



The WorldFish Center

Reducing poverty and hunger by improving fisheries and aquaculture

MEDIUM-TERM PLAN 2009-2011

Medium-Term Plan 2009-2011



Table of Contents

A. WorldFish Center: Our Mission, Vision and Values	4
B. Acronyms	5
C. Development Challenges for Fisheries and Aquaculture	6
The bottom billion	7
Positioning ourselves to respond	7
Achieving development impacts – our development challenges	7
Impact roadmaps – our framework for action	9
D. Our Research Foci	12
WorldFish programs and CGIAR research priorities	14
Potential for impact	14
Meeting the challenges	15
Regional engagement	15
Improving science quality	17
Changes to the previous MTP	18
Highlights of the 2009 Project Portfolio	19
Center financial indicators	19
E. WorldFish Center Project Portfolio	20
MTP 1: Global drivers of change	20
MTP 2: Markets and trade	29
MTP 3: Multi-level and multi-sectoral governance	37
MTP 4. Improving sustainable aquaculture technologies	45
MTP 5. Aquaculture and the environment	51
MTP 6. Resilience in practice for small-scale fisheries	57
Crosscutting issues	63
F. Finance Plan	65
G. Financial Tables for 2009–2011	70
Annex I. Progress Report on Implementation of EPMR Recommendations	87

A. The WorldFish Center: Our Mission, Vision and Values

The WorldFish Center is part of the Alliance of international research centers supported by the Consultative Group for International Agricultural Research.

The WorldFish Center's **Mission**:

To reduce poverty and hunger by improving fisheries and aquaculture

Our **Vision**:

To be the science partner of choice for delivering aquaculture and fisheries solutions in developing countries

Taken together, our Mission and Vision clarify our fundamental purpose and ambition.

Our **Values** codify the principles by which we will operate as an organization to achieve these ends:

- Our two most fundamental values are integrity and trust. We will trust each other to be honest and open, and hold one another accountable for honoring that trust.
- In the workplace, we will strive for fairness. We will provide equal opportunities for all staff, recognize achievement, celebrate diversity and respect individual dignity. We will strive to practice effective leadership at all levels and empower staff so that they can give their best.
- In our work, we will search for excellence in all that we do. We will continually seek to improve the quality and efficiency of our products and services, and accept the need for risk taking and genuine mistakes as opportunities for learning.
- We will also value teamwork over individual effort, sharing knowledge amongst ourselves and our partners to build on our collective strengths and interdependencies.

B. Acronyms

ARI	–	advanced research institute
ASEAN	–	Association of Southeast Asian Nations
AusAID	–	Australian Agency for International Development
BoT	–	Board of Trustees
CCER	–	Center-Commissioned External Review
CEFAS	–	Centre for Environment, Fisheries and Aquaculture Science
CEMARE	–	Centre for the Economics and Management of Aquatic Resources
DFID	–	Department for International Development (United Kingdom)
DR Congo	–	Democratic Republic of the Congo
EPMR	–	External Program and Management Review
EU	–	European Union
FAO	–	Food and Agriculture Organization of the United Nations
FARA	–	Forum for Agricultural Research in Africa
GIFT	–	Genetically Improved Farmed Tilapia
GEF	–	Global Environment Facility
GTZ	–	German Agency for Technical Cooperation (Germany)
IAA	–	integrated aquaculture-agriculture
ICSF	–	International Collective in Support of Fishworkers
IDRC	–	International Development Research Centre (Canada)
IFPRI	–	International Food Policy Research Institute
ILO	–	International Labour Organization
ILRI	–	International Livestock Research Institute
INGA	–	International Network for Genetics in Aquaculture
IPG	–	international public good
IRRI	–	International Rice Research Institute
IUCN	–	International Union for the Conservation of Nature
IWMI	–	International Water Management Institute
MDG	–	Millennium Development Goal
MoU	–	Memorandum of Understanding
MTP	–	Medium-Term Plan
NACA	–	Network of Aquaculture Centers in Asia
NARES	–	National Agricultural Research and Extension Systems
NEPAD	–	New Partnership for Africa's Development
NERC	–	National Environment Research Council
NGO	–	non-governmental organization
PESS	–	Policy, Economics and Social Science Discipline
PML	–	Plymouth Marine Laboratory
SARNISSA	–	Sustainable Aquaculture Research Networks in Sub-Saharan Africa
SME	–	small and medium-sized enterprise
SPC	–	Secretariat of the Pacific Community
SSF	–	small-scale fisheries
UK	–	United Kingdom
UNAIDS	–	Joint UN Programme on HIV/AIDS
UNCTAD	–	United Nations Conference on Trade and Development
UNDP	–	United Nations Development Programme
UNESCO	–	United Nations Educational, Scientific and Cultural Organization
US/USA	–	United States of America
WHO	–	World Health Organization

NOTE

In this report, "\$" refers to US dollars.

C. Development Challenges for Fisheries and Aquaculture

The bottom billion

The international community has highlighted the plight of the world's bottom billion, and the Millennium Development Goals (MDGs) reflect a commitment to measurably improve their lives. Sadly, the latest global food outlook by the International Food Policy Research Institute (IFPRI)¹ concludes that we still leave many of the poorest and hungriest behind despite policies and action that aim to meet the MDGs. The stark reality is that, even if we meet the first MDG of halving poverty and hunger by 2015, at least 800 million people will remain in poverty and 600 million will still be hungry.

This Medium-Term Plan (MTP) sets out the WorldFish Center response for harnessing fisheries and aquaculture to help address this challenge. Together, fisheries and aquaculture can contribute substantially to meeting the MDGs. They provide employment and nutritious food, and they generate revenues for local and national governments from licenses and taxation on landings, exports, and various upstream and downstream multipliers.^{2,3} The sector provides employment for over 135 million people worldwide, a quarter of them in aquaculture. Ninety-eight percent of these people live in developing countries and support households totaling some 500 million people. For the world's 40 least-developed countries, fish products are the third largest export commodity after petroleum and garments.⁴ Global exports are worth nearly \$80 billion a year, and economists estimate that fishery products and services earn Africa over \$2.7 billion annually, with fisheries in Namibia, Uganda, Ghana and Senegal contributing over 6% to national gross domestic product.² Often, fish landing sites are centers of the cash economy in otherwise remote areas, stimulating the monetization of rural economies that many mainstream development policymakers see as the means to reduce rural poverty and create economic growth in agrarian states.⁵ In small island states and fishery-dependent regions of larger economies, fisheries are significant contributors to the economy and society. Despite the scale of these contributions, governments often overlook and undervalue the multiple benefits of fisheries. As a result, fisheries are often absent from poverty-reduction strategies.⁶

Fish also contributes indirectly to household and local food security through cash from fish sales, which sellers use to buy staple foods, and through its contribution to local economies. Fish accounts for at least half of the animal protein and mineral intake for 400 million people in the poorest African and South Asian countries, and the role of fish in providing micronutrients and essential fatty acids is even greater. Nutritious fish promotes maternal health, child development, resistance to infectious diseases and the efficacy of anti-retroviral therapies for treating AIDS.

Globally, aquaculture has expanded at an average annual rate of 8.9% since 1970, making it the fastest-growing subsector in food production. Aquaculture provides around half of the fish for human consumption today and must continue to grow because capture fisheries will be unable to meet demand from a growing population. Based on current per-capita consumption targets and population trends, many analysts recognize aquaculture as the only means of satisfying the world's growing demand for aquatic food products. Directly and indirectly, aquaculture could contribute to the livelihoods and nutrition of many hundreds of millions of people, acting as an engine for economic growth and as a diversification strategy in the face of environmental change.

Meanwhile, landings of wild fish from the world's capture fisheries, which grew rapidly through the 1970s and 1980s, have reached a plateau. About half of all fisheries are exploited to full capacity, while

¹ IFPRI. 2007. The world food situation: New driving forces and required actions.

² Bene et al. 2007. FAO Fish Tech Rep 481.

³ Heck et al. 2007. Fish & Fisheries 8:211-226.

⁴ UNCTAD. 2006. Least developed countries report 2006.

⁵ E.g., in the 2008 World Development Report.

⁶ Thorpe A, Andrew NL, Allison EH. 2007. Fisheries and poverty reduction. CAB Reviews: Perspectives in agriculture, veterinary science, nutrition and natural resources 2007, 2, No. 085.

a quarter are over-exploited.⁷ Despite their limited capacity to contribute to further increases in global food supply, capture fisheries remain vital to many national economies and the well-being of millions. Failure to secure and enhance the benefits that fisheries provide would have tragic results for health, income, livelihoods and social cohesion in many of the poorest countries.

Positioning ourselves to respond

To better respond to the challenges and opportunities presented by fisheries and aquaculture in the coming decade, we have refocused our work. Central to this is an updated strategy and a new research structure to implement it. The WorldFish Center Strategy Update 2005⁸ is rooted in the Center's Mission, Vision and Values and guided by the MDGs. These goals set a benchmark for achieving our Mission, against which we can judge our actions.

The most fundamental strategic choice we have made is deciding the arenas in which we will be active. This has required us to be as specific as possible about our key technologies, our focal geographic regions, the types of outputs we will produce and our focal research areas (Figure 1). We have also sought to clarify how our work will add value and deliver benefits and how we can partner with others to undertake research.

Achieving development impacts — our development challenges

To maximize our development impact we have focused our work to address two development challenges: developing Resilient Small-Scale Fisheries (SSF) and Sustainable Aquaculture. We chose these two development challenges because we believe they provide the best opportunities for investments in fisheries and aquaculture to contribute to the wider global development goals and agenda. Our intent is to help ensure that both of these entry points for development realize their full potential to deliver sustainable development impacts on income, food security, nutrition, health and gender equity.

In plain language we define resilient SSF as those that

- deliver the full range of societal and economic benefits of which they are capable and that people want from them;
- have stewards with the tools and skills to learn from experience and respond to threats and opportunities;
- improve the chances that benefits from fisheries will be sustained and enhanced;
- have participants free to choose alternative economic opportunities outside fishing;
- have all stakeholders fairly represented in decision-making so needed changes are accepted; and
- are governed effectively so that fishers always leave at least enough fish to ensure that fish populations are sustainable.

Similarly, we define sustainable aquaculture as aquaculture that

- provides food, nutrition and economic opportunity for those that need it most;
- produces fish in ways that do not store up environmental problems for the future;
- uses land, water, food and energy wisely and efficiently to deliver its full range of benefits; and
- is integrated into national economies in ways that maximize its development impact.

Meeting these development challenges will require interventions across the entire research-to-development spectrum. It will need new policies, improved infrastructure, strengthened institutions, new governance and management arrangements, and new knowledge. Targeting support well to meet these needs demands that we consider the full range of contributory factors and of actions needed to effect change, as well as the roles of the many different actors on the landscape.




⁷ FAO. 2007. The state of fisheries and aquaculture.

⁸ Available at www.worldfishcenter.org/pdf/strategyupdatepdfin.pdf.

To realize these visions we have prioritized our research to those areas in which we will have biggest impact. But we have also identified where we will pursue a role as broker and catalyst. These roles are needed to further partnerships and actions by those that use our research, foster an enabling policy environment, and build capacity to act.

We clearly spell out the problems that need solutions in the fisheries and aquaculture domain and those areas where we believe our added value is greatest. And we provide a framework to guide interventions on many fronts and at different scales. Armed with this framework, we can better focus our efforts to have the greatest impact, through research, and through our role as a bridge, broker and catalyst for development impact. This analysis allows us to focus on developing the diversity of well-targeted partnerships that will be critical to success.

Figure 1. This extract from the WorldFish Center Strategy Update 2005 describes the areas of research that we will emphasize over the next 3-5 years, shown from the perspective of the research disciplines. Also shown are those aspects of our work that we will keep at current levels of emphasis and investment and those areas where we will not ourselves be active. A summary of the strategy update is available at www.worldfishcenter.org/pdf/strategyupdatepdfin.pdf.

	Natural Resource Management	Aquaculture and Genetic Improvement	Policy, Economics and Social Science
 What we will increase	<ul style="list-style-type: none"> • Small-scale fisheries management tool development • Fisheries analysis for management of inter-sectoral basins and coastal zones • Ecological assessment • Water management-fisheries management interactions and approaches 	<ul style="list-style-type: none"> • Production system management: synthesis of lessons and approaches (incl environmental and health management) • Genetic improvement • Dissemination methodology development • Low cost feed and fishmeal replacement research (co-ordination and synthesis) • Product value adding livelihood options • Coastal aquaculture focus 	<ul style="list-style-type: none"> • Institutional, governance analysis • Gender analysis and the role fish in human development • Policy/Decision support tool development • Analysis of trade and market access; private-sector development • Small-scale fisheries and their place/role in decentralised governance and economic development processes • Local-scale (rural) commercial approaches to development • Ecological/environmental economics • Impact assessment
Overall increase in: Comparative analysis and synthesis (eg within the context of the WorldFish campaigns); future scenarios development (incl global change); cross-sectoral linkages development; knowledge network development; institutional capacity building; environmentally sustainable management practice re			
 We will maintain/adapt	<ul style="list-style-type: none"> • Knowledge bases • Stock enhancement 	<ul style="list-style-type: none"> • Dissemination of new breeds • Inland aquaculture focus 	<ul style="list-style-type: none"> • Resource valuation • Co-management arrangements and their (real) implication for poverty reduction in small-scale fisheries
 We will not do ourselves	<ul style="list-style-type: none"> • Lab-based genetic analysis research • Single species stock assessment tool development 	<ul style="list-style-type: none"> • Post-harvest technology development • Breeding and culture research • Disease diagnostic and treatment technology development • Aquaculture extension 	<ul style="list-style-type: none"> • Direct (operational) support to community-based management in Asia • Traditional farm management surveys at the micro level

Impact road maps — our framework for action

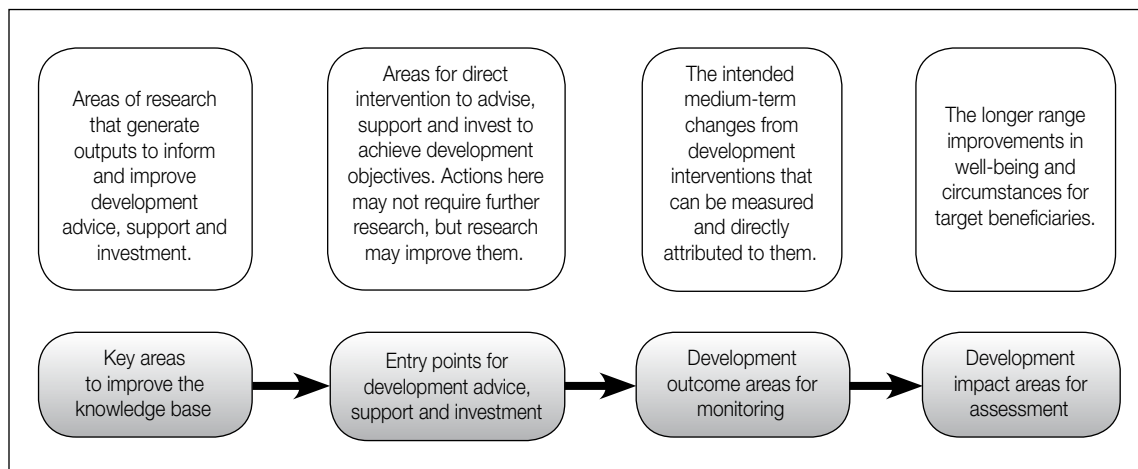
Planners often use road mapping approaches that lay out clearly the multiple pathways to impact and relationships between them.⁹ Adopting this approach, we have developed impact roadmaps for our two development challenges. We believe they provide a more complete and integrated picture of the development outcomes and impacts we desire and the array of interconnected research and other inputs needed to achieve them.

Our intent in producing these roadmaps is to facilitate an open and knowledgeable debate about the Center's role and the roles of others who are critical to achieving our development impacts. Such roadmaps clarify and enhance the connections between inputs such as research funding, investments in infrastructure, capacity building, policies and laws, and development outcomes. The approach can help bring together the different pieces of the development puzzle and integrate them into a coherent whole. In particular, roadmaps help us to identify the relationships we need to build with others to make development happen.

Given the complexity of delivering development outcomes, roadmaps of this kind have a flexibility and usefulness for diverse stakeholders in support of informed public discourse and decision making. We offer them not only to explain the choices we make about where to focus, but also to help others better contextualize outcome-oriented development options and tradeoffs and debate their own development choices.

Figure 2 shows the generic structure of a map. The right-hand side focuses on desired outcomes and impacts, while the left-hand side identifies the investments and actions needed to achieve them. Figure 4 shows the map for Resilient Small-Scale Fisheries and Figure 6 the map for Sustainable Aquaculture.

Figure 2. The basic structure of an impact roadmap.

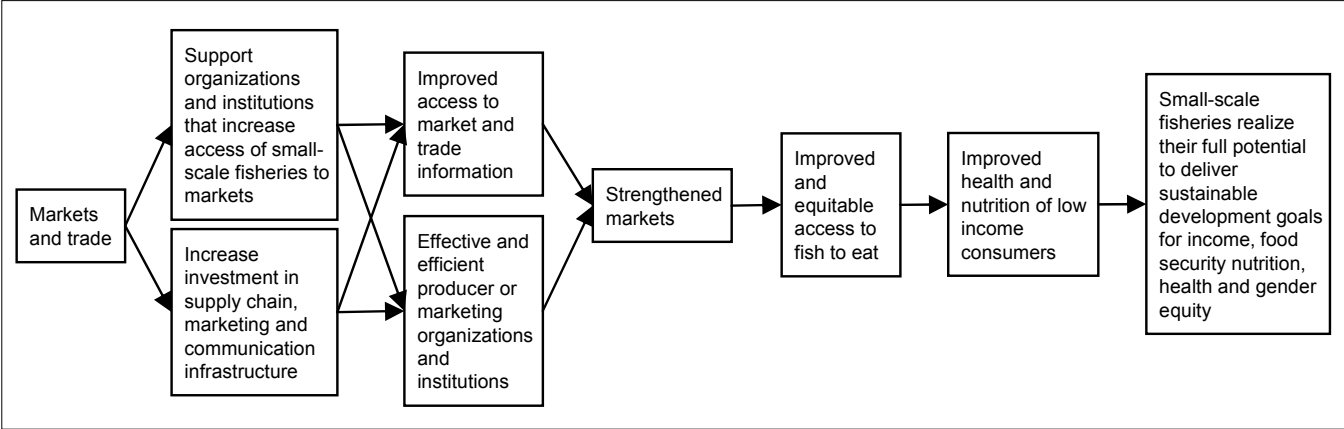


These maps are not intended as definitive products, nor are they the only approach for guiding thinking on development policy. Rather, they provide our current best assessment of the relationships between development investments and impacts, and of the role of research in supporting them. We believe that, in this form, they provide important clarity and offer them as an analysis for critique. We hope that, in so doing, we will help structure debate on the many possible paths for delivering development impacts from fisheries and aquaculture, and on the role of research in this effort.

⁹ Garfinkel MS, Sarewitz D, Porter AL. 2006. A societal outcomes map for health research policy. *American Journal of Public Health*, 96:441-446.

Consider impacts on health and nutrition. Figure 3 shows a subset of the roadmap for the development challenge of building more resilient SSF as a means to reduce poverty and hunger and improve well-being.¹⁰ These pathways show that better health and nutrition can come from improved and more equitable access to fish, which, in the context of increasing market demand, requires ways of supporting small-scale producers and fish traders in their efforts to secure access to higher-value markets. The pathway further shows that markets can be strengthened by focusing on two outcomes: improved market information and strengthened producer and marketing institutions. Working back along these pathways shows that new research in the arena of markets and trade to achieve these outcomes should focus on two areas. The first is working out the most effective institutional arrangements and how best to give support to improved access to markets for small-scale fishers. The second is to better understand infrastructure needs for supply chains, marketing and communications to maximize returns and impacts from investment. As well as research, however, supporting or catalyzing roles may also require investment. These may include brokering relationships between institutions, facilitating and supporting planning and dialogue, raising awareness, explaining policy choices, or advocating investment or action by others. Laying out the paths to impact in this way encourages a more systematic and complete discussion of where best to engage, with whom and in what capacity.

Figure 3. A subset of the impact roadmap dealing with markets and trade.



Examining this pathway in the context of the roadmap as a whole helps us to realize that these actions on their own will rarely achieve the outcomes and impacts desired. Showing the many other linkages that contribute to improving access and effective marketing organizations, to strengthening markets, and to improved and equitable access helps us to recognize the broad coalitions of stakeholders and varied investments needed to achieve long-term success. This is an important counterpoint to the “magic bullet” philosophy that has characterized much development debate, especially in fisheries and aquaculture.

A coherent effort to address these development challenges should make a difference to the poor globally. Casting action in the context of development challenges keeps discussion focused on the problem we need to solve. This is subtly, but importantly, different from a discussion that starts by asking how our research can contribute to impact. It helps us better contemplate changes in our research focus and alternative approaches for achieving impact, including new and better partnerships. It also helps us better identify improved institutional arrangements to plan, implement and oversee such a joint agenda.

¹⁰ The full impact web shows additional linkages, but we have simplified it here for illustrative purposes.

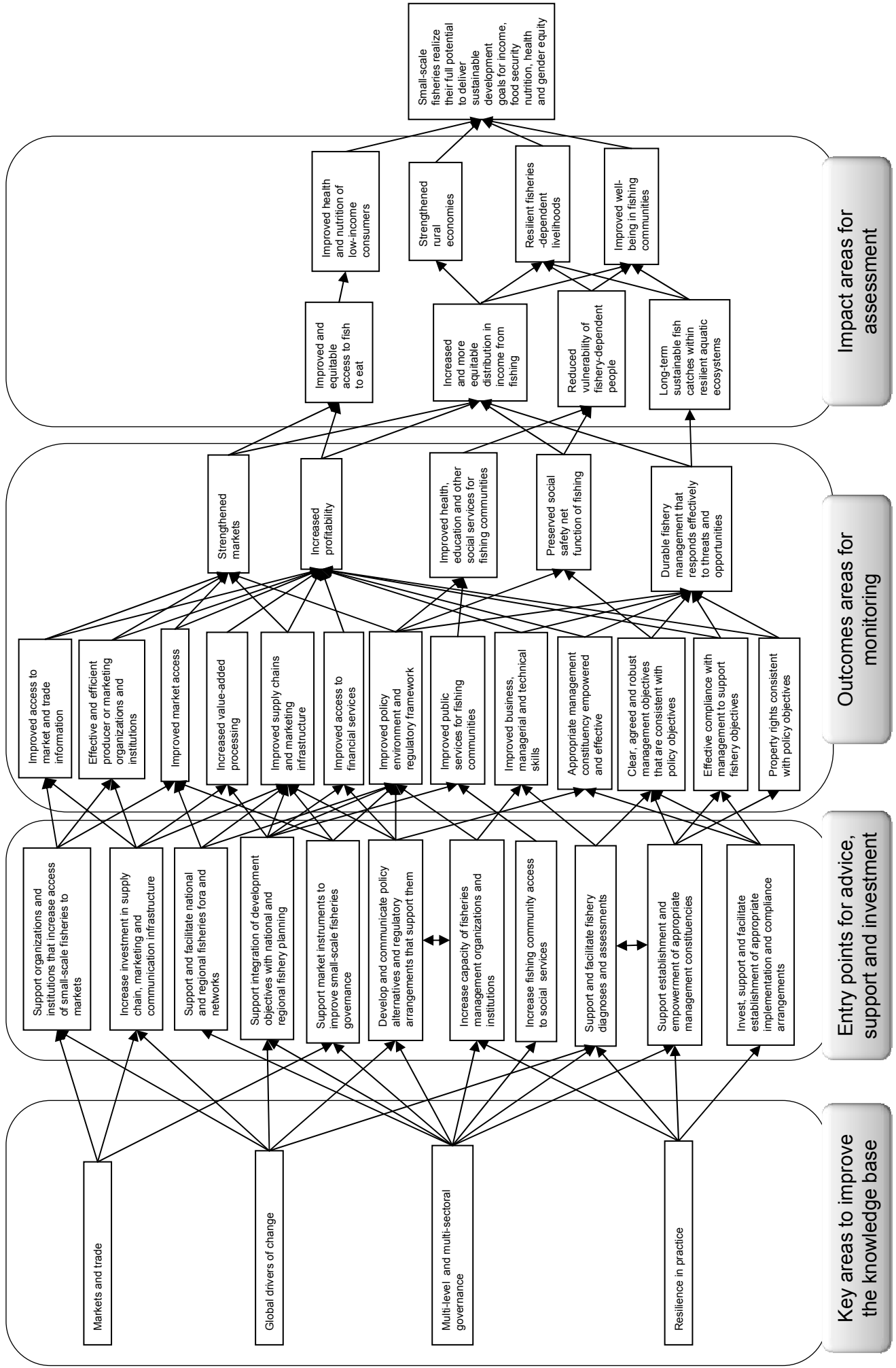


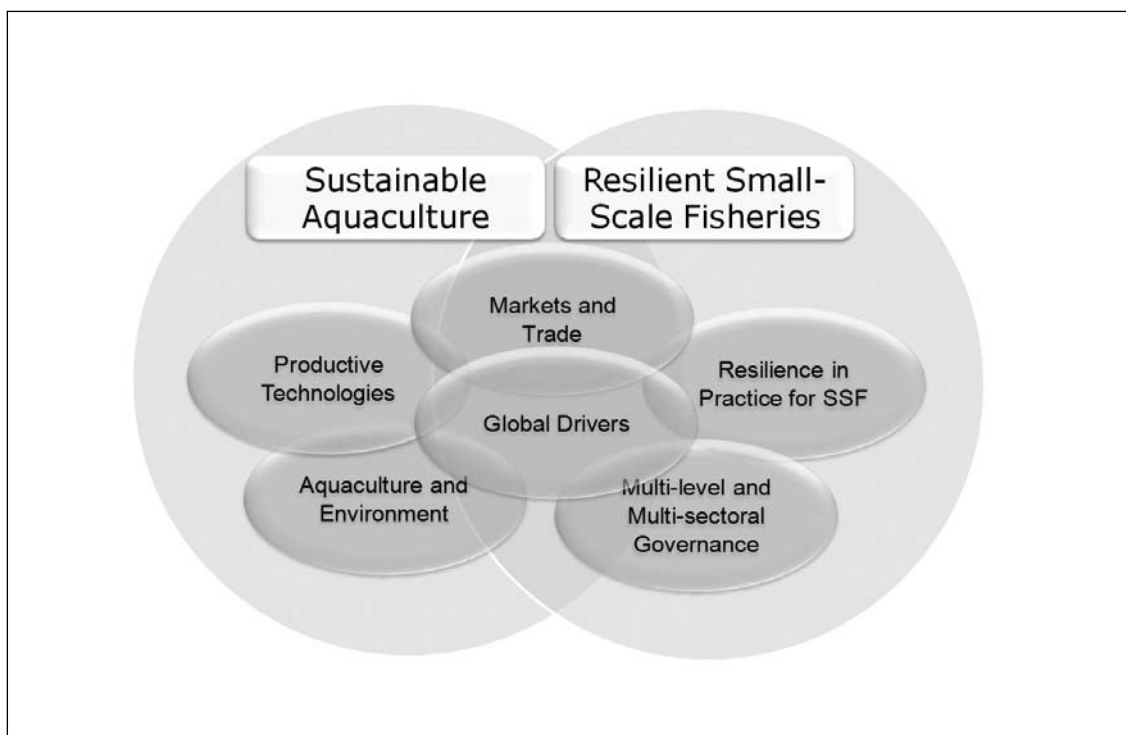
Figure 4. Impact roadmap for Resilient Small Scale Fisheries.

D. Our Research Foci

Using the impact roadmaps, we reviewed the entry points for advice, support and investment to identify where best to focus our research. Based on this analysis, we have identified six focal areas (MTP projects) for research. We chose these because they are the areas where (1) our research effort is most likely to have impact, (2) our comparative advantage as an international agricultural research center is greatest, and (3) we have the capacities to make a major contribution or can acquire them.

Figure 5 shows schematically how these six focal areas relate to our two development challenges. The section headed WorldFish Center Project Portfolio provides the rationale and details of the work we will undertake in each.

Figure 5. Schematic showing six interlinked focal research areas and their relative emphasis with respect to our two development challenges.



