



FISH: CGIAR Research Program on fish agrifood systems

Proposal
31 July 2016

SECTIONS ON SITE INTEGRATION

increases in the fish consumption of these nutritionally vulnerable groups and increased gender equality in household decision-making.

1.0.7 Cross CRP collaboration and site integration

As part of an integrated portfolio of CGIAR research programs, FISH has been designed to leverage high-priority synergies that contribute directly to delivering research outputs and realizing development outcomes in line with the program TOC.

The program will collaborate with four global integrative CRPs:

- **Policies, Institutions and Markets (PIM).** Making smart choices among various agricultural technologies and investment options requires a comparative perspective across food production sectors; therefore, we will continue analysis of aquaculture technology options as part of global foresight modeling led by PIM. Additional linkages with PIM focus on opportunities to jointly develop and leverage comparative lessons and tools—notably for value chain assessment, gender-equitable livelihoods development, and policies to improve natural resource governance.
- **Climate Change, Agriculture and Food Security (CCAFS).** To identify adaptation options most appropriate to expected future climate regimes, we will partner with CCAFS to analyze the impacts of climate change on fish production and associated livelihoods in our target geographies. As part of our scaling strategy to aid in influencing policies and investments targeting future climate-smart agriculture, we will work with CCAFS to communicate evidence on climate-smart aquaculture options (such as water-use efficiency, disease management and responses to salinization in coastal deltas), as well as adaptation responses in floodplain and reef fisheries.
- **Agriculture for Nutrition and Health (A4NH).** Fish provide exceptional nutritional benefits but remain poorly represented in nutrition strategies of national governments and development agencies. Our partnership with A4NH will address this gap by strengthening the evidence on nutritional outcomes and disseminating cost-effective solutions for nutrition-sensitive fish production, processing and behavioral change benefiting women and children. We will also partner on risk assessment and mitigation for fish food safety.
- **Water, Land and Ecosystems (WLE).** The productivity and sustainability of inland fisheries depend critically on changes in the broader landscape, notably water resource infrastructure and land-use change. Our partnership with WLE seeks to ensure that deliberations over basin and watershed-scale resource competition and development scenarios address fisheries outcomes. At more local landscape scales, we will partner to optimize water management in crop and fish production, and to manage water quality and pollution risks associated with aquaculture intensification.

Additional, targeted linkages include those between the aquaculture breeds research and CGIAR platforms on Excellence in Breeding, and Big Data. Particular site integration activities also include links with RICE on integrated rice-fish systems; Roots, Tubers and Bananas (RTB) on cassava waste inputs to novel aquafeeds; and Livestock on animal health and feeds. An overview of cross-CRP integration is provided in Annex 3.7.

Primary countries for site integration are Bangladesh, Nigeria, Tanzania and Zambia, where we will seek to partner with PIM, A4NH and CCAFS on analyses of opportunities to integrate fish-based solutions in support of national policies on food security, nutrition and climate change adaptation. Site-specific integration will also be pursued in these countries, as well as in Cambodia and Myanmar. Details of cross-CRP research as part of site integration plans are provided in Annex 3.7, Table 2a, along with the status of country and partner engagements to advance this site integration in Table 2b.

1.0.8 Partnerships and comparative advantage

The FISH CRP brings together a unique set of multi-stakeholder partnerships to harness emerging science in aquaculture and fisheries to deliver improved development outcomes at scale. We will exploit three elements of comparative advantage: (1) a globally unique research capability from within CGIAR and our research partners targeted at the specific objectives of each flagship; (2) unique resources maintained by FISH partners that cannot be readily replicated by other research providers, including (in aquaculture) GIFT and other farmed fish stocks developed by WorldFish, and (in fisheries) the [ReefBase](#) and [Coral Triangle Atlas](#) databases; and (3) a unique track record in convening dialogue and mutually beneficial collaborations in countries where we work. The partnership brought together through FISH is further distinguished by our emphasis on generating IPGs that would not be delivered by national research partners, NGOs and other development actors or the private sector.

Annex 3.7 Linkages with other CRPs and site integration

Linkages to global integrative CRPs and cross-cutting platforms

FISH has been designed in collaboration with each of the global integrative CRPs, in addition to the cross-cutting platforms. The rationale for these links is summarized here, with details provided in Tables 1 and 2a.

