



INITIATIVE ON  
Aquatic Foods



# CGIAR Research Initiative on **Aquatic Foods**

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This publication has been produced in close collaboration with the International Food Policy Research Institute (IFPRI), the International Institute of Tropical Agriculture (IITA), the International Water Management Institute (IWMI), and WorldFish.

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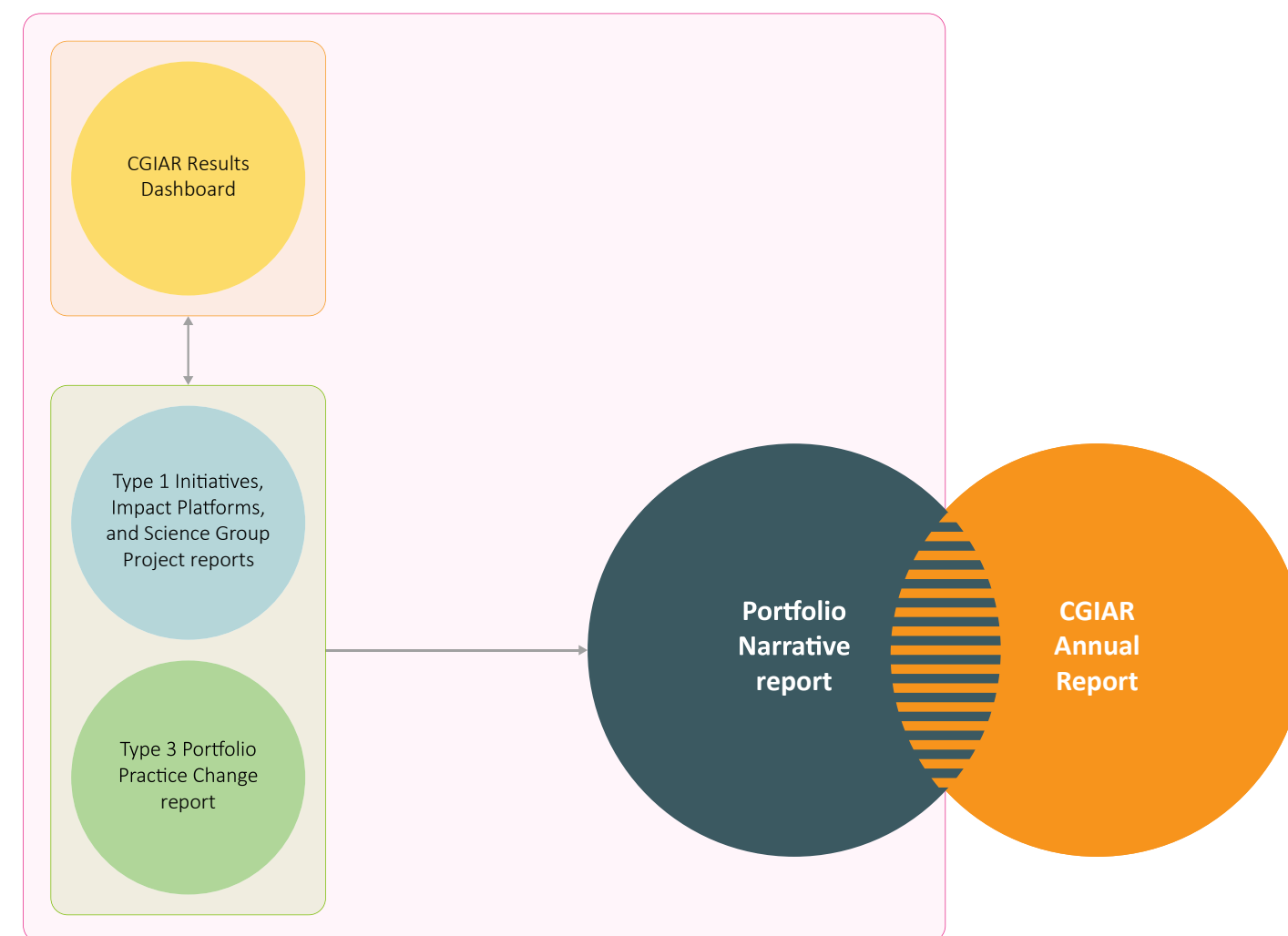
# CGIAR Technical Reporting 2023

CGIAR Technical Reporting has been developed in alignment with the [CGIAR Technical Reporting Arrangement](#). This Initiative report (“Type 1” report) constitutes part of the broader [CGIAR Technical Report](#). Each CGIAR Research Initiative submits an annual “Type 1” report, which provides assurance on Initiative-level progress towards End of Initiative outcomes.

The [CGIAR Technical Report](#) comprises:

- Type 1 Initiative, Impact Platform, and Science Group Project (SGP) reports, with quality assured results reported by Initiatives, Platforms and SGPs available on the CGIAR Results Dashboard.
- The Type 3 Portfolio Performance and Project Coordination Practice Change report, which focuses on internal practice change.
- The Portfolio Narrative, which draws on the Type 1 and Type 3 reports, and the CGIAR Results Dashboard, to provide a broader view on Portfolio coherence, including results, partnerships, country and regional engagement, and synergies among the Portfolio’s constituent parts.

The CGIAR Annual Report is a comprehensive overview of CGIAR’s collective achievements, impact and strategic outlook, which draws significantly from the Technical Report products above. For 2023, the Annual Report and Technical Report will be presented online as an integrated product.





## Section 1: Fact sheet and budget

<b>Initiative name</b>	Resilient Aquatic Food Systems for Healthy People and Planet
<b>Initiative short name</b>	Aquatic Foods
<b>Initiative Lead</b>	Rossignoli Cristiano ( <a href="mailto:C.Rossignoli@cgiar.org">C.Rossignoli@cgiar.org</a> )
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<b>Science Group</b>	Resilient Agrifood Systems
<b>Start – end date</b>	01/04/2022 – 31/12/2024
<b>Geographic scope</b>	<p><b>Regions targeted in the proposal</b> East and Southern Africa · South Asia · Southeast Asia and the Pacific · West and Central Africa</p> <p><b>Countries targeted in the proposal</b> Bangladesh · Cambodia · Ghana · India · Myanmar · Nigeria · Solomon Islands · Timor-Leste · Zambia</p>
<b>OECD DAC Climate marker adaptation score<sup>1</sup></b>	<p><b>Score 1: Significant:</b> The activity contributes in a significant way to any of the three CGIAR climate-related strategy objectives—namely, climate mitigation, climate adaptation and climate policy—even though it is not the principal focus of the activity.</p>
<b>OECD DAC Climate marker mitigation score<sup>1</sup></b>	<p><b>Score 1: Significant</b> The activity contributes in a significant way to any of the three CGIAR climate-related strategy objectives—namely, climate mitigation, climate adaptation and climate policy—even though it is not the principal focus of the activity.</p>
<b>OECD DAC Gender equity marker score<sup>2</sup></b>	<p><b>Score 1A: Gender accommodative/aware</b> Gender equality is an objective, but not the main one. The Initiative/project includes at least two explicit gender-specific outputs and (adequate) funding and resources are available. Data and indicators are disaggregated by gender and analyzed to explain potential gender variations and inequalities.</p>
<b>Website link</b>	<a href="https://www.cgiar.org/initiative/aquatic-foods/">https://www.cgiar.org/initiative/aquatic-foods/</a>

<sup>1</sup> The Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) markers refer to the OECD DAC [Rio Markers for Climate](#) and the [gender equality policy marker](#). For climate adaptation and mitigation, scores are: 0 = Not targeted; 1 = Significant; and 2 = Principal.

<sup>2</sup> The CGIAR Gender Impact Platform has adapted the OECD gender marker, splitting the 1 score into 1A and 1B. For gender equality, scores are: 0 = Not targeted; 1A = Gender accommodative/aware; 1B = Gender responsive; and 2 = Principal.

These scores are derived from [Initiative proposals](#), and refer to the score given to the Initiative overall based on their proposal.

**Executive summary**

This annual report provides the key achievements of the CGIAR Research Initiative on Aquatic Foods in 2023. During the year, Aquatic Foods made significant progress in delivering research from its four Work Packages (WPs) and strengthening partnerships and policy actions to start scaling key innovations in Bangladesh, Ghana, India, Kenya, Myanmar, Nigeria, Solomon Islands, Timor Leste, and Zambia.

The Initiative 1) produced and disseminated research innovations for the sustainable development of aquatic food systems; 2) made substantial contributions to policy influence and change across the aquatic agrifood system at national and global levels in Africa, Asia, and the Pacific; and 3) provided improved knowledge and capabilities to Aquatic Foods research users, through a growing network of collaborators and development partners. The emerging evidence and innovations from the Initiative are laying a strong foundation to support the transformation of global food systems toward healthier, more inclusive, and sustainable diets and societies, where aquatic foods have a considerable role to play.

Notably, eight journal articles achieved significant attention in 2023, based on the number of citations, downloads, and Altmetric scores (>50). These explored the value of “blue” foods for sustainable food systems; the decolonization of ocean research for more equitable and effective ocean governance; the nexus between human rights and marine conservation; and the hidden economic, social, and food and nutrition security values of small-scale fisheries at global and national scales.

Aquatic Foods reported multiple innovations during 2023. Genetic research led to the production of Generation 17 of the faster-growing Abbassa tilapia strain in Egypt; Generation 0 of faster-growing genetically improved farmed tilapia (GIFT) in Nigeria; Generation 2 of silver carp and a further batch of Generation 1 catla carp in Bangladesh; and Generation 19 of Tilapia Lake Virus (TiLV)—resistant GIFT in Malaysia. In Bangladesh, WorldFish officially handed over the genetically improved third generation (G3) rohu to the Bangladesh Fisheries Research Institute. G3 rohu carp grow up to 30 percent faster than conventional rohu strains and could greatly benefit aquaculture in the country.

Data and digital research by Aquatic Foods focused on key digital innovations to 1) spread knowledge on aquatic species (FishBase); 2) collect and monitor data on the performance of aquatic food systems (PesKAAS); 3) connect fishers and farmers with value chain actors (Macher Gari app); and 4) make public the Aquatic Food Ontology (AQFO).

Gender research focused on exploring gender dynamics in aquatic food systems. The team worked on the development of a gender equality and social inclusion strategy and guidelines for undertaking aquatic foods research-for-development through a gender lens.

Capacity-sharing activities focused on establishing multistakeholder platforms and participatory consultation processes in Africa to support the scaling and adoption of Aquatic Foods innovations. In Bangladesh, Ghana, India, Myanmar, Nigeria, and Solomon Islands, close cooperation with national partners was key to supporting stakeholders in areas such as rice-fish systems, decision support tools, and cage farming. In Solomon Islands, Aquatic Foods promoted a multipurpose innovation hub at the WorldFish Nusatupe Research Station to respond to the demand for a facility to convene research, training, and services with national and provincial partners.

	2022	2023	2024
<b>PROPOSAL BUDGET</b>	\$7.50	<b>\$12.50</b>	\$15.00
<b>APPROVED BUDGET <sup>1</sup></b>	\$5.65	<b>\$5.84 <sup>2</sup></b>	\$4.97 <sup>3</sup>

<sup>1</sup> The approved budget amounts correspond to the figures available for public access through the [Financing dashboard](#).

<sup>2</sup> This amount includes carry-over and commitments.

<sup>3</sup> This amount is an estimation of the 2024 annual budget allocation, as of the end of March 2024.