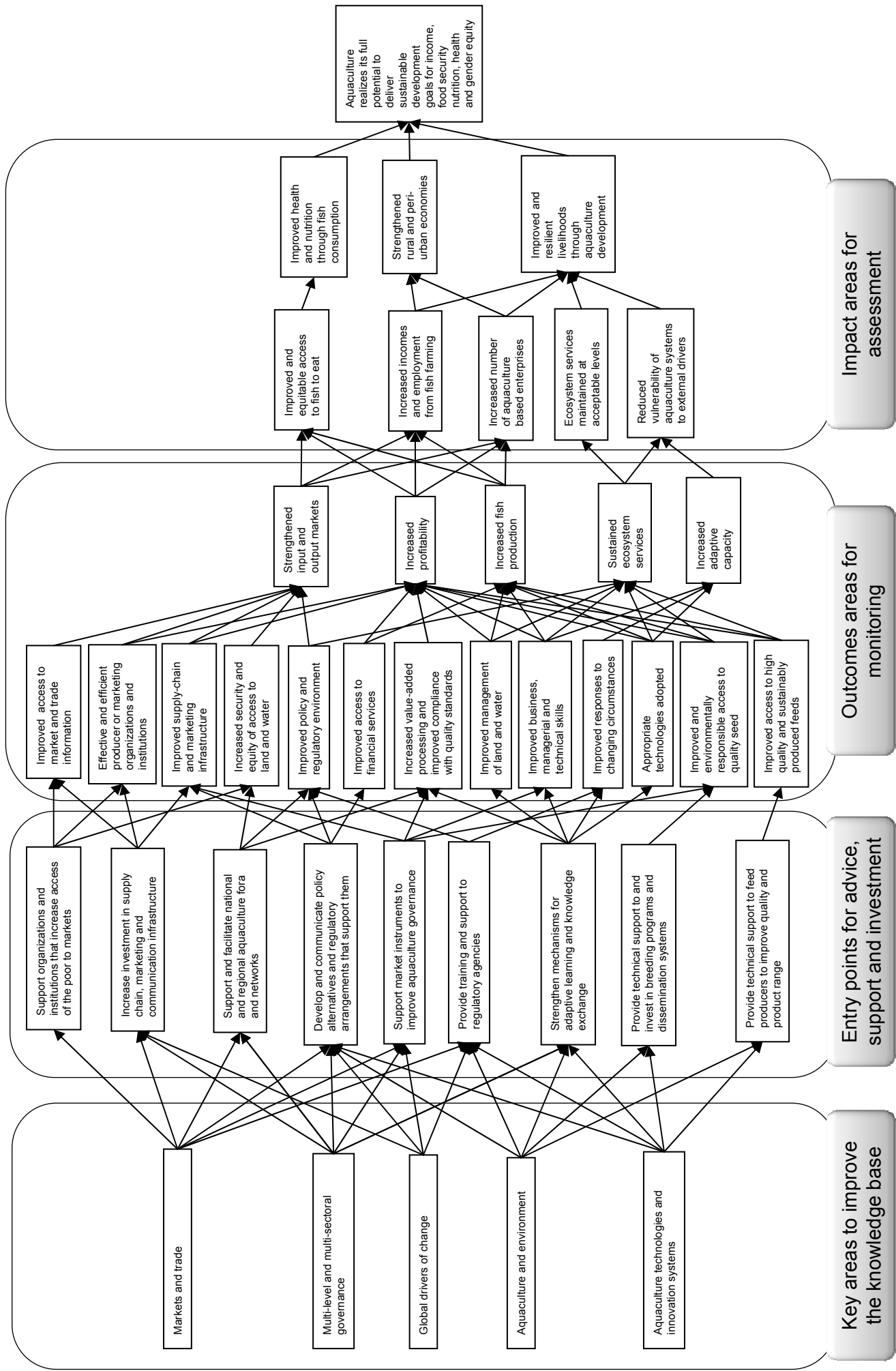


Figure 6. Impact roadmap for Sustainable Aquaculture.

Worldfish programs and CGIAR research priorities

WorldFish continues to review its programs to ensure that they remain relevant to global development needs. We have paid particular attention to congruence between our research and the CGIAR research priorities for the period 2005-2015.¹¹ Many of our programs and achievements support CGIAR system priorities, and we will ensure that we meet the development challenges for fisheries and aquaculture by focusing on and aligning with the core approaches the priorities describe (Table 1). The section on project narratives for 2008-2010 describes how we plan to divide spending among the priorities.

Table 1. CGIAR priorities and relative WorldFish research emphasis				
WorldFish Activities in Relation to CGIAR Priorities				
1. Sustaining biodiversity for current and future generations	2. Producing more and better food at lower cost through genetic improvement	3. Reducing rural poverty through agricultural diversification and emerging opportunities of high-value commodities and products	4. Promoting poverty alleviation and sustainable management of water, land and forest resources	5. Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger
1A: Promoting conservation and characterization of staple crops	2A: Maintaining and enhancing yields and yield potential of food staples	3A: Increasing income from fruit and vegetables	4A: Promoting integrated land, water and forest management at landscape level	5A: Improving science and technology policies and institutions
1B: Promoting conservation and characterization of underutilized plant genetic resources	2B: Improving tolerance to selected abiotic stresses	3B: Increasing income from livestock	4B: Sustaining and managing aquatic ecosystems for food and livelihoods	5B: Making international and domestic markets work for the poor
1C: Promoting conservation of indigenous livestock	2C: Enhancing nutritional quality and safety	3C: Enhancing income through increased productivity of fisheries and aquaculture	4C: Improving water productivity	5C: Improving rural institutions and their governance
1D: Promoting conservation of aquatic animal genetic resources	2D: Genetically enhancing selected high-value species	3D: Promoting sustainable income generation from forests and trees	4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas	5D: Improving research and development options to reduce rural poverty and vulnerability

Key – Relative research emphasis  >  > 

Potential for impact

The justification for our focus must ultimately lie in its potential for impact. What scale of impact can we anticipate from realizing these visions for fisheries and aquaculture? Although we cannot provide a definitive answer yet, we think it will produce development impacts of massive proportions. We believe, for example, that the right investments to develop resilient SSF can secure and improve food access and income for 20 million poor people dependent on them by 2015. Similarly, the right investments in sustainable aquaculture can improve livelihoods and nutrition for 1 billion of the world's poor. Improving the accuracy of these estimates is an important task for us as we move forward, and it is one that CGIAR centers such as ours have been challenged to undertake:

¹¹ Available at www.worldfishcenter.org/cms/list_article.aspx?catID=3&ddlID=346.

“Is anyone working on the agricultural and natural resource equivalent of DALYs [daily disability-adjusted life years] — something that would not only measure the benefit of increased kilos of food, but also estimate the value of public bad avoided, hunger eliminated, children not going blind, women empowered, families lifted over the poverty line, topsoil not clogging up the rivers, natural resource conflicts avoided, families not displaced by flooding or livelihoods improved. Surely with all our combined skill it would be worth a try — anything would be better than watching a senior manager’s eyes glaze over as you try and explain the virtues of (for the umpteenth time) the 40-80% rate of return to agricultural research projects.” (Wadsworth J. 2007. Mobilising financial resources for science, CGIAR Science Forum, Beijing, 4 December.)

Meeting the challenges

Regional engagement

We will continue to focus our work on Africa, Asia and the South Pacific: Africa because it is the continent in greatest need; Asia because of the large number of poor who continue to depend on fisheries and aquaculture for income and nutrition; and the South Pacific because many countries in the region have high levels of poverty and few alternatives to livelihoods provided by aquatic resources. To better manage our research in these regions, we have organized ourselves into six regional portfolios. Each of these has responsibility for conceiving and delivering our science nationally and regionally and for developing and maintaining relationships with regional and national investors and partners. In each region the Center will address priority issues where concerted programs of research can inform policy and improve capacity to manage fishery and aquaculture development. We will pursue this research in countries and sites where opportunities for impact and learning are greatest. To complement this regionally focused research, we have identified focal countries where the Center will seek to engage strategically in support of national programs for fisheries and aquaculture research.

In selecting these focal countries, we have sought to strengthen the potential for learning that has regional and global value. There is high potential for drawing lessons from research in each country where we work that is applicable to other countries. Table 1 summarizes further criteria used to make the final choice of where we work.

Table 2. Criteria for determining WorldFish focal countries	
Human development need	Is there development need in the country based on national poverty and hunger statistics?
Resource potential	Are the fisheries resources and aquaculture potential of major significance in meeting national and regional food security and livelihood needs?
Potential for impact by WorldFish	Is there high potential for improvements in fisheries and aquaculture to deliver impacts on poverty and hunger?
Enabling environment	Does the institutional and security environment in the country make research for development and the delivery of outcomes and impact feasible?
Past relationships and need	Do we have sufficiently well-established relationships with institutions in the country to warrant focal country status, and are we fulfilling a research need that partners cannot?

Africa

In 2006 the Center consolidated its regional portfolios in sub-Saharan Africa to match the CGIAR sub-regions of Eastern and Southern Africa and West and Central Africa. We manage the first of these from our regional office in Malawi and are exploring options for opening a regional office in West and Central Africa as and when funding allows. In 2007 we opened offices in Zambia and the Democratic Republic of the Congo (DR Congo) to pursue more intensive programs of research in these locations,

and an office will be opened in Mozambique in 2008. These changes reflect the directions set out in our Strategy Update and the importance we place on focusing our research on areas of greatest need and opportunity for impact.

Linked to these changes, the Center is recruiting more staff for its Africa program, as well as expanding regional partnerships. Recruitment has focused on adding to our science capacity in areas where we believe we need a core capacity and where we are currently weak. In this vein, recent appointments include a gender specialist and trade economist recruited to Eastern and Southern Africa and an aquaculture specialist in West and Central Africa. We are building on this growth in staff capacity by strengthening our partnerships with advanced research institutes (ARIs) in those areas where their expertise can complement our own, including for example genetic risk assessment, genetic improvement, fisheries ecology and HIV/AIDS. Similarly, we are expanding our partnerships with national agricultural research and extension systems (NARES) to build national and regional capacity and improve the targeting, dissemination and use of the Center's research outputs.

Regionally, we have paid particular attention to developing partnerships with regional and sub-regional institutions. Of special importance is the Center's growing partnership with the Forum for Agricultural Research in Africa (FARA). This was formalized through a memorandum of understanding (MoU) signed in January 2008 and provides the basis for us to strengthen our work in support of the aquaculture and fisheries priority agreed by the FARA General Assembly in 2007. Similarly the Association for Strengthening Agricultural Research in East and Central Africa, one of FARA's sub-regional organizations, has for the first time included fisheries and aquaculture as a priority research area in its new program structure. Through these regional bodies a strong international and regional constituency is emerging for improving the quality of investments in African fisheries using science-based approaches. The Center is working to strengthen the capacity of these regional bodies, and that of their members, to pursue the science required to meet this demand.

Asia

The current geographical foci of the Center's research in Asia are Bangladesh, China, the Greater Mekong region, Indonesia and the Philippines. Over the next 3 years we intend to consolidate our work in these areas and will add staff as required, notably in our aquaculture discipline. We will pay particular attention to developing our partnership with China, as it delivers 70% of the world's aquaculture production. This will build on our MoU with the Chinese Academy of Fishery Sciences to strengthen initiatives that are underway between the CGIAR system and China. The 5-year agreement builds on long-term collaborative work between China and WorldFish, especially in developing improved strains of important farmed fish species. It seeks to promote joint research to improve the sustainability and social and economic impacts of aquaculture development and to support the Chinese government's commitment to poverty reduction through aquaculture production and sustainable livelihoods. These are priorities both for China's rural development strategy and for WorldFish. Specific outcomes of the collaboration will be

- generation of aquaculture production, socioeconomic and environmental data to underpin sustainable rural development;
- strengthened mutual research capabilities;
- increased economic, social and environmental sustainability of fisheries production;
- dissemination of information and increased capacity through training and international exchanges;
- increased protection of key fish genetic resources; and
- production of international public goods for the benefit of the global community.

Within the framework of the MoU, WorldFish has set up a project office based in the Freshwater Fisheries Research Center in Wuxi and a coordinating office in the Chinese Academy of Fishery Sciences in Beijing.

Pacific

Recognizing how critically important fisheries are for many of the Pacific's poor communities, we look to expand our work in this region. We will build on current activities in the Solomon Islands and Fiji in particular but seek to expand regional partnerships that can increase our impact across the Pacific and transfer international public goods (IPGs) to other small island developing states. To help guide this work, we will conduct a review in 2008 of the Center's role in the Pacific.

Improving science quality

One of the Center's comparative advantages is our ability to provide high-quality scientific advice and information to support development. As recognized by the 2006 External Program and Management Review (EPMR), we need to work to maintain that advantage by improving our researcher base and increasing the number of peer-reviewed scientific publications we produce. We use several approaches to help achieve this.

First, our research matrix, comprised of regional portfolios and academic disciplines, helps us focus on developing high-quality scientists and scientific outputs. Recognized international scholars and leaders in their field head each of the Center's three Disciplines: Natural Resources Management, Aquaculture & Genetics, and Policy, Economics & Social Sciences. These Discipline Directors are responsible for setting and reviewing the scientific outputs of researchers, assigning research staff to projects, and developing the competencies and careers of researchers under their responsibility. All researchers belong to a Discipline and benefit from this arrangement.

Second, between 2006 and 2008, the Center has increased its science capacity by using financial reserves to invest in several new appointments, both senior and junior. To manage the consequent risk of increased costs we have expanded our staff capacity in a staged and focused manner to ensure that we attract commensurate increases in funding in the longer term. We are already seeing the benefits of this investment with increases in the number and quality of scientific publications and new research projects aligned with the Center's strategy. In 2006 the number of peer-reviewed publications per scientist rose to 1.29 (from 0.97 in 2005), and in 2007 reached 1.68. In 2008 we expect the number of publications to rise further.

Finally, to complement our investments, we use several mechanisms to further increase the benefits we obtain from our research partnerships with ARIs. These include creating senior research fellowships and supporting sabbatical arrangements, part-time appointments, joint appointments with other CGIAR centers, and adjunct professorships.

Final oversight of the scientific and programmatic quality of the Center's research program is the responsibility of the Board of Trustees (BoT). In 2006, BoT decided to abolish its program subcommittee and to refer all key decisions and oversight responsibilities directly to the full BoT. In addition, it set up the more comprehensive Science Advisory Committee, which advises BoT and management on various aspects of its research agenda. The committee was established in late 2006 and met in August 2007 and April 2008. It includes external experts who work with each discipline to review existing and proposed research and provide advice to management and BoT. At its August 2007 meeting, the Science Advisory Committee reviewed plans for revising the Center's MTP and, in April 2008, reviewed the current MTP 2009-2011.

Box 1: Research Dissemination: Key Publications

A total of 63 peer-reviewed papers on aquaculture, fisheries and the environment were produced in 2007. Some papers were published in journals with a high impact factor rating (such as *Fish and Fisheries*, impact factor 4.97; *Biological Conservation*, 2.58; *Coral Reefs*, 2.40; *Marine Ecology Progress Series*, 2.32; *Canadian Journal of Fisheries and Aquatic Sciences*, 1.95; and *Aquaculture*, 1.37). Selected publications that highlight our work are listed below:

- Abernethy KE, Allison EH, Molloy PP, Cote IM. 2007. Why do fishers fish where they fish? Using the ideal free distribution to understand the behaviour of artisanal reef fishers. In: *Canadian Journal of Fisheries and Aquatic Sciences*, 64:1595-1604.
- Adhuri DS, Visser LE. 2007. Fishing in, fishing out: Transboundary issues and the territorialization of blue space. In: *Asia-Pacific Forum*, 36:112-145.
- Andrew N, Béné C, Hall S, Allison E, Heck S, Ratner B. 2007. Diagnosis and management of small-scale fisheries in developing countries. In: *Fish and Fisheries*, 8:1-14.
- Bell, JD, Leber KM, Blankenship HL, Loneragan, NR, Masuda R. 2007. A new era for restocking, stock enhancement and sea ranching of coastal fisheries resources. In: *Reviews in Fisheries Science*, 16:1-9.
- Béné C, Macfadayan G, Allison EH. 2007. Increasing the contribution of small-scale fisheries to poverty alleviation and food security. In: *Fisheries Technical Papers 481*, Food and Agriculture Organization, Rome, 141 p.
- Bose ML, Dey MM. 2007. Food and nutritional security in Bangladesh: Going beyond carbohydrate counts. In: *Agricultural Economics Research Review*, 20:203-225.
- Heck S, Béné C, Reyes-Gaskin R. 2007. Investing in African fisheries: Building links to the Millennium Development Goals. In: *Fish and Fisheries* 8 (3):211-226.
- Israel DC, Ahmed M, Petersen E, Yeo BH, Hong MC. 2007. Economic valuation of aquatic resources in Siem Reap Province, Cambodia. In: *Journal of Sustainable Agriculture*, Vol. 31, No. 31.
- Ponzoni RW, Nguyen NH, Khaw HL. 2007. Investment appraisal of genetic improvement programs in Nile tilapia (*Oreochromis niloticus*). In: *Aquaculture*, 269:187-199.
- Saiti F, Jamu D, Chisala B, Kambewa P. 2007. Simulation of harvesting strategies for small-scale mixed sex tilapia (*Oreochromis shiranus*, Boulenger, 1896) ponds using a bio-economic model. In: *Aquaculture Research*, 38:340-350.
- Tewfik A, Garcés L, Andrew NL, Béné C. 2007. Reconciling poverty alleviation with reduction in fisheries capacity: Boat aid in post-tsunami Aceh, Indonesia. In: *Fisheries Management & Ecology*, 15:147-158.
- van der Zijpp AJ, Verreth JAJ, Tri LQ, van Mensvoort MEF, Bosma RH, Beveridge MCM (eds.). 2007. *Fishponds in farming systems*. Wageningen Academic Publishers. 311 p.
- Yong-Sulem S, Brummett RE, Tabi TE, Tchoumboué J. 2007. Towards the maximum profitability of smallholder catfish nurseries: Predator defense and feeding-adapted stocking of *Clarias gariepinus*. In: *Aquaculture*, 271:371-376.

Changes to the previous MTP

In 2006 we completed a strategic review of our science project portfolio and future direction. This, augmented by the EPMP and Center-Commissioned External Reviews, was reflected in the MTP 2008-2010 when we realigned our research around resilient SSF (MTP 2008-2010 projects 1-4) and sustainable aquaculture development (MTP 2008-2010 projects 5-8). As noted in the Science Council's commentary, and as agreed and expanded upon by the Center's Science Advisory Committee and BoT, several areas of the MTP needed strengthening as our thinking developed further.

In response, we have refined and focused the MTP 2009-2011 more tightly. We achieved this in two ways, through (1) an improved analysis of the pathways to achieving the development impacts and (2) an extensive regional consultation on the specific areas where the Center can generate the science outputs needed to achieve them. This has resulted in a regrouping and consolidation of MTP projects

from eight to six and a more integrated approach within each of them. As a result, four of the six projects contribute to achieving Resilient Small Scale Fisheries, and five to achieving Sustainable Aquaculture. With these changes we believe the basic structure of the Center's MTP will remain stable until after the next EPMP. Progress toward other EPMP recommendations is detailed in Annex I.

Highlights of the 2009 project portfolio

The main highlights of the 2009 project portfolio are (1) further clarification of the Center's focus and alignment towards addressing the development challenges of resilient SSF and sustainable aquaculture and (2) the grouping of our research priorities into six more integrated and targeted MTP projects. These adjustments direct our research more clearly toward achieving impact and developing coherent IPGs.

Highlights of the 2009 project portfolio are

- a framework for integrated assessment of SSF and new definitions of sustainability,
- a global critical synthesis of the Global Environment Facility (GEF)-funded coral reef management studies,
- a global assessment of rights-based management in SSF,
- an analysis of the distribution of benefits among participants in enhanced floodplain fisheries,
- analyses of livelihood diversification as a means of reducing pressure on wild fisheries,
- tools for assessing the recycling of on-farm wastes developed and evaluated,
- a policy brief on water productivity and aquaculture in Africa and Asia, and
- a review of aquaculture and resilience issues.

Center financial indicators

For 2008, we will meet or exceed all financial benchmarks (see Finance Plan). Although we have exceeded the recommended range for long-term ratios in recent years, the trend has been downward owing to a BoT-approved plan to draw down the reserve over the course of 2005-2007. BoT has now approved plans to further draw down the Center's reserve in 2008. It has, however, decided that it will keep the reserve at no less than 100 days of working capital.

E. Worldfish Center Project Portfolio

MTP project 1: Global drivers of change

Background and rationale

Development challenges in fisheries and aquaculture are shaped by complex combinations of biophysical, social, political and economic forces operating at supranational scales. While we usually have limited scope for altering these global drivers of change, we must identify them and understand and plan for their impacts on fisheries and aquaculture.

Three main drivers of biophysical change are global warming, water scarcity and epidemic disease, including water-borne zoonotic diseases. Fisheries and aquaculture and their dependent populations are already affected by sea-level rise, increased storminess and altered water regimes, but the climate change discourse has so far had little impact on fisheries policy. Similarly, water scarcity causes increased competition for water supplies in multiple-use systems, but only very limited consideration of fisheries and aquaculture requirements enter into these debates. And, while there is now growing recognition of the high prevalence of HIV and AIDS in the fisheries sector, exposure to other neglected and emerging diseases is also high. Moreover, in much of sub-Saharan Africa malnutrition is increasing. Fish is widely considered an important source of micronutrients and protein for the poor, but the understanding of its specific contributions and how they may be enhanced is still poor. We need to understand these impacts and identify adaptive strategies to cope with them.

Globalization, supported by liberalized policies on economic development, affects the fisheries sector both by providing increased opportunities for producers to access global seafood markets and by attracting investment in increasing supply. Meanwhile, rapid population and income growth and urbanization raises demand for fish in developing countries and drives the development of a thriving regional trade in fisheries and a burgeoning aquaculture industry. Understanding these economic drivers and targeting investments to respond is a key priority for the sector.

The purpose of this project, recognizing the scale and importance of these drivers, is to better understand their pathways to impact and likely effects on the capacity of SSF and aquaculture to alleviate poverty and hunger. To achieve this we will focus on five key areas. First, we will undertake global syntheses and analyses of the potential impacts of climate change. Second, we will analyze demand for water from aquaculture and other uses in selected international river systems. Third, we will carry out national and regional analyses of the supply and demand for fish products. Fourth, we will assess the impacts of epidemic disease and a range of occupational health issues, as well as of malnutrition arising from living and working in conditions of poverty, on the contribution of SSF and aquaculture to alleviating poverty and hunger. Finally, we will assess new opportunities for governance reform in fisheries that are emerging from trends in democratization, agricultural policy change and development investment patterns. Research and development support activities needed to inform and implement appropriate responses to these drivers are addressed in the other five MTP projects.

Goal

Poverty reduction policies and investment choices take into account the effects of major drivers on fisheries and aquaculture.

Objectives

1. To strengthen understanding of the potential impacts of climate change on fisheries and aquaculture.
2. To better inform strategies for planning water resource use and foster the appropriate inclusion of fisheries and aquaculture values.
3. To better inform and target policy and investment responses to changing supply and demand for fishery products that result from globalization and demographic change.

4. To raise awareness of the impacts of epidemic diseases (especially water-borne diseases), occupational health issues and malnutrition on the contribution of SSF and aquaculture to reducing poverty and hunger, and encourage networks and communities of practice to address identified threats.
5. To identify new opportunities for governance reform in fisheries emerging from trends in democratization, agricultural policy change and development investment.

Alignment with CGIAR system priorities

Table 3. Project 1 allocation of resources to system priorities (%)												
Project 1	Global Drivers of Change	ID	2B	3C	4A	4B	4C	4D	5A	5B	5C	5D
Output 1	Global syntheses and analyses of the potential impacts of climate change	10	10	10	10	30		10				20
Output 2	Analyses of water requirements for fisheries and aquaculture			10		20	70					
Output 3	Analyses of factors affecting supply and demand for fishery products, including demographic change			10		30				60		
Output 4	Assessment of the impacts of epidemic diseases, health and malnutrition of fishing-dependent people on the contribution of small-scale fisheries and aquaculture to reducing poverty and hunger			10		30			20		10	30
Output 5	Assessment of new opportunities for governance reform from trends in democratization, agricultural policy change and development investment patterns	10		10	10	20		20			20	10

Impact pathway

The Center's work on global drivers of change has the premise that improved understanding of these drivers will lead to a strengthened policy environment and greater institutional capacity to manage fisheries and aquaculture in the face of change. For example, by knowing how and where climate change-induced changes in surface water availability, sea-level rise, and ocean currents influence the productivity and accessibility of fisheries, we can better support the development of more responsive institutions and an improved regulatory environment that is resilient to climate change. This can help increase adaptive capacity, maintain ecosystem services and contribute to reducing the climate vulnerability of both the production systems and the people who depend on them, leading to increased investment in aquatic production and improved livelihoods and well-being.

Similarly, research on the dynamics of global supply and demand for fish can help us understand how economic globalization may affect fisheries and aquaculture. We must also understand how they interact with the trade governance system to affect people's lives, as well as the sustainability of the production systems they depend upon. Research findings on these issues can inform strategies for strengthening marketing systems and lead to better livelihood outcomes for fish producers and improved or maintained access to fish supplies for lower-income consumers. These impact pathways are summarized in Figure 7.

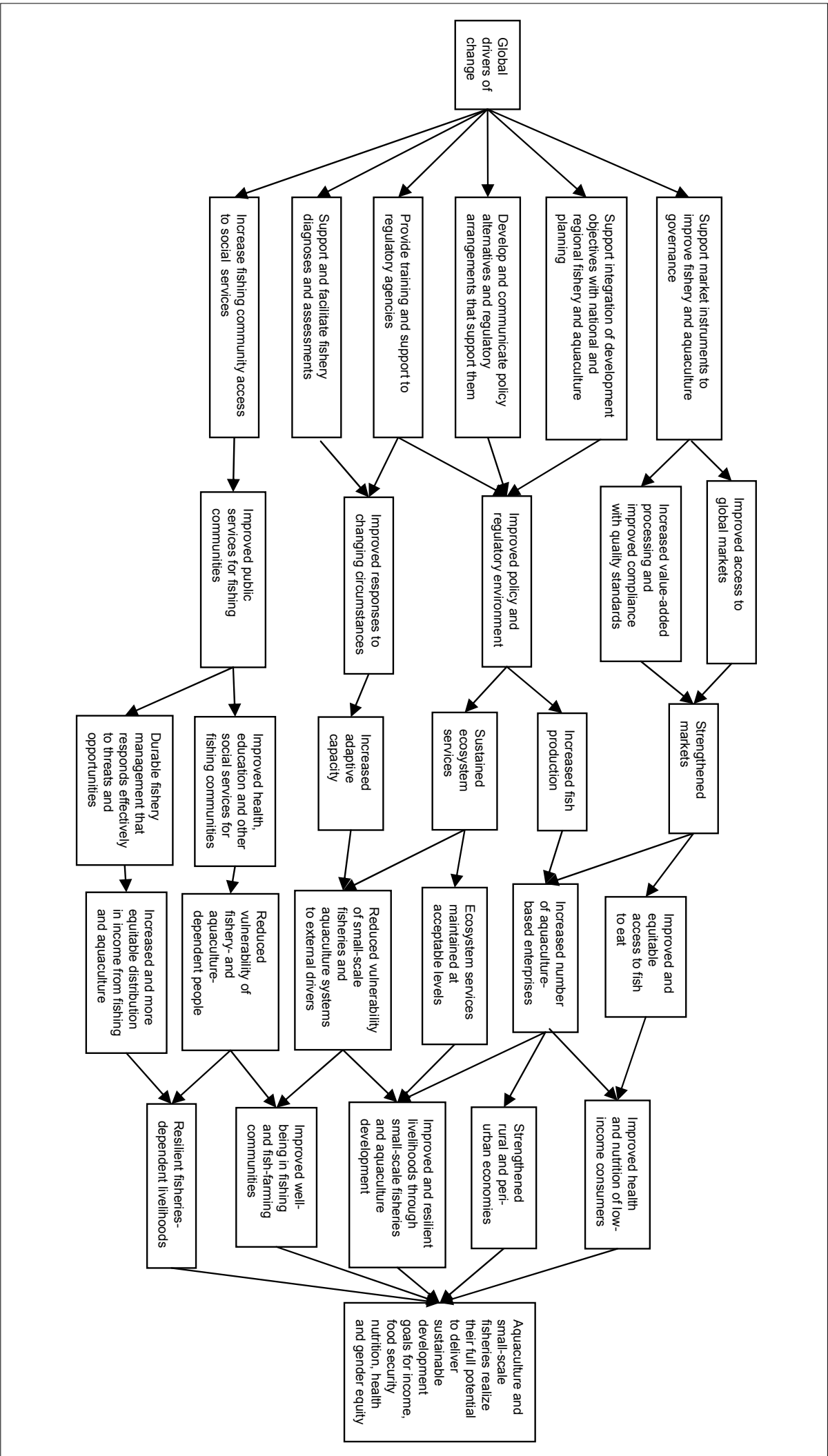


Figure 7. Impact pathway for Project 1.

International public goods

The IPGs produced from this project will largely take the form of new knowledge and understanding to inform policy and investment choices. We anticipate that our papers and policy publications in this area will map out new areas in the landscape that future fisheries governance and investment should address. A particular concern is to integrate the fishery sector with wider development thinking and to frame our analyses in terms of major themes in development policy analysis. Although the research is often concerned with global synthesis as a starting point, an important goal will be to explain local experiences of the impacts of global drivers and to inform adaptation planning and investment options. Engagement with policy processes in the areas of climate, water, trade, food security, social development, agrarian change and poverty reduction will seek to inform and influence their outputs with regard to fisheries, aquaculture and development, and so generate important IPGs. Such higher-level, cross-sectoral outputs, for which we will be participants rather than leaders, are required to influence the policy agenda. Little can be achieved in this macro-level context from a narrow fisheries perspective. Where appropriate, however, WorldFish will act as a convener in such processes, building on initiatives such as Fish for All.

