



RESEARCH
PROGRAM ON
Fish

Led by WorldFish



Supporting more sustainable,
productive and inclusive
fish agri-food systems

ANNUAL REPORT
2018

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FISH at a glance

The CGIAR Research Program on Fish Agri-Food Systems (FISH) is a multidisciplinary research program led by WorldFish in partnership with the International Water Management Institute (IWMI), James Cook University, the University of Greenwich and Wageningen University & Research. A fish agri-food system is an interconnected and interdependent system involving components of fish production, through to processing, marketing and consumption. FISH, in collaboration with other research and development partners and a diversity of stakeholders, develops and implements research innovations that optimize the individual and joint contributions of aquaculture and small-scale fisheries to reduce poverty, improve food and nutrition security and sustain the underlying natural resources and ecosystem services upon which both depend.

Our vision

Resilient fish agri-food systems that deliver sustainable increases in socially and gender-inclusive production and equitable distribution of nutritious fish to those most in need.

Our mission

To deliver evidence-based solutions that address the complex challenges and opportunities in fish agri-food systems in the developing world.

Our beneficiaries

FISH works to reduce poverty and improve food and nutrition security for fish-dependent households and communities as well as the processors, traders and consumers of the fish they produce.

Our research primarily targets the needs of small-scale fishers and fish farmers in low-income, food-deficit countries in Africa, Asia and the Pacific. We focus particularly on developing the capacity of women and youth to participate in decision-making around aquaculture technologies and small-scale fisheries management, as a key enabler of impact.

As fisheries and aquaculture adapt to changing ecological challenges and opportunities, our work on climate-smart technologies and production systems and mitigation strategies is building adaptive capacity and resilience to external shocks for fishers, farmers and other stakeholders in fish value chains.

Message from the Chair of the Independent Steering Committee



Nigel Preston

Chair, Independent Steering Committee

FISH made progressive advances in all aspects of its operations in 2018, including executing the annual plan of work and budget, recruitment, funding, fulfilling reporting requirements and planning for the future. The leadership team and all participants are to be congratulated on their achievements as well as their commitment to addressing a few key areas for strengthening.

These areas were identified by the Independent Steering Committee (ISC) following an in-depth review we conducted of the program during the year. The ISC noted the need to ensure that the planning and delivery of the crosscutting research themes—gender, youth, capacity development and climate change—are embedded in all FISH work. In the case of gender, increased engagement with the Netherlands' Royal Tropical Institute, which includes building capacity with key partners, will enhance gender integration across the FISH portfolio.

Significant advances in research were achieved in sustainable aquaculture. For example, fish genetics research identified

several new traits for future genetic selection using genomic tools, including [feed efficiency](#) and disease resistance, which are critical for sustainable intensification under climate change.

Remarkable progress was also achieved in research, funding and recruitment for small-scale fisheries work, following a challenging start in 2017. This was facilitated by a new USD 1.5 million grant from the Oak Foundation that aims to improve collaborative governance, develop global monitoring and evaluation (M&E) systems for small-scale fisheries investments and influence policy through strategic communications.

The ISC recommended enhancing strategic discussions about fish in multifunctional landscapes, including those already underway with partners including IWMI. The collaboration with IWMI, a FISH managing partner, has already resulted in [research](#) at national (Myanmar) and global levels that holds considerable promise from a policy perspective because of the opportunities for change in water management that could substantially increase the values of inland fisheries and their contribution to food and nutrition security.

Several other partnerships with CGIAR centers and research programs are helping to build synergies on various dimensions of the food system. As an example, a partnership with the International Rice Research Institute has highlighted the need for quality research evidence on the value of integrated rice–fish production systems to inform critical policy changes that prioritize nutrition for vulnerable communities, particularly women and children in the first 1000 days. Focusing initially on the Mekong region, such evidence is also of interest for rice–fish systems in Africa.

Research quality is given a high priority in all aspects of FISH implementation, and we welcome the appointment of a dedicated M&E leader to guide the development and implementation of a rigorous M&E strategy across the program. This has been strengthened by the adoption of the Monitoring, Evaluation and Learning Platform (see page 4).

Looking ahead, the ISC's key focus in 2019 will be on strategic science guidance. The approval this year of new ISC member Dr. Marian Kjelleevold, Head of Research at the Institute of Marine Research in Norway, will bring critical expertise in human nutrition to this focus.

Message from the Director



Michael Phillips

Director, CGIAR Research Program on Fish Agri-Food Systems

FISH delivers benefits to poor and vulnerable populations by enhancing sustainable aquaculture and small-scale fisheries in Africa, Asia and the Pacific. As we look back over the program's second year, new and critical understanding of fish in food systems is clearly emerging from our work in these regions. This is reshaping traditional views about responses to the challenges posed by climate change and meeting the growing global demand for fish.

We continue to lead the way in sustainable aquaculture research through the development of genomic tools to allow the selection of tilapia based on genetic markers. These will enable us to expand our long-standing [genetic improvement research](#) beyond faster growth to introduce selection for characteristics such as disease resistance, resilience and feed efficiency. These are new and unique characteristics for tilapia globally.

Our fish disease research highlighted the global threat of [tilapia lake virus](#). As part of our efforts to improve biosecurity and disease control, we developed and deployed a new online tool for disease risk assessment in Bangladesh, Egypt and Zambia. Close engagement with government agencies has helped improve national aquatic animal health policies in these countries.

Cooperation with the Food and Agriculture Organization of the UN (FAO) and Duke University has been significant for the [Illuminating Hidden Harvests](#) study, which is assessing the contribution of small-scale fisheries to food security, nutrition and poverty reduction globally. In 2018, we developed an innovative methodology for the study, which now extends to 52 countries. The completed research, which will be published in 2020 as a major synthesis report, will help draw the attention of decision- and policymakers to small-scale fisheries, which are often underreported and undervalued in governance and policy decisions and in discussions of food futures.

In the face of threats like climate change, sustainable resource use is a key focus for FISH. In collaboration with the CGIAR Research Program (CRP) on Rice Agri-Food Systems, we brought together over a hundred participants from six countries to discuss opportunities to optimize integrated rice–fish production systems and their nutritional benefits in Myanmar and other parts of Asia. The [symposium](#) resulted in the Naypyitaw Agreement, a foundation for policy change to enable the integration of rice–fish farming practices in national development initiatives.

Moreover, a [framework](#) published in *Nature Climate Change* provided a new approach to build and analyze adaptive capacity of coastal communities across five domains. An associated FISH [program brief](#) was prepared in cooperation with the Climate Change, Agriculture and Food Security CRP to apply these principles in diverse inland and coastal fisheries systems and provide policy guidance to national governments and investors.

Our successful funding of two new postdoctoral positions for fish and climate change research, both of which will start in 2019, will increase our capacity to integrate climate change into our work.

Across the program, capacity development is one of the main ways we share our research and engage with stakeholders to inform effective policies, programs and investments. Our capacity development activities in 2018 included researchers, national partners and local communities. A total of 67,687 people received short-term training through FISH, of which 25,270 (37 percent) were women.

Many more key results and lessons learned during the year are highlighted in this annual report, demonstrating solid foundations for future work that we will continue to build on in the coming years.



Highlights from 2018

FISH made significant progress during 2018 in producing and disseminating a suite of research innovations for the sustainable development of fisheries and aquaculture across Africa, Asia and the Pacific.

Disseminating research innovations

Among these innovations are three fish genetics research platforms, providing improved generations of tilapia in Malaysia and Egypt and improved generations of three key carp species in Bangladesh. Research in these platforms has identified several new traits for future genetic selection of tilapia using genomic tools, including oxygen adaptation, [feed efficiency](#) and disease resistance, all critical traits for sustainable intensification of aquaculture under climate change.

Fish disease and biosecurity research provided new surveillance and diagnostic techniques and tools for addressing the global challenge presented by the emerging [tilapia lake virus](#). We assisted with the application of these tools in several countries to improve surveillance and policies for health management, notably in Bangladesh, Egypt and

Zambia. Several new partnerships established with private sector actors, including global fish feed manufacturer [Skretting](#), are providing new avenues for scaling innovations arising from our research.

Generating new knowledge and thinking on fish

Our research on small-scale fisheries generated new knowledge of [global human dependence](#) on marine ecosystems, indicating high dependency among 775 million people on marine fisheries, and providing the basis for more targeted management and policy interventions for vulnerable small-scale fishing communities. A study conducted with FISH managing partner James Cook University and published in *Nature Climate Change* contributed a new framework for [building adaptive capacity](#) to climate change in tropical coastal communities. This was subsequently tested through [cases](#) in Bangladesh, Cambodia, Malawi, Solomon Islands and Timor-Leste. Meanwhile, application of fisheries [co-management innovations](#) in Bangladesh is helping transform the sustainable management of hilsa, the national fish and the country's most important single-species fishery.

