2019 Annual REPORT

Aquatic Foods for Healthy People and Planet

WorldFish

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WorldFish an overview

WorldFish is an international, non-profit research organization that works to reduce hunger, malnutrition and poverty across Africa, Asia and the Pacific.

With a 45-year track record of leading science, WorldFish generates scientific evidence and innovations for the inclusive and sustainable development of aquaculture and fisheries, making fish and aquatic foods a path towards shared prosperity, inclusive growth and healthy and resilient livelihoods.

WorldFish is part of the CGIAR, the world's largest agricultural innovation network, whose mission is to end hunger by 2030 through science to transform food, land and water systems under threat of climate change. Within CGIAR and the wider global agenda of agricultural research for development, WorldFish has a unique research mandate focusing on the role and contribution of aquatic foods and aquatic food systems to the global food systems transformation towards healthier and resilient diets. Our research shapes and supports progress on multiple Sustainable Development Goals (SDGs), with a mission focus on SDG2: Zero Hunger and a special focus on SDG14: Life Below Water.

Our mission

WorldFish is dedicated to making fish and other aquatic foods a key component of the transformation of global food systems, contributing to addressing poverty, hunger and malnutrition among the millions of people who depend on aquatic foods in low- and middle-income countries throughout Africa, Asia and the Pacific. Our mission is to end hunger and advance sustainable development by 2030 through science to transform food systems for healthier people and planet.

Aquatic Foods
Animals, plants and microorganisms that are farmed in and harvested from water, as well as cell- and plant-based foods emerging from new technologies.

Our goal is to improve the health and welfare of aquatic food producers, processors, traders and consumers to promote resilience, adaptability and environmental sustainability in the face of climate change, and to empower women and youth, in particular, to take part and share in the benefits of the emerging blue economy.

What we do

WorldFish provides households, the private sector, policymakers, civil society organizations, investors and development actors with rigorous scientific evidence to shape action, policies and practices for the sustainable development of fisheries and aquaculture. Capacity building, co-creation, learning and dialogue are the primary ways in which we share our research and engage with stakeholders to inform effective policies, programs and investments that contribute to productive, sustainable and resilient aquatic food systems.

We are supported by a diverse network of investors aligned with common goals. Our research is designed to address specific challenges within the global 2030 sustainable development agenda. Our work is rooted in multidisciplinary science and food systems thinking. It is guided by national priorities and the capacity development needed to improve agricultural research and extension systems, and it is enhanced by our unique ability to convene and broker novel partnerships with development actors and the private sector as a mechanism to scale innovations and impact.

Who benefits from our research

WorldFish works to benefit producers, processors, traders and consumers of fish and aquatic foods, especially women and children in Africa, Asia and the Pacific. We focus our research activities in regions where there are high levels of poverty, and food and nutrition insecurity, and where fisheries and aquaculture are vital sources of nutrient-rich protein and livelihoods.

Specifically, our research contributes strongly to the SDGs and the five impact areas of CGIAR's 2022–2030 strategy and program: nutrition, poverty, gender, climate and environment. Our research on aquaculture focuses on sustainable increases in production, ensuring that fishers and fish farmers, their families and communities, receive direct nutritional and economic benefits. Our small-scale fisheries research targets fishery-dependent households and communities, and the traders and consumers of the fish they catch. Through our work on value chains and nutrition, we aim to increase the availability, accessibility and consumption of nutrient-rich fish by poor consumers, with an emphasis on women and children in the first 1000 days of life—from conception to the child's second birthday.

Cutting across all our work is a focus on gender, entrepreneurship and climate change. Our gender research identifies strategies that influence social norms and bridges the gaps in women's access to and control of productive assets and resources. Our youth-responsive research aims to increase opportunities for safe, rewarding employment and entrepreneurship in inclusive and sustainable aquaculture and fisheries value chains.

Key facts

Fish provide around 3 billion people with 20% of their animal protein intake. In 2017, fish accounted for 17% of all animal proteins consumed globally.

In per capita terms, fish consumption rose from 9.0 kg (live weight equivalent) in 1961 to 20.5 kg today.

In 2018, an estimated 59.5 million people were engaged in the primary sector of fisheries and aquaculture.

Women account for 14% of those engaged in the primary sector of fisheries and aquaculture.

Total fish production is expected to expand from 179 million tons in 2018 to 204 million tons by 2030.

35% of the global harvest in fisheries and aquaculture production is either lost or wasted.

In 2018, about 88% of the 179 million tons of total fish production was utilized for direct human consumption.

Fish caught in aquaculture is projected to reach 109 million tons in 2030, an increase of 32% (26 million tons) over 2018.

67 million tons of fish were traded internationally 2018, for a total export value of USD 164 billion. This accounts for around 38% of all fish caught or farmed globally.

In 2018, aquaculture hit a record high producing 114.5 million tons of aquatic foods with an estimated value of USD 263.6 billion.

Source: The State of World Fisheries and Aquaculture 2020, *published by the Food and Agriculture Organization of the United Nations.*

Message from the Board Chair and Director General

The momentum we have built up since launching our current strategy in 2017 has enabled us to continue our work in three important areas; building evidence of the key role aquatic foods play in food systems, improving the ability of people to make sustainable use of aquatic food resources and informing policymakers of the benefits to be derived from a holistic approach to SDG14: Life Below Water.

We have shown the contribution food from water can make to the nutrition and well-being of millions of people who rely on aquatic foods, yet this opportunity is in many cases being squandered. Countries export fish of high value, viewed in purely financial terms, while low-value but nutritious fish go to waste as unwanted by-catch. Changes in policy to favor local markets would improve the health of the population, and in so doing contribute to economic development. Furthermore, we continue to boost aquatic food nutrition research in developing countries to inform policy.

We pledged USD 1 million for research at the Our Ocean Conference, with Africa the top priority. The potential for aquaculture in Africa is enormous. Our ambition to establish the Fish for Africa Innovation Hub seeks to foster cutting edge science, technology, policy and market innovations to leverage the potential of the world's fastest growing food production sector to supply a burgeoning consumer market of over a billion people with sustainable, affordable, safe and nutritious aquatic foods.

There is room for improvement at every part of the aquatic food system, in the path from supply of fish and aquatic foods, through markets, policies and value chains to consumers. Our research shows that in some places the simplest innovation, such as improved cold storage, can result in great gains. Whether it's an insulated container in Egypt or a solar-powered freezer in the Solomon Islands, the result is less waste, more nutritious diets and improved livelihoods.

Our work is informing critical discourses and shaping policies at the highest levels. Several of the Blue Papers for the High-Level Panel for a Sustainable Ocean Economy drew on our scientific expertise. Access to ocean resources is rarely equitably distributed. Many of their benefits are accumulated by a few, while most harms from development are borne by the most vulnerable. Our work promoted the importance of small-scale fishers and the need to redress their neglect by high-level groups.

Our research innovations on antimicrobial resistance and on tracking small-scale fisheries catch won top awards at the CGIAR Platform for Big Data in Agriculture Inspire Challenge. Our gender research has focused on enhancing women's independence, leading to greater recognition and empowerment within the household.

In 2019, we reviewed our organizational strategy and began working on a refreshed 10-year version that aligns with the One CGIAR reforms and maturing of the 2030 SDGs. With support of the Board of Trustees, we made a critical shift towards food systems research and innovative aquatic food solutions for healthier and sustainable diets.

We are dedicated to building a more holistic agricultural research agenda that pays greater attention to linkages between land and water food production systems. Aquatic foods must occupy a central place in our food futures and in the global agricultural research agenda alongside land-based crops and livestock.

At the time of writing this message, the COVID-19 pandemic has caused significant disruption in food systems exacerbating efforts to improve the livelihoods of the most vulnerable. WorldFish and its partners—across the public and private sectors—are working to shed light on the impacts on fish and aquatic food systems across Africa, Asia, and the Pacific.

We are fortunate to have the continuing support of our funders and partners. We cannot advance the agenda for aquatic foods on our own, because the holistic approach it calls for requires a wide range of interests and expertise to work alongside one another.

This report provides a window into the exciting journey we have launched towards mobilizing a global movement of researchers, policymakers, investors, business leaders and local producers and consumers to create shared value and co-design interventions that will make aquatic foods an integral part of the food systems transformation and the One CGIAR reform.

Yvonne Pinto
Outgoing Board Chair

Baba Yusuf Abubakar
Incoming Board Chair

Gareth Johnstone
Director General

RESEARCH PROGRAM ON Fish

CGIAR

Led by WorldFish

Shaping agri-food systems with fish

The CGIAR Research Program on Fish Agri-Food Systems (FISH), led by WorldFish and partners has made significant progress on transforming aquatic food systems during 2019. In collaboration with research partners, beneficiaries and stakeholders, FISH supports 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. Highlights of the progress made by the program in 2019 are presented here. The full FISH annual report is available at fish.cgiar.org.

- **50** national-level case studies using a novel methodology in a multi-partner research collaboration co-led by FISH, Food and Agriculture Organization of the United Nations (FAO) and Duke University to illuminate the hidden economic, social and food and nutrition security values of small-scale fisheries, at global and national scales.

- **204,887** vulnerable women, children and men increased fish consumption and dietary diversification and 294,817 people were assisted to exit poverty due to aquaculture and small-scale fisheries interventions.

- **339** capacity development initiatives were taken up during 2019. 177,474 people received short-term training through FISH, of which **145,441** (82 percent) were women.

- More than **41,459** households have adopted improved aquaculture and fisheries practices, derived from FISH research and disseminated via multiple channels.

- Research at scale increasingly helped shape the policy environment for uptake of **45** innovations and influenced the development of nearly **26** policy improvements and investment decisions at various levels.

Big splashes in 2019

26 policies influenced **and/or** changed

87% of **articles** are **open** access

63 peer reviewed **articles**

USD **20.96** million **invested by** **5** top donors **in 2019**

45 research **innovations** at various stages from **research** to scaling

Over **50** countries with **Illuminating Hidden Harvest** studies

61 active projects as of the end of **2019**

248 active **partnerships**

34 new projects in **2019**

194 **publications**

30 **studentships,** of which **24** were **PhD** and **Masters** and **6** internships

6 **publications** with Almetric scores above **100**

4 **countries** with fish genetic **improvement** programs

98 new **partnerships**

2019 highlights

Advancing food systems thinking with aquatic foods

For 45 years, WorldFish has been working to improve the livelihoods of some of the poorest and most marginalized people through fisheries and aquaculture. Increasingly, we have come to realize that fish alone is not enough.

We need to think holistically about all aquatic foods and how they contribute to healthy, sustainable diets.

The past year has seen us strengthen this endeavor.

Aquatic foods—animals, plants and microorganisms that are farmed in and harvested from water, as well as cell- and plant-based foods emerging from new technologies—are uniquely placed to meet the need for better nutrition sustainably while at the same time responding to and mitigating the impacts of climate change.

The EAT Lancet report drew attention to the importance of aquatic foods, which are rich sources of healthy nutrients, such as fatty acids and essential micronutrients like vitamins A, B12, D, iron, zinc and calcium. Our work as part of the international experts group developing the Blue Papers for the High-level Panel for a Sustainable Ocean Economy reinforces the case for aquatic foods. *The Future of Food from the Sea* makes it clear that while the ocean is already an important source of food, it "has the potential to play a much more significant role through increased mariculture."

Livelihood options

Aquaculture and fisheries provide important new options for livelihoods in regions impacted by climate change, such as the salinizing deltas of Asia and the coastlines of Africa. Aquatic foods can also be produced with low environmental footprints, adding efficiency gains to human food supplies that are limited with land crops, both in terms of the resources needed and in the emission of greenhouse gasses. Our research provides innovations and evidence for responding to climate change, but we recognize that research must also influence policy and investment at all levels, to turn research into action at the scale required.

Shifts in global policies will be needed to reduce overfishing of wild stocks while at the same time ensuring that aquaculture is sustainable and that its products are accessible and affordable to coastal people. Equally, inclusive policies are necessary to enable accessibility of poorer consumers to aquatic products.

Almost all research on the nutritional benefits of aquatic foods comes from the Global North, but it is in the Global South that aquatic foods can do the most good.

Genetic resources

Improving the productivity of aquaculture systems benefits significantly from genetics, for which we absolutely must have genetic diversity. It is by selecting faster growing or more disease-resistant parents that we breed better performing tilapia, for example. A new report from the FAO, the first of its kind for aquatic foods, points out that better conservation of genetic resources is essential if the world is to meet increased demand for fish and other foods from water.

