WorldFish
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MEDIUM-TERM PLAN

2010-2012

Reducing poverty and hunger by
improving fisheries and aquaculture

Partnerships | Excellence | Growth

Medium-Term Plan 2010-2012

WorldFish
CENTER

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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** is:

"To reduce poverty and hunger by improving fisheries and aquaculture".

Our Vision is:

"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
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, despite considerable international investment in policies and action to meet the MDGs, we still leave many of the poorest and hungriest behind[1]. 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

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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 2005[8] 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.

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7 FAO. 2007. The state of fisheries and aquaculture.
8 Available at www.worldfishcenter.org/pdf/strategyupdatepdffin.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/strategyupdatepdffin.pdf.

	Natural Resource Management	Aquaculture and Genetic Improvement	Policy, Economics and Social Science
What we will increase	• Small-scale fisheries management tool development • Fisheries analysis for inter-sectoral basin and coastal zones management • Ecological assessment • Water management-fisheries management interactions and approaches	• 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	• 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 research.			
What we will maintain/adapt	• Knowledge bases • Stock enhancement	• Dissemination of new breeds • Inland aquaculture focus	• Resource valuation • Co-management arrangements and their (real) implication for poverty reduction in small-scale fisheries
We will not do ourselves	• Lab-based genetic analysis research • Single species stock assessment tool development	• Post-harvest technology development • Breeding and culture research • Disease diagnostic and treatment technology development • Aquaculture extension	• 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

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

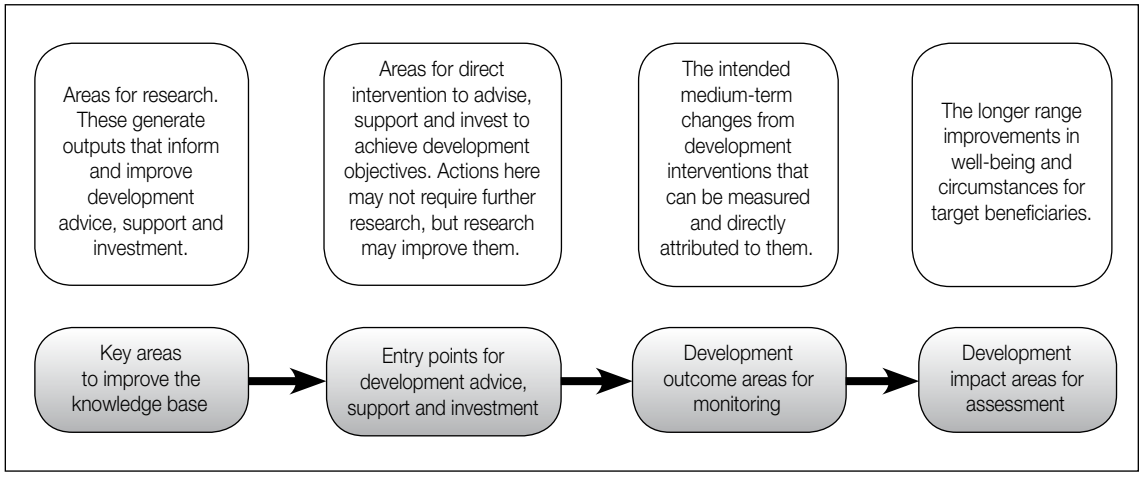
development outcomes and impacts we desire and the array of interconnected research and other inputs needed to achieve them.

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 5 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.



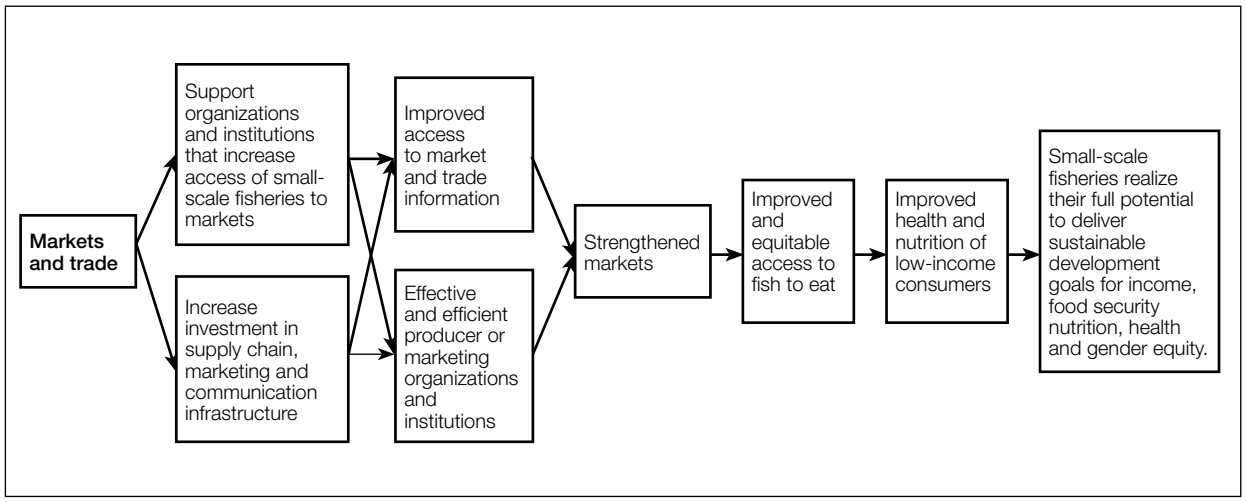
These maps are not intended as definitive products, nor are they the only approach for guiding thinking on development policy. Rather, they provide our current best assessment of the relationships between development investments and impacts, and of the role of research in supporting them. We believe 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.

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. 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.[10] The pathway further shows that markets can be strengthened by focusing on two outcomes: improved

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

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.

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

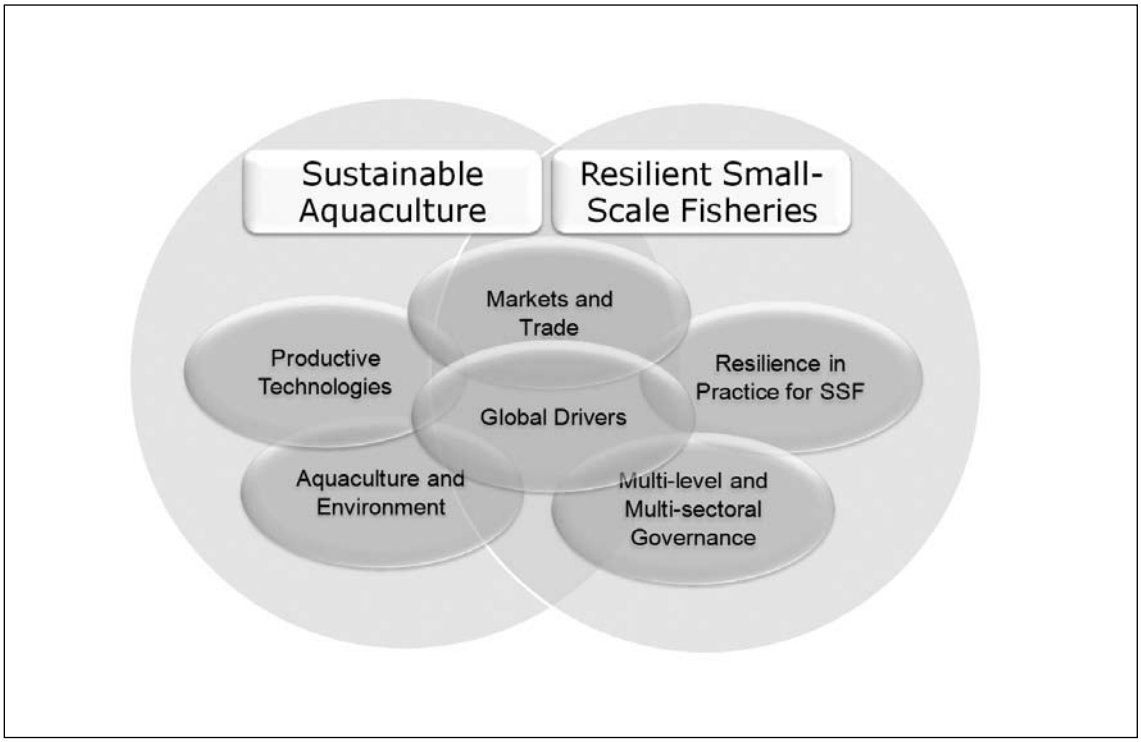


Figure 5. Impact roadmap for Resilient Small Scale Fisheries.

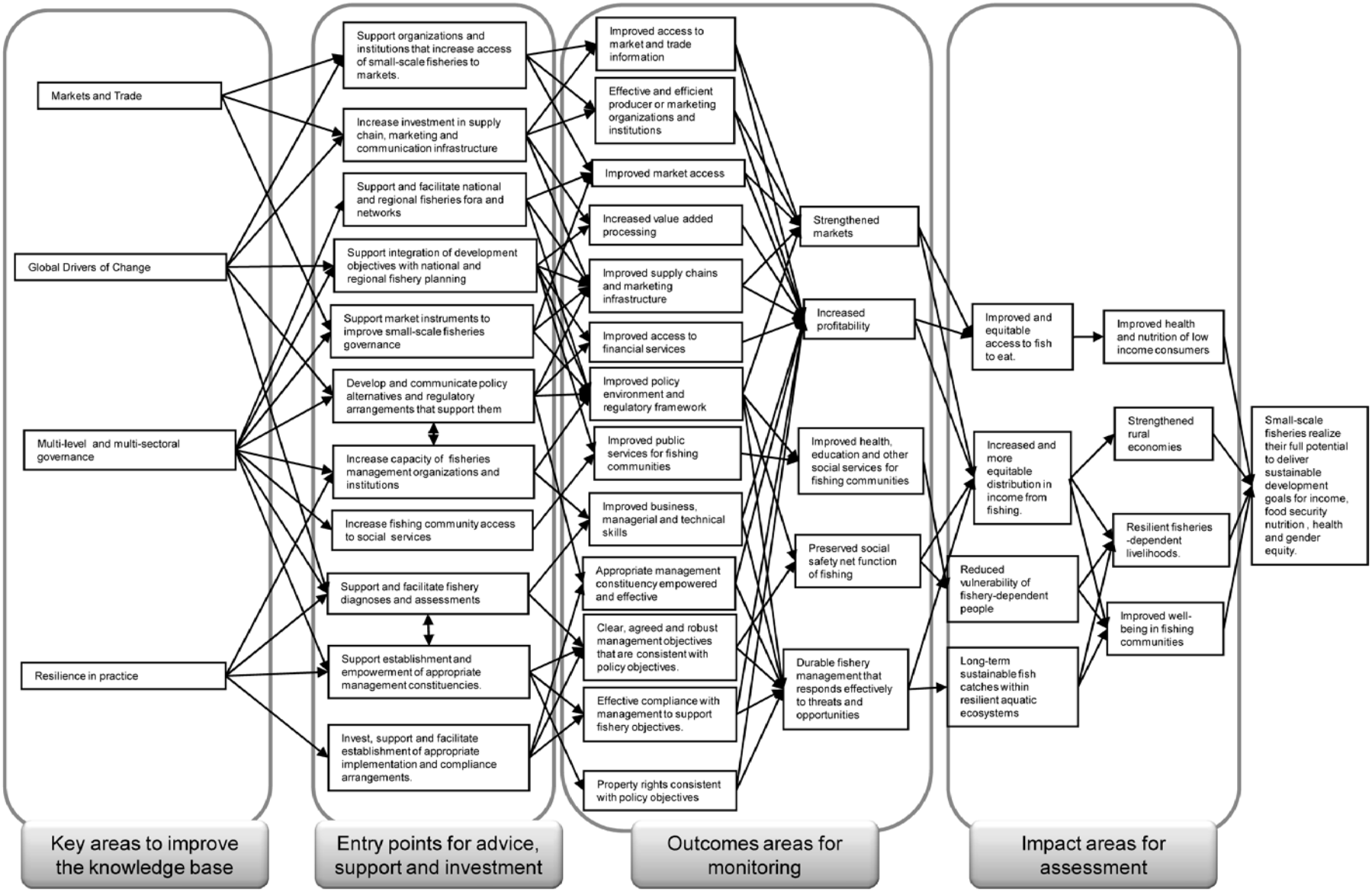
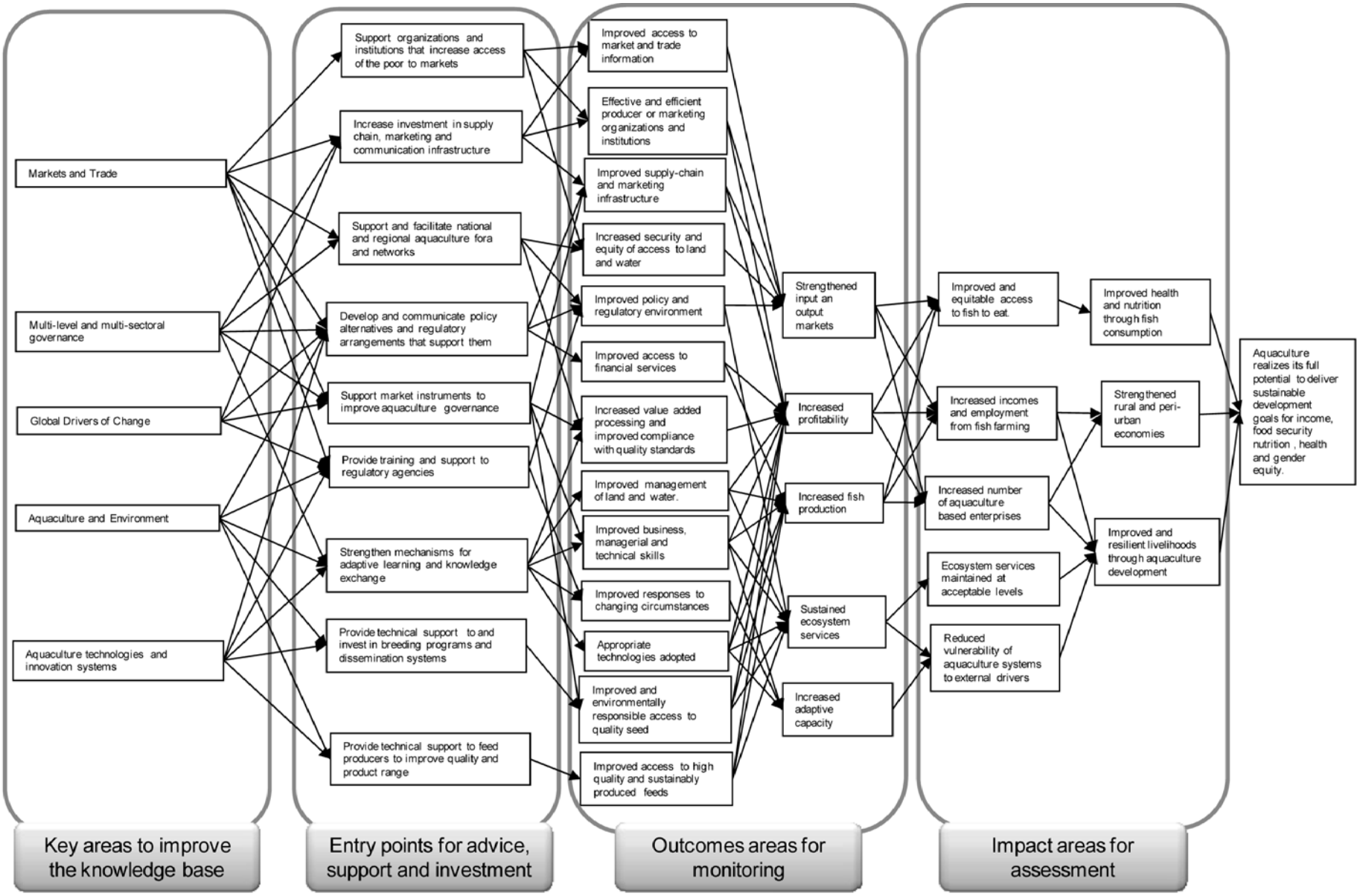


Figure 6. Impact roadmap for Sustainable Aquaculture.



