroves. Fatna is 20 years old and dreams of being able to earn her own living. She is considering supplementing her income with off-farm handicrafts.

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support the co-benefits of improving crop and livestock production. It promotes employment opportunities for youth through the creation of groups to engage in microenterprises and small businesses in fish and fish products in coastal and inland communities. The project is using incentives to support the participation of women and, in particular, women heads of households, to increase incomes through fish value addition and marketing as well as net making and mending. Proposals for financial and technical support presented by cooperatives with at least 30 per cent women heads of households as members receive preferential consideration. A gender and youth action plan will further help to operationalize commitments under project components. Intrahousehold power dynamics will be addressed by “household methodologies” and cover equitable workloads and decision-making. Climate-smart investments in labour-saving technologies, such as solar fish driers and improved access to water, will also benefit women.

Results

- The project targets approximately 5,000 young people, comprising 30 per cent of all beneficiaries, and women will account for at least 30 per cent.
- Climate risk analysis and vulnerability assessment in both inland and marine fisheries are being carried out.
- It is expected that household assets will increase, annual net income of artisanal fishers, processors and traders will increase, and fish consumption will go up. Household dietary diversity is also expected to increase.
- Fish production in the country is expected to increase, as well as the amount of fish available to consumers. Fishers cooperatives will be supported to receive adequate inputs to sustainably increase production.
- Nutrition training is being carried out through cooperatives and ministry officials.



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India: artificial reefs and insurance innovation

Key facts

Project name	Post-Tsunami Sustainable Livelihoods Programme for the Coastal Communities of Tamil Nadu (PTSLP)
Dates	2007-2020
Target audience	630,000 coastal dwellers in villages affected by the tsunami including: (i) coastal fishers using beach-launched craft; (ii) wage labourers employed in the fisheries and agricultural sectors; (iii) small-scale women fish vendors and processors; (iv) small and marginal farmers; and (v) other marginalized groups
Financing	Total: US\$113,451,986 from IFAD, domestic financing institutions, national and local government, beneficiaries
Project aims	To build self-reliant coastal communities, resilient to shocks and able to manage their livelihoods base in a sustainable manner

Development challenges

The tsunami in the Indian Ocean on 26 December 2004 caused untold devastation in India. Tamil Nadu was one of the worst-affected states, and the fisheries sector suffered major damage. Many fishers lost boats and gear, and could not work. Coastal households not only suffered direct losses in the tsunami, but also faced new threats to their livelihoods. Poorer fishers and boat crew were unable to go to sea until communities decided that issues with the government over compensation



for damaged boats had been settled and all boats repaired. The livelihoods of many of these households were vulnerable even before the tsunami. Not only were artisanal fishers under pressure from larger trawlers, but small-scale women fish vendors and processors were limited to handling only low-value fish as they lacked the capital and know-how to improve their efficiency and reduce processing and transport losses. Other vulnerable groups including tribal communities were restricted to fishing in increasingly polluted backwaters for low-value fish.

Project responses

Originally conceived as a post-disaster rehabilitation intervention, the PTSLP was later redesigned to include a comprehensive package of interventions: from coastal area management, rural finance and risk-transfer instruments, employment generation and skill training, to community-based sea safety and disaster management. The project set out to develop viable enterprises and resource management systems, owned and operated by poor men and women in the region affected by the tsunami, and supported by community and other appropriate institutions. The coastal area management includes a focus on fisheries resources, including awareness creation through workshops on environmental impact, safe fishing practices and the diversification of fishing operations at the village, district and state levels.