The State of the World's Aquatic Genetic Resources for Food and Agriculture is a comprehensive survey based on 92 country reports as well as overarching background studies and literature reviews. It was launched in August at a meeting of the FAO's Commission on Fisheries in Trondheim, Norway.

"The world's aquatic genetic resources will play an increasingly critical role in feeding billions and nourishing nations in the future."

– Gareth Johnstone
WorldFish Director General

Innovations for Africa

WorldFish pioneered improved genetics for sustainable aquaculture, and at a meeting in Edinburgh, Scotland, before the launch of the FAO report continued our long-term commitment to the sustainable use of genetic resources. John Benzie, Program Leader, Sustainable Aquaculture, who contributed to the FAO report, led a four-day workshop on Approaches to Genetic Improvement of Fish in Africa. Participants discussed genetic improvement considering the latest developments and the practical issues they face. The workshop was part of a three-year project funded by the International Fund for Agricultural Development (IFAD), which has seen improved strains of tilapia, carp and catfish become more widely available and equitably distributed.

African aquaculture remains a priority for WorldFish and in October we announced USD 1 million for new research on aquatic foods, with a focus on Africa.

The pledge, at the Our Ocean Conference 2019 in Oslo, Norway, supports two goals: a new, multi-year global research program on aquatic foods; and the development of a Fish for Africa Innovation Hub. Both will help to gather the evidence needed to drive the take-up of aquatic foods.

The hub will be a public-private partnership to serve aquaculture in Africa, with the potential for tens of millions of new jobs in fish production, processing and trade by 2050. The new research program will speed the transition to sustainable aquatic food systems and enhanced ocean governance.

Big data to manage disease

One challenge facing more intensive aquaculture is antimicrobial resistance (AMR). Antibiotics, routinely fed to animals, select for resistant bacteria, which can then infect humans. WorldFish joined the CGIAR Antimicrobial Resistance Hub, launched in February 2019, to tackle the problem. Aquaculture is perhaps the least understood system for AMR. The sector is expanding rapidly with under-developed processes and sometimes poorly controlled use of antimicrobials.

"A greater understanding of farmer practices and behaviors is helping us to identify risk factors for disease emergence," said Jérôme Delamare-Debouteville, WorldFish Sustainable Aquaculture Scientist, whose team will be an important part of the Hub. His team, boosted by an award by the CGIAR Platform for Big Data in Agriculture, will use advanced techniques to identify fish diseases, beaming results back via smartphone in almost real-time. The new tool will reduce the need for antibiotic treatments and ensure the right treatments are used where necessary.

Research, capacity development and advocacy are the foundations on which WorldFish has promoted the value of aquatic foods for food and nutrition security, and economic development. Just as aquatic foods are uniquely positioned to contribute to human welfare, so WorldFish is uniquely positioned to ensure that aquatic foods meet their full potential within the CGIAR.

Big wins for WorldFish's digital innovation

WorldFish's investment in digital technologies has continued to be rewarded by the CGIAR Platform for Big Data in Agriculture (BIG DATA).

At its convention in October, BIG DATA awarded Jérôme Delamare-Debouteville USD 100,000 to develop an innovative and rapid approach to monitoring and treating fish diseases, which can destroy an aquaculture enterprise in a matter of days. This approach could be extended to all farmed animals through the CGIAR AMR Hub, an example of how our expertise in the aquatic realm contributes to the goals of the CGIAR.

In addition, Alex Tilley's project to enhance the visibility of small-scale fisheries was awarded USD 125,000 in scale-up funds. This will allow the project, which was selected as a pilot project in 2018 and proved its worth in Timor-Leste, to be extended to seven more countries in Asia and Africa.

Influencing the blue economy agenda

Small-scale fishers in developing countries are responsible for more than half the catch, 90–95 percent of which is eaten locally. Along with traders, producers and processors, small-scale fisheries supports tens of millions of people worldwide. And yet, when it comes to global and regional discussions around the blue economy, the voices of those fishers, who provide a billion people a day with nutrition, are seldom heard.

WorldFish believes that we have a moral obligation to raise the profile of small-scale fisheries.

Quite apart from being small individually, these fisheries are diverse and take place in remote locations, making them easy to ignore them. But there is also a dearth of data about small-scale fisheries.

WorldFish is tackling both problems. Illuminating Hidden Harvests (IHH) is a project with FAO and Duke University to gather and synthesize critical information on the diverse and misreported livelihood and economic contributions of capture fisheries globally. IHH has commissioned comparable studies from over 50 countries around the world, who between them represent 69 percent of the marine catch and 81 percent of the catch from inland waters. IHH reports will provide evidence that policymakers currently lack.

Better data are absolutely essential. Millions of metric tons of seafood caught by small-scale fisheries, perhaps 65 percent of their total, go unrecorded. That gives a false impression of both the importance of small-scale fisheries and of the threats they face.

At the 6th World Ocean Summit in Abu Dhabi in March, Gareth Johnstone, WorldFish Director General, bemoaned the absence of scientific knowledge and information about small-scale fisheries in the Summit's deliberations. As an example, he pointed to WorldFish's pioneering work in Timor-Leste, using mobile and digital technologies to track fishing vessels and the behavior of fishers. "Our research is helping to uncover the extent to which small-scale fisheries are contributing to the blue economy," said Johnstone. At events throughout the year, WorldFish representatives have made the case for small-scale fisheries.

- In July, in London, England, an event at the International Institute for Environment and Development heard about IHH and fiscal tools to support fishers and the environment.

- In December, WorldFish and the CGIAR Research Program on Fish Agri-Food Systems co-sponsored the FAO's Global Symposium on Fisheries Sustainability. Philippa Cohen, Program Leader, Resilient Small-scale Fisheries, told delegates in her keynote presentation how small-scale fisheries provide entry points for achieving multiple SDGs.

The challenge facing the blue economy is to ensure equitable benefits. We need to protect marine and aquatic resources, and ensure that all users can prosper from those resources. Decision-makers need to know about small-scale fisheries and how important they are. That is the key step to ensuring that these crucial players are given their due in all considerations of the global blue economy.

Global collective action in support of small-scale fishers

As well as advocating for small-scale fisheries in global discussions of the blue economy, WorldFish also seeks to help small-scale fishers represent themselves.

Aside from taking part in smaller meetings, in September at WorldFish headquarters we brought together more than 40 participants from small-scale fisheries, social movements, indigenous people's groups, research, intergovernmental and environmental non-governmental organizations to build an initiative in support of the FAO's Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries. The goal is to coordinate collective action in support of the Voluntary Guidelines which, as the FAO reports, are "about people, not just about fish."

Growing recognition of fish for nutrition

Small fish and aquatic foods are important for nutrition and could make a big contribution to vanquishing malnutrition around the world.

Fish are rich in micronutrients essential to health and boost the nutritional value of foods they're eaten with.

Small fish especially are an under appreciated nutritional resource. In addition to vitamins and minerals, aquatic foods provide protein with much lower greenhouse gas emissions than beef, chicken or pork.

Small island states may have benefitted economically from the interest foreign fishing fleets have shown in their waters, but the small fish islanders once depended on are thrown away as trash. As a result, malnutrition and ill-health are rife in many island and coastal communities.

Shakuntala Thilsted, Program Leader, Value Chains and Nutrition at WorldFish, told the FAO Committee on World Food Security in October that diverting just a fraction of the catch away from export to coastal communities could make a huge dent in the scourge of malnutrition around the world.

Aquaculture too can be made more nutritious, and innovative technologies have an important part to play. Solar-powered freezers and driers can prevent waste and improve incomes while at the same time increase the availability and affordability of nutritious aquatic foods. In Bangladesh, WorldFish worked to pioneer a chutney made of dried, whole, small fish species. One tablespoon a day provides pregnant and lactating women with most of the micronutrients they need, and they like it.

Encouraging the production and consumption of more small fish, at the same time as reducing waste and losses to make better use of existing supplies, can together improve nutrition among people who need it most.

WorldFish Value Chain and Nutrition Research Leader Shakuntala Thilsted addresses influential decision and policymakers at the 2019 Our Ocean Conference in Oslo, Norway.

Taking small fish for nutrition to policymakers

Sharing the lessons we have learned is an essential element in our work. The government of Odisha in India sent senior officers to WorldFish to learn about how best to maximize the nutritional value of the state's fisheries and aquaculture. After the visit to Malaysia, they traveled to Cambodia to see our work on nutrition-sensitive aquaculture and fisheries development.

Cambodia was also the focus of the final workshop in our Small Fish for Nutrition project, delivering the project results and planning scaling activities. Delegates from Ghana, India, Kenya, Malawi and Zambia joined in a study tour after the workshop to see how the project had improved the production and productivity of aquatic foods, and the consumption of fish and vegetables.

Exploring partnerships and investments for future fish products

Research companies with an eye on the value of aquatic foods are already beginning to work on plant-based and lab-grown "synthetic" fish and shrimp meat. How will these new products contribute to food system transformation, and influence the millions of producers, processors, and others in the developing world who depend on aquatic foods for their livelihoods? That key question is part of a new Memorandum of Understanding between WorldFish and the International Food Policy Research Institute (IFPRI).

WorldFish needs to ensure aquatic foods are part of the sustainable food systems of the future, and that developing countries play a big part. Collaboration with IFPRI on the policy environment for aquatic foods will help us do that.

A three-way agreement signed by WorldFish, the International Rice Research Institute (IRRI) and the International Water Management Institute (IWMI) will help to ensure a transformation of rice-based landscapes and food systems in Southeast Asia.

The partnership is a recognition of the major food system benefits for more integrated approaches involved in rice, fish and water. The development of rice monoculture in policy and practice has led to neglect of the importance of aquatic foods in

WorldFish Director General Gareth Johnstone delivers his keynote speech to the World Seafood Congress in Penang, Malaysia.

the livelihoods and health of people. Too often, as recently seen in Myanmar, irrigation and other development for rice actually damages aquatic resources that are a vitally important aquatic sources of nutrition and income, undermining the goal of sustainability of the food system.

This five-year agreement focuses on sustainable intensification and management of rice-fish systems.

Both agreements support the tighter collaboration among CGIAR Research Centers that will be a key feature of the One CGIAR reforms.

The World Seafood Congress, the first in Asia, offered WorldFish Director General Gareth Johnstone an opportunity to share our research and vision with private-sector industry leaders. Focusing on the central importance of SDG14: Life Below Water—and how it contributes to several other SDGs, Johnstone's keynote speech outlined the transformations that would be required, for example, from production to sustainability and from quantity to quality.

Agriculture contributes to climate change while the production of aquatic foods is both less susceptible to climate change and emits lower levels of greenhouse gases.

WorldFish took part in several other panels and events at the congress.

A generous grant by the Bill and Melinda Gates Foundation helped kick off our mid-term review process to refresh our current research strategy, and to conduct an organizational assessment through a series of reflection and learning exercises with external and internal stakeholders.

We partnered with Dalberg, a strategy and policy advisory firm specializing in global development, to develop value propositions for three critical areas that will inform the strategic direction of WorldFish and shape our research work on aquatic food systems in the upcoming decade.

These value propositions focused on:

- The development of a new global research program on aquatic foods to ensure that they contribute to the sustainable development agenda. A coalition of like-minded public and private sector partners will help us generate and mobilize the research evidence and appropriate investments needed to ensure fish and aquatic foods are part of the global call to action for a food systems transformation.
- The development of an impact-driven private sector engagement strategy to help scale key WorldFish innovations stemming from our genetic improvement program on tilapia and carp, two of the most important cultured finfish species worldwide.
- The creation of public-private partnerships to establish a Fish for Africa Innovation Hub. The vision is to position fish firmly at the heart of discourse, policy and practice to transform African food systems for healthier diets, improved livelihoods and shared prosperity.

We also partnered with ReD Associates, an innovation and strategy consulting firm, to examine and identify opportunities to strengthen organizational effectiveness in the way we work. Changes to the way we mobilize talent, partnerships, resources, digital transformation, communications and our institutional culture of learning and innovation will help us to remain a world-class research organization that is fit for purpose in the 21st century.

The results of these two processes are shaping the refreshed vision and mission of WorldFish, which focuses on building a new global research program and partnerships. We need to ensure that fish and aquatic foods are an integral part of the CGIAR mission and of the global agricultural research agenda, an essential element in the global food systems transformation for healthy people and planet.