Linkages and partnerships

This project is concerned largely with knowledge generation and synthesis, and with raising awareness and identifying improved strategies for planning and adaptation to address identified threats and opportunities. We envisage, therefore, that we will partner for research mainly with ARIs and existing networks in these “big science” arenas. These include institutions involved in the proposal for the CGIAR-Earth Systems Science Partnership, as well as our own networks in organizations working on environment-development interfaces and in marine science and water resources research. IFPRI is a key partner within the CGIAR for this type of work.

We will build on good linkages through two existing funded projects, on climate change and trends in ecosystem services and their multiple drivers and impacts on the poor. Both projects are funded by United Kingdom (UK) research councils and the UK Department for International Development (DFID). The projects are both conducted in partnership with the University of East Anglia, whose strengths are in Earth system science (e.g., through the Tyndall Centre for Climate Change Research) and development studies. These projects link to consortia of institutions associated with the United Nations Educational, Scientific and Cultural Organization (UNESCO)-supported Global Ocean Ecosystems Dynamics program, including the Centre for the Economics and Management of Aquatic Resources (CEMARE) in Portsmouth, University of Plymouth, and Institut de Recherche pour le Développement (IRD) in Montpellier, France.

For high-level policy engagement, we will build on our connections in the development banks; United Nations (UN) agencies including the Food and Agriculture Organization (FAO), UNESCO, International Labour Organization (ILO), United Nations Environment Programme (UNEP), International Organization for Migration and International Maritime Organisation (IMO); the regional development groupings including the New Partnership for Africa's Development (NEPAD) and Association of Southeast Asian Nations (ASEAN); and regional and bilateral donors and their associated research funding organizations: including the German Agency for Technical Cooperation (GTZ by its German abbreviation), International Development Research Centre (IDRC), DFID, and the European Union (EU).

Our partners in exploring implementation pathways and generating capacity to respond to global drivers will be drawn from national research and government organizations and national and international nongovernmental organizations (NGOs) in the countries in which we have a significant research presence: Bangladesh, Cambodia, DR Congo, Egypt, Malawi, Solomon Islands, Vietnam and Zambia.

Key partners and their roles

Table 4. Project 1 key partners and their roles		
Partner	Output	Role
IDRC/DFID	1	Funding support for mapping vulnerability of fisheries to climate change in Africa
National Environment Research Council (NERC) Quest Fish Project (Plymouth Marine Laboratory [PML]; CEMARE; University of East Anglia; WorldFish; and Centre for Environment, Fisheries and Aquaculture Science [CEFAS])	1	Development of tools for mapping climate vulnerability and analyzing social-economic-ecological scenarios for 20 large marine ecosystems
Mekong River Commission, national Mekong committees	1	Research on climate change impacts and adaptation, and support to policy implementation and institutional strengthening in the Greater Mekong region
Secretariat of the Pacific Community (SPC), South Pacific Regional Environment Programme, South Pacific Applied Geosciences Commission, Australian Agency for International Development (AusAID)	1	Support and research network coordination on climate change in the region; collaborators in Reefbase Pacific and climate change
International Water Management Institute (IWMI), WaterAID, World Bank, major river basin commissions	2	Research partnership in developing models and pathways to impact on policy for improved valuation of water resources and fisheries
IFPRI	3	Develop and update global food system models to examine supply, demand and trade governance (updating <i>Fish to 2020</i>)
FAO, Danish International Development Agency, United States Agency for International Development	3	Funding and technical support to develop global and regional Asian and African supply-demand models for fisheries and aquaculture
Danish Institute for International Studies, IRD (France), CEMARE (UK), PML (UK), University of Stirling (UK)	3	Research partnerships in ARIs on global supply-demand modeling in the fish meal, aquaculture and fish trades
SPC	3	Future fish needs analysis for Pacific island countries and territories
CGIAR Platform on Agriculture and Health, FAO, World Food Programme, Liverpool School of Hygiene and Tropical Medicine, UK Medical Research Council, US National Institutes of Health, International AIDS Vaccine Initiative, Uganda Virus Research Institute, Health Economics & HIV/AIDS Research Division (HEARD, south Africa), Food for the Hungry International (Bangladesh), World Health Organisation.	4	Assistance with convening a research-and-practice network on HIV and AIDS, and on water-borne diseases and human health and nutrition issues in fishing communities
Department of Economics of University of Namur, Catholic University of Louvain (Belgium), Agriculture and Economics departments of Cornell University (USA), departments of fisheries and economics in universities in target countries	5	Develop and implement frameworks and tools for improved valuation of SSF in selected Asian and African countries

MTP project logframe — project 1: Global drivers of change

Table 5. Project 1 logframe				
Outputs		Intended users	Outcome	Impact
Output 1				
<i>Global syntheses and analyses of the potential impacts of climate change</i>				
Output targets 2009	<p>Impact of coral bleaching on reef fisheries analyzed and advice on adaptation disseminated (global).</p> <p>Analysis of the vulnerabilities of national economies to climate change impacts on fisheries (sub-Saharan Africa).</p> <p>Economic vulnerability indices and metrics for comparative analyses of fishery systems developed and applied in Lake Chad and Zambezi Basin.</p>	<p>Coral reef fisheries researchers and managers.</p> <p>International science community, donors, regional planning bodies, national governments.</p> <p>NARES, government agencies, international research and development organizations, NGOs engaged in natural resource management issues.</p>	<p>Fisheries managers adapt policy and regulations to minimize impacts of coral bleaching.</p> <p>National planners use improved understanding of vulnerability to make better investments in adaptation and mitigation.</p> <p>Policy and management decision-makers respond more effectively to the interests of poor communities reliant on aquatic resources, and government agencies and NGOs have the capacity to serve them effectively.</p>	<p>Reduced vulnerability and improved adaptive capacity of fishery-dependent communities.</p> <p>Reduced vulnerability and improved adaptive capacity of vulnerable national economies.</p> <p>Improved food security and incomes for aquatic resource-dependent communities in Nigeria, Cameroon, Niger, Zambia and Malawi and reduced livelihood vulnerability.</p>
2010	<p>Analysis of impacts of climate change and other global drivers on aquaculture production in Bangladesh, Southeast Asia and Africa published.</p> <p>Assessment and application of tools for environmental protection and analyzing effects of climate change on fisheries in Bangladesh.</p>	<p>NARES, government agencies, international research and development organizations, NGOs engaged in natural resource management issues.</p> <p>United Nations Development Program (UNDP), Ministry of Environment and Forestry, Ministry of Fisheries and Livestock, Bangladesh Centre for Advance Studies, local agencies.</p>	<p>Policy and management decision-makers respond more effectively to the interests of poor communities reliant on aquatic resources, and government agencies and NGOs have the capacity to serve them effectively.</p> <p>Contribution of fisheries to larger sector-wide UNDP program to integrate environment and climate change into development planning.</p>	<p>Improved food security and incomes for aquatic resource-dependent communities in Cameroon, Malawi, Nigeria, Niger and Zambia and reduced livelihood vulnerability.</p> <p>Adaptive capacity of local communities enhanced and process of evaluating changes integrated into the planning and investment framework.</p>
2011	<p>Analysis of local impacts of alternative climate change scenarios on fisheries and fishery-dependent communities, including measures taken to mitigate impacts such as water harvesting and infrastructure development, completed in at least two river basins.</p>	<p>National line agencies, provincial and local authorities, NGOs that support them.</p>	<p>Agencies that influence resource-management decisions are better equipped to consider likely vulnerabilities.</p>	<p>Policies developed and implemented to increase adaptive capacity of fishery-dependent communities.</p>

Outputs		Intended users	Outcome	Impact
Output 2 <i>Analyses of water requirements for fisheries and aquaculture</i>				
Output targets 2009	Social, economic and ecological tradeoffs in uses of water and wetlands at local and basin scales in the lower Mekong Basin analyzed.	Mekong River Commission, national government agencies.	Productivity, equity and sustainability considerations explicitly weighed in national water-allocation planning.	Improved water productivity that better reflects local needs and priorities.
2010	Analysis of local impacts of alternative development scenarios with particular reference to dams and other built structures on fisheries and fishery-dependent people completed in at least one river basin. Comparative analysis of the environmental drivers of sustainability of inland fisheries in sub-Saharan Africa completed and disseminated. Water productivity curricula and training materials to serve capacity-building needs developed and disseminated (global).	National line agencies, provincial and local authorities, NGOs that support them. NARES, government agencies, international research and development organizations, NGOs engaged in natural resource management issues. Researchers, policymakers, trainers, universities.	Agencies that influence resource-management decisions are better equipped to consider likely vulnerabilities. Policy and management decision-makers respond more effectively to the interests of poor communities reliant on aquatic resources. Improved water productivity.	Policies developed and implemented to increase adaptive capacity of fishery-dependent communities. Improved food security and incomes for aquatic resource-dependent communities. Increased food production and reduction in poverty.
2011				
Output 3 <i>Analyses of factors affecting supply and demand for fishery products, including demographic change</i>				
Output targets 2009	Regional analysis of fish supply-and-demand trends in the western Pacific Ocean .	SPC, international donors, national governments.	Improved planning and policy based on better understanding of the gaps between domestic supply and demand.	Less vulnerable fishing communities through better policy.
2010	Analysis of the impacts of regional and global market integration on supply to low-income African consumers and livelihoods of fishing-dependent people in sub-Saharan Africa . Analysis of demographic changes affecting small-scale fisheries and aquaculture in key countries in sub-Saharan Africa .	Regional economic communities, United Nations Conference on Trade and Development (UNCTAD), FAO, national governments. National governments, regional economic communities, NGOs.	Improved policy environments for developing pro-poor fish-marketing strategies. Improved public sector planning; planning basis for service delivery and private sector investment strengthened.	Improved access to nutritious food for low-income consumers in Africa; strengthened rural economies based on improved access to markets. Fisheries livelihoods sustained and sector development better targeted at the poor.
2011	An analysis of impacts of alternative scenarios of demographic, environmental and market changes on production, consumption and income in Southeast Asia . An analysis of mobility and migration in small-scale fisheries in developing countries.	Government agencies, regional bodies, researchers. UN agencies, regional economic communities, national governments.	Better understanding of likely impacts of shifts in market demand under urbanization and economic growth and environmental shocks. Better understanding of trends, constraints and benefits arising from mobility and migration; improved basis for regional policy development.	Reduced vulnerability and improved likelihood of adaptation. Improved livelihood security and enhanced resilience of fisheries in which migrants and mobile populations play a major role.

Outputs	Intended users	Outcome	Impact	
Output 4				
<i>Assessment of the impacts of epidemic diseases, health and malnutrition of fishing-dependent people on the contribution of small-scale fisheries and aquaculture to reducing poverty and hunger</i>				
Output targets 2009	Options for reducing risk and impact of HIV/AIDS through economic investments in SSF in sub-Saharan Africa identified, documented and disseminated.	NGOs, fishing communities, private sector, fisheries departments, donors.	Investment options in key economic areas affecting HIV/AIDS vulnerability of fishing communities made available.	Improved capacity among fisheries stakeholders to manage impact of HIV/AIDS in the sector.
2010	<p>National risk assessments of vulnerability to HIV/AIDS and priorities for investment in Malawi, Mozambique and Zambia.</p> <p>Guidelines and models for reducing risk and impact of HIV/AIDS through improved investments in fisheries and aquaculture developed and disseminated.</p> <p>Community of practice on health, fisheries and aquaculture established, with focus on water-borne diseases.</p> <p>Assessment of current role of fish for nutrition security among populations vulnerable to malnutrition in key countries in sub-Saharan Africa.</p>	<p>NARES, government agencies and NGOs engaged in managing the fisheries sector to reduce vulnerability to HIV/AIDS.</p> <p>NGOs, fishing communities, farmer groups, national governments.</p> <p>Health-sector organizations, including government ministries, World Health Organization (WHO), ILO, Joint UN Programme on HIV/AIDS (UNAIDS).</p> <p>Food security monitoring systems, national government agencies, NGOs, WHO.</p>	<p>Improved knowledge of the risk factors, informing national strategic responses to HIV/AIDS linked to wider sustainable support processes available at local scales.</p> <p>Increased investments in good practice support options in fishing communities, along marketing chains and among fish farmers.</p> <p>Priority health investments in coastal and riparian communities identified.</p> <p>Improved basis for programs targeting malnutrition crisis; increased recognition of the value of the fisheries sector regarding nutrition and food security.</p>	<p>Improved capacity at national and local level to manage impact of HIV/AIDS in the sector.</p> <p>Reduced vulnerability in sector; improved income and health benefits from fisheries and aquaculture.</p> <p>Improved ability to respond to chronic and epidemic disease that undermine sectoral efficiency goals and impair the ability of fishing-dependent people to escape poverty.</p> <p>Improved responses to malnutrition crisis; improved access to high-quality nutrition among vulnerable populations.</p>
2011	Assessment of the impact of water-borne diseases on fishing and fish-farming communities.	Health-sector organizations, including government ministries, WHO, ILO, UNAIDS.	Priority health investments in coastal and riparian communities identified.	Improved ability to respond to chronic and epidemic disease that undermine sectoral efficiency goals and impair the ability of fishing-dependent people to escape poverty.

Outputs	Intended users	Outcome	Impact	
Output 5 <i>Assessment of new opportunities for governance reform from trends in democratization, agricultural policy change and development investment patterns</i>				
Output targets 2009	<p>Policy briefing and papers on rights-based approaches to fisheries governance in Asia and Africa.</p> <p>Review of impact of key national policy reforms in sub-Saharan Africa on fisheries and aquaculture (decentralization, privatization of government services and integrated economic planning).</p>	<p>UN High Commission for Refugees, global security networks, donors, national governments, NGOs, other civil-society organizations.</p> <p>National governments, regional economic communities, development banks, donors.</p>	<p>Improved appreciation of the need for broad consideration of human rights in a rights-based approach to fisheries.</p> <p>Improved understanding of policy needs of fisheries and aquaculture under prevailing policy conditions.</p>	<p>Reduced vulnerability of fishing-dependent people; improved well-being (including gender equity) livelihood security and outcomes in participatory governance of resources.</p> <p>Macro-policies fine-tuned to offer more support to fisheries and aquaculture, thereby increasing benefits to wider group of stakeholders.</p>
2010	<p>Analysis of the role of fisheries sector in the rural economy in Southeast Asia and Africa: labor sink, safety net or engine of growth?</p> <p>Fisheries and aquaculture development options in small island developing states in the Pacific.</p>	<p>NEPAD, ASEAN, development banks, national governments.</p> <p>SPC, donors, national governments.</p>	<p>Fisheries-management targets and fisheries policy are tailored to the role that fisheries play —or could optimally play — in the economy.</p> <p>Potential and limitation of different strategies for fisheries and aquaculture development analyzed.</p>	<p>SSF contribute more to poverty reduction in least-developed countries through more effective policy formulation and investment support.</p> <p>Improved policy formulation and investment targeting leads to more effective and appropriate support to rural livelihoods in small island developing states.</p>
2011	Guidelines for reducing fishing capacity in SSF.	World Bank, FAO, national governments, international conservation NGOs.	Improved understanding of options for reducing fishing capacity where overcapacity demonstrably exists in SSF.	Improved flow of benefits from fisheries to poverty reduction; reduced vulnerability of fishing-dependent people.

MTP project 2: Markets and trade

Background and rationale

The 2008 *World Development Report* emphasizes the critical role of trade in agricultural produce and services as a means of reducing poverty. Small-scale producers of primary commodities, such as farmers and fisherfolk, are seen as foci for development investment to enable them to participate in and benefit from improved access to markets for their products.

The global fish trade rose more than fivefold from \$15 billion in 1980 to \$78 billion in 2005, with developing countries accounting for more than half of the global export value. Asian developing countries are the largest fish producers, accounting for some 55% of global production, and aquaculture provides a major and increasing share. For the world's 40 least-developed countries, fish products are the third largest export commodity after petroleum and garments.

Small-scale fishers and fish farmers are connected to the global market for fishery products to varying degrees. But, while cross-border and rural-urban trade brings new opportunities for small-scale producers, it also adds to the pressure on aquatic resources and the inputs required for aquaculture development. The costs and benefits of increasing market integration are not yet fully understood and are a major information gap in both the fishery and global trade fields. A key concern regarding linking small-scale producers with the buoyant global consumer demand for fishery products is to ensure that strengthened market access does not cause accelerated resource depletion in capture fisheries or uncontrolled, environmentally and socially unsustainable growth in aquaculture. The dynamics of supply and demand and their impact on the resources and livelihoods of fishery-sector workers is addressed by MTP Project 1, while finding effective ways to use market-based instruments in resource and environmental management is an element of our research on multi-level, multi-sectoral governance (MTP Project 3). Our focus in MTP Project 2 is on developing practical ways in which producers and traders can take advantage of the benefits, while avoiding the negative consequences of greater market integration. This may involve working with producers to develop ways of critically assessing which markets to focus on to help them realize their own development goals, and to trade off risks and potential rewards in engaging with the highly segmented and differentiated markets for aquatic produce. For example, the aggressive promotion of greater global market integration for a small-scale capture fishery may be an inadvisable entry point for poverty reduction in situations where local nutritional dependency on fish is high, or where resources are poorly governed and thus likely to be rapidly depleted. Similarly, promoting the uptake of aquaculture technology may not be successful until functional markets for inputs are developed and can provide producers guaranteed access to high-quality seed and feed at reasonable cost. Without these favorable market environments in place, promoting aquaculture investment by poor, small-scale farmers may place them at unreasonable risk.

Where opportunities for strengthening input markets and access to regional and global output markets are identified, access to them may be limited by capability deficits among small-scale producers. For example these may take the form of lack of access by entire fishing or farming communities to the basic infrastructure necessary to meet product quality standards in higher-value urban, regional and global markets (e.g., cold storage and transportation facilities). There may also be a lack of access to information on emerging market demand-and-supply patterns, prices and alternative marketing channels. Where information is available, producers and traders lacking functional literacy (including in digital technology) may not be able to take advantage of opportunities. In some cases, small-scale producers may simply lack access to sufficient capital to invest in upgrading their products to meet product quality demands, or to invest in chain-of-custody certification schemes to access differentiated markets, such as those for organic, eco-labeled or fair-traded products. Solutions to these problems are largely known in outline: improved infrastructure provision; support to market information systems; appropriate credit provision; shared investment, risk and concerted challenge to market power through the development of producer organizations; improved extension service and enterprise development advice; and so on. What is missing is analysis that helps identify the priority interventions in any given set of circumstances, how to finance the provision of these services sustainably, and how to ensure that these services are effectively targeted to ensure equal opportunity to the poor. The distributional

impacts of variable access to higher-value markets is particularly a concern with respect to gender roles and relationships in market chains.

Similarly, substantial research is required to understand what investments will make markets work best for poor fishers and fish farmers and how these should be applied. Particularly in aquaculture, strengthening input markets is required to remove a major constraint on the sector's growth in resource-poor settings. Credit markets, and markets for high-quality seed and feed, are particularly important and amenable to being developed through public-private partnerships. Partnerships can also be developed around other areas of service provision, such as for information, infrastructure and technology development. One critical area for public-private partnerships is in developing schemes to assure product quality (e.g., analysis of hazards at critical control points), biosafety procedures and other processes necessary to create the conditions for access by small-scale producers to international markets. Again, the relative need and efficacy for each of these investments remains largely unknown and needs to be informed by research.

In light of this analysis the purpose of this project is to enhance the benefits that poor fishers and farmers secure from global and regional market integration. To achieve this the project will focus on three areas. First, we will develop and disseminate a set of diagnostic tools for the analysis of costs and benefits of promoting market integration, including analyses of feasibility, risk and opportunity. Second, we will identify and address barriers to entry by the poor into higher value-added commodity chains, including regional and global markets and those for fair-trade or eco-labeled products. Third, we will assess the role of public-private partnerships in addressing key market constraints to aquaculture development.

Goal

Increased benefits to small-scale producers from global and regional market integration.

Objectives

1. To develop diagnostic tools and strategic policy advice to inform and support appropriate fisheries and aquaculture marketing investments that benefit the poor.
2. To identify and address barriers to entry by the poor into higher value-added commodity chains, including regional and global markets, and those for fair-trade or eco-labeled products.
3. To strengthen the role of public-private partnerships in addressing key market constraints to fisheries and aquaculture development.

Alignment with CGIAR system priorities

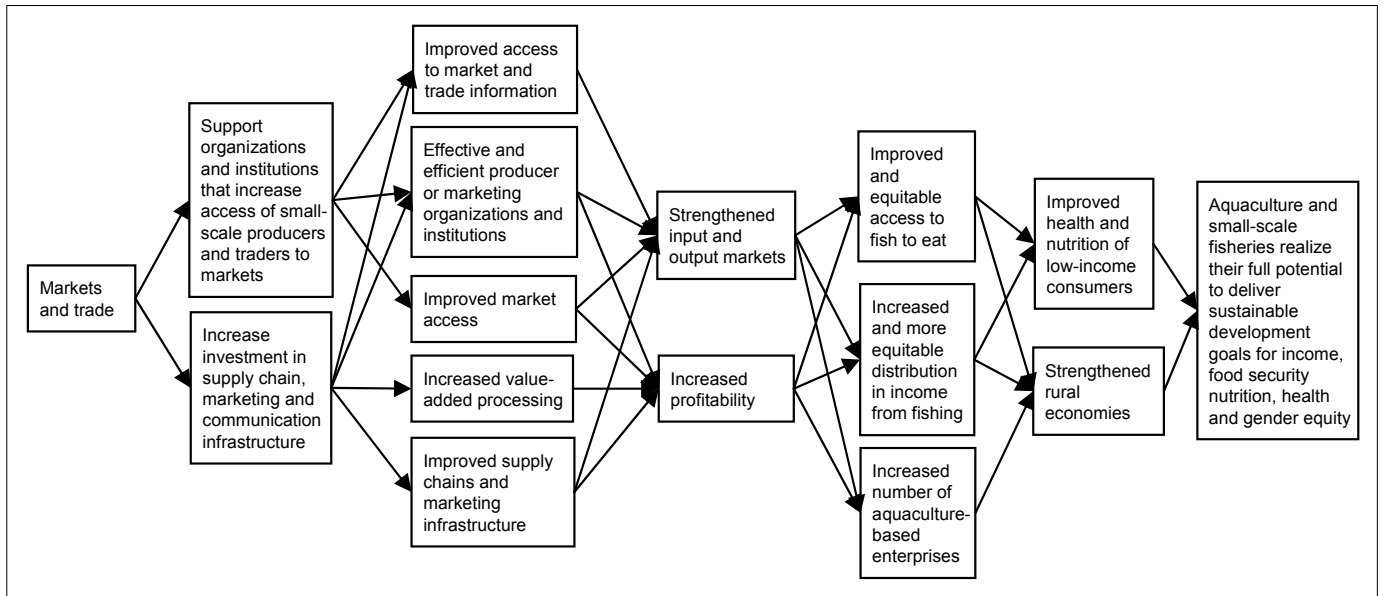
Table 6. Project 2 allocation of resources to system priorities (%)				
Project 2	Markets and trade	3C	4B	5B
Output 1	Diagnostic tools and policy advice to inform and support appropriate fisheries and aquaculture marketing investment strategies that benefit the poor	60	10	30
Output 2	Assessment of barriers to entry by the poor into higher value-added commodity chains	70		30
Output 3	Assessment of the role of Public-Private Partnerships in addressing key market constraints to aquaculture development	70		30

Impact pathway

Market failures caused by poor governance, inadequate infrastructure or limited information flows constrain the ability of the poor to benefit from buoyant markets for fishery products. This project will address these failures through research on fish marketing and trade systems. We will design the research to identify and address the key sources of failure in differing contexts. We will disseminate results from this work to strengthen the market power of small-scale producers and increase the equity

and efficiency of input and output supply chains. Gendered analysis of development impacts and opportunities is a priority because women are predominant in many trading and value-addition sectors. The feminization of lower-margin activities is an emerging feature of many global value chains, including those in shrimp aquaculture in South Asia. The impact pathway for this research is summarized in Figure 8.

Figure 8. Impact pathway for Project 2.



International public goods

We will undertake research into how to facilitate access for small-scale fishers and farmers and small and medium-sized enterprises (SME) to input and output markets at a range of geographic scales and at levels appropriate to their current capacity and their livelihood asset and risk profiles. We will develop and test interventions to strengthen the capacity of the poor to gain access to improved markets, including through partnership with the private sector, where possible. We will then synthesize and disseminate lessons to donors, policymakers, NGOs and private sector institutions to help them scale up and scale out successful models and to provide appropriate policy frameworks for fishery and aquaculture sector development. There will be a strong gender component, as fish value chains contain several strongly gendered linkages.

This research will generate publications that will improve understanding of how to help small-scale producers strengthen their livelihoods through more informed and equitable access to local, regional and global markets for both high- and low-value products. We will develop and disseminate policy advice on the most effective means of connecting farmers and fishers to these dynamic, diverse and segmented markets to maximize development benefits and minimize the social and environmental costs of inequitable and uncontrolled access to resources that can occur when resources utilized and managed by marginalized and vulnerable producers are connected with markets dominated by powerful regional and global interests. We will enhance knowledge of fishery commodity-trading systems and of key parts of agricultural innovation systems, including input markets and the role of regulatory services in mediating market access.

An important outcome from this stream of research will be heightened awareness of the contributions that small-scale local and cross-border trading makes to maintaining the supply of fish for low-income consumers in the context of increased export orientation. The comparative advantages of various investments in addressing identified marketing constraints will be highlighted in various WorldFish publications and policy briefs, as well as through workshops.

Linkages and partnerships

To improve access to input and output markets in aquaculture and strengthen the capabilities of small-scale producers to access higher-value urban, regional and global markets, a combination of research, policy advice and targeted implementation is required. Some of the work involves technology development and service provision in areas such as food safety and product quality. While some of the necessary skills exist within WorldFish, many others are better sourced in NARES, other CGIAR centers (especially IWMI, IFPRI, International Livestock Research Institute [ILRI]), ARIs, NGOs and the private sector. We will therefore work in partnership with each as appropriate.

For Output 1, developing diagnostic tools and policy advice on market-strengthening investment choices, key partnerships are with ARIs (including other CGIAR centers) and NGOs working to analyze the costs and benefits in increased market integration. Existing partnerships in this area are with the Danish Institute for International Studies and Wageningen University in the Netherlands. We will include in our partnerships civil-society critics of globalization as a strategy for poverty reduction, as well as its promoters in multilateral and bilateral development agencies. This will bring balanced, critical and informed results, formulated at appropriate scales. Partners may include producer and consumer organizations, advocacy groups such as the Environmental Justice Foundation and the International Collective in Support of Fishworkers and civil society and private sector organizations involved in fair-trade and eco-labeling schemes. Donor agencies and international organizations investing in and promoting the strengthening of markets in the fishery sector (World Bank, DFID, FAO, GTZ, EU, UNCTAD, FAO) are both partners and audiences for our research outputs.

For Output 2, identifying and promoting strategies to increase the capacity of the poor to access improved markets, our partnerships will be mostly with community-based organizations (including women's groups), national government departments, local government, NGOs and private sector organizations involved in capacity development and service provision. These may include education providers, microfinance organizations, producer organizations and fisheries co-management agencies. The emphasis is on working with these organizations to identify practical means of strengthening peoples' and communities' capacities to access and benefit from buoyant world seafood markets.

For Output 3, our partnerships will be with organizations already working with public-private partnerships and direct partnerships with private sector actors involved in the fishery and aquaculture sectors. These include seafood companies, technical service providers, privatized extension services and information technology providers.

For all three outputs, effectively scaling up and scaling out from project results to maximize development impact demands the effective dissemination of key results and policy advice. These are roles that FAO, UNCTAD, other UN organizations, national and international NGOs, and producer organizations are often better placed than WorldFish to play. We will therefore work to strengthen our linkages with these partners in these areas.