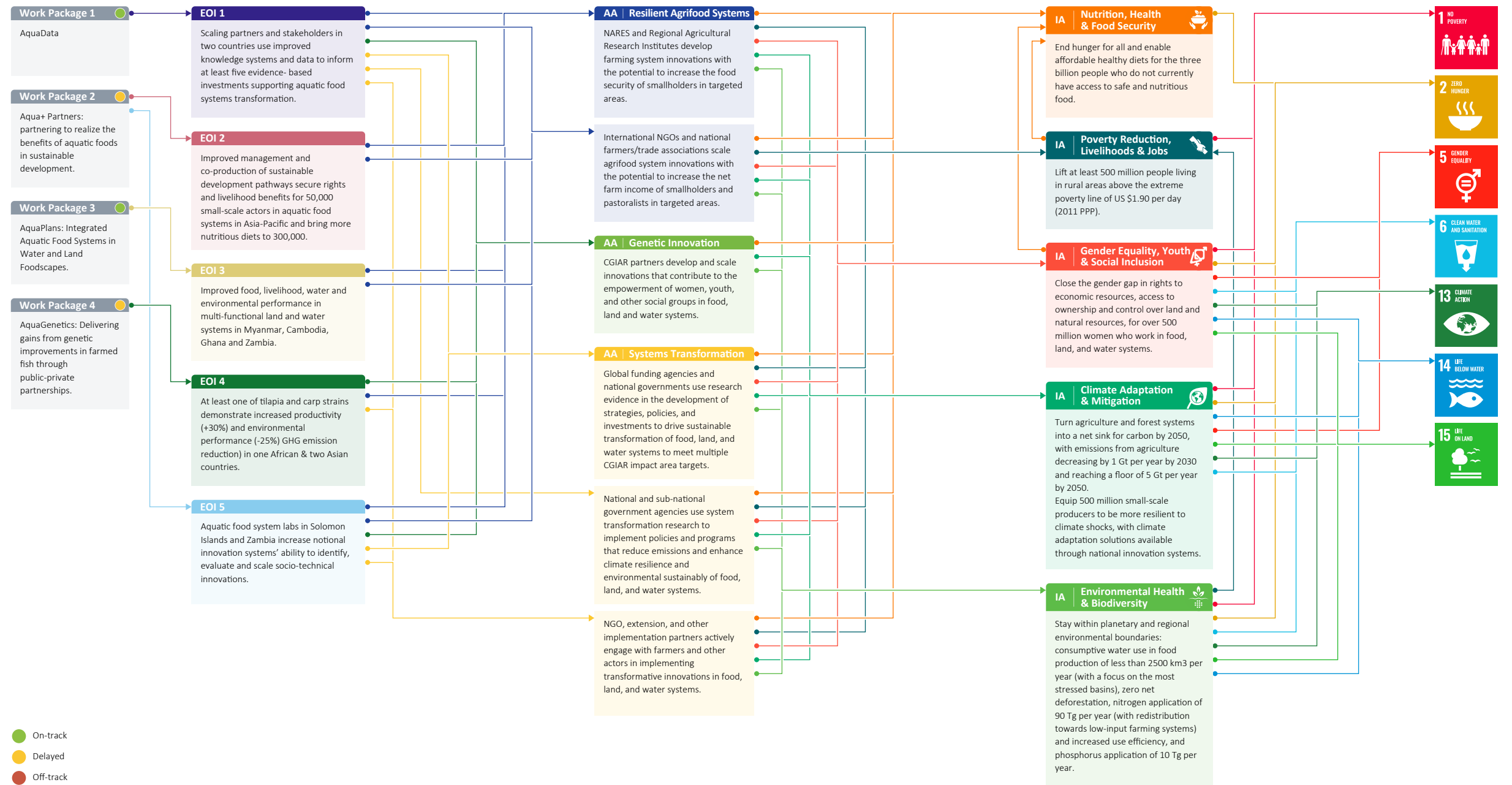
Md. Polash Mia, a G3 rohu fish farmer is catching fish to check growth at his pond. He found this G3 rohu's growth is higher than other fish. As his profit is higher now so he wants to grow more G3 rohu as fish fry and food fish at Kursha, Kaunia, Rangpur, Bangladesh on 13 October 2022. Credit: WorldFish



## Section 2: Progress on science and towards End of Initiative outcomes

### Initiative-level theory of change diagram

This is a simple, linear, and static representation of a complex, non-linear, and dynamic reality. Feedback loops and connections between this Initiative and other Initiatives' theories of change are excluded for clarity.



**EOI** End of Initiative outcome  
**AA** Action Area  
**IA** Impact Area  
**SDG** Sustainable Development Goal

**Note:** A summary of Work Package progress ratings is provided in Section 3.





River fisheries, Africa.  
Credit: Chris Bene

## Summary of progress against the theory of change

The Aquatic Foods Initiative impacts nutrition, health, poverty reduction, gender equality, environmental health, and climate efforts through four WPs: AquaData (WP1), Aqua+Partners (WP2), AquaPlans (WP3), and AquaGenetics (WP4). The Initiative focuses on generating benefits in developing countries in Africa, Asia and the Pacific by improving scientific and practical knowledge on aquatic food systems that contribute to Sustainable Development Goals (SDGs) 1, 2, 5, 13, and 14. In 2023, the Initiative progressed in research, partnerships, and policy actions across multiple countries, with two WPs on track and two facing delays. Funding cuts of 53 percent led to activity reductions and plan adjustments.

The Initiative published 80 research items (79 percent open access). Our research continues to reveal a new and critical understanding of aquatic food systems, how to manage them, their relevance to climate change, public health issues related to malnutrition, and the increasing need to meet growing global aquatic food demand within planetary boundaries. Eight of these publications achieved significant attention from the research community and stakeholders based on the number of citations, downloads and Altmetric scores (>50). The highest Altmetric score (334) was associated with a paper in PLOS Climate exploring different scenarios under which food systems transformation can achieve net negative emissions. The other seven papers published advances in knowledge on the [value of blue foods for sustainable food systems](#); [decolonizing ocean research for more equitable and effective ocean governance](#); [the nexus between human rights and marine conservation](#); [the contributions of small-scale fisheries to sustainable development \(Illuminating Hidden Harvests\)](#); the contribution of aquaculture to SDGs on improved human and planetary health; [fishery co-management research](#); and [principles for transformative ocean governance](#).

More than 50 policy and technical briefs, videos, and guidelines were disseminated in multiple languages to a wide and diverse audience. This includes researchers and academic institutions, local and international private sectors (including small- and medium-sized

enterprises, and farmers' and related associations), governments and local departments of fisheries, and other policymakers and investors. Such products are key to simplifying complex research questions to inform or influence [policies and decisions](#), and to support scaling, [adoption, and investment in innovations](#).

Key studies in Bangladesh, Egypt, Myanmar, and Pakistan explored the impact of adopting aquatic food innovations on the productivity, livelihoods, and food security of small-scale aquaculture producers, and benchmarked the sustainability performance of aquatic food production systems. The studies found that 1) [diversification in small-scale fish farming can make a positive contribution to the sustainable intensification of aquaculture in some geographies](#); and 2) [the adoption and proper implementation of small-scale aquaculture BMPs, combined with nutrition training, has enormous potential to boost rural livelihoods](#). They also identified the [sustainability characteristics of tilapia production systems](#), unveiling their economic and environmental impacts and implications for food security.

In 2023, 1,784 people received formal training from Aquatic Foods, of whom one-third were women. In Africa, capacity-sharing activities focused on establishing multistakeholder platforms and participatory consultation processes in Ghana, Kenya, Nigeria, Tanzania, and Zambia. These brought together governments, nongovernmental organizations (NGOs), the private sector, farmers' associations, small-scale fishers, farmers, processors, and others.

In Bangladesh, Ghana, India, Myanmar, Nigeria, and Solomon Islands, there is close cooperation with national partners for the training of stakeholders in areas related to sustainable aquatic food systems such as [rice-fish systems](#), data systems and data collection, and [cage farming](#). In Bangladesh, WorldFish handed over [G3 Rohu to BFRI](#). The event brought together international and national participants from WorldFish, the Department of Fisheries (DoF), the Bangladesh Fisheries Research Institute (BFRI), the United States Agency for International Development, the Feed the Future Innovation Lab for Fish, NGOs, carp hatchery associations, universities, fish hatchery

owners, and farmers. In the Solomon Islands, WP2 promoted a multipurpose innovation hub at the [WorldFish Nusatupe Research Station](#) to respond to the demand for a facility to convene research, training, and services with national and provincial partners.

Aquatic Foods reported 44 innovations during 2023, either new (39) or working to ensure that 6 existing innovations are in use and applied at scale in three countries (Bangladesh, Myanmar, and Timor-Leste). These innovations contribute to improvements in aquatic food systems, from the production of more sustainable supplies of fish from aquaculture and small-scale fisheries to more inclusive governance systems and new digital solutions.

In terms of data and digital research, WP1 (AquaData) reported on the performance of two CGIAR data innovation platforms: 1) FishBase, which receives 700,000 unique monthly users and has reached a total of 10,685 citations; and 2) PeskaAS, the national fisheries monitoring platform used in Timor-Leste, which is publicly available, and received 3,800 visits from 882 unique visitors from 65 countries in 2023. PeskaAS is being adapted for use in Kenya, Mozambique, and Tanzania, where it is funded by a large investment from the United Kingdom's Foreign, Commonwealth & Development Office (FCDO). Other digital solutions, such as the Macher Gari app in Bangladesh, helped 1,723 fish farmers and 25 nursery owners organize the transport of their fish. The app generated 302 trips and delivered 172 metric tons of fish worth USD 225,240. In Myanmar, the Shwe Ngar app provides fish farming families with timely information on fish management, fish feed, fish health, and aquaculture technologies, as well as on basic human nutrition, and water, sanitation, and hygiene practices. It was used in 2023 by 11,646 people (524 women) including farmers, extension agents, and other private sector operators. Aquatic Foods researchers and partners also finalized the development of the [AQFO](#) to enable easy aggregation and analysis of data generated by the Initiative. It is available on [AgroPortal](#), and is based on the UN's Food and Agriculture Organization (FAO)'s AGROVOC terminology.

In WP2, a social platform for indigenous foods was created in the Solomon Islands [with novel partnerships spanning several sectors of society and island food system actors](#). In Timor-Leste, the WP team convened partners from several sectors of society involved in the national school meal program, which was identified as a significant lever for national aquatic food integration for nutritional outcomes. The WP team assessed pathways for securing a sustainable supply of fish and the extent to which partners have adopted aquatic foods. One partner served more than six tons of fish powder to 35,000 school students in 2023. In India, there was strong emphasis on fish and fish-based products through the Mission Shakti system and with women's self-help groups. Here, the team led the development and completion of the first national assessment of aquatic food consumption to provide our policy partners with options. The findings were published in a [journal article about research legitimacy as a precursor to effectiveness](#).

WP3 (AquaPlans) continued its work on innovative geospatial tools to identify [aquaculture suitability in small reservoirs in Ghana](#), and on the new generation of fish-friendly irrigation innovations in Asia and Africa.

WP4 (AquaGenetics) continued the dissemination of its valuable fish strains. In Bangladesh, 24 private hatcheries, 12 DOF hatcheries, one hatchery at BFRI, and one educational institution hatchery were supplied with G3 multiplier broodstock spawned in 2023. In addition, the BFRI hatchery was provided with 52 mature G3 multiplier fish from the 2020 spawning. By the end of 2023, 38 geographically disparate private hatcheries, 18 DoFs, one BFRI, and two educational institution hatcheries were known to maintain G3 rohu broodstock.