In June 2019, WorldFish convened a two-day forum in Egypt with potential partners and investors to explore ideas and insights for building a shared vision for a regional Fish for Africa Innovation Hub. The goal is to leverage scientific evidence and cutting-edge innovations to shape and support transformational change in aquaculture and fish value chains in Africa.

Johnstone described the Hub as "an idea whose time has come to help realize the unfulfilled promise of the world's largest-growing food production sector for Africa, especially for women and youth."

The Hub will build on WorldFish's rich experience and wide network of public and private sector partners in Africa and on the 20-year history of the WorldFish Africa Aquaculture Research and Training Center (AARTC) in Abbassa, Egypt.

At the Forum, Baba Yusuf Abubakar, Chair of WorldFish's Board of Trustees, explained that the Hub would "catalyze a vibrant private sector with innovative fish-based enterprises and business associations."

The goal of the Fish for Africa Innovation Hub is to help accelerate country, regional and continental efforts to meet the SDGs by 2030. It will offer much-needed collaborative space, scientific tools, research skills and world-class knowledge along with the latest innovations to use fish to help turn Africa's rapid urbanization, technology adoption and entrepreneurship into inclusive wealth, opportunities and shared prosperity, particularly for women and young people.

Our portfolio of partners has continued to grow, with 98 new partners added in 2019. The 248 partners we worked with in the year include private sector actors, national agricultural research systems, governments and non-governmental organizations and many others. And, of course, we work closely with all other CGIAR Research Centers.

Our contribution to the Sustainable Development Goals

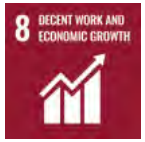
WorldFish is part of the global effort to eradicate poverty, hunger and malnutrition and reverse environmental degradation, as well as many complex global challenges reflected in the 2030 Sustainable Development Goals (SDGs). Ten of these SDGs are particularly pivotal to our work and mission.

Globally, approximately 800 million people depend on fisheries and aquaculture for their livelihoods. WorldFish works to create opportunities in sustainable and productive fisheries and aquaculture to help lift out of poverty people who rely on fish for their income, livelihoods and well-being.

Fish offers untapped potential to meet increasing demand for safe, nutritious food by a growing population. By sustainably improving the productivity fisheries and aquaculture in an environmentally and socially responsible way, WorldFish seeks to improve the supply, accessibility and utilization of fish within diverse and nutrient-rich diets.

Fish, particularly small fish, are rich in micronutrients like vitamin A, iron, calcium, zinc and essential fatty acids. WorldFish strives to make quality fish available and affordable to the poor in developing countries, particularly women and children in the first 1000 days. Our research informs strategies for combating under- and malnutrition and for preventing public health issues, such as stunting and other non-communicable diseases related to poor diets and nutritional deficiencies.

Rural women play a vital role in fisheries and aquaculture as fishers, farmers, processors and traders. However, they often have unequal access to the resources and services they need to be successful. WorldFish works to address gender inequalities and their underlying factors in order to improve the fish-based livelihoods of women, who in turn amplify the benefits of these livelihoods for their children, families and communities.



WorldFish research shows that adopting new technologies alone is not enough to improve productivity. Using natural resources efficiently, pursuing innovation and having access to knowledge, networks or credit to invest in business and other entrepreneurial activities, especially for poor women and youth, are also vital and central to our contribution to this SDG, particularly in Small Island Developing States.

WorldFish works closely with national actors to enhance local capacities for scientific research and technological innovation in fisheries and aquaculture. We also support the integration of small-scale fish producers and enterprises into national, regional and global value chains and markets.

In the face of a growing world population and the impacts of climate change, there is an increasing imperative to do more and better with less. WorldFish works to achieve sustainable management and efficient use of natural resources and to reduce waste and loss along fish value chains.

Overfishing, ineffective management practices, industrial development, agricultural pollution and the impacts of climate change have reduced fish stocks. WorldFish conducts cutting-edge genetics research on improved and resilient fish species and promotes a sustainable approach to fisheries and aquaculture to ensure that enough nutritious fish are available for future generations.

Ensuring that all users benefit equitably from marine and aquatic resources requires new thinking, new information and greater collaboration between less traditional partners. Among the 15 members of CGIAR, WorldFish is uniquely positioned to contribute to this SDG. We focus on generating evidence-based solutions that inform policies and practices relating to sustainable ocean governance and the development of an inclusive and people-centered blue economy, with special attention for the value and contribution of small-scale fisheries.

The results of many land-based activities, such as pollution, plastics, deforestation and livestock waste, are affecting, altering or destroying oceans, lakes and other inland aquatic ecosystems and habitats. Preserving life below water (SDG 14) also requires the adoption of environmentally sustainable practices on land. WorldFish research is informing interventions to reduce waste and loss in fish handling and processing, to conserve and restore degraded ecosystems in inland and coastal environments and to develop gender-responsive practices and technologies for innovative small-scale aquaculture systems with low environmental impact.

From research to impact

Fish and aquatic foods as the basis of better livelihoods

WorldFish has long seen fish and aquatic foods as offering people a route out of poverty. With around 800 million people dependent on fisheries and aquaculture primary sector and value chains for their livelihoods, improving the production and use of aquatic foods remains an important goal. Fish farming stands to make large gains from sustainable intensification and we are beginning to scale innovations that improve production and reduce waste. Capture fisheries too can be better managed for greater benefits. A key focus is to ensure that women and youth are empowered to improve their lives through the more effective use of aquatic resources.

Sustainable expansion and management of aquaculture and fisheries in Egypt

Egypt

Aquaculture in Egypt and the value of the fish produced have seen significant gains thanks to two projects funded by Swiss Development Cooperation (SDC). Projects on Sustainable Transformation of Egypt's Aquaculture Market Systems (STREAMS) and Youth Employment in Aswan Governorate (YEAG) ended last year with tangible evidence of success.

STREAMS trained more than 1000 women—crucial actors in the informal fish trade—who saw their businesses develop on multiple fronts. Low-tech innovations, including insulating iceboxes, weighing scales, cleaning equipment and tricycles for transporting everything, reduced waste and improved incomes.

The women said that they had difficulty accessing capital to expand their activities. The project helped them to organize savings groups that together secured loans of 2.7 million Egyptian pounds (about USD 175,000).

The YEAG project worked closely with fishers to develop management plans for Lake Nasser, behind the Aswan dam on the Nile. Results came rapidly, as participants saw larger harvests of bigger fish, which fetched a higher price. The project also brought in solar energy so people could mend their nets at night and reduce their dependence on fossil fuel.

YEAG offered more than 100 women in Aswan Governate the same sort of training and support as the STREAMS project. A competition for young entrepreneurs was won by a business plan to produce smoked fish. Along with salting and the use of insulated containers, this will help to reduce food waste. To further increase the supply of fish for the people of upper Egypt, YEAG worked to convert land not suitable for agriculture to aquaculture.

An important component of the STREAMS project was to improve the overall performance of aquaculture. At our research center in Abbassa, WorldFish researchers adapted a new technology known as the in-pond raceway system. Pumps circulate the water in an aquaculture pond and the system offers several benefits. Fish grow more rapidly on less feed, while their waste can be more readily removed and used as agricultural fertilizer.

With this and other innovations, the STREAMS project reported profitability increases of 13 percent, largely as a result of 20 percent lower use of purchased feed. Water consumption also dropped by 10 percent. STREAMS and YEAG applied lessons learned by WorldFish elsewhere, and themselves act as models for improving the livelihoods of fishers in other countries.

Harrison Karisa, WorldFish Country Director for Egypt and Nigeria sees this as an additional benefit: "One of the major lessons learned is the fact that change can come quite quickly when the focus is on empowering the people."

4,297 farmers have adopted integrated Best Management Practices in Egypt

Better care of carp raises profits for Indian farmers

India

WorldFish is currently halfway through a six-year agreement with the Department of Fisheries and Animal Resources Development of the government of Odisha State in Eastern India. One element of the agreement is to apply lessons in sustainable intensification from Bangladesh to improve aquaculture, and production of carp has already doubled at a pilot site.

Dhuanpari village consists of 72 households. Together, they communally own and manage five ponds that cover a little more than seven hectares. The ponds supply small indigenous species, which are vital for household nutrition, and Indian major carp as a source of income.

An important change for the village was to agree to stock the pond with larger carp fingerlings than before. These fingerlings are less likely to be eaten by predators in the tank and are more resilient. They also reach marketable size more rapidly, which means villagers can stock twice a year.

Other better management practices that the villagers learned included the importance regular feeding, testing water quality and liming when required. They also monitor the levels of plankton on which the fish feed and keep a closer eye on possible outbreaks of disease.

The first harvestable carp were taken from the ponds after just five months. In addition, the ponds provided 10-20 kg a week of small fish, crucially important in a state where more than 34 percent of children suffer from malnourishment (stunting).

During this pilot phase the government is subsidizing the cost of additional fish feed, which the villagers did not use before. However, villagers are preparing for the end of subsidies by learning to make their own feed. Some of it is agricultural by-products, such as rice bran, oil cakes etc, which are easily available in the local market.

A lead farmer who participated in the pilot phase showed it was possible to reduce production costs at nearly 25 percent per kilogram of fish.

Each harvest has seen a profit of more than USD 2000 for the families. They agreed to spend some on further development of their aquaculture. Investments in a guardhouse and in groundwater pumps will both help to maintain the productivity of their ponds.

Trilochan Swain, WorldFish Component Leader, was initially wary of working with Dhuanpari village, because "community ponds are the property of everyone and the responsibility of none." And yet, these were the best-performing ponds in the project, serving as an example for other communities in the district. Learning from the trials in the Dhuanpari village, Swain believes that with strong leadership, ponds can flourish.

967 households adopted carp-based polyculture through backyards and community ponds

Tackling hunger and malnutrition with aquatic foods

Fish and other aquatic foods are a valuable source of important nutrients. And yet, too often the people closest to those resources are the least likely to be able to make use of them. We want to turn this around, globally and locally, by providing the evidence on which to base nutrition-sensitive governance and policies. Around the world, fish caught offshore would vastly improve local nutrition if only a small fraction were diverted away from export. On a community scale, in Cambodia, our research shows how community management of nutritious aquatic foods disproportionately benefits the poorest people.

Aquatic foods in the nutrition and health debate

Nigeria, Ghana, Malawi

For the first time, the world has an idea what the global fish catch means as nutrition, rather than merely tonnage and value in the market. The new information reveals that many of the world's poorest people, those most affected by malnutrition, would see huge improvements to their health if only a small part of the fish caught in local waters were made available for local consumption.

Fish are often thought of purely as protein, but they are also important sources of vitamins, minerals and essential fatty acids. A large multidisciplinary study by WorldFish scientists and collaborators, published in the important scientific journal Nature, measured seven micronutrients in 367 species of marine fish and used the data to build a model of the nutrition in the global catch.

In many countries, despite living within 100 km from coastal aquatic food systems, people still do not have access to the nutritious food they require.

Micronutrient deficiencies put a brake on economic performance to the tune of 11 percent per year in some African countries. "A fraction of current landings could be particularly impactful for children under five years of age," the researchers note, which would have benefits far into the future.

Much of the exported catch does not even feed people directly. "Low-value" fish is converted into fishmeal for export, which is then fed to high-value fish. WorldFish

is working to develop alternative, sustainable sources of food for aquaculture, so that local people can continue to benefit from these fish, which are far more valuable as a source of human nutrition than as fishmeal.

The root problem is that fisheries policies are based almost entirely on conventional economics. With demand rising among wealthy, urban consumers, it seems rational to focus on high-value fish for export and to turn low-value fish into an export commodity. This research is just one of the pieces of evidence that WorldFish is bringing to bear in an effort to turn global policies in a better direction. Aquatic foods have much to contribute, sustainably and without contributing to the climate crisis.

Eddie Allison, WorldFish Research Chair for Equity and Justice in the Blue Economy, acknowledged that the research, to which he contributed, is only a start.

"All that we, the research authors, are asking is to consider shifting the policy agenda toward nutrition-sensitive fisheries."

For the poor of the world, fish is not just another item in a rich and varied diet, it is an essential source of nutrition lacking in their daily staples.