Key partners and their roles

Table 7. Project 2 key partners and their roles		
Partner	Output	Role
CEMARE, University of Portsmouth and Imperial College (UK) General Authority for Fish Resources Development (Egypt)	1	Market survey research on farmed tilapia
Catholic University of Louvain (Belgium), Institut Africain pour le Développement Economique et Social (DR Congo), Centre de Formation et de Recherche Coopératives (Rwanda)	2	Contribute to study of SSF marketing chains and potential to improve livelihoods of poor
African Wildlife Foundation, World Wildlife Fund/Worldwide Fund for Nature (WWF)	2	Supporting research on collective action to improve fish marketing
Departments of fisheries in Bangladesh, Cameroon, China, DR Congo, Ghana and Malawi; Universities of Hohenheim and Kassel (Germany)	1	Design tools, collect data and pilot recommendation domain tools
Department of Fisheries, Cameroon	1	Support to small-scale peri-urban catfish producers
DFID (UK)	1	Synthesis and dissemination of lessons learned on small-scale aquaculture development in West Africa
Caritas (Bangladesh)	1	Development of aquaculture among Adivasi tribal people in north and northwest Bangladesh
Marine Stewardship Council, WWF, SeaFish for Justice, International Collective in Support of Fishworkers (ICSF)	1	Improved knowledge and implementation of eco-labeling and fair-trade considerations in the fish trade
Danish Institute for International Studies, European Union, Stirling University, Kasetsart University (Thailand), Nha Trang University (Vietnam)	1	Development and testing of an ethical aquaculture index
Ministry of Agriculture (Bangladesh)	1, 3	Partner in implementation of Bangladesh-based projects
Shrimp Foundation (Bangladesh)	1, 3	Increasing access of women to shrimp value chain; implementing quality-assurance scheme among small-scale producers
Project Concern International (USA)	2	Improvement and commercialization of pond-raised fish in Malawi via market-based credit and technical-support systems
BetterWorld Together Foundation (USA)	2,3	Increasing access of small-scale farmers to market-based credit and technical support services in Malawi, DR Congo and Ghana
Chemonics (USA)	2,3	Bangladesh shrimp export promotion via certification and traceability
INFOFISH, GTZ/Federal Ministry for Economic Cooperation and Development (Germany)	3	Assist with developing public-private partnerships

MTP project logframe — project 2: Markets and trade

Table 8. Project 2 logframe				
Outputs		Intended users	Outcome	Impact
Output 1				
<i>Diagnostic tools and policy advice to inform and support appropriate fisheries and aquaculture marketing investment strategies that benefit the poor</i>				
Output targets 2009	Policy brief on prospects for aquaculture development in different market environments (Malawi, Cameroon, DR Congo, Ghana).	Donors, agriculture and aquaculture sector planners in governments.	Use of resources to support aquaculture development optimized and effectively targeted.	Increased resilience of small farms and poverty reduction through increased aquaculture participation.
	Review paper and policy brief on niche markets for high-value reef products for small-holder coastal farmer-fishers in the Pacific and ornamental fish trade in Africa .	Regional and national policymakers, investors and donors.	Informed investment in fisheries and aquaculture marketing.	Improved incomes and fishery and aquaculture contributions to poverty reduction and rural development.
	Policy brief on options for optimizing tradeoffs between increased global fish market integration and supply of low-cost fish to low-income consumers in Africa .	Donor agencies; international finance organizations; fisheries, finance and economic planning departments; export-promotion agencies in African governments; NEPAD.	Informed investment and development strategies for engagement with global markets in different fishery products from African waters.	Improved contribution of fisheries to local economies and national government revenues in African countries; improved or maintained access to lower-cost fish for low-income African consumers.
	Analysis of fish supply and demand among the poor in Africa's growing cities.	Policymakers, municipal authorities, UN agencies, donors and NGOs working with fishing communities and/or on nutrition issues.	Improved planning basis for public and private sector investment; enhanced monitoring of food security among urban poor.	More sustained fish supply to urban poor; business opportunities for urban poor enhanced.
	Analysis of opportunities for and best practice in targeting microfinance to promote pro-poor livelihoods in the fish value chain (DR Congo, Ghana).	Microfinance institutions, donors, NGOs.	Improved access to microfinance in the fish value chain.	Improved and more resilient fish-based livelihoods.
	Analysis of the role of SSF and aquaculture in reducing harmful trade in bushmeat (DR Congo) , with relevance to bushmeat trade in forest regions of West and Central Africa .	NGOs, governments, donors.	Better targeting of interventions intended to reduce trade in bushmeat.	More effective use of resources, particularly those of environmental agencies and NGOs, and reduction in bushmeat trade.
2010	Index of ethical aquaculture developed and promoted.	Developed country importers, consumers, developing country producers, ARIs, donors, seafood import/export companies.	Provide a basis for informed choice by consumers of seafood to support fair trade and environmental sustainability and	Reduce impacts of aquaculture on environmental services and on inequality; increase benefits for poverty reduction through trade.

<p>2011</p>	<p>Global review paper and public information briefs and press articles synthesizing assessment of costs, benefits and constraints to small-scale producers in accessing international markets.</p> <p>Ex-post study of impact of aquaculture intensification on the poor.</p> <p>Understand role of aquaculture SME in creating an enabling environment for small-scale producers.</p>	<p>Donor agencies, seafood companies, regional economic development agencies, developed country consumers, developing country producer organizations.</p> <p>Small-scale farmers, consumers.</p> <p>Small-scale producers, NGOs, producer organizations.</p>	<p>Access to international markets for small-scale producers improved.</p> <p>Improved and more sustainable pro-poor aquaculture policy environments.</p> <p>Increased, sustained uptake of aquaculture by small-scale producers and SME.</p>	<p>Reduced poverty and improved food security.</p> <p>Reduced poverty and improved food security.</p> <p>Reduced poverty and improved food security.</p>
<p>Output 2 <i>Assessment of barriers to entry by the poor into higher value-added commodity chains</i></p>				
<p>Output targets 2009</p> <p>2010</p>	<p>Analyses of mechanisms to connect landless and socially marginalized groups of aquaculture producers to inputs, including water (Bangladesh).</p> <p>Ex-post study of impact of contract farming on small-scale producers.</p> <p>Typology and toolkit of options to improve the livelihoods of the poor involved in postharvest activities in Africa.</p> <p>Practical tools (manuals, investment guidance briefs) for identifying constraints to aquaculture adoption for fishers who collect wild seed (Philippines).</p>	<p>Small-scale producers.</p> <p>Small-scale producers, NGOs, producer organizations.</p> <p>Small-scale traders (women and men), donors, local and national government and other service providers, community-based organizations.</p> <p>Local government investment promotion agencies, NGOs involved in SME development, fishers and fish farmers.</p>	<p>Sustained uptake of aquaculture by landless, socially marginalized people.</p> <p>Increased, sustained uptake of aquaculture by small-scale producers and SMEs.</p> <p>Small-scale traders have improved access to livelihood support services.</p> <p>Establishment of aquaculture as a livelihood-diversification strategy for poor fishers.</p>	<p>Improved incomes and fishery and aquaculture contributions to rural development in small island developing states.</p> <p>Reduced poverty and improved food security.</p> <p>More resilient livelihoods, increased income from fish trade.</p> <p>Improved incomes and fishery and aquaculture contributions to rural development in coastal environments in Southeast Asia.</p>
<p>2011</p>	<p>Understand alternative extension approaches.</p> <p>Assessment of impacts on poverty of value chain and market interactions stemming from aquaculture and fisheries production, along with opportunities for livelihood improvements.</p>	<p>Small-scale producers, NGOs, producer organizations.</p> <p>Policymakers, donors, investors, consumers.</p>	<p>Increased, sustained uptake of aquaculture by small-scale producers and SME.</p> <p>Coherent policies for pro-poor aquaculture and fisheries.</p>	<p>Reduced poverty and improved food security.</p> <p>Reduced poverty and improved food security.</p>

Outputs		Intended users		Impact
Output 3				
<i>Assessment of the role of Public-Private Partnerships in addressing key market constraints to aquaculture development</i>				
Output targets 2009	Assessment of small-scale shrimp producers' participation in quality assurance scheme (Bangladesh).	Farmers, NGOs, exporters.	Increased access by the poor to international markets, contributing to increased income and wider development through rural growth linkages.	Sustainable production of export commodities by small-scale producers.
2010	Models for successful Public-Private Partnerships in aquaculture disseminated. Models for Public-Private Partnerships in providing market information for fishery and aquaculture sector in tsunami-affected coastal areas of Banda Aceh, Indonesia.	Public and private sectors, farmers. Fishery development organizations, donors, fish producer organizations, local and district government departments, information and communication technology for development (ICT4D) community.	Increased supplies of quality seed and feed. Farmers and fishers gain access to improved market information, resulting in more competitive markets and fairer prices for producers.	Increased food security and decreased poverty. Increased income and livelihood security; greater proportion of value captured locally, fostering rural growth linkages and reduction in coastal poverty in tsunami-affected areas in Aceh.
2011	One Public-Private Partnership scheme to increase provision of seed or feed to poor producers developed for implementation.	Public and private sectors, farmers.	Increased supplies of quality seed and feed.	Increased food security and decreased poverty.

MTP project 3: Multi-level and multi-sectoral governance

Background and rationale

Small-scale fisheries and fish-farming enterprises in the developing world are numerous, diverse, geographically dispersed, and vulnerable to forces external to the sector. Historically, development interventions for this sector have sought to reduce poverty through accelerated economic growth, improvements in technology and infrastructure, and market-led economic policy reform. The limited success of these interventions has led to a reexamination of the causes of poverty in SSF of strategies for uptake by SMEs in aquaculture, and in particular to reform of how fisheries are governed.

A key challenge facing both SSF and aquaculture is the indifference and neglect of governments. In a recent global review of 281 national policy papers, including 50 poverty-reduction strategy papers, few countries were found to include fishing and fish-farming communities among their target groups. Nor did they accord the fisheries sector an explicit role in poverty reduction or food security. An FAO review of national strategies in West African countries, for example, showed that small-scale fisheries were rarely or poorly considered, despite producing over 1 million tonnes annually and providing livelihoods for over 7 million fishers.

The dynamic institutional and policy environment typical of many developing countries is in itself a source of uncertainty and potential threat. Manipulation by elites, lack of transparency or dialogue about policy objectives, and the limited capacity and weak influence of civil society diminish coherent fishery policy and management in many countries. Because SSF have a mostly weak political constituency — and aquaculture production is either large scale and highly capitalized or dispersed and hidden within agricultural systems, yet unrecognized in agricultural policy — the political and institutional costs of improved management in the small-scale subsectors are often great. The momentum and political capital for change will often come from outside, and examples of policy reforms opening new avenues for managing SSF and supporting SME aquaculture are growing.

The central challenge for SSF is to use sound scientific evidence to provide a compelling argument for how investment in SSF will generate tangible livelihood improvements and economic returns for national economies and contribute to meeting national development objectives and MDGs. However, in the imperfect policy environment that exists in all developing countries, this will not be enough. Better evidence will not in itself lead to better policies. Research needs to engage with policy differently, entering into dialogue when defining research agendas and creating ownership of the research process, thereby influencing policy.

As well as the capture fisheries sub-sector, public policy may facilitate or hinder pro-poor aquaculture development in different institutional and economic contexts. In the aquaculture policy arena, the drivers determining aquaculture-related policies and their effective implementation remain unclear. What role should the poor play in determining the aquaculture policy environment, and how is this best facilitated? How can relevant stakeholder groups effectively voice their priorities so that aquaculture policy reflects societal interests? How can we effectively link research for development to policy and economic-investment processes nationally and regionally to ensure rational and far-sighted economic planning, including investment in research? Research is also needed to determine if effective compensatory private sector mechanisms in failed or failing states are realistic.

Recognizing these challenges, the purpose of this project is to use science-based approaches to increase the integration of SSF and aquaculture into local, national, regional and global development policy. To achieve this, the project will focus on three key areas. First, we will improve understanding of key policy processes, particularly decentralization and democratization, and the opportunities and constraints they provide for SSF and aquaculture. Second, we will identify ways through which governance and social institutions for SSF and aquaculture can be strengthened. Third, we will provide a more comprehensive understanding of the value of SSF and aquaculture in relation to key development indicators.

Goal

Increased integration of SSF and aquaculture into local, national and global development policies and programs.

Objectives

1. To improve understanding of key policy processes, particularly decentralization and democratization, and the opportunities and constraints they provide for SSF and aquaculture in the context of development policy in key countries.
2. To strengthen governance and social institutions that have an impact on SSF and aquaculture development, to provide an enabling environment that provides incentives for building resilience.
3. To provide a more comprehensive understanding of the value of SSF and aquaculture in relation to key development indicators.

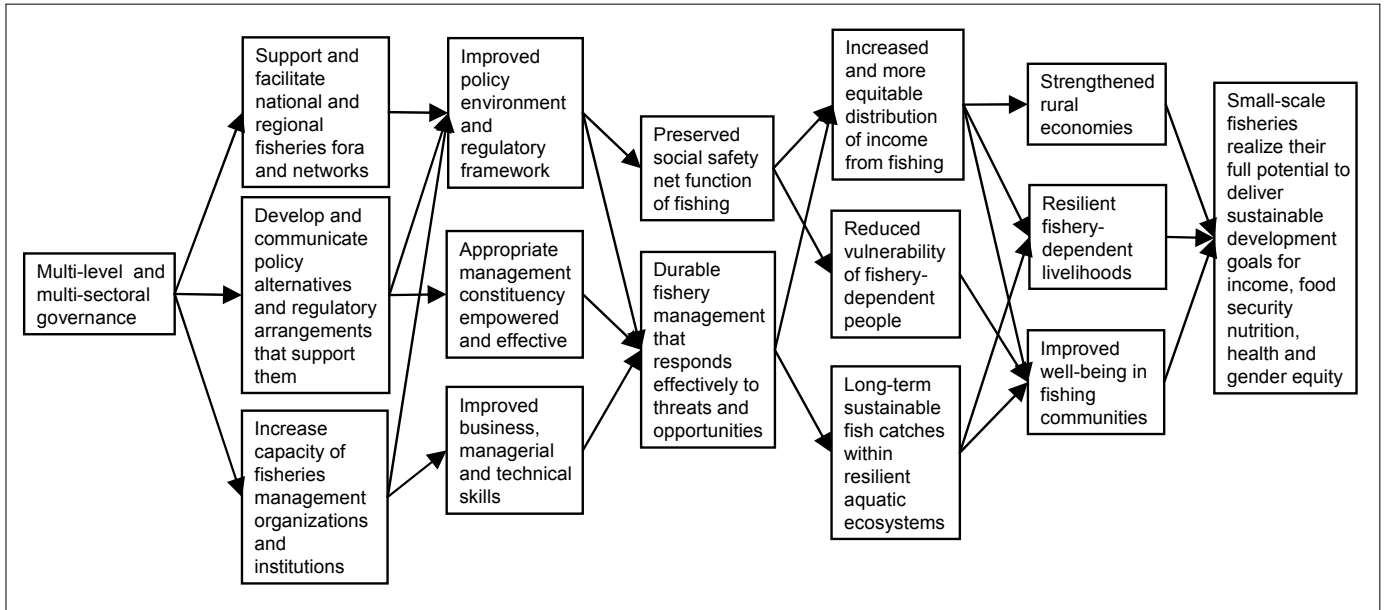
Alignment with CGIAR system priorities

Project 3	Multi-level and multi-sectoral governance	3C	4A	4B	4C	5D
Output 1	Tools, policy briefs and analyses that improve understanding of key policy processes, particularly decentralization, and the opportunities and constraints they provide for small-scale fisheries and aquaculture	20	30	20	10	20
Output 2	Institutions and policies for small-scale fishery and aquaculture development nurtured to create an enabling environment that provides incentives for building resilience	10	10	30	10	40
Output 3	Policy briefs, information products and tools that promote increased understanding and valuation of small-scale fisheries and aquaculture in national and regional policy	70		20	10	

Impact pathway

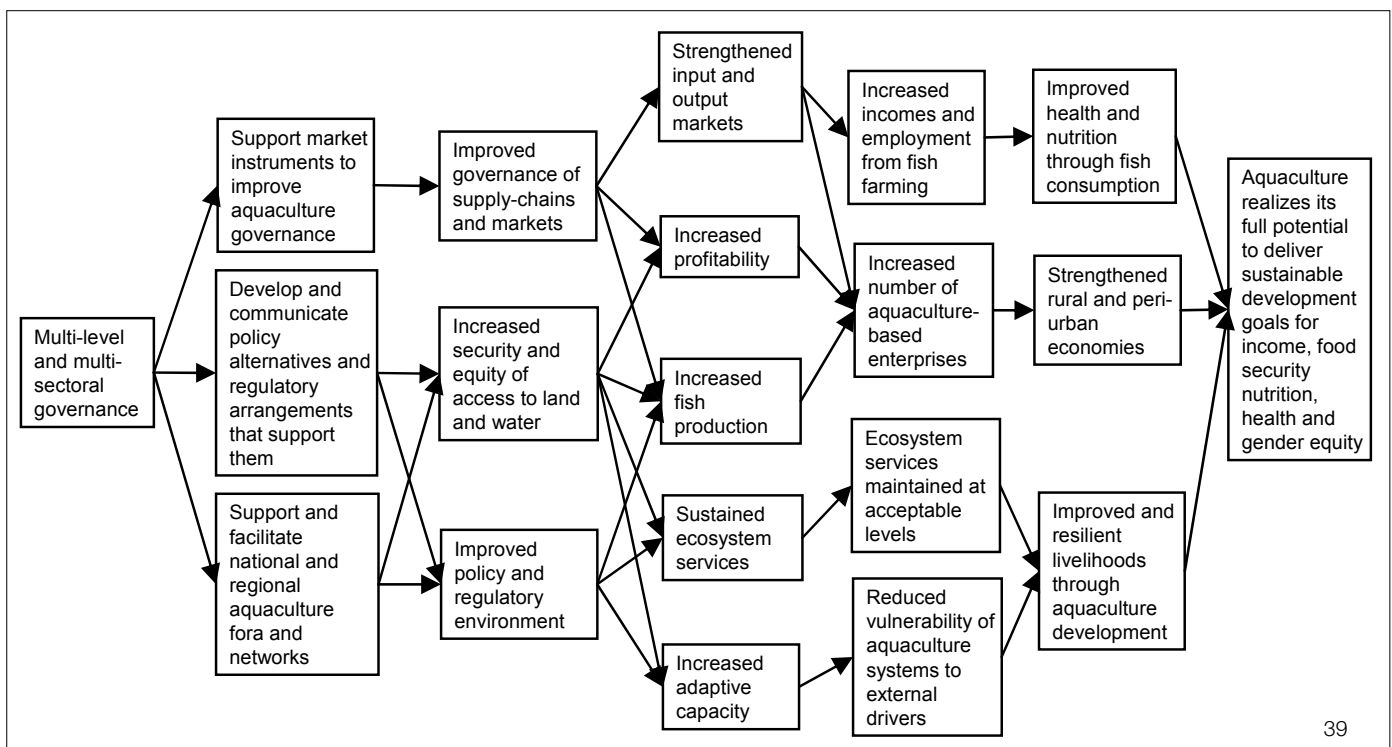
SSF play diverse roles in society and are governed by a complex network of institutions, from market-based mechanisms to social institutions within and outside the sub-sector. Achieving resilient SSF, improving well-being, and reducing vulnerability requires a much sharper focus on the societal role SSF play. Some serve as social safety nets and others as generators of wealth for a clearly defined group within society. A clearer understanding of these roles will provide a springboard to stronger governance through the legitimacy of appropriate institutions and empowerment of women. Research will provide the knowledge base to underpin this process. Research organizations can play an important role in facilitating small-scale producer organizations appropriate to particular fisheries and in catalyzing the political process to determine and legitimize the best management constituency for individual fishery systems. This pathway is summarized in Figure 9.

Figure 9. Impact pathway for Project 3 (multi-level and multi-sectoral governance).



For aquaculture to have significant and sustainable impacts on poverty, public policies that foster an enabling environment and efficient markets must accompany appropriate technology adoption. Research is needed locally, nationally and regionally, and in different institutional and economic contexts, to determine the role of public policy in this regard. An integrated, enabling policy environment requires political will and stakeholder engagement in the policy development process. Efforts to harmonize policies are most likely to occur if policymakers are convinced that aquaculture can be an important engine for economic growth. This requires not only solid evidence generated through research but also well-planned and adequately resourced efforts to scale up and scale out research results. Policy-development mechanisms that are inclusive of the poor and responsive to private sector and civil society concerns are best at ensuring that policy reflects the wishes of society at large and that there is a continuing consensus supporting the process. This pathway is summarized in Figure 10.

Figure 10. Impact pathways for Project 3 (policy development).



International public goods

This project will draw on studies and lessons learned across fishery and aquaculture systems to generate a range of IPGs. Contributions to the global knowledge base will include improved estimates of participation and catches in the world's small-scale fisheries and of the value and benefits generated by SSF and aquaculture. Critical global analyses will provide new lessons on the impacts of decentralization policy on poverty reduction, the institutional and policy instruments that can be used to support the role of women in fisheries and aquaculture, and on what constitutes an enabling environment for aquaculture for development. Building on these lessons, we will produce guidelines for action. Topics for guidelines include improving the access of women to the benefits of fish production and best practices for integrated aquaculture-agriculture (IAA) and cage culture in African lakes. In sum, we expect these outputs, and the actions needed to generate them, will increase institutional capacity to support national and regional sector planning.

Linkages and partnerships

Perhaps more than the other projects in this MTP, this project relies on partnerships and networks outside of the fisheries sector to succeed. Facilitating regional fora and analyzing how they might best operate is critical to brokering and catalyzing improved governance in fisheries and aquaculture. In the context of the Challenge Program on Water and Food, WorldFish has adopted, jointly with other CGIAR centers, the impact pathway methodology as a scientific framework. This is used for evaluation and outreach (scaling out and scaling up) of the interventions developed in its projects and to assess their potential impact across scales. The method aims to translate lessons learned into desirable development outcomes along impact pathways.

Given the multiple scales at which fisheries are governed, if we are to understand and have influence on the sector, it is important for us to engage across global, regional, national and local discussion and advisory fora, both within the fishery and aquaculture sector, and in strategically chosen forums outside the sector. These could include dialogues and processes relating to water resource policy, coastal development planning, aquatic biodiversity conservation, and marine and aquatic tourism. It may also include less obvious dialogues in instances where social development issues are particularly pertinent to fishery resource governance. These can include strategic engagement with projects and governance initiatives to address issues such as migration and labor mobility, human security and disasters, human rights (e.g., relating to gender, child labor and bonded labor in the fisheries sector) or the control of epidemic diseases affecting either fish (e.g., in aquaculture) or fishing communities (e.g., vector control programs). Recent and current examples of these kinds of linkages into policy processes at various levels include participation in the Millennium Ecosystem Assessment (Wetlands and Water), Inter-governmental Panel on Climate Change, CGIAR Platform on Agriculture and Health, FAO Committee on Fisheries, New Partnership for Africa's Development, and ICSF.

A distinctive feature of our evolving portfolio of projects is an increased interaction with civil society organizations, including community-based organizations that govern resources locally. Such engagement brings us into processes that are often overtly political, and our partnerships with organizations perceived to be lobby groups have to be carefully calibrated and articulated. We will make it clear that we provide research results dispassionately, learn from the impact of these groups and the processes pursued, and avoid engaging in explicit support of specific group or sectoral interests.

Key partners and their roles

Table 10. Project 3 key partners and their roles		
Partners	Output	Role
ARIs: Universities of Bergen, Stirling, East Anglia; Asian Institute of Technology; Poverty Alleviation and Sustainable Livelihoods in Small-scale Fisheries network	1,2,3	Research implementation and mobilization of new science; advanced training (doctoral and post-doctoral)
NARES: Fishery administrations (including Inland Fisheries Research and Development Institute [Cambodia], Department of Livestock and Fisheries [Lao PDR] and Department of Fisheries [Vietnam]), Prince of Songkla University (Thailand), Can Tho University and Nong Lam University (Vietnam), University of Lusaka (Zambia), Chancellor College and Bunda College of Agriculture (Malawi), Makerere University (Uganda)	1,2	Project implementation, policy dialogue, training, event management, strategy development, capacity building, research implementation, technical support for participatory planning and monitoring, fisheries management options
International organizations: FAO, Asian Institute of Technology	1	Strategy development, capacity building, research implementation, technical support for participatory planning and monitoring, fisheries management options
IWMI, International Rice Research Institute (IRRI) and other CGIAR centers, IUCN-International Union for the Conservation of Nature	2,3	Support for rice-fish system governance research and policy advisory service delivery Valuation methods for integrating inland fisheries with other productive uses of water
Regional policy and advisory bodies: NEPAD, FARA, Southern African Development Community, Economic Commission for Africa, Economic Community of West African States, Southeast Asian Fisheries Development Center, Mekong River Commission, Zambezi River Basin Authority, National Mekong Committees	2	Policy development, scientific support for regional issues, capacity building, development of regional programs, implementation of science and capacity building components
NGOs: WWF, The Nature Conservancy, African Wildlife Foundation	1	Linkages with science and technical training providers, research and capacity-building implementation

MTP project logframe — project 3: Multi-level and multi-sectoral governance

Table 11. Project 3 logframe				
Outputs		Intended users	Outcome	Impact
Output 1				
<i>Tools, policy briefs and analyses that improve understanding of key policy processes, particularly decentralization, and the opportunities and constraints they provide for small-scale fisheries and aquaculture</i>				
Output targets 2009	Analysis of role of women in inland aquaculture development in Asia and sub-Saharan Africa published in the primary science literature and as policy briefs.	Fisheries, agriculture and social development departments of national governments, FAO and other UN agencies, donors, fisheries sector, development and aquatic conservation NGOs.	Pathways to empower women in household decision-making utilized by agencies and NGOs.	Greater participation and empowerment of women in inland aquaculture.
	Analyses of the institutional structures and processes that shape policy and governance in Lake Chad and Zambezi river basins published and disseminated in regional policy fora.	International governance and development research community, regional resource managers, policymakers.	Conceptual and empirical understanding of policy and governance reform processes in SSF co-management improves national and local policy.	Increased governance capacity for SSF.

<p>2010</p>	<p>Analyses of different rights regimes on the vulnerability and adaptive capacity of small-scale producers, livelihoods and institutions completed and published in the social science and fisheries literatures, and as policy briefs (global).</p> <p>Critical analysis of the impacts of decentralization policy on poverty reduction in Indonesia and the Philippines published.</p> <p>Estimates of participation and role of women and children in SSF in selected countries in sub-Saharan Africa.</p> <p>Technical guidelines for policy and regulatory frameworks for cage aquaculture in inland waters in sub-Saharan Africa produced and disseminated.</p> <p>Decentralization and policy process in coastal fisheries in the Pacific.</p>	<p>International science community, multilateral and bilateral donors, international organizations, government agencies, fishery sector civil-society groups.</p> <p>International science community, multilateral and bilateral donors, international organizations, government agencies, fishery sector civil society.</p> <p>Donors, government agencies, UN agencies.</p> <p>NARES; FAO; World Bank; private sector investors; donors; government agencies for environment, agriculture and fisheries.</p> <p>International science community, national and regional managers and policymakers.</p>	<p>Improved laws and international norms with respect to the rights and vulnerability of fish dependent communities.</p> <p>Better understanding of the impacts of decentralization policy used to guide reform process.</p> <p>Policy and management decisions respond more effectively to the interests of women and children and government agencies, and NGOs have the capacity to serve them effectively.</p> <p>Guidelines used to develop aquaculture in a sustainable manner.</p> <p>Conceptual and empirical understanding of policy and governance reform processes in SSF co-management improve national and local policy.</p>	<p>Increased governance capacity for SSF.</p> <p>Increased governance capacity for SSF.</p> <p>Improved food security, increased incomes and reduced livelihood vulnerability for women and children.</p> <p>Development of sustainable aquaculture delivers improved food security and incomes.</p> <p>Improved governance and co-management policies in SSF.</p>
<p>2011</p>	<p>Case studies of the responses of local institutions to global governance mechanisms and frameworks completed and published (sub-Saharan Africa).</p> <p>Comparative analysis of sources of conflict affecting SSF, and of the effectiveness of alternative governance arrangements in supporting capacity to manage conflict, completed and published in the science literature and in policy materials disseminated through regional networks (Greater Mekong).</p>	<p>National line agencies, regional advisory bodies, NGOs, civil society networks.</p> <p>National line agencies, regional advisory bodies, NGOs, civil society networks.</p>	<p>Lessons learned incorporated into policy locally, nationally and globally.</p> <p>Lessons learned incorporated into strategies for governance reform promoted by governments, regional bodies, NGOs and civil society networks.</p>	<p>Improved adaptability and response of local institutions to threats and opportunities arising from national and global processes.</p> <p>Improved capacity locally, nationally and regionally.</p>

Outputs	Intended users	Outcome	Impact	
Output 2 <i>Institutions and policies for small-scale fishery and aquaculture development nurtured to create an enabling environment that provides incentives for building resilience</i>				
Output targets 2009	<p>Local institutions engage in collaborative assessment of water and wetlands management options, with implications for national and regional policy in the Greater Mekong region identified, published in policy reports and delivered through workshops.</p> <p>Review and comparative analysis of innovation systems in SSF and aquaculture completed in selected sub-Saharan Africa countries published as a policy report.</p> <p>Regional networks and advisory bodies supported to synthesize and exchange lessons relating to management approaches and stakeholder roles (Southeast Asia and sub-Saharan Africa).</p>	<p>National line agencies; regional advisory bodies; NGOs; researchers; provincial, district and commune planning units.</p> <p>Regional fora (e.g., NEPAD, FARA, sub-regional research organizations), government agencies, donors.</p> <p>Regional fora, government agencies, donors.</p>	<p>Local institutions more capable of integrating productivity, equity and sustainability considerations relating to fisheries, agriculture and water management, and of advocating them in national planning.</p> <p>Increased and better-targeted investments in fisheries and aquaculture in sub-Saharan Africa.</p> <p>Improved investments in SSF by national agencies and donors.</p>	<p>Combined land and water productivity including fisheries improved and better reflecting local needs and priorities.</p> <p>Improved regional networks and fora and more effective policy environment.</p> <p>Improved regional networks and fora and more effective policy environment.</p>
2010	<p>Community-based management models for inland fisheries in Bangladesh scaled up and models proposed for piloting in coastal communities and published as both policy advisory notes and science publications.</p> <p>Participatory trans-boundary river fishery management plan implemented in Malawi and Tanzania.</p> <p>Improved governance systems for rice-fish culture practices identified, drawing on selected case study sites in Mekong and Yellow river basins.</p> <p>Critical analysis of winners and losers in the changing landscape of aquatic resource-based livelihoods in the Mekong.</p>	<p>Government, donors and coastal communities in Bangladesh; global community of scholars interested in participatory natural resource management.</p> <p>River basin development authorities, government agencies, NGOs.</p> <p>Governments, national agencies, basin organizations, NARES, others in target basins.</p>	<p>Adjustment of the community-based fisheries-management model to suit coastal communities.</p> <p>Improved management of shared fisheries resources in the context of integrated river basin management.</p> <p>Equitable distribution of benefits from ecosystems. Informed decision-making process with participation of all stakeholders.</p> <p>Improved policies and institutional arrangements for fostering integrated farming systems in two basins.</p>	<p>Enhanced livelihood benefits for concerned communities and improved knowledge base on co-management experiences.</p> <p>Policies, plans and management processes for shared river fisheries enhanced and river fisheries production increased.</p> <p>Improved food security, increased incomes and participation in decision making for rural communities.</p> <p>Policy, institutions and governance enhanced. Equitable distribution of benefits from ecosystems. Informed decision-making process with participation of all stakeholders.</p>

	Social, economic and ecological tradeoffs in uses of water and wetlands at local and basin scales in two river basins in sub-Saharan Africa analyzed, and governance options identified and reported.	National and local government agencies; NGOs, especially in conservation and development; donors.	Productivity, equity and sustainability considerations relating to fisheries, agriculture and water management explicitly weighed in national planning and addressed in local project implementation.	Combined land and water productivity including fisheries improved and better reflecting local needs and priorities.
2011	Technical guidelines for regulatory frameworks and capacity for implementation of IAA published (sub-Saharan Africa and Bangladesh). Tools developed to determine the water requirements for maintaining fisheries in at least three river basins.	National and local government agencies; NGOs, especially in conservation and development; donors. Governments, national agencies, basin organizations, NARES, others in target basins.	Guidelines used by planning agencies to develop sustainable, pro-poor aquaculture. Decisions on water allocation informed by the requirements of aquatic ecosystems and the services they provide.	Pro-poor benefits from sustainable aquaculture realized. Water allocation supports long-term sustainability of fisheries production and associated livelihoods.
Output 3 <i>Policy briefs, information products and tools that promote increased understanding and valuation of small-scale fisheries and aquaculture in national and regional policy</i>				
Output targets 2009	Analysis of contribution of river fisheries to rural and urban livelihoods in DR Congo, Lake Chad and Zambezi basin completed. Estimates of global participation and catches in SSF published (global).	NARES, governmental agencies, international research and development organizations, and NGOs engaged in natural resource management. World Bank, FAO, regional fishery organizations, donors, international science community.	Opportunities for strengthening water policy processes with high-quality information on the value of fisheries. Awareness of the magnitude of the sub-sector used to better inform national and regional development agendas.	Improved food security and increased incomes for aquatic resource-dependent communities in Cameroon, DR Congo, Malawi, Niger, Nigeria and Zambia, and reduced livelihood vulnerability, particularly through measures that protect ecosystem sustainability. Increased investment in SSF, improved livelihoods and more resilient ecosystems.
2010	Tools developed to assess the value of ecosystem goods and services from fisheries in three river basins (global). Critical review of concept of water productivity published (global).	Governments, national agencies, basin organizations, NARES, others in target basins. Challenge Programme on Water and Food, regional fishery organizations, international science community.	Value of ecosystem goods and services in the selected river basins inform decision-making in water allocation for aquatic New analyses of water productivity used to guide policy on water allocation decisions in river basins.	Water allocation supports long-term sustainability of fisheries production and associated livelihoods. Water allocation supports long-term sustainability of fisheries production and associated livelihoods.
2011	Global comparative database on poverty, vulnerability and social exclusion in fishing-dependent communities synthesized from livelihoods-related studies in at least 100 fisheries developed and made publicly available.	Communities of research and development practice in common property theory, rural development, and fisheries and aquaculture.	Improved understanding of the multiple dimensions of poverty in fishing communities used to guide investments in support of rural development in these areas.	Improved guidance for social and economic development support to fishing-dependent communities.