Research [illuminating the hidden harvests](#) of small-scale fisheries, in partnership with the FAO and Duke University, now extends to 52 countries. Aside from generating the often missing evidence on the value of small-scale fisheries to the emerging blue economy and the discourse on sustainable ocean governance for the successful implementation of SDG 14 (Life below water), this research is capturing critical insights on the nutritional value of marine fish and the opportunities for tackling micronutrient deficiencies through fish in support of SDG 2 (Zero hunger).

Other research highlights include gender and fish foresight. Gender research on inclusive value chains and [gender-transformative approaches](#) continues to position FISH as a leader in gender research in fish agri-food systems. [Foresight modeling](#) work in Africa generated new understanding of future fish supply–demand trends, providing important insights for strategic planning and investments in aquaculture and capture fisheries across the continent. Similarly, [an analysis](#) of the Zambian fish sector presented a picture of fish demand outstripping supply and indicating that imports will continue contributing significantly to fish consumption by 2030 unless additional investments are made in aquaculture and small-scale fisheries.

Informing sustainable development policy

Our research continues to inform national, regional and global policies, with national policy contributions made in Bangladesh, Cambodia, Egypt, India, Malawi, Myanmar, Solomon Islands, Timor-Leste and Zambia during the year. These are laying a strong foundation for future contributions to our own targets and to the Sustainable Development Goals (SDGs).

Robust monitoring and evaluation

In 2018, FISH joined several other CGIAR centers and research programs in **adopting the award-winning Monitoring, Evaluation and Learning Platform**. The platform is a results-based management system that enables **better reporting, coordination, risk management and performance evaluation** as well as knowledge sharing, research dissemination and learning across the program and with external partners. The appointment of a **dedicated monitoring and evaluation leader** has had a significant positive impact on the implementation of the platform, which can semi-automate many tasks, saving considerable time and resources while reducing the risk of error.



FISH's contribution to the Sustainable Development Goals

FISH contributes directly to SDGs 1 (No poverty) and 2 (Zero hunger) by increasing the productivity of fisheries and aquaculture to provide poor and marginalized women, men and youth with more food, nutrition and income. It also addresses a range of related goals targeting improved human health and reduced disease (SDG 3), gender equality (SDG 5), decent work (SDG 8), reduced food waste (SDG 12), climate adaptation (SDG 13), sustainable ecosystems (SDG 15), effective institutions (SDG 16) and global partnerships (SDG 17). Within the CGIAR portfolio, FISH makes unique contributions to SDGs on protecting and restoring water-related, marine and coastal ecosystems (6.6, 14.2, 14.5) and encouraging economic growth of small island developing States (14.7).

CONTRIBUTING TO THE SDGs

FISH research **contributes directly** to 10 SDGs:



FISH research also **contributes to aspects** of two other SDGs:



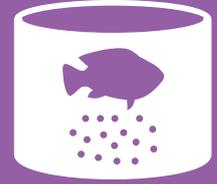


9 countries

where
research
informed
national
policies

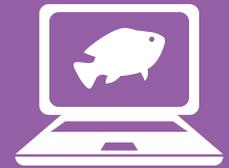
6 countries

adopted **improved fish seed and farm management practices**



3 countries

deployed new **online tool for disease epidemiology and risk assessment**



179 active partnerships:
85 new for 2018

35% of partnerships
focused on scaling

16%
in 2017

32 private sector
partnerships

9

in 2017



18,000 audience
in panel presentations on
'women in the blue economy'

775 million people

highly dependent on marine fisheries,
new FISH evidence showed

67,687 people

received **short-term training**, of which
25,270 were women

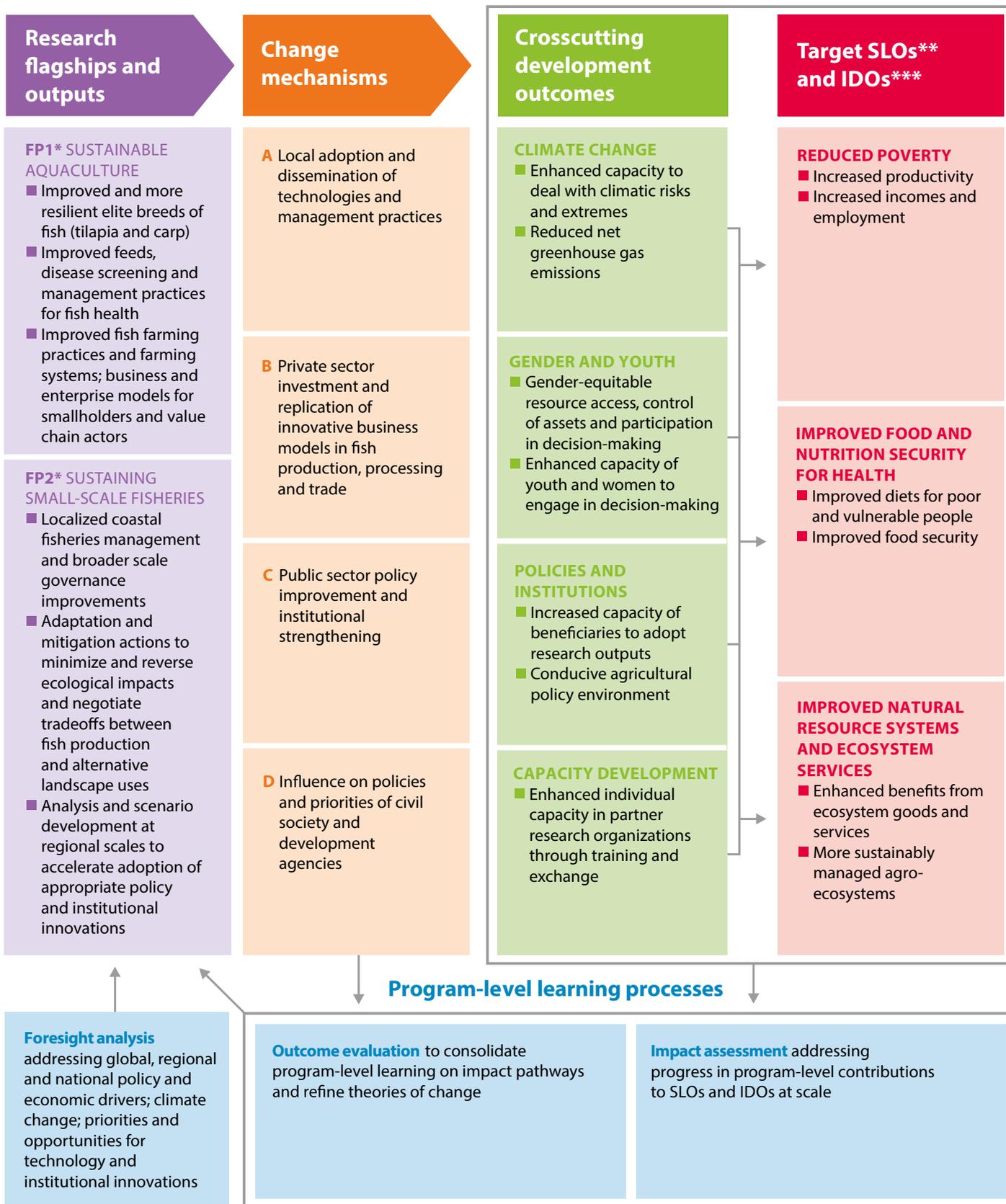


52 countries

where **research with the FAO** is illuminating the
hidden harvests of small-scale fisheries