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 2010-2012 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:

> 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

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

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.)

E. 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. 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 regional focus, we have identified programme countries where the Center will devote greatest effort to engaging strategically in support of national programmes for fisheries and aquaculture research.

In selecting these programme 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 criteria used to make the choice of programme countries.

Table 2. Criteria for determining WorldFish programme countries	
Development impact	There is exceptionally high potential for impact over project time frames and for sustained impact over the long term.
Development challenges	Our work there will make significant and sustained progress toward one or both DCs.
IPGs	Work here will generate high profile IPGs that have credible potential for regional and global impact.
Partnerships	We can foster durable partnerships with multiple stakeholders to implement projects and deliver impacts in the short, medium and long term.
Value added	There are high value opportunities to support sustained development or R4D and increased policy impact.
Funding	Work can be funded through sustained grant funding at levels needed to pursue the volume of research required.
Enabling environment	Work can be pursued effectively in the short, medium and long-term in the operating environment in place in the country.

In 2010 the Center will consolidate its regional portfolios in sub-Saharan Africa into one Africa region. It is intended that this change will free up resources for research and further strengthen regional partnerships. Simultaneously the Center will give greater focus to implementing work in programme countries; Egypt because of the opportunities to learn from its expanding aquaculture sector, and the Democratic Republic of the Congo, Zambia and Malawi, because of the importance of their inland fisheries and aquaculture potential. In line with these changes the Center is continuing to recruit more staff to work in its Africa programme, and we will also deploy existing staff from other locations as required.

In Asia the Center will also integrate our work into a consolidated Asia programme, but in doing so will continue to build on the current geographical foci of Bangladesh, Cambodia and the Greater Mekong, and the Philippines. We will also build on our work in Aceh to develop further research activities in Indonesia where grant funding allows this.

In the Pacific we will continue to focus on the Solomon islands as a programme country but will develop activities in Papua New Guinea, Fiji and other countries as opportunities emerge. We will also seek to

expand regional partnerships that can increase our impact across the Pacific and transfer international public goods to other small island developing states.

In order to strengthen capacity to implement the programme the Center is continuing to strengthen 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 will continue to pay particular attention to developing partnerships with regional and sub-regional institutions. Of special importance are the Center's growing partnerships in Africa, notably with the Forum for Agricultural Research in Africa (FARA) and the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA), one of FARA's sub-regional organizations. Both FARA and ASARECA have identified aquaculture and fisheries as a priority and 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.

In Asia and the Pacific the Center is also working with regional partners that have identified fisheries and aquaculture as priorities. These include the South East Asia Regional Center for Graduate Study and Research in Agriculture (SEARCA), the Mekong River Commission, and the Secretariat of the Pacific Community (SPC).

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 regions 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 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 grant 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 2008 the number of peer-reviewed publications per scientist was 1.5.

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 now meets annually, normally in April immediately prior to a meeting of the BoT. It includes external experts who work with each discipline to review existing and proposed research and provide advice to management and BoT. At its April 2009 meeting, the Science Advisory Committee reviewed science plans that are now reflected in the MTP 2010-2012.

Changes to the previous MTP

In its commentary on the 2009-2011 MTP the Science Council endorsed the approach being taken by the Center. For this reason the 2010-12 MTP makes only minor changes to the narrative and approach that was first set out in the previous MTP. The major changes are focused on updating of the project logframes, with updated output targets for 2010 and 2011 and new targets for 2012.

Highlights of the 2010 Project Portfolio

Highlights of the 2010 project portfolio are

- Water productivity curricula and training materials to serve capacity-building needs developed and disseminated (**global**).
- National risk assessments of vulnerability to HIV/AIDS and priorities for investment in **Malawi, Mozambique** and **Zambia**.
- Technical guidelines for policy and regulatory frameworks for cage aquaculture in inland waters in **sub-Saharan Africa** produced and disseminated.
- Improved governance systems for rice-fish culture practices identified, drawing on selected case study sites in **Mekong** and **Yellow river basins**.
- Quality seed distribution strategies for **Bangladesh, Egypt** and **Ghana**.
- 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**.
- Opportunities for livelihood diversification as a means of reducing pressure on wild fisheries assessed in **Solomon Islands** and **Indonesia**.
- Guidelines for adaptive management in SSF in the developing world incorporated in national and regional fisheries development in the **Pacific** and **sub-Saharan Africa** regions.
- Policy brief on cage aquaculture (**global**).
- Policy brief on aquaculture and adaptation to climate change (**global**).

Center Financial Indicators

For 2009, we expect to meet all financial benchmarks (see Finance Plan). The Center expects to reduce its reserves in 2009, however the BoT has decided that no further draw down of the Center's reserves should occur and that the Center should keep its reserves at no less than 110 days of working capital.

Box 1: Research Dissemination: Key Publications

A total of 68 peer-reviewed papers on aquaculture, fisheries and the environment were produced in 2008. Some papers were published in journals with a high impact factor rating (such as *Frontiers in Ecology and the Environment*, impact factor 4.94; *Fish and Shellfish Immunology, 3.16; Marine Ecology Progress Series, 2.55; Coral Reefs, 2.28; Restoration Ecology* 1.93). Selected publications that highlight our work are listed below:

Armitage, D., Plummer, R., Berkes, F., Arthur, R., Davidson-Hunt, I., Diduck, A., Doubleday, N., Johnson, D., Marschke, M., McConney, Pinkerton, E., and L. Wollenber. 2008. Adaptive Co-management for Social-Ecological Complexity. Frontiers in Ecology and Environment. 6 doi:10.1890/070089

Béné, C. and S. Merten. 2008. Women and fish-for-sex: transactional sex, HIV/AIDS and gender in African fisheries. *World Development* 36(5): 875-899.

Béné, C. E. Steel, B.K. Luadia and A. Gordon. 2008. Fish as the "bank in the water" – evidence from chronic-poor communities in Congo. *Food Policy* 34(1): 108-118.

Bhujel, R. C., Shrestha, M. K., Pant J. & Buranrom, S. 2008. Ethnic Women in Aquaculture in Nepal. *Development, 51*, 259-264.

Briones, R.M. M.M. Dey, M. Ahmed, M. Prein and I Stobutzki. 2008. Priority setting for research on aquatic resources: an application of modified economic surplus analysis to natural resource systems. *Agricultural Economics* 39: 1-13.

Brummett, R. E., J. Lazard & Moehl. J. F. 2008. African aquaculture: Realizing the potential. *Food Policy, 33,* 371-385.

Choo, P.S., S. Barbara, K. Nowak, K. Kusakabe and M.J. Williams (eds). 2008. Special Edition: Gender and Fisheries. *Development* 51(2).

Jahan, K. M., Beveridge, M. C. M. & Brooks, A. C. 2008. Impact of long-term training support on small-scale carp polyculture farms of Bangladesh. *Journal of the World Aquaculture Society, 39*, 441-453.

Lugten, G and N. Andrew. 2008. Maximum Sustainable Yield of Marine Capture Fisheries in Developing Archipelagic States - Balancing Law, Science. Politics and Practice. The International Journal of Marine and Coastal Law 23: 1-37

Mesalhy,S., Adel Galil, Y., Abdel-Aziz Ghareeb, A. & Mohamed, M.F. 2008. Studies on *Bacillus subtilus* and *Lactobacillus acidophilus* as potential probiotics on the immune response and resistance of *Tilapia nilotica (Oreochromis niloticus)* to challenge infections. *Fish & Shellfish Immunology, 25,* 128-136.

Ponzoni, R. W., Nguyen, N. H., Khaw, H. L. & Ninh, N. H. 2008. Accounting for genotype by environment interaction in economic appraisal of genetic improvement programs in common carp *Cyprinus carpio. Aquaculture, 285,* 47–55.

Tewfik, A., Garces, L., Andrew, N.L. and Bene, C. 2008. Reconciling poverty alleviation with reduction in fisheries capacity: Boat Aid in Post-Tsunami Aceh, Indonesia. Fisheries Management and Ecology 15:147-158

Rhodes, K.L. Tupper, M. and C. Wichilmel. 2008. Characterization and management of the commercial sector of the Pohnpei, Micronesia, coral reef fishery. Coral Reefs 27(2): 443-454

Purcell, S.W. and Simutoga M. 2008. Spatio-temporal and size-dependent variation in the success of releasing cultured sea cucumbers in the wild. Reviews in Fisheries Science. 16(1-3):204-214,2008

Sheriff, N., D.C. Little and K. Tantikamton. 2008. Aquaculture and the poor: Is the culture of high-value fish a viable livelihood option for the poor? *Marine Policy* 32: 1094-1102.

F. 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.

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. In the context of global drivers, this means that overlooking the importance of SSF and aquaculture leads to their being excluded when looking at the impacts of these drivers on poverty and food security. This applies to drivers such as climate change, water resource management and coastal zone land use planning.

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 provide a more comprehensive understanding of the value of SSF and aquaculture in relation to key development indicators, and the role these sectors can play in contributing to broader development goals. 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 provide a more comprehensive understanding of the value of SSF and aquaculture in relation to key development indicators and trends, as well as their contribution to meeting development challenges.

Alignment with CGIAR System P riorities

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	Publications and policy briefs providing global syntheses and analyses of the potential impacts of climate change	10	10	10	10	30		10				20
Output 2	Technical reports and publications on analyses of water requirements for fisheries and aquaculture			10		20	70					
Output 3	Publications reporting analyses of factors affecting supply and demand for fishery products, including demographic change			10		30				60		
Output 4	Community of practice formed to assess 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	Policy briefs, information products and tools that promote increased understanding of the values of small-scale fisheries and aquaculture and their contributions to meeting development challenges.			70		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 pathway is summarized in Figure 7.

International Public Goods

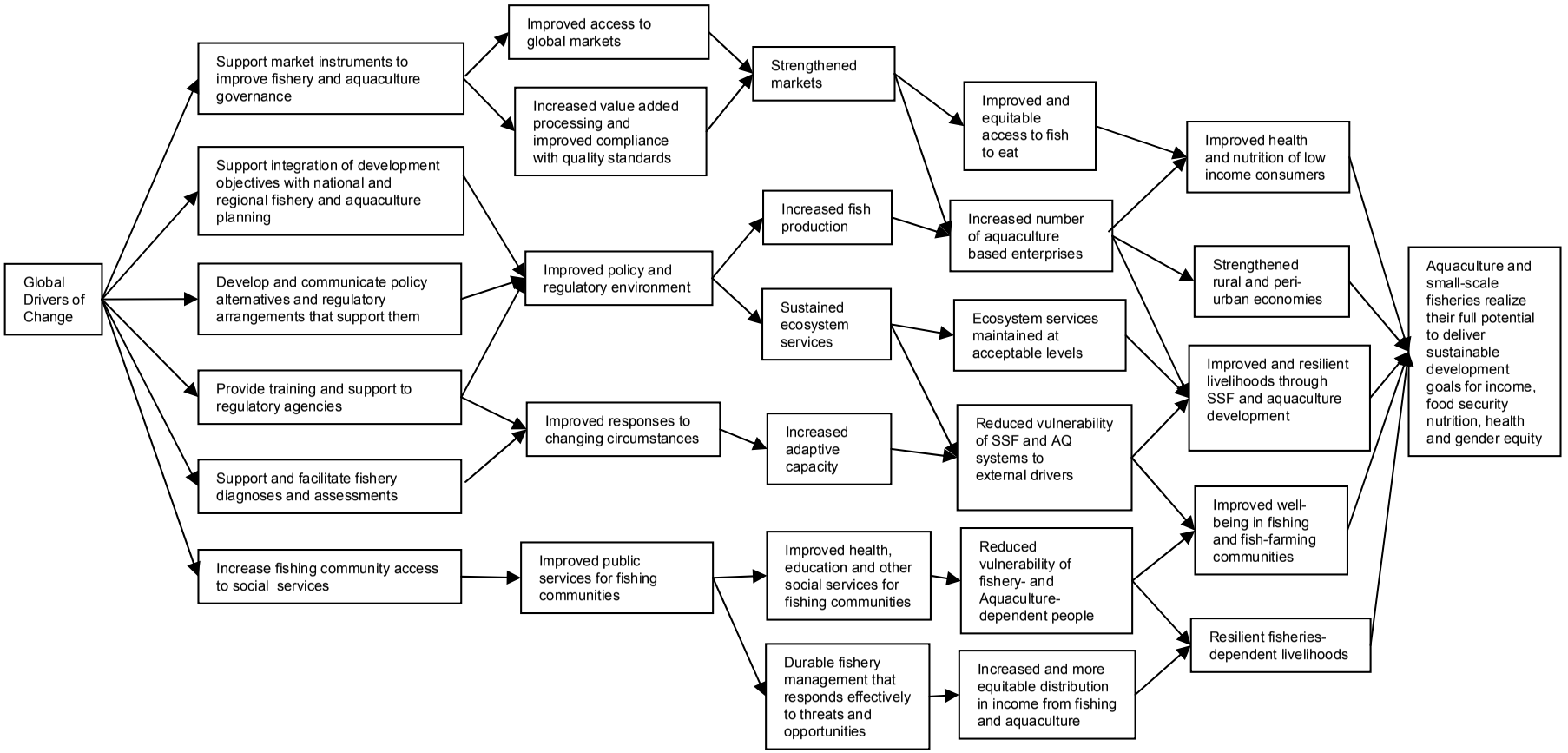
The IPGs produced from this project will largely take the form of new knowledge and understanding to inform policy and investment choices. We anticipate that our papers and policy publications in this area will map out new areas in the landscape that future fisheries governance and investment should 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 Ecosytems 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.

