

Resilient Aquatic Foods for Healthy People and Planet

Initiative Lead and Co-Lead	Primary CGIAR Action Area	Estimated 2022 - 2024 Budget
Edward Allison Sonali Senaratna Sellamuttu	Resilient Agri-food Systems	\$25 - \$30 M

Challenge

Aquatic foods (animals and plants grown or harvested from water for food or feed) provide micronutrient-rich foods for 3.3 billion people and support livelihoods of over 120 million (WorldFish, 2020, <https://bit.ly/3spSyPX>). However, access to food for low-income consumers and food and income for the majority (>90%) small-scale actors in wild-caught aquatic food systems (AqFS) is threatened by inadequate management and competing demands for aquatic foods by wealthier consumers. Climate change impacts AqFS productivity, viability and resilience (Barange et al. 2018, <https://bit.ly/3tjQ2fk>). Aquatic animal diseases threaten production, and treating them can cause antimicrobial resistance that threatens human health (Cabello et al. 2013, <https://bit.ly/3mPmtzZ>). Reducing loss, waste and environmental impacts are imperatives throughout AqFS.

Productivity, biodiversity and carbon-sequestering functions of aquatic ecosystems are threatened by competing water demands, pollution, infrastructure development, land use change, and competition for space and resources (Vorosmarty et al. 2010, <https://go.nature.com/2RvOv7Q>; Cohen et al. 2019, <https://bit.ly/2Qpdc5s>). AqFS-dependent communities risk being excluded from these food environments, traditionally managed as commons (Cohen et al., 2019; Joffre et al., 2017, <https://bit.ly/2QrN61F>). Investment in novel cell or plant-based seafoods and aquaculture feeds (e.g. microalgae) is concentrated in the Global North, while 'aquatic superfoods' (seaweeds, shellfish) have yet to reach their full potential, and traditionally diverse, local 'food environments' are threatened by low-quality food imports (Sievert et al. 2019, <https://bit.ly/3gjW5gf>).

Underinvestment in breeding aquatic animals for improved growth, feed conversion efficiency, climate resilience and disease resistance constrains environmental performance and productivity, particularly for smaller-scale farmers (FAO 2019, <https://bit.ly/3x0erZO>).

Inadequate data and management systems hinder effective governance and marginalize AqFS within wider food system policy discourses (Bennett et al, 2021, <https://bit.ly/3uVu42>). This limits investments required to realize AqFS contributions to the UN Sustainable Development Goals.

Objective

Aquatic foods are rich in highly bioavailable forms of essential vitamins and minerals and are major sources of omega-3 and vitamin B12 (Thilsted et al. 2016, <https://bit.ly/3x2qjtY>). AqFS provide business opportunities for tens of millions but are also harvested from aquatic commons by millions of landless and marginalized people. Our overall objective by 2030 is to ensure that the projected 160 million diverse AqFS actors and their dependents in our 11 target countries improve their access to income and nutrition from aquatic foods, and that our contributions to sustainably manage aquatic foodscapes and growing aquaculture will prevent up to 500 million people from becoming malnourished (Golden et al 2016, <https://go.nature.com/2Q0ENKy>).

Our initiative aims to accelerate transition towards an aquatic food system that is regenerative rather than extractive, so that by 2024, in our 11 target countries, 30% of AqFS production will come from the sustainable and efficient use of biodiverse inland freshwater systems and coastal wild and farm production environments. These AqFS will evidence improvement in social equity, climate-preparedness, and micronutrient yields. They will offer desirable employment for youth, and contribute to a 10 % increase in per capita aquatic food consumption for the 3.6 billion fish-consuming people in our target countries. We will achieve this by building on previous CGIAR research that has generated innovations in governance models, partnership modalities, technologies and knowledge services. Our initiative will scale up these innovations and apply our co-created knowledge base to influence policy and market behaviour in the AqFS and the broader food system.

Theory of Change

Our theory of change is that aquatic foods could deliver more to human nutrition, livelihoods and environmentally sustainable agrifood systems if research-for-development investments were made in natural resource management and delivery and uptake of innovations throughout aquatic foods value chains. We propose a program of partnership-based research and innovation to help accelerate on-going sustainability transition in the aquatic food system.