Over the year, Aquatic Foods contributed to the development of 13 policy changes at various scales in Bangladesh, Ghana, India, Nigeria, Timor-Leste, and Zambia. Policy contributions include the review and update of [Nigeria's National Fisheries and Aquaculture Policy](#), the [inclusion of fish and fish-based products in Timor-Leste's school meals program](#), and the Integrated Child Development Scheme



Md. Hafizur Rahman, a rice fish farming is giving feed to the pond beside his rice field. He said, by this way the profit is high, paddy cultivation growth is high because insects are eaten by the fish. Also, I have to provide less feed for fish. I am happy provide training on rice fish farming if any of our fish farmer wants from me at Kursha, Kaunia, Rangpur, Bangladesh on 13 October 2022.  
Credit: WorldFish

Supplementary Nutrition Program to tackle malnutrition in Assam, India. In Ghana, Aquatic Foods and partners contributed to the integration of aquaculture in the design of the government's "One Village, One Dam" program. Finally, the [government of Odisha \(India\) committed to working with WorldFish scientists to support the livelihoods and nutrition of 5,000 women in self-help groups](#).

Gender research focused on capturing promising learning areas from previous CGIAR programs, and co-producing key knowledge products. It also undertook research to integrate the importance of sex- and gender-disaggregated data into aquatic food systems; explore gender dynamics in aquatic food systems; lead gender integration and research activities within the different WPs; conduct gender capacity development among research teams; and scale up the Women's Empowerment in Fisheries and Aquaculture Index. In addition, the team worked on a [gender equality and social inclusion strategy](#) to guide aquatic food research-for-development. Finally, new [research](#) identified the influencers and drivers of gender-transformative approaches (GTAs) in the agricultural research-for-development ecosystem of organizations, while also raising concerns about the rush to embrace GTAs.



## Progress by End of Initiative Outcome

**EOIO 1: Scaling partners and stakeholders in two countries use improved knowledge systems and data to inform at least five evidence-based investments supporting aquatic food systems transformation.**

Significant progress in delivering research outputs and outcomes in 2023 along the TOC. The government of Timor-Leste continued its investment in PeskaAS. Over 15,000 km<sup>2</sup> of the country's coastline was under improved management thanks to this investment. PeskaAS, a real-time monitoring system for fisheries, became part of a major investment by the FCDO to support fishery management in Kenya, Mozambique and Tanzania. Additionally, two public-private platforms, FishBase and AquaData, facilitated data and knowledge exchange in 2023, with FishBase attracting 700,000 monthly users and AquaData being refined for wider use. Research informed policy updates in Bangladesh and India, while a collaborative effort supported the revision of Nigeria's National Fisheries and Aquaculture Policy.

**EOIO 2: Improved management and co-production of sustainable development pathways secure rights and livelihood benefits for 50,000 small-scale actors in aquatic food systems in Asia-Pacific and bring more nutritious diets to 300,000 people.**

In the Solomon Islands, the Nusatupe innovation hub, established by Aquatic Foods, offers training and knowledge-sharing, featuring a food garden, environmental restoration, seaweed farming, and aquaponics, and completed its first youth internship for six rural youth. In Timor-Leste, Aquatic Foods contributed to the national school meal program, incorporating more than 6 tons of fish powder into 35,000 students' meals in 2023. Meanwhile, in India, the focus was on promoting fish and fish-based products via the Mission Shakti system and women's self-help groups.

**EOIO 3: Improved food, livelihood, water, and environmental performance in multifunctional land and water systems in Myanmar, Cambodia, Ghana, and Zambia.**

Research aligned with the TOC yielded five key innovations, including three decision support tools for sustainable aquaculture in Cambodia, Ghana, and Myanmar, and two tools supporting inclusive governance in Ghana and Zambia. These innovations were backed by knowledge products and a robust capacity-building component, directly benefiting more than 400 stakeholders (fishers, farmers, private sector representatives, extension agents, policymakers) in Cambodia, Ghana, Myanmar, and Zambia.

**EOIO 4: At least one of tilapia and carp strains demonstrate increased productivity (+30 percent) and environmental performance (-25 percent GHG emission reduction) in one African and two Asian countries.**

The transfer of the GIFT tilapia strain to Nigeria marks the beginning of a GIFT-based aquaculture industry there, with the development of best management practices (BMPs) and the production of a high-performing G0 generation. In Bangladesh, Generation 3 rohu carp, growing more than 30 percent faster than traditional strains, was introduced to enhance aquaculture production, supporting a significant market. Additionally, new generations of selected tilapia and carp strains were produced in 2023, including Generation 19 of TiLV-resistant GIFT in Malaysia, Generation 17 of Abbassa tilapia in Egypt, and Generation 2 silver carp along with more Generation 1 catla carp in Bangladesh.

**EOIO 5: Aquatic food system labs in Solomon Islands and Zambia increase national innovation systems' ability to identify, evaluate, and scale sociotechnical innovations.**

In Solomon Islands, the Nusatupe innovation hub established by Aquatic Foods responds to the national demand for a training and knowledge-sharing facility. Several demonstration sites were established, including a 100 m<sup>2</sup> food garden, an environmental restoration site (coral replanting), a seaweed farm, and an aquaponic system.

The Nusatupe hub hosted an international forum on scaling community-based resource management with regional partners such as The Pacific Community, the World Wildlife Fund (WWF), the Wildlife Conservation Society (WCS), and the Locally-Managed Marine Area Network (LMMA) International.

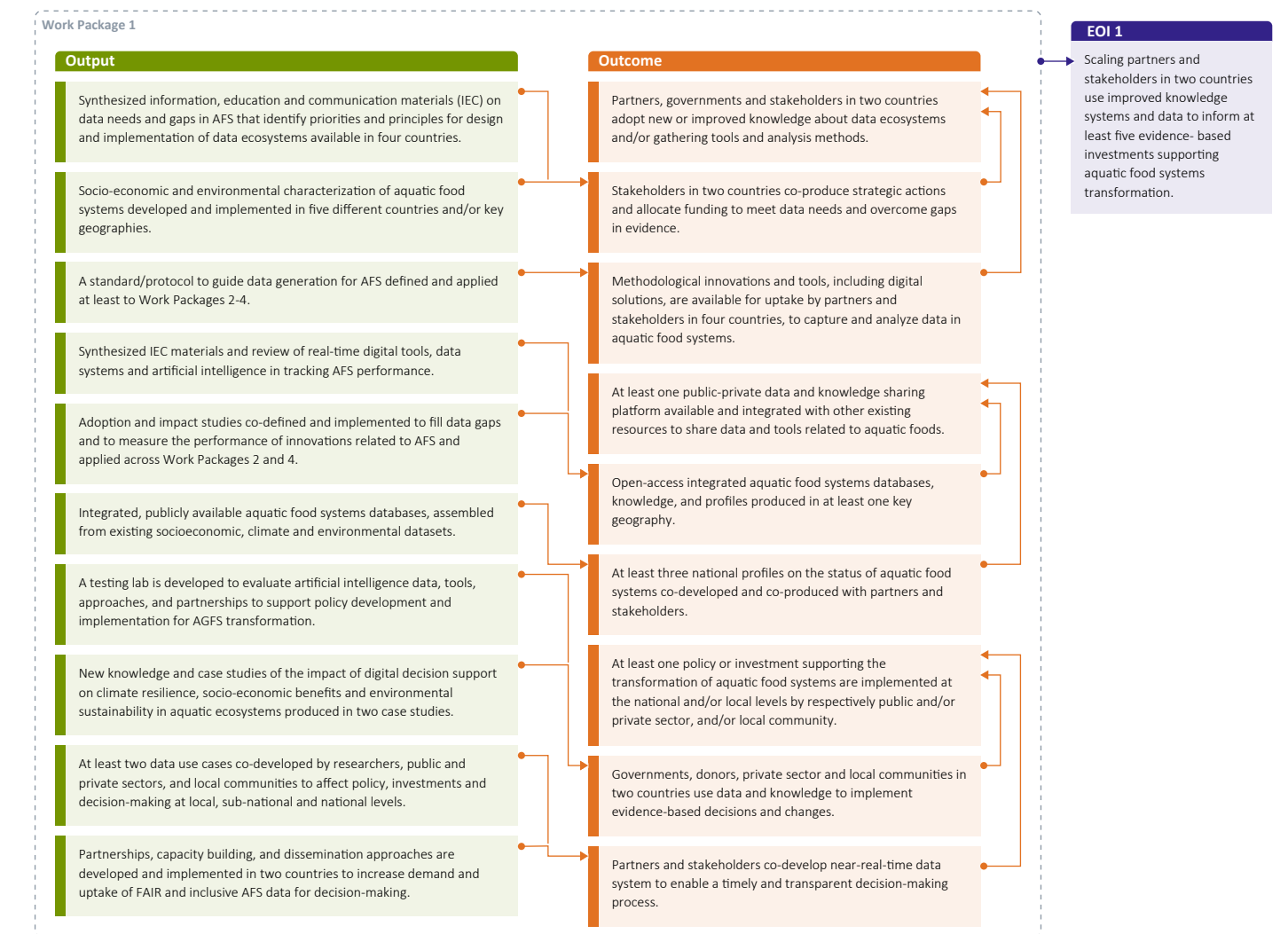


Fish harvesting at Odisha.  
Credit: Sourabh Dubey

## Section 3: Work Package progress

### WP1: AquaData

On track



### Work Package 1 progress against the theory of change

WP1 (AquaData) made substantial progress in delivering research outputs and outcomes in line with its TOC. Twenty-seven knowledge products were produced, including 14 peer-reviewed articles. Key publications focused on closing the knowledge gap about the contribution of small-scale fisheries to 1) sustainable development, and 2) the sustainability of production systems and practices in Bangladesh, Egypt, India, Myanmar, and Pakistan. These provide the foundation for understanding the sustainability performance and trade-offs between sustainability outcomes for aquatic food systems across different contexts.

Thirteen new innovations were under development in 2023, while four were already in use in Bangladesh, Timor-Leste, and globally. These focused on addressing data gaps and needs in aquatic food systems and/or developing key digital ecosystems and solutions to support data gathering and sharing. The innovations have been key in delivering research outputs and outcomes in line with the AquaData research plan. Key innovations were related to the definition of the monitoring, evaluation, and learning framework

for sustainable small-scale fisheries produced with FAO and the International Center for Agricultural Research in the Dry Areas. This is now promoted as a key tool for the implementation of the voluntary guidelines for sustainable small-scale fisheries worldwide. In addition, AquaData has been promoting the adoption of the new AQFO in the fisheries and aquaculture space.

AquaData and partners continued the development of the first-ever Data for Action Portal on aquatic food systems, with an improved framework of indicators for sustainable aquatic foods (AquaIndicators).