Figure 7. Impact pathway for Project 1.



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 *Fish to 2020*)
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, Medical Research Council (MRC) (Gambia), Uganda Virus Research Institute, NEAD (South Africa), Food for Hungry International (Bangladesh)	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
NEPAD, FAO, IDRC, MRC, SPC, United Nations Development Programme (UNDP), Overseas Development Institute, Institute of Development Studies, IWMI, IFPRI	5	Promote improved integration of fisheries and aquaculture sectors into policy on water resource management, climate adaption, agricultural policy and poverty reduction

MTP Project Logframe — Project 1: Global Drivers of Change

Table 5. Project 1 logframe

Outputs		Intended users	Outcome	Impact
Output 1 Global syntheses and analyses of the potential impacts of climate change				
Output targets 2010	Analysis of impacts of climate change and other global drivers on aquaculture production in **Bangladesh, Southeast Asia** and **Africa** published.	NARES, government agencies, international research and development organizations, NGOs engaged in natural resource management issues.	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.	Adaptation planning in Bangladesh, Southeast Asia and Africa includes provision for the needs of the fishery and aquaculture sectors.
	Assessment and application of tools for environmental protection and analyzing effects of climate change on fisheries in **Bangladesh**.	United Nations Development Program (UNDP), Ministry of Environment and Forestry, Ministry of Fisheries and Livestock, Bangladesh Centre for Advance Studies, local agencies.	Contribution of fisheries to larger sector-wide UNDP program to integrate environment and climate change into development planning.	Adaptive capacity of local communities enhanced and process of evaluating changes integrated into the planning and investment framework.
2011	Analysis of local impacts of alternative climate change scenarios on fisheries and fishery-dependent communities, including measures taken to reduce impacts such as water harvesting and infrastructure development, completed in at least two river basins.	National line agencies, provincial and local authorities, NGOs that support them.	Agencies that influence resource-management decisions are better equipped to consider likely vulnerabilities.	Policies developed and implemented to increase adaptive capacity of fishery-dependent communities.
2012	Analysis of options for carbon sequestration and greenhouse gas emissions reduction using Aquatic production systems.	National governments, producer associations , major seafood buyers, regional and global fishery, aquaculture and marine environmental organizations, UNFCCC.	Viable options for linking climate mitigation to adaptation *and* improved livelihood outcomes using carbon markets identified and promoted – e.g. REDD scheme, carbon markets.	Fisheries and aquaculture sector in at least two WorldFish focal countries (Solomon Islands andone other) adopt new measures that enhance both sector outputs (production, income, reduced vulnerability) and reduce the sectors' contribution to greenhouse gas emissions.

Output 2 Analyses of water requirements for fisheries and aquaculture				
Output targets 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.	National line agencies, provincial and local authorities, NGOs that support them.	Agencies that influence resource-management decisions are better equipped to consider likely vulnerabilities.	Policies developed and implemented to increase adaptive capacity of fishery-dependent communities.
	Comparative analysis of the environmental drivers of sustainability of inland fisheries in **sub-Saharan Africa** completed and disseminated.	NARES, government agencies, international research and development organizations, NGOs engaged in natural resource management issues.	Policy and management decision-makers respond more effectively to the interests of poor communities reliant on aquatic resources.	Improved food security and incomes for aquatic resource-dependent communities.
	Water productivity curricula and training materials to serve capacity-building needs developed and disseminated (**global**).	Researchers, policymakers, trainers, universities.	Improved water productivity.	Increased food production and reduction in poverty.
Output 3 Analyses of factors affecting supply and demand for fishery products, including demographic change				
Output targets 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**.	Regional economic communities, United Nations Conference on Trade and Development (UNCTAD), FAO, national governments.	Improved policy environments for developing pro-poor fish-marketing strategies.	Improved access to nutritious food for low-income consumers in Africa; strengthened rural economies based on improved access to markets.
	Analysis of demographic changes affecting small-scale fisheries and aquaculture in key countries in **sub-Saharan Africa**.	National governments, regional economic communities, NGOs.	Improved public sector planning; planning basis for service delivery and private sector investment strengthened.	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**.	Government agencies, regional bodies, researchers.	Better understanding of likely impacts of shifts in market demand under urbanization and economic growth and environmental shocks.	Reduced vulnerability and improved likelihood of adaptation.
2012	An analysis of mobility and migration in small-scale fisheries in developing countries.	UN agencies, regional economic communities, national governments.	Better understanding of trends, constraints and benefits arising from mobility and migration; improved basis for regional policy development.	Improved livelihood security and enhanced resilience of fisheries in which migrants and mobile populations play a major role.

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				
Output targets 2010	National risk assessments of vulnerability to HIV/AIDS and priorities for investment in **Malawi**, **Mozambique** and **Zambia**.	NARES, government agencies and NGOs engaged in managing the fisheries sector to reduce vulnerability to HIV/AIDS.	Improved knowledge of the risk factors, informing national strategic responses to HIV/AIDS linked to wider sustainable support processes available at local scales.	Improved capacity at national and local level to manage impact of HIV/AIDS in the sector.
	Community of practice on health, fisheries and aquaculture established, with focus on water-borne diseases.	Health-sector organizations, including government ministries, World Health Organization (WHO), ILO, Joint UN Programme on HIV/AIDS (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.
2011	Guidelines and models for reducing risk and impact of HIV/AIDS through improved investments in fisheries and aquaculture developed and disseminated.	Food security monitoring systems, national government agencies, NGOs, WHO.	Improved basis for programs targeting malnutrition crisis; increased recognition of the value of the fisheries sector regarding nutrition and food security.	Improved responses to malnutrition crisis; improved access to high-quality nutrition among vulnerable populations.
	Assessment of current role of fish for nutrition security among populations vulnerable to malnutrition in key countries in **sub-Saharan Africa**.	NGOs, fishing communities, farmer groups, national governments.	Increased investments in good practice support options in fishing communities, along marketing chains and among fish farmers.	Reduced vulnerability in sector; improved income and health benefits from fisheries and aquaculture.
2012	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.

Output 5 Policy briefs and tools that promote increased understanding of the values of small-scale fisheries and aquaculture and their contributions to meeting development challenges.				
Output targets 2010	Analysis of fisheries and aquaculture development options in small island developing states in the **Pacific**.	SPC, donors, national governments.	Potential and limitation of different strategies for fisheries and aquaculture development analyzed.	Improved policy formulation and investment targeting leads to more effective and appropriate support to rural livelihoods in small island developing states.
	Review of the value of food from coastal zones as a provisioning ecosystem service.	Investors and partners in coastal zone planning and management.	Value of coastal ecosystems as food production systems used to inform coastal policy development.	Coastal zone planning is more effective at sustaining food production as a coastal use.
	Tools developed to assess the value of ecosystem goods and services from fisheries in three river basins (**global**).	Governments, national agencies, basin organizations, NARES, others in target basins.	Value of ecosystem goods and services in the selected river basins inform decision-making in water allocation for aquatic ecosystems.	Water allocation supports long-term sustainability of fisheries production and associated livelihoods.
2011	Analysis of the role of fisheries sector in the rural economy in **Southeast Asia** and **Africa**: labor sink, safety net or engine of growth?	NEPAD, ASEAN, development banks, national governments.	Fisheries-management targets and fisheries policy are tailored to the role that fisheries play —or could optimally play — in the economy.	SSF contribute more to poverty reduction in least-developed countries through more effective policy formulation and investment support.
	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.
2012	**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.
	Critical review of concept of water productivity published (**global**).	Challenge Programme on Water and Food, regional fishery organizations, international science community.	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.

MTP Project 2: Markets and Trade

Background and Rationale

The 2008 *World Development Report* emphasized 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 (%)

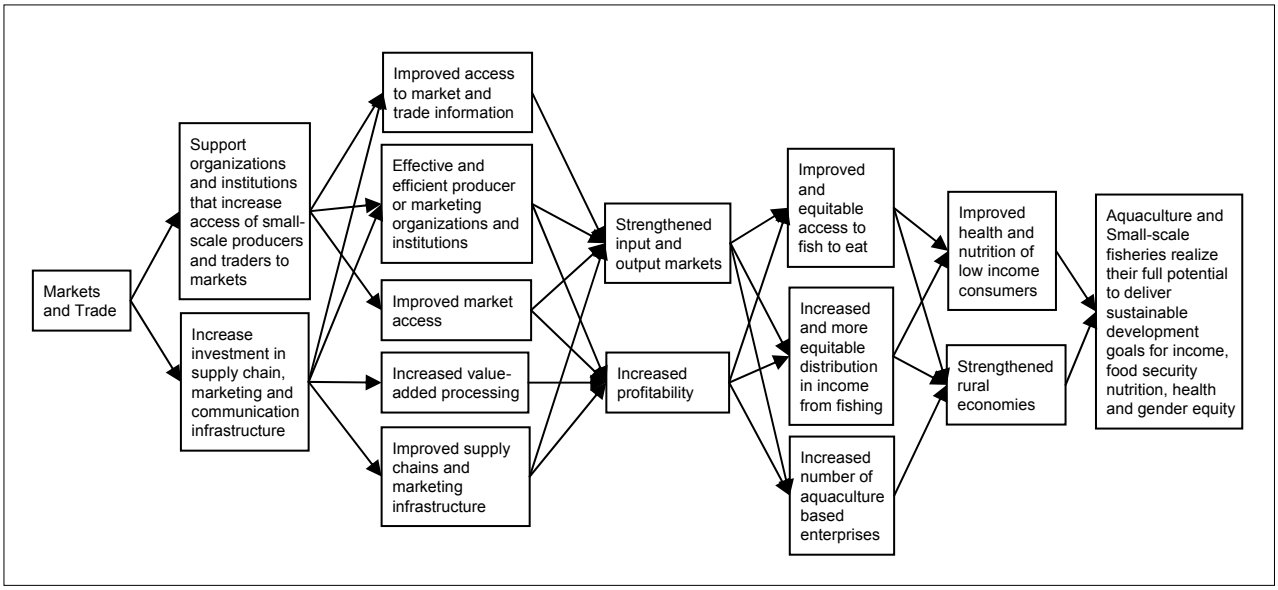
Project 2	Markets and trade	3C	4B	5B
Output 1	Diagnostic tools and policy advice to inform and support appropriate fisheries and aquaculture marketing investment strategies that benefit the poor	60	10	30
Output 2	Assessment of barriers to entry by the poor into higher value-added commodity chains	70		30
Output 3	Assessment of the role of Public-Private Partnerships in addressing key market constraints to aquaculture and fishery 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.
Departments of fisheries in Bangladesh, Cameroon, China, DR Congo, Ghana and Malawi; Universities of Hoenheim 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
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 the poor
African Wildlife Foundation, World Wildlife Fund/ Worldwide Fund for Nature (WWF)	2	Supporting research on collective action to improve fish marketing
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 Diagnostic tools and policy advice to inform and support appropriate fisheries and aquaculture marketing investment strategies that benefit the poor				
Output targets 2010	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.
	Paper on market trends in fisheries in at least two countries participating in the Coral Triangle Initiative.	National government agencies, investors and conservation NGOs involved in the Coral Triangle Initiative.	Conservation planning informed by seafood market and consumption analysis.	Maintain access by the poor to fish for nutrition in the context of regional coastal conservation planning.
2011	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 standards on which traders and producers will agree.	Reduce impacts of aquaculture on environmental services and on inequality; increase benefits for poverty reduction through trade.
2012	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.	Donor agencies, seafood companies, regional economic development agencies, developed country consumers, developing country producer organizations.	Access to international markets for small-scale producers improved.	Reduced poverty and improved food security.
	Ex-post study of impact of aquaculture intensification on the poor.	Small-scale farmers, consumers.	Improved and more sustainable pro-poor aquaculture policy environments.	Reduced poverty and improved food security.
	Understand role of aquaculture producer networks in creating an enabling environment for small-scale aquaculture producers.	Small-scale producers, NGOs, producer organizations.	Increased, sustained uptake of aquaculture by small-scale producers and SME.	Reduced poverty and improved food security.

Output 2 Assessment of barriers to entry by the poor into higher value-added commodity chains				
Output targets 2010	Typology and toolkit of options to improve the livelihoods of the poor involved in postharvest activities in **Africa**.	Small-scale traders (women and men), donors, local and national government and other service providers, community-based organizations.	Small-scale traders have improved access to livelihood support services.	More resilient livelihoods, increased income from fish trade.
	Practical tools (manuals, investment guidance briefs) for identifying constraints to aquaculture adoption for fishers who collect wild seed (**Philippines**).	Local government investment promotion agencies, NGOs involved in SME development, fishers and fish farmers.	Establishment of aquaculture as a livelihood-diversification strategy for poor fishers.	Improved incomes and fishery and aquaculture contributions to rural development in coastal environments in Southeast Asia.
2011	Understand alternative extension approaches.	Small-scale producers, NGOs, producer organizations.	Increased, sustained uptake of aquaculture by small-scale producers and SME.	Reduced poverty and improved food security.
	Ex-post study of impact of contract farming on small-scale producers.	Small-scale producers, NGOs, producer organizations.	Increased, sustained uptake of aquaculture by small-scale producers and SMEs.	Reduced poverty and improved food security.
2012	Assessment of impacts on poverty of value chain and market interactions stemming from aquaculture and fisheries production, along with opportunities for livelihood improvements.	Policymakers, donors, investors, consumers.	Coherent policies for pro-poor aquaculture and fisheries.	Reduced poverty and improved food security.
Output 3 Assessment of the role of Public-Private Partnerships in addressing key market constraints to aquaculture and fisheries development				
Output targets 2010	Models for successful Public-Private Partnerships in aquaculture disseminated.	Public and private sectors, farmers.	Increased supplies of quality seed and feed.	Increased food security and decreased poverty.
	Models for Public-Private Partnerships in providing market information for fishery and aquaculture sector in tsunami-affected coastal areas of Banda Aceh, **Indonesia.**	Fishery development organizations, donors, fish producer organizations, local and district government departments, information and communication technology for development (ICT4D) community.	Farmers and fishers gain access to improved market information, resulting in more competitive markets and fairer prices for producers.	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.
2012	One public-private partnership to increase access to global markets for small-scale producers (aquaculture and fisheries) via certification schemes.	Public and private sectors, farmers.	Increased volume of trade from small-scale producers who meet eco- and fair-trade criteria.	Increased income and improved environmental and social sustainability of small-scale producers.

