



Annual Plan of Work and Budget (POWB) for 2021

CGIAR Research Program on Fish Agri-Food Systems (FISH)

Led by



In partnership with



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This Plan of Work and Budget 2021 was prepared by WorldFish in collaboration with FISH managing partners: International Water Management Institute, James Cook University, Natural Resources Institute of the University of Greenwich and Wageningen University and Research

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List of Abbreviations

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
ACIAR	Australian Centre for International Agricultural Research
AMR	antimicrobial resistance
ASFA	Aquatic Sciences and Fisheries Abstracts
AWFISHNET	African Women Fish Processors and Traders Network
BMGF	Bill & Melinda Gates Foundation
BMPs	best management practices
BOBLME	Bay of Bengal Large Marine Ecosystem
CapDev	capacity development
CBFM	community-based fisheries management
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
COA	Cluster of Activity
COFI	Committee on Fisheries
CRP	CGIAR Research Program
DO	Dissolved oxygen
EAT	A global platform for food system transformation
EiB	CGIAR Excellence in Breeding Platform
FAO	Food and Agriculture Organization of the United Nations
FISH	CGIAR Research Program on Fish Agri-Food Systems
FP1	Flagship 1 (Sustainable Aquaculture)
FP2	Flagship 2 (Sustaining Small-Scale Fisheries)
GIFT	genetically improved farmed tilapia
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IDOs	Intermediate Development Outcomes
IFPRI	International Food Policy Research Institute
IHH	Illuminating Hidden Harvest
IIFET	International Institute of Fisheries Economics & Trade
ILRI	International Livestock Research Institute
IMR	Institute of Marine Research, Norway
IRRI	International Rice Research Institute
ISC	Independent Steering Committee of the CGIAR Research Program on FISH
LCA	life-cycle assessment
LUANAR	Lilongwe University of Agriculture and Natural Resources
M&E	monitoring and evaluation
MC	FISH Management Committee
Norad	Norwegian Agency for Development Cooperation
OICR	Outcome and Impact Case Reports
PIM	CGIAR Research Program on Policies, Institutions, and Markets
POWB	Plan of Work and Budget
RICE	CGIAR Research Program on Rice Agri-Food Systems
RTB	CGIAR Research Program on Roots, Tubers and Bananas
SA	sustainable aquaculture
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
SEOnt	Socio-economic ontology
SIDS	Small Island Developing States
SLOs	System Level Outcomes

SNP	single nucleotide polymorphism
SPC	the Pacific Community
SRC	Stockholm Resilience Centre
SSFs	small-scale fisheries
TAAT	Technologies for African Agricultural Transformation
TiLV	tilapia lake virus
ToC	theory of change
UN	United Nations
USAID	United States Agency for International Development
WLE	CGIAR Research Program on Water, Land and Ecosystems
WUR	Wageningen University and Research

CGIAR Research Program on Fish Agri-Food Systems

This document provides the 2021 Plan of Work and Budget (POWB) for the CGIAR Research Program on Fish Agri-Food Systems (FISH).

1. Adjustments/changes to the theories of change

Theories of change at program, flagship and country levels continue to inform the planning of FISH with the FISH Management Committee (MC) conducting a review of the flagships (*Sustainable Aquaculture* (FP1) and *Sustaining Small-Scale Fisheries* (FP2)) and overall program ToC with reference to: (1) plausibility of delivery of planned research outputs and outcomes, (2) efficacy of pathways toward development outcomes and targets, (3) key change mechanisms and scaling strategies, and (4) research prioritization and investments. In 2020, FISH also refined the ToC for all six research clusters and for specific FISH innovations, a process that has informed 2021 priority investments towards the most promising areas of innovation, policy change and outcomes.

The MC and flagship research teams also reviewed and revised the milestones ([Table 2A](#)) in October 2020. This review built on FISH successes and learning to date, overall seeking to ensure that the milestones better adhere to the FISH research-development continuum by capturing new partnerships, research priorities and scaling approaches. The review has helped to optimize the delivery of FISH outcomes by 31 December 2021.

In 2021, FISH enters a key phase of consolidating learning from its research advances, optimizing the delivery and quantification of outcomes and impacts, and synthesizing and communicating these achievements. The year is also of vital importance as a foundation for the future, enhancing the contributions of fish and aquatic foods to achieve CGIAR SLOs, new One CGIAR impact areas and SDGs. Four types of FISH synthesis products are being planned: (i) strategic learning; (ii) synthesis papers; (iii) innovation and product descriptions; and (iv) impact and outcome assessments, including policy contributions and OICR and projected benefit analysis. Innovation and product descriptions will enable FISH to assess scaling readiness, methods and strategies, and synthesize the key learnings across the FISH research portfolio and countries. Outcome and Impact Case Reports, along with impact research in 2020, will be used evaluate the effectiveness of the FISH ToC, including all the nested levels: flagships, clusters and countries, with special emphasis on SDGs.

COVID-19 impacted FISH operations in all focal and scaling countries during 2020; whilst adjustments have been made, disruptions are expected to continue in 2021. COVID-19 and related policy responses have impacted supply chains for fish and other aquatic foods due to transportation, trade, and labor disruptions. Acute negative impacts on food and nutrition security in short- and medium-term have been seen in all FISH countries, with particularly dire consequences for the poor and vulnerable. In 2021, FISH will continue to cooperate with the CGIAR COVID-19 hub, and explicitly explore how the pandemic has impacted FISH ToC and fish agri-food systems, to formulate evidence-based policy advice and design actions that support both shorter-term recovery initiatives and longer-term fish agri-food system resilience.

2. Plans and expected progress toward outcomes

FISH plans for 2021 were determined based on three factors: (1) rigorous assessment of progress to date, including review of individual innovations at various stages; (2) potential for outcomes; and (3) a subsequent prioritization exercise conducted by the FISH MC and ISC. Prioritized areas also reflect investments in synthesis of FISH learning, and continued drawing together of evidence and research investments that lead to optimal impacts of fish within agri-food systems at all levels: local, national, regional and global, including preparation for the new One CGIAR Research portfolio in 2022. The following provides highlights of outcomes and outputs by cluster and cross-cutting theme.

Sustainable Aquaculture

The **Sustainable Aquaculture** flagship (FP1) will continue to contribute to Intermediate Development Outcomes (IDOs) and System Level Outcomes (SLOs), with 2021 priorities progressing towards those outcomes, completion of most promising research lines and preparing a foundation of evidence for the future. The following areas of innovation are prioritized:

- The continued development of faster growing and more robust tilapia and carp strains, with a key milestone being the creation of GIFT generation 18 developed from disease free backup stock, a foundation for wider dissemination during 2021.
- The assessment of strategies for genomic selection of resilience traits (tilapia lake virus (TILV) response, feed efficiency and aerobic performance) as a significant milestone in the pathway for breeding of resilient tilapia for the future.
- The completion of a genome sequence of the GIFT strain, providing a major stepping stone for future scientific applications and technology development.
- The rapid genomic pathogen detection work to validate rapid field diagnostics and the epidemiology tool box to support designing disease prevention and management improvements for wider application in Asia and Africa.
- The nutritious pond concept being more widely scaled and large-scale utilization of an open access feed ingredient database to formulate balanced diets using local ingredients, all through public and private sector partners now widely engaged across Asia and Africa.
- The integration of FISH performance assessment tools into a set of digital aquaculture tools that can be widely applied to assess on-farm performance of improved fish strains, providing a platform of performance data for future analysis of environment-genetics-management interactions.