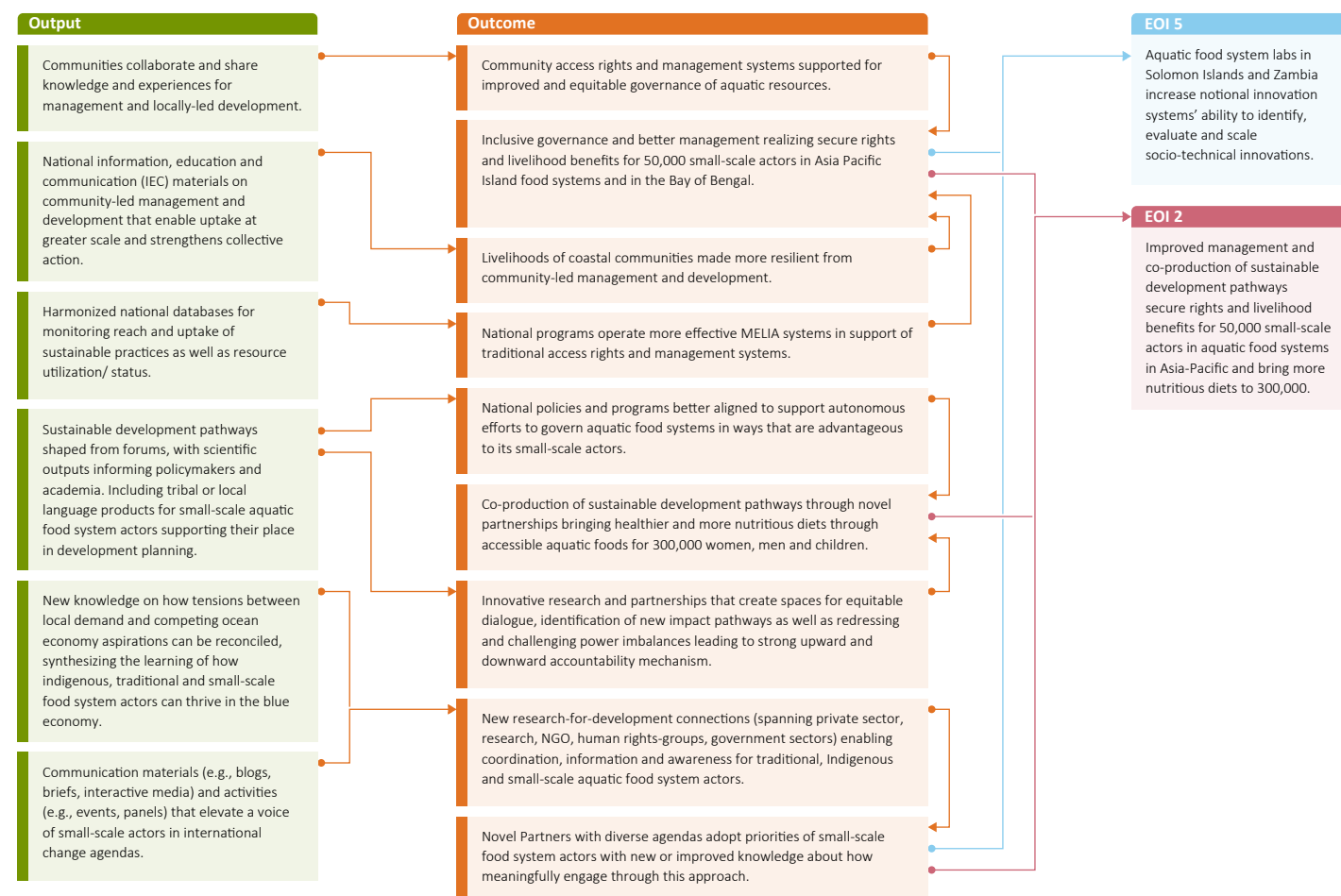
AquaData worked on six policy changes in 2023. These related to key recommendations and actions required to close data gaps relating to aquatic foods in Bangladesh and India, and the review and update of Nigeria's National Fisheries and Aquaculture Policy.

Twenty capacity-sharing activities were implemented in countries including Bangladesh, India, Kenya, Malaysia, Nigeria, and Zambia.

## WP2: Aqua+Partners



Delayed



### Work Package 2 progress against the theory of change

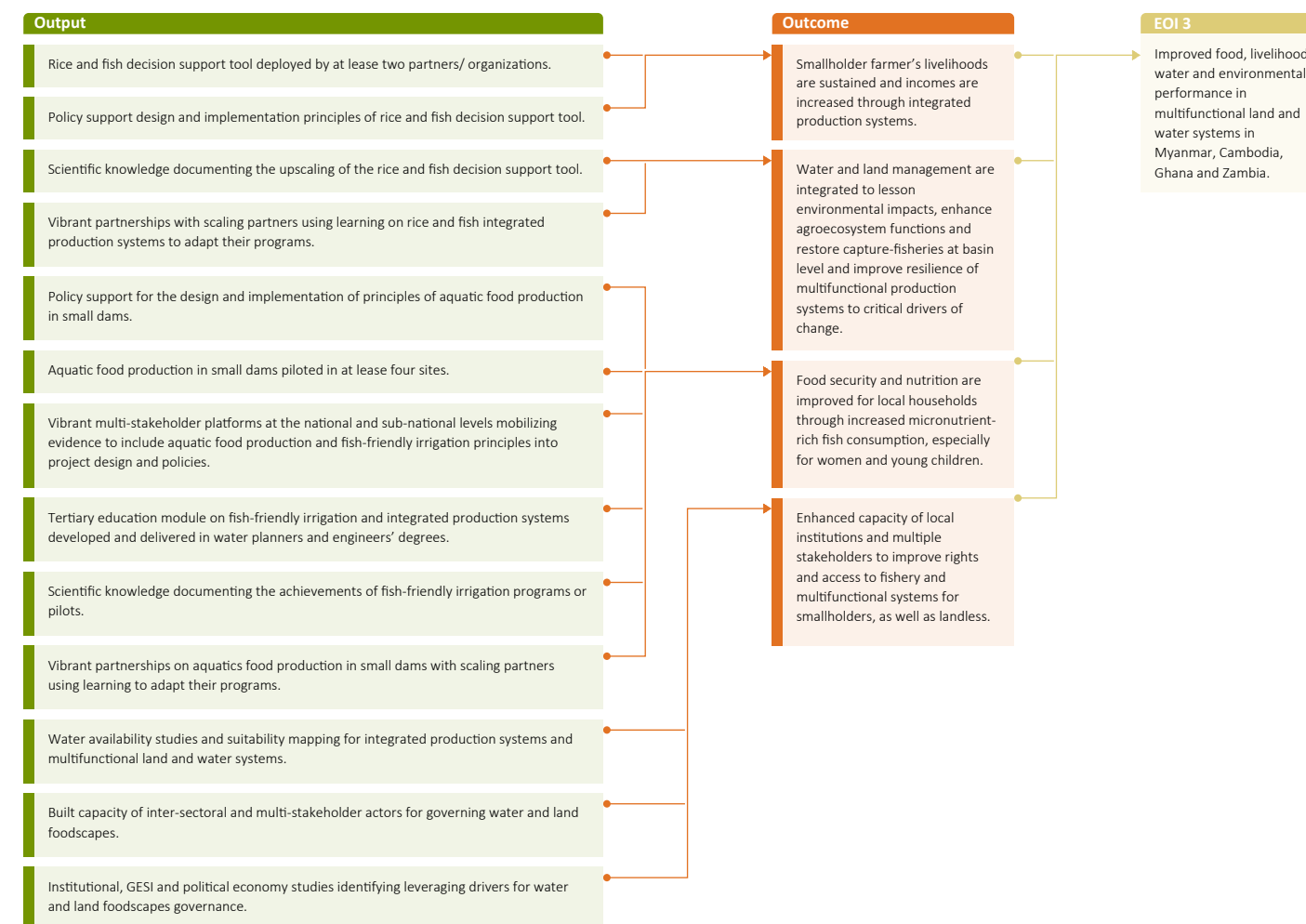
WP2 (Aqua+Partners) delivered on key activities in the TOC and was able to make progress in all areas, despite significant budget cuts. In Solomon Islands, Aqua+Partners created a social platform for Indigenous foods and novel partnerships spanning several sectors of society and island food system actors. The team convened a national forum to imagine island food system futures and established the Nusatupe innovation hub for island food systems. The hub responds to national demand for a training and knowledge sharing facility. Several demonstration sites were set up including a 100 m2 food garden, an environmental restoration site (coral replanting), a seaweed farm, and an aquaponic system. The hub completed the first round of youth internships with six rural youth (three men and three women). The hub hosted an international forum on scaling community-based resource management with regional partners such as The Pacific Community, WWF, WCS, and LMMA International.

In Timor-Leste, Aqua+Partners convened partners from several sectors of society involved in the national school meal program. This program was identified as a significant lever for national aquatic food integration for nutrition outcomes. The team also assessed pathways for securing a sustainable supply of aquatic foods and the extent of adoption by partners, with one serving more than 6 tons of fish powder to 35,000 school students during 2023. In India, a similar focus was retained with a strong emphasis on fish and fish-based products through the Mission Shakti system and with women's self-help groups. Here, the team also led the development and completion of the first national assessment of aquatic food consumption to provide our policy partners with options. Learnings from these experiences and approaches were published in a journal article about research legitimacy as a precursor to effectiveness. In total, the WP reported 10 journal articles, six knowledge briefs, and six reports.

## WP3: AquaPlans



On track



### Work Package 3 progress against the theory of change

In 2023, WP3 (AquaPlans) focused on finalizing designs and upscaling innovations. It delivered 19 knowledge products, including open-access journal articles, reports, manuals, and briefs. [Duncan and colleagues](#) assessed fish-friendly irrigation guidelines previously published for the Lower Mekong, while [Foudi and colleagues](#) and [Ramamurthy and colleagues](#) considered the impact of multipurpose dams with NEXUS and One Health approaches. The role of multistakeholder platforms in facilitating integrated water and landscape management across different scales of governance in Zambia was documented ([Siangulube and colleagues](#)), as well as knowledge production, collective action, and social learning processes for managing aquatic food systems in Cambodia ([Gleich and colleagues](#)). Integrated production systems continued to be a focus with Ignowski and colleagues showing evidence of the impact of integrating terrestrial aquatic foods on nutrient and economic productivity.

Five innovations were under development: the decision support tool for sustainable aquaculture development, the suitability tool for

scaling aquaculture in small reservoirs, rice-fish suitability decision support system modeling, fish cage production in small reservoirs, and a multistakeholder platform for managing complex and multifunctional landscapes.