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.

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 in 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?

In fisheries and aquaculture systems alike, prospects for livelihood improvement depend critically on the ability of small-scale producers and other beneficiaries in the value chain to maintain access to productive assets, and to have a voice in policy and institutional reforms that affect them. Where these and other basic rights are not respected, it is unrealistic to expect poor stakeholders to engage in long-term planning, or collective action to sustain environmental resources. It is also critical to build understanding and capacity of a range of stakeholders to anticipate and manage inter-sectoral resource conflicts that affect the prospects for resilience in both sub-sectors. This must address competition over water resources at river basin and catchment scales, infrastructure development, land use change, and coastal development.

Recognizing these challenges, the purpose of this project is to use evidence-based approaches 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.

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 engage in partnerships that help strengthen the rights of small-scale fishers and aquaculture producers, their capacity

to engage in policy and institutional reform processes, and the accountability of public and private decision makers for decisions that affect them. Third, we will improve the capacity of public agencies and civil society organizations to anticipate and equitably manage intersectoral resource conflicts that affect the livelihoods of small-scale fishers and aquaculture producers.

Goal

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.

Objectives

1. 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. Strengthen the rights of small-scale fishers and aquaculture producers, their capacity to engage in policy and institutional reform processes, and the accountability of public and private decision makers for decisions that affect them.
3. Improve the capacity of public agencies and civil society organizations to anticipate and equitably manage inter-sectoral resource conflicts that affect the livelihoods of small-scale fishers and aquaculture producers.

Alignment with CGIAR System Priorities

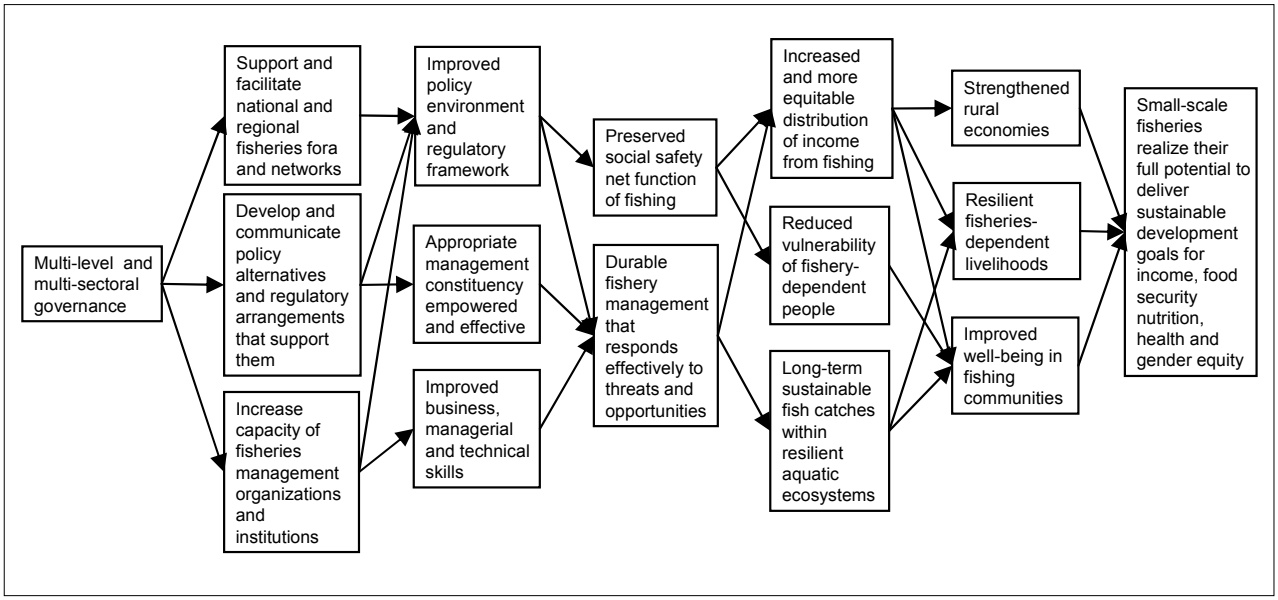
Table 9. Project 3 allocation of resources to system priorities (%)

Project 3	Multi-level and multi-scale governance	3C	4A	4B	4C	5C	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	Analyses of best practices to strengthen the rights of small-scale fishers and aquaculture producers, their capacity to engage in policy and institutional reform processes, and the accountability of public and private decision makers for decisions that affect them.	10	10	10	10	20	40
Output 3	Diagnostic tools and stakeholder dialogue processes that improve the capacity of public agencies and civil society organizations to anticipate and equitably manage inter-sectoral resource conflicts.	10	50	20		10	10

Impact Pathway

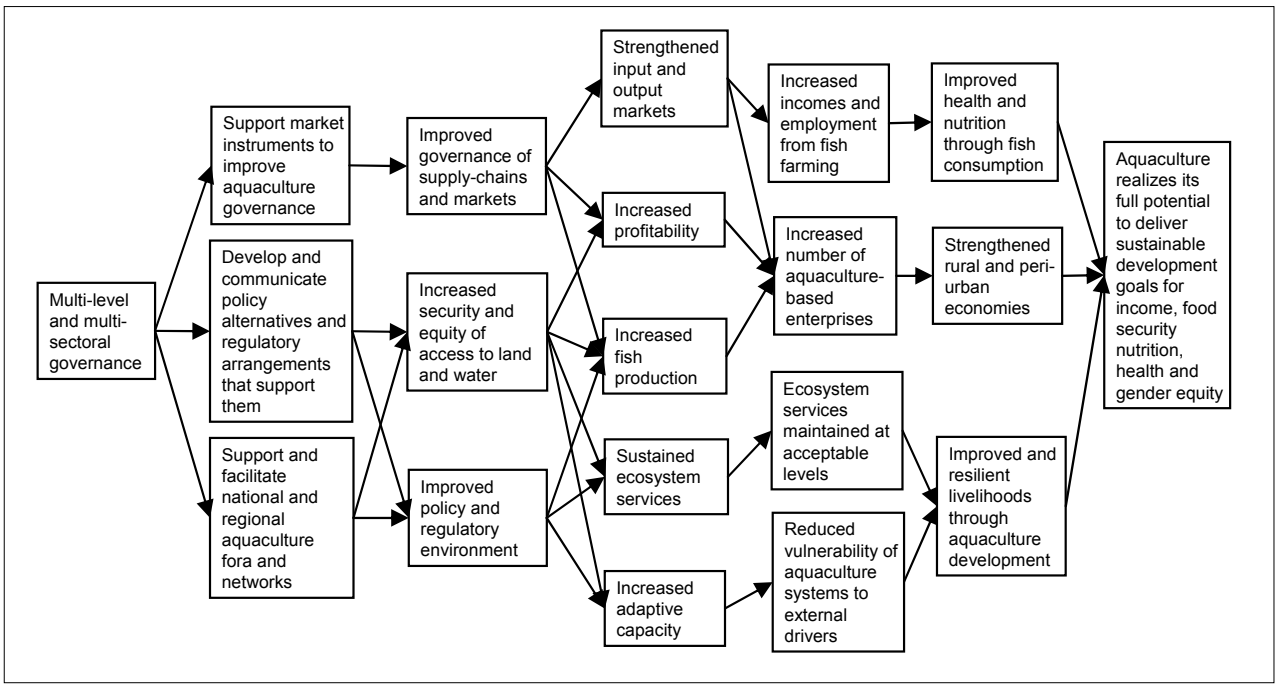
SSF play diverse roles in society and are governed by a complex network of institutions, from market-based mechanisms to social institutions within and outside the sub-sector. Achieving resilient SSF, improving well-being, and reducing vulnerability requires a much sharper focus on the societal role 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 and other vulnerable groups. 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, catalyzing the political process to determine and legitimize the best management constituency for individual fishery systems, highlighting vulnerabilities to fishery livelihoods, and strengthening the capacity of stakeholders to address these. This pathway is summarized in Figure 9.

Figure 9. Impact pathway for Project 3 (resilient small-scale fisheries).



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 (sustainable aquaculture).



International Public Goods

This project will draw on studies and lessons learned across fishery and aquaculture systems to generate a range of IPGs. 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 empower women and other vulnerable groups to secure long-term benefits from fisheries and aquaculture, and the role of governance and institutional reforms in creating an enabling environment for aquaculture for development. Building on these lessons and ongoing engagement in focal program countries, we will produce best practice guidelines that outline pathways for government, civil society, and private sector stakeholders to integrate fisheries and aquaculture development concerns in broader development 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 of governance that influence fisheries development outcomes, 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 fora 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 were social development issues are particularly pertinent to fishery resource governance. These can include strategic engagement with governance initiatives to address issues such as public sector reform and social accountability, migration and labor mobility, human security and disasters, and human rights (e.g., relating to gender, child labor and bonded labor in the fisheries sector), 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, FAO Committee on Fisheries, New Partnership for Africa's Development, and ICSF (on rights-based approaches and civil society engagement).

A distinctive feature of our evolving portfolio of projects is an increased interaction with civil society organizations, including community-based organizations that manage 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 – apart from the broad mandate to reduce poverty and support social-ecological resilience – avoid engaging in explicit support of specific subnational 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 IWMI, International Rice Research Institute (IRRI) and other CGIAR centers, IUCN-The World Conservation Union	1 2,3	Strategy development, capacity building, research implementation, technical support for participatory planning and monitoring, fisheries management options 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-scale governance

Table 11. Project 3 logframe

Outputs		Intended users	Outcome	Impact
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				
Output targets 2010	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**).	International science community, multilateral and bilateral donors, international organizations, government agencies, fishery sector civil-society groups.	Improved laws and international norms with respect to the rights and vulnerability of fish dependent communities.	Increased governance capacity for SSF.
	Critical analysis of the impacts of decentralization policy on poverty reduction in **Indonesia** and the **Philippines** published.	International science community, multilateral and bilateral donors, international organizations, government agencies, fishery sector civil society.	Better understanding of the impacts of decentralization policy used to guide reform process.	Increased governance capacity for SSF.
	Technical guidelines for policy and regulatory frameworks for cage aquaculture in inland waters in **sub-Saharan Africa** produced and disseminated.	NARES; FAO; World Bank; private sector investors; donors; government agencies for environment, agriculture and fisheries.	Guidelines used to develop aquaculture in a sustainable manner.	Development of sustainable aquaculture delivers improved food security and incomes.
2011	Estimates of participation and role of women and children in SSF in selected countries in **sub-Saharan Africa**.	Donors, government agencies, UN agencies.	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.	Improved food security, increased incomes and reduced livelihood vulnerability for women and children.
	Decentralization and policy process in coastal fisheries in the **Pacific**.	International science community, national and regional managers and policymakers.	Conceptual and empirical understanding of policy and governance reform processes in SSF co-management improve national and local policy.	Improved governance and co-management policies in SSF.
2012	Case studies of the responses of local institutions to global governance mechanisms and frameworks completed and published (**sub-Saharan Africa**).	National line agencies, regional advisory bodies, NGOs, civil society networks.	Lessons learned incorporated into policy locally, nationally and globally.	Improved adaptability and response of local institutions to threats and opportunities arising from national and global processes.

Output 2 Analyses of best practices to strengthen the rights of small-scale fishers and aquaculture producers, their capacity to engage in policy and institutional reform processes, and the accountability of public and private decision makers for decisions that affect them.				
Output Targets 2010	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.	Government, donors and coastal communities in Bangladesh; global community of scholars interested in participatory natural resource management.	Adjustment of the community-based fisheries-management model to suit coastal communities.	Enhanced livelihood benefits for concerned communities and improved knowledge base on co-management experiences.
	Participatory trans-boundary river fishery management plan implemented in **Malawi** and **Tanzania**.	River basin development authorities, government agencies, NGOs.	Improved management of shared fisheries resources in the context of integrated river basin management.	Policies, plans and management processes for shared river fisheries enhanced and river fisheries production increased.
	Improved governance systems for rice-fish culture practices identified, drawing on selected case study sites in **Mekong** and **Yellow river basins**.	NARES, fishing households, rural development NGOs, local government.	Equitable distribution of benefits from ecosystems. Informed decision-making process with participation of all stakeholders.	Improved food security, increased incomes and participation in decision making for rural communities.
2011	Critical analysis of winners and losers in the changing landscape of aquatic resource-based livelihoods in the **Mekong**.	Governments, national agencies, basin organizations, NARES, others in target basins.	Improved policies and institutional arrangements for fostering integrated farming systems in two basins.	Policy, institutions and governance enhanced. Equitable distribution of benefits from ecosystems. Informed decision-making process with participation of all stakeholders.
	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.
2012	Technical guidelines for regulatory frameworks and capacity for implementation of IAA published (**sub-Saharan Africa** and **Bangladesh**).	National and local government agencies; NGOs, especially in conservation and development; donors.	Guidelines used by planning agencies to develop sustainable, pro-poor aquaculture.	Pro-poor benefits from sustainable aquaculture realized.
	Tools developed to determine the water requirements for maintaining fisheries in at least three river basins.	Governments, national agencies, basin organizations, NARES, others in target basins.	Decisions on water allocation informed of the requirements of aquatic ecosystems and the services they provide.	Water allocation supports long-term sustainability of fisheries production and associated livelihoods.

Output 3 Improve the capacity of public agencies and civil society organizations to anticipate and equitably manage inter-sectoral resource conflicts that affect the livelihoods of small-scale fishers and aquaculture producers.				
Output targets 2010	Network of conflict and environmental governance specialists with interests in fisheries and aquaculture established and funded in Asia	ARIs, Fisheries agencies, Asian non-traditional security network, NGOs	Improved conflict monitoring and analysis systems established	Reduced conflict leading to improved human security among fishery and aquaculture dependent people
2011	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**).	National line agencies, regional advisory bodies, NGOs, civil society networks.	Lessons learned incorporated into strategies for governance reform promoted by governments, regional bodies, NGOs and civil society networks.	Improved capacity for conflict management, locally, nationally and regionally.
2012	Conflict resolution tools developed and tested in aquaculture and fisheries in at least two resource conflict or post-civil conflict situations (**Asia, Africa**).	National line agencies, development agencies, regional security networks, NGOs and civil society organizations.	Fisheries and aquaculture restored in post-conflict situations.	Improved human and food security in conflict-affected areas.