Fish consumption and dietary diversification of 204,887 vulnerable women, children and men have been connected to aquaculture and small-scale fisheries interventions in 2019

More fish for nutrition in Cambodia

Cambodia

Fish and other aquatic animals, such as frogs and snails, that live in flooded fields have long been an integral part of the diet of rice-growing people. In past decades, however, a concentration on rice productivity saw a decline in the amount of food supplied by rice field fisheries. In 2019, WorldFish published a manual based on the first five years of the Rice Field Fisheries Enhancement Project in Cambodia. It documents good practices to provide evidence-based, step-by-step guidance for boosting rice field fisheries (RFF).

The key to RFF is a refuge that provides a safe place for the fish during the dry season. Fishing in the refuge is generally prohibited. Next season, when the fields are flooded once again, the fish are allowed out of the pond and migrate into the fields where they thrive and grow and can be caught. Rice fields are owned by individuals, but RFF are open to all; a community fish refuge (CFR) managed by a committee of community members can improve the harvest for the whole village.

Within a year, communities can see their overall catch increase by 9 percent.

And because RFF are open, the poorest people see the largest benefits, with catches up to 70 percent for the poorest fifth of households.

Throughout the year, steps can be taken to optimize the process and improve the yield of aquatic foods. During the Rice Field Fisheries Enhancement Project, WorldFish and partners worked closely with 134 communities in four provinces of Cambodia—Kampong Thom, Siem Reap, Battambang and Pursat—to study what works best, now shared in the manual.

The manual offers several lessons, from siting the pond in an area that has not dried up over the past 20 years to guidance on how to assess water quality. Managing the water level in the refuge and the plants on the banks and in the water can profoundly improve conditions for the fish. Managing the community is important too, developing a shared vision for how the CFR will improve their lives and ensuring that everyone obeys restrictions on fishing. Community members must work together for example, to look after the CFR and to ensure that migration channels for the fish are kept open.

Based on its success, the Rice Field Fisheries Enhancement Project was extended in Cambodia. The lessons of Phase I, gathered in the manual, can improve household nutrition further and will be of benefit elsewhere in the region.

3965 households adopted improved management practices of fish refuges in Cambodia

Policy approaches to enhance sustainability

The role of aquatic foods in providing better nutrition and opportunities for income generation is indisputable. However, there is a need to ensure that people have equitable access to aquatic resources and that these resources remain available in the long-term. National governments establish the policy framework for fish and agri-food systems. Through our work with local communities and high-level stakeholders, we aim to provide policymakers with evidence to inform their decisions. The goal is to offer a solid foundation for policies that are inclusive, equitable and sustainable—and to then help people make good use of those policies.

Governing Myanmar's inland fisheries: Looking for the right balance

Myanmar

Myanmar is one of the top ten fish producers globally but has reached a fork in the road to greater development. At stake is the balance between private enterprises and local communities.

WorldFish, through a long-term project supported by the Australian Centre for International Agricultural Research (ACIAR), has been helping to gather evidence on which sustainable, equitable policies can be based. At the same time, we are working with people and institutions to develop their capacity to assemble and assess information to guide fisheries policy in future.

The problem is the historical allocation of fishing rights in the Ayeyarwady delta, one of the most densely populated regions of Myanmar. Since colonial times, an annual auction system sold fishing rights to the highest bidder. Local communities could not afford to compete, and increasingly businesses seek to maximize profits rather than optimize for sustainability.

A recent appetite for change has seen some political interest in local, community-based fisheries management (CBFM). However, partly as a result of previous practices, there is almost no data about local fisheries and little experience within the communities.

ACIAR is now supporting a second phase of the project Improving Fishery Management in Support of Better Governance of Myanmar's Inland and Delta Fisheries, better known as MYFish 2. In the first phase the project worked with government and practitioners to establish a Fisheries Development Research Network and a Fisheries Information Center. The new phase is documenting existing management systems

and working closely with an initial tranche of 13 experimental CBFM schemes.

In the communities, capacity development has focused on daily monitoring of biological factors important to the production of aquatic foods.

More than 1000 households are taking part in sociological surveys every six months to assess the impacts of the project.

Five local universities are involved, building their capacity to carry out their own research.

Research from MYFish 2 is already pointing the way towards policy reforms that could offer local communities greater participation in the resources of the delta. First indications are that CBFM could be scaled out to more than 3000 fisheries. Another WorldFish project is providing policymakers evidence to ensure that development for rice production does not degrade fisheries. One key factor is that communities, too, can over-exploit their resources, hence the need to ensure that they have the knowledge and empowerment to manage their fisheries sustainably.

Balancing social and economic needs, both dependent on the biological resources of the delta, will be essential for long-term sustainable development in Myanmar.

Timor-Leste round table influences policy

Timor-Leste

The second National Aquaculture Forum took place in Dili, capital of Timor-Leste, in August 2019. The event marked a crucial milestone in the implementation of the country's National Aquaculture Development Strategy, which we helped Timor-Leste to realize in 2012. A couple of months before the Forum, the first private hatchery in Timor-Leste had opened for business, to meet the greatly increased demand for fingerlings created by the Strategy.

About 40 percent of the people of Timor-Leste live below the poverty line and malnutrition is widespread. The government's strategy calls to more than double the consumption of fish by 2030. The focus is on tilapia, which thrive in local conditions and which people like.

WorldFish renovated a government hatchery so that it could supply our genetically improved farmed tilapia (GIFT) stock to farmers. The hatchery opened in January 2016, but within three years it could no longer meet demand.

We worked with government and a fish farmer, Joao Da Silva, to build the new hatchery, a public-private partnership. This hatchery will get broodfish from the government hatchery, which will now focus on maintaining high-performing parental GIFT stocks.

At the Forum, WorldFish launched the Better Management Guidelines for Tilapia Farming. The guidelines consolidate the lessons we learned working with Timorese fish farmers to implement the government's aquaculture strategy. More than 1000 farmers, most of them new to aquaculture, took part in a series of day-long farmer field schools. They learned about pond construction, stocking, water quality, feed preparation and feeding, disease management, and harvesting and marketing of fish.

A key topic was to teach farmers how to make their own low-cost fish feed using ingredients such as rice bran or cassava flour. The cost of feed is the biggest factor in profitability; if farmers can fertilize their ponds with locally available chicken or pig manure and make their own feed, it ensures the viability of their operation.

As the Forum heard, this systems approach, from high-quality broodstock through hatcheries, fingerlings and farmer field schools, has paid off. The Better Management Guidelines reflect production increases for each fish-rearing cycle from 1.2 metric tons per hectare to 4.3 metrics tons per hectare, with some farmers achieving 7 metrics tons per hectare. A primary focus of the Forum, which is now an annual event, was to foster additional partnerships. For example, about 10 additional hatcheries will be needed to scale these achievements and achieve the goals of Timor-Leste's National Aquaculture Development Strategy.

Informing action on climate change

Climate-smart agriculture works to adapt food production to climate change while at the same time making agriculture more resilient and mitigating its impact on climate. Aquaculture provides more than half of all fish consumed, and because catches from the wild have peaked, it will need to more than double by 2050 to meet the world's needs. Fortunately, aquaculture currently contributes to around 4.5 percent of agricultural greenhouse gas emissions and is also less susceptible to climate change. Our research helps to bring about sustainable, resilient increases in the food supply through climate-smart aquaculture.

The global aquaculture sector contributed 0.49 percent of anthropogenic greenhouse gas (GHG) emissions in 2017[1]

New approaches for climate-smart aquaculture in Bangladesh

Bangladesh, Indonesia

In Bangladesh, farmers have discovered that flash floods, extended heatwaves and saline intrusion—all aspects of the climate crisis—have made their homestead fish ponds less productive. In an innovative approach, WorldFish decided to work specifically with women to craft more climate-smart approaches to aquaculture.

In two climate-smart villages in Barisal and Khulna divisions, 24 women joined us as co-researchers to measure which species grew fastest and which best survived extreme weather events. At the same time, they learned how to manage their ponds better, for example netting them to keep out falling leaves. Bought fish feed is one of the biggest sources of greenhouse gas emissions in aquaculture; learning to make their own feed from household scraps and agricultural waste makes a double contribution, reducing their costs and strengthening the circular economy.

In the two climate-smart villages, homestead fish production more than doubled. The women then shared their skills and practical knowledge with five neighboring villages, which saw similar gains.

[1] *Quantifying and mitigating greenhouse gas emissions from global aquaculture, FAO*

Quite apart from the extra resilience and food security, though, the project increased the women's status and empowerment by giving them knowledge and skills and an independent income.

Around the world, fish and aquatic foods are going to have to increase dramatically in the global diet, as pointed out by the EAT Lancet report and by *Creating a Sustainable Food Future* from the World Resources Institute (WRI). The WRI report, to which WorldFish made important contributions, makes clear both the challenges this will entail and also the benefits for climate. A new departure will be to introduce aquaculture to people and places where aquatic foods have not been part of their history.

That was one thrust of an event WorldFish organized at the 5th Global Science Conference on Climate Smart Agriculture, in Indonesia. Our session on Blue Solutions examined the role of aquatic foods in the transformation to climate-smart food systems.

Our research on alternative sources of fish food, along with increased production and reduced losses, and the naturally low carbon footprint of aquatic foods, will enable aquaculture to provide resilience to communities struck by climate change, especially those where land-based agriculture is struggling to adapt.

Perhaps the greatest potential lies in Africa, which is starting from a very low base. Technical innovations pioneered at our new Innovation Hub in Abbassa in Egypt are being rolled out to 10 African countries that are adapting their agri-food systems in the face of climate change.

Overshooting our natural capital again in 2019

Solomon Islands, Timor-Leste

Earth Overshoot Day is the day on which we have taken more from nature than it can replace in a year, a sobering measure of how we are living beyond our means. In 2019, it fell on 29 July, two days earlier than in 2018.

For 45 years, our work at WorldFish has been dedicated in different ways to moving the date back towards 31 December, and perhaps even beyond so that we replace natural capital.

Food production is one of the biggest threats to climate stability and ecosystem resilience. Our focus on transforming the global food system is the most effective way to enhance human and planetary health in tandem.

One approach that delivers multiple benefits is to reduce food losses and waste. Not only does that make more food and nutrition available, it also mitigates the climate effects of producing food that is not consumed.

Around 30 percent of the fish catch is never eaten, a loss that particularly affects women and that is the target of much of our recent work.

Rural women in the Solomon Islands cook fish for their families and sell the surplus. But in places where reliable electricity remains a dream, too much goes to waste. With a network of women's groups, we evaluated solar-powered freezers to reduce waste and improve livelihoods. The women store surpluses in the freezers and rent extra space to others, earning enough to cover the cost of maintaining the freezer. We have shown that solar-powered freezer technology could transform remote Pacific Island food systems.

In Timor-Leste, women worked with us to develop and market fish-based products. The women buy freshly caught sardines, cook them and bottle them. These fish last longer and can be distributed and sold at local markets. Timorese people eat the fish whole, which further reduces processing waste and supports micronutrient intake, for example from minerals in the bones.

Small indigenous fish species are a welcome part of the diet in many other countries. However, people often discard the head and guts, missing out on considerable nutrition.

In many countries, notably Cambodia, Bangladesh, and Zambia, we showed women how to prepare small fish to retain more micronutrients, reducing waste and improving family health. We have also helped to develop products such as snacks and fish powders that extend shelf life and availability.

You will find many other examples of how work by WorldFish brings sustainable food systems closer throughout this annual report.

Essential transformations for gender equity

Looking at official reports and statistics, you might imagine that fisheries are an entirely masculine operation. And yet, we know that women play an absolutely vital role in the entire value chain. While we focus on better economic opportunities for women and youth, we also recognize that we must do more. Business as usual with minor changes to accommodate more women will not help. In fact, as our research shows, it may make matters worse. We need transformative approaches to gender, which is not an issue for women alone.

Gender transformative approaches: Strategies and emerging evidence

Global

Women and men play very different roles in fisheries, that much is clear. Men, by and large, are the ones who land fish, in the wild and in aquaculture. Women, by and large, are the ones who turn fish into food. Whether working in large international processing plants or at home in the informal sector, women have long been invisible in fisheries policy.

At every level, the aquatic food sector is "woman intensive but male dominated," in the words of former WorldFish Director General Meryl Williams.

The biggest obstacle facing women is that even in the recent past, as gender inequality has come into focus, too many efforts have effectively been just workarounds, accommodating women without challenging or changing the societal norms that put them at a disadvantage in the first place.