One innovation is the use of artificial reefs. The Tamil Nadu State Department of Fisheries identified artificial reefs as one of their key interventions for the conservation and management of fisheries resources. The Fisheries Department's Policy Note (2014-15) explains the government-driven initiative to develop fish habitats, by setting up artificial reefs in the inshore waters along the state's marine sector, as a conservation and stock enhancement measure. The idea is that these reefs would help to enhance fish production by providing shelter to marine aquatic organisms and act as a barrier against bottom trawling operations. The use of artificial reefs is provided for in a number of international conventions and agreements, such as the Code of Conduct for Responsible Fisheries (FAO, 1995). Environmental benefits include the creation of biodiversity hotspots and a decrease in the speed and force



PTSLP has also been promoting alternative livelihoods to fishing. Aiyisha and friends are making handicrafts out of palm leaves. Before the project, they would take loans from the informal financial sources that would charge an interest rate of around 48 per cent per annum. Further, they had to sell fish at a lower price to middlemen to whom often they owed a debt. The project helped them to set up a joint liability group known as Bishmi Palm Leaf and to access loans at an interest rate of 12 per cent from formal financial institutions. The project also helped them to develop business plans and to secure their own markets directly. As a result, their input costs fell and their revenue increased dramatically from 2,000 to 8,000 rupees a month. The women on the left have also benefited from similar support and seen their incomes rise.

of waves, thereby protecting coastlines from the effects of storms (UN Environment et al., 2017).

Another innovation is a form of asset insurance that is accessible to very poor coastal dwellers who often face unpredictable weather and other shocks. The PTSLP has therefore been enrolling rural coastal people in various microinsurance schemes such as group insurance, health insurance for rural poor and their family members, personal accident insurance, house insurance, group insurance for female fish vendors and credit life insurance for the microcredit extended to female fish vendors. However, an innovative product design was needed to bring more affordable insurance to small-scale fishers for their assets. Asset risks for small-scale fishers include loss of or damage to fishing vessels, equipment and gear as a result of natural disasters, sea erosion, accidents and collision with other vessels due to bad weather. Many fishers reported that even though they had taken out expensive insurance, they had never received compensation, which led to scepticism and a reluctance to take out insurance.

The project began by forming the PTSLP Fishing Asset Risk Mutual Society (P FARMS) in which district-level fishers federations are the founder members. P FARMS works with private insurance companies to make asset insurance accessible to poor fishers, ensuring a rapid and easy claim procedure backed up by increasing fishers' awareness of savings and of reduction measures. The risks covered include natural disasters, riots and accidents. The programme is an innovative hybrid model of a mutual risk-sharing mechanism covered by a risk management fund run by P FARMS and drawn from membership fees, and commercial insurance against natural disasters. This approach means that members like Narendran (pictured) can receive compensation for their losses from collective contributions, which insurance companies are not able to offer at an affordable premium.

Results

- PTSLP has completed the deployment of 200 artificial reefs in each of 12 sites that were identified by the Central Marine Fisheries Research Institute at Madras Research Centre, which also carries out monitoring after the reefs are deployed.



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A preliminary study to monitor the impacts of artificial reefs indicates that they are contributing to improved diversity of fish species as well as an overall increase in fish stocks in these areas. The study report reveals that the reefs have improved the fishery potential of certain groups of fish such as perch and carangids. This was corroborated by fishers, who observed that there are better catches around the areas where reefs are located. The direct beneficiaries are the small-scale hook and line fishers, who have reported an almost 50 per cent increase in incomes attributed to reef fishing, and significant reduction in boat fuel consumption. The reefs act as aggregating sites for breeding fishes, and juvenile recruitment¹⁴ in the reef area is immense. The reefs also attract bait fish, which fishers use to catch economically valuable pelagic fish slightly offshore. Fishers are of the opinion that the reef area should be increased by deploying additional reef structures, horizontally across the sea bed and vertically in layers. The reefs have been received very positively by fishers and the Department of Fisheries and there is potential and strong interest to replicate them in new areas.