FISH on-farm performance tools and methods across a wider range of countries will enable performance of improved tilapia, management practices and strategies for dissemination and adoption to be evaluated, providing a unique data set for analysis of tilapia aquaculture performance. These tools, methodologies, data and learning will be widely shared, but with particular focus on supporting decision making for public and private investors in tilapia aquaculture in Africa, within and beyond FISH focal and scaling countries.¹

FP1 is demonstrating the benefits of closely integrating research on genetic improvement, nutrition, health and production environments. This is reflected in FISH tilapia and, more recently, carp genetic improvement programs, which have delivered productivity improvements of 8%–10% per generation—a rate of genetic gain far greater than is possible in terrestrial animal and crop sectors. The flagship is strongly committed to optimizing the introduction, dissemination and scaling of these advances with partners across focal and scaling countries. In 2021, a priority will be to draw together key evidence and learning from the 4-years of FISH, thus creating a strong foundation for scaling relevant innovations into the future.

Cluster of Activity 1.1: Fish breeds and genetics

In 2021, the fish breeds and genetics cluster will restart distribution of GIFT from the core-breeding population, now under new biosecurity arrangements, to new countries, whilst continuing to support national partners with dissemination of existing tilapia strains in several focal and scaling countries. A strong direction during 2021 will be to explore the new business models for future management of core breeding populations of tilapias and partnership with the private sector, for greater dissemination impact and partnerships for long-term sustainability in the OneCGIAR post-2022 strategy.

The next generations of faster growing GIFT and the Abbassa tilapia, production of the first selected generation of catla carp and the third selected generation of rohu carp only partially achieved in 2020 will be

¹ Key FISH countries remain as per the proposal: *Focal countries*: Bangladesh, Cambodia, Myanmar, Nigeria, Tanzania and Zambia. *Aquaculture research and training hub*: Egypt. *Small-scale fisheries research hub*: Solomon Islands. *Scaling countries*: Ghana, India, Indonesia, Kenya, Malawi, Philippines, Sierra Leone, Timor Leste, Uganda and Vietnam.

pursued to completion. Disease challenge tests of GIFT in relation to TiLV are planned, as well as assessment of strategies for introducing resilience traits into breeding programs. The GIFT and Abbassa strain genome sequence will be completed, providing a basis for further technology development. Gender disaggregated user trait preferences research for tilapia and carp in Bangladesh and India will be published. Genetic improvement programs for the indigenous three spotted tilapia (*Oreochromis andersonii*) in Zambia and tilapia shiranus (*Oreochromis shiranus*) in Malawi will be continued, plus support to selected West African countries in assessing imports of new elite strains. 2021 also concludes the first phase of the GIFT traits and genomics research (targeting key disease resistance, feed efficiency and low dissolved oxygen tolerance traits), learning from which will be distilled into a genomics strategy to provide policy guidance on applying these newly identified resilience traits in future tilapia breeding programs.

Cluster of Activity 1.2: Feeds, fish nutrition and health

Fish disease research in 2021 prioritizes two key innovations; firstly, the “Lab-in-a-backpack” for rapid genomic pathogen detection and secondly the on-line epidemiology tool for tilapia, carps and catfish. In both cases, emphasis will be on continuing promising lines of research and enabling outcomes through more extensive engagement with private and public partners to facilitate the widest possible application and outcomes. The epidemiology tool will be put into use in 4 countries (Bangladesh, Egypt, Ghana, Nigeria) and made available in on-line and open access format for wider application. FISH will engage with public sector partners in five countries (Bangladesh, Myanmar, Nigeria, Malawi, and Zambia) in response to demand for improving biosecurity and health management policies. The Lab-in-a-backpack prototype for rapid genomic pathogen detection will be tested for wider application, particularly among private sector partners. We will also engage in synthesis and an active dissemination of improved diagnostic, biosecurity and health management practices arising from FISH research to the widest possible audience.

Fish feeds and nutrition research prioritizes outcomes from scaling up of nutritious pond feeding technology and wide application of the open access feed ingredient database through online training and engagement with public and private sector partners to assist in identification and sustainable use of local feed ingredients. FISH will partner with three private sector partners in Bangladesh (Mega Feed, Victor Feed, Single Spark), one in Egypt (Skretting), two in Zambia (Yalelo and Aller Aqua) and one in Nigeria to test and apply these innovations at greater scale. FISH researchers will engage with the policy environment in Bangladesh and elsewhere to enable scaling of nutritious pond technology and use of sustainable fish feed ingredients.

Cluster of Activity 1.3: Aquaculture systems

Aquaculture systems research is key for assessing on-farm performance of improved tilapia and carp strains, designing inclusive and sustainable production system models and enabling scaling for impact. This cluster receives significant W3/bilateral funding, including large USAID and BMGF investments, that provide important opportunities for scaling and learning.

In 2021, the priorities will be to complete ongoing farm performance assessments of GIFT, and newly released improved carp varieties in Bangladesh. Performance assessment data on improved tilapia will be generated from eight countries; Bangladesh, Egypt, India, Myanmar, Malawi, Nigeria, Timor Leste and Zambia, and contribute to a global assessment of GIFT impacts. Other highlighted outputs in 2021 will include publication of the results of Life Cycle Assessments of tilapia aquaculture; a manuscript on cross country/cross region on farm performance of aquaculture systems in Africa and Asia; and production of a framework to analyse aquaculture technology innovation systems. This cluster has also developed a set of innovative digital tools for performance assessment; during 2021 they will be consolidated into readily accessible tools and made available for wider audiences to support aquaculture system analysis and decision making.

Sustaining Small-Scale Fisheries flagship (FP2)

The **Sustaining Small-Scale Fisheries** flagship (FP2) will also contribute further to IDOs and SLOs during 2020. FP2 has made significant advances in using research to demonstrate the multiple values of small-scale capture fisheries to global and national policy makers. The POWB for 2021 reflects firm plans to cement this attention to policy commitments and changes towards more enabling policy environments, including greater nutrition-sensitivity in fisheries governance. Piloting, scaling and evaluations in FISH focal and scaling countries illustrate the success and further potential of FISH innovations for improved sustainability, food and nutrition security and increased or more secure incomes for small holders. Priorities for 2021 include:

- Methodological and analytical innovations for more equitable and inclusive ocean and aquatic food governance, livelihoods and management developed, piloted and ready for scaling, particularly in the Pacific through regional partners (e.g., SPC, FAO and with ACIAR) and national investments (e.g., in Solomon Islands, Bangladesh, Timor-Leste). Wider uptake of these insights will contribute to several outcomes, including those related to more equitable decision-making and control over and access to productive assets.
- Scaling of the multi-partner guidelines on improving fisheries performance and production in multi-functional landscapes will be progressed through partners involved in land and water management (e.g., irrigation, dams, rice-systems) and a communication and influencing strategy targeting government, the private sector and development banks. In Myanmar, the full implementation of these guidelines will be tested through integrated agricultural land, using a geographic information system, multi-stakeholder platforms and cross-sector planning processes targeting multifunctional rice-dominated landscapes. Research on this combination of technical and social innovations will draw insights for future investment in rice and water dominated landscapes in Asia and Africa
- Translating the global “model of nutritional yield”² to novel analysis, data tools and synthesizing from these policy insights for nutrition-sensitive fish/aquatic food futures. Applications include analysis of trade and global distribution, the nutritional gains in addressing overfishing, and developing global and national recommendations to guide policy and investment in fish and aquatic foods – policy processes include the FAO Committee on Fisheries, the Blue Food Assessments, the UN High Level Panel on Food and Nutrition Security and UN Food Systems Summit.
- BigData advances (award through the BigData platform and through modelling innovations and connections to global platform FishBase) in the Flagship have generated substantial interest for scaling and will be applied where appropriate across all three Clusters.