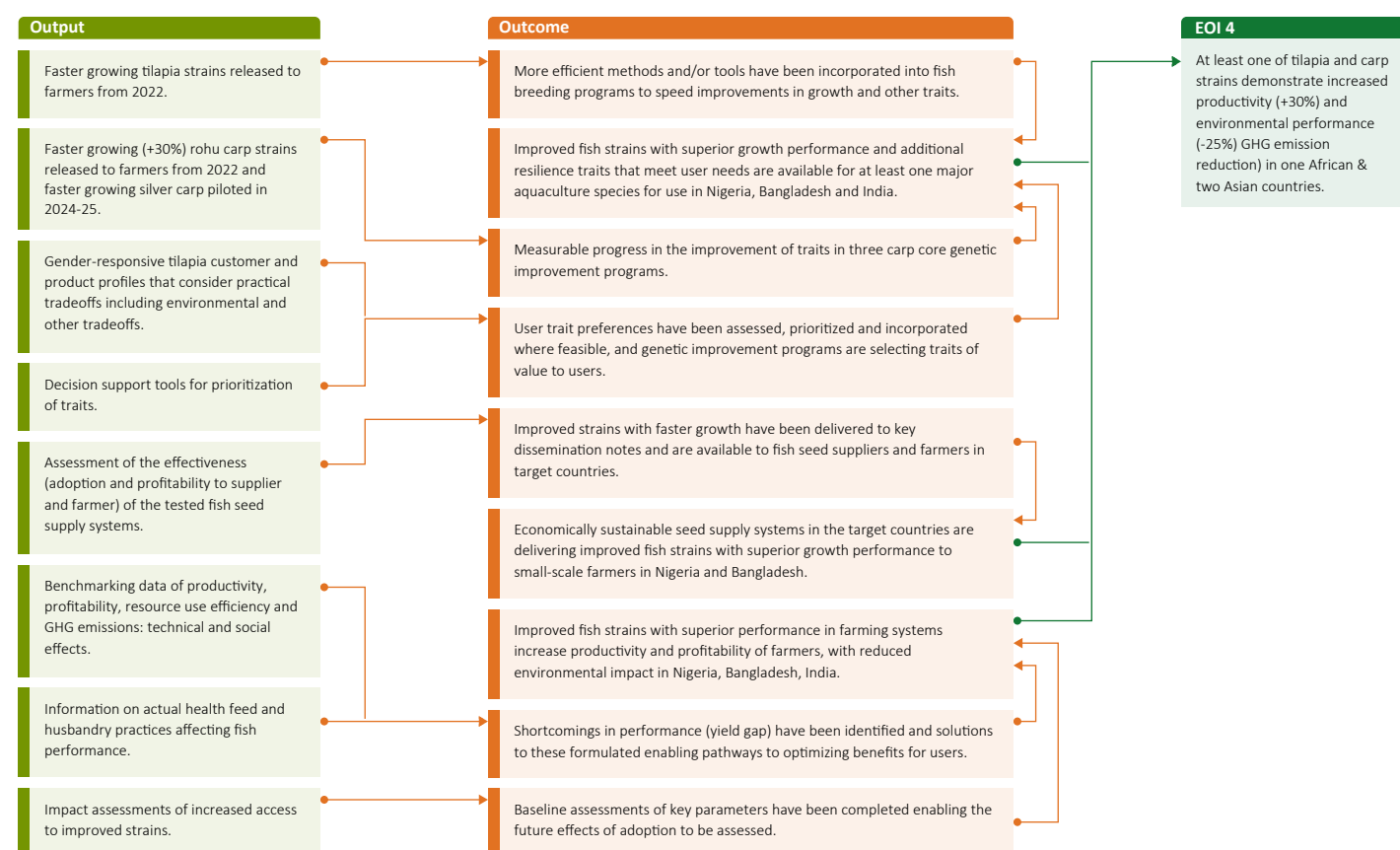
Development and scaling of innovations were supported by knowledge products capacity building of more than 400 stakeholders (including fishers, farmers, private sector representatives, extension agents, and policymakers) in Cambodia, Ghana, Myanmar, and Zambia.

AquaPlans' research also contributed to policy formulation for sustainable aquatic food systems. Pilots of cage fish cultivation in four reservoirs in northeastern Ghana and suitability mapping to upscale the pilots to additional locations were taken up by the One Village, One Dam program (phase 2), with the potential to integrate aquaculture into the design (or rehabilitation) of other reservoirs. In Cambodia and Zambia, MSP processes are supported by local government institutions as a way of enhancing the governance of multifunctional landscapes.



## WP4: AquaGenetics

● Delayed



### Work Package 4 progress against the theory of change

WP4 (AquaGenetics) made good progress in delivering research outputs and outcomes in line with its three-year research plan. New generations of several selected strains of tilapia and carp were produced as scheduled: Generation 19 of TiLV-resistant GIFT, Generation 17 of the faster-growing Abbassa tilapia strain, Generation 2 of silver carp, and a further batch of Generation 1 of catla carp. Production of Generation 19 of the GIFT fast-growth line scheduled for Q4 of 2023 was delayed. A journal article was published demonstrating that joint rearing of improved catla and rohu carp strains did not affect the improved growth performance of either strain and provided key information for management within farming systems.

Together with its partners, AquaGenetics generated 12 knowledge products and implemented key capacity-sharing activities in Bangladesh to support the uptake of G3 rohu carp, which is a major achievement.

Work continued in improving the productivity of tilapia and carp strains through faster growth and in selecting for increased disease resistance for TiLV in GIFT tilapia strains. This included development of further genomic tools (such as the Abbassa strain genome) aimed at increasing efficiency of selection in both tilapia and carps. Baseline studies into the dissemination of these genetic innovations have been completed in Bangladesh and Nigeria. Work to investigate on-farm performance and impact of Rohu carp in Bangladesh and the GIFT growth line in Nigeria were successfully implemented. Also in Nigeria, Aquatic Foods facilitated the legal agreement of WorldFish with the private sector to open the path to investments and future growth of GIFT.

Delays and reductions in budgets led to the cancellation of a number of activities.

## Work Package progress rating summary

WORK PACKAGE	PROGRESS RATING & RATIONALE
1	<p><span style="color: green;">●</span> <b>Progress rating</b></p> <p>Most deliverables planned for 2023 were met and all key deliverables critical to achieving the outcomes planned in the 2023 TOC were completed. Therefore, the WP is going in the right and expected direction.</p> <p>However, budget cuts in 2023 required significant changes to plans and will affect the overall achievements of the WP going forward. Prioritization of research and scaling activities will be necessary to ensure the successful delivery of key innovations.</p>
2	<p><span style="color: yellow;">●</span> <b>Progress rating</b></p> <p>As a whole, the WP is making progress in the intended direction and with the right focus on levers of change identified with partners. However, the much-reduced funding and associated uncertainty in planning is continuing to influence the pace and scale of implementation. This affects our assumptions of being impactful by building capacity, forming change coalitions, and influencing system-level change. These assumptions require the original scale of intent for the budget.</p>
3	<p><span style="color: green;">●</span> <b>Progress rating</b></p> <p>Annual progress made in 2023 in WP3 aligns with the plan of results and the TOC defined at the design stage of the Initiative. Outputs have been delivered as per the results framework under the three pathways and are now being translated into intermediary outcomes. Actual spending, which fell behind the initial plan in 2022, has satisfactorily caught up in 2023.</p>
4	<p><span style="color: yellow;">●</span> <b>Progress rating</b></p> <p>Annual progress was delayed in the delivery of a few activities due to both technical and logistical issues, and budget uncertainty, which seems to characterize the implementation of the CGIAR Research Initiatives.</p> <p>Revision of the TOC and prioritization of activities will be continued in 2024, in order to cope with changes in the implementation of genetics activities and scaling of key genetic innovations.</p>

### Definitions

<span style="color: green;">●</span> On track	<span style="color: yellow;">●</span> Delayed	<span style="color: red;">●</span> Off track
<ul style="list-style-type: none"> <li>Annual progress largely aligns with Plan of Results and Budget and Work Package theory of change.</li> <li>Can include small deviations/issues/delays/risks that do not jeopardize success of Work Package.</li> </ul>	<ul style="list-style-type: none"> <li>Annual progress slightly falls behind Plan of Results and Budget and Work Package theory of change in key areas.</li> <li>Deviations/issues/delays/risks could jeopardize success of Work Package if not managed appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>Annual progress clearly falls behind Plan of Results and Budget and Work Package theory of change in most/all areas.</li> <li>Deviations/issues/delays/risks do jeopardize success of Work Package.</li> </ul>





Farmer feeding the fish at a cage farm in Atempoku, near the Akosomb. Credit: Nana Kofi Acquah

## Section 4: Key results

This section provides an overview of results reported by the CGIAR Research Initiative on Aquatic Foods in 2023. These results align with the CGIAR Results Framework and Aquatic Foods' theory of change. Source: *Data extracted from the CGIAR Results Dashboard on 29 March 2024.*

### OVERVIEW OF REPORTED RESULTS



### PERCENTAGE OF REPORTED RESULTS TAGGED TO CGIAR IMPACT AREAS



● **Principal:** The result is principally about meeting any of the Impact Area objectives, and this is fundamental in its design and expected results. The result would not have been undertaken without this objective.  
 ● **Significant:** The result has made a significant contribution to any of the Impact Area objectives, even though the objective(s) is not the principal focus of the result.  
 ● **Not targeted:** The result did not target any of the Impact Area objectives.

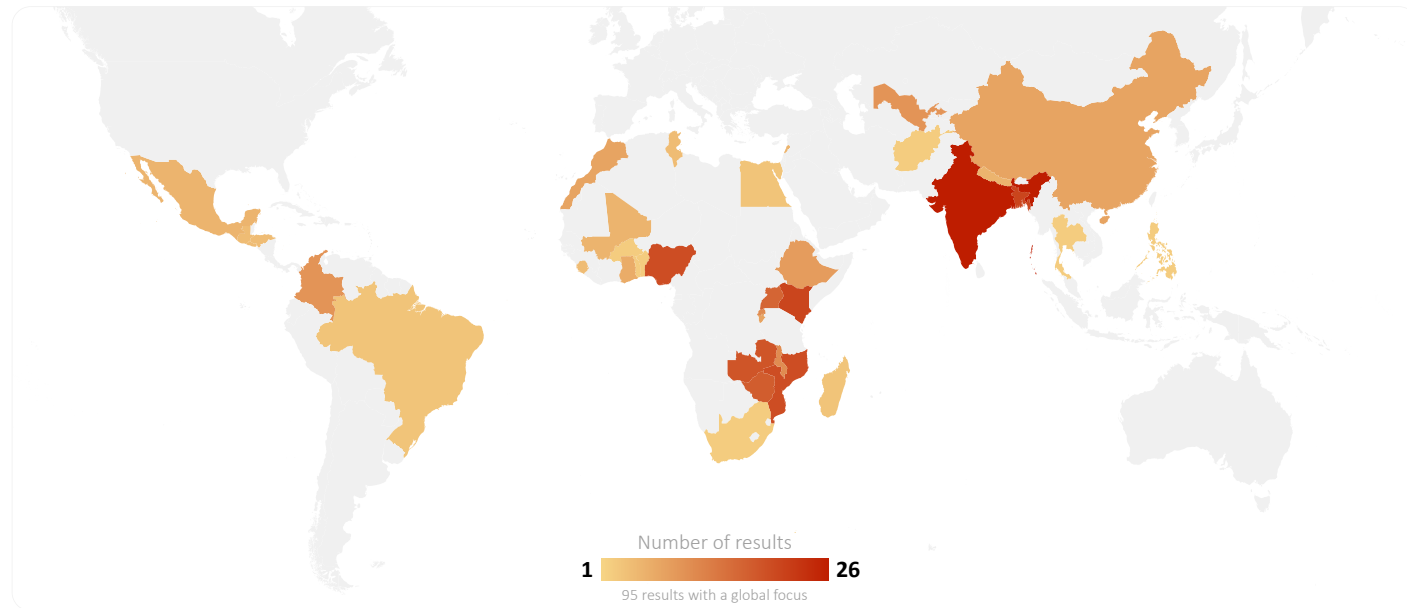
### CONTRIBUTIONS TO THE UN SUSTAINABLE DEVELOPMENT GOALS



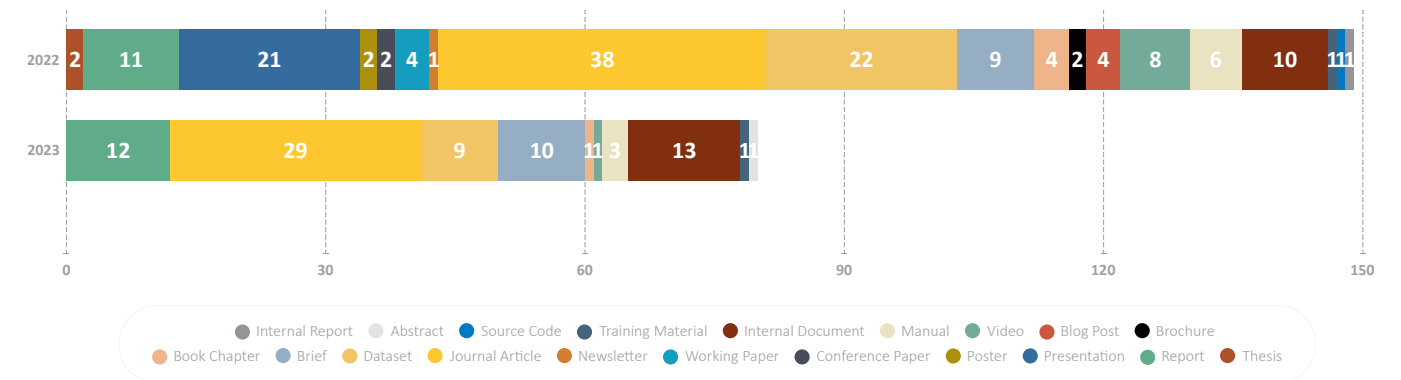


### NUMBER OF RESULTS BY COUNTRY

Data here represents an overview of reported results in 2023. One result can impact multiple countries and can therefore be represented multiple times.