Five work packages comprising bundled socio-technical innovations will deliver benefits to all five OneCGIAR impact areas. Decision-support tools, innovation-system relationships and production technologies to improve access to wild and farmed aquatic food production in inland freshwater systems and coastal waters (WP1, 2), together with genomic tools selecting for improved farmed fish growth and resilience (WP4), will help close fish supply-demand gaps, lower prices, and improve access to nutritious aquatic foods, while also creating jobs for women, men and youth. Moreover, well-managed food-producing wetlands and coastal waters are carbon sinks and aquatic farmed foods can be carbon-efficient. Innovation hubs will co-design, pilot and accelerate uptake of nutritious and climate-smart foods and aquaculture feeds, reduce loss and waste in value chains and support traditionally diverse local diets (WP3). Knowledge platforms will allow all partners to learn, anticipate change, and make better investment decisions in aquatic food futures (WP5).

The socio-technical innovation bundles in each WP will include gender-transformative approaches and be combined, in a given location, depending on diagnosed need and opportunity. We will also work in partnership with other synergistic regional and thematic initiatives to amplify outcomes and impact, including: Protecting human health through a One Health approach; Her+: Harnessing equality for resilience in the agri-food system; Resilient cities through sustainable urban and peri-urban agrifood systems; Transforming food systems from greenhouse gas sources to sinks (S2S); and the Securing the Asian Mega-Deltas against sea-level rise, flooding, salinization and water insecurity initiative.



Resilient Aquatic Foods for Healthy People and Planet

Highlights

Managing water for aquatic foods. Here we promote a participatory, inclusive landscape planning approach, focusing on habitat protection, connectivity and fish-friendly infrastructure, to get more food from water and ensure fair access. We will stimulate inter-sectoral collaboration to increase water productivity, carbon sequestration, biodiversity conservation, employment and nutrition from natural wetlands, irrigated rice and gray/green infrastructure.

Partnering for peopled seas. AqFS actors are being squeezed out of coastal zones by competing ocean uses. Building on relationships with fisherfolk associations, we will partner with 'ocean citizen action groups' to supply on-demand research to uphold their economic, social and cultural rights to traditional food-producing spaces and ocean-based livelihoods.

AquaLabs in four countries will incubate, pilot and accelerate uptake of novel nutritious, climate-smart aquatic foods and aquaculture feeds; improve processing to reduce waste and loss; market-test new products; and/or help revive traditional diets. We will co-design, co-pilot and scale with diverse AqFS actors, including women, youth and Indigenous Peoples.

AquaGenetics. Accelerating the creation and adoption of better-performing strains of main cultured fish (tilapias, carps, African Catfish), that meet users' needs, through novel institutional dissemination arrangements: improving productivity, profitability and environmental performance of fish farms, while building disease and climate-change resilient farming systems and reducing fish supply-demand gaps.

AquaData. Redesign fisheries and aquaculture sector data around a food systems approach, via an interactive AqFS knowledge platform for OneCGIAR and partners to: fill data gaps; identify priority threats and opportunities; model AqFS futures; conduct intersectional political economy analysis; evaluate policy proposals and provide AqFS actors with access to robust information.

Work Packages

Scope of Work		3-year Outcomes
Aquatic Foodscapes: Managing Aquatic Food Systems (AqFS) within Environmental Boundaries and Changing Climates	Co-design with AqFS partners, integrated packages for management and investment in AqFS with improved environmental and climate performance, by applying at scale, piloted innovations (e.g., integrated rice-fish farming, aquatic food production in water infrastructure and climate-smart fisheries management), to incentivize sustainable water and land use for resilient, nutrition-sensitive AqFS.	Guidelines on managing aquatic foods in multi-functional land/waterspaces rolled out in 2 countries in Asia (Cambodia and Myanmar) and two countries in Africa (Zambia and Ghana) by 2024
Partnering for Peopled Seas.	Building on extensive engagement in participatory resource management, gender transformative approaches and community development models, we will reformulate our partnerships with fisherfolk to deliver locally-demanded, co-created technical, socio-political and legal research that supports traditional access rights and management systems, and enables fisherfolk to prosper in the accelerating 'blue economy'	Transformed existing partnerships with 15 coastal communities to provide on-demand research in Odisha (India), Timor Leste and Solomon Islands serving food producers' autonomous efforts to sustainably govern aquatic resources and pursue new opportunities in the 'blue economy'.
AquaLabs: Innovation Hubs for Aquatic Food Systems (AqFS)	Where local aquatic food producers, actors involved in value addition and financing along the food value chain and consumers come together to design, pilot and accelerate socio-technical innovation bundles in AqFS. Ensuring food produced/consumed is culturally and contextually appropriate and ecologically sustainable providing economic opportunities and affordable, nutritious, micronutrient-rich diets locally.	Established four aquatic food system hubs in Solomon Islands, Bangladesh, Nigeria, Kenya or Zambia to identify, evaluate and scale socio-technical innovations around AqFS waste and loss recovery, novel aquatic foods and feeds and to promote diverse, nutritious, safe, affordable diets.
AquaGenetics: Accelerating the development and delivery of improved fish strains	Applying genomic innovations will accelerate improved performance of tilapia, carp and catfish to meet users' needs, delivered by novel institutional arrangements (including public-private partnerships), and gender- and youth-responsive management tools and extension services to make fish farming systems more productive, profitable and inclusive, increasing livelihood security and affordable fish for all.	Tilapia and carp strains (at least two) with improved performance demonstrate increased efficiency/resilience, productivity and profitability in the farming systems in Africa and Asia to which they were supplied together with management practices that address yield gaps and the novel institutional partnerships that demonstrate increased scale of supply to farmers.
AquaData: in support of an enabling policy environment for aquatic food systems to thrive	Models, impact evaluations, sector-focused political economy analysis and a novel set of aquatic food-system indicators that deliver the empirical and conceptual analysis required to support inclusive decision-making and representation in critical policy arenas: blue economy, water resource governance, gender equity and youth employment; food system transformation; planetary health	Improved AqFS data availability and access, including missing data on demographics of AqFS actors, role of aquatic foods in diets and life-cycle analysis of AqFS