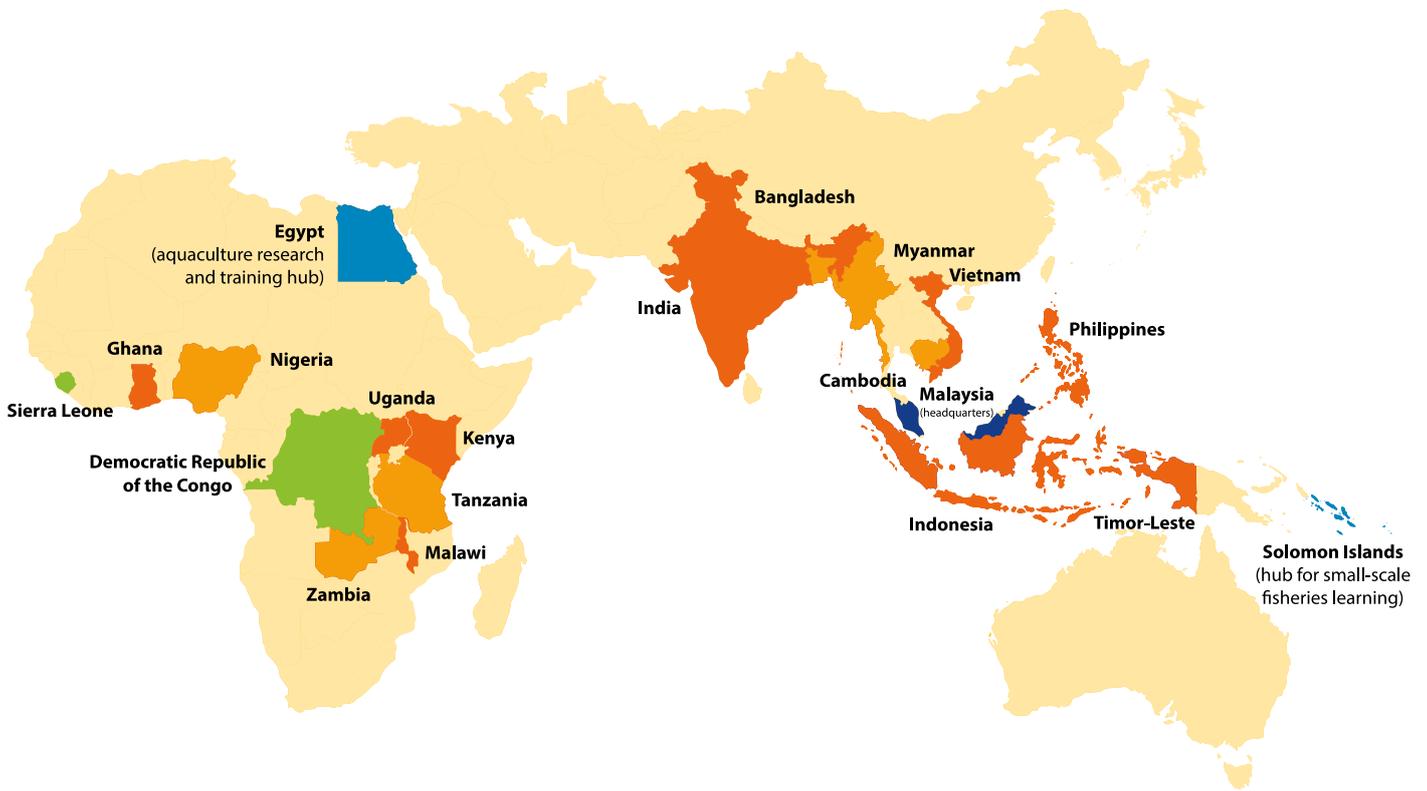


FISH IMPACT PATHWAYS AND THEORY OF CHANGE



* flagship project
 ** system-level outcomes
 *** intermediate development outcomes

Where we work



- Focal countries
- Scaling countries
- Learning hubs
- Other countries with significant projects
- Program office

FISH pursues an integrated body of research in six focal countries. Three are in Asia (Bangladesh, Cambodia and Myanmar) and three are in Africa (Nigeria, Tanzania and Zambia). In addition, the program focuses on Egypt as a research hub and training center for our aquaculture capacity development in Africa, and Solomon Islands as a hub for our learning networks on small-scale fisheries governance in the Pacific.

Successes and lessons learned from research are scaled with partners to achieve impact and are being progressively expanded to Ghana, India, Indonesia, Kenya, the Philippines, Malawi, Sierra Leone, Timor-Leste, Uganda and Vietnam.

Research highlights by region



Africa

- We completed research on integration of fish into foresight studies and fish supply–demand modeling, including landmark publications on sustainable aquaculture growth at [Africa](#) regional level and for [Zambia](#), both indicating the essential need for future investment in fisheries and aquaculture.
- Our participatory engagement with regional and national governments along the four main trade corridors in Southern, Eastern, Central and West Africa led to some significant policy shifts, including fish product standards and trade facilitation. The [COMESA Fish Inspection and Certification Facility](#), which was opened in December 2018 on the Zambia-Zimbabwe-Mozambique border, is one example of outcomes from research that identified challenges impeding cross-border trade, including lengthy customs and bureaucratic formalities at border posts.
- We designed and tested tablet-based performance assessment tools in several countries, including Egypt. A new partnership with private sector feed manufacturer [Skretting](#) was agreed to further develop these tools and extend their use in tilapia aquaculture, with a focus on Africa.
- We produced new knowledge on gender barriers and implications in fisheries-dependent communities, published in key papers from [Malawi](#) and [Zambia](#).
- Our research on fish disease and biosecurity provided new surveillance and diagnostic techniques and tools for addressing the global challenge from the emerging [tilapia lake virus](#). Assistance with the application of these tools was provided to several countries to improve policies for health management, including Egypt and Zambia.
- Our research fed into a rapid assessment of fish in food systems and value chains in the Great Lakes region, as reported in keynote presentations and a side event at the [6th Pan-African Fish and Fisheries Association conference](#).
- Findings from a youth-focused study led by FISH managing partner IWMI in eight focal countries are being published in a brief on youth in fish agri-food systems and a FISH youth strategy, due for 2019 release. In addition, actions are being integrated into new youth-focused interventions in the 10-country aquaculture component of the [Technologies for African Agriculture Transformation](#) initiative as well as capacity development in an [aquaculture vocational and entrepreneurship training](#) investment in Zambia.
- We conducted studies in Nigeria to identify [entrepreneurship opportunities for women](#).

Asia

- Improved fish breeds, aquafeeds, fish disease control measures and/or improvements in aquaculture management practices derived from our research continued to be disseminated widely and adopted by fish farm households across Asia, through multiple channels and partnerships.
- [Co-management innovations](#) derived from our research were adopted across large areas of the Meghna river system in Bangladesh and the nationally important hilsa fishery, contributing to substantial gains in productivity and sustainability.
- In a series of experiments in Bangladesh and Vietnam, our [feeds research](#) showed that low-protein, high-energy diets stimulated natural food production in the pond, which compensated not only for the reduced supply of dietary protein but also contributed to higher fish growth.
- Research on fish in [sustainable rice–fish systems](#) and co-organization of a [regional symposium](#) led to the [Naypyitaw Agreement](#), a foundation for policy change to enable adoption of integrated rice–fish system innovations by farmers at scale in Myanmar and potentially beyond.
- Our research with the Government of Odisha, India contributed to policy changes in the state. For example, the Government Policy Corrigendum on Grant of Long-term Lease of Gram Panchayat Tanks for Pisciculture allows communities longer term access to small water bodies for aquaculture.
- Our technologies and management systems were integrated in climate-smart agriculture initiatives in Bangladesh, Cambodia and Vietnam, leading to several promising climate-smart agriculture innovations for vulnerable communities dependent on aquatic systems. During 2018, a gendered analysis of the learning and outcomes from these investments in Bangladesh was conducted, including drawing out lessons to enhance impacts of climate-smart agriculture investments in Bangladesh on vulnerable women.
- We completed a study on the adoption of better management practices in Bangladesh. The study, which will be published in 2019, indicated that farmers adopting simple operational improvements had 50 percent higher productivity.
- Our assessments of potential for [sustainable intensification of aquaculture](#) in Bangladesh identified changes in fish farming technology and management that can help make the global transition to more intensive forms of aquaculture more sustainable.
- Our research made national policy contributions in nine countries, including Bangladesh, Cambodia, India and Myanmar.



Pacific

- A study conducted with FISH managing partner James Cook University and published in *Nature Climate Change* contributed a new framework for [building adaptive capacity](#) in tropical coastal communities. The framework was subsequently tested through [cases](#) in five countries, including Solomon Islands and Timor-Leste.
- We collaborated with private sector partner Pelagic Data Systems to develop an integrated data pipeline to highlight temporal and spatial changes in production from small-scale fisheries. The proposal was a winner of the CGIAR Platform for Big Data in Agriculture's 2018 [Inspire Challenge](#), which encourages the use of big data approaches to advance agricultural research and development.
- We generated new knowledge and collaboration on cross-scale governance mechanisms, with evidence published in key papers focusing on [Pacific Island coastal fisheries](#) and [Solomon Islands](#).
- Our small-scale fisheries researchers facilitated revision of the national fisheries law in Timor-Leste governing 75,000 hectares of coastal seas. Forty diverse stakeholder groups across three workshops, and a technical working group across many meetings, saw a 15-year-old fisheries law reduced from 465 articles to 150 and made relevant to the sector, supporting the rights of fishers and promoting nutrition security through fisheries.
- We conducted youth-focused research in eight focal countries, including Solomon Islands, providing a framework for analyzing youth inclusion and identifying potential interventions for more youth-inclusive aquaculture and fisheries sectors.
- We tested the ['lite-touch' approach](#) to community-based resource management in Solomon Islands, as a result of which 1137 hectares of marine water area were brought under improved management by 23 communities.
- Our efforts to support women fishers to participate in decisions about small-scale fisheries, including through the landmark [Women Fishers' Forum](#), are providing inputs to fisheries policy processes in Timor-Leste.