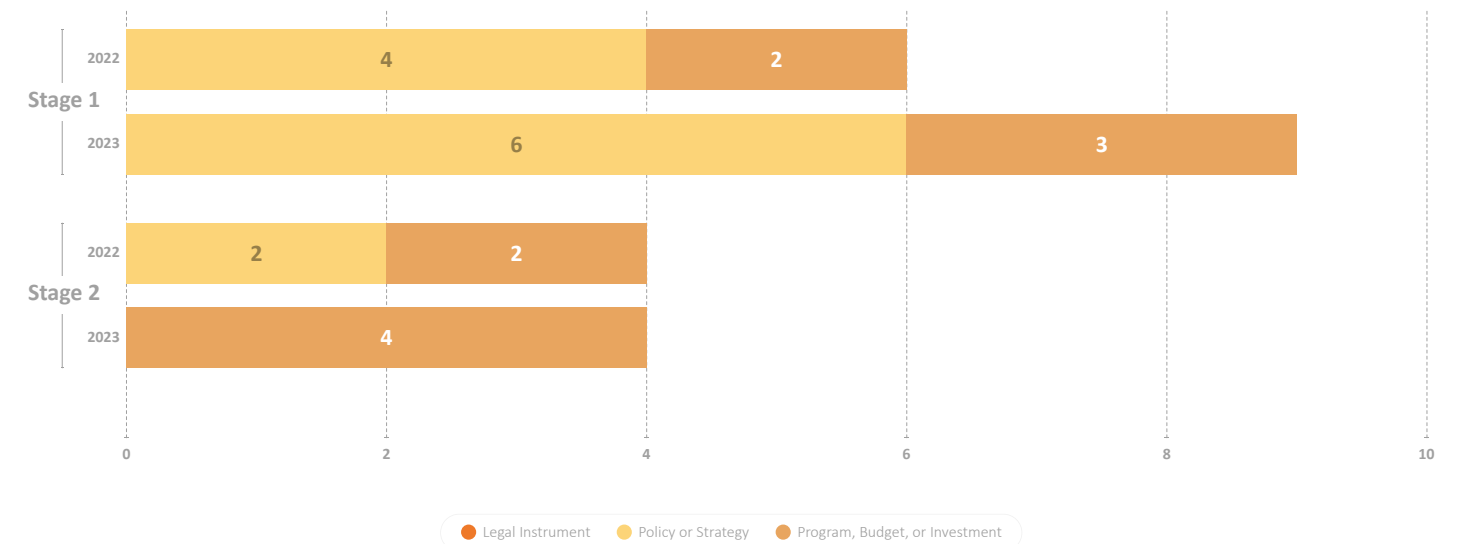


### NUMBER OF KNOWLEDGE PRODUCTS BY TYPE (TREND OVERVIEW, 2022-2023)



### NUMBER OF POLICIES BY STAGE AND BY TYPE (TREND OVERVIEW, 2022-2023)

Data here represents an overview of reported results in 2022 and 2023. One result can impact multiple countries and can therefore be represented multiple times.



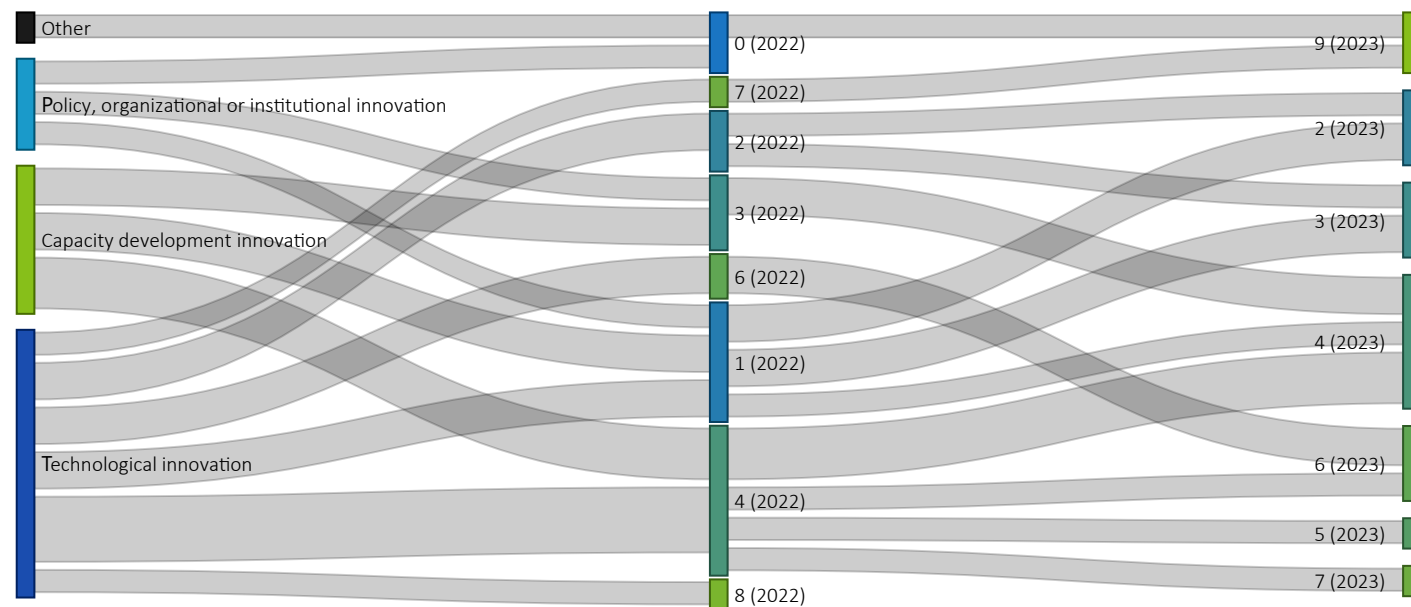
#### Stages

- **Stage 1:** Research taken up by next user, policy change not yet enacted..
- **Stage 2:** Policy enacted (provide link to published documents).

#### Policy types

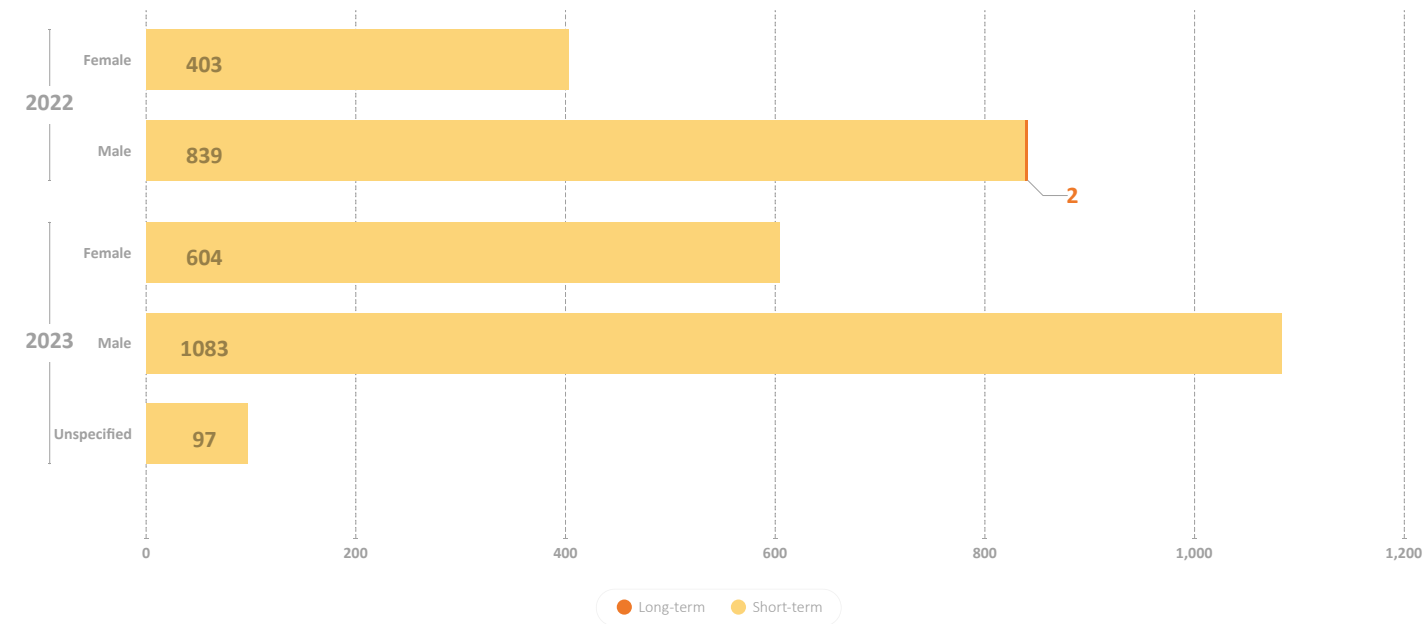
- **Policy or strategy:** Policies or strategies include written decisions on, or commitments to, a particular course of action by an institution (policy); or a (government, NGO, private sector) high-level plan outlining how a particular course of action will be carried out (strategy). These documents show the intent of an organization or entity. Examples are country growth strategies, country agricultural policies, organization strategic plans or road maps. This could also be observed as information campaigns (e.g., for improved diets). These documents set the goalposts but then require other instruments for implementation.
- **Program, budget or investment:** These are implementing mechanisms that often follow from a strategy, policy or law. There is typically a well-defined set of actions outlined over a specific period of time and with a specific budgetary amount attached.