- The Tamil Nadu State Department of Fisheries has shown interest in scaling up the fishing asset insurance to cover all 35,000 small crafts in the coastal area of Tamil Nadu. The scheme has gained momentum, with 5,888 boats and engines insured as of 31 March 2018, within four months of being launched. The insurance premium is lower than other available products as it takes into account the age of the boat and engine.
- The project won two prestigious national awards in 2019 from the SKOCH Group, an Indian think-tank dealing with socio-economic issues, for its work on financial inclusion for small-scale fishers and entrepreneurs in coastal communities.
- In addition, as of 2017:
 - Approximately 110,000 people were receiving project services, of whom 95,000 were women and 15,000 men. Project services were reaching over 8,800 groups.
 - In project areas, 80 per cent of households were earning an average income of more than 6,000 rupees a month compared with 64 per cent in non-project areas.
 - Fishing and fish marketing was the main source of livelihoods for 32 per cent of households in project areas compared with 2 per cent in non-project areas – possibly because of comprehensive support from the project.
 - Over 1,300 coastal resource plans and studies had been developed.
 - Over 4,000 young people had received vocational training, and around 1,600 of these had already found jobs.
 - Almost 9,000 school children had been on learning visits about emergency responses and disaster preparedness.

¹⁴ Recruitment is the process by which young individuals (e.g. fish) become part of the adult population. Source: <http://reefresilience.org/understanding-coral-reef-resilience/recruitment/>.



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Lessons learned and the way forward for IFAD's engagement in fisheries and aquaculture

A recent evaluation by the Independent Office of Evaluation at IFAD (IOE) highlighted a number of important lessons learned that should be integrated into the future work of IFAD in addressing aquatic resources:

- It is important to ensure there is adequate technical expertise in aquatic resource management.
- Adequate technical and management attention should be paid to the specificities of aquatic resources issues when these are part of multisector projects.
- Support is needed for the development of national norms and policies for aquatic resource management.
- IFAD's long-term commitment to the sector in each country is necessary in order to achieve sustainable results.
- Contextual analysis – in particular of the upstream and downstream environments – must be adequate when proposing value chain development based on aquatic resources.
- Monitoring must be effective and must capture indicators that measure progress in livelihoods that depend on aquatic resources.
- Information should be shared among successful projects.

New artisanal boats provided by the IFAD Dom Távora project.

The same evaluation also proposed recommendations for further strengthening IFAD's engagement in fisheries and aquaculture to achieve "inclusive and sustainable rural transformation" (IFAD, 2016). These have been embraced by IFAD and the key thrusts are:

- **Enhance engagement in aquatic resources** and especially in SIDS, most coastal states, and in those with sufficient inland water resources, increasing support to primary target groups including women and youth in value chains. This should include increasing Member States' awareness of IFAD's capacity to support the development of fisheries, aquaculture and coastal zones.
- **Increase collaboration**, especially with other United Nations technical agencies, CGIAR bodies, regional fisheries bodies and organizations, and national fisheries and aquaculture research institutions, to draw on their technical expertise including through country offices and the strategic use of grants.
- **Balance projects focused exclusively on aquatic resources with those integrating them as part of a livelihoods diversification strategy**, but in both cases ensure that these dimensions receive attention and are not overshadowed by land-based approaches.
- **Step up attention to social development issues**, including gender equality, inclusion of youth, decent work aspects, and the rights and obligations of beneficiaries and other stakeholders, given some of the inequalities known to characterize the sector.
- **Systematically incorporate environmental sustainability and resilience to climate change**, scaling up successes in providing alternative livelihoods for fishing communities.

The latest edition of *The State of World Fisheries and Aquaculture* by FAO, a key IFAD partner, projects that by 2030, combined production from capture fisheries and aquaculture will grow to 201 million tons. This represents an 18 per cent increase over the current production level of 171 million tons. Future growth will require continued progress in strengthening fisheries management regimes, reducing loss and waste, and tackling problems such as illegal fishing, pollution of aquatic environments and climate change, the report adds. IFAD is ready to support Member States to meet their national development priorities through support to fisheries and aquaculture in partnership with others, and is committed to supporting more projects in this area.

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