FP2 methodological advances on understanding resilience, adaptive capacity and limits to adaptation in the face of climate change and Covid-19 shocks will be translated into areas of high return for investment and policy recommendations, including guiding the OneCGIAR strategy implementation.

Cluster of Activity 2.1: Resilient coastal fisheries

Resilient coastal fisheries research in 2021 prioritizes synthesising and consolidation of outputs, and facilitating and documenting outcomes in three areas of innovation; refining and scaling inclusive co-management, evaluating interactions between drivers such as COVID-19 and climate on local resilience, and testing, refining and scaling improved livelihoods. Cluster 1 has a geographical focus on the Pacific region, Timor-Leste and Bangladesh. Policy and practice briefs, and associated events, with regional bodies or initiatives (SPC, BOBLME) and national partners (Solomon Islands and Timor-Leste, in particular) will ensure FISH lessons and innovations are scaled through investments and enabled by policies. In Bangladesh and Myanmar, contributions will be made to national policies to improve livelihood and food security outcomes from co-management of the hilsa fishery. Big Data innovations for small-scale fisheries management will be consolidated as digital tools and data sets for next generation use, including through FishBase, and increasing application in management. Co-management (and associated livelihood innovations) will be evaluated and published in 2021, collating key evidence for future OneCGIAR research and innovation investments.

² Hicks et al. 2019. *Nature*.

Cluster of Activity 2.2: Fish in multifunctional landscapes

Fish in multi-functional landscapes research in 2021 will focus on synthesis of learning and progressing to outcomes of three promising areas of innovation; a suite of innovations related to rice-fish systems, decision support tools and guidelines for integration of fish in water management schemes, and a novel methodology for examining vulnerability within multifunctional landscapes. Policy outcomes will be achieved through campaigns and scaling strategies operationalised with FAO and national partners - particularly through continuation of engagement through multi-stakeholder platforms in Myanmar. We will use strategic communications and engagement to facilitate widespread adoption of new guidelines amongst water resource planners, managers and engineers. Research on rice-fish systems will be synthesised through a journal paper completed on diets, EAT-Lancet commission recommendations and multifunctional agri-aqua food landscapes (a collaboration co-funded with the WLE CRP) and two policy contributions on putting rice-fish systems into policy in Myanmar and Cambodia.

Cluster of Activity 2.3: Fish in regional food systems

The key highlight for 2021 is the release of the “Illuminating Hidden Harvest” (IHH) initiative in partnership with FAO and Duke University. The release includes the publication of global and regional syntheses products (publication of three journal articles) and policy recommendations (policy briefs and fora), and associated representations and commitments to and by the United Nations Committee of Fisheries. We will directly support India, Malawi, Nigeria and Zambia to co-design policy, investment and actions responses based on IHH findings to put IHH findings into use. In preparation for the UN Food Systems Summit, FISH will prepare policy briefs on nutrition-sensitive fish/aquatic food futures, (fit for global, regional) and select national levels (Timor Leste, India/State of Odisha). The Cluster will produce one journal article and one video representation of lived experiences of COVID-19 from fisher and fish trader perspectives. This research will guide inputs to relevant Blue Papers (three in preparation with Cluster 3 engagement) ‘Action Tracks, particularly the Action Track 4 to Advance equitable livelihoods’ (WorldFish co-Chair) and Action Track 1 to ‘Ensure access to safe and nutritious food for all’ (representation by close FISH partner). Three journal articles will be completed on fish in food systems for the Great Lakes region of Africa. One strategic brief will be prepared in collaboration with RTB/CIP, providing new insights into the role of fish in food systems in the African Great Lakes region.

Crosscutting themes: Gender, youth, capacity development and climate change

Gender integration and gender strategic research, within both flagships, will seek to synthesize key gender evidence and insights (regarding gender dynamics, barriers and opportunities in fish agri-food systems) from FISH and enable the wider use of the associated FISH gender-related innovations (strategies, frameworks, methodologies and tools). This includes scaling to partners and beyond, including embedding relevant learning and research into the new CGIAR gender platform.

Three key areas – which represent FISH’s most in-depth and longstanding gender approach and methodological investments - will receive attention:

1. Scaling FISH’s project-oriented “Women’s Empowerment in Fisheries Index” (Pro-WEFI) for wider application: This bespoke tool measures before and after changes in women’s empowerment and gender norms in relation to interventions. FISH will launch the Pro-WEFI (Women’s Empowerment in Fisheries Index for Project use) tool including guidance for use and analysis.
2. Consolidation of gender transformative approaches (GTA) tools and learning: Key GTA learning, strategies and tools from FISH will be consolidated into one online resource. This is significant both in terms of FISH’s GTA legacy as well as enabling ease of access to these resources and thus continuation of scaling post-FISH.
3. Synthesis of FISH gender insights regarding gender dynamics, barriers and opportunities in fish agri-food systems: As outlined in FISH’s Gender Strategy, at the start of FISH there were multiple gaps in knowledge regarding gender in fish agri-food systems. This synthesis output will draw on the body of FISH work – embedded in the larger literature - to respond to these gaps, including speaking to pathways for women’s empowerment in fish agri-food systems. It will also highlight key issues for future research in aquatic food systems and food systems transformations more broadly.

These outputs will directly support FISH gender research findings and evidence informing emerging One CGIAR investments in gender and aquatic foods as well as to feed into the UN Food Systems Summit.

In addition, the model and learning from the innovative theory-of-change based FISH Gender Integration Coaching Program (piloted and refined in 2019 and 2020 in Solomon Islands, Egypt, India and Myanmar) will be widely shared. All will contribute to effective gender integration within FISH projects and into the design of CGIAR gender platform and fish and aquatic food system learning within the new One CGIAR portfolio.

FISH's implementation of its **Youth Strategy** will focus on improving our tracking of age-disaggregated data, including FISH M&E systems. FISH youth research will feed into the UN CFS High Level Panel of Experts (HLPE) paper on "Promoting youth engagement and employment in agriculture and food systems" to be released during 2021 and two policy briefs (supported by completed papers from Myanmar and Nigeria and joint communications released with WLE).

Capacity development (CapDev) activities are integrated within flagships and crosscutting themes of FISH, across W1/W2 and W3/bilateral funded projects. Training sessions, workshops, PhDs and mentoring young scientists will continue to enhance research capabilities across the program. Highlights for FP1 include the synthesis of learning from digital tools for vocational education in Zambia and an accelerated program of training associated with dissemination of BMPs widely across multiple geographies. FISH training materials across FP1 and FP2 will be collated, synthesized and made available to a wider audience, including through the emerging Fish4Africa Innovation Hub(s). Highlights specially for FP2 include policy oriented capacity development to enable uptake of rice-fish innovations in the Mekong region and a continuing focus on improving research capabilities with national partners in the African Great Lakes region. In country coordinators will continue to collate FISH capacity development outcomes for 2021 CGIAR reporting requirements and training data and indicators captured in MEL.

FISH investments in **climate change** will involve an analysis and consolidation of the costs and benefits from climate related outcomes associated with FISH innovations across the aquaculture and small-scale fisheries flagships, collated into a strategic paper for COP26 (part funded by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)), seeking to enhance awareness of the role of fish and aquatic foods in climate change mitigation and adaptation. FISH will also contribute to the development of CGIAR's special initiative on climate change "Two-degree initiative". Three outputs are highlighted: a strategic brief on FISH and climate resilience of fish and aquatic food systems (for COP26); a strategic brief on economic evaluation of climate information services for aquatic food producers; and a methodology and tool for assessing responses of the aquatic food system to climate change. FISH will also collaborate with the CCAFS/World Bank project "Accelerating Impacts of CGIAR Climate Research in Africa (AICCRA)".