Resilient Aquatic Foods for Healthy People and Planet

Impact Area Contributions

Nutrition, health & food security	AqFs transformation to sustainability increases availability and consumption of safe and nutritious AqFs for 3,6 billion people (50% women) and leads to reduce micronutrient deficiencies in 11 countries in Africa and Asia especially for women, children and other vulnerable groups
Poverty reduction, livelihoods & jobs	70 million small-scale producers and fishers (50% women) increase and stabilize their income and 15 million inclusive and sustainable jobs and resilient livelihoods opportunities are created in the aquatic food systems
Gender equality, youth & social inclusion	Applying a gender transformative and intersectional approach leads to improved gender equality, youth and social inclusion: 40 million women, youth and other vulnerable groups are empowered through AqFS.
Climate adaptation & greenhouse gas reduction	The adoption of improved and more sustainable production and management practices for AqFS leads to a 20% decrease in CO2 emissions and a 10% increase in water- and nutrient-use efficiency in 11 countries in Africa and Asia
Environmental health & biodiversity	The adoption of improved and more sustainable production and management practices for AqFs leads to restoration of 5 million hectares of degraded multifunctional land and water systems in 11 countries in Asia and Africa

Impact on SDGs



Regions

Global	East and Southern Africa (ESA), South Asia (SA), South East Asia and the Pacific (SEA), West and Central Africa (WCA)
--------	---