WorldFish has been promoting gender transformative approaches, which target power dynamics and social norms directly. Occasionally, all it takes is a demonstration of success. In Bangladesh, for example, where we worked with women to improve the productivity of homestead ponds. When men saw the benefits of women being able to produce fish themselves and market the surplus, they became open to sharing decision-making with their wives. And the women felt empowered to contribute.

While we may be making progress at community level, fisheries officers too often are simply not interested in anything beyond production and see no need for data about women. We are developing a research tool to assess national fisheries agencies for their ability and

willingness to integrate gender research and gender equity. The tool will enable us to focus attention where it will do most good and monitor progress.

It may be a truism that "you cannot manage what you do not measure," but it remains true nevertheless. A fundamental deficiency for any efforts at gender transformation in fisheries is that there are next to no disaggregated data at any level.

The little information we have on small-scale fisheries globally focuses on production, most of which is done by men. We know that women make a vital contribution, but not how, or how much. That is why the research for Illuminating Hidden Harvests gathers data separately from women and men as a matter of course. This disaggregation goes far beyond recording gender; women and men face different challenges and different opportunities and we need to understand that in detail in all fisheries, large and small.

Planting the seeds of change to close the gender gap

Australia, India

WorldFish takes every opportunity to promote a gender transformation approach where it will make a difference. Global conferences and discussion forums give us the chance to spread the word and influence different actors within the overall fisheries sector, an effort we continued to pursue in 2019.

At the Seeds of Change conference in Canberra, Australia, we took part in 12 panels, presentations and discussions, all intended to close the gender gap by presenting our research, not only on the factors that create and perpetuate gender barriers, but also on the innovations and strategies that help give women a greater say in their own lives.

Cynthia McDougall, Gender Research Leader at WorldFish, welcomes the opportunities to embed social considerations and gender inclusion in these potent multi-stakeholder processes.

At Seeds of Change, among many other topics, we shared research on the importance of women in the value chain that transforms fish into food. In Odisha State in India, for example, we worked with women's groups to improve their production of dried fish. For people inland, dried fish is often all they can get, and yet dried fish is considered unclean. That bad reputation is well deserved, because much dried fish is produced informally and casually in extremely unsanitary conditions.

We worked with women's self-help groups, training them to use solar driers to produce high-quality dried fish hygienically. It isn't enough, however, just to make the product. The project brought the Food Standards Safety Authority of India on board to certify the women's fish and, recognizing that women may not be free to travel to sell their products, also helped the women to negotiate a contract to supply dried fish to the government, which it distributes as part of food assistance.

The Odisha example shows that one way to empower women is to formalize their work in the informal sector. The details will differ from place to place, but the principles are constant.

Gender-sensitivity is embedded in all our work, as revealed in so many of the stories in this Annual Report.

Of course, it would not be right to offer advice to others about gender equality if our own policies were found wanting. In 2019, the number of women in science at WorldFish increased to just under 40 percent, 60 percent of management are women, and for the first time in our history, the leadership team has an equal balance of women and men.

Giving sight to gender-blind training in the Solomon Islands

Solomon Islands

Too many interventions to improve livelihoods are gender-blind. That is, they do not take account of the norms that influence how women and men experience the intervention and its outcomes. At the very least, initiatives need to consider that they may increase the burden on women.

We used a method developed by the CGIAR Gennovate Initiative to look at gender and livelihoods in three coastal communities in the Solomon Islands that depend on fisheries and agriculture.

We learned from the women that past interventions, such as improving the productivity of their home gardens or organizing savings clubs, had indeed backfired because they left the women less time to fulfill the domestic duties men expected of them. For example, men said it wasn't right for women to go away to market; they needed to be at home looking after the children.

Nevertheless, transformation is possible. Deeply entrenched positions can flex when the benefits of success are clear. In discussions with men, they appreciate the benefits of savings clubs. As they become aware of those benefits, they support women being more independent and are even willing to consider sharing the housework. As one man said, "today women can instruct their husbands to clean the house when they are away. This is not something that was practiced before."

Our research also showed us that women are more risk averse than men, because whatever happens they are expected to put food on the table.

As a result, they may not adopt innovations that could pay off in the long-term that have negative consequences to begin with. One solution might be for development projects to carry the initial costs of an innovation, thus reducing the risks for women and potentially enhancing their participation.

Opening the eyes of others working to improve livelihoods is part of WorldFish's effort to reduce gender-blindness.

Building local capacity in line with national and regional development priorities

Building capacity is a key stage in the pathway from research to development and is important at all levels. WorldFish trains the women and men on the ground who are responsible for the productive small-scale fisheries on which many communities depend. We have worked with the organizations that represent small-scale fishers and fish workers and their communities to strengthen their voice in national, regional and global discussions. And our own strength in scientific research drives training for the next generation of leaders in agricultural research for development.

MuSIC enhances communication

Malaysia, Botswana

For too long, thinking about small-scale fisheries (SSF) has been dominated by the idea that these communities are poor.

We believe that the emphasis should shift from their poverty to the vital contribution they make to local and national economies.

To that end, in collaboration with FAO, we organized a Multi-Stakeholder Information and Communication (MuSIC) Workshop at our headquarters in Penang, Malaysia, in February.

John Kurien, a WorldFish Honorary Fellow, led the workshop, which aimed to build a communications alliance that would support SSF by promoting their contributions to food security and nutrition. Journalists, researchers and representatives of civil society from six countries saw for themselves how SSF produce not only fish for nutrition, but also local employment, especially for women, which can reduce poverty and increase independence.

A similar effort in Kasane, Botswana, in July aimed to strengthen networks for advocacy in Africa. In 2010, WorldFish helped to establish five sub-regional non-state actors to advocate for SSF. These organizations and the pan-African Network for Women in Fisheries (AWFISHNET) contributed to the 2014 African Union Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa (PFRS). Now they want to be more widely heard, and at the workshop considered their needs for capacity development.

The intention is to form a pan-African platform, as outlined in the PFRS, to advocate with a coherent voice for fisheries policies that will support SSF. Participants agreed that the African Union should take the lead on creating the platform, with technical support from WorldFish and FAO, and that the platform should take care to ensure that women are adequately represented. Looking forward, participants also discussed forming an advisory group that would be able to engage with the Small-Scale Fisheries Global Strategic Framework on behalf of all African SSF in support of the FAO's Voluntary Guidelines.

Global growth of tilapia best management practices

Benin, Cameroon, Nigeria, Egypt, Timor-Leste, Zambia

On the ground, WorldFish continues to train aquaculture entrepreneurs to make more of their businesses. In 2019, we saw immediate impact from the 2018 workshop we delivered at Abbassa in Egypt. The workshop was part of our Aquaculture Compact with Technologies for African Agriculture Transformation. People from all 10 partner countries spent two weeks learning better management.

- In **Benin**, Romaric Aizonou put the lessons learned to work in his own hatchery, increasing tilapia fry production from 50,000 to 120,000 a month. He has also reduced the cost of feed by 70 percent by compounding his own from local material and shared his training with Benin's Young Fish Farmers network, of which he is President.
- In **Cameroon**, an aquaculture group established in 2002 is now producing monosex tilapia fingerlings, which are much more productive, and managing its broodstock more carefully to avoid inbreeding and disease. Joseph Ondoua, who attended the workshop, has tripled production of African catfish fingerlings and increased the number of clients to whom his group sells.
- In **Nigeria**, a demonstration at the workshop of cannibalism among tilapia fingerlings prompted Remi Ahmed, President of the Tilapia Developer Association of Nigeria, to implement more careful grading in his own hatchery. Building the graders and making hapa nets, another technique shown at the workshop, is providing employment to local artisans. Workshop lessons were shared with more than 70 fish entrepreneurs from 15 Nigerian states.

The center in Egypt brings to Africa the approach we pioneered in Asia and the Pacific: better management practices (BMPs) result in greater production of higher-quality fish.

The work, however, never ends because new practices become available and because different countries call for different practices. In 2019, we published two new BMP manuals, for genetically improved farmed tilapia in Timor-Leste and for smallholders farming tilapia in ponds in Zambia. Both deal with everything from choosing a site for the ponds to business plans to ensure that the farm is sustainable and profitable.

In Timor-Leste, the manual is based on Farmer Field Schools that we held in three communities from 2016 to 2018. The farmers analyzed the problems they faced and came up with solutions suitable for their conditions. Implementing those solutions boosted GIFT productivity almost three-fold on average and showed that GIFT can improve food and nutrition security and boost household income. The BMP manual is available in both Tetum and English.

The manual for Zambia covers much the same ground but for a range of tilapia species. It is intended to help the private sector deliver training and extension to smallholders, with the goal of improving productivity and profitability. A further consideration is that because smallholders have not been very efficient in the past, their environmental impact per kilogram of fish has been high. Better management will reduce negative impacts at the same time as securing a better income and strengthening the supply chain for fish traders.

Crawford Fund Master Class: Building leadership in science

Malaysia

In 2019, once again, we hosted the Crawford Fund's Master Class in Agricultural Research Leadership and Management, organized by The Crawford Fund in conjunction with ACIAR. This was the 4th such class offered by the Crawford Fund, and it attracted 25 people from 16 countries. Among other things, the course introduced them to the skills they would need to manage and lead successful programs of agricultural research for development. We look forward to continuing our relationship with all those who took part.

Modeling a better future for aquaculture and fish in Africa

Africa

Fish and other aquatic foods make a large contribution to Africa's food and nutrition security. They contribute 19 percent of the animal protein, supply important micronutrients that are scarce in other foods and support the livelihoods of the most marginalized sectors of society. Those contributions, however, until recently went largely unnoticed in policy circles. A new study from WorldFish researchers and colleagues at the IFPRI aims to correct that. It examines the prospects for fish in Africa over the next three decades and makes three strong policy recommendations.

The study, published in the journal Global Food Security, examines alternative scenarios using the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) economic model developed by IFPRI. Demand for fish will increase, and aquaculture will have to expand rapidly to meet that demand. If the leading aquaculture producers can become as productive as Egypt, that will go a long way to meeting the needs of a growing population. Imports will continue to be necessary but could then come from greater trade within Africa.

The research concludes that policies to promote sustainable aquaculture, to reduce postharvest losses and to facilitate trade are indispensable. With them, fish and aquatic foods will continue to play a critical part in Africa's future.

Living our values

WorldFish is founded on the values of integrity and trust, fairness and equity, excellence and innovation, and teamwork and partnership. We aspire to be an organization that is built to learn and respond rapidly to change by optimizing the flow of information, encouraging experimentation and organizing as a network of staff and stakeholders motivated by a shared purpose.

In 2019, we launched several initiatives that support our commitment to living our values across the organization.

Integrity and trust

We are honest, open and accountable with the resources invested in us, and we deliver on our commitments.

Fairness and equity

We respect and celebrate diversity and actively challenge social and gender inequities that impede progress toward our goals.

Excellence and innovation

We pursue high standards of scientific and professional rigor and embrace impartial evaluation, critical reflection, learning and adoption.

Teamwork and partnership

We seek to leverage our complementary strengths within teams and across institutional boundaries to achieve the greatest impacts.

Strengthening research quality

In 2019, WorldFish utilized the 'learning organization' approach to track and enhance its research quality. Several key moments of critical reflection were held with staff and partners around the world at all levels to assess progress on the four dimensions of quality outlined by CGIAR. We selected 'scientific credibility' as the focal area for 2019-20 and established pilot teams to develop and test institutional innovations in three areas: resourcing proposals for science effectively; right people, right roles; and, research protocol processes.

Showing leadership on ethics in the workplace

Following the implementation of the Anti-Harassment, Bullying and Discrimination Policy in 2018, we initiated a series of training sessions in collaboration with the Internal Audit Function in 2019 on our Code of Conduct, Anti-Fraud and Anti-Corruption Policy, Fraud and Internal Controls and Whistleblowing Policy, to ensure that behavioral expectations were clearly expressed, with zero tolerance for infringements.

Enhancing gender, diversity and inclusion in the workplace

In 2019, we celebrated a historic achievement of an equally gender-balanced Executive Team, highlighting our continued focus on gender, diversity and inclusion in the workplace. There were also significant strides in the diversity of our research leadership composition, including 36 percent representation of women in science, 61 percent representation of women in management and 68 percent of managerial positions held by staff whose country of origin is not Europe, North America or Australia. WorldFish shared co-supervision of the CGIAR System's Senior Adviser for Gender in the Workplace.