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 Asian and African aquaculture will need to grow substantially to meet demand for fish and it must do so not only by expanding the areas of land devoted to aquaculture but also by increasing production per unit land and water use. 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 off-farm feed and fertilizers have consistently been identified as the most widespread and persistent obstacles 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 resulted in 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 off-farm resources, including feeds, for intensifying production limits impacts on poverty and food security. With limited access to fishmeal and fish oil and high 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, if aquaculture is to make sustainable and significant contributions to improving food security and reducing poverty technologies must minimize demands on environmental services through improving water and land productivity and,, increasing the use of both on-farm and off-farm wastes such as oil cakes and wastes from feedlot cattle production systems.

Experience in Asia and Africa and from the agricultural sector has shown that to have significant impacts on poverty and food security there must be an expanded focus on farmers with greater adaptive capacity, on developing the potential of the SME sector and on developing aquaculture in peri-urban areas in countries where infrastructure is poor. Participatory action research approaches to technology development help ensure that technologies match the natural, capital and educational assets and the aspirations of producers. 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 increase the availability of 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, implementation and dissemination 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 and disseminate guidelines for the use of off-farm resources, both fertilizers and feeds, that maximize production and profits, that are consistent with an ecosystem-based approach to aquaculture development, and that produce nutritionally sound aquaculture products. Our research on technology will give increasing emphasis to aqua-farming systems that will be resilient to climate variability and change.

Goal

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

Objectives

1. To develop and disseminate sustainable aquaculture technologies targeted at increasing food security and reducing poverty .
2. To develop and promote methodologies to increase the availability of quality seed for key aquaculture species while conserving genetic resources in anticipation of future needs.
3. To develop and promote methods to increase the availability of off-farm fertilizer and feed sand 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 technologies to maximize productivity, profitability and development impact			80		20
Output 2	Technologies established to develop and disseminate quality seed for key aquaculture species and to conserve genetic resources in anticipation of future needs.	10	40	50		
Output 3	Methods to support the development and dissemination of off-farm fertilizers and 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

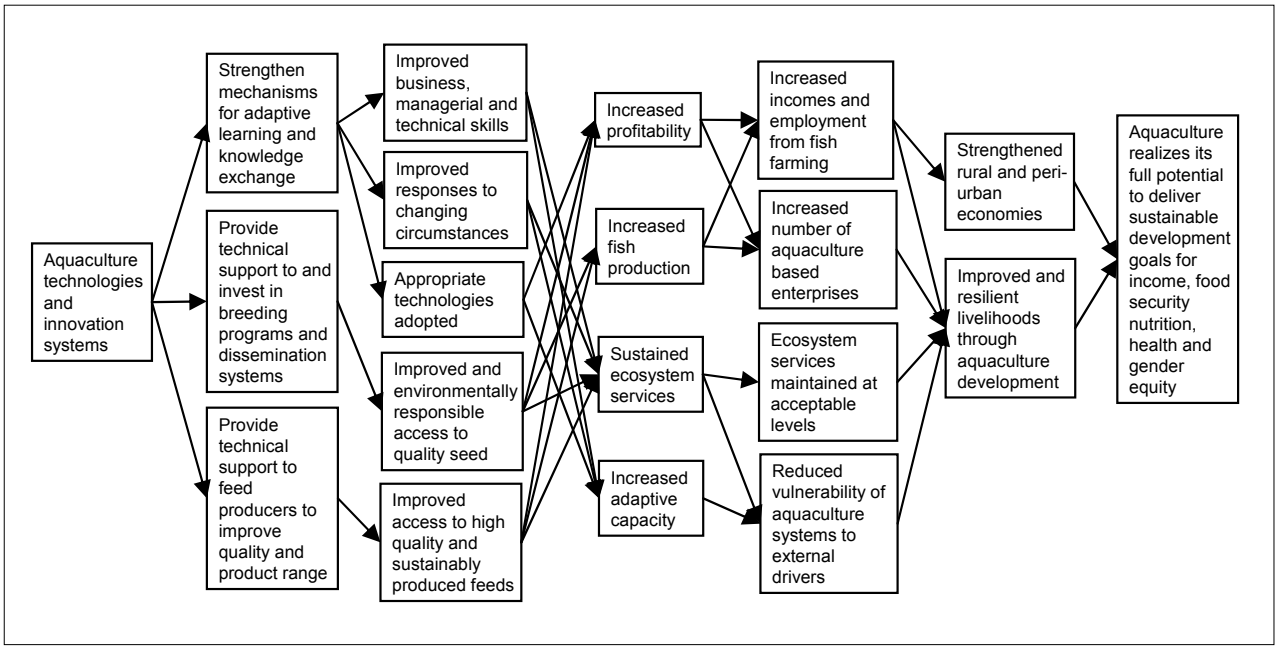
To maximize its potential to contribute to development goals for income, food security, nutrition, health and gender equity, aquaculture must strengthen rural and peri-urban economies and build resilient livelihoods. While the poor can benefit directly from engaging in aquaculture production, the sector will only fulfill its' full potential to improve food security and reduce poverty when less vulnerable farmers who have greater adaptive capacity as well as the SME sector are also targeted. To complement this effective means must also be found to facilitate engagement of the poor with other parts of the value chain (e.g. seed production and trading, fish transport).

This project seeks to achieve these objectives by targeting both small-holder farmers and the SME sector and by working with stakeholders to develop and disseminate productive and profitable technologies that minimize demands on ecosystem services. 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 farmers and 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 focus on the establishment of peer-to-peer networks, especially among smallholder farmers, which have been shown to disseminate aquaculture technologies effectively and at low cost.

Through this participatory process, the project aims to develop and promote aquaculture technologies that improve the livelihoods of farmers and SME producers, and do 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 most likely to result in significant improvements in food security and reductions in poverty. 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 and peri-urban economies. 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, the technologies that can maximize production and profits per unit land and water resources are poorly understood. Technology choice and development must be pursued through participatory action research, which 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 fostering technology ownership and building adaptive 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 the use of off-farm resources, such as fertilizers and feeds, including nutritionally complete feeds, currently focus on Egypt, Indonesia, Malawi and Zambia. We will use the 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, Hoenheim, Kassel, Leuven, Malawi,, Stirling, Stockholm, 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, securing access to inputs (e.g. water, seed) 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	Partnering on research; development, dissemination and implementation of technical guidelines.
NGOs: Caritas, WWF, AIDA, Technoserve	1-3	Implementing research; facilitating access of producers to affordable finance, seed and feed; capacity building
Networks: Forum for Agricultural Research in Africa (FARA), Association for Strengthening Agricultural Research in East and Central Africa (ASARECA), Secretariat for the Pacific Community (SPC), International Network for Genetics in Aquaculture (INGA), Network of Aquaculture Centers in Asia-Pacific (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; policy making; 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 Framework and tools to identify target groups, clarify intervention objectives, and design and implement technologies to maximize productivity, profitability and development impact				
Output targets 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.
	Review paper on aquaculture and poverty. **Global**.	Policymakers, NARES, researchers	Better targeted research, better designed and focused development projects, sustained ecosystem services.	Increased food security, reductions in poverty.
	Policy brief on inland aquaculture for food security and adaptation to climate change, **Solomon Islands**.	Policymakers, NARES, researchers.	Increased adoption of inland aquaculture in the Pacific.	More resilient livelihoods in the Pacific Region.
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.
	Review paper on aquaculture extension methodologies. **Global**.	Extension agents, NGOs, researchers, NARES	Adoption of more effective and cost-effective extension methods	More sustained uptake of aquaculture
2012	Assessment of impacts of aquaculture on resilience of post-tsunami communities in **Aceh, Indonesia**.	Households, policymakers, NARES, donors, researchers	Aquaculture technologies adopted that increase resilience of coastal dwellers	Improved food security and income diversification for poor rural households
	Provide technical support and strategic guidance to rural development NGOs to identify high priority interventions for rural aquaculture in **Cambodia**.	International and domestic rural development NGOs, line agencies	Improved targeting of investments and capacity building efforts for rural aquaculture	Improved food security and income diversification for poor rural households

Output 2 Technologies established to develop and disseminate quality seed for key aquaculture species and conserve genetic resources in anticipation of future needs				
Output targets 2010	Quality seed distribution strategies for Bangladesh, **Egypt** and **Ghana**. Genetic improvement programs for aquatic species underway in Asia (**China, India, Malaysia, Sri Lanka, Vietnam**) and Africa (**Egypt, Ghana, Malawi**).	FAO, NARES, ARIs, policymakers, private sector, NGOs. FAO, NARES, ARIs, policymakers, private sector, NGOs.	Improved and ecologically responsible access to quality seed, increased profitability. Improved and ecologically responsible access to quality seed, increased profitability.	Sustained ecosystem services, increased fish production, improved and resilient livelihoods. Sustained ecosystem services, increased fish production, improved and resilient livelihoods.
2011	Online guidelines on technologies for the development and dissemination of quality seed for key aquaculture species and for the conservation of genetic resources in anticipation of future needs	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.
Output 3 Methodologies to support the development and dissemination of off-farm fertilizers and 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				
Output targets 2011	Technical guidance manual for selecting and sourcing profitable, ecologically sound feedstuffs, their and their on-farm use and on-farm management. Development of leaf-based feeds for fish farmers in **DR Congo** and other savannah fish-farming systems.	Policymakers, SMEs, farmers, NARES. Policymakers, SMEs, 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.
2012	Review paper on strategies to sustainably increase the productivity of aquaculture. **Global**.	Policymakers, SMEs, farmers, NARES.	Increased fish production and profitability	Improved food security and reduced poverty

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 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 and assimilate 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 the latter in particular may depend on inputs from the wild. Aquaculture is thus characterized by its dependence on ecological services.

Consuming ecological services entails environmental impacts that can both undermine sustainability and bring the sector into conflict with other stakeholders. Unless impacts are managed they 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 ecologically 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, utilize off-farm wastes, use scarce water resources efficiently and improve ecological 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 FAO, with partners, has recently developed and is beginning to promote an Ecosystem-Based Approach to aquaculture that seeks to comprehensively address these issues. The purpose of this project is to design innovations that support implementation of this approach, thereby fostering the adoption of aquaculture that benefits the poor and makes better use of ecological services without unacceptably compromising ecosystem structure and function and their productive and non-productive use. To achieve this, the project will focus on four areas. First, we will develop a framework and tools to determine the water productivity of different types of aquaculture. Second, we will develop and test integrated watershed-level assessment tools that facilitate better-informed policies and foster stakeholder-based adaptive management approaches for the sustainable development of 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 water productivity of different types of aquaculture.
2. To develop integrated watershed management approaches that inform policies and management practices for the sustainable uptake of aquaculture.
3. To identify and manage risks associated with developing and disseminating genetically improved strains of farmed aquatic animals.
4. To promote the adoption of best environmental management practices through finding ways to connect consumers to SME aquaculture producers.

Alignment with CGIAR System Priorities

Table 15. Project 5 allocation of resources to CGIAR system priorities (%)							
Project number 5	**Aquaculture and the environment**	**1D**	**4A**	**4B**	**4C**	**4D**	**5A**
Output 1	A framework and tools to assess aquaculture water productivity				80	20	
Output 2	Integrated watershed-level tools that facilitate better-informed policies and community-based adaptive management for the sustainable uptake of 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	10	40	40			10

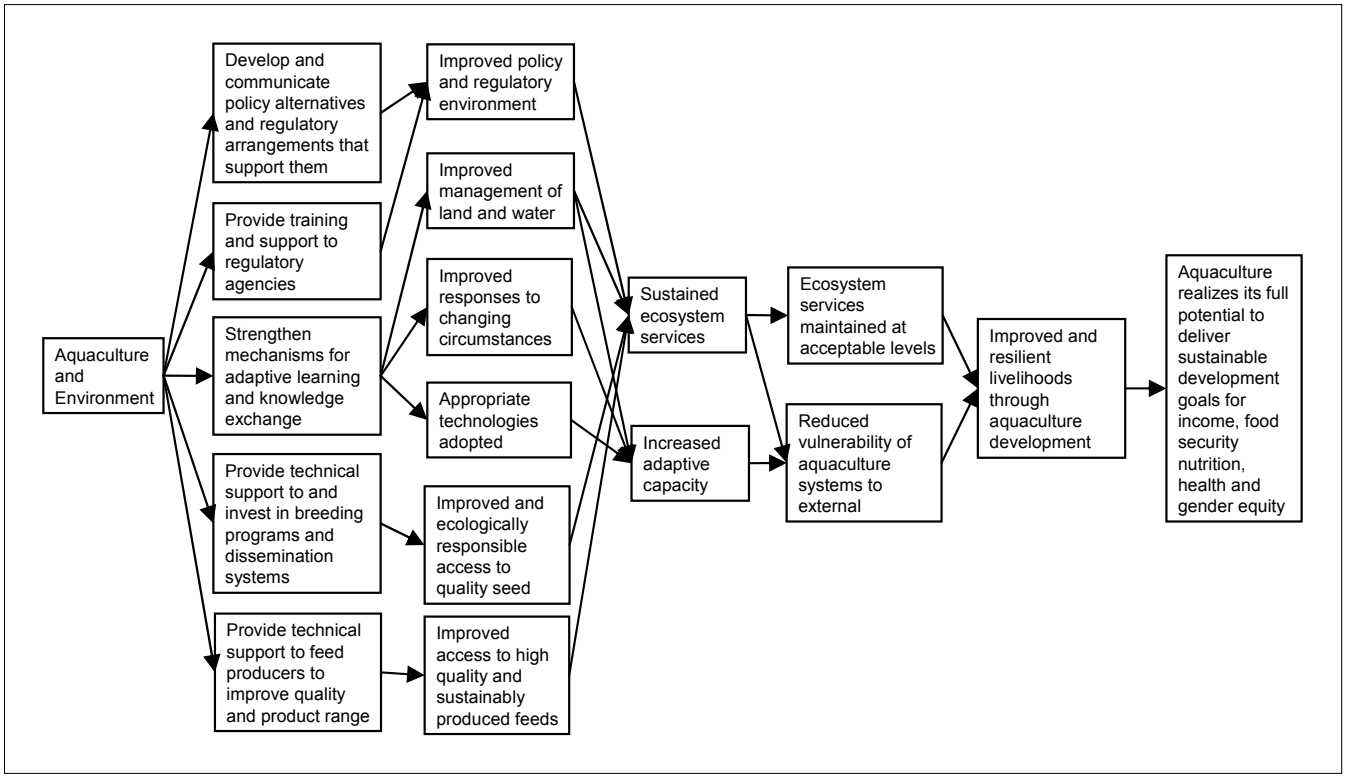
Impact Pathway

For aquaculture to realize its potential contribution to achieving the MDGs, ways must be found to maximize benefits to all who participate in the value chain without unacceptably compromising the provision of ecosystem services. An inter-sectoral approach is essential and, provided due attention is given to inter-basin and global transfers of ecosystem services, especially with regard to aquaculture feedstuffs, 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 sustain the resilience of aquatic ecosystems while bringing net and equitable improvements in the livelihoods of those who depend on the ecosystem services they provide. If the appropriate policy and regulatory environment is implemented, 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 can be sustained. Increased adaptive capacity will result from a sound and responsive policy environment coupled with good community-based 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. Adaptive management is the key to dealing with the uncertainties that typically arise. The impact pathway is summarized in Figure 12.