MTP project 4. Improving sustainable aquaculture technologies

Background and rationale

Aquaculture is the fastest-growing food-production sub-sector in the world today, currently supplying half of global fish consumption. Projections to 2020 indicate that demand for fish will continue to grow and that capture fisheries will be unable to respond. Current indications are that aquaculture will need to grow substantially over large parts of Asia and Africa to meet demand for fish. In response, WorldFish will place growing emphasis on developing IPGs that can support national and regional efforts to meet this need.

The limited availability of quality seed and feed has consistently been identified as the most widespread and persistent obstacle to the development of smallholder and SME-based aquaculture. Of particular importance is the use of genetically improved strains of fish and low-cost fertilizers and feeds.

Selective breeding of fish and, more recently, shellfish has yielded sustained improvements in growth over many generations of 5-10% per generation. This has produced strains that perform much better in farm conditions than their wild ancestors. Despite this, most farmers remain reliant on strains of fish that differ little from wild fish in terms of growth performance. Indeed, the strains in use are often inferior to wild fish because of poor genetic management and in-breeding in hatcheries. Similarly, lack of access to affordable quality feeds limits production. With limited access to fishmeal and fish oil and rising fuel prices, farmers will increasingly have to rely on locally made, plant-based diets.

If aquaculture is to grow sustainably and meet its potential for food and income, technologies to meet these needs for seed and feed must be developed for key fish species and farming systems. They must be developed and implemented alongside effective dissemination mechanisms and, for genetically improved seed, tools to identify and manage risks. Finally, technologies will need to minimize demands on environmental services by improving water and land productivity and, where practicable, increasing the recycling of on-farm wastes.

Experience in Asia and Africa has shown the importance of adopting participatory action research approaches to technology development, ensuring that technologies match the natural, capital and educational assets and the aspirations of farmers. Determining the various roles of the public and private sectors and civil society in technology development and dissemination is key to scaling out for maximum development impact.

The purpose of this project is to respond to this analysis and make more available technologies that improve the productivity and profitability of smallholder and SME-based aquaculture. To achieve this, the project will focus on three areas. First, we will develop a framework and tools that can be used to target the design and implementation of aquaculture technologies to maximize development impact. Second, we will develop ecologically responsible technologies and methodologies to improve and disseminate quality seed for key aquaculture species. Third, we will develop methods to support the development and dissemination of aqua-feed and feeding guidelines that maximize profitability, that are consistent with an ecosystem-based approach to aquaculture development, and that produce nutritionally sound aquaculture products.

Goal

Increased productivity, resilience and development impact of smallholder and SME aquaculture-based livelihoods.

Objectives

1. To provide well-designed technologies for sustainable aquaculture targeting groups with which development impacts can be maximized.
2. To increase the availability of quality seed for key aquaculture species while conserving genetic resources.
3. To increase the availability of aqua-feeds and feeding systems that maximize profitability, that are consistent with an ecosystem-based approach to aquaculture development and that produce nutritionally sound aquaculture products.

Alignment with CGIAR system priorities

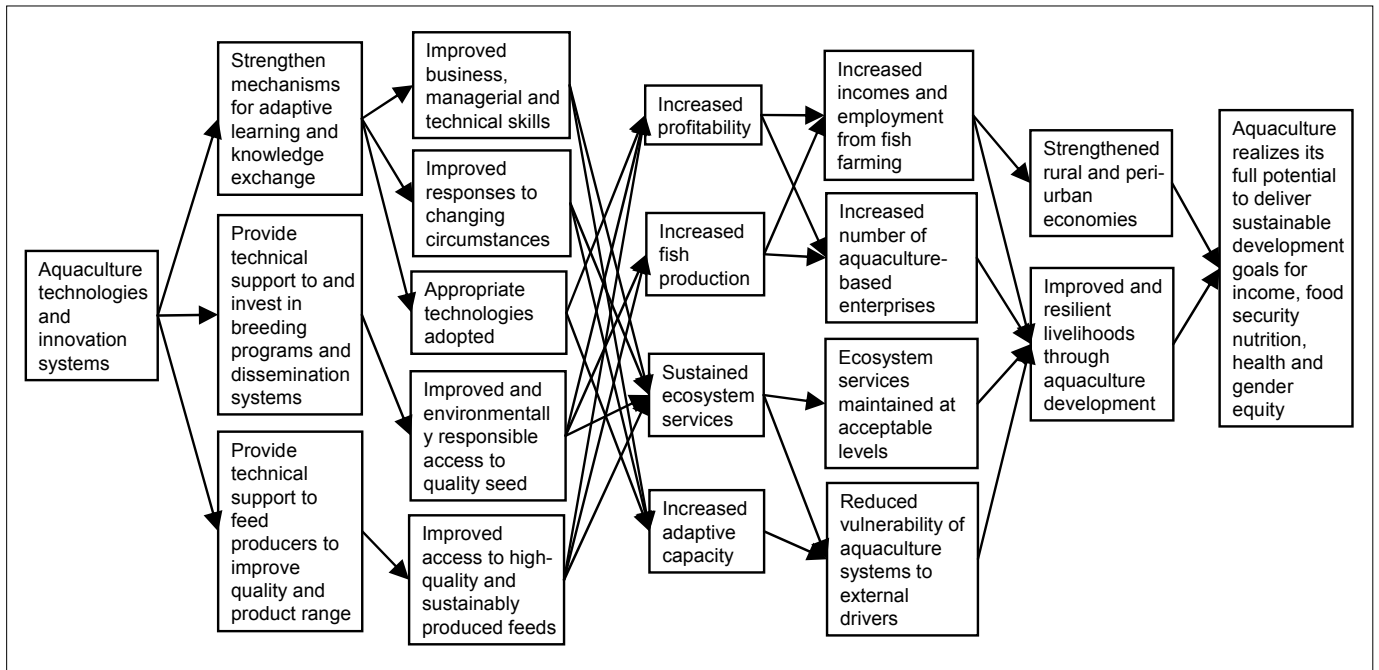
Table 12. Project 4 allocation of resources to system priorities (%)						
Project 4	Improving sustainable aquaculture technologies	1D	2D	3C	4B	5A
Output 1	Framework and tools to identify target groups, clarify intervention objectives, and design and implement appropriate technologies to maximize development impact			80		20
Output 2	Ecologically responsible technologies and methods to develop and disseminate quality seed of key aquaculture species	10	40	50		
Output 3	Methods to support the development and dissemination of aqua-feeds and feeding guidelines that maximize profitability, that are consistent with an ecosystem-based approach to aquaculture development and that produce nutritionally sound aquaculture products			70	10	20

Impact pathway

To maximize its potential to contribute to development goals for income, food security, nutrition, health and gender equity, aquaculture must strengthen rural and peri-urban economies and build resilient livelihoods. The project seeks to achieve this by working with stakeholders to develop and disseminate productive, profitable and ecologically sound technologies. By doing so through participatory action research, our work will target critical needs and technologies tailored to address them. This targeted approach, together with capacity building, will strengthen the adaptive capacity of SME producers and strengthen the resilience of aquaculture systems in the face of change. We will achieve these impacts by working with a network of partners to pursue the research and disseminate the technologies. We will rely strongly on the establishment of peer-to-peer networks, which have been shown to work effectively to disseminate technologies for aquaculture among smallholder farmers.

Through this participatory process, the project aims to develop and promote aquaculture technologies that address effectively the livelihood aspirations of SME producers, while doing so sustainably. By strengthening access to quality seed and feed, improving productivity and profitability at the farm level, and developing social networks that can help disseminate the results, the project seeks to provide the technological foundation for sustainable aquaculture in those areas where environmental, market and social conditions are favorable. By improving profitability and uptake, while sustaining ecosystem services and building adaptive capacity, this research investment can bring sustainable increases in incomes and employment. By working with community associations, enterprise-development and producer groups, and the NGOs that foster them, we can scale out these practices and substantially expand aquaculture enterprises and strengthen rural economies. When they are developed to their fullest, aquaculture will realize its full potential to deliver sustainable development benefits. The impact pathway is summarized in Figure 11.

Figure 11. Impact pathway for Project 4.



International public goods

The outputs from this project complement one another by focusing on the three main elements of the development of sustainable aquaculture technologies: aquaculture systems, genetically improved seed, and fertilizers and feed. Although generic technologies such as cages, ponds, feeds and seed are well known, technology choice and development must be pursued through participatory action research. This approach tailors the technologies to the specific assets (e.g., available natural, human and economic capital) and aspirations of the users, to market conditions, and to the prevailing agro-ecosystems while ensuring ownership and building capacity. While specific stakeholder requirements drive the development of genetically improved seed, our research indicates that investment in IPGs such as Genetically Improved Farmed Tilapia (GIFT) provides a fast-track means of establishing a founding breeding stock on which to build local genetic improvements. We increasingly focus our efforts on determining how best to support demand-led genetic-improvement initiatives.

To ensure that the diversity of wild fish and shellfish is conserved, both for future breeding use and to maintain ecosystem structure and function and the provision of ecosystem services, the Center will act as a catalyst or partner for research and work with FAO and others. Together we will develop and promote risk-assessment and management procedures and technical guidelines for developing and disseminating genetically improved strains. The Center's research efforts on development of feeds currently focus on Cameroon, DR Congo, Egypt, Malawi, Malaysia and Zambia. We will use these results to inform the debate and wider policy environments concerning how to intensify aquaculture production sustainably.

Linkages and partnerships

The development and sustained uptake of aquaculture technologies that impact on poverty require a wide range of technological and socioeconomic skills. While some of the necessary skills exist within WorldFish, many others are better sourced in NARES, other CGIAR centers (especially IWMI, ILRI and IFPRI), ARIs, NGOs and the private sector. Effectively scaling up and scaling out from project results to maximize development impact requires effective dissemination of key results and a degree of advocacy. These are roles that FAO and other UN organizations, national and international NGOs, and producer organizations are generally better able to play.

Key partners and their roles

Table 13. Project 4 key partners and their roles		
Partner	Output	Role
ARIs: Universities of Bergen, Ghent, Guelph, Hohenheim, Kassel, Leuven, Malawi, Sains Malaysia, Stirling, Wageningen	1-3	Implementing research; data collection, analysis and synthesis; drafting of scientific publications to scale up from project results; development of technical guidelines; capacity building (MS and PhD)
NARES: Departments and ministries of fisheries and agriculture of all key countries in logframe, Chinese Academy of Fisheries Science, Indian Council for Agricultural Research	1-3	Project implementation; data collection, analysis and synthesis; brokering and, where necessary, guaranteeing access to inputs (e.g., water) and output markets; capacity building of producers
International agricultural research centers: IWMI, IRRI	1	Collection and analysis of data; collaboration on scientific publications
FAO	1-3	Implementing research; development and dissemination of technical guidelines.
NGOs: Caritas, WWF, Technoserve	1-3	Implementing research; facilitating access of producers to affordable finance, seed and feed
Networks: International Network for Genetics in Aquaculture (INGA), Network of Aquaculture Centers in Asia (NACA), Sustainable Aquaculture Research Networks in Sub-Saharan Africa (SARNISSA, a network of European, African and Asian researchers funded by the European Commission), farmers groups such as the Egyptian Fish Council, women's groups	1-3	Development and dissemination of technical information; capacity building
Private sector: American Soybean Association, Indiana Soybean Board, CAB International, hatchery owners, feed manufacturers, farmers	3	Participatory research into technology design, implementation and dissemination; development and dissemination of genetically improved fish strains and quality seed; development of affordable, quality feeds; development of technical guidelines

MTP project logframe — project 4: Improving sustainable aquaculture technologies

Table 14. Project 4 logframe				
Outputs		Intended users	Outcome	Impact
Output 1				
<i>Framework and tools to identify target groups, clarify intervention objectives, and design and implement appropriate technologies to maximize development impact</i>				
Output targets 2009	Assessment of poverty impact of IAA technologies in Bangladesh .	Policymakers, NARES, farmers, researchers.	Increased fish production, sustained ecosystem services.	Improved and resilient livelihoods.
	Review paper on the technological, economic and institutional issues associated with community-based fish culture in seasonal floodplains.	Policymakers, NARES, farmers, researchers.	Increased fish production, sustained ecosystem services.	Improved and resilient livelihoods.
	Policy brief that provides clear evidence-based and accessible guidelines on the development of aquaculture in sub-Saharan Africa for different market and producer profile scenarios.	Policymakers, NARES, NGOs.	Increased fish production, sustained ecosystem services.	Improved and resilient livelihoods.

2010	Analysis of barriers to adoption of cage aquaculture by socially marginalized groups in Bangladesh .	Policymakers, NARES, farmers researchers.	Barriers removed to allow increased security and equity of access to water; increased adaptive capacity.	Improved and resilient livelihoods.
	Guidelines on the development and use of decision support tools for aquaculture to realize its potential to deliver sustainable development goals in sub-Saharan Africa .	Policymakers, NARES, researchers.	Increased fish production, sustained ecosystem services.	Improved and resilient livelihoods.
	Framework for matching national aquaculture development objectives to the IAA SME target group in West Africa .	Policymakers, NARES, researchers.	Increased fish production, sustained ecosystem services.	Improved and resilient livelihoods.
2011	Guidelines on participatory action research approaches to the development of aquaculture technologies in Asia and Africa.	Researchers, farmers, NGOs.	Aquaculture technologies adopted that are appropriate to the assets of users and minimize demands on ecological services.	Sustained uptake of aquaculture.
Output 2				
<i>Ecologically responsible technologies and methodologies to develop and disseminate quality seed of key aquaculture species</i>				
Output targets 2009	Breeding programs for genetically improved aquatic species underway in Asia (China, India, Malaysia, Sri Lanka) and Africa (Egypt, Ghana, Malawi).	FAO, NARES, ARIs, policymakers, private sector, NGOs.	Improved and ecologically responsible access to quality seed, increased profitability.	Sustained ecosystem services, increased fish production, improved and resilient livelihoods.
	Review of multiplication and dissemination strategies for improved strains of farmed aquatic organisms.	FAO, NARES, ARIs, policymakers, private sector, NGOs.	Improved and ecologically responsible access to quality seed, increased profitability.	Sustained ecosystem services, increased fish production, improved and resilient livelihoods.
2010	Quality seed distribution models for China, Egypt and Ghana .	FAO, NARES, ARIs, policymakers, private sector, NGOs.	Improved and ecologically responsible access to quality seed, increased profitability.	Sustained ecosystem services, increased fish production, improved and resilient livelihoods.
2011	Online technical guidelines on ecologically sound genetic improvement of farmed aquatic animals and their effective distribution.	FAO, NARES, ARIs, policymakers, private sector, NGOs.	Improved and ecologically responsible access to quality seed, increased profitability.	Sustained ecosystem services, increased fish production, improved and resilient livelihoods.
	Global networks established to update and support technical guidelines (INGA, global , SARNISSA, Africa).	FAO, NARES, ARIs, policymakers, private sector, NGOs.	Improved and ecologically responsible access to quality seed, increased profitability.	Sustained ecosystem services, increased fish production, improved and resilient livelihoods.

Outputs	Intended users	Outcome	Impact	
Output 3 <i>Methodologies to support the development and dissemination of aqua-feeds and feeding guidelines that maximize profitability, that are consistent with an ecosystem-based approach to aquaculture development and that produce nutritionally sound aquaculture products</i>				
Output targets 2009	Identification of local ingredients for production in Egypt .	Policymakers, feed producers, farmers, NARES.	Improved access to high-quality and sustainably produced feeds.	Increased fish production, increased profitability.
2010	Review paper on Public-Private Partnership models for developing national aquaculture feed industries in Africa .	Policymakers, SME, farmers, NARES.	Improved access to high-quality and sustainably produced feeds.	Increased fish production, increased profitability.
2011	Technical guidance manual for development of profitable, ecologically sound feeds and its dissemination and on-farm management. Development of leaf-based feeds for fish farmers in DR Congo and other savannah fish-farming systems.	Policymakers, SME, farmers, NARES. Policymakers, SME, farmers, NARES.	Improved access to high-quality and sustainably produced feeds. Improved access to high-quality and sustainably produced feeds.	Increased fish production, increased profitability. Increased fish production, increased profitability.

MTP project 5. Aquaculture and the environment

Background and rationale

Many people welcome the potential for growth in aquaculture for its contributions to food security and diversifying business opportunities for millions of producers, processors and traders. There is, however, a clear risk that unmanaged expansion and intensification of production methods will place unsustainable demands on ecological services and worsen inequities and social exclusion.

Farming fish and shellfish requires land to use for ponds, and coastal commons and littoral areas of lakes and rivers for cage, pen or shellfish culture systems. Water is needed to support the animals, supply dissolved oxygen and disperse wastes. Seed (eggs or fry) is required to stock the systems, and this is often harvested from the wild, especially in the marine environment. Fertilizers and feed are needed to promote growth and production, and both normally depend on inputs from the wild. Aquaculture is thus characterized by its dependence on the environment for ecological services.

Consuming ecological services entails environmental impacts that can both undermine sustainability and bring the sector into conflict with other stakeholders. Unless this conflict is managed, it may further marginalize poorer stakeholders, who often depend most on these services. Overharvesting of wild seed can harm stocks and fisheries, and demand for aquaculture feeds can exacerbate food security issues by promoting the conversion of the low-cost fish that feed the poor into fishmeal and fish oil for aqua-feeds. By contrast, farming aquatic animals that feed low in the food web is an efficient means of producing highly nutritious food. Aquaculture can also provide ecological services, as for example seaweed and mollusc farming that are known to mitigate the effects of eutrophication. By integrating with agriculture, aquaculture can recycle and retain nutrients on-farm, use scarce water resources efficiently, and improve resilience.

For aquaculture to fulfill its potential to meet sustainable development goals, we need to both understand these relationships and develop the tools to manage them. The purpose of this project is to do this and so foster the adoption of aquaculture that benefits the poor and makes better use of ecological services without unacceptably compromising ecosystem structure and function. To achieve this, the project will focus on four areas. First, we will develop a framework and tools to assess the relationship between water productivity and aquaculture. Second, we will develop and test integrated watershed-level assessment tools that facilitate better-informed policies and management for the uptake of sustainable aquaculture. Third, we will develop tools to assess and manage the risks associated with developing and disseminating genetically improved strains of farmed aquatic animals. Fourth, we will identify and test mechanisms that connect consumers to SME producers, thereby promoting the adoption of best ecological management practices.

Goal

Adoption of aquaculture that benefits the poor and makes better use of ecological services without unacceptably compromising ecosystem structure and function.

Objectives

1. To strengthen capacity to assess the relationship between water productivity and aquaculture.
2. To inform policies and management practices for the uptake of sustainable aquaculture.
3. To minimize risks associated with developing and disseminating genetically improved strains of farmed aquatic animals.
4. To connect consumers to SME producers and promote the adoption of best environmental management practices.

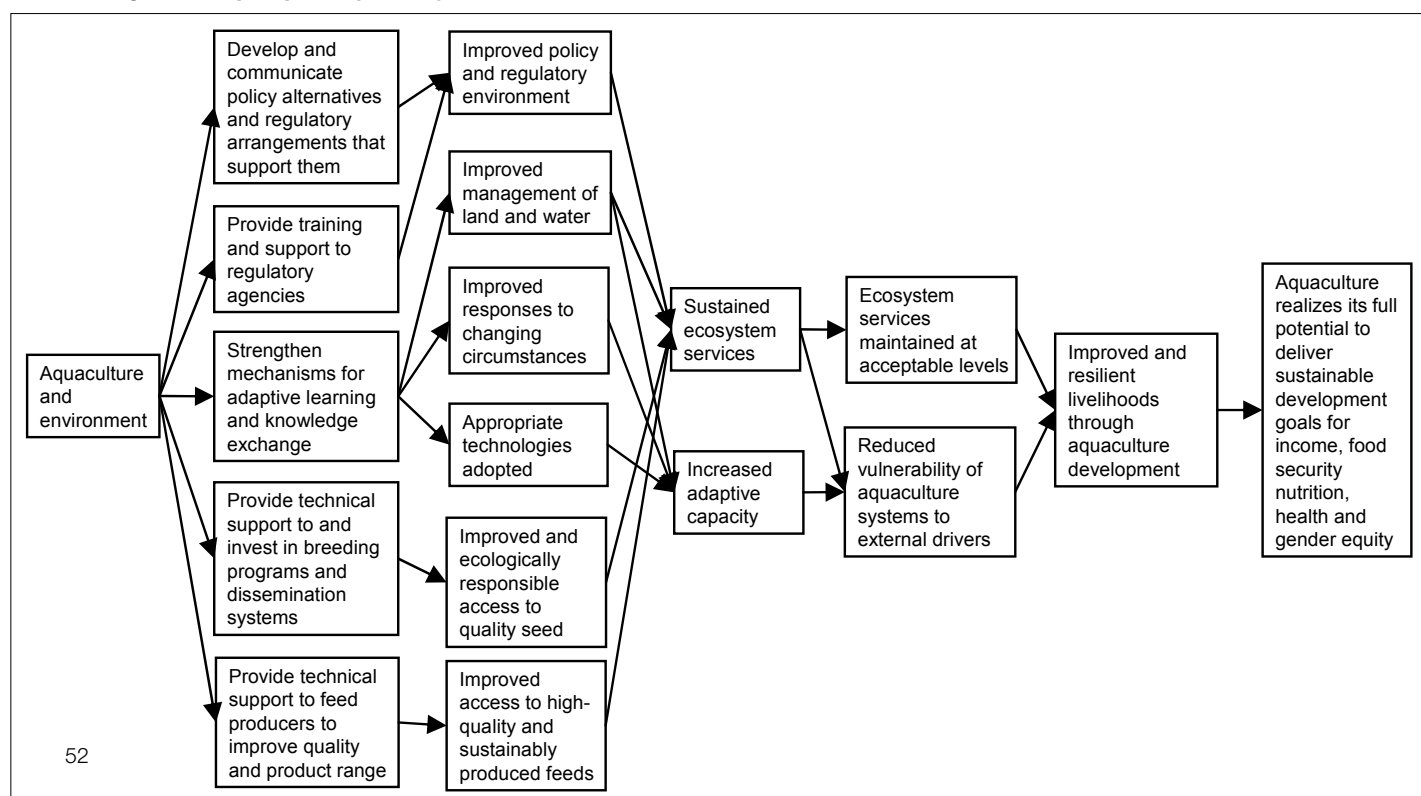
Alignment with CGIAR system priorities

Project number 5	Aquaculture and the environment	1D	4A	4B	4C	4D	5A
Output 1	A framework and tools to assess the relationship between water productivity and aquaculture				80	20	
Output 2	Integrated watershed-level tools that facilitate better-informed policies and management for the uptake of sustainable aquaculture		50	50			
Output 3	Tools to assess and manage the risks associated with developing and disseminating genetically improved strains of farmed aquatic animals	100					
Output 4	Mechanisms that connect consumers to small and medium-sized producers and promote the adoption of best ecological management practices	20	30	30			20

Impact pathway

For aquaculture to realize its potential contribution to achieving the MDGs, it must bring tangible benefits to all who participate in the value chain. An inter-sectoral approach is essential and, provided due attention is given to inter-basin and global transfers of ecosystem services, the watershed (and appropriate coastal zone) is the appropriate scale at which to plan and manage development. At the watershed scale, the adoption of aquaculture must bring net and equitable improvement in the resilience of both natural aquatic ecosystems and the livelihoods of those who depend on the ecosystem services they provide. If the appropriate policy and regulatory environment is enabled, if sound management of land and water is in place, and if producers are connected to environmentally sound sources of seed and feed, ecosystem services will be sustained. Increased adaptive capacity will result from a sound and responsive policy environment coupled with good management of land and water. Appropriate public-private partnerships are needed to provide technical support to seed and feed producers and to help build the capacity of individuals, key NARES and policymakers. Interventions must be founded on sound knowledge generated by well-targeted research conducted by a range of partners. This impact pathway is summarized in Figure 12.

Figure 12. Impact pathway for Project 5.



International public goods

This project will produce tools that promote ecosystem and integrated approaches to aquaculture development managed at the scale of the watershed and coastal zone. Such tools will help deliver sustainable development goals for many developing countries. Similarly, the risk-assessment and management toolkit will be designed for use by countries wishing to import, or develop and disseminate, genetically improved farmed aquatic animals and will have wide applicability, as will our intended framework to identify and protect aquatic genetic diversity in the context of expanding aquaculture production. This project will produce regionally focused guidelines on how to connect consumers to SME producers to improve both ecological and social resilience. Our approach for increasing institutional capacity to support national/regional sector planning at different levels and in different contexts will draw on the regional and global lessons that we learn.

Linkages and partnerships

Aquaculture depends heavily on ecological services. To maximize aquaculture's contribution to meeting the MDGs, interdisciplinary research and management at multiple scales are essential. We must also seek means to engage with other sectors, especially those competing for the same ecosystem services. Participatory research methods allow researchers to involve producers (farmers, SME) in developing technologies that strengthen their resilience to external forces, including those posed by the changing availability of water. This approach offers the best means for developing workable solutions. At a watershed or basin scale — defined here to include appropriate parts of the coastal zone — researchers, policymakers and planners must work together to develop the skills and tools needed to manage ecological services to meet development goals. As aquaculture production methods intensify, we must better understand and manage interregional flows of essential inputs such as feeds. At this scale the ecosystem approach to aquaculture development that FAO and partners are developing may have much to offer. Finally, by finding ways to better connect producers to consumers, especially wealthier, Western consumers, it may be possible to create a win-win situation in which markets are strengthened and provide better prices to producers, while environmentally sound production methods become more widely adopted. There are thus increasingly well-defined roles for farmers, scientists, NARES, policymakers and consumers in ensuring the development and implementation of ecologically sound aquaculture for maximum impact on development goals.