Nurturing an organizational culture of learning, innovation and knowledge sharing

Significant efforts were made in 2019 to foster a culture of learning, sharing and internal communication. Through a series of 48 'Town Halls', 'Fish Talks' and 'Fish Learning Hours', we facilitated conversations on strategic organizational matters and shared expertise on research disciplines, policies, tools and processes.

Fish for thought

We revamped and rebranded our Fish for Thought events with more interactive formats to enable greater sharing of knowledge across scientific disciplines, projects, country offices and external research and development professionals, experts, strategic partners and investors. These varied events were used to enhance the quality, outreach and impact of our research work and position WorldFish as a leader in sustainable aquaculture and fisheries development.

No single-use plastics

We continue to maintain our commitment to no single-use plastics as part of the global effort to eliminate plastic pollution, particularly in marine environments. Our staff and guests are provided with reusable water bottles and encouraged to use tiffin carriers for takeaway lunches and we choose to work with service providers who share this commitment.

Monitoring and evaluation

The appointment of a dedicated monitoring and evaluation leader and the adoption of the award-winning Monitoring, Evaluation and Learning Platform (MEL) is facilitating our capacity to monitor progress toward outputs, outcomes and impacts, as well as improving our overall research management capacities. The platform became fully operational in 2019, with 453 active users. Across 21 training sessions, 121 people were trained to support organization-wide implementation.

Improving project management quality

The creation of a Project Management Unit (PMU) in 2019 has led to improvements in capacity across the project life cycle and the use of digital tools and measurements to support active monitoring and engagement. The PMU assisted 16 global projects in 2019 and facilitated successful start-up of three projects. The PMU also assisted in pursuing nine funding opportunities over the course of the past year.

Communicating science knowledge and evidence

We believe that effective communication of our research and the scientific evidence we produce is critical for making a difference to the people whose livelihoods, in both the developing and developed world, depend on and are shaped by aquatic foods.

Those who support our work understand through communication that our research is relevant because it helps shape solutions to many pressing development challenges. At the same time, effective communication enables others to translate our science into actions—from discourse and advocacy to practice and policy.

Growing beyond our borders

Our continued implementation of the communication and marketing strategy that was rolled out in 2018, with a digital first approach, has increased our brand recognition as a global leader in fisheries, aquaculture and aquatic resources. This has enabled the organization greater opportunities at events and in top tier media engagement. In total there were more than 400 stories in international media about our work, which reached more than 430 million people globally.

Social media conversations at key moments throughout the year saw WorldFish engage in World Oceans Day, International Women's Day, and World Fisheries Day, among other significant events in our campaign calendar. These engagements targeted our specific research outcomes and successes, targeted toward audiences in the context of the wider global conversations taking place on these days. We grew 52 percent on social media in 2019 to just shy of 60,000 followers, with significant growth on our professional network, LinkedIn, growing more than 135 percent. Our messages on social media reached 3.86 million people globally, up more than 110 percent year-on-year.

1.55B people reached through **traditional media**

Organized **and participated in 86 events**

52% increase in social media followers

434M people reached from **top blog and op-eds**

3.86M people reached on **social media**

403 stories about our **work** and WorldFish **in** international news

272,675 new visitors to the website

259,100 views **on YouTube**

At the FAO's Aquatic Sciences and Fisheries Abstracts (ASFA) Advisory Board Meeting in September 2019, WorldFish representative Florine Lim presented a paper on publishing and disseminating research through communications products. She was appointed as the ASFA newsletter editorial board member and ASFA 50th Year Anniversary Committee co-chair. WorldFish will continue to collaborate with ASFA Secretariat to produce more communications outputs.

Selected publications

Harnessing global fisheries to tackle micronutrient deficiencies

Nature Publishing Group

Hicks CC, Cohen PJ, Graham NAJ, Nash KL, Allison EH, D'Lima C, Mills DJ, Roscher M, Thilsted SH, Thorne-Lymans AL and MacNeil MA.

https://hdl.handle.net/20.500.12348/3790

IMPACT FACTOR 43.07 | 653

A lack of understanding of the nutrient composition of most fish and how nutrient yields vary among fisheries has hindered the policy shifts that are needed to effectively harness the potential of fisheries for food and nutrition security. In this journal article, using the concentration of 7 nutrients in more than 350 species of marine fish, the authors estimate how environmental and ecological traits predict nutrient content of marine finfish species.

See video abstract: https://youtu.be/Jf9uW70ZvJ0

Escaping the perfect storm of simultaneous climate change impacts on agriculture and marine fisheries

American Association for the Advancement of Science

Thiault L, Mora C, Cinner JE, Cheung WWL, Graham NAJ, Januchowski-Hartley FA, Mouillot D, Sumaila UR and Claudet J.

https://hdl.handle.net/20.500.12348/3923

IMPACT FACTOR 12.804 | 504

The authors evaluate the vulnerability of societies to the simultaneous impacts of climate change on agriculture and marine fisheries at a global scale. Under a "business-as-usual" emission scenario, ~90 percent of the world's population—most of whom live in the most sensitive and least developed countries—are projected to be exposed to losses of food production in both sectors, while less than 3 percent would live in regions experiencing simultaneous productivity gains by 2100.

Mapping global human dependence on marine ecosystems

Elsevier

Selig ER, Hole DG, Allison EH, Arkema KK, McKinnon MC, Chu JJ, de Sherbinin A, Fisher B ,Glew L, Holland MB, Ingram JC, Rao NS, Russell RB, Srebotnjak T, Teh LC, Troëng S, Turner WR, Zvoleff A.

https://hdl.handle.net/20.500.12348/2225

We created a new conceptual model to map the degree of human dependence on marine ecosystems based

on the magnitude of the benefit, susceptibility of people to a loss of that benefit, and the availability of alternatives. We focused on mapping nutritional, economic, and coastal protection dependence, but our model is repeatable, scalable, applicable to other ecosystems, and designed to incorporate additional services and data.

The black box of power in polycentric environmental governance

Elsevier

Morrison TH, Adger WN, Brown K, Lemos MC, Huitema D, Phelps J, Evans L, Cohen P, Song AM, Turner R, Quinn T and Hughes TP.

https://hdl.handle.net/20.500.12348/3792

Failure to address unsustainable global change is often attributed to failures in conventional environmental governance. The authors draw together diverse social science perspectives and research into a variety of cases to show how different types of power shape rule setting, issue construction, and policy implementation in polycentric governance.

Sixteen years of social and ecological dynamics reveal challenges and opportunities for adaptive management in sustaining the commons

United States National Academy of Sciences

Cinner JE, Lau JD, Bauman AG, Feary DA, Januchowski-Hartley FA, Rojas CA, Barnes ML, Bergseth BJ, Shum E, Lahari R, Ben J and Graham NAJ.

https://hdl.handle.net/20.500.12348/3885

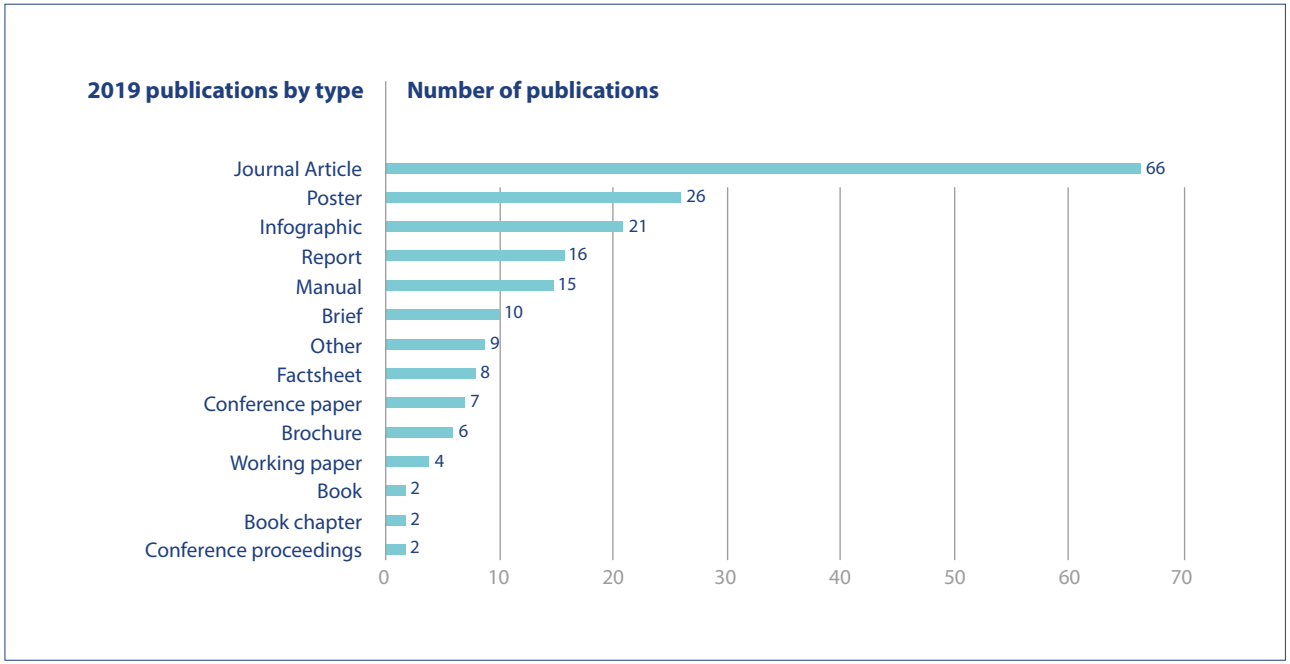
The authors present a 16-year analysis of ecological outcomes and perceived livelihood impacts from adaptive coral reef management in Papua New Guinea. The adaptive management system studied was a customary rotational fisheries closure system (akin to fallow agriculture), which helped to increase the biomass of reef fish and make fish less wary (more catchable) relative to openly fished areas.

Securing a just space for small-scale fisheries in the blue economy

Frontiers in Marine Science

Cohen PJ, Allison EH, Andrew NL, Cinner J, Evan LS, Fabinyi M, Garces LR, Hall SJ, Hicks CC, Hughes TP, Jentoft S, Mills DJ, Masu R, Mbaru EK and Ratner BD.

http://hdl.handle.net/20.500.12348/3202



Other includes the following types of publications: flyer, success story, abstract, magazine article and field notes.

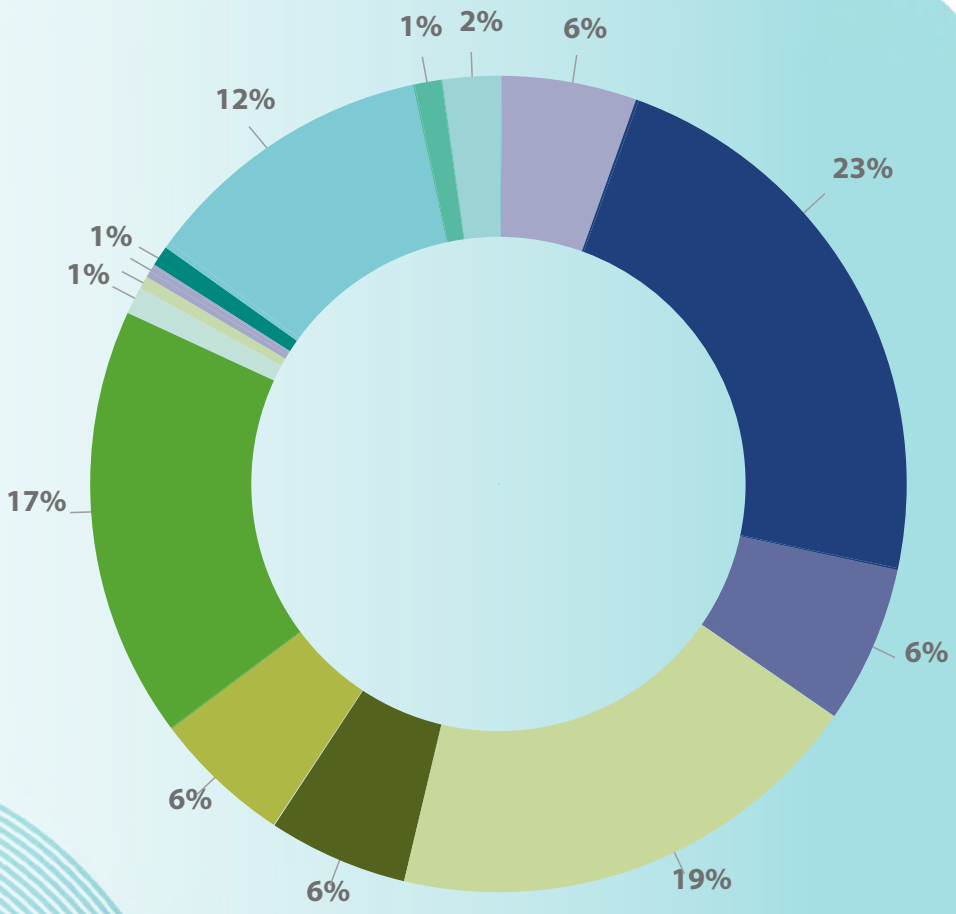
Our partners

Our work is rooted in multidisciplinary science and food systems thinking. It is guided by national priorities and the capacity development needed to improve agricultural research and extension systems. It is enhanced by our unique ability to convene and broker novel partnerships with development actors and the private sector as a mechanism to take innovations and have impact at scale.