International Public Goods

This project will produce tools that promote ecosystem and integrated coastal zone and agro-ecosystem based approaches to aquaculture development managed at the scale of the watershed and coastal zone. A focus here will be on the development of tools to help manage water for aquaculture, especially in the context of multiple use water systems. 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 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.

Figure 12. Impact pathway for Project 5.



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 and implementing 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, Dartmouth College, Leiden, London (Imperial), Malawi, Minnesota, , 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: FARA, ASARECA, INGA, SARNISSA, Integrative Graduate Education Research Traineeship, NACA, SPC, Aquaculture Network for Africa	2,3,4	Development and dissemination of technical information; policy making; 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 A framework and tools to assess aquaculture water productivity				
Output targets 2010	Paper on 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.
Output 2 Integrated watershed-level tools that facilitate better-informed policies and community-based adaptive management for the sustainable uptake of aquaculture				
Output targets 2010	Policy brief on cage aquaculture. **Global**.	Policymakers, NARES, researchers.	Rational, precautionary approach to the development of lakes for cage aquaculture.	Sustainable and equitable development of lakes that reduces poverty and improves food security.
	Policy brief on aquaculture and adaptation to climate change. **Global**.	Policymakers, NARES, researchers.	Better approaches to adaptation of aquaculture systems to climate variability.	Resilient livelihoods for adaptation to climate change.
2011	Models to assess impacts of pond aquaculture on ecological and socioeconomic resilience at a landscape level in **sub-Saharan Africa** and **South Asia**.	NARES, policymakers, ARIs.	Sustained ecosystem services, increased fish production.	Increased incomes and employment from fish production.
2012	Models to assess impacts of cage aquaculture on ecological and socioeconomic resilience at a landscape level in **sub-Saharan Africa**.	NARES, policymakers, ARIs.	Sustained ecosystem services, increased fish production.	Increased incomes and employment from fish production.
Output 3 Tools to assess and manage the risks associated with developing and disseminating genetically improved strains of farmed aquatic animals				
Output targets 2010	Risk assessment and management guidelines for use of genetically improved strains. **Global**.	Policymakers, NARES, fish farmers.	Sustained tilapia diversity.	Ecosystem services maintained at acceptable levels.
2011	Analysis of tilapia genetic resources and their conservation requirements in the Volta Basin and elsewhere in **Africa**.	Policymakers, NARES, fish farmers.	Sustained tilapia diversity.	Ecosystem services maintained at acceptable levels.
	Framework to identify and conserve aquatic genetic resources. **Global**.	Policymakers, NARES, fish farmers.	Sustained tilapia diversity.	Ecosystem services maintained at acceptable levels.
	National and regional policy analyses associated with conservation of aquatic genetic resources in **West Africa**.	Policymakers, NARES, fish farmers.	Sustained tilapia diversity.	Ecosystem services maintained at acceptable levels.

Output 4 Mechanisms that connect consumers to small and medium-sized producers and promote the adoption of best environmental management practices				
Output targets 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	Analysis and review of sustainable and ethical trade of Asian aquaculture produce and consumer behavior.	Policymakers, producers.	Increased profitability and sustained ecosystem services.	Reduced vulnerability of aquaculture-dependent systems to aquaculture drivers, and ecosystem services maintained at acceptable level.
	Aquaculture sector development plans that meet changing consumer demands and behavior, while making effective sustainable use of available productive resources.	Policymakers, producers.	Increased profitability and sustained ecosystem services.	Reduced vulnerability of aquaculture-dependent systems to aquaculture drivers, and ecosystem services maintained at acceptable level.
	Analysis and review of environmental outcomes from use of market instruments to promote more environmentally sustainable aquaculture	Policy makers, NARES, private business, farmers	Better understanding of environmental benefits from use of market instruments to promote more environmentally sustainable aquaculture.	Sustained ecosystem services.
2012	Development of an ethical aquaculture consumer index. **Global**.	Policymakers, producers.	Increased profitability and sustained ecosystem services.	Reduced vulnerability of aquaculture-dependent systems to aquaculture drivers, and ecosystem services maintained at acceptable levels.

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

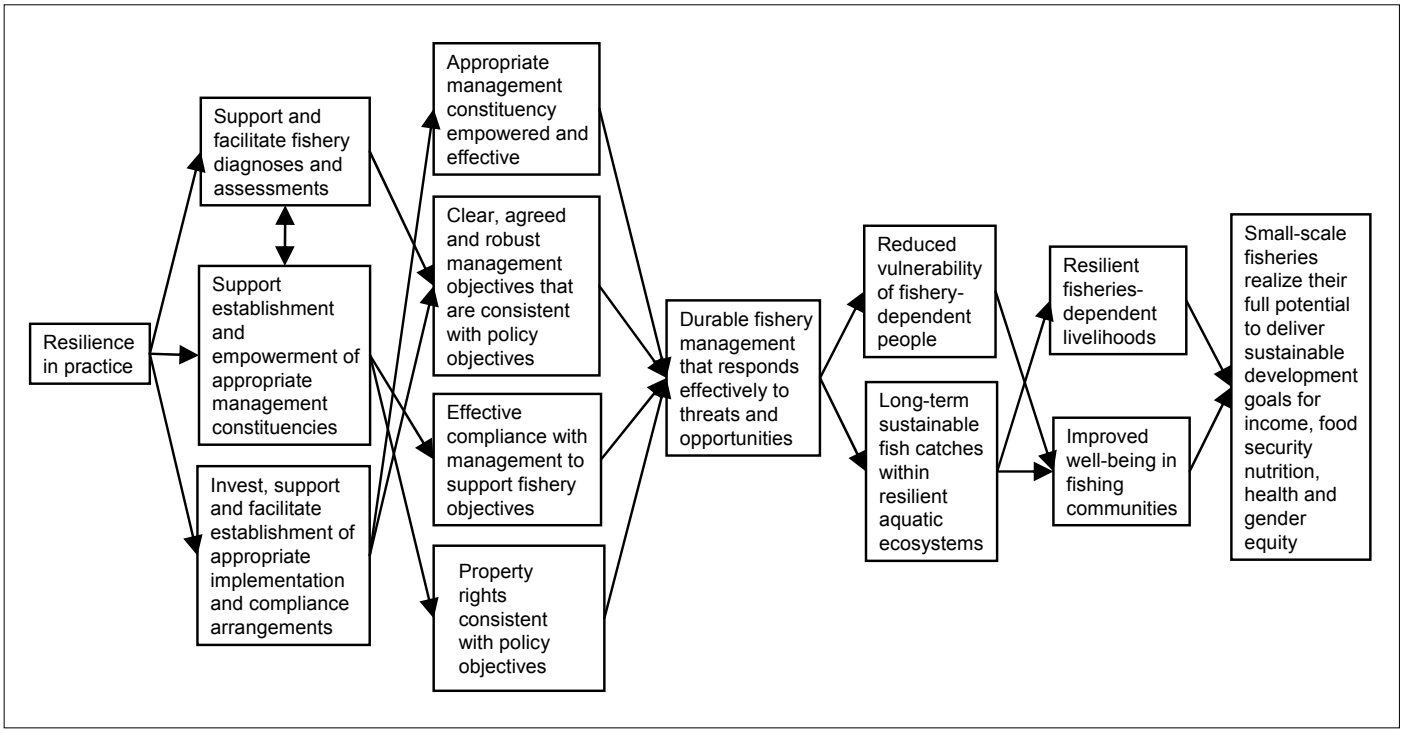
Table 18. Project 6 allocation of resources to CGIAR system priorities (%)

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 engage more effectively with multi-sectoral resource competition and decision making (see MTP Project 3), be responsive to external drivers of change (see MTP Project 1), and take advantage of market linkages to benefit livelihoods (see MTP Project 2). 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 management 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 Improved methods for integrated assessment and advice				
Output targets 2010	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 including fisheries improved and better reflecting local needs and priorities.
	Improved capacity for effective local management of Marine Protected Areas (MPAs) in the **Philippines**.	Fisheries researchers, managers and extension workers in government departments; research agencies; NGOs in developing countries.	New assessment and advisory tools used to improve MPA management. MPA networks are better integrated into "ridges to reefs" coastal management plans.	Reduced vulnerability and strengthened adaptive capacity in fishery-dependent communities.
	Guidelines for the analysis of fishery dependence and adaptive capacity of SSF (**global**)	Fisheries researchers, managers and extension workers in government departments; research agencies;	Improved understanding of historical drivers of change used to improve management and national policy.	Reduced vulnerability and strengthened adaptive capacity in fishery-dependent communities.
	Enhanced FishBase and ReefBase tools to support fisheries management through expanded SSF portal and development of INCOFISH, a database for marine invertebrate species (**global**).	NGOs in developing countries. Fisheries researchers, managers and extension workers in government departments; research agencies;	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.
	A comprehensive package of data updates for ReefBase Pacific DVD and website developed.	Reef resource managers, scientists and students.	Reef resource managers, scientists and students will have improved access to information to support decision making, science and education in the region.	Improved nearshore fisheries in Pacific countries and reduced vulnerability of people and ecosystems.
	Guidelines to improve the assessment of potential impacts of dams on fisheries disseminated in **Cambodia** and the **Mekong** region	National line agencies, Mekong River Commission, international development agencies, NGOs National line agencies, Mekong River Commission, international development agencies	Improved awareness of impacts of dams on fisheries and of appropriate assessment tools	Reduced vulnerability of fishing communities from dam development
	Enhanced the inventory of MPA/MPA networks with coral reefs and related ecosystems together with associated information, in East Asia and Micronesia region.	NGOs, MPA manager, Reef resource managers, scientists and researcher.	MPA manager, Reef resource managers, scientists and researcher use ReefBase to effectively collect, manage, store, and communicate the information on MPAs in the region	Improved the inventory of MPA/ MPA networks in East Asian and Micronesia region.

2011	Guidance manuals for MPA managers published (**global**).	Fisheries researchers, managers and extension workers in government departments; research agencies; NGOs in developing countries.	New approaches to fisheries/MPA management incorporated in policy and practice.	Improved fisheries/ MPA management and governance leading to more resilient fisheries and coastal ecosystems.
	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
	Guidance manuals for fishery assessment and management published (**global**).	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.
2012	A comprehensive package of data updates for ReefBase Pacific DVD and website developed (**global**)	Reef resource managers, scientists and students.	Reef resource managers, scientists and students will have improved access to information to support decision making, science and education in the region.	Improved nearshore fisheries in Pacific countries and reduced vulnerability of people and ecosystems
	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 drivers of change used to improve management and national policy.	Reduced vulnerability and strengthened adaptive capacity in fishery-dependent communities.
Output 2 Management concepts and approaches that mitigate risk tested in a range of ecological and social settings				
Output targets 2010	**Global** assessment of rights-based management in SSF.	Resource managers, researchers, policymakers.	Greater understanding of inequities in distribution of benefits among participants.	Greater equity in distribution of benefits from enhanced fisheries.
	Efficacy of alternative local approaches to fisheries and wetlands management assessed and compared in the **Mekong** region.	Community fishery organizations, local governments and line agencies.	Successful approaches recognized and supported by national agencies.	Improved sustainability and productivity for the benefit of poor households.
	Assessments of role of closed areas (e.g., sanctuaries), and impediments to their functioning in **Malawi** and the **Mekong** river basin.	Community fishery organizations, local governments and line agencies.	Successful approaches recognized and supported by national agencies.	Improved sustainability and productivity for the benefit of poor households.
	Guidelines for adaptive management of grouper fisheries (esp. spawning aggregations)	Community fishery organizations, local governments and line agencies.	Successful approaches recognized and supported by local, national and regional/international agencies.	Improved capacity to design appropriate management interventions.

2011	Lessons learned from case studies in SSF management for resilience in five fisheries in **sub-Saharan Africa** published.	International science community, government agencies, NGOs.	New definitions of sustainability and better management methods used in fisheries, and lessons scaled out to other regions.	Reduced vulnerability and improved resilience in fish-dependent communities.
	Meta-analysis completed of the effectiveness of marine protected areas as a fisheries management tool (**global**).	Regional bodies, national agencies, researchers.	Better understanding of the social and ecological contexts in which marine protected areas are successful.	Improved fisheries management and livelihoods for coastal communities.
	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.	Community fishery organizations, local governments and line agencies.	Successful approaches recognized and supported by national agencies.	Improved sustainability and productivity for the benefit of poor households.
2012	**Global** lessons in the management of SSF for resilience published.	International science community, government agencies, NGOs.	Lessons incorporated into improved management and governance.	Reduced vulnerability and improved resilience in fish-dependent communities
	Implementation of resilience-based management of Malawi lake catchments completed and early lessons published	International research community, National agencies and NGOs.	Lessons incorporated into improved management and governance.	Reduced vulnerability and improved resilience in fish-dependent communities
	Prognosis of likely future of **global** river fisheries published	International research community, National agencies and NGOs.	Lessons incorporated into improved management and governance	Reduced vulnerability and improved resilience in fish-dependent communities
Output 3: Livelihood diversification options that reduce dependence on small-scale fisheries				
Output targets 2010	An analysis of the distribution of benefits among participants in enhanced floodplain fisheries in **Bangladesh**, **Mekong** and **China**.	Resource managers, researchers and policymakers.	Greater understanding of inequities in distribution of benefits among participants.	Greater equity in distribution of benefits from enhanced fisheries.
	Critical analysis of winners and losers in the changing landscape of aquatic resource-based livelihoods in the **Mekong**.	Governments, national agencies, basin organizations, NARES and others in target basins.	Improved policies and institutional arrangements for fostering integrated farming systems in two basins.	Policy, institutions and governance enhanced; equitable distribution of benefits from ecosystems; informed decision-making process with participation of all stakeholders.