Countries



Resilient Aquatic Foods for Healthy People and Planet

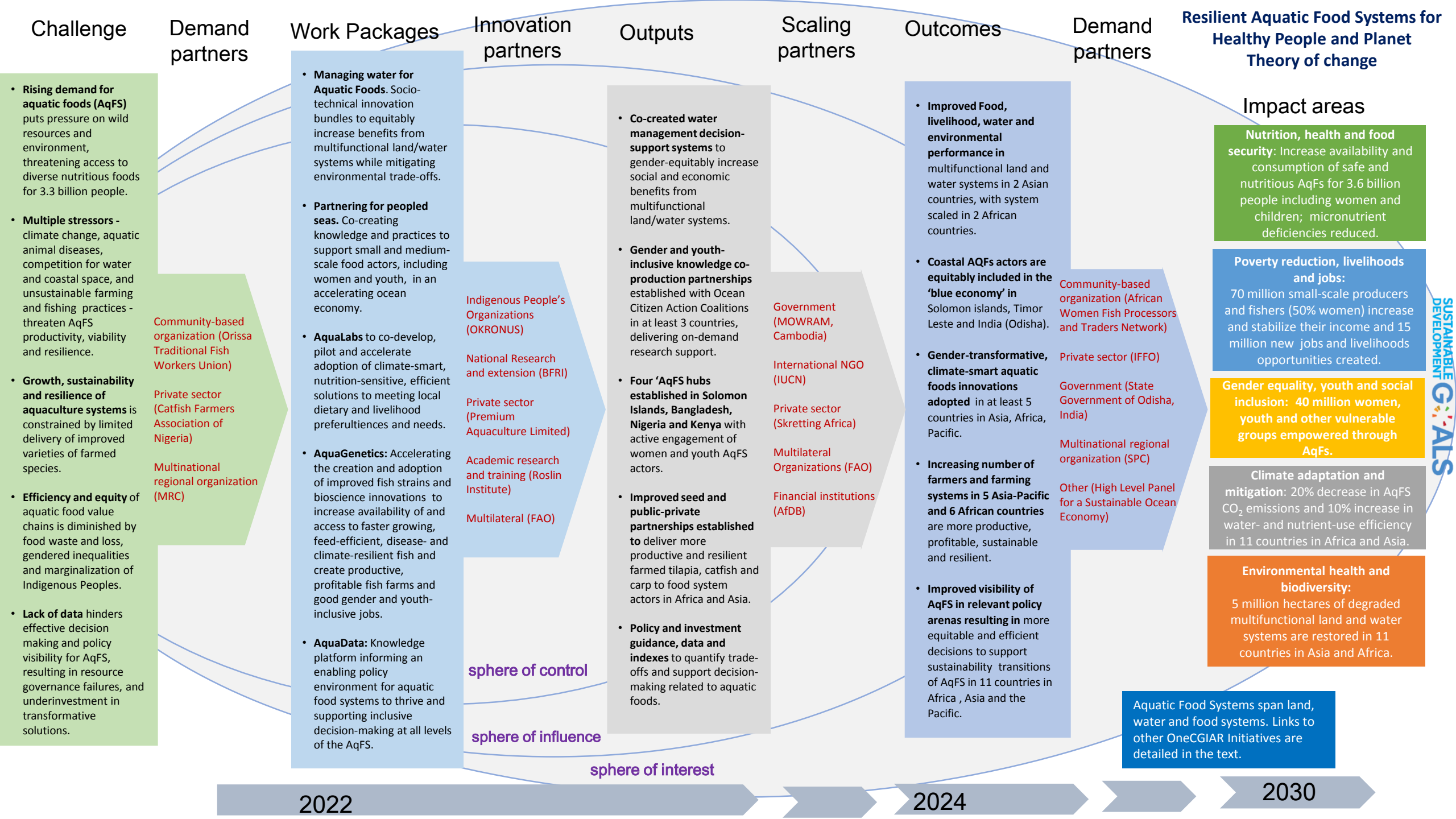
Innovations

Decision support tools (models, institutional mechanisms, maps and guidelines) to co-design and co-manage with AaFS actors, targeted investments in multifunctional land/waterscapes. Providing data-backed gains for improved water and land management (e.g., integrated rice-fish farming, fish in irrigation infrastructure and climate-smart fisheries management) to increase productivity, profitability and development outcomes.
Decolonized relationships between OneCGIAR and coastal communities, delivering on-demand research combining local and scientific knowledge to inform AqFS actors' efforts to build thriving coastal communities and to steward safe, productive spaces for food production amid 'squeeze' from coastal urbanization, exclusionary marine conservation and an accelerating ocean economy.
Hubs for AqFS actors to evaluate and scale local innovations in: i) novel species culture, new food products and aquaculture feeds; ii) reducing waste along value chains; and iii) reviving nutritious traditional diets. Hubs are gender and youth-inclusive, foster peer-to-peer learning and stimulate local innovations through public-private-research partnerships
Tilapia and carp strains (at least two) with improved performance through application of latest breeding technologies and social science research, that demonstrate increased efficiency/resilience and meet users' needs, delivered to farming systems in Africa and Asia via novel institutional partnerships, together with management practices that address identified yield gaps.
Comprehensive publicly-available data systems that: enable timely response to inquiries from land/water/AqFS actors and stakeholders; ensure aquatic foods are properly integrated into wider food systems analysis in OneCGIAR; support gendered and intersectional analysis; and are disseminated through a bi-annual 'state of aquatic food systems' report.

Key Partners

Demand	Other	High Level Panel for a Sustainable Ocean Economy (14 Heads of State)
		Mekong River Commission
		Orissa Traditional Fish Workers Union
	Private Sector	Catfish Farmers Association of Nigeria
	Regional NGO	African Women Fish Processors and Traders Network
Innovation	Academic, Training and Research	Bangladesh Fisheries Research Institute (BFRI)
		Roslin Institute, Division of Genetics and Genomics, U.K.
	Multilateral	Global Strategic Framework in support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the context of food security and poverty eradication, UN Food and Agriculture Organization
	Other	OKRONUS Resource Management and Development Trust, Malaita Province, Solomon Islands
	Private Sector	Premium Aquaculture Limited
Scaling	Government	Royal Government of Cambodia Ministry of Water Resources and Meteorology (MOWRAM)
	International NGO	International Union for the Conservation of Nature
	Multilateral	African Development Bank
		UN Food and Agriculture Organization (Fisheries and Water Resources Divisions)
	Private Sector	Skreeting Africa



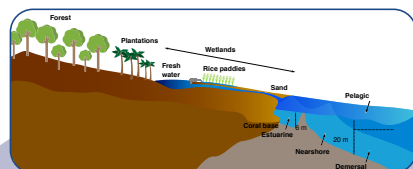


**Research question:**  
How can this initiative help get diverse, nutrient-rich and sustainable aquatic foods to nutritionally vulnerable consumers?