Policies, Institutions and Markets (PIM). Making smart choices among various agricultural technologies and investment options requires a comparative perspective across food production sectors. Therefore, we will continue to collaborate with PIM to develop and apply foresight modeling tools and models to conduct ex ante assessment of alternative aquaculture technologies, policies and investment options and explore future fish supply and demand scenarios at national, regional and global levels. Impact assessment domains will include fish supply, demand, trade, prices, and implications on fish food security, nutrition and health. The IMPACT model developed by IFPRI and the fish sector model developed by WorldFish (AsiaFish) will be used in foresight modeling research. Additional linkages with PIM focus on three opportunities to jointly develop and leverage comparative lessons and tools:

- *Value chain assessment.* We will continue to collaborate with PIM on value chain tools and innovations, including postharvest loss assessment tools. PIM will provide general methodologies, which we will adapt, pilot and use for fish value chains. The FISH CRP therefore provides PIM with a context to test the suitability of tools for a specific commodity. Fish, with the highest trade value among the agri-food commodities, has many unique features distinct from agricultural crops. These include great diversity and variation in the species and products being traded; the limited correlation of price trends in wild and farmed species; the great variation in income and price elasticities of demand between species, regions and income groups; and high perishability. Because of these features, fish requires specific attention. The FISH CRP will also link into the broader postharvest waste and loss platform that PIM has been setting up with FAO.
- *Gender equity.* The FISH program will be an active player in and contributor to the CGIAR Collaborative Platform for Gender Research (PIM FP6). We will contribute to gender agenda setting and increasing the visibility of gender in CGIAR through active engagement in the platform and dissemination of quality gender outputs, ranging from peer-reviewed scientific publications to popular media. We will apply the experience from L&F and AAS to support the gender methods development aims of the platform, including refining tools for assessing women's empowerment in fisheries contexts. Drawing on PIM learning regarding the Women's Empowerment in Agriculture Index, the FISH program will contribute by refining and testing ex ante and ex post gender assessments and the adapted tool for fisheries initiated under AAS: the Women's Empowerment in Agriculture Index for fisheries. Moreover, while benefiting from the platform's continued development of sex-disaggregated standards and protocols, the FISH CRP will build on AAS and L&F experience in the area of gender-transformative strategies by further developing and sharing empirically tested methods and tools for gender-transformative change.
- *Policies and institutions for inclusive natural resource governance.* PIM FP5 has been designed to develop analytical tools, synthesize lessons, and strengthen policies and institutions aimed at securing resource tenure for poor producers and promoting inclusive governance of agro-ecological landscapes. Fisheries governance is a priority for comparative analysis alongside forest, pastureland and water management cases, which face comparable challenges of gender and social equity in stakeholder representation, participation in decision-making, and public and private sector accountability towards poor resource users. Tools such as the Collaborating for Resilience approach aim to promote inclusive multi-stakeholder deliberation over the roots of resource competition and strategies to address these. PIM FP5 will enable an exchange of lessons on the application of such tools across countries and resource systems, and derive policy lessons for governments, development agencies and civil society networks. The FISH CRP will apply these in its work on small-scale fisheries and in addressing competition over water and land as an aspect of sustainable intensification of aquaculture.

Climate Change, Agriculture and Food Security (CAAFS). To identify adaptation options most appropriate to expected future climate regimes, we will collaborate with CCAFS Flagship 1 (Priorities and Policies for Climate Smart Agriculture) that will enable us to draw on analyses of future climate scenario projections, early warning systems of monsoon shifts, and saline incursions, to better understand where our aquaculture technologies can contribute most effectively to adaptation to climate change across our key geographies. We will continue partnership on documenting the outcomes of local innovations as part of the FISH scaling strategy to aid in influencing policies and investments targeting future climate-smart agriculture. In Cambodia, Lao PDR and Vietnam, we and other CCAFS partners are developing a process in which fishing and farming communities prioritize and test a suite of climate-smart agriculture technologies and practices suited to the local context, such as rice field fisheries enhancement and dry season water management for aquaculture. This approach will be refined and scaled out to other communities through action research and peer learning, and contribute