Key partners and their roles

Table 16. Project 5 key partners and their roles		
Partner	Output	Role
ARIs: Universities of Can Tho, Copenhagen, Leiden, London (Imperial), Malawi, Minnesota (Duluth, St Paul's), Montpellier, Notre Dame (Indiana), Shanghai, Stirling, Stockholm, Wageningen; CEFAS (UK); IRD; National Committee for Research Ethics (Norway)	1,2,3,4	Implementing research; data collection, analysis and synthesis; coauthoring of scientific publications to scale up from project results; development of technical guidelines; capacity building (MS and PhD)
NARES: departments and ministries of fisheries and agriculture of all key countries in logframe, Research Institute for Aquaculture No. 2 (Vietnam)	1,2,3,4	Project implementation; data collection, analysis and synthesis; brokering and (where necessary) guaranteeing access to inputs (e.g., water) and output markets; capacity building of producers
Regional bodies: NEPAD, FARA		Policy development and dissemination
International agricultural research centers: IWMI, IRRI	1,2	Collection and analysis of data; collaboration on drafting of scientific papers in relation to water productivity issues; dissemination to appropriate scientific and policymaking fora
FAO	1,2,3,4	Implementing research; development and dissemination of technical guidelines; coauthoring of scientific publications
NGOs: World Fisheries Trust, WWF	3,4	Implementing research; facilitating producers' access to affordable finance, seed and feed; developing and disseminating technical guidelines; awareness raising

Networks: INGA, SARNISSA, Integrative Graduate Education Research Traineeship, Aquaculture Network for Africa	2,3,4	Development and dissemination of technical information; capacity building
Private sector: farmers	2,4	Participatory research into design, adoption and dissemination of water-efficient aquaculture technologies and technologies that meet consumer criteria with regard to environmentally sound production methods

MTP project logframe — project 5: Aquaculture and the environment

Table 17. Project 5 logframe				
Outputs	Intended users	Outcome	Impact	
Output 1				
<i>A framework and tools to assess the relationship between water productivity and aquaculture</i>				
Output targets 2009	Assessment of resilience of smallholder IAA systems to drought in southern Malawi .	Scientists.	Increased adaptive capacity among adopters of IAA.	Improved and resilient livelihoods.
	Review of water productivity and aquaculture in Africa and South and Southeast Asia .	Policymakers, NARES, NGOs, farmers.	Increased fish production, sustained ecosystem services, increased profitability.	Improved and resilient livelihoods.
	Policy brief on water productivity and aquaculture in Africa and Asia .	Policymakers, NARES, NGOs, farmers.	Increased fish production, sustained ecosystem services, increased profitability.	Improved and resilient livelihoods.
2010	Study of water productivity and aquaculture in the Nile Delta, Egypt .	Policymakers, NARES, farmers.	Strengthened capacity to manage water-allocation issues.	Sustained ecosystem services and increased food security.
	Incorporation of water-productivity tools into decision-support tool software.	Policymakers, NARES, ARIs.	Strengthened capacity to manage water-allocation issues.	Sustained ecosystem services and increased food security.
	Distance learning course module in aquaculture and water management developed.	NARES, ARIs, NGOs.	Strengthened capacity to manage water-allocation issues.	Sustained ecosystem services and increased food security.
Output 2				
<i>Integrated watershed-level tools that facilitate better-informed policies and management for the uptake of sustainable aquaculture</i>				
Output targets 2009	Review of aquaculture and resilience.	ARIs, policymakers.	Sustained ecosystem services, increased adaptive capacity.	Ecosystem services maintained at acceptable levels, reduced vulnerability of aquaculture-based livelihoods.
	Guidance on operationalizing an ecosystem approach to aquaculture.	ARIs, policymakers, NARES.	Sustained ecosystem services, increased adaptive capacity.	Ecosystem services maintained at acceptable levels, reduced vulnerability of aquaculture-based livelihoods.

2010	Studies of environmental and socioeconomic impacts of cage aquaculture on Lake Volta in Ghana and Lake Malawi published.	NARES, policymakers, ARIs.	Sustained ecosystem services, increased fish production.	Increased incomes and employment from fish production.
2011	Models to assess impacts of pond aquaculture on ecological and socioeconomic resilience at a landscape level in sub-Saharan Africa and South Asia . Models to assess impacts of cage aquaculture on ecological and socioeconomic resilience at a landscape level in sub-Saharan Africa .	NARES, policymakers, ARIs. NARES, policymakers, ARIs.	Sustained ecosystem services, increased fish production. Sustained ecosystem services, increased fish production.	Increased incomes and employment from fish production. Increased incomes and employment from fish production.
Output 3 <i>Tools to assess and manage the risks associated with developing and disseminating genetically improved strains of farmed aquatic animals</i>				
Output targets 2009				
2010	Analysis of tilapia genetic resources and their conservation requirements in the Volta Basin and elsewhere in Africa . Risk assessment and management guidelines for use of genetically improved strains.	Policymakers, NARES, fish farmers. Policymakers, NARES, fish farmers.	Sustained tilapia diversity. Sustained tilapia diversity.	Ecosystem services maintained at acceptable levels. Ecosystem services maintained at acceptable levels.
2011	Framework to identify and conserve aquatic genetic resources. National and regional policy analyses associated with conservation of aquatic genetic resources in West Africa .	Policymakers, NARES, fish farmers. Policymakers, NARES, fish farmers.	Sustained tilapia diversity. Sustained tilapia diversity.	Ecosystem services maintained at acceptable levels. Ecosystem services maintained at acceptable levels.

Outputs	Intended users	Outcome	Impact	
Output 4 <i>Mechanisms that connect consumers to small and medium-sized producers and promote the adoption of best environmental management practices</i>				
Output targets 2009				
2010	Review of aquaculture-certification systems in South and Southeast Asia.	Policymakers, producers.	Increased profitability and sustained ecosystem services.	Reduced vulnerability of aquaculture-dependent systems to aquaculture drivers, and ecosystem services maintained at acceptable level.
2011	<p>Analysis and review of sustainable and ethical trade of Asian aquaculture produce and consumer behavior.</p> <p>Development of an ethical aquaculture consumer index.</p> <p>Aquaculture sector development plans that meet changing consumer demands and behavior, while making effective sustainable use of available productive resources.</p>	<p>Policymakers, producers.</p> <p>Policymakers, producers.</p> <p>Policymakers, producers.</p>	<p>Increased profitability and sustained ecosystem services.</p> <p>Increased profitability and sustained ecosystem services.</p> <p>Increased profitability and sustained ecosystem services.</p>	<p>Reduced vulnerability of aquaculture-dependent systems to aquaculture drivers, and ecosystem services maintained at acceptable level.</p> <p>Reduced vulnerability of aquaculture-dependent systems to aquaculture drivers, and ecosystem services maintained at acceptable level.</p> <p>Reduced vulnerability of aquaculture-dependent systems to aquaculture drivers, and ecosystem services maintained at acceptable level.</p>

MTP project 6. Resilience in practice for small-scale fisheries

Background and rationale

Conventional fisheries management has largely failed to ensure sustainable fishery systems and livelihoods for the millions of people dependent on SSF in the developing world. Management at inappropriate scales, inappropriate property rights, inability to control fishing capacity, poor governance and other factors have conspired to block these fisheries from achieving their potential. Classically, management has concentrated on the fishery itself, even though this may present relatively weak levers for change. Improving the management of these fisheries requires a radical rethink of established theory, approaches and definitions of sustainability, as well as of indicators of management performance.

A new conceptualization of sustainability in fisheries is emerging from much broader developments in natural resource management. In its modern form, “resilience” has become a powerful metaphor for sustainable development, but advances in theory have yet to be translated into more resilient aquatic ecosystems or better lives for poor fisherfolk in developing countries. The challenge to utilizing resilience theory to manage and govern SSF is an important frontier for development science, as more than half the world’s wild-caught fish are from SSF, and most fishers live in developing countries. As complex systems, these fisheries exemplify the dynamic and unpredictable interdependencies of people and nature. Fisherfolk in SSF are vulnerable to the compounding effects of stresses within fishery systems as well as to ecological and social forces outside their domain of influence. Building adaptive capacity in ecosystems and people is central to realizing the conservation and social and economic potential of SSF.

The purpose of this project is to develop concepts, methods and sustainability indicators that will catalyze a fundamental change in SSF management in the developing world. To achieve this, the project will focus on three key areas. First, we will test and refine methods for integrated assessment of SSF. Second, we will build on these assessment tools to test and learn lessons from a range of alternative management interventions in a range of social and ecological settings. Third, we will develop and test a range of livelihood diversification options that can be used to reduce dependence on SSF in those cases where this is required to reduce vulnerability and strengthen resilience.

Goal

Management of SSF that yields profound improvements in the lives of fishery-dependent people and the aquatic ecosystems they use

Objectives

1. To strengthen capacity for integrated assessment and advice in SSF that moves beyond traditional forms of stock assessment and sets SSF in the broader ecological, social and economic context.
2. To provide incentives to both mitigate risk and adapt to change, including operationalizing resilience and adaptation.
3. To reduce dependence on small-scale fisheries.

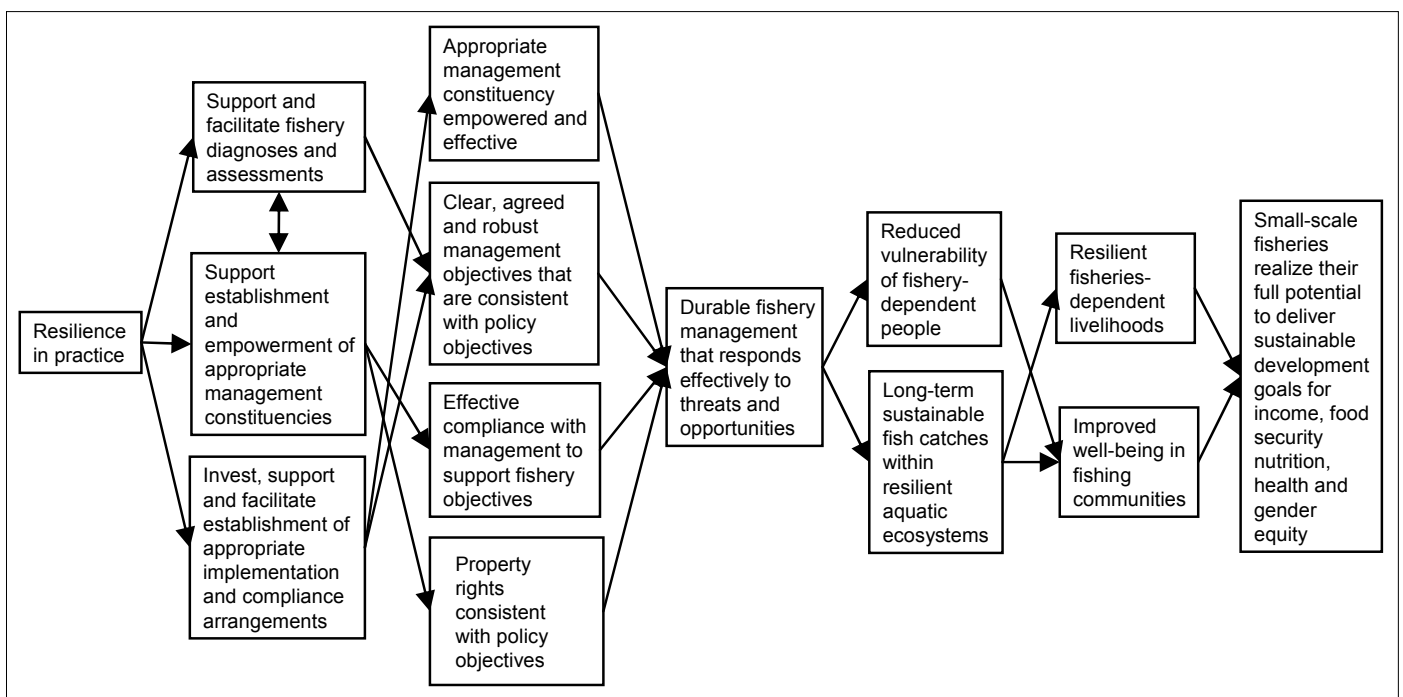
Alignment with CGIAR system priorities

Project number 6	Resilience in practice for small-scale fisheries	3C	4A	4B	4C	5D
Output 1	Improved methods for integrated assessment and advice	20	30	20	10	20
Output 2	Management concepts and approaches that mitigate risk tested in a range of ecological and social settings	30	30	20	10	10
Output 3	Livelihood diversification options that reduce dependence on small-scale fisheries	70		20	10	

Impact pathway

For SSF to realize their potential to deliver sustainable development, fisheries management must become more multi-sectoral (the focus of MTP Project 2) and responsive to external drivers of change (see MTP Project 1). Within the sector, it needs to refocus on responding to threats and opportunities rather than narrowly on maximizing yield. To achieve this, the appropriate management constituencies must be engaged and empowered, agreement must be reached on clear management objectives, and compliance must be effective. Achieving these outcomes requires investments to facilitate fishery diagnosis and assessment, establish the required constituencies and governance mechanisms, and support implementation and compliance. These investments must be underpinned by research that develops and tests methods to diagnose and develop effective institutional approaches and to understand the ecological potential of fishery systems and the constraints on them. They must also support work to broker and catalyze social processes to build the legitimacy of managers and durable management interventions. The impact pathway for achieving this is summarized in Figure 13.

Figure 13. Impact pathway for Project 6.



International public goods

This project is a mix of field-based action research, method development and international information system development. We will develop and test new methods to operationalize resilience concepts and test them in a range of social and ecological contexts in sub-Saharan Africa, the Mekong basin, Bangladesh and the Solomon Islands. This will lead to publications in the primary scientific literature, manuals, guidelines and software. This body of knowledge is designed to provide governments, community groups, NGOs, development agencies and international organizations with a new and innovative source of information on management for resilient small-scale fisheries. As such it will serve as a new and important suite of international public goods in this field.

The project is supported by two global information systems: FishBase and ReefBase. FishBase now contains all described species of fish (>30,000) and their habitats. ReefBase is a global information system on the status, threats and management of coral reefs and associated ecosystems in over 100 countries and territories. Both of these databases are highly regarded as IPGs.

Linkages and partnerships

Building the momentum and political capital for change will involve partnerships with institutions outside the fisheries sector and at various scales. The perspective of development banks and the private sector is needed to adequately target investments in the sector. Partnerships with CGIAR centers, notably IWMI and IRRI, that lead research on other productive uses of water are key to a better integration of inland fisheries in the wider context of water resources development. Partnerships with national governments and NARES will help identify interdependencies in opportunities and threats to national and local economies. FAO and regional policy and advisory bodies are key partners in developing global and regional strategies to achieve the goal of strengthening the impact of SSF on rural development and poverty alleviation. They will also be central to mainstreaming these approaches.

Key partners and their roles

Table 19. Project 6 key partners and their roles		
Partners	Output	Role
ARIs: Universities of Minnesota, Bergen, Stirling, East Anglia, Helsinki (University of Technology), Biota BD (Finland); FishBase Consortium (WorldFish + 8 ARIs)	1,2	Research implementation and mobilization of new science; advanced training (PhD and postdoctoral)
NARES: Departments and ministries of fisheries of all key countries in logframe, Department of Livestock and Fisheries (Lao PDR); Inland Fisheries Research and Development Institute (Cambodia), Institute for Fisheries Economics and Planning, Can Tho University, Nong Lam University	1,2,3	Project implementation, policy dialogue, training, event management, strategy development, capacity building, research implementation, technical support for participatory planning and monitoring, fisheries management options
FAO	1	Strategy development, capacity building, research implementation, technical support for participatory planning and monitoring, fisheries management
Foundations: Bangladesh Shrimp and Fish Foundation and Small Enterprise Development Foundation	2,3	MoUs developed for shared proposal development and implementation responsibility
IWMI, IRRI other CGIAR centers and Challenge Program on Water and Food	1,2	Methods for integrating inland fisheries with other productive uses of water
Regional policy and advisory bodies: NEPAD, FARA, Southern African Development Community, Economic Commission for Africa, Economic Community of West African States, Southeast Asian Fisheries Development Center, Mekong River Commission, National Mekong Committees	1,2	Policy development, science support on regional issues, capacity building, development of regional programs, implementation of science and capacity-building components
NGOs: WWF, The Nature Conservancy, African Wildlife Foundation, Conservation International	1,3	Linkages with science and technical training providers; research and capacity-building implementation

MTP project logframe — project 6: Resilience in practice for ssf

Table 20. Project 6 logframe				
Outputs	Intended users	Outcome	Impact	
Output 1				
<i>Improved methods for integrated assessment and advice</i>				
Output targets 2009	National databases and coral reef decision-support systems established in at least three countries in the Pacific region.	Coral reef managers, researchers and NGOs in Asia and the western Pacific.	Key stakeholders make better use of existing data and information from their region in status reports, management plans and policy briefs.	Reefs in the Pacific are more effectively managed because of enhanced capacity of managers.
	Enhanced ReefBase tools to support fisheries management through improved coral reef-mapping products, expanded coverage of freshwater species, and inclusion of marine invertebrates (global) .	Fisheries researchers, managers and extension workers in government departments, research agencies, NGOs in developing countries.	Fisheries managers and researchers have wider access to information that contributes to more effective decision making and fisheries and aquaculture policies.	Fisheries and aquaculture are more productive, efficient and ecologically sustainable.
	Validated participatory decision-support tools developed integrating water, agriculture and fisheries aspects and interactions for floodplain fisheries in the lower Mekong .	Ministries of agriculture; NGOs; researchers; provincial, district and commune planning units.	Productivity, equity and sustainability considerations relating to fisheries, agriculture and water management explicitly weighed in planning processes.	Combined land and water productivity improved and better reflecting local needs and priorities.
	Framework for integrated assessment of SSF and new definitions of sustainability published (global) .	Fisheries researchers, managers and extension workers in government departments; research agencies; NGOs in developing countries.	New assessment and advisory tools used to improve fisheries management.	Reduced vulnerability and strengthened adaptive capacity in fishery-dependent communities.
2010	Historical analysis of resilience in five fishery systems in sub-Saharan Africa published.	Fisheries researchers, managers and extension workers in government departments; research agencies; NGOs in developing countries.	Improved understanding of historical drivers of change used to improve management and national policy.	Reduced vulnerability and strengthened adaptive capacity in fishery-dependent communities.
	A typology of SSF developed and used to guide management interventions in a range of institutional and ecological settings (global) .	Fisheries researchers, managers and extension workers in government departments; research agencies; NGOs in developing countries.	Improved understanding of historical drivers of change used to improve management and national policy.	Reduced vulnerability and strengthened adaptive capacity in fishery-dependent communities.
	New Web interface in FishBase to assess the risks of establishing introduced species, particularly those imported for the aquarium trade (global) .	National agencies for biodiversity conservation, trade companies and local producers.	Increased awareness of the risks associated with introduced species.	Reduced risk from introduced species.
	Enhanced FishBase and ReefBase tools to support fisheries management through expanded SSF portal and development of INCOFISH, a database for marine invertebrate species (global) .	Fisheries researchers, managers and extension workers in government departments; research agencies; NGOs in developing countries.	Fisheries managers and researchers use FishBase and ReefBase to obtain information, which contributes to more effective decision making and fisheries and aquaculture policies.	Fisheries and aquaculture are more productive, efficient and ecologically sustainable.
2011	Guidance manuals for fishery managers published.	Fisheries researchers, managers and extension workers in government departments; research agencies; NGOs in developing countries.	New approaches to fisheries management incorporated in policy and practice.	Improved fisheries management and governance leading to more resilient fishery systems.

Outputs	Intended users	Outcome	Impact	
Output 2				
<i>Management concepts and approaches that mitigate risk tested in a range of ecological and social settings</i>				
Output targets 2009	<p>Co-management systems developed for managing culture-based fisheries in selected reservoirs in Ganges, Nile and Volta basins.</p> <p>Global critical synthesis of GEF-funded coral reef-management studies completed and lessons published.</p> <p>Models for assessing the potential and options for restocking collapsed fisheries in the Pacific and sub-Saharan Africa developed and disseminated.</p> <p>Global assessment of rights-based management in SSF.</p>	<p>Fishery co-operative societies and government agencies, decentralized government.</p> <p>GEF, donors, regional advisory bodies.</p> <p>NARES, ARIs, CGIAR.</p> <p>Resource managers, researchers, policymakers.</p>	<p>Improved governance of culture-based fisheries under a co-management regime demonstrated in the three basins.</p> <p>Good and bad practice in coral reef-management studies identified and lessons disseminated.</p> <p>Improved capacity among scientists and planners to assess potential and options for restocking.</p> <p>Greater understanding of inequities in distribution of benefits among participants.</p>	<p>Enhanced participation of stakeholders in decision-making processes and equitable distribution of benefits from the fisheries.</p> <p>Reduced dependence on coral reef fisheries; more sustainable local benefits secured.</p> <p>Investments in restocking that improve sustainability and productivity for the benefit of poor households.</p> <p>Greater equity in distribution of benefits from enhanced fisheries.</p>
2010	<p>Guidelines for adaptive management in SSF in the developing world incorporated in national and regional fisheries development in the Pacific, Mekong, and sub-Saharan Africa regions.</p> <p>Efficacy of alternative local approaches to fisheries and wetlands management assessed and compared in the Mekong region.</p> <p>Assessments of role of closed areas (e.g., sanctuaries), and impediments to their functioning in Malawi and the Mekong river basin.</p> <p>Global synthesis published on lessons learned in SSF management and governance based on analysis of at least 200 fisheries.</p>	<p>Community fishery organizations, local governments and line agencies.</p> <p>Community fishery organizations, local governments and line agencies.</p> <p>Community fishery organizations, local governments and line agencies.</p> <p>FAO, NARES, ARIs, World Bank.</p>	<p>Successful approaches recognized and supported by national agencies.</p> <p>Successful approaches recognized and supported by national agencies.</p> <p>Successful approaches recognized and supported by national agencies.</p> <p>System for extracting lessons from the diversity of SSF implemented.</p>	<p>Improved sustainability and productivity for the benefit of poor households.</p> <p>Improved sustainability and productivity for the benefit of poor households.</p> <p>Improved sustainability and productivity for the benefit of poor households.</p> <p>Improved capacity to design appropriate management interventions.</p>
2011	<p>Lessons learned from case studies in SSF management for resilience in five fisheries in sub-Saharan Africa published.</p> <p>Meta-analysis completed of the effectiveness of marine protected areas as a fisheries management tool (global).</p>	<p>International science community, government agencies, NGOs.</p> <p>Regional bodies, national agencies, researchers.</p>	<p>New definitions of sustainability and better management methods used in fisheries, and lessons scaled out to other regions.</p> <p>Better understanding of the social and ecological contexts in which marine protected areas are successful.</p>	<p>Reduced vulnerability and improved resilience in fish-dependent communities.</p> <p>Improved fisheries management and livelihoods for coastal communities.</p>

Outputs	Intended users	Outcome	Impact	
Output 3: <i>Livelihood diversification options that reduce dependence on small-scale fisheries</i>				
Output targets 2009	<p>An analysis of the distribution of benefits among participants in enhanced floodplain fisheries in Bangladesh, Mekong and China.</p> <p>Opportunities for livelihood diversification as a means of reducing pressure on wild fisheries assessed in Solomon Islands and Indonesia.</p> <p>Institutional mechanisms for integrating fish and crop production developed and disseminated in the Ganges.</p> <p>Guidelines on selected opportunities to improve women's livelihoods from fishing (Cameroon, DR Congo.)</p>	<p>Resource managers, researchers and policymakers.</p> <p>Resource managers, researchers and policymakers.</p> <p>Governments, national agencies, basin organizations, NARES and others in target basins.</p> <p>NGOs, donors, government agencies.</p>	<p>Greater understanding of inequities in distribution of benefits among participants.</p> <p>Greater understanding of inequities in distribution of benefits among participants.</p> <p>Improved policies and institutional arrangements for fostering integrated farming systems in two basins.</p> <p>Improved incomes and greater resilience in women's fishing activities in Central Africa.</p>	<p>Greater equity in distribution of benefits from enhanced fisheries.</p> <p>Greater equity in distribution of benefits from enhanced fisheries.</p> <p>Policy, institutions and governance enhanced; equitable distribution of benefits from ecosystems; informed decision-making process with participation of all stakeholders.</p> <p>Improved sustainability and equity in incomes from SSF.</p>
2010	<p>Critical analysis of winners and losers in the changing landscape of aquatic resource-based livelihoods in the Mekong.</p> <p>Critical synthesis and technical guidelines on the potential for small-scale aquaculture to provide alternative income streams and empower SSF-dependent women in South Asia.</p>	<p>Governments, national agencies, basin organizations, NARES and others in target basins.</p> <p>Governments, national agencies, basin organizations, NARES and others in target basins.</p>	<p>Improved policies and institutional arrangements for fostering integrated farming systems in two basins.</p> <p>Improved policies and institutional arrangements for fostering integrated farming systems in two basins.</p>	<p>Policy, institutions and governance enhanced; equitable distribution of benefits from ecosystems; informed decision-making process with participation of all stakeholders.</p> <p>Policy, institutions and governance enhanced; equitable distribution of benefits from ecosystems; informed decision-making process with participation of all stakeholders.</p>
2011	<p>Critical analysis of the capacity of aquaculture to substitute for declines in capture fishery production and livelihoods in the Mekong and sub-Saharan Africa.</p>	<p>National line agencies; NGOs; researchers; provincial, district and commune planning units.</p>	<p>Productivity, equity and sustainability considerations relating to fisheries, agriculture and water management explicitly weighed in planning processes.</p>	<p>Combined land and water productivity including fisheries improved and better reflecting local needs and priorities.</p>

Crosscutting issues

Background

Several key crosscutting issues are addressed in all six MTP projects. In some of them, aspects have been identified as researchable issues. To complement this we have developed a set of approaches to guide us in addressing crosscutting issues in project identification and planning across all projects. These approaches are summarized below. To help ensure that they are pursued effectively, a research coordinator will oversee and guide our work in each area. We will adapt our project development and management processes as required to facilitate integration.

Gender analysis

Governance reforms, global drivers and technology developments are all likely to have different impacts on men, women, children, youth and the elderly. They are also likely to affect gender and other social relations. For example, as women gain access to education and communication technologies through gender-equity policies in other sectors, their roles in market chains, contributions to household income, and decision-making on household investment and expenditure may change. To help us take better account of these issues, the Center is currently investing in developing specialized skills in gender analysis, and we are complementing this by improving the capacity of non-specialists to understand the gender impacts of change. To help achieve this we will ensure the following:

- All WorldFish projects will, where possible, explicitly identify opportunities for collecting gender-disaggregated data and build this in to project design.
- Research and development activities that are identified a priori as having strongly gender-differentiated impacts will incorporate a component of gender analysis, using one of the available gender analysis frameworks.
- Gender-policy linkages will be explored in policy-related research and policy-engagement activities.
- Where there are agenda-setting research possibilities in the field of gender studies that are significant beyond the fishery sector, they will be identified, and possibilities for research will be encouraged. This may include gender relations in the context of high HIV prevalence in fishing communities, gendered analysis of risk perception and discounting in the context of incentives for men and women to invest in co-management, and experimental economic studies in gendered differences in expenditure patterns of men and women and their propensity to save. All of these are areas of gender research of significance across the CGIAR and beyond.

Capacity development

Developing capacity to conduct research; provide training and advice; implement policy; and design, communicate, support and implement technological innovation is a core part of the mandates of WorldFish and the CGIAR. Indeed, capacity development is of critical importance to valuing and strengthening partnerships to achieve our mission. There are many researchable issues in the field of capacity development, such as the effectiveness of different models of extension service delivery, design and strengthening of innovation systems, and creating networks of practice around particular topics (as we have done for addressing HIV and AIDS in the fisheries sector). In our approach to capacity development we will ensure the following:

- We evaluate opportunities at the planning stage of projects and programs for capacity development for our target beneficiaries, our partners, ourselves and other relevant stakeholders.
- We identify capacity-development activities that can be undertaken in the project that will help achieve project outcomes. These may include awareness-raising workshops, technical training, or facilitation of stakeholder dialogues that involve capacity development in policy formulation or consensus building.

- We develop, where possible, IPGs related to capacity development. An example from the MTP 2009-2011 is to develop a network or community of practice addressing the impacts of water-borne disease in riparian and lakeshore communities. As our research seeks to address drivers of poverty and vulnerability in the fisheries sector, these cross-discipline, cross-sectoral networks become increasingly important.