We had 248 active partnerships in 2019, 98 of which were new. At the global level, a partnership with the Bill and Melinda Gates Foundation signaled their first investments into aquatic food systems, which will generate knowledge and research evidence on the role of sustainable aquaculture for increasing incomes, diversifying diets and empowering women in Bangladesh and Nigeria.

Private sector partnerships also rose in 2019 to 57, from 32 in 2018. A new partnership with Pelagic Data Systems is transforming data collection in small-scale fisheries in Timor Leste, allowing local governments and fisheries scientists to track boats and fish catches.

An innovation project in partnership with the IFPRI is looking at opportunities to better understand the future of aquatic foods and the likely rise of lab-grown fish meat. The partnership will generate research and policy recommendations to support the sustainable transformation of aquatic foods, including fish, mollusks, seaweed and synthetic fish meat produced in laboratories.



COLLABORATIONS ACROSS CGIAR	
CGIAR Excellence in Breeding Platform	WorldFish supported improved efficiency and quality control development for tilapia and carp genetic improvement programs. Provided initial work on the data entry forms for breeding program assessments and the application to fish genetic improvement programs.
CGIAR Platform for Big Data in Agriculture	Collaborative research for harnessing the power of big data, bioinformatics and genome sequencing for rapid disease diagnosis in aquaculture for the Inspire Challenge Project, Rapid Genomic Detection of Culture Pathogens. Research on the automation and scaling of digital fisheries monitoring and analytics to drive inclusive small-scale fisheries governance in Asia and Africa for the Inspire Challenge Scale-up Project, A digital Pipeline for Small-Scale Fisheries.
CGIAR RESEARCH PROGRAM ON Policies, Institutions, and Markets	Collaborative research to understand patterns of animal source foods and implications for future interventions, developing new tools and updating existing tools for foresight modeling. Research in Nigeria on willingness to pay for aquaculture food safety certification and how to upgrade aquaculture supply chains to respond to the demand. Collaborative research and co-investment into global synthesis research on policy impact pathways in fisheries contexts. Research-backed institutional knowledge building to support existing and emergent institutional structures to protect food and nutrition security functions of small-scale capture fisheries.
CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS	Integration of fish into climate-smart agriculture projects for scaling in the Mekong and Bangladesh, and publication of an assessment of gender and climate smart agriculture in Bangladesh. Publication of a paper on modeling of low-emissions development pathways for aquaculture. Improving access of climate information services to aquaculture farmers and fishers in Bangladesh and India.
CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas	Developed a working paper on synergies between fish and roots, tubers and bananas in food systems, focusing on Nigeria and Bangladesh and identifying future research opportunities to increase our collective impact.

COLLABORATIONS ACROSS CGIAR	
CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems	Contributed to refinements to ecosystem-based approaches to fisheries management and associated innovations. Accounting for competing demands and tradeoffs between the different uses of land and water in multifunctional landscapes. Adapting to external drivers of change and natural seasonal and inter-annual variability. Investigating gender in the highly vulnerable wetlands in Myanmar and applying lessons from previous research methodologies to assess inclusion-exclusion in governance.
CGIAR RESEARCH PROGRAM ON Agriculture for Nutrition and Health	Research collaboration and advisory arrangements between early career researchers to build the fish in food systems research agenda. Collaboration on fish and food systems research outputs, including through co-supervision of research students, in Bangladesh and Nigeria. Co-funding of PhD on modeling of fish in food systems at Wageningen University.
CGIAR GENDER Platform	A member of the Advisory Committee which strengthens CGIAR's gender integration and strategic gender research and increases the profile of CGIAR as a gender research leader in research for development. Committee member and theme leader for the Seeds of Change Conference, co-sponsored by ACIAR and the University of Canberra. Led the development of the book chapter on gender transformative approaches for the Platform's priority collaborative output in 2019.
CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas CGIAR RESEARCH PROGRAM ON Grain Legumes and Dryland Cereals	A close collaboration to refine and develop the Monitoring, Evaluation and Learning Platform. Communication material and training tools were jointly developed and training provided to all FISH researchers.
CGIAR Antimicrobial Resistance Hub	A shared post-doc for the stewardship, capacity building and collaborative research on antimicrobial resistance under the one health framework. Collaborative initiatives on modeling antimicrobial resistance in water systems and assessment and reduction of AMR use in aquaculture.

Our investors

Our research is designed to address specific challenges within the global 2030 sustainable development agenda and respond to the global call to action for a food systems transformation for healthier people and planet. Our work is funded by an extensive network of research partners, funders and investors committed to tackling these challenges. Thanks to their generous support, we are helping to eradicate poverty, hunger and malnutrition among the millions of people who depend on fish for food, nutrition and income in the developing world.

Academic institutions

- Chiang Mai University
- Duke University
- Lilongwe University of Agriculture & Natural Resources
- Mississippi State University
- Stockholm Resilience Centre
- Swedish University of Agricultural Sciences
- The Governing Council, University of Toronto
- University of Amsterdam
- University of Exeter
- University of Malawi
- University of Stirling
- University of Wollongong
- Wageningen University & Research

Advanced research institutions

- Economic and Social Research Council
- International Institute for Environment and Development

Financing institutions

- African Development Bank
- Asian Development Bank
- Bill & Melinda Gates Foundation
- Biotechnology and Biological Sciences Research Council
- European Commission
- International Fund for Agricultural Development
- Koepon Stichting
- Livelihoods and Food Security Fund
- Margaret A. Cargill Philanthropies
- National Philanthropic Trust
- Walton Family Foundation
- World Bank

Governments

- Assam Rural Infrastructure and Agricultural Services Society
- Local Government Engineering Department, Bangladesh
- Department for International Development, United Kingdom
- Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
- Fisheries & Animal Resources Development Department, Government of Odisha
- Government of Norway
- Ministry of Foreign Affairs & Trade, New Zealand
- Ministry of Foreign Affairs, Japan
- Ministry of Foreign Affairs, Norway
- Department of Agriculture, Forestry and Fisheries, South Africa

International agricultural research centers

- Australian Center for International Agricultural Research
- World Vegetable Center

International organizations

- CGIAR Trust Fund
- Food and Agriculture Organization of the United Nations
- Japan International Cooperation Agency
- New Zealand Aid Programme
- Norwegian Agency for Development Cooperation
- Swedish International Development Cooperation Agency
- Swiss Agency for Development and Cooperation
- United States Agency for International Development
- Winrock International
- World Food Programme

National agricultural research system

- Indian Council of Agricultural Research
- Rajiv Gandhi Centre for Aquaculture

Non-governmental organizations

- American Soybean Association
- CARE Bangladesh
- Global Environment Facility, UNEP
- Istituto Oikos Onlus
- Oak Foundation
- Plan International UK
- Save the Children
- Synergos

Private sector

- 3 Ideas Ltd
- AquaBioTech Group
- De Heus Animal Nutrition
- Pelagic Data Systems
- Skretting Egypt
- U.S. Soybean Export Council

Financial overview

This section provides an overview of our financial position for the year ended 31 December 2019. 2019 was a year of growth; our revenue grew by 12 percent and our deficit decreased by a third from the 2018 position. While our total assets grew, the net assets position decreased by 7 percent as a result of the deficit. Our full audited financial statements are available on our website.

We signed 46 new contracts in 2019, valued at USD 25 million, taking the total value of live projects in 2019 to USD 126 million. The majority of the new contracts was from traditional donors and international financial institutions (USD 20.7 million). We continue to diversify our funding base to reflect emerging opportunities in the research-for-development space as well as evolving investor interest, particularly in the private sector and philanthropic. Funding provided by the philanthropic sector was valued at USD 2.1 million. This was influenced largely by our continual engagement with the Bill & Melinda Gates Foundation although there were several other philanthropic investors, including the Margaret A. Cargill Philanthropies. We received smaller contributions from emerging economies and the private sector, the latter being a key growth area we are actively pursuing.

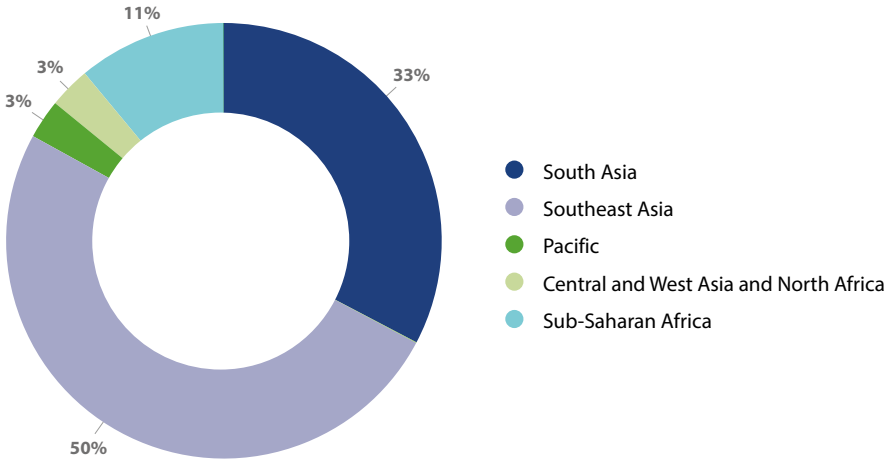
STATEMENT OF FINANCIAL POSITION (USD '000)

	As of 31 Dec 2018	As of 31 Dec 2019
Assets		
Cash and cash equivalents	10,555	17,224
Accounts receivable	6100	4602
Other current assets	277	256
Non-current assets	516	818
Total Assets	**17,448**	**22,900**
Liabilities		
Accounts payable	6653	12,394
Accruals and provisions	1480	1507
Other current liabilities	57	219
Non-current liabilities	430	566
Total Liabilities	**8620**	**14,686**
Net Assets	**8828**	**8214**
Total Liabilities and Net Assets	**17,448**	**22,900**

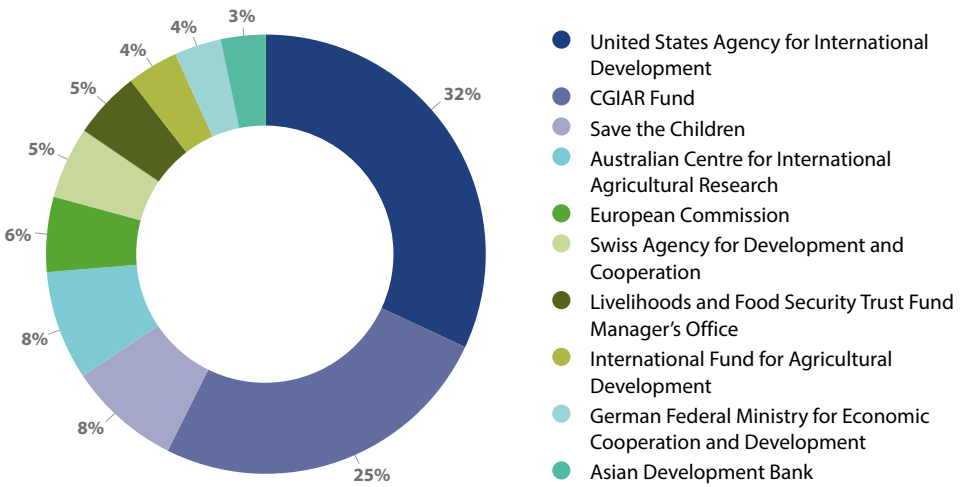
STATEMENT OF OPERATING ACTIVITIES (USD '000)