to sub-national agriculture planning at commune and district levels. In the Mekong Delta in Vietnam and Cambodia, FP2 will also consider the inadvertent risks to fisheries brought by infrastructure-based strategies favored by local governments for climate adaptation, such as construction of dikes and irrigation schemes. FP1 sustainable aquaculture research will develop, test and scale climate-smart aquaculture, building on work by WorldFish and CCAFS in Bangladesh and Vietnam, thus contributing to CCAFS Flagship 2 (Climate Smart Technologies and Practices). FP1 research on addressing mitigation through development of aquaculture systems with reduced greenhouse gas emissions will further contribute to CCAFS Flagship 3 (Low Emissions Development). We will work with CCAFS to communicate evidence on climate-smart aquaculture options, such as water-use efficiency, disease management and responses to salinization in coastal deltas. Research on climate-smart farming systems, involving integration of fish into household farming systems, has shown promise in Bangladesh and Vietnam, and such experiences will continue to be explored, increasingly scaling from both countries to elsewhere in Asia and Africa.

Agriculture for Nutrition and Health (A4NH). Fish provide exceptional nutritional benefits but remain poorly represented in nutrition strategies of national governments and development agencies. Our partnership with A4NH will address this gap by strengthening the evidence on nutritional outcomes and disseminating cost-effective solutions for nutrition-sensitive fish production, processing to address nutritional quality and food safety, and behavioral change to improve fish consumption by women and children. Our research results, focused on production and consumption of nutrient-rich fish, will feed directly into A4NH research at country and regional levels to develop and promote policies that enable food system innovation and scaling for improved dietary diversity and healthier diets. This will be fostered especially through collaboration with A4NH Flagship 1 (Food systems for healthier diets), Flagship 3 (Food safety), and Flagship 4 (Supporting Policies, Programs and Enabling Action through Research), as well as the strong partnerships A4NH has developed with international and regional networks such as Scaling up Nutrition (SUN), 1,000 Days, and the Comprehensive African Agriculture Development Programme (CAADP). We will also partner on risk assessment and mitigation for fish food safety. Working with A4NH FP3, our work on fish value chains for poor consumers will benefit from A4NH research on technological and institutional solutions and appropriate policy and regulatory options, especially for perishable foods sold in informal markets, where the majority of poor people buy and sell fish.

Water, Land and Ecosystems (WLE). The productivity and sustainability of inland fisheries depend critically on changes in the broader landscape, notably water resource infrastructure and land-use change. Our partnership with WLE seeks to ensure that deliberations over basin and watershed-scale resource competition and development scenarios address fisheries outcomes. FISH FP2 research at landscape level in Cambodia and Vietnam will be nested within the basin-scale analysis in the Greater Mekong on water variability and inter-sectoral tradeoffs across the water, energy and food sectors, initiated under WLE Flagship 4 on managing resource variability and competing uses for increased resilience (VCR). This is expected to identify the trade-offs associated with sustaining fisheries and opportunities for increased resource-use efficiency in agri-food systems, thereby providing a route to promote adaptation within a broader biophysical and socio-economic context. Similarly, FP2 work in Bangladesh will contribute to and benefit from the basin-scale perspective offered by WLE work in the Ganges basin. At more local landscape scales, we will partner to optimize water management in crop and fish production, and to manage water quality and pollution risks associated with aquaculture intensification. WLE research with AAS in Bangladesh has shown how water management regimes and governance remain critical to achieving productivity gains for farmers from improvements in integrated rice and fish farming technologies, and these learnings will help inform research proposed in both Cambodia and Myanmar. FISH research on scaling new aquaculture technologies will benefit from ongoing links with WLE addressing these critical dimensions of the broader landscape primarily through WLE Flagship 4, to identify solutions for managing water variability and competition between sectors.

Excellence in Breeding Platform. FP1, through its cluster on fish breeds and genetic improvement, is the focus for links with the Excellence in Breeding Platform. The platform is expected to provide bioinformatics tools and services, genotyping and sequencing tools and services, and phenotyping tools and services to support the improvement of fish (tilapia and carp) breeding programs to achieve more rapid genetic gains. The FISH CRP will contribute to the community of practice in animal breeding and provide an opportunity for the platform to consolidate learning on genetic gains in fish, as well as testing tools and methodologies, including key metrics around breeding program performance (e.g. rates of genetic gains, delivery to farmers and use of varieties).

Big Data Platform. Investments by the FISH program into fish genomics open new opportunities for genetic improvement of fish and new gene discoveries. Genomic approaches applied in the CRP will generate large amounts of data, and new and improved data management and analytical approaches are required. Collaboration with the Big Data Platform will allow the CRP to access methods and approaches to managing and analyzing larger databases through consultations and training. The platform will also gain access to large datasets of fish genetics and related data, helping to make them more widely used by allied research programs globally.