### INNOVATIONS READINESS LEVEL PROGRESS FROM 2022 AND 2023 (TREND OVERVIEW, 2022-2023)



## NUMBER OF INDIVIDUALS TRAINED BY AQUATIC FOODS (TREND OVERVIEW, 2022-2023)

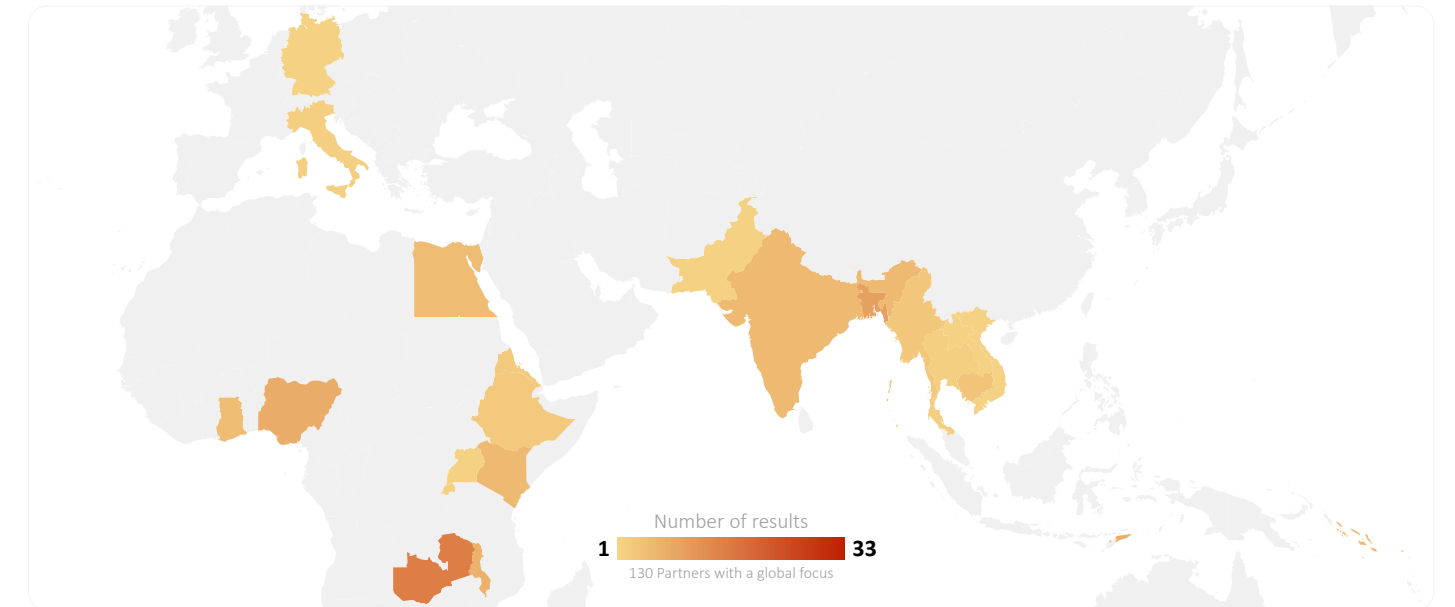
Data here represents an overview of reported results in 2022 and 2023. One result can impact multiple countries and can therefore be represented multiple times.



Lift net out side Pobitora WLS in Assam.  
Credit: Sourabh Dubey

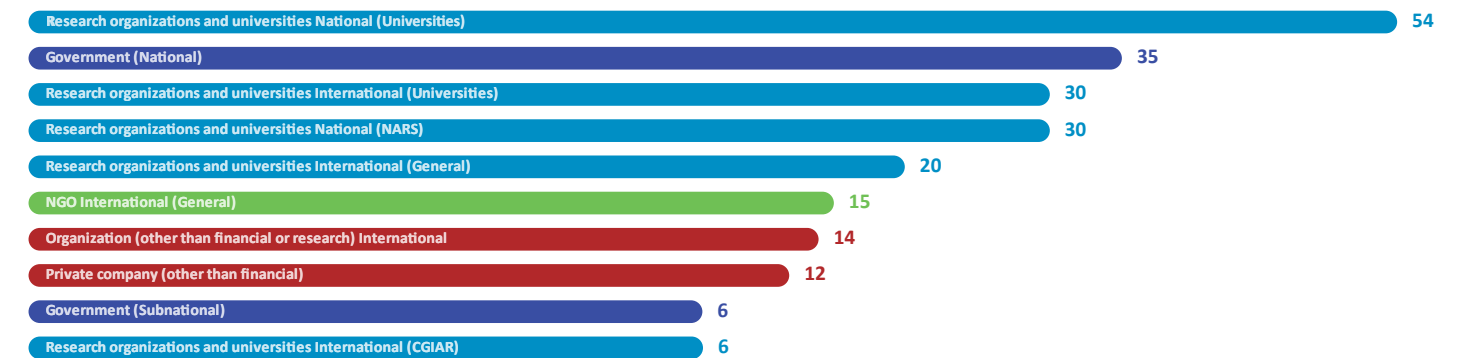
## Section 5: Partnerships

### EXTERNAL PARTNERS CONTRIBUTING TO RESULTS, PER COUNTRY



Colors represent the number of different partners which collaborated on results achieved in a specific country. One result can impact different countries and therefore the same partner can be associated with more than one country. Source: Data extracted from the [Results Dashboard](#) on 29 March 2024.

### TOP 10 PARTNER TYPOLOGIES THAT CONTRIBUTED TO DELIVERING 2023 RESULTS



### Partnerships and Aquatic Foods' impact pathways

In 2023, Aquatic Foods was engaged in 305 active external partnerships, 214 of which were established during the year. Academic and research organizations made up 52 percent of partners, but there was significant growth in partnerships with national agriculture research systems (14 percent) and governments (19 percent). This reflects greater attention to delivering innovations and outcomes with partners at scale through policy contributions, commercialization, and capacity-building partners. Most of the partnerships remained focused on innovation development (45 percent), while those relating to scaling accounted for 18 percent.

The Initiative supported WorldFish to build key partnerships in Nigeria and Bangladesh, in relation to the adoption of faster-growing strains of tilapia and/or carp respectively.

In Solomon Islands, the Initiative successfully integrated aquatic foods into the traditional agricultural movement under the headline of Indigenous foods. The in-country partner, Kastom Gaden Association, which manages a network of 10,000 farmers, has now gained access to training and information about safe aquatic food handling and processing (farmers are also fishers). This work has created a new social platform for the Indigenous foods movement.

In Timor-Leste, Aquatic Foods successfully integrated research and diverse partners under the program on school feeding. Here, aquatic foods have taken a central role in the planning and procurement of meals for young school children.

In Myanmar, key partnerships have been consolidated with the Department of Agriculture, Department of Planning, and DOF, under the Ministry of Agriculture, Livestock and Irrigation, to play a key role



in co-designing and deploying innovative approaches to rice and fish integrated production systems.

In Ghana, the Council for Scientific and Industrial Research and the Fisheries Commission, Ministry of Fisheries and Aquaculture Development, co-lead the implementation of a pilot project on fish cage production in small reservoirs, and are key in influencing the scaling of the innovation beyond the pilot.

In Zambia, the multistakeholder platform was launched under the auspices of the Ministry of Fisheries and Livestock.

In Cambodia, Aquatic Foods formally partnered with the Inland Fisheries Research and Development Institute, whose role is to jointly contribute to research and policy uptake. Building partnerships with national agricultural research and extension systems, particularly the DoF or their equivalent in target countries,

was key in 2023. In several cases, such as in India, Ghana, Solomon Islands, Timor-Leste, and Zambia, this involved supporting the department and/or other key traditional partners to work together on common investments and development plans for the fisheries and aquaculture sectors.

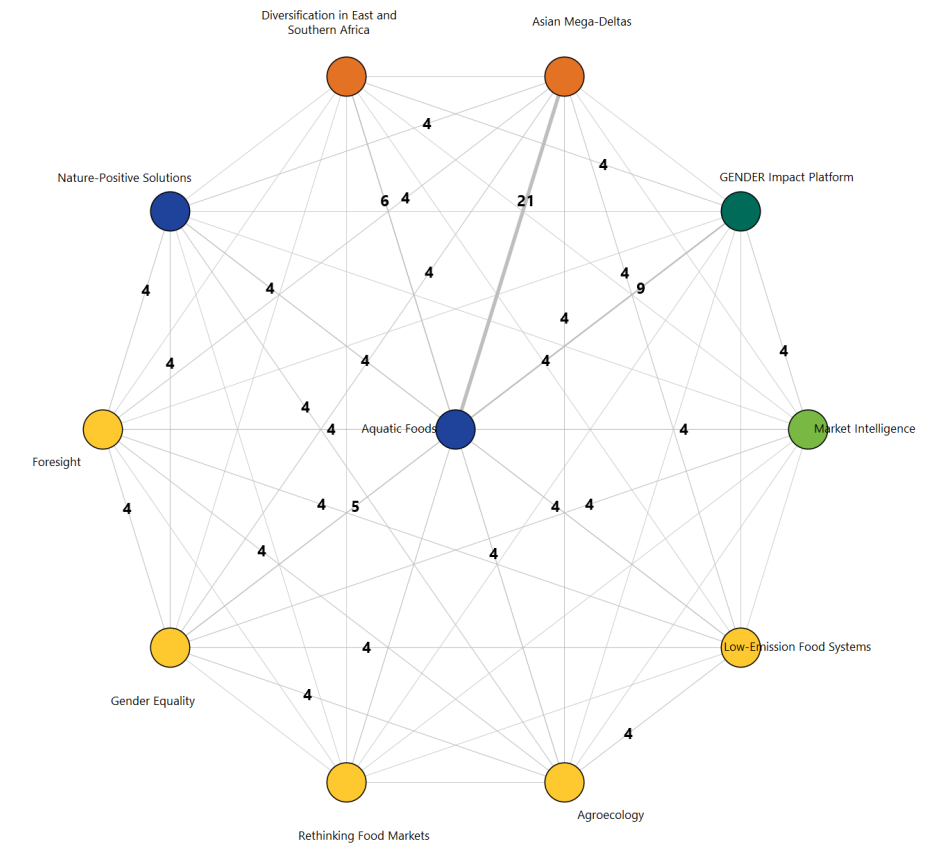
The cooperation with FAO and Duke University on the Illuminating Hidden Harvests initiative contributed to global policymaking and produced key knowledge around the role of small-scale fisheries in food security in various contexts. FAO is an important partner for the Initiative and more than 10 outputs were produced in collaboration with them. Aquatic Foods and FAO also co-developed a novel participatory monitoring, evaluation, and learning framework to support the transparent implementation of the voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty.



Protecting and enforcing inshore exclusive zones for small-scale fisheries: Leveraging communication strategies and tools to organise advocacy and mobilisation. Credit: Afeez Olumide Garuba

## Section 6: CGIAR Portfolio linkages

### AQUATIC FOODS' INTERNAL PORTFOLIO NETWORK



Connections are sized by the number of reported results. Collaborations where only one result was reported with a linkage between two Initiatives are excluded.

### Portfolio linkages and Aquatic Foods' impact pathways

Cross-CGIAR collaborations and portfolio linkages have been very important for the Aquatic Foods Initiative and were pursued in various ways during 2023. The Initiative cooperated closely with the Gender Impact Platform and two regional Initiatives—Asian Mega-Deltas and Diversification in East and Southern Africa (Ukama Utskawi). Together, the Gender Impact Platform and Aquatic Foods co-produced nine knowledge products including 1) a journal article aiming to explore the status of women's empowerment in the aquaculture sector in Kenya, 2) a report exploring gender-equal access and control over resources, technology, and information among smallholder farmers in climate change hotspots in Africa, and 3) a technical workshop report about climate change, gender, and livelihoods among fisher communities in Kenya's Lake Victoria region.

Aquatic Foods actively contributed to the CGIAR Gender Conference in New Delhi, India. This event was an important opportunity for Initiative researchers to share their experiences and current strategy for aquatic foods, learn from existing gender research, and enhance capacities for quality and impactful gender research that will advance CGIAR's 2030 development targets.

Linkages with the Asian Mega-Deltas and Diversification in East and Southern Africa Initiatives support the delivery of the TOC and End of Initiative outcomes in Asia and Africa. In Cambodia,

close collaboration between WP3 of Aquatic Foods and WP4 of Asian Mega-Deltas allows the work on water and land foodscapes governance to be delivered more effectively and at a larger scale. Finally, in Zambia, Aquatic Foods works with Diversification in East and Southern Africa to govern and enable sustainable diversification and intensification of aquatic food systems and applied the scaling readiness approach for promising innovations in Africa.