COVID-19. Crosscutting research on COVID-19 in 2021 will build on the practical experience and knowledge gains made during research on this subject during to 2020 to elaborate and promote practical strategies to overcome value chain fractures, support One Health objectives, and establish the basis for resilient recovery in aquatic food systems. This will be done through quarterly phone surveys of COVID-19 impacts on aquatic food supply chains in Myanmar, Bangladesh, India, Egypt and Nigeria that aims to assess COVID-19 impacts, adaptations, and coping mechanisms in these countries. A journal article on COVID-19 impacts on aquatic food supply chains is targeted to be submitted in 2021. Close cooperation will continue to be explored with the CGIAR COVID-19 hub. In addition (across gender, COVID-19 and FP2 Cluster 3) a synthesis paper on lived experiences of coastal communities through COVID-19 will be published together with a video portrait from women in fish trading networks in Africa, all to be presented in high level fora.

Evaluations, impact assessments and learning exercises

FISH's monitoring, evaluation and learning system framework will continue monitoring and capturing evidence and lessons along the FISH research-development continuum across in 2021. As every year, this will include a back and forward work around FISH focal and scaling countries ToCs to ensure that appropriate

feedback is integrated into the FISH ToC for greater plausibility, and in 2021 a special analysis of the application of the ToC approach across the FISH program. Impact and outcome assessments are planned for both FP1 and FP2, with the selection of assessments reflecting the level of maturity of FISH research and assessing progress towards its final targets. Impact assessments priorities cover key FISH innovations, such as improved fish strains (GIFT and Rohu carp) and inclusive fisheries co-management approaches.

Collaboration with the CGIAR Research Program on Policies, Institutions, and Markets (PIM) will continue to be implemented via a jointly supervised position, specifically to enhance knowledge and understanding of processes around policy influence and the contribution of FISH to SLOs and Sustainable Development Goals (SDGs).

The FISH MEL system will be used to monitor all W1-W2 and W3-bilateral projects and investments to ensure capturing and valuing development and scaling initiatives and their outcomes. In this light, additional investment is being made in capturing lessons from W3-bilateral projects, specifically on approaches for scaling FISH innovations, to better inform future FISH-related investments. Foresight cooperation with PIM is expanded during 2021, with new publications on Nigeria and new research on fish and aquatic foods in global food systems, building on the recent incorporation of a fish module within the global IMPACT model.

Four MC meetings during the year will support monitoring the program progress and capture learning, within the framework of FISH's overall TOC and results-based-management system. [Table 2B](#) provides planned studies for outcome and impacts, and relevant monitoring, evaluation and learning exercises. Each impact/outcome study will explore and reflect on the links to the IDOs, SLOs and SDGs, depending on the focus of the studies. Nutritional outcomes will receive particular attention, reflecting the increasing evidence of nutritional values of fish and the implications for healthy and nutritious diets.

Collaborations

Partnerships have been a key to the success and impact of FISH and will continue to receive significant attention at all levels during 2021. During 2021, the partnerships strategy emphasizes completion of research, synthesis of FISH evidence and learning, and a continued emphasis on policy- and outcome-oriented partnerships, seeking to accelerate putting of FISH research into use. Private sector partnerships for scaling innovations in FP1 will receive attention in several countries. Collaboration on COVID-19 also continues with the CGIAR COVID-19 hub. New FISH collaborations, within and external to the CGIAR, are described in more detail in [Table 2C](#).

3. Financial plan for 2021, including use of W1/W2

As in 2020, FISH's planned budget for 2021 ([Table 3](#)) estimates approximately 82 percent of funding³ from W3/bilateral sources and approximately 18 percent from W1/W2. The blend of both W3/bilateral and W1/W2 sources are again planned for research under both FP1 and FP2. W3/bilateral funds are mapped to the FISH flagships following an *ex-ante* review process that determines their contribution to priority FISH outputs and outcomes, aligned to the overall program TOC. The enhanced mapping process introduced for FISH during 2019 and 2020 was aligned with the CGIAR Performance Management Standards and will continue to be applied rigorously in 2021. As 2021 is the final year of the FISH CRP, a limited number of new W3/bilateral investments are anticipated, but significant investment will be made in impact assessments and capturing learning from the investments made during implementation of the program.

W1/W2 investments are made directly into flagships and also to facilitate the integration across clusters and strategic cross-cutting areas of the program. In 2021, this covers strategic key areas not addressed by W3/bilateral funds, including sustaining or completing priority research areas, impact assessment, a major set of synthesis products and cross-country collaboration and partnerships, as well as FISH management and

³ Updated W3/bilateral estimates based on signed contracts as of 31 December 2019.

support costs. As in 2020, an intense prioritization process has guided the priorities chosen for W1/W2 investments, with strong emphasis on bringing together a set of significant synthesis products of various forms, capturing FISH learning, evidence and a foundation for the future. As of 1 January 2021, the amount of secured W3/bilateral funds for 2021 was USD 26.0 million. The planning guidance for W1 and W2 funds provided to FISH in the 2021 financial plan is USD 3.00 million and USD 2.91 million, respectively, providing a total of USD 5.910 million as per the CGIAR 2021 Financial Plan.⁴ Subject to final auditing, an estimated USD150,000 of W1/W2 funds are carried over from 2020. These funds will be allocated by the FISH Management Committee during Q1 2021.

No major changes are being made to FP1. Prioritized investments are in line with the approved FISH proposal across each of the three FP1 research clusters, but with focus on key priorities within each cluster. In FP2, the contribution of W1 and W2 funds will cover key research and program management capabilities and activities. This will ensure sufficient research capability is available to deliver the quality research outputs already identified in the POWB 2021. Partial funding contributions are made to partners to enable better engagement in the FP2 research implementation. There is additional investment in synthesis products across each flagship, and the FISH program more broadly. Some increased investment is also being made in impact, outcome and policy research following recommendations of the FISH external evaluation.

⁴ As per the 2021 Revised CGIAR Research Financing Plan (2021 FINPLAN) presented to the 18th CGIAR System Management Board meeting, 24 November, 2020.

Table 2A. Planned milestones mapped to FISH outcomes in 2022.

(Note: For each milestone, the table indicates the level of change from the original proposal, means of verification, CGIAR crosscutting markers for gender, youths, CapDev, climate change, and likely risk to achievement (low risk = very likely to be achieved).