STORIES OF CHANGE

Reduced poverty

Sustainable increases in fish production directly increase the income of small-scale producers, provide opportunities for value chain innovations and reduce the cost of fish for consumers. In the aquaculture sector, our focus is on enabling farmers to improve their livelihoods via transformational gains in productivity and profitability. In small-scale fisheries, innovations for more effective and inclusive governance and management seek to enhance equity and diversity of livelihood opportunities for fisheries-dependent women, men and youth.

Research underlines livelihood potential of rice-fish farming

Myanmar



In Papat village, the rice field of Kyi Kyi Than and her husband Aung Kyaw looks the same as those of their neighbors, except for one difference: they grow fish as well.

"I don't need to buy vegetables and fish any longer, because I grow my own vegetables. And if my family wants to eat fish, I just go and get the fish from the farm," says Kyi Kyi of their integrated rice field and fish pond. "Before, if we had to buy the vegetables and fish in the market, we would only eat them 10 times per month. But now our six-person family can eat them more than 20 times per month."



Rice farming in Myanmar covers approximately 8 million hectares and involves more than 5 million households, most of them in rural areas. Since Myanmar's independence in 1948, successive governments have focused on achieving rice self-sufficiency. This has led to strict agricultural policies that discourage farmers from integrating other crops into their rice fields or converting a proportion for fish farming. To do so, farmers have to get permission from the Ministry of Agriculture, Livestock and Irrigation, which is typically reluctant to allow the transformation of paddy to pond.

A rice-fish system is a rice field with a fish refuge area (between 10 and 15 percent of the total plot size) with water 10 times the depth of the rice-growing zone (1.5 meters versus 0.15 meters). Fish fingerlings, often rohu carp and silver barb, are added to the refuge area. In addition, wild fish are encouraged, and many of these are self-recruiting species that breed in the rice-field environment. Here, both stocked and wild fish are more abundant. The wild fish breed and establish a small rice-fish ecosystem. The fish swim into the rice production area, eat pests and fertilize the soil with their feces.

The concern for the Myanmar Government is that rice yields will be lost if large areas are transformed into ponds. However, our [research](#) with partners showed that when the rice cultivation area is reduced by 13 percent to accommodate a fish refuge area, rice production increases by 6 percent. Net profit also increases 132 percent because of the fish factor.

These results, from small experimental plots, are likewise found in full-size commercial systems with integrated agriculture systems. Better management practices for rice, fish and water are shown to increase rice yield, profitability, employment options for youth and women and family nutrition because of greater fish consumption.

This was adapted from a story and photos developed by Majken Schmidt Sogaard for ACIAR, a WorldFish partner. Republished with permission.

Carp intensification doubles production and increases profits

India



In Odisha State, fish farmers have been able to double their production and increase their profits thanks to a [carp intensification program](#). The program is being carried out as part of a six-year agreement (2016–2022) with the Fisheries and Animal Resources Development (F&ARD) Department of the Government of Odisha to increase the productivity of aquaculture through improvements in seed, technology and farming systems.

We provide technical support to the F&ARD. This support builds on learnings and experience from neighboring Bangladesh, where we have many years of success in scaling up production with new technologies and training.

In Dhanpari village in Jagatsinghpur district, 72 households share five community ponds totaling just over 7 hectares. Nutrient-rich small fish were already present in the ponds; the first stocking of carp took place in February 2018. The main species stocked are rohu, catla and mrigal and sometimes small amounts of grass carp.

“ We received training on when to feed the fish and how much. We also learned how to formulate our own feed from agricultural byproducts. Combined, the technical interventions have helped us reduce our production costs by around 25 percent.”

Bibhuti Bhusan Dash, farmer, Dhanpari village, Jagatsinghpur district, India

Following stocking, the farmers were advised on better feeding and management practices, such as regular liming, water quality parameter testing, plankton density analysis and disease surveillance.

The community saw results after just two months of the improved practices. The first carp were harvested in May 2018. Between May and September, a total of 2 metric tons were harvested, generating USD 2145 in profit for each harvest. In addition, around 25 kg of small fish were harvested weekly, providing a source of nutritious food for household consumption.

With the profits from carp sales, the community has continued to invest in its ponds, for instance building a guard house and installing two groundwater pumps. The groundwater is used to maintain the pond level and keep the water temperature stable, allowing year-round production.

In 2018, these were the best performing community ponds in the program, serving as an example for other communities in the district.



Improved food and nutrition security for health

Fish is a vital, nutrient-dense food for many nutritionally vulnerable people, including children and pregnant and lactating women. We specifically address micronutrient deficiency by expanding polyculture of micronutrient-rich small indigenous fish species, using improved feeds to enhance the nutritional value of fish, and increasing productivity and reducing waste and loss in fish value chains important to poor consumers.

Scaling successes from nutrition-sensitive fish production

Bangladesh, Myanmar



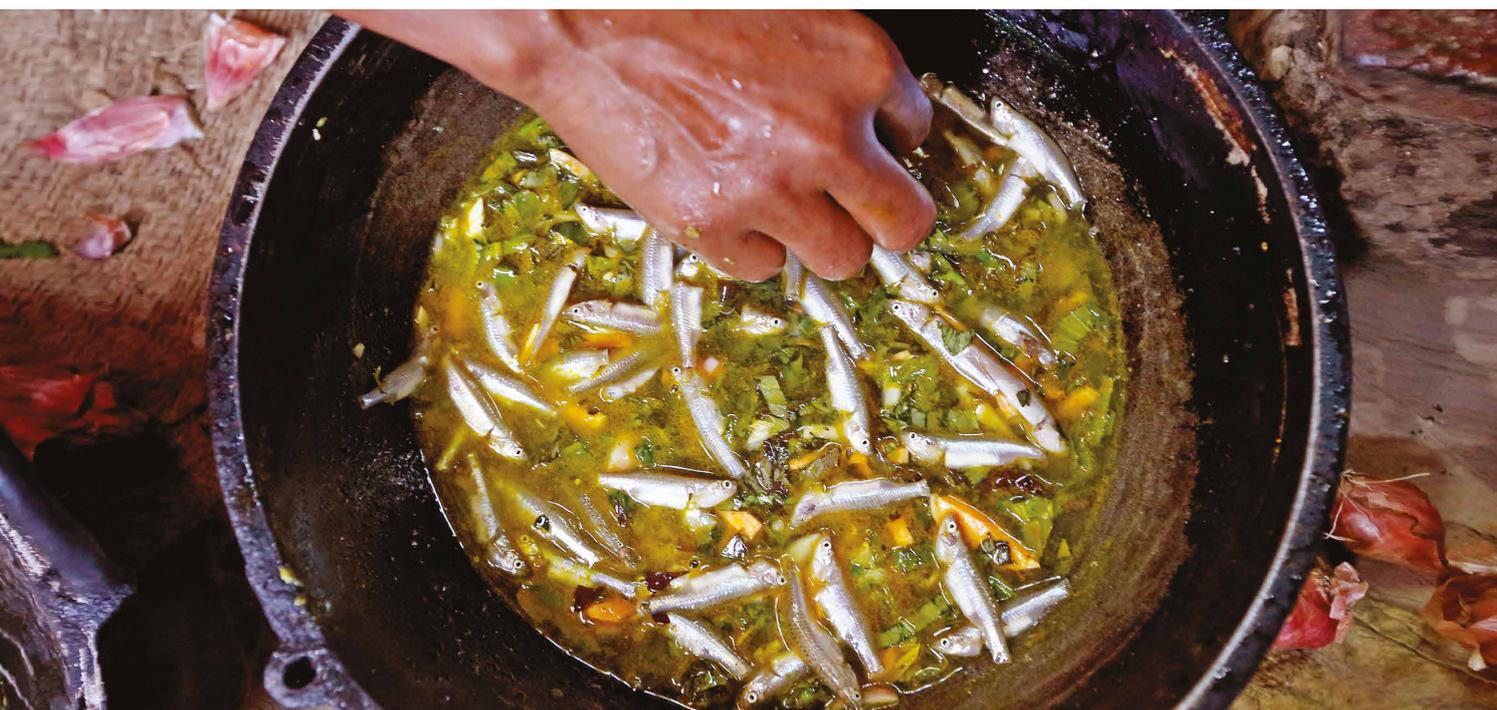
In Myanmar, fish is an important food in the diet. Fish is also a source of many essential nutrients, including micronutrients, essential fatty acids and animal protein. Our [research](#) shows that small fish, in particular, when eaten whole, provide calcium, iron, zinc, vitamin B12 and vitamin A.

In a country where at least one in every three children under five years of age suffers from stunting, and one in every five is underweight, the addition of small fish to the diet can support the country in nourishing its next generation.