	For the years ended December 31	
	2018	**2019**
Revenue		
Grants	29,070	32,652
Other income	469	416
Total Revenue	**29,539**	**33,068**
Expenses		
Research	19,261	21,224
Administration, support and other	11,187	12,458
Total Expenses	**30,448**	**33,682**
Net Deficit	**(909)**	**(614)**

WORLDFISH EXPENDITURE BY REGION, 2019

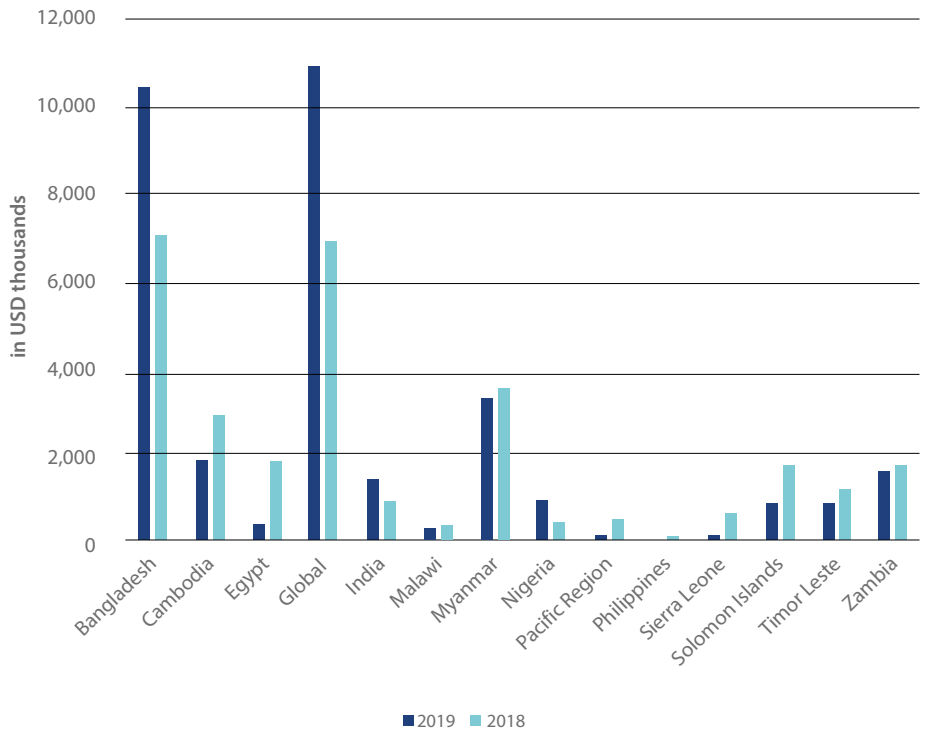


WORLDFISH TOP 10 FUNDERS



Full audited financial statements are available at https://www.worldfishcenter.org/who-we-are/financials

FUNDING BY COUNTRY



Leadership and governance

Our leadership team is a diverse, global group of leaders who bring decades of experience in scientific research, international and organizational development and communications.

Board of trustees

The Board of Trustees approves the center's long-term organizational strategy, annual plan of work and budget and research agenda, monitors progress toward the achievement of the center's mission, sets and approves programs and policies and financial regulations, exercises oversight of investment and risk management and ensures compliance with relevant legal and regulatory requirements. It also has scientific oversight and fiduciary responsibility for the implementation of FISH.

Executive team

The Executive Team comprises the Director General, the Director of Aquaculture and Fisheries Sciences, the Director of International Partnerships and Program Delivery, the Director of Communications and Marketing, the Director of Finance and IT and the Director of Human Resources and Administration. The Director General is delegated by the Board of Trustees to implement the organizational strategy, programs, policies and plans. The Executive Team works together to realize the strategy, research agenda and organizational vision for WorldFish and take decisions on issues that affect the organization across various functions at all levels.

Global research leaders

The global research leaders are responsible for the overall coordination and management of our research agenda. The research leaders prepare annual work plans at global levels, and support country and regional level teams with research plans to ensure consistency with our strategic goals and allocate appropriate budget.

Country directors

The country directors are accountable for the leadership and management of our country programs. Working collaboratively with our global research and functional leaders, country directors work to mobilize resources and deliver an integrated research-for- development program that addresses national priorities and organizational goals, strengthens institutional and partner capabilities across the aquaculture and fisheries sectors, including building capacities, policy influence and evidence-based research capabilities.

Our people

Board of trustees

Baba Yusuf Abubakar, Board Chair, University of Abuja, Nigeria (elected June 2019)

Yvonne Pinto, Board Chair, Agricultural Learning and Impact Network (ALINe), United Kingdom (term ended June 2019)

Africa

Ayman Anwar Ammar, ex-officio member, Central Laboratory for Aquaculture Research (CLAR), Egypt

Abdou Tenkouano, West and Central Africa Council for Agriculture Research and Development (CORAF), Senegal

Mona Mehrez Aly, Egyptian Poultry Farmers Association (joined November 2019)

Asia-Pacific

Anthony Haymet, Board Vice-Chair and Chair of the Governance Committee, Scripps Institution of Oceanography, Australia

Yong Hee Kong, Chair of the Audit and Risk Committee, ASEAN Advisory, Malaysia

Dato' Haji Munir Haji Mohd Nawi, ex-officio member, Department of Fisheries, Malaysia

North America

Cristina Rumbaitis del Rio, Global Commission on Adaptation, United States

Europe

Gareth Johnstone, ex-officio member, WorldFish, United Kingdom

Zarinah Davies, Board Secretary, WorldFish, United Kingdom

Executive team

Gareth Johnstone, Director General

Michael Phillips, Director, Aquaculture and Fisheries Sciences

Tana Lala-Pritchard, Director, Communications and Marketing

David Shearer, Director, International Partnerships and Program Delivery

Zarinah Davies, Director, Human Resources and Administration

Marion Barriskell, Director, Finance and IT

Global research leaders

John Benzie, Program Leader, Sustainable Aquaculture

Philippa Cohen, Program Leader, Resilient Small-scale Fisheries

Shakuntala Thilsted, Program Leader, Value Chains and Nutrition

Cynthia McDougall, Gender Research Leader

Cristiano Rossignoli, Monitoring, Evaluation and Learning (MEL) and Impact Assessment Research Leader

Country directors

Africa

Harrison Charo Karisa, Country Director, Egypt and Nigeria

Sloans Chimatiro, Country Director, Zambia and Tanzania (term ended August 2019)

Victor Siamudaala, Country Director Zambia and Southern Africa (joined July 2019)

Asia

Malcolm Dickson, Country Director, Bangladesh (term ended June 2019)

Christopher Price, Country Director, Bangladesh (joined July 2019)

Yumiko Kura, Country Director, Cambodia (term ended November 2019)

Michael Akester, Country Director, Myanmar

Pacific

Delvene Boso, Country Director, Solomon Islands

Acronyms

AARTC	Africa Aquaculture Research and Training Center
ACIAR	Australian Centre for International Agricultural Research
AMR	antimicrobial resistance
ASFA	Aquatic Sciences and Fisheries Abstracts
AWFISHNET	African Women Fish Processors and Traders Network
BIG DATA	Platform for Big Data in Agriculture
CBFM	community-based fisheries management
CFR	community fish refuge
FISH	CGIAR Research Program on Fish Agri-Food Systems
FAO	Food and Agriculture Organization of the United Nations
GIFT	genetically improved farmed tilapia
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IHH	Illuminating Hidden Harvests
IRRI	International Rice Research Institute
IMPACT	International Model for Policy Analysis of Agricultural Commodities and Trade
IWMI	International Water Management Institute
MEL	Monitoring, Evaluation and Learning Platform
MuSIC	Multi-Stakeholder Information and Communication
PFRS	Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa
PMU	Project Management Unit
RFF	rice field fisheries
SDC	Swiss Development Cooperation
SDGs	Sustainable Development Goals
SSF	small-scale fisheries
STREAMS	Sustainable Transformation of Egypt's Aquaculture Market Systems
WRI	World Resources Institute
YEAG	Youth Employment in Aswan Governorate

Where we work

Headquarters

Malaysia
Tel: +604 628 6888
Email: worldfishcenter@cgiar.org

Country offices

Bangladesh
Tel: +8802 5503 5902, +8802 5503 5903, +8802 5503 3331, +8802 5503 3332
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Solomon Islands
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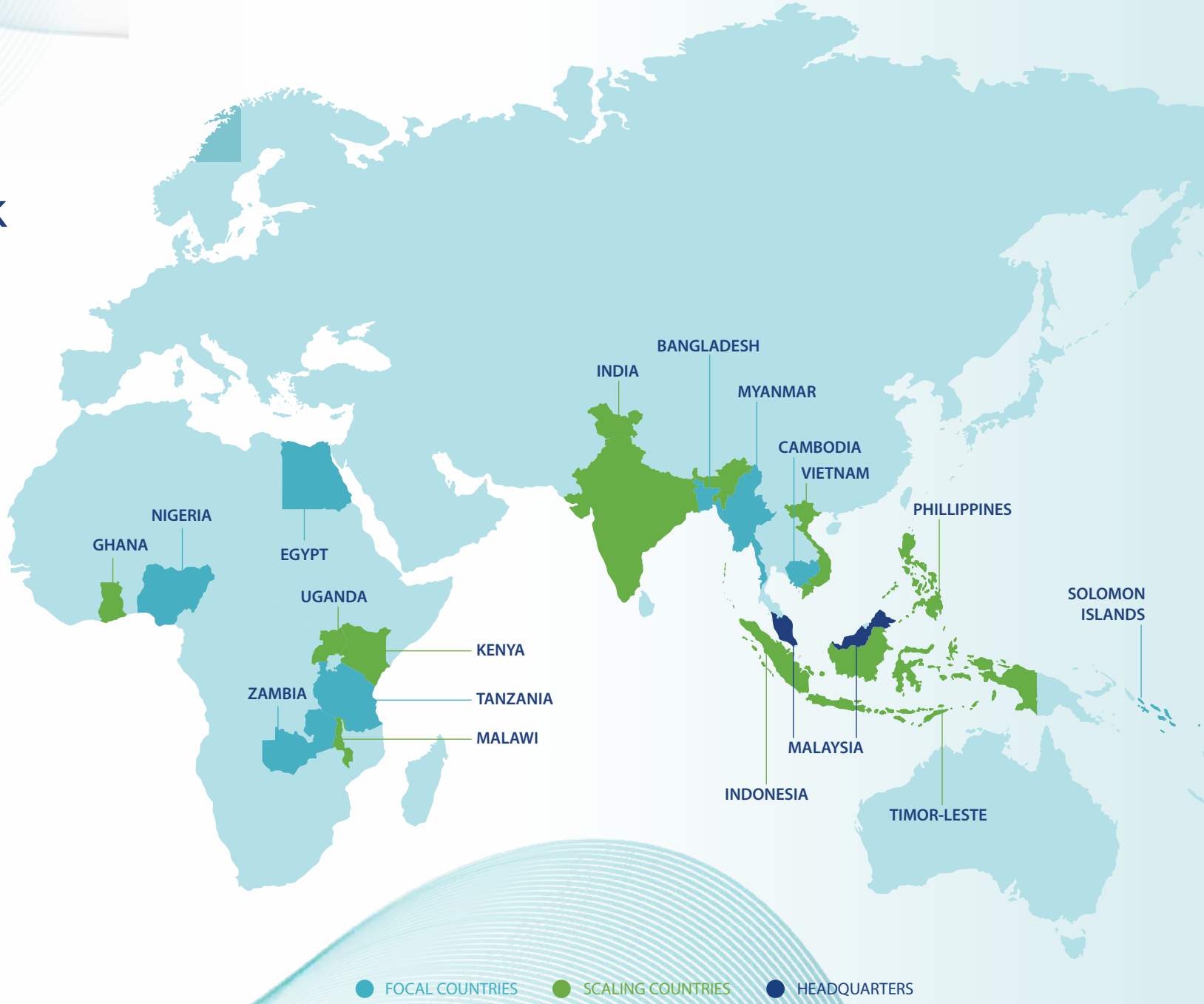
Email: worldfish-solomon@cgiar.org

Zambia
Tel: +260 211 294065, +260 211 294072
Email: worldfish-zambia@cgiar.org



About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving aquatic food systems, including fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions of people who depend on fish for food, nutrition and income in the developing world. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific. WorldFish is a member of the CGIAR, the world's largest research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources.

For more information, please visit **www.worldfishcenter.org**

WorldFish