FP	Mapped to Sub-IDO	2022 FP outcomes	Milestone (2021)	Milestone: identical to proposal reworded/rephrased from proposal, or new/changed*	Means of verification	CGIAR Crosscutting markers for the milestone 0=not targeted 1=significant 2=principal N/A=not applicable				Risk assessment to achieve the milestone (L/M/H)	Main risk for medium/high risk assessment
						for gender	for youth	for CapDev	for climate change		
FP1	1.4.3/2.1.3: Enhanced genetic gain	OUTCOME 1.1 - 1.5 million households have access to and are using our electively improved, faster growing and more resilient strains of tilapia and carp seed using our selectively improved, faster growing and more resilient strains of tilapia and carp seed	MIL1.1.1 - 2021 - New multi---year public and/or private investment programs have extended improved tilapia breeding programs to 4 FISH scaling countries with high potential for impact (Nigeria, Malawi, Solomon Islands, Timor-Leste; India)	Reworded or rephrased	Tracking Major program developments in countries of interest	0	0	1	1	Low	
FP1	1.4.3/2.1.3: Enhanced genetic gain	OUTCOME 1.1 - 1.5 million households have access to and are using our electively improved, faster growing and more resilient	MIL1.1.2 - 2021 - Strategies for the incorporation of the new resilience traits into tilapia breeding programs developed to	Reworded or rephrased	Program reports	0	0	0	0	Low	

		strains of tilapia and carp seed using our selectively improved, faster growing and more resilient strains of tilapia and carp seed	support private sector in Africa and Asia								
FP1	1.4.3/2.1.3: Enhanced genetic gain	OUTCOME 1.1 - 1.5 million households have access to and are using our electively improved, faster growing and more resilient strains of tilapia and carp seed using our selectively improved, faster growing and more resilient strains of tilapia and carp seed	MIL1.1.2 - 2022 - Improved rohu carp strains released to farmers in Bangladesh	Identical to proposal	Program reports, Partner contacts from annual outcome review	0	0	1	0	Low	
FP1	1.3.4: More efficient use of inputs 1.4.2/2.1.2: Closed yield gaps through improved agronomic and animal husbandry practices 2.4.2: Reduced risk of livestock and fish disease associated	OUTCOME 1.2 - 2.5 million households have adopted disease detection and control strategies, cost-effective and sustainable aquafeeds and/or improved aquaculture management practices	MIL1.2.1 - 2021 - Public sector and/or private sector policies/investment s supporting scaling of Fish health, feed and management practices documented in focal and scaling countries in Africa and Asia (Bangladesh, Egypt,	Reworded or rephrased	Sample surveys, M&E data, national fish production data reports	1	1	1	1	Low	

	with intensification and climate change 3.3.2: Enhanced adaptive capacity to climate risks 2.4.2: Reduced risk of livestock and fish disease associated with intensification and climate change		India, Timor- Leste, Myanmar, Nigeria)								
FP1	1.3.4: More efficient use of inputs 3.3.3: Reduced net greenhouse gas (GHG) emissions from agriculture, forests and other forms of land use	OUTCOME 1.3 - 4.8 million mt of annual farmed fish production with reduced environmental impact and increased resource use efficiency (measured by 20% reduction in GHG emissions and 10% increase in water and nutrient-use efficiency)	MIL 1.3.1 - 2021 - National institutions and public private sector investments strategies and policies support scaling of FISH integrated sustainable aquaculture technologies to support poor men, women and youth in 10 scaling and focal countries in Africa and Asia (Egypt, Zambia, Nigeria, Malawi, Kenya, India, Myanmar, Bangladesh, Solomon Islands, Timor Leste)	Identical to proposal	Outcome tracking/sample surveys	1	1	1	0	Low	

FP1	<p>1.3.1: Diversified enterprise opportunities</p> <p>1.3.2: Increased livelihoods opportunities</p> <p>2.1.2: Increased access to nutrient rich foods</p> <p>3.3.1: Increased resilience of agro-ecosystems and communities, especially those including smallholders</p>	<p>OUTCOME 1.4 - 2.3 million poor men, women and youth access improved livelihood opportunities resulting from increased aquaculture production and associated value chains and enterprise development (of which 50% are women).</p>	<p>MIL 1.4.1 - 2021 - National institutions and public private sector investments strategies and policies support scaling of FISH integrated sustainable aquaculture technologies to improve environmental performance in 5 scaling and focal countries in Africa and Asia (Egypt, Nigeria, India, Myanmar, Bangladesh)</p>	<p>Reworded or rephrased</p>	<p>Program reports, partner contacts from annual outcome review</p>	1	0	1	1	Low	
FP2	<p>1.3.2: Increased livelihood opportunities</p> <p>2.1.2: Increased access to nutrient-rich foods</p> <p>3.2.1: More productive and equitable management of natural resources</p> <p>XC 3.1.3: Conducive</p>	<p>Outcome 2.1: Reduced poverty for 1 million fishery dependent households as a result of adopting improved fisheries management</p>	<p>MIL2.1.1 - 2021 - Achieving a status where global and regional food, fisheries, and marine focused policies and investments are accounting for food and nutrition values of fish and aquatic foods</p>	<p>New or changed</p>	<p>Pre and post capacity assessment data, analysis of policy statements and policy and program content, Learning products and related publications, documentation of learning events and dialogues organised Process</p>	1	0	1	1	Low	

	agricultural policy environment				monitoring mechanisms in research and research-uptake processes initiated /catalysed by the CRP; Research output tracking in the CRP level Management Information System; Outcome monitoring and shared learning workshops /internal reviews; Centre Commissioned External Reviews or External Evaluation commissioned by Independent Evaluation Arrangement in CGIAR						
FP2	1.3.2: Increased livelihood opportunities 3.2.1: More productive and equitable management of natural resources	Outcome 2.2: 1.2 million people, of which half are women, assisted to exit poverty through livelihood improvements	MIL2.2.1 - 2021 - Achieving a status when national and regional water management, infrastructure and land-use policies accounted for SSF	Identical to proposal	Flagship level field monitoring data and reports, partner program monitoring reports, Secondary data and reports on	0	1	0	1	Low	

	<p>XC 2.1.1: Gender-equitable control of productive assets and resources</p> <p>XC 1.1.4: Enhanced capacity to deal with climate extremes</p>		use, rights and access		this aspect, External evaluation reports						
FP2	<p>1.3.2: Increased livelihood opportunities</p> <p>3.2.1: More productive and equitable management of natural resources</p> <p>3.3.1: Increased resilience of agro-ecosystems and communities, especially those including smallholders</p> <p>XC 2.1.1: Gender-equitable control of productive assets and resources</p> <p>XC 3.1.3: Conducive agricultural policy environment</p>	<p>Outcome 2.3</p> <p>2.1 million hectares of inland aquatic and coastal marine habitat restored and under more productive and equitable management</p>	<p>MIL2.3.1- 2021 - Adoption of improved co management models in focal and scaling countries at wider-scale, and policy recognition and support for complementary livelihood and governance models</p>	<p>Reworded or Rephrased</p>	<p>Flagship level field monitoring data and reports, partner program monitoring reports, Secondary data and reports on this aspect, External evaluation reports. Outcome monitoring and shared learning workshops /internal reviews; Centre Commissioned External Reviews or External Evaluation commissioned by Independent Evaluation Arrangement in CGIAR</p>	1	0	0	0	Low	

Table 2B. Planned evaluations/reviews, impact assessments and learning exercises for 2021.

CRP	FP/CRP	Status	Planned studies/learning exercises	Geographic scope	Who is commissioning this study?
FISH	FP1	new	Assessing the impacts of GIFT on livelihoods, nutrition and food security, and gender empowerment	Bangladesh	Funding Standing Panel on Impact Assessment or W1/W2
FISH	FP1	ongoing	Impact assessment of the Odisha Convergence program on Fish Farming by women self-help groups in village tanks	Odisha, India	Odisha State
FISH	FP1	ongoing	Project evaluation: Improving the Production, Nutrition and Market Values of Small-Scale Aquaculture in Myanmar's Shan State and Sagaing Region (INLAND MYSAP)	Shan State and Sagaing Region, Myanmar	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ)
FISH	FP1	new	Socio-economic and nutritional impact of carp-mola polyculture in Odisha	Odisha State, India	M S Swaminathan Research Foundation, USAID
FISH	FP1	new	Ex-ante impact evaluation of genetically improved Rohu carp in Bangladesh	Bangladesh	W1/w2, Bill and Melinda Gate project
FISH	FP1	new	Baseline study for the assessment of current aquaculture systems in India	Odisha State, India	Odisha State, w1/w2
FISH	FP1	new	Baseline study for the assessment of current aquaculture systems in Nigeria	Nigeria	Bill and Melinda Gate project, w1/w2
FISH	FP2	ongoing	Impact assessment of co-management systems on productivity, nutrition and food security, and environment	Bangladesh and Solomon Islands	W1/W2
FISH	FP2	new	Project evaluation: Feed the Future Cambodia Rice Field Fisheries Phase II	Cambodia	USAID
FISH	FP2	new	Baseline study – livelihood, food security and nutrition baseline in Timor Leste	Timor Leste	ACIAR
FISH	FP2	new	Socio-economic and environmental impact of PeskaAS - National Fisheries Monitoring System of Timor-Leste	Timor Leste	BigData, w1/w2

Table 2C. Planned major new collaborations (CGIAR internal or with non-CGIAR collaborators).