An increasing demand for fish in Myanmar has boosted aquaculture, which has grown rapidly in the last 20 years. However, there are geographical disparities in fish supply and consumption, with low consumption in remote, hilly and mountainous regions.

Lessons learned from implementing nutrition-sensitive fish production systems in Bangladesh are being considered as a model for rolling out similar systems—specifically homestead pond polyculture of carp and small fish species—in Myanmar.

Successes from Bangladesh include the use of readily available and familiar ingredients, such as inexpensive small fish, garlic, onion, chili, mustard oil and vinegar, to make [fish chutney](#).



When consumed regularly, the chutney contributes to increasing dietary diversity.

Additionally, strong linkages and cooperation with government institutions serve as core mechanisms in implementing the activities at the community level, during distribution of fingerlings and brood stock, training and dissemination campaigns.

As support for aquaculture increases, we are working to make interventions nutrition-sensitive, resulting in increased productivity and income for small-scale fish farmers as well as, most importantly, better nourished children, a key strategic objective for the government.

New inspection and certification facility boosts cross-border fish trade

Mozambique, Zambia, Zimbabwe



On 6 December 2018, COMESA, an economic bloc of 21 countries in Eastern and Southern Africa, launched the COMESA Fish Inspection and Certification Facility in Luangwa, on the Mozambique-Zambia-Zimbabwe border.

The [facility](#) is the result of data we gathered at border posts in the four trade corridors of Southern, Eastern, Central and West Africa. These showed that intra-regional informal fish trade is a significant entrepreneurial activity and contributor to food and nutrition security throughout the continent. However, the data also identified challenges impeding cross-border trade, including lengthy customs and bureaucratic formalities at border posts and a lack of harmonized regional fish standards and conformity assessments.

The facility comprises offices for government regulators and two cross-border fish traders associations that will co-manage the facility with the Government of Zambia, storage for dried, salted and smoked fish, a cold room for fresh fish as well as a small laboratory to test the quality and safety of fish products crossing the border.



Certification will take place according to the regional harmonized fish standards we facilitated and that were approved by the Southern Africa Development Community (SADC) in March 2017. The standards cover 11 products and areas, including fresh, frozen, farmed, salted and smoked fish, fish snacks, fish sausages, canned sardines and Good Aquaculture Practices for bream fish. At least three SADC countries have already adopted the standards in their national policies.

“ My hope is that the launch of this new facility will not only mobilize political support for further regional integration but will also demonstrate that we have established a system that places fish at the center of the intra-regional commodity trade. ”

Sloans Chimatiro, Country Director, Zambia and Tanzania, WorldFish

The Luangwa border crossing is being used as a model for application of the COMESA 'Green Pass' for fish products. The Green Pass is a certification scheme to support trade in agricultural commodities. It is expected to open the way to high-value markets by guaranteeing the safety and quality of the commodities. Hence, several follow-up activities are planned in which we will also be involved. These include reviewing cross-border trade regulations and procedures, streamlining the procedures in order to simplify them for small-scale cross-border fish traders, especially informal and women traders, and testing and rolling out the Green Pass.

Improved natural resource systems and ecosystem services

There are dramatic national and regional differences in environmental footprints of aquaculture for the same species and production methods. We are using life-cycle assessment to quantify the carbon footprint and other environmental impacts of aquaculture production to identify and promote the development of gender-responsive aquaculture systems with low environmental impact. In small-scale fisheries, we are uniquely placed to integrate local-scale action research on tenure systems with analysis of broader institutions and policies for governance, contributing to equitable resource use and restoration of agroecosystems in both inland and coastal environments.

Lite-touch approach to resource management shows promise

Solomon Islands



In Solomon Islands, where coastal resource decline and environmental degradation are increasingly putting livelihoods and food security at risk, community-based resource management (CBRM) is the main strategy for managing coastal fisheries.

It is estimated that hundreds of communities have already implemented some sort of CBRM with the support of government ministries, nongovernmental organizations (NGOs)

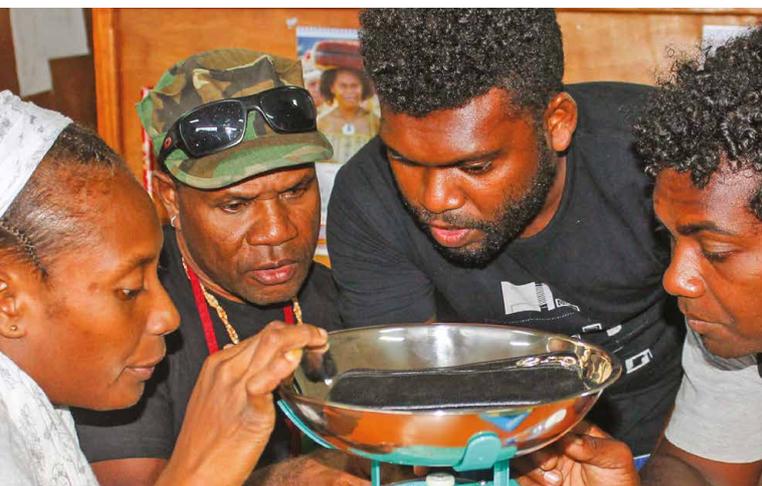
and research agencies. However, the different approaches employed by these partners are often intensive and long-term. Consequently, engagement with communities is slow, expensive and unlikely to reach many of the approximately 4000 coastal communities in the geographically dispersed island state.

The lite-touch approach has been suggested as a more efficient and cost-effective way [to establish and spread CBRM](#). The approach is similar to other models but requires less intense or frequent engagements with communities, with the potential to promote local ownership of (rather than project dependency on) the process and outcomes.

In Mararo, a remote community in East 'Are'are, Malaita Province, we [tested](#) the effectiveness of the lite-touch approach in supporting the implementation of CBRM and acting as a 'core' community to encourage others to follow suit. One of the main strategies employed in Solomon Islands to spread CBRM has been 'look and learn' trips, where representatives from communities that are not currently implementing CBRM visit a community that is successfully doing so.

[Follow-up research](#) was conducted in the 14 villages in East 'Are'are that had received awareness presentations from representatives from Mararo. The use of Mararo's informal networks was effective for spreading CBRM information and helped to overcome challenges of geographic isolation and high costs of logistics. As a result, two additional villages have since initiated CBRM.

The case of Mararo suggests that the lite-touch approach can be successful in promoting the implementation and spread of CBRM at lower cost. Mararo was effective as a core site in terms of raising awareness and sharing experiences and knowledge with surrounding communities as well as motivating them to take management action themselves.



Using research to help fisherfolk co-manage their fishery

Myanmar



In Myanmar, small-scale leasable fisheries have typically been controlled by a well-off leaseholder. Following the adoption of a new Ayeyarwady fisheries law in 2018, fishing communities are being supported to jointly manage leasable fisheries with the Department of Fisheries (DoF), universities and local NGOs. This is a significant step toward achieving a sustainable fishery management system that is more equitable for the millions of rural households who depend on small-scale fisheries for food and income.

The 2012 Vacant, Fallow and Virgin Land Management Law allowed the conversion of areas within floodplains to large aquaculture ponds. The latter often encroach on leasable fisheries and interrupt the connectivity between floodplains and river systems, which provide migration routes for many important fish species. For local fisherfolk, many of whom rely solely on fishery activities for their income, this has increased their vulnerability.

To help address this challenge, community fishing committees are being established in the Ayeyarwady Delta. The committees have responsibility for creating local laws and regulations to address key challenges and threats in their local fishery.

Our [research](#) shows that the community-based fisheries management (CBFM) model is efficient in minimizing illegal fishing, which involves destructive fishing methods that use electrofishing, explosives and poison. After receiving training from the project and local NGOs, many of the fisherfolk who previously fished illegally now have a better understanding of the damage caused and have access to an improved fishery benefiting the community.

Women, who actively participate in small-scale fisheries in Myanmar but have less access to and control over resources than men, are actively targeted as committee members. Daw Cho Mar, who runs a small business as a 'collector' buying locally caught fish and selling it in the nearby Maubin township market or in the capital Yangon, decided to join.



“ Before, there was only one owner who had the rights to the business and the leased floodplain fishery, but now we are an association of 711 fisherfolk with a management committee that can share the access to it. ”

Daw Cho Mar, fish collector and seller, Papin, Myanmar

To maximize small-scale fisheries production in a sustainable way, we have been collaborating with and providing guidance to the Myanmar Government. This contributed to the modification of the Ayeyarwady fisheries law in April 2018. The new law was informed by our research in 2012–2016 characterizing all floodplain fisheries across Myanmar as well as ongoing research using socioeconomic and environmental-biological baseline studies at 14 representative sites in the Ayeyarwady region.

The research provides a picture of how the floodplain and other inland fishery systems work as well as establishing monitoring indicators. This knowledge enables the community and DoF to assess together what improvements can be made and will promote the uptake of CBFM in marine and inland fisheries across Myanmar.