Linkages to other agri-food system CRPs

Particular site integration activities also include links with the following AFS CRPs:

RICE on integrated rice-fish systems. Integrated rice-fish systems are widely practiced in Asia, particularly in the coastal deltas of South and Southeast Asia, where the addition of fish to rice farming systems can yield significant productivity, income and nutritional gains for farm households. FISH will collaborate with RICE to identify opportunities for further promotion of such integrated systems through site integration in Asia (Bangladesh, Cambodia and Myanmar) and to identify opportunities for scaling such systems to Africa. In addition, a research partnership between CSIRO and FISH provides access to technology that uses microbial processes to bio-convert plant wastes, such as rice husks, into a bioactive product (Novacq™). This technology enhances the growth and health of farmed prawns and eliminates the need for wild-harvest fishmeal in prawn feeds, a world-first achievement in aquafeed sustainability. In collaboration with RICE, we will test the bioconversion efficiency of different forms of rice waste (including variations in pre-processing the waste) for conversion into bioactive ingredients for fish feeds, then test the effects on the growth of tilapia and shrimp. Proof-of-concept trials will be done in the Philippines in partnership with IRRI and national partners CLSU and BFAR. Successful proof of concept would provide a sound basis for subsequent funding support for scaling up the technology in Asia and then Africa, enabling local entrepreneurs to develop aquafeed enterprises, a focal point for capacity development for the aquaculture industry.

Roots, Tubers and Bananas (RTB) on cassava waste inputs to novel aquafeed. In collaboration with RTB we will explore use of Novacq™ technology to test the bioconversion efficiency of different forms of cassava waste (including variations in pre-processing the waste) and the bioactive effects on the growth of crustaceans (prawns and crabs) and fish (tilapia and catfish). The proof-of-concept trials will be done in Tanzania in partnership with IITA postharvest research on livelihood improvements through demand-oriented interventions for competitive production and processing of cassava, the ENABLE Youth Research and Training Center, and the Institute of Marine Science in Zanzibar. Successful proof of concept would enable subsequent funding support for scaling up the technology, enabling local entrepreneurs to develop aquafeed enterprises, a focal point for capacity development for the emerging aquaculture industry in Africa.

Grains, Legumes and Dryland Cereals (GLDC) on use of sorghum in fish feeds. Collaborative research with GLDC will assess the potential use of sorghum protein as a fish feed ingredient for tilapia farming, and the use of Novacq™ technology to convert sorghum waste into a bioactive aquaculture feed ingredient. The proof-of-concept trials will be done in Kenya, in collaboration with ICRISAT. Potential scaling into fish farms in Kenya will be through ongoing ICRISAT projects, and a partnership between WorldFish and Farm Africa for development of aquaculture in Kenya.

Livestock on animal health, feeds and human nutrition. Cross CRP-collaboration will be achieved by strengthening the already established research partnerships between WorldFish and ILRI under L&F flagships on livestock animal health, feeds and forages, and systems analysis. Systems analysis will emphasize value chains, environmental assessment, gender and animal-source foods for human nutrition. We will continue to share experiences on the best use existing ingredients for fish feeds and the development of novel ones, making extensive use of ILRI feed ingredient data and NIRS capacity. Tilapia disease has been identified as a topic of mutual interest for joint research in Egypt under the animal health flagship with new investigations into unsolved fish disease problems, building on analysis started in L&F. We will explore access to the Biosciences eastern and central Africa (BecA) hub at ILRI with scope for training and capacity development in animal health and continue sharing analytical methods and tools between the animal CRPs.

Staging and prioritization of cross-CRP linkages

Table 1, below, provides a high-level summary of these linkages, noting the particular FISH FP that provides the anchor for each point of integration. Table 2a provides more specificity on the mode of partnership for each. These partnership modes aim to distinguish staging (ongoing vs. new), degree of integration (co-investment vs. parallel investment) and prioritization in terms of use of window 1-2 vs. bilateral funds (where “joint resource mobilization” indicates activities dependent on new sources of bilateral funding, and are only intended to launch once those sources have been secured).