The collaboration with Asian Mega-Deltas produced several knowledge-sharing products, including an article about the impacts of climate change on aquaculture and the potential of climate information services to support sustainable aquaculture development and capacity-sharing activities, with the organization of a consultation workshop for stakeholders and partners on water governance and food production systems in Cambodia.

Finally, work with Nigeria's National Policies and Strategies (NPS) Initiative resulted in the production of flagship reports on policy coherence in food, land, and water systems. Based on work undertaken in Ghana and Zambia, these provide a framework for policy and institution landscape analysis, which can be applied to other countries. Aquatic Foods also collaborated closely with NPS to support the review and update of Nigeria's National Fisheries and Aquaculture Policy.



## Section 7: Adaptive management

In 2023, the Initiative team conducted a “pause and reflect” process to better understand some of the major green lights and roadblocks in the second year of implementation. It focused on a series of discussion points such as operationalization and implementation processes, science delivery, gender integration, results and roadmap to impact, budgeting, TOC, partnerships, and engagement, risks, and next cycle. Many of the challenges identified in the first year remained relevant in 2023. Among these, the limited Initiative cycle duration, budget allocation uncertainty, and continuous budget cuts were seen as major roadblocks affecting the success of the Initiative in many aspects. In the short term, these limit opportunities for engagement and collaboration across WPs and, across CGIAR, they limit the depth and breadth of research activities and compromise trust and relationship building with partners.

The differences between the expected/promised and actual allocated budget created the need to continuously replan and review activities and partner engagement. As a consequence, in 2023, significant revisions were made to the TOC, including the complete withdrawal of WP5, whose aim was to build synergies among all WPs and support the scaling of innovations. Other WPs were also forced to reduce the scale of their activities, thus affecting the reach of the outcomes (now reduced by 50–60 percent). Over the long term, time and budget limitations affect the Initiative’s capacity to align with scaling and generate impact. With regard to future portfolio

developments, it is recommended that such considerations are taken into account. Stronger financing and longer cycles would ensure sustainability and continuity of innovation and scaling efforts, which otherwise risk being fragmented and lost.

On the operational side, CGIAR-led administrative and financial procedures are still perceived as quite demanding, adding further layers to existing Center policies and structures. The processes and guidelines are not always easy to follow, and the number of focal and contact points is too high and difficult to keep track of. In addition, the management information systems (MIS) do not function well: there are too many platforms serving different purposes (such as the TOC tool, performance and results management, risk tool). These have limited functionalities and there is no linking/synchronicity with existing Center systems.

Internally, we appraised Initiative-specific management procedures and meetings established to facilitate communication and knowledge sharing within the Aquatic Foods teams, and to ease the administrative load. Better efforts are encouraged on knowledge exchange platforms and communication across Initiatives, Centers, and stakeholders to create stronger synergies, engender better adaptive processes, and take advantage of opportunities for lesson-learning. On this note, it is strongly recommended that the new investment cycle builds up the work that has been done under the Aquatic Foods Initiative to support a science continuum and scaling.



Protecting and enforcing inshore exclusive zones for small-scale fisheries: Leveraging communication strategies and tools to organise advocacy and mobilisation. Credit: Hong Chern Wern

### RECOMMENDATION

### SUPPORTING RATIONALE

Strengthen communication and increase synergies across WPs and with other CGIAR Initiatives and non-pooled funding

The withdrawal of WP5 was the result of significant budget cuts. WP5 was supposed to serve as a connector between WPs and support more collaboration and linkages. Its withdrawal affected communication exchange and collaboration opportunities internally and externally. Knowledge exchange platforms conveyed at the country level could create better synergies and links with other Initiatives and projects.

Improve country-level infrastructure and financial resource allocation to better support Initiatives

In-country support for Initiative implementation and engagement is seen as a constraint and not efficient enough. This is particularly relevant in those cases where contributing CG Centers do not have country offices in the geographies of interest and need to rely on other CG Centers or partners’ local offices, and often there is no staff time or budget allocated. In the first two years of implementation, this has made it hard to coordinate, disrupting the ability to implement in-country activities. Coordinated efforts between Centers and greater financial resources could support better operational activities in countries.

Increase funding allocation and reduce uncertainties from CGIAR, including better synergies with non-pooled funding

With regard to the investment cycle for new Initiatives, it is necessary to consider adequate financial resources and better budget allocation processes that can support the delivery of quality science and scaling for impact in a more robust way.

Continue focusing on priorities on key science delivery and quality

In the final year of implementation, considering budget constraints, the Initiative will continue to build the publication pipeline with a focus on key priorities, science quality, and sustainability.

Ensure Aquatic Foods’ science sustainability and continuum in the next portfolio

Aquatic Foods has been delivering great results and the science behind these should be integrated into the next investment cycle. It is important to ensure the continuity of existing innovations and scaling work to ensure greater impact is generated as a result. Longer duration of Initiative cycles would also contribute toward this.

CGIAR and Centers to coordinate efforts in improving the MIS and administrative procedures to better facilitate Initiatives in the implementation process and sharing of results

The lack of integration of CGIAR systems and procedures with those of the Centers has resulted in an increased burden on the Initiative, especially in planning and reporting processes. Better coordinated efforts are needed to streamline processes and tools that can support Initiatives more efficiently and effectively.

Increase resource allocation to better support gender research and integration and capacity sharing for development

Reduction in actual funding has influenced the capacity for great gender research and integration, and capacity building and sharing opportunities. The PhD programs have been particularly affected. This is also due to the short duration of the Initiative cycle.

Continue improving the multistakeholder engagement and consultation processes

Continuing to invest in multistakeholder engagement and consultation appears to have a positive effect on improving policy development and innovation adoption across geographies in support of more sustainable aquatic food systems.



## Section 8: Key result story

### Genetically improved tilapia supports Nigeria’s aquaculture goals

A breeding population of GIFT was established in Nigeria, producing fish for distribution to hatcheries and farmers.



A hatchery worker feeds GIFT F1 fry at PAL's site farm in Oyan Dam, Ogun State, Nigeria.  
Credit: Oluwadare Olubunmi Olofintila, WorldFish

The government of Nigeria wants to boost sustainable aquaculture countrywide. In 2023, a breeding population of fast-growing GIFT was established in the country, successfully producing young fish for distribution to hatcheries and farmers. This achievement was the result of work by scientists at WorldFish in collaboration with the Federal Ministry of Agriculture and Food Security, Premium Aquaculture Ltd (PAL), and other national partners.

In 2023, scientists from the CGIAR Research Initiative on Aquatic Foods in Nigeria reached important milestones in supporting the establishment of an industry for [GIFT](#) in the country.

Fish are already critical to diets and the economy in Nigeria, but around 45 percent of demand is met through imports. With abundant inland water resources, there is significant scope to expand homegrown aquaculture and respond to the demands of a population expected to leap from 196 million to 260 million by 2030.

While catfish accounts for more than 80 percent of aquaculture in the country, dependence on a single species is risky: disease could sweep through hatcheries and farms, wiping out stocks. In addition, signs of inbreeding in the country’s catfish populations have resulted in reduced growth and survival rates of the fish.

As part of the government’s five-year [Agricultural Technology and Innovation Policy](#), launched in 2022, scientists from Aquatic Foods have been working on pioneering approaches to boost aquaculture. These aim to meet local protein needs, reduce imports, improve climate change resilience, empower the country’s smallholders, and create 500,000 new jobs in the aquaculture value chain.

Initiative scientists identified GIFT as being a good option for supporting these aims. GIFT is a strain of Nile tilapia that has benefited from multiple generations of selective breeding. It is fast growing, adaptable to a wide range of conditions, and—as an herbivore—its feed requirements are cheaper than other farmed fish, making it attractive to smallholders. GIFT also provides many of the same nutritional benefits as other fish, namely zinc, iron, Vitamin A, calcium, and protein.

In 2022, WorldFish teamed up with PAL, a hatchery and fish farm in Ogun State. As part of the partnership, 60,000 GIFT “swim-up fry”

(very young fish) were packed into polythene bags with oxygenated water and flown from WorldFish headquarters in Malaysia to PAL, where they entered a mandatory month-long quarantine period. In 2023, the now-adult fish were used to produce a GIFT breeding population. The resulting progeny were supplied to farmers and hatcheries to establish their own production.

During 2023, onsite trials at the PAL hatchery involving local fish feed producer Premier Feed Mills showed that GIFT were performing well. Under different feeding regimes, they showed faster rates of growth and more efficient feed conversion than nonimproved fish already used by PAL. These should mean higher production, lower costs, and potentially more earnings for farmers.

The Initiative also supported the establishment of a breeding population at a PAL site in Ogun State and two small-scale hatcheries in Delta State, including pilot “grow-out” ponds for raising fish to market size. In November, PAL started supplying the second generation of GIFT fry to farmers.

“This is the best possible start for the introduction of GIFT in Nigeria,” said Sunil Siriwardena, of WorldFish, who leads the work of Aquatic Foods in the country.

“At hatcheries, we’re seeing GIFT doing what they do best: resisting disease and quickly reaching a harvestable size, while the response from farmers has been overwhelmingly positive. We expect GIFT will be a huge asset in strengthening and expanding fish farming in Nigeria and supporting the government in achieving its aquaculture goals.”

In 2023, the Initiative produced a range of learning materials for hatcheries and farmers, including a handbook on [BMPs for raising Nile tilapia](#). It also produced a [curriculum on tilapia breeding, nursing, and grow-out farming](#), which was used to train around 200 farmers, approximately two-thirds of whom were women.

The work has a broader goal of decentralizing the production of GIFT seed to improve farmers’ access to it. A special focus is needed on boosting aquaculture in the northern region of the country, where fish farming and fish consumption is lower than in the south.

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This is the best possible start for the introduction of GIFT in Nigeria. We expect GIFT will be a huge asset in strengthening and expanding fish farming in Nigeria and supporting the government in achieving its aquaculture goals.

Sunil Siriwardena, Officer-in-charge, WorldFish Nigeria

#### Primary Impact Area



#### Other relevant Impact Areas targeted



#### Contributing Initiative

Aquatic Foods

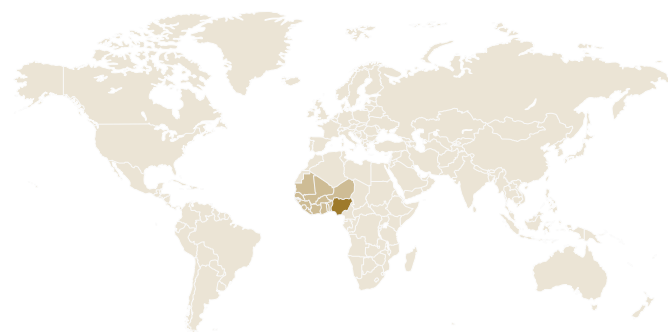
#### Contributing Center

WorldFish

#### Contributing external partners

Nigeria’s Federal Ministry of Agriculture and Food Security · Premium Aquaculture Limited

#### Geographic scope



Region: West Africa

Country: Nigeria





**Front cover photo**

Happy youth entrepreneur, Nigeria.  
Credit: Adesanya Omotomiwa IITA and Olaniyi Ajibola, WorldFish

**Back cover photo**

Fishing the river plume.  
Credit: Wade Fairley



INITIATIVE ON  
Aquatic Foods