This was adapted from a story and photos developed by Majken Schmidt Sogaard for ACIAR, a WorldFish partner. Republished with permission.

CROSSCUTTING IMPACTS

Climate change

Research that addresses the grand challenge of climate change is one of several important crosscutting issues in FISH, particularly as fisheries and aquaculture production adapts to changing ecological challenges and opportunities. During 2018, we contributed several outputs and outcomes to the CGIAR climate change portfolio, including dimensions related to vulnerability, adaptation and mitigation.

Building adaptive capacity to climate change

Solomon Islands



Many government and nongovernment organizations are working to equip people to respond to climate change, to minimize negative effects and even look for new

opportunities. Having 'adaptive capacity' means having the necessary resources at hand as well as the willingness and ability to take effective action in the face of change.

In some spheres, people have held a restricted view of the capacity to adapt. A [study](#) conducted with FISH managing partner James Cook University and published in *Nature Climate Change* widens this perspective and outlines five areas that need to be considered to truly build adaptive capacity:

- the assets that people can draw upon in times of need;
- the flexibility to change strategies;
- the ability to organize and act collectively;
- learning to recognize and respond to change;
- the agency to determine whether to change or not.



The researchers used tropical coastal communities as examples because they are already feeling the impacts of climate change. However, the findings highlight broader lessons that will be useful to efforts to build adaptive capacity elsewhere.

A core component of the study's framework is the interlinkages between the five domains. The examples discussed suggest that it may be ineffective only to build or examine any one dimension. Feedbacks and interactions can occur among any of the domains. For example, when the distribution of fish species available to coastal societies changes (something that is predicted because of rising sea temperatures), fishers might use their savings or borrow money to buy bigger boats and freezers to store fish during longer voyages. However, greater capital investment into fishing might reduce flexibility—in this case the ability to switch to a different livelihood—a characteristic shared by many small-scale fishers and farmers.

Building adaptive capacity demands compromises among the different domains, a consideration of justice and distribution and managing the complex feedback process.

Future research will look at how processes of change affect people differently—and what social factors, including gender or wealth, might mean that some people fare better after climate or other shocks. Policymakers will need to consider and plan for this to address the principle of 'leaving no one behind', a key facet of the SDGs.

In-pond innovation doubles production, minimizes water use

Egypt



To mitigate the impact of rising production costs and limited land and water availability in Egypt, we are [testing](#) innovative ways for fish farmers to sustainably increase productivity and profitability.

The in-pond raceway system (IPRS) cultures fish in raceways in existing pond units. Solid waste is removed, conserving water

quality for reuse. Developed at Auburn University in Alabama, the system has been used to produce channel catfish in the United States and grass carp in China. This is the first time it has been tested for tilapia production in Egypt.

To create the raceways, three concrete cells were constructed in a 1 *feddan* (approximately 4000 m²) pond at the WorldFish-run [Africa Aquaculture Research and Training Center](#) in Abbassa, outside Cairo. The cells were equipped with pumps for continuous water movement and aeration during the production season and stocked with a fast-growing Nile tilapia strain developed by WorldFish.

The water current carries fish waste through a screen at the end of the raceways into a 'quiescent zone'. Waste settles in the quiescent zone before being removed by a suction pump for use as a crop fertilizer. The water then moves to the open area of the pond where it is recharged with oxygen and returned to the raceway. No water is discharged, other than to periodically replace seepage and evaporation losses.

The IPRS was selected for testing in Egypt to meet the increasing demand for aquaculture products in the country while addressing mounting economic and environmental constraints. The technology addresses these constraints by allowing maximum use of available water resources and greater production at lower per-unit cost through higher fish survival and feed conversion. The zero-water exchange, or closed, system also improves biosecurity measures, thus minimizing disease risks and the need to apply drugs and chemicals.

Results from the test showed that the system can produce 10–12 metric tons of tilapia from a 1 *feddan* pond, compared with a regular earthen pond that produces 4–5 metric tons. This is more than double the production within four months.

“The system has the potential to revolutionize the way aquaculture is done in Egypt. This could pave the way for further innovations in sustainable intensified production of farmed fish here and elsewhere on the African continent.”

Harrison Charo Karisa, Country Director, Egypt and Nigeria, WorldFish

Gender and youth

Our gender research seeks to overcome identified gendered barriers limiting women's access to and control of key assets and resources, effective participation in decisions, and equitable and substantive wealth generation and livelihood benefits from fish value chains. Our approach is articulated in the [FISH gender strategy](#), published in 2018. Our youth research progressed during the year with a study assessing youth in fish agri-food systems in eight focal countries. Research findings, which identified various challenges facing young people looking to engage in or remain in fisheries and aquaculture, are being integrated into a brief and a FISH youth strategy, due for 2019 release.

Gaining a voice at the first Women Fishers' Forum

Timor-Leste



In the remote fishing village of Adara, on Atauro Island in Timor-Leste, men have typically made the decisions about how fishery resources should be managed. Following our efforts to improve equitable representation in decision-making, women now have a greater voice in governance discussions and are engaging in collective action.



In 2016, we supported the introduction of a traditional community-based management approach known as [tara bandu](#). Involving women was critical, as the approach would impact on women and men, who both actively engage in many types of fishing, and the community as a whole, which is increasingly focused on marine tourism.

Fisher Joana da Costa said that initially the women in Adara did not understand *tara bandu* and did not attend the meetings about fisheries. Now, women are involved in all meetings related to fishery management, she said. Women also manage the collection of a 'reef contribution' from tourists when they snorkel or dive in the protected area. The collected funds are being saved to support the building of a primary school to benefit all community members.

This powerful story was told by Da Costa, one of several speakers, to the 100 guests attending the FISH-supported Women Fishers' Forum (WFF) held on 15 October 2018 in the capital Dili. The aim of the forum was for participants to develop consensus statements about women's fishing, which the women fishers would present at the first National Fishers' Forum the following day.

Efforts to support women to participate in policy discussions are critical for realizing Timor-Leste's vision for gender equality, as outlined in the government's landmark [Maubisse Declaration](#), released in 2015.

Studies show that women in Timor-Leste undertake more than half of all agricultural work, but their role is often undervalued or overlooked, and they have less access to resources and opportunities than men. In small-scale fisheries specifically, women are consistently underrepresented in statistics and policy. As highlighted in the [FISH gender strategy](#), this reduces the effectiveness of management actions, perpetuates inequities in the opportunities small-scale fisheries offer and hinders the achievements of food and nutrition security outcomes.

Building on the momentum from the WFF, we are now looking at the possibility of establishing a network to help women fishers stay connected with and learn from one another.



Opening up opportunities for young people

Egypt, Zimbabwe



Young women and men face several barriers to participating in fisheries and aquaculture, from limited access to fishing grounds, capital and training to perceptions of risk in the sectors. FISH adopts a youth-responsive research agenda to increase opportunities for safe and rewarding employment and entrepreneurship.

In Egypt's Aswan governorate, home of Lake Nasser, unemployment is high. In the wake of the 2011 uprising, Aswan and other governorates that were heavily reliant on tourism suffered economically, further exacerbating the persistent unemployment problem. In collaboration with partners, we introduced a number of measures, including a seasonal fishing ban, postharvest handling training and low-cost processing technologies.

These are helping to protect Lake Nasser's fish stocks while opening up economic opportunities for a target 6500 young people.

In Zimbabwe, 16 students from across Southern Africa completed the first Aquaculture Vocational Mentorship Course, held at the Lake Harvest Company. Located on Lake Kariba, Lake Harvest is the largest aquaculture farm in Zimbabwe and one of the largest in the Southern African Development Community (SADC).

The [aim of the course](#), which we ran in collaboration with Chinhoyi University of Technology and Lake Harvest, is to promote aquaculture development in Africa by improving the practical application of university education, ensuring that graduates have sufficient practical experience to work on or run a fish farm after graduation.

The course objectives and learning outcomes were designed in such a way that, at the end of the month, the students had increased basic understanding of aquaculture practices, fish rearing and management and gained hands-on, practical experience in freshwater aquaculture through placement at fish farms on Lake Kariba.

By partnering with Chinhoyi University and other higher education institutions, we are effectively augmenting the skills of new graduates to develop science-based models that can help in aquaculture research and development in the region, in line with the [SADC Regional Aquaculture Strategy and Action Plan \(2016–2026\)](#).

Capacity development

As a strategic enabler of impact, capacity development is important in all change mechanisms of the FISH impact pathways (see page 6) and is required to support movement from research outputs to research outcomes and ultimately to development outcomes. In 2018, we made substantial progress in capacity development activities across various dimensions, including researchers, national partners and communities, at global, regional and national levels. Capacity development in Africa was a priority.