FISH CRP			
	FP1: Sustainable aquaculture	FP2: Sustaining small-scale fisheries	FP3: Enhancing the contribution of fish to nutrition and health of the poor
PIM	<i>FISH provides:</i> Analysis of aquaculture technology options and scenarios for integration in comparative foresight modeling <i>Receives:</i> Impact assessment methods and tools for technology adoption and scaling; gender analysis and outcome evaluation tools	<i>FISH provides:</i> Governance analysis of floodplain and coastal fisheries systems; strategies to sustain gender-equitable access for marginalized groups <i>Receives:</i> Synthesis of learning on processes of multi-stakeholder dialogue to improve natural resource governance	<i>FISH provides:</i> Co-development of fish value chain assessment and postharvest loss assessment tools <i>Receives:</i> Value chain methods and approaches; results from broader trade policy research in target countries; scaling postharvest fish value chain innovations in regional-level interventions
A4NH	-	-	<i>FISH provides:</i> Research on the role of fish in meeting nutrition and health goals; integration into agricultural development and nutrition strategies; risk assessment and mitigation on fish food safety <i>Receives:</i> Ex ante, ex post evaluation regarding progress against nutrition targets; support to analyze food safety strategies
CCAFS	<i>FISH provides:</i> Climate-smart aquaculture options (including water-use efficiency, low-emission production, adaptation responses to salinization in coastal deltas) <i>Receives:</i> Integration of aquaculture in policy engagement on climate adaptation and mitigation	<i>FISH provides:</i> Analysis of climate resilience in small-scale fisheries; links between climate change and nutrition (e.g. coral reef fisheries productivity) <i>Receives:</i> Integration of fisheries in policy engagement on climate adaptation	-
WLE	<i>FISH provides:</i> Water-use efficiency for aquaculture productivity in multifunctional aquatic landscapes; management of water quality and pollution risks with aquaculture intensification <i>Receives:</i> Analysis of aquaculture in mosaic of land uses and food production in peri-urban and nearby rural areas	<i>FISH provides:</i> Research on connectivity of natural systems for aquatic biodiversity and fisheries productivity <i>Receives:</i> Policy convening on water governance in focal basins, including tradeoffs related to water infrastructure (dams, irrigation systems, etc.) and fisheries productivity	-

Livestock	<i>FISH provides:</i> Expertise in aquatic epidemiology and aquatic animal diseases; information on aquaculture feeds and feed ingredients <i>Receives:</i> Expertise in bacterial disease diagnostics, molecular biology and livestock vaccines; information on feed quality of aquaculture feed and feed ingredients; aquafeed ingredients for testing in aquaculture diets	-	<i>FISH provides:</i> Joint research on strategies to incorporate animal-source foods into diets of infants and young children; development of measurement tools and approaches to enhance the availability, affordability and consumption of animal-source foods <i>Receives:</i> Methods for value chain assessment applicable to perishable products; methods for assessing contribution of animal-source foods in human nutrition
RICE	<i>FISH provides:</i> Research on productivity improvements in rice-fish farming systems and technology for research on production of novel bioactive ingredients for fish feed from rice wastes <i>Receives:</i> Rice productivity management practices integrating aquaculture in target geographies; research on rice byproducts	<i>FISH provides:</i> Productivity improvements for wild-capture fisheries in rice field systems <i>Receives:</i> Scaling opportunities through integration of rice-fish innovations in broader rice system productivity improvement programs	-
RTB	<i>FISH provides:</i> Technology to bio-convert cassava waste into bioactive ingredients in fish feeds and testing in fish feed trials <i>Receives:</i> Postharvest research on demand-oriented interventions for competitive production and processing of cassava; research on women and youth employment in cassava value chains	-	-
GLDC	<i>FISH provides:</i> Technology for fish feed formulation and bio-conversion of sorghum waste into bioactive ingredients in fish feeds and testing in fish feed trials <i>Receives:</i> Research on sorghum strains, value chains and access to field sites for on-farm pilot testing. Access to partners in Kenya for sorghum processing waste.	-	-

Excellence in Breeding Platform	<i>FISH provides:</i> Fish breeding programs as a core resource for genomic analysis; technology for rapid genomic assessment of tilapia and data from breeding programs <i>Receives:</i> Genomic tools to accelerate the speed of genetic gain in fish; access to shared genotyping platforms; assistance in data analysis methodologies and breeding program management	-	-
Big Data platform	<i>FISH provides:</i> Access to fish genetics and related data <i>Receives:</i> Approaches and training in the analysis of large datasets	-	-

Table 1. Overview of inter-CRP collaboration: What the FISH CRP provides and receives.