	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**.	Governments, national agencies, basin organizations, NARES and others in target basins.	Improved policies and institutional arrangements for fostering integrated farming systems in two basins.	Policy, institutions and governance enhanced; equitable distribution of benefits from ecosystems; informed decision-making process with participation of all stakeholders.
2011	Critical analysis of the capacity of aquaculture to substitute for declines in capture fishery production and livelihoods in the **Mekong** and **sub-Saharan Africa**.	National line agencies; 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 including fisheries improved and better reflecting local needs and priorities.
2012	Critical review of the efficacy of livelihood diversification programmes in the **Pacific** published	National line agencies; 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 including fisheries improved and better reflecting local needs and priorities.

G. 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 2010-2012 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 suite of smaller projects. The guidelines were developed in 2009 and will be institutionalized in 2010. 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 2010, 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, as does our global work on climate change vulnerability, adaptation and mitigation.

H. Finance Plan

1. 2008 Results and 2009 Development

The 2008 net expenditure level was US$20.847 million. About 85% of 2008 resources were utilized for programmatic activities. We expect to this ratio may increase slightly in 2009. The WorldFish Center (ICLARM) ended the year with a deficit of US$ 1.52 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 2008 grant income from donors amounted to US$ 18.650 million in addition to US$ 0.675 million of earned income. Grant income for 2009 is projected at US$20.6 million. The increase in 2009 Center income is due to more restricted funding. Recovery of indirect costs from funded projects amounted to US$ 2.2 million.

The 2009 expenditures are estimated at US$ 21 million compared to actual spending of US$ 20.847 million for 2008. The increase in expenditure small in relation to the increase with the restricted project funding since this budget is intended to return the Center to a zero deficit compared to previous years.

Table 1: Comparison of 2008 performance and 2009 current estimate

	2008 Actual (US$ million)	2009 Estimate (US$ million)
Sources of Funds		
Donor Funding	18.650	20.600
Earned Income	.675	0.400
Total	**19.325**	**21.000**
Application of Funds		
Programmatic	17.760	19.610
Management and General Expenses	3.947	3.347
Depreciation	0.250	0.250
Less: Overhead Recoveries	(1.110)	(2.207)
Net Expenditures	**20.847**	**21.000**
Unexpended Balance *	**(1.522)**	**-**

* Negative balances were planned and approved by the Center Board in 2008 as part of its strategy to reduce its reserves by investing in key areas for future growth.

The 2008 spending and 2009 current planned resource allocation by CGIAR activity is summarized below:

Table 2: Allocation of resources by priorities

	2009	
	Estimate	**%**
1D Conservation of aquatic animal genetic resources	0.840	4
2B Tolerance to selected abiotic stresses	0.210	1
2D Genetic enhancement of selected species to increase income generation by the poor	0.420	2
3C Enhancing income through increased productivity of fisheries and aquaculture	8.610	41
4A Integrated land, water and forest management and landscape level	2.520	12
4B Sustaining and managing aquatic ecosystems for food and livelihoods	3.360	16
4C Improving water productivity	1.680	8
4D Sustainable agro-ecological intensification in low and high-potential areas	0.210	1
5A Science and technology policies and institutions	0.630	3
5B Making international and domestic markets work for the poor	0.630	3
5C Rural institutions and their governance	0.210	1
5D Improving research and development options to reduce rural poverty and vulnerability	1.680	8
Total	**21.000**	**100**

Table 3: Actual and planned resources allocation by CGIAR activity for 2008 and 2009			
	US$ (million)		
	2008 Actual	2009	
		Estimate	%
Increasing Productivity	4.323	5.250	25
Protecting the Environment	2.421	2.940	14
Saving Biodiversity	0.865	1.050	5
Improving Policies	5.534	6.720	32
Strengthening NARS	4.150	5.040	24
Total	**20.847**	**21.000**	**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 US$ 9.60 million in 1996 to US$ 21.000. million in 2009 (expected), an increase during the period of over 119%.

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 2008 was US$ 0.708 million, appropriated by the Board of Trustee for property and equipment renewal.

1.3 Working Capital (Days)

The working capital as of 31 December 2008 can support operations for 114 days compared to CGIAR benchmark of 90 days of operations. .

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.

Table 4: Liquidity ratio analysis		
	2008	2009
Current Ratio (times)	2.49	1.916
Cash to current assets (%)	75	58
Cash to Current Liabilities (%)	186	110

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 2008 was 114 days.

2. 2009 - 2011 Plans

2.1 Funding Requirements and Financing Plans

The funding level for the first year of the MTP 2010 – 2012 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 2008 and the Center expects more new projects to materialize in the year.

The expected level of donor funding for 2009 is projected at US$ 20.6 million and indirect cost recoveries from funded projects of US$ 2.2 million. The Center's projected operating levels (net of indirect cost recoveries) and allocations to MTP Projects for 2009 to 2012 are:

Table 5a: The WorldFish Center Operating Levels

	US$ (million)			
	2009	**2010**	**2011**	**2012**
Projected Donor Funding	20.60	20.70	22.70	24.70
Center income	0.40	0.30	0.30	0.30
Reserve draw down	0.00	0.00	0.00	0.00
Total	**21.00**	**21.00**	**23.00**	**25.00**

Table 5b: The WorldFish Center Operating Levels

	MTP Project Expenditure (in USD millions)						
Year	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
2009	3.52	2.20	2.23	5.31	3.19	4.55	**21.00**
2010	3.52	2.20	2.23	5.31	3.19	4.55	**21.00**
2011	3.86	2.41	2.44	5.82	3.49	4.98	**23.00**
2012	4.28	2.67	2.71	6.45	3.87	5.53	**25.50**

Earned income: Earned income is expected to be at the level of approximately US$0.40 million for 2009 and US$0.30 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 US$ 2.2 million for 2009. Indirect cost recovery is still well below the full costs of targeted research projects. In line with the best financial practice we will be targeting to increase our cost recovery to a full cost basis over the next three years.

2.2 Operating Budget 2010-2012

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 85% 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 40% 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 52% of resources are allocated to Asia, 43% to Sub-Saharan Africa, 1% to Latin America and the Caribbean and 4% to West Asia and North Africa (Financial Table 6).

Personnel input: Center-hired Internationally Recruited staff (IRS) level is estimated at around 55 positions including post-doctoral fellows.

Nationally Recruited Staff (NRS) overall level is expected to reach around 280 for all Center sites in 2010.

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 2010-2012, US$ (million)

	2010	2011	2012
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 2% - 3% 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 remain stable at 3.5-3.6 against the US Dollar. The Ringgit has appreciated against the US Dollar and its exchange rate to the dollar was 3.56 on 0 April 2009.

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. Overall the declining dollar has positively impacted our financial position.

2.6 Financing Plan 2010

The confirmed and high probability funding for financing the Center operations in 2010 amounts to US$ 20.7 million.

The projected core funding and project funding amounts to US$ 6.68 million and US$ 14.02 million respectively.

2.7 Summary of Financing Plan

The resource requirements over the plan period are based on the 2009 Budget level and the best estimate of resources for 2010 which is the basis for this plan period. The spending plan is increased by an annual growth of 9.5% and 8.7% for 2011 and 2012 respectively.

Table 7 provides details of the funding and donor support for 2010 agenda.

Table 7: The WorldFish Center Financing Plan for 2010 US$ (million)		
	US$ (M)	**%**
Core support	6.68	27.5
Targeted/restricted Funding	14.02	71.0
Subtotal	20.70	98.5
Center earned income	0.30	1.5
Total revenue	21.00	100
Draw down on reserve	(0.00)	-
Expenditure in 2010	**21.00**	**100**

I. Financial Tables for 2010–2012

Table 1: Allocation of Project Costs by Priority Area and Priorities, 2010 in $millions													
	Priority Area 1	**Priority Area 2**		**Priority Area 3**	**Priority Area 4**				**Priority Area 5**				
Project	**1D**	**2B**	**2D**	**3C**	**4A**	**4B**	**4C**	**4D**	**5A**	**5B**	**5C**	**5D**	**Total**
MTP 1: Global Drivers of Change		0.634		0.423		0.563	0.493		0.141	0.423	0.493	0.352	3.522
MTP 2: Markets and Trade				1.758						0.439			2.197
MTP 3: Multi-Level and Multi-sectoral Governance				0.744	0.298	0.521	0.223					0.446	2.232
MTP 4: Sustainable Aquaculture Technologies	0.177		0.708	3.542		0.177			0.708				5.312
MTP 5: Aquaculture and the Environment	0.957				0.637	0.637	0.637	0.159	0.159				3.186
MTP 6: Resilience in Practice for Small-Scale Fisheries				1.821	0.910	0.910	0.455					0.455	4.551
Total	**1.134**	**0.634**	**0.708**	**8.288**	**1.845**	**2.808**	**1.808**	**0.159**	**1.008**	**0.862**	**0.493**	**1.253**	**21.000**

Table 2: Allocation of Project Costs to CGIAR Priorities, 2009-2012 in $millions				
Projects / **Priorities**	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
MTP 1: Global Drivers of Change				
2B	0.617	0.634	0.695	0.770
3C	0.411	0.423	0.463	0.513
4B	0.548	0.563	0.617	0.684
4C	0.480	0.493	0.540	0.599
5A	0.137	0.141	0.154	0.171
5B	0.411	0.423	0.463	0.513
5C	0.479	0.493	0.540	0.599
5D	0.343	0.352	0.386	0.428
Total Project	**3.426**	**3.522**	**3.858**	**4.277**
MTP 2: Markets and Trade				
3C	1.474	1.758	1.925	2.134
5B	0.368	0.439	0.481	0.533
Total Project	**1.842**	**2.197**	**2.406**	**2.667**
MTP 3: Multi-Level and Multi-sectoral Governance				
3C	0.808	0.744	0.815	0.904
4A	0.323	0.298	0.326	0.361
4B	0.566	0.521	0.571	0.633
4C	0.243	0.223	0.244	0.271
5D	0.485	0.446	0.489	0.542
Total Project	**2.425**	**2.232**	**2.445**	**2.711**
MTP 4: Sustainable Aquaculture Technologies				
1D	0.179	0.177	0.194	0.215
2D	0.718	0.708	0.776	0.860
3C	3.590	3.542	3.877	4.300
4B	0.179	0.177	0.194	0.215
5A	0.718	0.708	0.776	0.860
Total Project	**5.384**	**5.312**	**5.817**	**6.450**
MTP 5: Aquaculture and the Environment				
1D	0.828	0.957	1.046	1.162
4A	0.552	0.637	0.698	0.774
4B	0.552	0.637	0.698	0.774
4C	0.552	0.637	0.698	0.774
4D	0.138	0.159	0.175	0.193
5A	0.138	0.159	0.175	0.193
Total Project	**2.760**	**3.186**	**3.490**	**3.870**
MTP 6: Resilience in Practice for Small-Scale Fisheries				
3C	2.065	1.821	1.994	2.209
4A	1.033	0.910	0.997	1.105
4B	1.033	0.910	0.997	1.105
4C	0.516	0.455	0.498	0.553
5D	0.516	0.455	0.498	0.553
Total Project	**5.163**	**4.551**	**4.984**	**5.525**
Total	**21.000**	**21.000**	**23.000**	**25.500**

Table 3: Summary of Project Costs, 2009-2012 in $millions				
Project	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
MTP 1: Global Drivers of Change	3.426	3.522	3.858	4.277
MTP 2: Markets and Trade	1.842	2.197	2.406	2.667
MTP 3: Multi-Level and Multi-sectoral Governance	2.425	2.232	2.445	2.711
MTP 4: Sustainable Aquaculture Technologies	5.384	5.312	5.817	6.450
MTP 5: Aquaculture and the Environment	2.760	3.186	3.490	3.870
MTP 6: Resilience in Practice for Small-Scale Fisheries	5.163	4.551	4.984	5.525
Total	**21.000**	**21.000**	**23.000**	**25.500**

Table 4: Summary of Priority Costs, 2009-2012 in $millions				
Priorities	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
1D	1.007	1.134	1.240	1.377
2B	0.617	0.634	0.695	0.770
2D	0.718	0.708	0.776	0.860
3C	8.348	8.288	9.074	10.060
4A	1.908	1.845	2.021	2.240
4B	2.878	2.808	3.077	3.411
4C	1.791	1.808	1.980	2.197
4D	0.138	0.159	0.175	0.193
5A	0.993	1.008	1.105	1.224
5B	0.779	0.862	0.944	1.046
5C	0.479	0.493	0.540	0.599
5D	1.344	1.253	1.373	1.523
Total	**21.000**	**21.000**	**23.000**	**25.500**

Table 5: Investments by Undertaking, Activity and Sector, 2008-2012 in $millions					
	Actual 2008	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
Increasing Productivity	6.448	6.702	6.662	7.296	8.089
Germplasm Enhancement & Breeding	2.581	2.706	2.762	3.025	3.354
Production Systems Development & Management	3.867	3.996	3.900	4.271	4.735
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	3.867	3.996	3.900	4.271	4.735
Protecting the Environment	2.578	2.565	2.466	2.701	2.995
Saving Biodiversity	1.158	1.136	1.169	1.280	1.420
Improving Policies	6.854	6.731	6.875	7.530	8.348
Strengthening NARS	3.809	3.866	3.828	4.193	4.648
Training and Professional Development	1.247	1.263	1.271	1.393	1.544
Documentation, Publications, Info. Dissemination	1.762	1.780	1.727	1.891	2.096
Organization & Management Couselling	0.000	0.000	0.000	0.000	0.000
Networks	0.800	0.823	0.830	0.909	1.008
Total	**20.847**	**21.000**	**21.000**	**23.000**	**25.500**