#### Objectives

By 2030, 160 million diverse Aquatic Food Systems actors and their dependents in our 11 target countries improve their access to income and nutrition from aquatic foods, and 500 million aquatic food consumers are prevented from becoming malnourished, through sustainable Aquatic Food Systems.



**Managing water for aquatic foods (WP1)**  
to increase water productivity and keep people and food integral to managed land-water interfaces



**Partnering for peopled seas (WP2)**  
To put research under the control of small-scale fishers who are fighting to keep their place in a fast-growing ocean economy

#### Gender inclusion:

- Reach
- Benefit
- Empower
- Transform



**AquaGenetics (WP4)**  
Bringing benefits of bioscience innovations to close supply-gaps, improve, feed-efficiency, and put disease- and climate-resilient fish in farmers' hands



**AquaLabs (WP3)**  
where farmers, fishers, traders, entrepreneurs and researchers meet to co-create the aquatic foods future



**AquaData (WP5)**  
to inform an enabling policy environment for aquatic food systems

#### Key Definitions

**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



**Resilience:** A resilient aquatic food system is one that continues to deliver diverse nutritious food at affordable prices to those who need it, despite shocks and perturbations and under a range of future market and climatic conditions.

#### Differentiators

1. Aquatic food systems include both plants and animals, are diverse and nutrient rich, with some affordable to all and others of value as 'cash crops'
2. Potential to contribute to transformative increase in the global availability of micronutrient-rich foods.
3. Diverse new Partnerships – e.g., with fisher community associations, 'ocean citizen action groups' and the private sector.
4. Indigenous Peoples are important stewards and consumes of aquatic foods
5. Pacific Region is included



## THE BIG FACTS ON AQUATIC FOODS

Aquatic foods less well-known than their terrestrial counterparts but are diverse, nutritious, often sustainable and have growth potential. Here is some key information that supports the case for investing in sustaining and increasing their contributions to a transformed global food system.

#### Nutrition, health and food security

**3.3 billion**  
Number of people getting **20%** of their **animal protein** from eating aquatic foods.



**17%**  
Percentage of all **animal protein** consumed globally that comes from **aquatic foods**.



**2 billion**  
Number of people suffering the **triple burden of malnutrition** who can benefit from the life-changing option of consuming **nutrient-rich** aquatic foods.



**1000 days**  
Aquatic foods are dense in **micronutrients**, which are essential to cognitive development in the first **1000 days of a child's life**.



#### Climate adaptation and mitigation

**70%**  
Percentage of the planet that is covered by the **ocean**, which houses **80% of all life on earth** while **sequestering carbon** and providing **half of the world's oxygen**.



Production of aquatic foods has a **much lower carbon footprint** and **far fewer biodiversity impacts** compared to production of crops and livestock.



#### Poverty reduction, livelihoods and jobs

**50%**  
Percentage of the total global catch from **small-scale fisheries**.



**800 million**  
Number of people around the world who depend on **small-scale fisheries** and **aquaculture** for their livelihoods.



**60 million**  
Number of people engaged in the primary sector of **fisheries** and **aquaculture** in 2018.



#### Gender equality, youth and social inclusion

**1 in every 2**  
Workers in the primary and secondary sectors of fisheries and aquaculture who are **women**.



They are crucial to aquatic food systems, providing **labor, innovative ideas** and **entrepreneurship**.

**90%**  
Percentage of all **small-scale fishers** living in low- and middle-income countries in the Global South.



#### Environmental health and biodiversity

**Over 3000 species**  
of aquatic food plants and animals are harvested from the wild and **over 600 are cultivated**.



Growing food in surface waters provides **incentive to maintain water quality**, which benefits aquatic ecology.

**78%**  
Percentage of **fishstocks** currently within **biologically sustainable** levels, compared to 90% in 1990.



**\$ 22.5 billion**  
The **annual loss** of discarded fish alone.



**35%** of the global harvest from fisheries and aquaculture is **lost or wasted** and **could be recovered**.