Submitting CRP: Fish Agri-Food Systems (FISH)

Partner CRP	Activity [country(ies) in which this takes place]	FISH role	Collaborating CRP role	Collaboration mode	Output; added value; target countries
PIM	Foresight modeling [Malaysia]	Participate in community of practice, provide biophysical and other attributes for general modeling suite, run scenarios of particular interest to CRP, share results	Development and maintenance of core modeling suite, training, convening community of practice, coordination and synthesis of cross-cutting foresight studies	Co-investment (ongoing)	- Scenarios with different assumptions about technologies - Value: for decisions on investment in research, value for regional and national planning for climate-preparedness - Bangladesh, Nigeria, Tanzania, Myanmar
	Strengthening value chains [Bangladesh, Egypt, Tanzania]	Developing tools and methods, applying to fisheries and aquaculture value chains, sharing lessons with community of practice, disseminating PIM and CRP results to stakeholders in relevant value chains	Developing research tools and methods, convening community of practice, prioritization of value chains and enabling environment constraints, coordination and synthesis of cross-cutting value chain studies, maintaining online platform for dissemination	Parallel investment (ongoing)	- More systematic understanding of bottlenecks in value chains and workable interventions - Value: cross-CRP learning - Bangladesh, Egypt, Tanzania
	Measuring and reducing postharvest losses [Bangladesh, Tanzania]	Co-development of methodology, application of methodology in fish value chains, sharing findings with the research, development and policy communities	Developing methodology, coordinating joint studies, convening to discuss results and disseminate; linkage into the global postharvest waste and loss platform	Parallel investment (new)	- Rigorous quantification of postharvest losses, design of cost-effective interventions - Value: cross-CRP learning, integrated view - Bangladesh, Tanzania
	Managing shared landscapes (inland and coastal fisheries governance; aquaculture expansion) [Myanmar, Bangladesh, Cambodia, Tanzania]	Governance analysis of floodplain and coastal fisheries systems, analysis of sources of competition over natural resources and strategies to sustain gender-equitable access for marginalized groups	Development and management of online resource center, training materials; convening to share approaches and results, providing tenure and governance inputs into landscape-level interventions tested; synthesis of policy lessons	Co-investment (ongoing); joint resource mobilization	- Shared body of work covering a range of resources within shared landscapes - Value: cross-CRP learning, joint policy impact - Myanmar, Bangladesh, Cambodia, Tanzania

	CGIAR Collaborative Platform for Gender Research	Participating in collaboration through the platform, applying and disseminating good gender research practices, raising visibility of gender in CGIAR research, contributing gender-transformative strategies	Managing platform	Parallel investment (PIM funds platform, FISH funds gender research)	• Better coordination of gender research, strategic prioritization • Value: cross-CRP learning, joint impact • All focus countries
A4NH	Integration of fish in nutrition strategies of national governments and development agencies [Bangladesh, Zambia, Tanzania]	Strengthening the evidence on nutritional outcomes and disseminating cost-effective solutions for nutrition-sensitive fish production, processing and behavioral change benefiting women and children	Enabling country performance on improving human nutrition	Co-investment (ongoing)	• Strong evidence of nutritional value of fish • Value: integrated policy engagement • Bangladesh, Zambia, Tanzania
	Risk assessment and mitigation for fish food safety [Bangladesh, Tanzania]	Analysis of food safety and fish quality issues along the chain integrated into the consumer-focused value chain assessments	Research tools and methods	Parallel investment (new)	• Improved understanding of food safety risks along fish value chains in target countries • Value: cross-CRP learning, integrated view • Bangladesh, Tanzania
	Reducing postharvest fish losses [Bangladesh, Tanzania]	Expand research to reduce postharvest fish losses, increase penetration of distant markets with fresh fish, and improve fish drying and smoking processes	Research tools and methods	Parallel investment (ongoing)	• Identification of value chain enhancement measures • Value: integrated policy engagement • Bangladesh, Tanzania
CCAFS	Foresight analysis and scenario development	Analysis of the impacts of climate change on fish production and associated livelihood and nutrition outcomes in our target geographies	Analysis of future climate scenario projections; early warning systems of monsoon shifts and saline incursions, feeding into design of climate-smart aquaculture systems	Co-investment (ongoing)	• Improved understanding of aquaculture technologies that enhance adaptation to climate change • Value: for regional and national planning, cross-CRP learning • Bangladesh, Cambodia, Myanmar, Pacific