Boosting aquaculture through farmer-to-farmer learning

Sierra Leone



Small-scale aquaculture has significant potential to diversify livelihoods, raise incomes and create employment opportunities as well as improve household food security through greater access to fresh, nutritious fish. Despite these

benefits, few farmers in Sierra Leone are currently engaged in aquaculture, mainly because the concept of fish farming for business is relatively new in the country.

As part of our efforts to support the growth of the national aquaculture sector, we have been [developing and testing](#) participatory extension approaches designed to give farmers the skills and knowledge they need to operate profitable aquaculture businesses.

Of the extension approaches tested to date, our research suggests that the most successful learning occurs at the pond site. Through exchange visits, new and interested farmers are able to observe the construction of fishponds, receive assistance in farm management, ask questions and hear about challenges and successes from their peers.



“We are very happy to show other people our ponds and try to bring them on board. There is high demand for fish in our communities and we alone cannot supply all the fish needed all year round. It is also a privilege to help impact other people’s lives and improve their livelihoods.”

Jeremiah Janjuma, lead farmer, Tonkolili District, Sierra Leone

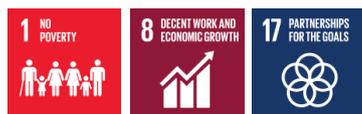
Jeremiah Janjuma, one of the lead farmers in Bumbuna community, stocked his first pond with tilapia fingerlings in August 2017 and shared his progress with other farmers. In his 500 m² pond, he produced 137 kg of fish. He sold 117 kg of that and earned 700,000 Sierra Leonean leones (USD 43). He reserved the remaining 20 kg for household consumption.

Sustained attention to creating an enabling environment for farmer-to-farmer learning and equipping farmers with the skills and knowledge to run businesses will ensure that long-term benefits are maintained and scaled up beyond the duration of the project.

In addition, the willingness of lead farmers to act as community extension workers and spearhead the adoption of better farming techniques through training sessions and knowledge sharing holds the promise of transforming the aquaculture sector in Sierra Leone.

Providing digital advisory services to small-scale fish farmers

Bangladesh



A [new agreement](#) with ACI Agribusiness, a leading aggregator of agri inputs in Bangladesh, will enable us to provide timely and affordable access to digital advisory services to small-scale fish farmers and their local service providers. The agreement aligns with our increasing use of digital technologies for both information collection (data documentation) and dissemination to support decision-making and capacity building.



Rupali, which we are jointly developing with ACI Agribusiness and the USAID-funded [Feed the Future Bangladesh Aquaculture and Nutrition Activity](#), will be helpful to retailers and dealers of feed, aqua chemicals and pond mechanization equipment, hatchery owners, fish wholesalers, officials and researchers of government and nongovernmental extension services.

For fish farmers, Rupali will assist in all aspects of aquaculture from stock planning to taking the end-product to market. By following the platform’s advice, farmers are expected to increase their productivity and generate more income. The target is to have 7500 users in the first year and 45,000 or more in the second year.

By increasing access to information for fish farmers and other actors in the aquaculture value chain, Rupali will help the sector to become more efficient and responsive to the needs of Bangladeshi consumers, while ensuring the financial sustainability of both small-scale and larger scale operators.

Users will be able to access Rupali, which is due to be launched in the second half of 2019, via a mobile app, website, SMS, outbound and inbound call center. ACI Agribusiness will initially implement Rupali in five districts in south-west Bangladesh—Bagerhat, Khulna, Gopalganj, Satkhira and Jessore—the first three of which have productivity below the national average. We will provide management, monitoring and evaluation support as well as transfer aquaculture-related global best practices.

The platform is being co-financed by ACI Agribusiness and Feed the Future Bangladesh Aquaculture and Nutrition Activity. The latter is a five-year, USD 24.5 million investment that builds on the achievements of the [Aquaculture for Income and Nutrition](#) project. The overall goal of the investment is to achieve inclusive aquaculture sector growth through a market systems approach.

Communications and knowledge sharing

Communication is a way for us to share knowledge and deliver research evidence to a variety of audiences, including fishers, farmers and traders, policymakers, extension agents and the scientific community. We focus on three areas, with the aim of enabling others to translate our science into action:

- **Practitioner guidance** to enable adoption of technologies and management practices, for example on improved fish feeds or measures to reduce loss and waste in the value chain.
- **Evidence, learning and exchange** on technologies and innovations shared via peer-reviewed literature, outcome stories and evidence-based narratives focused on FISH-generated science. For peer-reviewed research publications, we encourage our scientists to publish in open access journals. In those instances where publishing in fee-paying journals is preferred, FISH endeavors to cover open access costs. Of the 55 peer-reviewed articles published in 2018, 34 were open access.
- **Policy dialogue** demonstrating the value of fisheries and aquaculture to address national and regional food and nutrition security and poverty reduction goals, and evidence to support the analysis of policy alternatives, including foresight modeling and scenario analysis.

Raising our digital profile

We provide publicly accessible reporting on our progress, demonstrating accountability and transparency toward investors, partners and beneficiaries. Supporting this is our growing digital presence, which is helping to raise the profile and reach of our work beyond our traditional stakeholders.

In 2018, we launched the [FISH website](#) and a dedicated FISH social media strategy. FISH also has its own [Facebook](#) and [Twitter](#) accounts to complement the WorldFish presence on [Facebook](#), [Twitter](#) and [LinkedIn](#). These are helping to distinguish our research from our institutional activities as well as providing opportunities to target different audiences with relevant and engaging messages. At the end of the year, we had reached 612,960 people via the FISH social media channels and increased the number of new followers by 577 percent.

39,946
downloads
of FISH publications



55 peer-reviewed
articles published:
34 open access

40,974 pageviews
of the new
FISH website



612,960
people reached
on social media

577% increase
in new followers
on Facebook and Twitter



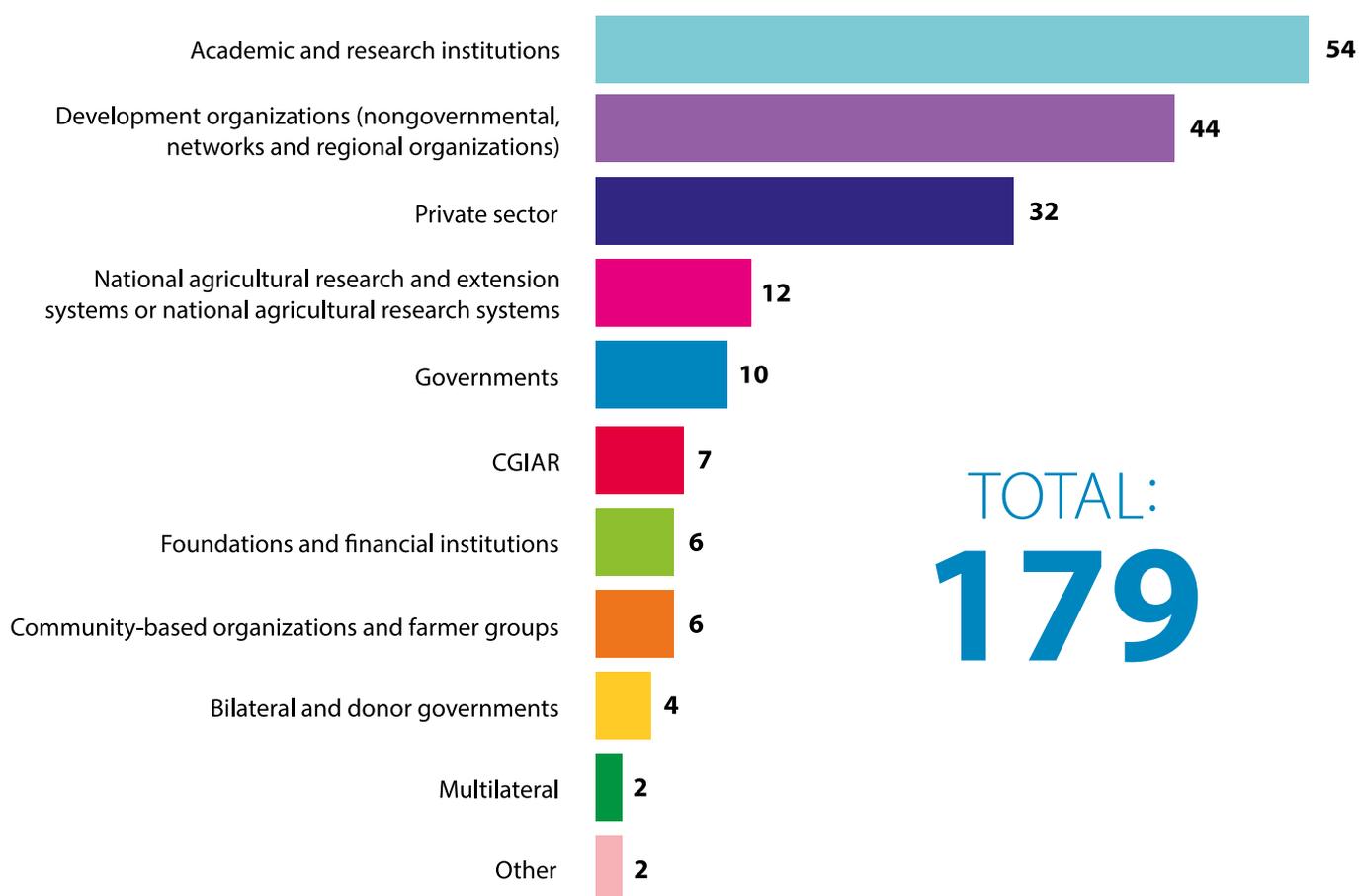
Supporting quality science dissemination

We regularly share our knowledge and research evidence at scientific conferences and other strategic events. To support our scientists, who are the (co-)producers of our research and ambassadors of our brand, we developed a suite of FISH-specific [tools and materials](#) that ensure we are making the case for fish in agri-food systems in the strongest possible way.