Impact assessment

WorldFish is strongly aware of the need to improve its performance in evaluating the impact of its research program. In the past, impact assessment has been largely opportunistic and piecemeal. Today, we actively work to develop an impact-assessment culture in the organization and, in this MTP, are taking the following steps:

- We are developing a set of guidelines for all project proposers and managers to use to ensure that impact assessment can be conducted as part of any research investment greater than \$1 million, whether funded as a single project or as a suite of smaller projects. The guidelines will be available by December 2008 and will be tested starting in 2009. They will advise on how to conduct good baseline studies, the design a system for monitoring and assessment, and the use of post-project impact-assessment tools.
- We will inform future MTPs with studies of the potential impact of different streams of research. Such impact studies are currently missing from the capture fisheries subsector, where the impact of research on policy — and of policy change on fisheries productivity, poverty and hunger — are challenging to evaluate. This is a researchable issue to be developed in future MTPs. For aquaculture, standard methods used in agricultural research impact assessment can be utilized for technology-development programs, but problems similar to those of fisheries affect policy-related research.
- Building on work initiated through the CGIAR Standing Panel on Impact Assessment, we will develop tools and research proposals to evaluate the impact of all major streams of past and current WorldFish work.
- Starting in 2009, we will begin developing an approach for higher-level global or regional analysis to track progress in meeting our two development challenges and evaluate the impact of those efforts.

Communication and policy linkage

While communication strategies and the analysis of policy influencing processes is a research field in itself, partly overlapping with impact-assessment research, we possess limited research capacity in this area. Our objectives for communication and policy linkages are to ensure that we are effective and aware of innovations in communication and policy processes. Our strategy is based on the following:

- **Making impact pathways explicit.** All research projects in WorldFish are required to fit in an impact pathway framework that clearly identifies their relevance to policy and their opportunities to affect policies that can reduce poverty and hunger. Impact pathways are specified at the MTP level, and project leaders are required to develop explicit impact pathways for all projects.
- **Understanding and engaging with policy processes.** We are developing a much more strategic approach to informing policy formulation based on researching and participating in the systems of consultation and policy formulation nationally, regionally and globally. Our work in the Greater Mekong region and in sub-Saharan Africa pays particular attention to this.

F. Finance Plan

1. 2007 results and 2008 development

All figures given as dollars (\$) refer to US dollars. The 2007 net expenditure level was \$17.293 million. About 88% of 2007 resources were used for programmatic activities. We expect to maintain approximately this ratio in 2008. The WorldFish Center (ICLARM) ended the year with a deficit of \$0.9 million. This reflects the decision of the Board to draw down on the Center's reserves through a strategic program for investment which will promote growth in priority areas.

The 2007 grant income from donors amounted to \$15.171 million in addition to \$1.222 million of earned income. Grant income for 2008 is projected at \$17.994 million. The increase in 2008 Center income is due to more restricted funding. Recovery of indirect costs from funded projects amounted to \$1 million.

The 2008 expenditures are estimated at \$20.218 million compared to actual spending of \$17.293 million for 2007. The increase in expenditure is in line with the increase with the restricted project funding.

Table 1: Comparison of 2007 performance and 2008 current estimate		
	2007 Actual (\$million)	2008 Estimate (\$million)
Sources of funds		
Donor funding	15.171	17.994
Earned income	1.222	0.400
Total	16.393	18.394
Application of funds		
Programmatic	15.189	17.845
Management and general expenses	2.871	3.375
Depreciation	0.398	0.465
Less: Overhead recoveries	(0.767)	(1.000)
Net expenditures	17.293	20.218
Unexpended Balance *	(0.900)	(1.824)
* Negative balances were planned and approved by the Center Board as part of its strategy to reduce its reserves by investing in key areas for future growth.		

The 2007 spending and 2008 current planned resource allocation by CGIAR activity is summarized below:

	2008	
	Estimate	%
1D Conservation of aquatic animal genetic resources	0.738	4
2B Tolerance to selected abiotic stresses	0.235	1
2D Genetic enhancement of selected species to increase income generation by the poor	0.421	2
3C Enhancing income through increased productivity of fisheries and aquaculture	8.271	41
4A Integrated land, water and forest management and landscape level	2.411	12
4B Sustaining and managing aquatic ecosystems for food and livelihoods	3.190	16
4C Improving water productivity	1.753	8
4D Sustainable agro-ecological intensification in low and high-potential areas	0.106	1
5A Science and technology policies and institutions	0.580	3
5B Making international and domestic markets work for the poor	0.587	3
5C Rural institutions and their governance	0.182	1
5D Improving research and development options to reduce rural poverty and vulnerability	1.744	8
Total	20.218	100

	\$(million)		
	2007 Actual	2008	
		Estimate	%
Increasing productivity	4.752	5.084	25
Protecting the environment	2.658	2.839	14
Saving biodiversity	0.901	1.021	5
Improving policies	4.895	6.417	32
Strengthening NARS	4.087	4.857	24
Total	17.293	20.218	100

1.1 Funding trends

With continued efforts in fund raising and the harnessing of greater public awareness on the importance of aquatic resources management amongst its community of donors and partners, the Center has consistently increased its share of resources within the CGIAR system since 1994. Funding has increased, in nominal terms, from \$9.60 million in 1996 to \$20.218 million in 2008 (expected), an increase during the period of over 110%.

1.2 Capital fund

The purpose of the Capital Fund is to finance all Center core capital requirements. The balance of the Capital Fund at 31 December 2007 was \$0.73 million, appropriated by the Board of Trustees for property and equipment renewal.

1.3 Working capital (days)

The working capital as of 31 December 2007 can support operations for 172 days compared to CGIAR benchmark of 90 days of operations. As mentioned above, the Board has approved an investment plan that will draw down some of these reserves.

1.4 Liquidity

The Center's liquidity declined slightly last year. We are taking actions to restore an improving trend by focusing attention on actual cash flows and management of capital expenditures.

	2006	2007
Current ratio (times)	2.6	2.5
Cash to current assets (%)	72	75
Cash to current liabilities (%)	189	187

1.5 Equity: Longer term management of resources

The minimum equity requirement of 90 days is required for research operations as determined by the CGIAR. The Center equity for 2007 was 172 days. This equity will be reduced over the next 2 years as the Center uses its reserves for strategic investment purposes. It is expected to decline to between 100 and 110 days.

2. 2009–2011 Plans

2.1 Funding requirements and financing plans

The funding level for the first year of the MTP 2009–2011 was based on a carefully projected core and project funding. In 2008 the level of funding is higher due to the inclusion of the carry over of unexpended funds from 2007 and the Center expects more new projects to materialize in the year.

The expected level of donor funding for 2008 is projected at \$17.994 million and indirect cost recoveries from funded projects of \$1 million. The Center's projected operating levels (net of indirect cost recoveries) for 2008 to 2011 are:

	\$(million)			
	2008	2009	2010	2011
Projected donor funding	18.00	22.56	24.50	26.50
Center income	0.40	0.34	0.50	0.50
Reserve draw down	1.82	0.00	0.00	0.00
Total	20.22	22.90	25.00	27.00

2009 is expected to grow by approximately 13% and growth rate thereafter is expected to be 9% and 8% per year.

Earned income: Earned income is expected to be at the level of approximately \$0.40 million and \$0.34 million for 2008 and 2009 respectively and \$0.50 million thereafter.

Indirect Cost Recovery: Indirect cost recovery is a critical component for financing the Center's non-research activities and operations that are essential and critical support services to research. The Center has developed a full cost recovery system similar to the private sector which has been implemented in 2008. The Center's indirect cost recovery is expected to be around \$1 million for 2008. Indirect cost recovery is still well below the full costs of targeted research projects. We will be targeting to increase our cost recovery significantly over the next three years.

2.2 Operating budget 2009–2011

The research activities and allocation of resources were determined by an in-depth review of WorldFish Center discipline and research projects, and a Center-wide review by Board and management was conducted. The six portfolios and three science disciplines were allocated 74% the Center's priorities and strategies. The allocation of funds to the projects, sources of funding, and linkage with the CGIAR research agenda within the newly adopted log frame are reflected in the main budget tables.

Allocation of resources by object of expenditures (cost structure): The WorldFish Center carefully monitors the cost structure of operations to ensure that fixed costs are kept within a reasonable proportion of the annual budget. Approximately 49% of the resources are allocated to personnel costs for the years 2009–2011 (Financial Table 8).

Allocation of resources by CGIAR undertaking: The allocation of resources to CGIAR undertakings is in accordance with the Center's research directions and consistent with CGIAR strategies and priorities (Financial Table 5).

Allocation of resources by region: Approximately 44% of resources are allocated to Asia, 47% to sub-Saharan Africa, 1% to Latin America and the Caribbean and 8% to West Asia and North Africa (Financial Table 6).

Personnel input: Center-hired Internationally Recruited Staff (IRS) level is estimated at around 53 positions including post-doctoral fellows. Additional positions are planned subject to funding availability in 2009 and beyond (Financial Table 11).

Nationally Recruited Staff (NRS) overall level is expected to reach around 263 for all Center sites in 2009.

2.3 Capital budget

The Center will be budgeting modest amounts for research equipment and computer hardware and software purchases as follows.

Table 6: The WorldFish Center capital requirements 2009 – 2011, \$(million)			
	2009	2010	2011
Capital needs	0.350	0.400	0.400

It is envisaged that a major refurbishment of the Headquarter buildings in Malaysia will be required within the next five years.

2.4 Inflation and exchange rates

Local inflation is estimated to be in the region of 3% - 5% during the plan period. Currently the RM (Malaysian Ringgit) is now allowed to float against a basket of currencies and is monitored by the Central Bank of Malaysia. It is expected to strengthen against the US dollar. The ringgit has appreciated against the US dollar and its exchange rate to the dollar was 3.2 on 31 May 2008.

The US dollar had declined against all major currencies, which has resulted in a positive impact on non-US dollar denominated contributions for 2007 but this is more than offset by expenditures from local sources.

2.5 Financing plan 2009

The confirmed and high probability funding for financing the Center operations in 2009 amounts to \$22.56 million. Included in this amount is \$1.19 million from the World Bank.

The projected core funding and project funding amounts to \$6.29 million and \$16.27 million respectively.

2.6 Summary of financing plan

The resource requirements over the plan period are based on the 2008 Budget level and the best estimate of resources for 2009 which is the basis for this plan period. The spending plan is increased by an annual growth of 9% and 8% for 2010 and 2011 respectively.

Table 7 provides details of the funding and donor support for 2009 agenda.

Table 7: The WorldFish Center Financing Plan for 2009, \$(million)		
	\$(M)	%
Core support	6.29	27.5
Targeted/restricted funding	16.27	71.0
Subtotal	22.56	98.5
Center earned income	0.34	1.5
Total revenue	22.90	100
Draw down on reserve	(0.00)	-
Expenditure in 2009	22.90	100

G. Financial Tables for 2009–2011

- Table 1. Allocation of Project Costs by Priority Area and Priorities, 2009
- Table 2. Allocation of Project Cost to CGIAR Priorities, 2007 to 2011
- Table 3. Summary of Project Costs, 2007-2011
- Table 4. Summary of Priority Costs, 2007-2011
- Table 5. Investments by Undertaking, Activity and Sector, 2007-2011
- Table 6. Project Investments by Developing Region, 2007-2011
- Table 7. Summary of Investments by Developing Region, 2007-2011
- Table 8. Expenditure by Object, 2007 – 2011
- Table 9. Member & Non-member Unrestricted Grants, 2007-2009
- Table 9a. Member & Non-member Unrestricted and Restricted Grants, 2007-2009
- Table 10. Allocation of Member Grants and Center Income to Projects, 2007-2009
- Table 11. Internationally and Nationally Recruited Staff, 2007-2011
- Table 12. Currency Structure of Expenditure, 2007-2009
- Table 13. Statement of Financial Position (SFP), 2007-2009
- Table 14. Statement of Activities (SOA), 2007-2009

Table 1: Allocation of Project Costs by Priority Area and Priorities, 2009
in \$millions

Project	Priority Area 1		Priority Area 2		Priority Area 3	Priority Area 4				Priority Area 5				Total
	1D	2B	2D	3C	4A	4B	4C	4D	5A	5B	5C	5D		
MTP 1: Global Drivers of Change		0.433		0.289			0.385	0.337		0.096	0.289	0.337	0.242	2.408
MTP 2: Markets and Trade				2.895							0.724			3.619
MTP 3: Multi-Level and Multi-sectoral Governance				1.348	0.539	0.943	0.404						0.809	4.043
MTP 4: Sustainable Aquaculture Technologies	0.141		0.565	2.825		0.141			0.565					4.237
MTP 5: Aquaculture and the Environment	1.040				0.694	0.694	0.694	0.173	0.173					3.468
MTP 6: Resilience in Practice for Small-Scale Fisheries				2.048	1.024	1.024	0.512						0.513	5.121
Total	1.181	0.433	0.565	9.405	2.257	3.187	1.947	0.173	0.834	1.013	0.337	1.564	22.896	

**Table 2: Allocation of Project Costs to CGIAR Priorities, 2007-2011
in \$millions**

Projects	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
MTP 1: Global Drivers of Change					
2B	0.199	0.235	0.433	0.360	0.389
3C	0.132	0.156	0.289	0.240	0.259
4B	0.177	0.209	0.385	0.320	0.346
4C	0.155	0.182	0.337	0.280	0.302
5A	0.044	0.052	0.096	0.080	0.086
5B	0.132	0.156	0.289	0.240	0.259
5C	0.155	0.182	0.337	0.280	0.302
5D	0.110	0.131	0.242	0.200	0.217
Total Project	1.104	1.303	2.408	2.000	2.160
MTP 2: Markets and Trade					
3C	1.422	1.723	2.895	2.300	2.484
5B	0.356	0.431	0.724	0.575	0.621
Total Project	1.778	2.154	3.619	2.875	3.105
MTP 3: Multi-Level and Multi-sectoral Governance					
3C	0.957	1.547	1.348	1.208	1.305
4A	0.383	0.619	0.539	0.483	0.522
4B	0.671	1.084	0.943	0.846	0.913
4C	0.287	0.464	0.404	0.363	0.392
5D	0.574	0.928	0.809	0.725	0.783
Total Project	2.872	4.642	4.043	3.625	3.915
MTP 4: Sustainable Aquaculture Technologies					
1D	0.094	0.105	0.141	0.158	0.171
2D	0.376	0.421	0.565	0.633	0.684
3C	1.881	2.106	2.825	3.167	3.420
4B	0.094	0.105	0.141	0.158	0.171
5A	0.376	0.422	0.565	0.634	0.684
Total Project	2.821	3.159	4.237	4.750	5.130
MTP 5: Aquaculture and the Environment					
1D	0.633	0.633	1.040	0.825	0.891
4A	0.422	0.422	0.694	0.550	0.594
4B	0.422	0.422	0.694	0.550	0.594
4C	0.421	0.422	0.694	0.549	0.593
4D	0.106	0.106	0.173	0.138	0.149
5A	0.106	0.106	0.173	0.138	0.149
Total Project	2.110	2.111	3.468	2.750	2.970
MTP 6: Resilience in Practice for Small-Scale Fisheries					
3C	2.643	2.739	2.048	3.600	3.888
4A	1.322	1.370	1.024	1.800	1.944
4B	1.322	1.370	1.024	1.800	1.944
4C	0.661	0.685	0.512	0.900	0.972
5D	0.660	0.685	0.513	0.900	0.972
Total Project	6.608	6.849	5.121	9.000	9.720
Total	17.293	20.218	22.896	25.000	27.000

**Table 3: Summary of Project Costs, 2007-2011
in \$millions**

Project	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
MTP 1: Global Drivers of Change	1.104	1.303	2.408	2.000	2.160
MTP 2: Markets and Trade	1.778	2.154	3.619	2.875	3.105
MTP 3: Multi-Level and Multi-sectoral Governance	2.872	4.642	4.043	3.625	3.915
MTP 4: Sustainable Aquaculture Technologies	2.821	3.159	4.237	4.750	5.130
MTP 5: Aquaculture and the Environment	2.110	2.111	3.468	2.750	2.970
MTP 6: Resilience in Practice for Small-Scale Fisheries	6.608	6.849	5.121	9.000	9.720
Total	17.293	20.218	22.896	25.000	27.000

**Table 4: Summary of Priority Costs, 2007-2011
in \$millions**

Priorities	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
1D	0.727	0.738	1.181	0.983	1.062
2B	0.199	0.235	0.433	0.360	0.389
2D	0.376	0.421	0.565	0.633	0.684
3C	7.035	8.271	9.405	10.515	11.356
4A	2.127	2.411	2.257	2.833	3.060
4B	2.686	3.190	3.187	3.674	3.968
4C	1.524	1.753	1.947	2.092	2.259
4D	0.106	0.106	0.173	0.138	0.149
5A	0.526	0.580	0.834	0.852	0.919
5B	0.488	0.587	1.013	0.815	0.880
5C	0.155	0.182	0.337	0.280	0.302
5D	1.344	1.744	1.564	1.825	1.972
Total	17.293	20.218	22.896	25.000	27.000

**Table 5: Investments by Undertaking, Activity and Sector, 2007-2011
in \$millions**

	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
Increasing Productivity	4.752	5.084	6.057	7.150	7.722
Germplasm Enhancement & Breeding	1.550	1.686	2.388	2.450	2.646
Production Systems Development & Management	3.202	3.398	3.669	4.700	5.076
Cropping systems	0.000	0.000	0.000	0.000	0.000
Livestock systems	0.000	0.000	0.000	0.000	0.000
Tree systems	0.000	0.000	0.000	0.000	0.000
Fish systems	3.202	3.398	3.669	4.700	5.076
Protecting the Environment	2.658	2.839	2.673	3.631	3.922
Saving Biodiversity	0.901	1.021	1.219	1.244	1.343
Improving Policies	4.895	6.417	7.927	7.238	7.817
Strengthening NARS	4.087	4.857	5.020	5.737	6.196
Training and Professional Development	1.097	1.352	1.528	1.574	1.700
Documentation, Publications, Info. Dissemination	1.428	1.693	1.784	2.025	2.187
Organization & Management Counselling	0.000	0.000	0.000	0.000	0.000
Networks	1.562	1.812	1.708	2.138	2.309
Total	17.293	20.218	22.896	25.000	27.000

Table 6: Project Investments by Developing Region, 2007-2011 in \$millions						
Project	Region	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
MTP 1: Global Drivers of Change	Asia	0.589	0.573	1.059	0.880	0.950
	CWANA	0.153	0.104	0.193	0.160	0.173
	LAC	0.004	0.013	0.024	0.020	0.022
	SSA	0.358	0.613	1.132	0.940	1.015
Total Project		1.104	1.303	2.408	2.000	2.160
MTP 2: Markets and Trade	Asia	0.933	0.948	1.592	1.265	1.366
	CWANA	0.220	0.172	0.289	0.230	0.248
	LAC	0.005	0.022	0.036	0.029	0.031
	SSA	0.620	1.012	1.702	1.351	1.460
Total Project		1.778	2.154	3.619	2.875	3.105
MTP 3: Multi-Level and Multi-sectoral Governance	Asia	1.237	2.043	1.779	1.595	1.723
	CWANA	0.278	0.371	0.323	0.290	0.313
	LAC	0.006	0.046	0.040	0.036	0.039
	SSA	1.351	2.182	1.901	1.704	1.840
Total Project		2.872	4.642	4.043	3.625	3.915
MTP 4: Sustainable Aquaculture Technologies	Asia	1.597	1.390	1.864	2.090	2.257
	CWANA	0.366	0.253	0.339	0.380	0.410
	LAC	0.008	0.031	0.042	0.048	0.051
	SSA	0.850	1.485	1.992	2.232	2.412
Total Project		2.821	3.159	4.237	4.750	5.130
MTP 5: Aquaculture and the Environment	Asia	1.409	0.929	1.526	1.210	1.307
	CWANA	0.211	0.169	0.277	0.220	0.238
	LAC	0.005	0.021	0.035	0.028	0.030
	SSA	0.485	0.992	1.630	1.292	1.395
Total Project		2.110	2.111	3.468	2.750	2.970
MTP 6: Resilience in Practice for Small-Scale Fisheries	Asia	3.851	3.013	2.253	3.960	4.277
	CWANA	0.715	0.548	0.410	0.720	0.778
	LAC	0.019	0.069	0.051	0.090	0.097
	SSA	2.023	3.219	2.407	4.230	4.568
Total Project		6.608	6.849	5.121	9.000	9.720
Total		17.293	20.218	22.896	25.000	27.000

Table 7: Summary of Investments by Developing Region, 2007-2011 in \$millions					
Region	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
SSA	5.687	9.503	10.764	11.749	12.690
Asia	9.616	8.896	10.073	11.000	11.880
LAC	0.047	0.202	0.228	0.251	0.270
CWANA	1.943	1.617	1.831	2.000	2.160
Total	17.293	20.218	22.896	25.000	27.000

Table 8: Expenditure by Object, 2007-2011 in \$millions					
Object of Expenditure	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
Personnel	8.452	9.877	11.186	12.213	13.191
Supplies and services	4.144	5.231	5.924	6.469	6.986
Collaboration/ Partnerships	2.520	2.443	2.766	3.020	3.262
Operational Travel	1.779	2.290	2.593	2.832	3.058
Depreciation	0.398	0.377	0.427	0.466	0.503
Total	17.293	20.218	22.896	25.000	27.000

Table 9: Member and Non-Member Unrestricted Grants, 2007-2009 in \$millions NC = National Currency							
Member	Type NC	Actual 2007 (US\$)	Actual 2007 (NC)	Estimated 2008 (US\$)	Estimated 2008 (NC)	Proposal 2009 (US\$)	Proposal 2009 (NC)
Unrestricted Grants							
Member							
Australia	AUD	0.377	0.500	0.415	0.500	0.459	0.500
Canada	CAD	0.461	0.499	0.554	0.462	0.451	0.462
China	USD	0.000	0.000	0.030	0.030	0.030	0.030
Egypt	USD	0.000	0.000	0.250	0.250	0.250	0.250
FAO	USD	0.009	0.009	0.000	0.000	0.000	0.000
France	EUR	0.008	0.006	0.000	0.000	0.000	0.000
Germany	EUR	0.228	0.170	0.232	0.170	0.268	0.170
India	USD	0.138	0.138	0.038	0.038	0.038	0.038
Israel	USD	0.030	0.030	0.000	0.000	0.000	0.000
Japan	JPY	0.175	18.618	0.156	18.618	0.209	20.808
New Zealand	NZD	0.335	0.457	0.349	0.470	0.375	0.470
Norway	NOK	0.965	5.600	1.209	6.500	1.271	6.500
Philippines	PHP	0.025	1.171	0.020	0.936	0.022	0.936
Sweden	SEK	0.330	2.400	0.358	2.400	0.402	2.400
Switzerland	USD	0.000	0.000	0.000	0.000	0.050	0.050
United Kingdom	GBP	0.912	0.460	0.919	0.460	0.917	0.460
United States	USD	0.780	0.780	0.400	0.400	0.600	0.600
World Bank	USD	0.750	0.750	1.200	1.200	0.950	0.950
Subtotal		5.523		6.130		6.292	
Non-member							
CIAT	USD	0.000	0.000	0.020	0.020	0.000	0.000
Others	USD	0.000	0.000	0.019	0.019	0.000	0.000
Subtotal		0.000		0.039		0.000	
Total Unrestricted		5.523		6.169		6.292	

**Table 9a: Member and Non-Member Unrestricted and Restricted Grants, 2007-2009
in \$millions**

Member / Non-Member	Actual 2007	Estimated 2008	Proposal 2009
Unrestricted Grants			
Member			
Australia	0.377	0.415	0.459
Canada	0.461	0.554	0.451
China	0.000	0.030	0.030
Egypt	0.000	0.250	0.250
FAO	0.009	0.000	0.000
France	0.008	0.000	0.000
Germany	0.228	0.232	0.268
India	0.138	0.038	0.038
Israel	0.030	0.000	0.000
Japan	0.175	0.156	0.209
New Zealand	0.335	0.349	0.375
Norway	0.965	1.209	1.271
Philippines	0.025	0.020	0.022
Sweden	0.330	0.358	0.402
Switzerland	0.000	0.000	0.050
United Kingdom	0.912	0.919	0.917
United States	0.780	0.400	0.600
World Bank	0.750	1.200	0.950
Subtotal	5.523	6.130	6.292
Non-member			
CIAT	0.000	0.020	0.000
Others	0.000	0.019	0.000
Subtotal	0.000	0.039	0.000
Total Unrestricted	5.523	6.169	6.292
Restricted Grants			
Member			
ADB	0.752	0.000	0.338
AFDB	0.000	0.000	0.200
Australia	0.294	0.415	1.359
Bangladesh	0.007	0.134	0.021
Belgium	0.000	1.183	0.944
Canada	0.096	0.008	0.051
CGIAR	0.000	0.028	0.000
Denmark	0.000	0.060	0.109
Egypt	0.000	0.000	2.400
European Commission	2.296	1.432	2.009
FAO	0.040	0.096	0.075
Finland	0.000	0.202	0.082
Ford Foundation	0.000	0.000	0.150
Germany	0.918	0.480	0.770
IFAD	0.111	0.000	0.285

India	0.000	0.000	0.100
Israel	0.000	0.000	0.030
Japan	0.026	0.000	0.000
Malaysia	0.055	0.073	0.102
New Zealand	0.161	0.265	0.193
Norway	0.015	0.054	0.057
OPEC Fund	0.040	0.058	0.009
Philippines	0.054	0.113	0.076
South Africa	0.000	0.305	0.849
Sweden	0.710	2.525	1.976
UNDP	0.023	0.000	0.000
UNEP	0.468	1.020	0.193
United Kingdom	0.864	0.020	0.074
United States	0.659	0.066	1.208
World Bank	0.133	0.252	0.240
Subtotal	7.722	8.789	13.900
Non-member			
African Wildlife Foundation	0.059	0.053	0.000
Agence de Development Economic de la Nouvelle-Caledonia	0.156	0.023	0.000
Bill and Melinda Gates Foundation	0.058	0.000	0.000
Conservation International Foundation	0.015	0.121	0.000
Fishbase Information and Research Group (FIN)	0.139	0.240	0.000
Force of Nature Aid Foundation	0.087	0.109	0.000
IFPRI	0.020	0.000	0.000
International Fund for Agricultural Research (IFAR)	0.000	0.000	0.006
IUCN	0.053	0.043	0.000
National Oceanic & Atmospheric Administration (NOAA)/Univers	0.013	0.080	0.102
New Partnership for African Dev. (NEPAD)	0.000	0.292	0.000
Others	0.096	0.053	0.775
SPC	0.034	0.000	0.000
Sri Lanka	0.008	0.019	0.011
Water & Food/CP	1.104	1.916	1.472
World Wildlife Fund	0.084	0.087	0.000
Subtotal	1.926	3.036	2.366
Total Restricted	9.648	11.825	16.266
Total Grants	15.171	17.994	22.558

Summary and Statement of Activities	Actual 2007	Estimated 2008	Proposal 2009
Total Grants	15.171	17.994	22.558
Center Income	1.222	0.400	0.338
Revenue	16.393	18.394	22.896
Total Investment	17.293	20.218	22.896
Surplus (Deficit)	-0.900	-1.824	0.000

**Table 10: Allocation of Member Grants and Center Income to Projects, 2007-2009
in \$millions**

Project	Member		Actual 2007	Estimated 2008	Proposal 2009		
MTP 1: Global drivers of change	Member	ADB	0.060	0.000	0.000		
		AFDB	0.000	0.000	0.200		
		Australia	0.001	0.000	0.075		
		Bangladesh	0.001	0.025	0.002		
		Belgium	0.000	0.000	0.020		
		Canada	0.002	0.000	0.050		
		Denmark	0.000	0.000	0.021		
		Egypt	0.000	0.000	0.264		
		European Commission	0.176	0.183	0.365		
		FAO	0.002	0.000	0.002		
		Finland	0.000	0.017	0.003		
		Germany	0.000	0.000	0.209		
		IFAD	0.009	0.000	0.017		
		Japan	0.002	0.000	0.000		
		Malaysia	0.002	0.000	0.001		
		New Zealand	0.008	0.006	0.011		
		Norway	0.001	0.000	0.001		
		OPEC Fund	0.000	0.000	0.001		
		Philippines	0.004	0.000	0.002		
		South Africa	0.000	0.000	0.005		
		Sweden	0.001	0.000	0.042		
		UNDP	0.002	0.000	0.000		
		UNEP	0.000	0.000	0.017		
		United Kingdom	0.069	0.002	0.000		
		United States	0.053	0.000	0.095		
		World Bank	0.011	0.011	0.004		
			Non Member	African Wildlife Foundation	0.006	0.005	0.000
				Bill and Melinda Gates Foundation	0.005	0.000	0.000
		Conservation International Foundation		0.001	0.000	0.000	
		Fishbase Information and Research Group (FIN)		0.004	0.000	0.000	
		IFPRI		0.002	0.000	0.000	
		International Fund for Agricultural Research (IFAR)		0.000	0.000	0.002	
		IUCN		0.004	0.000	0.000	
	National Oceanic & Atmospheric Administration (NOAA)/Univers	0.001		0.000	0.000		
	Others	0.006		0.003	0.027		
	SPC	0.002		0.000	0.000		
	Water & Food/CP	0.049		0.000	0.039		
	World Wildlife Fund	0.008		0.007	0.000		
	Unrestricted + Center Income		0.612	1.044	0.933		
Project Total			1.104	1.303	2.408		