	Climate-smart agriculture [Cambodia]	Assess and communicate evidence on climate-smart aquaculture options and small-scale fisheries adaptation responses	Management of learning platform on ex ante evaluation and priority setting Communication of fisheries and aquaculture solutions in policies and investments targeting future climate-smart agriculture	Co-investment (ongoing)	- Proven process of designing, testing and scaling climate-smart fish interventions - Value: integration of various CGIAR Centers' expertise within a village context - Cambodia
WLE	Managing resource variability in multifunctional landscapes [Bangladesh, Cambodia]	Integration of fisheries and aquaculture development scenarios with broader research on multiple uses of water and land resources at landscape and river-basin scales	Analysis and convening on basin and watershed-scale resource competition and development scenarios; analysis to optimize water management in crop and fish production, and to manage water quality and pollution risks associated with aquaculture intensification	Parallel investment (ongoing) Joint resource mobilization (new)	- Improved knowledge and tools to inform water development decisions and policies - Value: integration of agri-food system innovations through water management lens - Bangladesh, Cambodia
Livestock	Animal disease detection and prevention; value chain assessment; animal-source foods and human nutrition [Bangladesh, Tanzania]		Methods for value chain assessment applicable to perishable products; methods for assessing contribution of animal-source foods in human nutrition	Parallel investment (ongoing) Joint resource mobilization (new)	- Identification of technological and institutional innovations to improve the performance of fish value chains based on the assessments - Value: joint impact - Bangladesh, Tanzania
RICE	Integrated rice-fish systems [Philippines]	Improve the productivity of both rice and fish; investigate microbial processes to bio-convert rice waste to bioactive aquafeed ingredients	Lead integrative farming system design in rice-dominated farming system areas; introduce novel rice management technologies that support the introduction of new fish; lead systems research on rice-based farming systems	Co-investment (new)	- Technologies and methods to increase system productivity, proven aquafeed technologies - Value: cross-CRP learning, joint impact - Bangladesh, Cambodia, Myanmar, Philippines
RTB	Conversion of cassava waste into fish feed [Tanzania]	Investigate use of microbial processes to bio-convert plant wastes, such as cassava waste, to bioactive aquafeed ingredients		Co-investment (new)	- Proven aquafeed technologies ready for scaling - Value: encourage private sector investment and entrepreneurship

					Nigeria, Tanzania
GLDC	Use of sorghum and sorghum wastes in fish feed [Kenya]	Investigate use of sorghum as a fish feed ingredient. Microbial processes to bio-convert sorghum waste, to bioactive aquafeed ingredients		Co-investment (new)	- Proven aquafeed technologies ready for scaling - Value: encourage private sector investment and entrepreneurship - Kenya
Excellence in Breeding Platform	Genetic improvement of tilapia and carp [Egypt, Malaysia]	Develop genomic tools to accelerate the speed of genetic gain, close the yield gap and enhance the production efficiency of our breeding programs for tilapias and carps	Provide the managing platform	Parallel investment (ongoing)	- Proven tools and methods to achieve genetic gains in fish breeding programs - Value: cross-CRP learning - Bangladesh, Egypt, Nigeria, Tanzania, Myanmar, Cambodia, Zambia
Big Data platform	Managing big data produced by genetic improvement of fish	Provide access to large datasets of fish genetics and related data; access data analysis tools	Provide methods and approaches to managing and analyzing larger databases, such as through consultations and training	Parallel investment (ongoing)	- New data and data management approaches on genetic improvement of fish - Value: cross-CRP learning - Bangladesh, Egypt, Nigeria, Tanzania, Myanmar, Cambodia, Zambia

Table 2a. Partnerships with other CRPs (activities, mode, geographies and outcomes sought).

Site integration

Primary countries for site integration are FISH focal countries Bangladesh, Nigeria and Tanzania (each highest priority ++ for CGIAR site integration), and Zambia (high priority + for site integration). In these countries, we aim to partner with PIM, A4NH, CCAFS and WLE, wherever possible, on analyses of opportunities to integrate fish-based solutions in support of national policies on food security, nutrition, land and water management, and climate change adaptation. In addition, we look to develop linkages to other agri-food system CRPs and their associated centers in these countries. These include collaboration with RTB on the use of cassava waste inputs to novel aquafeed. Further details of this intended collaboration with other CRPs is provided in Table 2b, together with a summary of the status of country and partner engagements to advance this site integration.