In addition, we provide mentoring for young scientists. In 2018, this took the form of a write shop entitled 'Science writing and communication skills week', led by FISH managing partner James Cook University, and a series of [instructive videos](#) on scientific publication. The series was the most watched of all the videos posted on our site this year.



Partners



We work with an extensive network of partners, including international, national, regional and local governmental institutions, universities, private sector organizations and NGOs, who share our commitment to creating positive change for the millions who depend on fish in the developing world.

In 2018, FISH was engaged in 179 active partnerships, 85 of which were new. A substantial percentage of these were with academic and research organizations (30 percent). However, there was significant growth in partnerships with development organizations, with 18 new public and private partnerships, ultimately contributing to the achievement of development outcomes and scaling.

This shift in the partnership portfolio to enable innovation delivery at greater scale has been firmly embedded within FISH focal countries (see page 7), with 75 percent of partnerships at the national and sub-national level. At the global level, [partnership with the FAO](#) is enabling FISH to connect research with global fisheries and aquaculture policy. A new partnership with the fish feed manufacturer [Skretting](#) is opening new opportunities for scaling our aquaculture research, particularly in Africa.

Investors and financial summary

To meet future demand for fish, particularly in developing countries, production will need to double by 2030. The scale of this challenge requires research innovations across the whole spectrum of fisheries and aquaculture production systems and value chains. We are extremely grateful to all our investors who enable us to conduct this vital research. In 2018, FISH had 46 investors, providing a total budget of USD 25.7 million.

TABLE 1. FISH FINANCIALS FOR 2018 (USD)

Planned budget 2018*			
	W1/W2**	W3/bilateral	Total
Sustainable Aquaculture	2,550,247	12,142,658	14,692,905
Sustaining Small-Scale Fisheries	953,055	8,493,894	9,446,949
Cross-program investments	905,366		905,366
FISH management and support costs	703,775		703,775
FISH total	5,112,443	20,636,552	25,748,995
Actual expenditure 2018***			
	W1/W2	W3/bilateral	Total
Sustainable Aquaculture	2,561,474	10,123,797	12,685,271
Sustaining Small-Scale Fisheries	914,526	8,505,735	9,420,261
Cross-program investments	898,823		898,823
FISH management and support costs	678,388		678,388
FISH total	5,053,211	18,629,532	23,682,743
Difference			
	W1/W2	W3/bilateral	Total
Sustainable Aquaculture	(11,227)	2,018,861	2,007,634
Sustaining Small-Scale Fisheries	38,529	(11,841)	26,688
Cross-program investments	6,543		6,543
FISH management and support costs	25,387		25,387
FISH total	59,232	2,007,020	2,066,252

* 2018 CGIAR System Management Office-approved budget USD 4.86 million + 2017 carry-over USD 252,443

** For an explanation of windows 1, 2 and 3 funding, please see the [CGIAR website](#)

*** Source: Audited lead and participating center financial report

Governance



FISH [governance](#) involves members of developing and developed country institutions, such as national research institutes, the private sector, fisher organizations and international organizations. The program has a wide upstream and downstream reach that includes participants and institutions with a key role in defining the fisheries and aquaculture development agenda.

Independent Steering Committee

The Independent Steering Committee (ISC) is responsible for the overall strategic direction of the program. This includes science quality and priorities, risk management, budget allocation and identification of new investment, partnering and funding opportunities to grow and sustain the program and enhance impact. Membership consists of scientists, practitioners and representatives from end-user bodies that represent a balance of disciplinary expertise, gender and national diversity.

During 2018, the ISC held virtual meetings in April, July and December and a face-to-face meeting in Penang, Malaysia in October, with reporting lines established to the WorldFish Board of Trustees, which has fiduciary responsibility for the implementation of FISH. The ISC further conducted an in-depth review of FISH, reporting overall positive progress for

the program but identifying a few key areas for strengthening (see page 1). The appointment of Marian Kjellekvold, Head of Research at the Institute of Marine Research in Norway, brings critical expertise in human nutrition to the ISC.

Management Committee

The Management Committee is responsible for timely and effective planning, budgeting and reporting of FISH. The committee is composed of representatives of the five managing partner institutions and the flagship coordinators, and is chaired by the FISH Director. The committee reviews the annual work plans and budgets developed at regional and global levels to ensure consistency, integration and appropriate budget allocation across the program. Once cleared by the Research Management Committee, work plans, budgets, strategies and other program implementation documents are submitted to the ISC for approval.

FISH people

Independent Steering Committee (ISC)

- Nigel Preston, **ISC Chair**, University of Queensland, Australia
- Editrudith Lukanga, Environmental Management and Economic Development Organization, Tanzania
- Gareth Johnstone, WorldFish, Malaysia
- Ian Cowx, University of Hull, United Kingdom
- M.A. Sattar Mandal, Bangladesh Agricultural University, Bangladesh
- Marian Kjellefold, Institute of Marine Research, Norway
- Mark Smith, International Water Management Institute, Sri Lanka
- Tony Haymet, Scripps Institution of Oceanography, Australia

Management Committee (MC)

- Michael Phillips, **MC Chair**, Director, CGIAR Research Program on Fish Agri-Food Systems and Aquaculture and Fisheries Sciences, WorldFish
- Cristiano Rossignoli, Monitoring and Evaluation Leader, WorldFish
- Cynthia McDougall, Gender Research Leader, WorldFish
- David Shearer, Director of International Partnerships and Program Delivery, WorldFish
- Emily Khor, Program Life Cycle Performance Manager, WorldFish
- Harrison Charo Karisa, Country Director, Egypt and Nigeria, WorldFish
- Johan Verreth, Head of the Chair Group Aquaculture and Fisheries, Wageningen University & Research

- John Benzie, Sustainable Aquaculture Program Leader, WorldFish
- John Linton, Commercial Director, Natural Resources Institute of the University of Greenwich
- Marc-Antoine Baïssas, Director of Finance and IT Systems (interim), WorldFish
- Michael Akester, Country Director, Myanmar, WorldFish
- Philippa Cohen, Resilient Small-Scale Fisheries Program Leader, WorldFish
- Paola Reale, Research Programs Manager, WorldFish
- Shakuntala Thilsted, Value Chains and Nutrition Program Leader, WorldFish
- Sonali S. Sellamuttu, Head of Southeast Asia Office, International Water Management Institute
- Tana Lala-Pritchard, Director of Communications and Marketing, WorldFish
- Terry Hughes, Director, ARC Centre of Excellence for Coral Reef Studies

Managing partner institutions

- WorldFish
- International Water Management Institute
- James Cook University
- University of Greenwich
- Wageningen University & Research



Acronyms

CBFM	community-based fisheries management
CBRM	community-based resource management
CRP	CGIAR Research Program
DoF	Department of Fisheries
F&ARD	Fisheries and Animal Resources Development Department of the Government of Odisha
FAO	Food and Agriculture Organization of the UN
FISH	CGIAR Research Program on Fish Agri-Food Systems
FP	flagship project
IDO	intermediate development outcome
IPRS	in-pond raceway system
ISC	Independent Steering Committee
IWMI	International Water Management Institute
MC	Management Committee
M&E	monitoring and evaluation
NGO	nongovernmental organization
SADC	Southern Africa Development Community
SDG	Sustainable Development Goal
SLO	system-level outcome
WFF	Women Fishers' Forum





About FISH

The CGIAR Research Program on Fish Agri-Food Systems (FISH) brings together a unique set of multistakeholder partnerships to harness emerging science in aquaculture and fisheries to deliver development outcomes at scale. The program partners closely with governments, NGOs, the private sector and research organizations to influence national, regional and global policy and development practice.

For more information, please visit fish.cgiar.org