CRP or non-CGIAR collaborator	Brief description of collaboration and value added
CGIAR collaborator	
Agriculture for Nutrition and Health (A4NH)	<p>A4NH and FISH will further strengthen cooperation with three A4NH flagships in 2020 to complete priority research on fish and human nutrition and health in food systems, helping to provide a synthesis of learning to date and gathering knowledge and insights for the new OneCGIAR portfolio. Specifically:</p> <ul style="list-style-type: none"> • A4NH Flagship 1 (Food Systems for Healthier Diets): Our co-funded PhD on modelling fish in Bangladesh food systems at Wageningen University and Research (WUR) will continue, with emphasis on synthesising future research priorities for fish within food systems and integration of fish in Food-based Dietary Guidelines (FBDG) in selected countries. • A4NH Flagship 5 (Improving Human Health): A new joint post-doctoral fellow has started working in 2020, on AMR, aquaculture and water systems. A global review titled “Antibiotic resistance in aquatic environments: current knowledge and research priorities for modelling and system analysis” will be published in collaboration with the emerging CGIAR AMR hub at the International Livestock Research Institute (ILRI) in Nairobi. • A4NH Flagship 5: Under this flagship, recently a CGIAR Covid-Hub initiative has commenced and WorldFish is part of the working group 2 “Integrate a One Health approach to COVID-19 responses”. Under this, collaboration on epidemiology, health economics and cross-over of pathogens between animals and humans is being planned for 2021 with seed money from A4NH.
Climate Change, Agriculture and Food Security (CCAFS)	<p>During 2021, we will continue to deepen cooperation with the CCAFS on raising the profile of fish within climate change agendas regarding the following, including in COP-26; in improving access of aquaculture farmers and fishers through the Capacitating Farmers and Fishers to manage climate risks in South Asia (CAFFSA) project will be implemented to improve access of climate information services for aquaculture farmers and fishers in Bangladesh and India; the Two-Degrees Initiative, particularly the Blue Challenge, and the new World Bank/CCAFS project Accelerating Impacts of CGIAR Climate Research in Africa (AICCRA).</p>
Livestock	<p>FISH will partner on futures studies and preparation of Livestock and Fisheries Masterplans in Odisha State, India</p>
Policies, Institutions and Markets (PIM)	<p>PIM Flagship 1 (Technological Innovation and Sustainable Intensification). FISH will contribute to fish foresight research to the CGIAR Foresight Report. Collaboration will occur on research on projected benefits and COVID-19 for scaling fish innovations.</p>
Water, Land and Ecosystems (WLE)	<p>During 2021, cooperation with the CGIAR Research Program on Water, Land and Ecosystems (WLE) will focus on capturing lessons of collaborative work and synthesis of learning and projected benefits of fish/water integration.</p> <p>We will conduct a proof of concept (together with Cambodian partners) on the potential for incorporating fish production into existing community-managed small-scale irrigation infrastructure.</p> <p>In Myanmar, a collaboration with the WLE is also exploring the EAT-Lancet report’s dietary guidelines and the application within the country and a second collaboration with IWMI under WLE on gender and Wetlands alongside the IUCN and Helvitas. Consumption patterns and diet gaps across regional Myanmar: work commissioned by the IWMI WLE CRP is now ready to be published and turned into a policy brief;</p>

CRP or non-CGIAR collaborator	Brief description of collaboration and value added
CGIAR Research Program on Rice Agri-Food Systems (RICE)	RICE Flagship 3 (Sustainable Farming Systems): Collaborative activities will continue in 2021 in Myanmar to enable policy change (with WLE and IWMI) to identify research priorities. We will extend lessons learned from rice-fish systems to Africa, including with Africa-Rice in Mali and Liberia. Strategies for adaptation in the Asian mega-deltas, as part of the CGIAR Two-Degree Initiative will be pursued. We will also collaborate with RICE/IRRI in Myanmar with reform of the curriculum at Yezin Agricultural University to include fish within agricultural education.
Roots, Tubers and Bananas (RTB)	Following release of a working paper on synergies between FISH and RTB in food systems in 2020, in 2021 we will collaborate on a study of fish and roots, tubers and banana crops and the food system in the Great lakes of Africa, exploring potential integrated future research for development opportunities for the OneCGIAR. We will progress our earlier findings in Nigeria, seeking to put into practice the opportunities identified for formulation of fish feeds using RTB by-products.
Big Data Platform	<p>In 2021, we will continue to contribute to the development of fish ontology. In collaboration with the Big Data platform, we have signed a MoU with the Alliance of Bioversity-CIAT where the aim is to jointly recruit a Masters intern and to continue future collaboration. We will now focus on contributing missing fish and fish related terms to the FAO AGROVOC a multilingual controlled vocabulary covering all areas of interest to FAO, including food, nutrition, agriculture, fisheries, forestry and the environment) and AFSA (a premier reference in the field of fisheries, aquatic and marine sciences). We will also look at new and existing FISH projects using digital technologies to implement the first results. A potential collaboration for 2021 will be with the Socio-Economic Ontology (SEOnt) working group using FISH survey questionnaires to extract meaningful keywords using algorithms to make the process easier and faster.</p> <p>FISH will continue to leverage digital technologies to enable effective and more efficient research. In 2021, we expect the adaptation and the operationalization of the CGIAR Digital strategy. This will enable us to have consistent and structured approach towards the management of our research assets and analytics.</p> <p>Additionally, we work as always to develop and implement standards and tools to ensure that FISH research outputs are FAIR (Findable, Accessible, Interoperable and Reusable) by tackling both cultural and technical challenges.</p> <p>Lastly, we will continue the process of making the FISH data repository – Dataverse, core seal certified. This certification will be an indicator of sustainability and will help build trust, be recognized as having a good repository, and may draw some funding to manage and maintain the repository 2021 and beyond.</p>
Excellence in Breeding	FISH will continue to interact with the EIB platform by engaging access to jointly negotiated molecular analysis capabilities and in providing joint advice for NARS fish genetic improvement programs where suitable.
CGIAR Gender Platform	FISH will contribute to the Gender Platform via multiple avenues, including a WorldFish seat on the Gender Management Committee, and possible roles within the Alliance Module. Dialogue will be pursued to explore how fish and aquatic foods might be integrated into Gender Platform in 2022 and beyond.