Project	Member		Actual 2007	Estimated 2008	Proposal 2009
MTP 2: Markets and trade	Member	ADB	0.086	0.000	0.000
		Australia	0.002	0.042	0.244
		Bangladesh	0.003	0.054	0.003
		Belgium	0.000	0.353	0.256
		Canada	0.002	0.000	0.000
		Denmark	0.000	0.000	0.016
		Egypt	0.000	0.000	0.336
		European Commission	0.324	0.183	0.434
		FAO	0.002	0.007	0.011
		Finland	0.000	0.094	0.035
		Ford Foundation	0.000	0.000	0.150
		Germany	0.052	0.038	0.486
		IFAD	0.013	0.000	0.034
		Japan	0.003	0.000	0.000
		Malaysia	0.003	0.010	0.007
		New Zealand	0.024	0.019	0.027
		Norway	0.002	0.006	0.006
		OPEC Fund	0.010	0.014	0.001
		Philippines	0.006	0.000	0.003
		South Africa	0.000	0.029	0.088
		Sweden	0.001	0.000	0.063
		UNDP	0.003	0.000	0.000
		UNEP	0.000	0.000	0.026
		United Kingdom	0.099	0.004	0.000
	United States	0.076	0.033	0.196	
	World Bank	0.015	0.009	0.156	
	Non Member	African Wildlife Foundation	0.029	0.026	0.000
		Bill and Melinda Gates Foundation	0.007	0.000	0.000
		Conservation International Foundation	0.002	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.006	0.000	0.000
		IFPRI	0.002	0.000	0.000
		International Fund for Agricultural Research (IFAR)	0.000	0.000	0.001
		IUCN	0.006	0.000	0.000
National Oceanic & Atmospheric Administration (NOAA)/Univers		0.002	0.000	0.000	
New Partnership for African Dev. (NEPAD)		0.000	0.117	0.000	
Others		0.009	0.003	0.095	
SPC		0.004	0.000	0.000	
Water & Food/CP		0.072	0.000	0.060	
World Wildlife Fund	0.034	0.047	0.000		
Unrestricted + Center Income		0.879	1.066	0.885	
Project Total			1.778	2.154	3.619

Project	Member		Actual 2007	Estimated 2008	Proposal 2009
MTP 3: Multi-Level and multi-sectoral governance	Member	ADB	0.109	0.000	0.186
		Australia	0.047	0.034	0.139
		Bangladesh	0.000	0.000	0.004
		Belgium	0.000	0.181	0.147
		Canada	0.003	0.000	0.000
		CGIAR	0.000	0.028	0.000
		Denmark	0.000	0.036	0.022
		European Commission	0.329	0.140	0.244
		FAO	0.003	0.005	0.009
		Finland	0.000	0.002	0.016
		Germany	0.260	0.195	0.019
		IFAD	0.016	0.000	0.200
		Japan	0.004	0.000	0.000
		Malaysia	0.004	0.000	0.052
		New Zealand	0.000	0.000	0.008
		Norway	0.001	0.005	0.006
		OPEC Fund	0.000	0.000	0.002
		Philippines	0.008	0.113	0.061
		South Africa	0.000	0.000	0.009
		Sweden	0.573	2.353	1.578
		UNDP	0.003	0.000	0.000
		UNEP	0.000	0.000	0.029
		United Kingdom	0.125	0.006	0.001
		United States	0.096	0.000	0.039
	World Bank	0.019	0.024	0.007	
	Non Member	African Wildlife Foundation	0.012	0.011	0.000
		Bill and Melinda Gates Foundation	0.008	0.000	0.000
		Conservation International Foundation	0.002	0.061	0.000
		Fishbase Information and Research Group (FIN)	0.007	0.000	0.000
		IFPRI	0.003	0.000	0.000
		International Fund for Agricultural Research (IFAR)	0.000	0.000	0.003
		IUCN	0.008	0.000	0.000
		National Oceanic & Atmospheric Administration (NOAA)/Univers	0.002	0.023	0.000
Others		0.011	0.002	0.076	
SPC		0.005	0.000	0.000	
Water & Food/CP		0.089	0.078	0.128	
World Wildlife Fund		0.016	0.017	0.000	
Unrestricted + Center Income		1.109	1.328	1.058	
Project Total			2.872	4.642	4.043

Project	Member		Actual 2007	Estimated 2008	Proposal 2009
MTP 4: Sustainable aquaculture technologies	Member	ADB	0.143	0.000	0.000
		Australia	0.003	0.001	0.174
		Bangladesh	0.000	0.000	0.004
		Belgium	0.000	0.411	0.299
		Canada	0.079	0.008	0.000
		Denmark	0.000	0.000	0.012
		Egypt	0.000	0.000	0.840
		European Commission	0.499	0.564	0.455
		FAO	0.004	0.022	0.030
		Finland	0.000	0.054	0.016
		Germany	0.018	0.014	0.025
		IFAD	0.021	0.000	0.000
		India	0.000	0.000	0.080
		Israel	0.000	0.000	0.024
		Japan	0.005	0.000	0.000
		Malaysia	0.033	0.063	0.022
		New Zealand	0.000	0.000	0.008
		Norway	0.006	0.037	0.036
		OPEC Fund	0.024	0.035	0.002
		Philippines	0.010	0.000	0.003
		South Africa	0.000	0.152	0.409
		Sweden	0.027	0.034	0.088
		UNDP	0.004	0.000	0.000
		UNEP	0.000	0.000	0.030
	United Kingdom	0.164	0.002	0.057	
	United States	0.125	0.016	0.179	
	World Bank	0.025	0.042	0.058	
	Non Member	Bill and Melinda Gates Foundation	0.011	0.000	0.000
		Conservation International Foundation	0.003	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.009	0.000	0.000
		IFPRI	0.004	0.000	0.000
		IUCN	0.010	0.000	0.000
		National Oceanic & Atmospheric Administration (NOAA)/Univers	0.002	0.000	0.000
New Partnership for African Dev. (NEPAD)		0.000	0.116	0.000	
Others		0.014	0.005	0.188	
SPC		0.007	0.000	0.000	
Sri Lanka		0.006	0.015	0.009	
Water & Food/CP		0.107	0.091	0.127	
	World Wildlife Fund	0.004	0.000	0.000	
	Unrestricted + Center Income	1.454	1.477	1.062	
Project Total		2.821	3.159	4.237	

Project	Member		Actual 2007	Estimated 2008	Proposal 2009
MTP 5: Aquaculture and the environment	Member	ADB	0.083	0.000	0.000
		Australia	0.002	0.000	0.104
		Bangladesh	0.000	0.000	0.003
		Belgium	0.000	0.119	0.104
		Canada	0.002	0.000	0.000
		Denmark	0.000	0.000	0.011
		Egypt	0.000	0.000	0.720
		European Commission	0.175	0.033	0.184
		FAO	0.002	0.014	0.020
		Finland	0.000	0.035	0.005
		Germany	0.553	0.207	0.014
		IFAD	0.012	0.000	0.000
		India	0.000	0.000	0.020
		Israel	0.000	0.000	0.006
		Japan	0.003	0.000	0.000
		Malaysia	0.003	0.000	0.017
		New Zealand	0.000	0.000	0.006
		Norway	0.005	0.006	0.006
		OPEC Fund	0.006	0.009	0.001
		Philippines	0.006	0.000	0.003
		South Africa	0.000	0.124	0.327
		Sweden	0.001	0.000	0.060
		UNDP	0.003	0.000	0.000
		UNEP	0.000	0.000	0.025
		United Kingdom	0.095	0.002	0.015
		United States	0.072	0.017	0.659
	World Bank	0.015	0.151	0.006	
	Non Member	Bill and Melinda Gates Foundation	0.006	0.000	0.000
		Conservation International Foundation	0.002	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.005	0.000	0.000
		IFPRI	0.002	0.000	0.000
		IUCN	0.006	0.000	0.000
		National Oceanic & Atmospheric Administration (NOAA)/Univers	0.001	0.000	0.000
New Partnership for African Dev. (NEPAD)		0.000	0.059	0.000	
Others		0.008	0.002	0.157	
SPC		0.004	0.000	0.000	
Sri Lanka		0.002	0.004	0.002	
Water & Food/CP		0.193	0.430	0.304	
World Wildlife Fund		0.002	0.000	0.000	
Unrestricted + Center Income		0.841	0.899	0.689	
Project Total			2.110	2.111	3.468

Project	Member		Actual 2007	Estimated 2008	Proposal 2009
MTP 6: Resilience in practice for small- scale fisheries	Member	ADB	0.271	0.000	0.152
		Australia	0.239	0.338	0.623
		Bangladesh	0.003	0.055	0.005
		Belgium	0.000	0.119	0.118
		Canada	0.008	0.000	0.001
		Denmark	0.000	0.024	0.027
		Egypt	0.000	0.000	0.240
		European Commission	0.793	0.329	0.327
		FAO	0.027	0.048	0.003
		Finland	0.000	0.000	0.007
		Germany	0.035	0.026	0.017
		IFAD	0.040	0.000	0.034
		Japan	0.009	0.000	0.000
		Malaysia	0.010	0.000	0.003
		New Zealand	0.129	0.240	0.133
		Norway	0.000	0.000	0.002
		OPEC Fund	0.000	0.000	0.002
		Philippines	0.020	0.000	0.004
		South Africa	0.000	0.000	0.011
		Sweden	0.107	0.138	0.145
		UNDP	0.008	0.000	0.000
		UNEP	0.468	1.020	0.066
		United Kingdom	0.312	0.004	0.001
		United States	0.237	0.000	0.040
	World Bank	0.048	0.015	0.009	
	Non Member	African Wildlife Foundation	0.012	0.011	0.000
		Agence de Development Economic de la Nouvelle-Caledonia	0.156	0.023	0.000
		Bill and Melinda Gates Foundation	0.021	0.000	0.000
		Conservation International Foundation	0.005	0.060	0.000
		Fishbase Information and Research Group (FIN)	0.108	0.240	0.000
		Force of Nature Aid Foundation	0.087	0.109	0.000
		IFPRI	0.007	0.000	0.000
		IUCN	0.019	0.043	0.000
	National Oceanic & Atmospheric Administration (NOAA)/Univers	0.005	0.057	0.102	
	Others	0.048	0.038	0.232	
	SPC	0.012	0.000	0.000	
	Water & Food/CP	0.594	1.317	0.814	
	World Wildlife Fund	0.020	0.016	0.000	
	Unrestricted + Center Income	2.750	2.579	2.003	
Project Total			6.608	6.849	5.121
Total Resticted			9.648	11.825	16.266
Total Unrestricted + Center Income			7.645	8.393	6.630
Total			17.293	20.218	22.896

**Table 11: Internationally and Nationally Recruited Staff, 2007-2011
in \$millions**

	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
NRS	245	244	263	284	306
IRS	37	49	53	58	62
Total	282	293	316	342	368

**Table 12: Currency Structure of Expenditure, 2007-2009
in millions of units and percent**

Currency	Actual 2007			Estimated 2008			Proposal 2009		
	Amount	\$ Value	% Share	Amount	\$ Value	% Share	Amount	\$ Value	% Share
AUD	0.202	0.169	1	0.219	0.197	1	0.235	0.223	1
EUR	0.731	0.084	0	0.066	0.098	0	0.070	0.111	0
MYR	14.962	4.295	25	16.572	5.022	25	17.800	5.687	25
Others	0.000	0.285	2	0.000	0.333	2	0.000	0.377	2
USD	12.460	12.460	72	14.568	14.568	72	16.498	16.498	72
Total		17.293	100 %		20.218	100 %		22.896	100 %

**Table 13: Statement of Financial Position (SFP), 2007-2009
in \$millions**

Assets, Liabilities and Net Assets	2007	2008	2009
Current Assets			
Cash and Cash Equivalents	9.601	7.959	7.459
Investments	0.325	0.143	0.143
Accounts Receivable			
- Donor	2.171	2.393	3.124
- Employees	0.123	0.129	0.136
- Other CGIAR Centers	0.003	0.003	0.003
- Others	1.047	1.099	1.154
Inventories	0.000	0.000	0.000
Pre-paid Expenses	0.000	0.000	0.000
Total Current Assets	13.270	11.726	12.019
Non-Current Assets			
Net Property, Plan and Equipment	0.362	0.380	0.399
Investments	0.000	0.000	0.000
Other Assets	0.182	0.191	0.201
Total Non-Current Assets	0.544	0.571	0.600
Total Assets	13.814	12.297	12.619
Current Liabilities			
Overdraft/Short Term Borrowings	0.000	0.000	0.000
Accounts Payable			
- Donor	2.623	2.754	2.893
- Employees	0.000	0.000	0.000
- Other CGIAR Centers	0.313	0.329	0.345
- Others	1.345	1.412	1.483
Accruals and Provisions	1.038	1.090	1.144
Total Current Liabilities	5.319	5.585	5.865
Non-Current Liabilities			
Accounts Payable			
- Employees	0.813	0.854	0.896
- Deferred Grant Revenue	0.000	0.000	0.000
- Others	0.000	0.000	0.000
Total Non-Current Liabilities	0.813	0.854	0.896
Total Liabilities	6.132	6.439	6.761
Net Assets			
Unrestricted			
- Fixed Assets	3.046	3.046	3.046
- Unrestricted Net Assets Excluding Fixed Assets	4.636	2.812	2.812
Total Unrestricted Net Assets	7.682	5.858	5.858
Restricted	0.000	0.000	0.000
Total Net Assets	7.682	5.858	5.858
Total Liabilities and Net Assets	13.814	12.297	12.619

**Table 14: Statement of Activities (SOA), 2007-2009
in \$millions**

		Unrestricted	Restricted		Total		
			Temporary	Challenge Programs	2007	2008	2009
Revenue and Gains	Grant Revenue	5.523	8.545	1.103	15.171	17.994	22.558
	Other revenue and gains	1.222	0.000	0.000	1.222	0.400	0.338
	Total revenue and gains	6.745	8.545	1.103	16.393	18.394	22.896
Expenses and Losses	Program related expenses	5.541	8.545	1.103	15.189	17.845	21.153
	Management and general expenses	2.871	0.000	0.000	2.871	3.373	3.998
	Other losses expenses	0.000	0.000	0.000	0.000	0.000	0.000
	Sub Total expenses and losses	8.412	8.545	1.103	18.060	21.218	25.151
	Indirect cost recovery	-0.767	0.000	0.000	-0.767	-1.000	-2.255
	Total expenses and losses	7.645	8.545	1.103	17.293	20.218	22.896
	Net Operating Surplus / (Deficit)	-0.900	0.000	0.000	-0.900	-1.824	0.000
	Extraordinary Items	0.000	0.000	0.000	0.000	0.000	0.000
	NET SURPLUS / (DEFICIT)	-0.900	0.000	0.000	-0.900	-1.824	0.000
Object of Expenditure	Personnel	4.905	3.029	0.518	8.452	9.877	11.186
	Supplies and services	1.558	2.500	0.086	4.144	5.231	5.924
	Collaboration/ Partnerships	0.071	2.075	0.374	2.520	2.443	2.766
	Operational Travel	0.870	0.789	0.120	1.779	2.290	2.593
	Depreciation	0.241	0.152	0.005	0.398	0.377	0.427
	Total	7.645	8.545	1.103	17.293	20.218	22.896

Annex I. Progress Report on Implementation of EPMR Recommendations

The report on the EPMR was presented to and discussed with the Science Council on 10 April 2006 and the Executive Council on 18 May 2006, as well as at the CGIAR Annual General Meeting in December 2006.

Recommendations	Center's Response	Milestone/Goal	Target Date of Completion	Progress Achieved
1. Commission an external review of new research structure by mid-2007.	Agreed but allow a full 3 years of operation of matrix and 2 full years of completion of strategy update before review. BoT requested rolling program of center-commissioned external reviews (CCERs).	1. Rolling program of CCERs to be presented to BoT 2. Center-wide review	1. Sep 2006 2. 2009	Completed: Rolling CCERs approved by BoT at Sep 2006 BoT meeting and revised at Nov 2007 meeting. Scheduled for 2009
2. Define strategy for leveraging additional resources through joint ventures, including co-financing of PhD and postdoctoral grants. Develop relationships with scientists and laboratories in advanced research institutes and develop joint research proposals.	Agreed. Center is already implementing a number of mechanisms such as senior research fellowships, sabbatical arrangements, part-time appointments, joint appointments with other CGIAR centers and adjunct professorships.	1. Prepare comprehensive review of strategic staffing approach. 2. Develop policy on opportunities leveraging additional resources.	1. Nov 2007 2. Nov 2007	Strategic staffing approach was presented to BoT in Nov 2007. This is now being implemented, and opportunities to leverage additional approaches developed.
3. Identify and embrace a limited number of key scientific issues and research objectives that can be achieved within a reasonable period of time (4 to 6 years) and that can (1) stimulate WorldFish scientists of different disciplines to promote interdisciplinary research, (2) cause WorldFish to be recognized by the scientific community as a cutting-edge research center and stimulate collaboration with scientists from both developed and developing countries, and (3) demonstrate the comparative advantage of the Center and its leadership capacity in the field of aquaculture and fisheries for developing countries.	Agreed. Discipline directors for natural resource management and aquaculture are developing research strategies for these disciplines that are designed to provide such a focus for them for the next 5-10 years.	1. Natural resource management and aquaculture strategies to be presented to BoT 2. Strategy for Policy, Economics and Social Science Discipline (PESS) to be further developed following recruitment of PESS discipline director.	1. Sep 2006 2. 2008	Completed: Strategies presented to BoT in Sep 2006 and now incorporated into the MTP. PESS Director recruited and outline strategy presented to BoT in Nov 2007. PESS strategy is being finalized in 2008.

<p>4. Conduct further research on GIFT focusing on genetics and nutrition, using more controlled experimental conditions and testing a large range of feeding levels.</p>	<p>Agreed in principle.</p>	<p>1. Incorporate research on genetics and nutrition into the pro- poor aquaculture strategy document.</p>	<p>1. Sep 2006</p>	<p>Completed. The issue has been incorporated into the Center's focus on sustainable aquaculture. A postdoc has been recruited and is working on nutrition trials with GIFT. Furthermore, a proposal to conduct work on fatty acid metabolism of GIFT has been jointly developed with the University of Science in Malaysia.</p>
<p>5. Move away from downstream development activities and explore opportunities for development-related activities to be executed by local or bilateral entities, where available. Analyze impacts and identify constraints and bottlenecks of development-related activities. Identify partners' strengths and weaknesses in order to better target capacity building, especially of NGOs. Synthesize and package existing information, including frameworks, manuals, protocols and guidelines, to ensure greater dissemination and use of products.</p>	<p>Agreed.</p>	<p>1. Undertake assessment of partners' strengths and weaknesses globally and regionally.</p> <p>2. Reexamine strategy and approach to knowledge sharing.</p>	<p>1. 2008</p> <p>2. Dec 2006</p>	<p>Assessments have been conducted in the Greater Mekong region, sub-Saharan Africa and Bangladesh to determine strengths and weaknesses of partners. Assessment of strengths and weaknesses of partners in the Pacific will be carried out in 2008 as part of strategy implementation for the Pacific region.</p> <p>Completed. A decision has been taken to consolidate knowledge management in WorldFish and combine it with Business Development. In 2007, WorldFish commenced implementation of a system to support sharing of knowledge on projects. A comprehensive strategy for knowledge management will be finalized end-2008.</p>
<p>6. Define Center's continuing involvement and role in FishBase, including specifying how the various demands on staff will be met.</p>	<p>We believe we have already defined our continuing role. We have signed an MoU that commits us long-term to ensure development for the FishBase project. We are committed with both human resources and financial support to continue to fully participate in the consortium.</p>	<p>1. Develop a position paper for BoT approval that clearly defines the Center's role in FishBase.</p> <p>2. Communicate approved position to FishBase Consortium members.</p>	<p>1. Sep 2006</p>	<p>Completed. BoT has reviewed the measures already taken and agreed that the Center has clearly specified its role in the FishBase Consortium.</p>

<p>7. Expand modeling work on the supply and demand of fisheries and aquaculture and undertake additional ex-post impact assessment in aquaculture, paying particular attention to technological environmental impacts and non-negligible dynamic (inter-temporal) effects of fisheries and aquaculture activities.</p>	<p>Agreed. Our research on fish supply and demand has been highly effective in guiding policy and future research on fisheries and aquaculture.</p>	<ol style="list-style-type: none"> Undertake ex-post impact assessments of the Center's aquaculture research. Present a major analysis of fish supply and demand in Asia and publish in a primary journal. 	<ol style="list-style-type: none"> Ongoing 2008 Dec 2007 	<p>Completed. WorldFish conducts ongoing ex-post impact assessment of its work. In 2006, the Center conducted an ex-post impact assessment of its IAA work in Bangladesh. Moving forward, the Center is strengthening capacity in impact assessment so that this can be done more systematically.</p> <p>Four articles were published in 2006-2007.</p>
<p>8. Define on a pragmatic and objective basis the acceptable dissemination area of an improved fish strain and the realistic monitoring that should be implemented in relation to this dissemination.</p>	<p>Agreed. The Center is committed to expanding our work on the development of improved breeds of tilapia, carp and African catfish and, in so doing, to developing improved tools for assessing both the economic utility and the environmental risk of introducing specific strains.</p>	<ol style="list-style-type: none"> Develop improved tools for assessing economic utility and environmental risk of introducing specific fish strains. Develop policy and risk-assessment methods for use of the GIFT tilapia strain (See MTP 2007-209 global Project 8 on pro-poor aquaculture). 	<ol style="list-style-type: none"> 2007 2007 	<p>Completed. A study was conducted evaluating the economic benefit of genetic improvement programs, with results published in the journal Aquaculture.</p> <p>Completed. One research project to develop risk-assessment methods has already been completed. A draft policy and code of practice relating to dissemination of GIFT was approved by BoT in Nov 2007.</p>
<p>9. For PESS, secure a discipline director as soon as possible. Conduct a strategic process of research planning and prioritization that enables the discipline to identify more precisely its research domain and a selected set of issues to produce significant IPGs. Develop and apply a balanced growth policy for qualified scientific staff according to research priorities.</p>	<p>Agreed. When the position was advertised internationally in 2005, no suitably qualified candidate was secured, but we were confident that this would happen in 2006. When in place, the discipline director will have explicit responsibility for leading a strategic research planning process and for developing staff capacity to pursue the discipline strategy.</p>	<ol style="list-style-type: none"> Procure discipline director for PESS. Develop research strategy for PESS. 	<ol style="list-style-type: none"> 2006 2008 	<p>Completed. New Director started work in September 2007.</p> <p>Being undertaken by PESS director.</p>

<p>10. WorldFish explores opportunities in sub-Saharan Africa for collaboration with other CGIAR centers, in particular with the International Institute of Tropical Agriculture (IITA), Africa Rice Center, International Rice Research Institute (IRRI), Center for International Forest Research, International Water Management Institute (IWMI), International Food Policy Research Institute (IFPRI), and World Agroforestry Center, possibly within the context of task forces, to identify gaps in the application of IAA technology and methodology or for activities related to fisheries governance.</p>	<p>Agreed. The Center is already collaborating with IWMI, ILRI and World Agroforestry in sub-Saharan Africa; with IWMI and IRRI in Asia; and with IWMI on water-management aspects of agriculture in southern Africa (See MTP 2007-2009 Project 5 on sub-Saharan Africa).</p>	<p>1. Increase partnership with CGIAR centers wherever this adds value to the work of both centers.</p>	<p>Ongoing 2008</p>	<p>The Center has participated in the development of the regional MTPs for Africa and is pursuing collaborative opportunities where they will add value to both Centers involved. Collaboration is expanding with IITA, IWMI, ILRI, Africa Rice and World Agroforestry through new projects under development in 2008.</p>
<p>11. Give high priority to (1) recruiting senior scientists with a proven track record, or involving such scientists in Center projects through various forms of partnership and adjunct arrangements, and (2) recruiting a cadre of younger, recent PhD graduates, particularly in view of present and past difficulties in attracting more senior scientists.</p>	<p>Agreed. BoT and management are committed to strengthening the scientific capacity of the Center. This is being pursued actively, but it is important to emphasize that increases in staffing need to be financially sustainable, and considerable effort is being invested in developing staff capacity in a staged manner to ensure sustainability.</p>	<p>1. Complete recruitment of 10 new scientists as approved by BoT under the investment strategy. 2. Develop staff capacity in a staged manner to ensure financial sustainability.</p>	<p>1. Dec 2006 2. 2008</p>	<p>Completed. 10 new scientists were appointed, followed by additional recruitment in 2007 and 2008. Completed. The new staff have been hired over a period of 3 years.</p>
<p>12. Elaborate a partnership strategy focusing on, among other things, the modus operandi for establishing strategic partnerships and alliances that would add significant value to the current research activities under taken by the Center. Explicitly define the roles and responsibilities of the Center relative to its partners in all major projects. Determine its positioning on the research-to-development continuum, within the framework of an impact pathway analysis, for all major projects. Elaborate a human resource capacity-building policy for staff and partners, taking into account as appropriate the suggestions that have been provided.</p>	<p>Agreed. We are committed to strengthening and expanding our partnerships to further increase our impact. We believe that a formal partnership strategy would assist by providing clear guidance to staff in pursuing this work, and we will develop such a strategy. The elements recommended by the panel will be addressed, including clarifying the position of the Center and partners on the research-to-development continuum, and building the capacity of staff and partners. WorldFish uses the value chain diagram to guide discussion and thinking about these issues.</p>	<p>1. Prepare formal partnership strategy. 2. Build capacity of staff and partners through workshops and/or training events.</p>	<p>1. 2007 2. Ongoing 2008</p>	<p>Draft policy presented to BOT in Mar 2007. To be finalized in 2008. Ongoing capacity building is occurring through staff-development plans and through the explicit capacity-building work in a range of projects in all regions.</p>

<p>13. Reduce BoT size to not more than nine trustees, including the ex-officio director general, host country representatives and the FAO nominee. Modify BoT committee structure to retain the Audit Committee, Nominating Committee and Executive Committee but eliminate the Program Committee. Include in the Center's annual reports a report of the trustees discussed and approved by, and signed on behalf of, BoT, and audited financials duly certified by the director general and the chief financial officer, along with the independent auditor's report. Constitute a science advisory committee of an appropriate number of members with suitable qualifications, experience and expertise, and with a BoT member as committee chair. The committee will report to BoT, and the committee chair (or any other member other than the director general) should brief BoT at every meeting on its deliberations and advice. Plan for CCERs on a 3-year rolling timeframe, to be updated each year to obtain the best panelists with adequate advance notice and spread the workload evenly over the period. CCER panel chairs should be requested to make the presentations to BoT on their reports and recommendations.</p>	<p>The Center initiated a process of BoT reform in Sep 2005, and we are pleased that the panel recommendations reflect the direction that has been taken.</p>	<ol style="list-style-type: none"> 1. Reduce BoT size to eight trustees, including the director general and host country representatives. 2. Modify BoT committee structure to retain the Audit Committee. 3. Replace the Nominating Committee with the Governance Committee. 4. Eliminate the Program Committee. 5. Pursue establishment of the Science Advisory Committee, whose terms of reference and operating procedures are to be reviewed at the 30th meeting of BoT. 6. Produce an annual report of the trustees, approved and signed on behalf of BoT, as well as audited accounts. 7. Plan CCERS on a 3-year rolling timeframe, to be considered by BoT at 30th meeting. 	<p>1. Mar 2006</p> <p>2. Mar 2006</p> <p>3. Mar 2006</p> <p>4. Mar 2006</p> <p>5. Sep 2006</p> <p>6. Jun 2006</p> <p>7. Sept 2006</p>	<p>Completed.</p> <p>Completed.</p> <p>Completed.</p> <p>Completed.</p> <p>Completed.</p> <p>Completed: Will be reflected in the 2006 annual report.</p> <p>Completed: Rolling CCERs approved at Sep 2006 BoT meeting and revised in Nov 2007.</p>
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<p>14. Continue to maintain reserves at a prudent but not unduly excessive level and to give this matter very high priority so that necessary and appropriate allocations are expeditiously approved and utilized.</p>	<p>Agreed. The Center has developed a plan to draw on its reserves to allow investment in science development.</p>	<ol style="list-style-type: none"> 1. Utilize \$1.2 million for additional scientists and support costs in 2006. 2. Make further strategic investments in research and support bringing reserves to no less than 100 days operating expenses. 	<ol style="list-style-type: none"> 1. 2006 2. 2008 	<p>Completed: BoT approved \$1.2 million drawdown on reserves in 2006 and further drawdowns in 2007 and 2008. These have been used to expand science capacity.</p> <p>Completed: It is projected that by the end of 2008 reserves will have been reduced to 103 days of operating expenses. From 2009 any additions to science capacity will need to be funded from increases in the recurrent budget.</p>
<p>15. Revisit and comprehensively review the recovery methodology (rental charges as a component of overhead) in all its aspects. Urgently seek directions from the Audit Committee and BoT and adopt an appropriate policy that would be (1) consistent with the Constitution mandating WorldFish as a not-for-profit organization, (2) in full compliance with the host country and land lease agreements with the Malaysian government, and (3) allow transparent disclosure to, and concurrence of, the projects where such recoveries are proposed to be applied.</p>	<p>Agreed.</p>	<ol style="list-style-type: none"> 1. Conduct comprehensive review on overhead-recovery concept and methodology that address all the issues pointed out by the EPMR team. 2. Present review to the Center's Audit Committee and BoT in BoT meeting. 	<ol style="list-style-type: none"> 1. August 2006 2. Sep 2006 	<p>Completed: BoT considered the overhead recovery method in Sep 2006 and clarified its policy.</p> <p>Completed.</p>

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