In addition to this focus on high-priority countries for CGIAR site integration, the FISH CRP will pursue opportunities for collaboration with other CRPs in other countries wherever possible. For example, WorldFish and IWMI have already worked closely with IRRI to identify opportunities for collaboration in Myanmar's Ayeyarwady Delta, and this will be pursued through collaboration among FISH, WLE and RICE. This collaboration will also be pursued in Cambodia.

Target countries (++) and (+) that are FISH focal countries	Steps taken so far to establish national-level engagement with other CRPs towards site integration	Plan and schedule through which the CRP will provide relevant elements for development of CGIAR site integration in this country
Bangladesh ++	In Bangladesh, a CGIAR advisory committee has been in operation for three years. This provides a venue for the seven CGIAR centers (and seven CRPs) present in Bangladesh, together with AVRDC and IFDC, to meet with NARES and ministry officials and strengthen alignment of CGIAR research with national priorities and processes. Two meetings were held in 2015, and two are scheduled for 2016. For FISH, WorldFish currently serves as Secretary to the Committee.	WorldFish has been engaged in research to support the development of aquaculture and fisheries in Bangladesh for over 20 years, and IWMI has been engaged in water management issues for a similar period. This has involved close collaboration with other CGIAR Centers and their related CRPs, notably IRRI, CIMMYT and IFPRI. FISH will build on this strong foundation to develop collaboration with other CRPs, in particular with RICE on rice field fisheries; WLE on fish in multifunctional landscapes; PIM on the development of tools and methods being used in study of fish value chains; CCAFS on the design of climate-smart aquaculture systems; and A4NH regarding nutrition-sensitive fish production, analysis of food safety and fish quality issues, and integration of learning in national nutrition strategies.
Nigeria ++	A national site integration and consultation workshop was convened by IITA in Abuja, Nigeria, on 16–17 November 2015. This meeting brought together all CGIAR centers working in Nigeria and a wide range of stakeholders in the agriculture sector to examine how CGIAR can be better integrated in the country's agriculture R4D efforts. WorldFish was unable to attend this meeting, but has liaised with IITA to engage in follow-up CGIAR integration activities, and pursued country engagement plans with national partners.	A roadmap to further development of site integration in Nigeria has been developed, and WorldFish will engage in this process in its role as the lead center for FISH. A critical step was a workshop on 11–15 April 2016 to support a new African Development Bank initiative on Technologies for African Agricultural Transformation (TAAT). WorldFish will attend this workshop in preparation for FISH with a specific focus on integrating aquaculture development elements within the initiative, including in particular in Nigeria, Tanzania and Zambia. Discussions with partners and with other centers and CRPs during this workshop will be used to further strengthen targeting of FISH in Nigeria, and a series of follow-up actions will be agreed upon for implementation in the remainder of 2016.
Tanzania ++	The Tanzania CGIAR stakeholders' consultation workshop was held during 3–4 December 2015 and there was agreement upon principles of success and major opportunities for integration between and among CGIAR centers, CRPs and national partners. FISH was not represented at the workshop, but follow-up discussions are being pursued.	An initial roadmap to further progress of site integration in Tanzania has been developed, and WorldFish will engage in this process in preparation for its role as the lead center for FISH. Specific areas of integration being pursued are linkages with PIM on the development of tools and methods being used in the study of the small fish value chain from Lake Victoria; with A4NH regarding integration of fish in national nutrition strategies, and analysis of food safety and fish quality issues in the small fish value chain; and with RTB on conversion of cassava waste into fish feed.
Zambia +	The Zambian site integration consultation workshop was held during 9–10 February 2016 and brought together key stakeholders from government, research and academic institutions, donors, NGOs and the private sector. The Zambian National Agriculture Investment Plan provided a basis and will be a key focus for alignment of the CRPs in Zambia. FISH was represented at the workshop by WorldFish.	An initial set of steps for site integration in Zambia has been agreed upon, and this will be developed after GCARD3. WorldFish will engage in this process on behalf of FISH and pursue best opportunities for integration with other CRPs. This is likely to include WLE on fish in multifunctional landscapes, and with PIM on governance of inland fisheries.

Table 2b. Plans for site integration in CGIAR target countries.