CRP or non-CGIAR collaborator	Brief description of collaboration and value added
	A Women's empowerment Index tool will be developed in Myanmar in collaboration with Includovate.
CGIAR AMR Hub	AMR in food systems will continue to receive attention. WorldFish is one of four members of the CGIAR hub and will continue working with range of international partners (e.g., Royal Veterinary College London, Stockholm Resilience Centre, Cefas UK, and Fleming Fund). The new post-doctoral fellow based in IWMI will research on AMR use and modelling in water systems. As part of the CGIAR AMR hub ILRI and WorldFish will provide mentorship to Fleming Fund fellows in Bangladesh.
CGIAR COVID-19 Hub	WorldFish is one of the partners for Working Group 2 (One Health) with ILRI, IFPRI, A4NH and London School of Hygiene & Tropical Medicine. We will continue to collaborate with the One CGIAR COVID Hub to integrated fish agri-food systems into working areas 1, 2, and 4, including co- funding for research in these areas.
Non-CGIAR collaborator	
<i>Partners engaged in discovery/proof of concept research</i>	
Centre for Environment, Fisheries and Aquaculture Science; Exeter University	New collaborative PhD starting in 2021 will continue research on patho-microbiomes, disease and AMR in carp-tilapia polyculture systems in Bangladesh. One health project activities will be initiated in Bangladesh under a new funding stream and Covid-19 detection systems for seafood and waste-water will be developed and pilot tested, working closely with the CGIAR Covid-19 hub.
Charles Sturt University	The collaboration will link our fisheries-focused analyses under the fish in multifunctional landscapes cluster in FISH FP2. There will include broader research on multiple uses of water and land at landscape and river basin scales and novel finance mechanisms for <i>Hilsa</i> management and joint promotion of collaborative research among water management policy makers and engineers.
Duke University	FISH will collaborate with Duke University (and FAO) in a major 2021 initiative to launch the Illuminating Hidden Harvests research findings on small-scale capture fisheries.
De Heus Animal Nutrition	Two new PhD students in Bangladesh on feeding strategies for carps and tilapia polyculture and development of low-cost for semi-intensive carp aquaculture in ponds in collaboration with Wageningen University and Research. The collaboration with De Heus Animal Nutrition relates to the scaling of nutritious pond technologies in Bangladesh and elsewhere.
Earlham Institute, UK	FISH research with the Earlham Institute on tilapia genomes will be extended to more extensive sequencing of GIFT and Abbassa selected strains.
Ibadan University, Nigeria	National partner in Nigeria for catfish and tilapia health research
International Institute of Fisheries Economics and Trade (IIFET)	This collaboration is for continuing momentum from 2020 key outcomes of scaling gender integration in the sector. Partners GAF, University of Mexico and University of California, Irvine will be involved in the translation of FISH and partner gender integration lessons and materials into an online gender integration course for IIFET.

CRP or non-CGIAR collaborator	Brief description of collaboration and value added
Indian Ministry of Fisheries, Animal Husbandry and Dairying.	New cooperation will be explored with the new Indian Ministry for policy development and implementation support, including national scaling of GIFT tilapia under Indian government program funding. In addition, we will continue to expand cooperation in the State of Odisha (completion of a Fisheries Masterplan) and Assam.
Johns Hopkins University, Berham Institute of Bioethics	Inclusion of aquatic foods in the Food Systems Dashboard, seeking to increase representation of fish and other aquatic foods in the dashboard, and improve recognition of the role that aquatic food systems play in shaping diets, globally and nationally
Lancaster University	Policy guidance will be developed to shift national policies to better integrate micronutrient values of coastal fisheries into national policies to address undernutrition within coastal populations. Collaboration on the Blue Food Assessment will lead to a co-authored paper on food justice, a new PhD scholar will be engaged and co-supervised, and collaboration extends to publication of models to predict nutrition composition of marine and inland fish species – including on the FishBase platform.
Mahidol University	TiLV research collaboration extended with experimental infection models to test susceptibility of GIFT families to TiLV.
Mississippi State University; USAID Feed the Future Innovation Lab on Fish	Increasing collaboration on an aquaculture program in Bangladesh and Nigeria, including a new project on carp genetics in Bangladesh and new project on improving biosecurity for catfish and tilapia farming systems in Nigeria in close partnership with Ibadan University.
Monash University, Faculty of Information Technology	Research on use of social media to influence policy change related to the use of fish within nutritional programs in Bangladesh will be reported during 2021.
Natural Resources Institute, University of Greenwich	Two post-doctoral research fellows will continue their focus on fish in food systems within the African Great Lakes region and Two post-doctoral research fellows will continue research on assessing fish in food systems within the African Great Lakes region, but with an additional collaboration with RTB/CIP to better understand the opportunities for integration of fish within diets dominated by roots, tubers and bananas. FISH teams continue to identify opportunities for uptake by next user with the FANSI program led by NRI.
Norwegian Veterinary Institute	The Norwegian Veterinary Institute will play a major role in validating the online epidemiology tool and supporting its scaling through uptake and adoption by research institutions and national authorities. The tool will be contextualized and made available for epidemiology and health economics work in carp, catfish and tilapia farming systems in Asia and Africa, supported in part through a newly funded Norad project on aquatic animal health management for Sub-Saharan Africa. Norad investment will also help build capacity of fish health researchers from Universities in Ghana and Kenya through 12 masters studentships.
The Roslin Institute, University of Edinburgh	Joint research on disease resistance focused on tilapia Lake virus (TiLV) will continue with further molecular analysis and development of strategies for the application of genomics and new resilience traits to more rapid tilapia genetic improvement.
Royal Veterinary College London	The AMR research and systems modelling work in Egypt will be published. In addition, WorldFish will supervise one new PhD student working on AMR and aquaculture (with the A4NH and the ILRI AMR hub)

CRP or non-CGIAR collaborator	Brief description of collaboration and value added
Stanford University	Co-lead of Blue Food Assessment (BFA) with Stockholm Resilience Centre (SRC). FISH scientists are engaged in the Blue Food Assessment Steering Committee and in several scientific papers being prepared for Nature publication in advance of the UN Food Systems Summit. The Blue Foods Assessments draw together evidence of the role of aquatic foods in the future of healthy, sustainable and equitable food systems, including research arising from FISH.
Stockholm Resilience Centre (SRC)	In addition to the collaboration on the Blue Food Assessment, Life Cycle Assessment Tools developed during FISH will be used to complete work on designing pathways for low environmental growth for aquaculture during 2021.
University of Queensland, Australia	Rapid genomic detection of aquaculture pathogens and sequencing of bacterial pathogens associated with carps, catfish and tilapia, plus a collaboration with “spin-off” company Genics for diagnostic tools for tilapia diseases.
University of Waterloo, Canada	Exploring future scenarios of AMR interventions and modelling work based on case studies from Europe and Asia. FISH researchers in WorldFish will be responsible for research in Asia.
University of Tasmania, Centre of Marine Socioecology	Building on collaborative work with University of Lancaster, we will work together on an analysis of fisheries trade data and the understanding of cross-broader nutrient flows associated with trade in fish and other aquatic products. The collaboration extends to work on a grant “Effects of environmental change on seafood micronutrients: a SE Asian focus” and also co-delivery of elements of a summer school program for students from Australia and the Pacific on research for development (as in 2020).
University of Ferrara, Italy, Department of Agriculture and Food Systems	Policy research on fish in food systems within FISH focal countries, and development of a project benefits tool, extending earlier cooperation with University of Pisa.
Wageningen University: Knowledge Technology and Innovation group	A joint PhD studentship in Bangladesh on innovation systems and the adoption of aquaculture technologies as well as on women’s entrepreneurship.
Wageningen University; Institute of Marine Research (IMR); Skretting and other industrial feed partners	<p>A Dutch government-funded research scientist (2019–2021) will continue to strengthen cooperation on fish nutrition in FISH FP1. This research scientist will play a major role in scaling nutritious pond technologies in Asia and Africa. A new cooperation with the Feed Calculator will also strengthen the dissemination of the nutritious pond technologies.</p> <p>In 2021, there will be a focus on training the public and private partners on accessing and using open access database to formulate balanced diets using local ingredients. Work on new traits related to oxygen efficiency will continue with deeper molecular and numerical analysis of data collected in previous years.</p>
WilderLab_	Rapid genomic detection of aquaculture pathogens and sequencing of bacterial pathogens associated with carps, catfish and tilapia; collaboration as part of the “Lab-in-a-backpack” research.
Partners engaged in policy/scaling/capacity development	

CRP or non-CGIAR collaborator	Brief description of collaboration and value added
African Development Bank and the Technologies for African Agricultural Transformation (TAAT) investment	We will continue to collaborate on the framework of TAAT for wider dissemination of aquaculture technologies at scale and applying new feed ingredient analyses and data analysis tools from FISH FP 1 (cluster 2) for sustainable aquafeeds in a wide group of African countries. A new collaboration in Cameroon will conduct a scoping of the aquaculture sector and the potential for investment in a genetic improvement program.
African Women Fish Processors and Traders Network (AWFISHNET)	A collaboration with AWFISHNET in 2021 will assess COVID-19 impacts on women processors in 28 African Union countries, to identify policy and other actions to enable adaptation and resilience of small-scale women fish processors and traders.
FAO	FAO collaboration will be progressed significantly in 2021 in aquaculture and small-scale fisheries particularly around policies, including the release of the Illuminating Hidden Harvest research, progressing the recently released WLE/IWMI guidelines on fish in water management and aquatic genetic management in East Africa, in partnership with the Lake Victoria Fisheries Organization. Joint activities in relation to the development of Aquatic Genetic Resources including the register of farmed strains and Access and benefit sharing will be undertaken through workshops, conferences and joint publications. A climate change risk assessment for fisheries and aquaculture adaptation was conducted in 2020 and policy recommendations and decision support tools will be developed under a Myanmar FAO-led FishAdapt project in 2021
Global Action Network: Sustainable Foods from the Oceans and Inland Waters for Food Security and Nutrition	Partnership for FISH in this network will seeks ways to mobilize actions to increase the role of sustainable food from the oceans and inland waters to ensure food security and nutrition in the Decade of Action on Nutrition (2016–2025), in line with the SDGs.
Includovate	A collaboration with this small private sector partner began in 2019 and continues into 2021. It is focused on building a custom-made methodology to examine women’s empowerment in small-scale fisheries value chains. In 2020, research with this partner focused on affordable fish feeds in low-income contexts; this collaboration will continue in 2021 in production of a number of research p-products to communicate results.
Lake Victoria Fisheries Organization	Collaboration on tilapia genetic research in Lake Victoria and associated watersheds, to help policy development on management of tilapia genetic resources for fisheries and aquaculture within the region (also in partnership with FAO, related to the follow up on recommendations arising from the 2019 FAO State of the World’s Aquatic Genetic Resources for Food and Agriculture)
Lilongwe University of Agriculture and Natural Resources (LUANAR)	Co-supervised and co-hosted by LUANAR, two PhD students working under Flagship 2, Cluster 3 will enter their second year of candidature and commence research on fish in the African Great Lakes food systems. Cooperation with LUANAR will extend to other publications on small-scale fisheries and fish in food systems research.
GeneSeq	New private sector partnership in Malaysia for provision of services (sequencing, PCR, bioinformatics, microbiome) in genetics and tilapia disease

CRP or non-CGIAR collaborator	Brief description of collaboration and value added
Minderoo Foundation	Over and above the role of Minderoo as a donor (not described here) FISH team members, Flagship 2, provide a guiding role and expert review to ensure that food and nutrition security, and equity are represented (employing and applying FISH methodologies and insights) in the Global Fisheries Index report to be released in March 2021.
Skretting	This collaboration builds on our cooperation with the Big Data platform and bilateral funded research in Bangladesh, Egypt and Nigeria in 2019 and 2020. Together we will focus on strengthening partnerships on the application of digital innovation in on-farm performance assessments and extension.
Southern African Development Community (SADC)	We will strengthen cooperation in policies and practices for fish trade, small-scale fisheries research and fish genetic improvement within the SADC region, including developing appropriate policies for access and benefit sharing. SADC will be a partner in supporting development and implementation of biosecurity governance in Sub-Saharan Africa
United Nations Food Systems Summit 2021	WorldFish researcher Dr Shakuntala Thilsted is Co-chair, Action Track 4: Advancing Equitable Livelihoods. FISH researchers will provide assistance to integrate FISH research into the Action Track work. FISH will also work with CGIAR and other partners to raise profile of the role of fish and aquatic foods in the UN Food Systems Summit.
United Nations Standing Committee on Nutrition (UNSCN)	FISH researchers will contribute to an UNSCN discussion paper on Aquatic Foods in Sustainable Healthy Diets, that will be released in 2021.

Table 3. Planned budget for 2021.*

	Planned budget (USD)				Comments on major changes
	W1/2	W3/bilateral	Center Own fund	Total USD	
Flagship 1	\$1,797,460	\$24,685,706	\$0	\$26,483,166	
Flagship 2	\$802,500	\$3,969,770	\$0	\$4,772,270	
Cross-program investments	\$1,587,490	\$0**	\$0	\$1,587,490	The budget line includes an impact assessment, ME&L, Investments in Scaling & Change Mechanisms, Gender, Youth, Capacity Development, Partnerships, and Communication
Contingency*	\$1,086,000	\$0	\$0	\$1,086,000	This budget line reflects unallocated funds as of 10 th January 2020. The funds are being allocated to priorities in each flagship and cross-cutting program themes through a competitive process managed by the FISH Management Committee, and will include any costs of 2021 reporting (including accrual in 2022 following System Council advice).
2020 carryover	\$170,466	\$0	\$0	\$170,466	The CGIAR System Council has requested that this 2020 carryover is explicitly reflected in this 2021 POWB budget table. The item will be allocated by the FISH Management Committee during Q1 2021. This is the estimate of 2020 carryover amount as of 18 th January 2021, subject to auditing.
CRP Management & Support Cost	\$636,550	\$0	\$0	\$636,550	
CRP Total	\$6,080,466	\$28,655,476	\$0	\$34,735,942	

* This table reflects the [CGIAR Research Financing Plan 2021](#) as approved by the System Council on 16-17 December 2020. The 2021 W1 and W2 budget is based on guidance provided in the 2021 FINPLAN for 90 percent of W1 target (USD 3.00 million) and W2 (USD 2.91 million).

** Cross-program investments are also funded by W3/bilateral. However, the figure for cross-program investments is embedded under the FP1 and FP2 W3/bilateral budget.

Annex budget table*

This additional Annex table provides estimated of the budget breakdown by major items, with estimates provided for 2020 (still subject to audit) and 2021. The figures provided are in indicative only and will be completed/updated and submitted to the CGIAR System Management Office when audited 2020 financial data are made available from the lead center.

	2020 Forecast (W1/W2)	2021 Budget (W1/W2)	Comments on major changes
Personnel	\$2,565,250	\$2,198,418	
Consultancy	\$620,315	\$194,083	
Travel	\$36,089	\$24,424	
Operational Expenses	\$ 1,739,382	\$2,554,094	
Collaborators and Partnerships	\$1,039,049	\$889,108	
Capital and Equipment	\$41,536	\$0	
Closeout Cost	\$0	\$220,339	A new item for 2021, reflecting the estimated costs of reporting and other related items for CRP closeout. Includes expenditure in 2021 and 2022.
CRP Total Budget	\$ 6,041,621	\$6,080,466	

* This additional Annex table is requested in the approved [CGIAR Research Financing Plan 2021](#).



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