Table 6: Project Investments by Developing Region, 2008-2012 in $millions						
Project	**Region**	**Actual 2008**	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
MTP 1: Global Drivers of Change	Asia	1.634	1.868	1.920	2.104	2.332
	CWANA	0.237	0.100	0.103	0.112	0.125
	LAC	0.012	0.034	0.035	0.039	0.043
	SSA	1.937	1.424	1.464	1.603	1.777
Total Project		**3.820**	**3.426**	**3.522**	**3.858**	**4.277**
MTP 2: Markets and Trade	Asia	0.788	1.004	1.198	1.312	1.454
	CWANA	0.148	0.054	0.064	0.070	0.078
	LAC	0.007	0.019	0.022	0.024	0.027
	SSA	0.765	0.765	0.913	1.000	1.108
Total Project		**1.708**	**1.842**	**2.197**	**2.406**	**2.667**
MTP 3: Multi-Level and Multi-sectoral Governance	Asia	0.965	1.322	1.217	1.333	1.478
	CWANA	0.150	0.071	0.065	0.071	0.079
	LAC	0.008	0.024	0.022	0.025	0.027
	SSA	1.267	1.008	0.928	1.016	1.127
Total Project		**2.390**	**2.425**	**2.232**	**2.445**	**2.711**
MTP 4: Sustainable Aquaculture Technologies	Asia	3.377	2.936	2.897	3.172	3.517
	CWANA	0.360	0.157	0.155	0.169	0.188
	LAC	0.019	0.054	0.053	0.058	0.065
	SSA	1.364	2.237	2.207	2.418	2.680
Total Project		**5.120**	**5.384**	**5.312**	**5.817**	**6.450**
MTP 5: Aquaculture and the Environment	Asia	1.755	1.505	1.737	1.903	2.110
	CWANA	0.216	0.080	0.093	0.102	0.113
	LAC	0.011	0.028	0.032	0.035	0.039
	SSA	0.681	1.147	1.324	1.450	1.608
Total Project		**2.663**	**2.760**	**3.186**	**3.490**	**3.870**
MTP 6: Resilience in Practice for Small-Scale Fisheries	Asia	3.319	2.815	2.481	2.718	3.013
	CWANA	0.325	0.150	0.133	0.145	0.161
	LAC	0.022	0.052	0.046	0.050	0.055
	SSA	1.480	2.146	1.891	2.071	2.296
Total Project		**5.146**	**5.163**	**4.551**	**4.984**	**5.525**
Total		**20.847**	**21.000**	**21.000**	**23.000**	**25.500**

Table 7: Summary of Investments by Developing Region, 2008-2012 in $millions					
Region	**Actual 2008**	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
SSA	7.494	8.727	8.727	9.558	10.596
Asia	11.838	11.450	11.450	12.542	13.904
LAC	0.079	0.211	0.210	0.231	0.256
CWANA	1.436	0.612	0.613	0.669	0.744
Total	**20.847**	**21.000**	**21.000**	**23.000**	**25.500**

Table 8: Expenditure by Object, 2008-2012 in $millions					
Object of Expenditure	**Actual 2008**	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
Personnel	9.344	9.670	9.670	10.591	11.742
Supplies and services	4.123	6.613	6.613	7.242	8.030
Collaboration/ Partnerships	5.356	2.196	2.196	2.406	2.667
Operational Travel	1.774	2.185	2.185	2.393	2.653
Depreciation	0.250	0.336	0.336	0.368	0.408
Total	**20.847**	**21.000**	**21.000**	**23.000**	**25.500**

Table 9: Member and Non-Member Unrestricted Grants, 2008-2010 in $millions NC = National Currency							
Member	**Type NC**	**Actual 2008 (US$)**	**Actual 2008 (NC)**	**Estimated 2009 (US$)**	**Estimated 2009 (NC)**	**Proposal 2010 (US$)**	**Proposal 2010 (NC)**
Unrestricted Grants							
Member							
Australia	AUD	0.415	0.500	0.480	0.500	0.458	0.500
Canada	CAD	0.569	0.663	0.473	0.596	0.532	0.596
China	USD	0.000	0.000	0.000	0.000	0.030	0.030
Egypt	USD	0.500	0.500	0.250	0.250	0.250	0.250
FAO	USD	0.001	0.001	0.000	0.000	0.000	0.000
France	EUR	0.008	0.006	0.000	0.000	0.000	0.000
Germany	EUR	0.318	0.227	0.225	0.170	0.317	0.227
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	0.190	16.926	0.000	0.000	0.000	0.000
New Zealand	NZD	0.392	0.500	0.284	0.500	0.306	0.500
Norway	NOK	1.209	6.500	0.957	6.500	1.026	6.500
Philippines	PHP	0.027	1.171	0.024	1.171	0.024	1.171
South Africa	USD	0.030	0.030	0.000	0.000	0.000	0.000
Sweden	SEK	0.352	2.400	0.352	2.400	0.323	2.400
Switzerland	CHF	0.314	0.320	0.281	0.320	0.295	0.320
United Kingdom	GBP	0.917	0.460	0.711	0.483	0.763	0.480
United States	USD	0.750	0.750	1.202	1.202	1.150	1.150
World Bank	USD	1.210	1.210	1.200	1.200	1.200	1.200
Subtotal		**7.370**		**6.477**		**6.712**	
Non-member							
CIAT	USD	0.000	0.000	0.000	0.000	0.000	0.000
Others	USD	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal		**0.000**		**0.000**		**0.000**	
Total Unrestricted		**7.370**		**6.477**		**6.712**	

Table 9a: Member and Non-Member Unrestricted and Restricted Grants, 2008-2010 in $millions			
Member / Non-Member	**Actual 2008**	**Estimated 2009**	**Proposal 2010**
Unrestricted Grants			
Member			
Australia	0.415	0.480	0.458
Canada	0.569	0.473	0.532
China	0.000	0.000	0.030
Egypt	0.500	0.250	0.250
FAO	0.001	0.000	0.000
France	0.008	0.000	0.000
Germany	0.318	0.225	0.317
India	0.138	0.038	0.038
Israel	0.030	0.000	0.000
Japan	0.190	0.000	0.000
New Zealand	0.392	0.284	0.306
Norway	1.209	0.957	1.026
Philippines	0.027	0.024	0.024
South Africa	0.030	0.000	0.000
Sweden	0.352	0.352	0.323
Switzerland	0.314	0.281	0.295
United Kingdom	0.917	0.711	0.763
United States	0.750	1.202	1.150
World Bank	1.210	1.200	1.200
Subtotal	**7.370**	**6.477**	**6.712**
Non-member			
CIAT	0.000	0.000	0.000
Others	0.000	0.000	0.000
Subtotal	**0.000**	**0.000**	**0.000**
Total Unrestricted	**7.370**	**6.477**	**6.712**
Restricted Grants			
Member			
ADB	0.000	0.000	0.151
AFDB	0.000	0.037	1.051
Australia	0.378	0.825	1.035
Bangladesh	0.088	0.119	0.000
Belgium	0.000	0.000	0.822
Canada	0.008	0.060	0.075
CGIAR	0.040	0.012	0.000
Denmark	0.055	0.129	0.041
Egypt	0.000	0.022	0.262
European Commission	1.441	1.472	1.086
FAO	0.047	0.256	0.000
Finland	0.033	0.099	0.190

France	0.000	0.109	0.070
Germany	0.401	0.488	0.947
IDRC	0.000	0.019	0.120
IFAD	0.000	0.000	0.112
India	0.000	0.090	0.099
Ireland	0.000	0.000	0.046
Israel	0.000	0.027	0.031
Japan	0.000	0.147	0.106
Malaysia	0.007	0.123	0.059
New Zealand	0.434	0.201	0.112
Norway	0.048	0.697	0.420
OPEC Fund	0.060	0.047	0.000
Philippines	0.006	0.252	0.333
South Africa	0.000	0.003	0.041
Spain	0.000	0.000	0.180
Sweden	2.370	1.671	0.843
UNEP	0.802	0.213	0.059
United Kingdom	0.024	0.236	0.421
United States	2.665	3.348	1.665
World Bank	0.062	0.041	0.322
Subtotal	**8.969**	**10.743**	**10.699**
Non-member			
African Wildlife Foundation	0.054	0.062	0.000
Agence de Development Economic de la Nouvelle-Caledonia	0.077	0.000	0.000
Agencia Espanola de Cooperacion Internacional	0.000	0.129	0.328
ASARECA	0.000	0.034	0.091
ASE (ASEAN)	0.000	0.007	0.053
British Gas	0.016	0.296	0.077
Brunei Department of Fisheries	0.000	0.083	0.000
Collective Action and Property Rights (CAPRi) Secretariat	0.000	0.044	0.171
Congo Basin Forest Fund	0.000	0.139	0.891
Conservation International Foundation	0.125	0.000	0.000
Fishbase Information and Research Group (FIN)	0.214	0.280	0.047
Force of Nature Aid Foundation	0.092	0.118	0.000
Industrial Modernization Center	0.000	0.051	0.294
IUCN	0.091	0.000	0.000
Japan Wildlife Research Center	0.000	0.015	0.011
Mekong River Commision	0.033	0.142	0.035
Mitsui Bussan Environment Fund	0.000	0.052	0.065
Natural Environmental Research Council (NER)	0.103	0.022	0.091

Others	0.040	0.153	0.374
Packard Foundation	0.037	0.043	0.012
Science and Technology Development Fund	0.000	0.053	0.364
Sri Lanka	0.018	0.011	0.011
The Global Fund to Fight AIDS, Tuberculosis and Malaria	0.000	0.018	0.180
Water & Food/CP	1.302	1.551	0.103
World Resources Institute (WRI)	0.000	0.028	0.000
World Vision	0.000	0.000	0.091
World Wildlife Fund	0.109	0.049	0.000
Subtotal	**2.311**	**3.380**	**3.289**
Total Restricted	**11.280**	**14.123**	**13.988**
Total Grants	**18.650**	**20.600**	**20.700**

Summary and Statement of Activities	**Actual 2008**	**Estimated 2009**	**Proposal 2010**
Total Grants	**18.650**	**20.600**	**20.700**
Center Income	**0.675**	**0.400**	**0.300**
Revenue	**19.325**	**21.000**	**21.000**
Total Investment	**20.847**	**21.000**	**21.000**
Surplus (Deficit)	**-1.522**	**0.000**	**0.000**

Table 10: Allocation of Member, Non-Member Grants and Other Sources to Projects, 2008-2010 in $millions					
Project	**Member**		**Actual 2008**	**Estimated 2009**	**Proposal 2010**
MTP 1: Global Drivers of Change	**Member**	ADB	0.000	0.000	0.025
		AFDB	0.000	0.000	0.176
		Australia	0.021	0.022	0.174
		Bangladesh	0.018	0.024	0.000
		Belgium	0.000	0.000	0.138
		Canada	0.001	0.010	0.013
		CGIAR	0.007	0.002	0.000
		Denmark	0.009	0.013	0.007
		Egypt	0.000	0.004	0.044
		European Commission	0.189	0.075	0.182
		FAO	0.008	0.057	0.000
		Finland	0.000	0.008	0.032
		France	0.000	0.000	0.012
		Germany	0.038	0.058	0.159
		IDRC	0.000	0.003	0.020
		IFAD	0.000	0.000	0.019
		India	0.000	0.000	0.017
		Ireland	0.000	0.000	0.008
		Israel	0.000	0.000	0.005
		Japan	0.000	0.000	0.018
		Malaysia	0.001	0.000	0.010
		New Zealand	0.011	0.005	0.019
		Norway	0.000	0.268	0.070
		OPEC Fund	0.010	0.000	0.000
		Philippines	0.000	0.005	0.056
		South Africa	0.000	0.000	0.007
		Spain	0.000	0.000	0.030
		Sweden	1.224	0.880	0.141
		UNEP	0.000	0.000	0.010
		United Kingdom	0.000	0.014	0.071
		United States	0.503	0.628	0.279
		World Bank	0.010	0.000	0.054
	Non Member	African Wildlife Foundation	0.005	0.006	0.000
		Agence de Development Economic de la Nouvelle-Caledonia	0.013	0.000	0.000
		Agencia Espanola de Cooperacion Internacional	0.000	0.013	0.055
		ASARECA	0.000	0.006	0.015
		ASE (ASEAN)	0.000	0.001	0.009
		British Gas	0.000	0.041	0.013
		Brunei Department of Fisheries	0.000	0.000	0.000
		Collective Action and Property Rights (CAPRi) Secretariat	0.000	0.005	0.029
		Congo Basin Forest Fund	0.000	0.023	0.150
		Conservation International Foundation	0.021	0.000	0.000

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
		Fishbase Information and Research Group (FIN)	0.017	0.004	0.008
		Force of Nature Aid Foundation	0.000	0.000	0.000
		Industrial Modernization Center	0.000	0.009	0.049
		IUCN	0.015	0.000	0.000
		Japan Wildlife Research Center	0.000	0.002	0.002
		Mekong River Commision	0.010	0.030	0.006
		Mitsui Bussan Environment Fund	0.000	0.009	0.011
		Natural Environmental Research Council (NER)	0.017	0.004	0.015
		Others	0.006	0.010	0.063
		Packard Foundation	0.000	0.000	0.002
		Science and Technology Development Fund	0.000	0.000	0.061
		Sri Lanka	0.000	0.000	0.002
		The Global Fund to Fight AIDS, Tuberculosis and Malaria	0.000	0.003	0.030
		Water & Food/CP	0.049	0.021	0.017
		World Resources Institute (WRI)	0.000	0.005	0.000
		World Vision	0.000	0.000	0.015
		World Wildlife Fund	0.012	0.005	0.000
	Unrestricted + Other sources		1.605	1.153	1.174
Project Total			**3.820**	**3.426**	**3.522**
MTP 2: Markets and Trade	**Member**	ADB	0.000	0.000	0.016
		AFDB	0.000	0.007	0.110
		Australia	0.039	0.176	0.108
		Bangladesh	0.017	0.023	0.000
		Belgium	0.000	0.000	0.086
		Canada	0.001	0.006	0.008
		CGIAR	0.004	0.001	0.000
		Denmark	0.006	0.000	0.004
		Egypt	0.000	0.002	0.027
		European Commission	0.133	0.141	0.114
		FAO	0.005	0.023	0.000
		Finland	0.007	0.015	0.020
		France	0.000	0.000	0.007
		Germany	0.043	0.050	0.099
		IDRC	0.000	0.002	0.013
		IFAD	0.000	0.000	0.012
		India	0.000	0.000	0.010
		Ireland	0.000	0.000	0.005
		Israel	0.000	0.000	0.003
		Japan	0.000	0.000	0.011
		Malaysia	0.001	0.000	0.006
		New Zealand	0.032	0.016	0.012
		Norway	0.005	0.125	0.044
		OPEC Fund	0.006	0.006	0.000

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
		Philippines	0.000	0.003	0.035
		South Africa	0.000	0.001	0.004
		Spain	0.000	0.000	0.019
		Sweden	0.204	0.141	0.088
		UNEP	0.000	0.000	0.006
		United Kingdom	0.010	0.068	0.044
		United States	0.032	0.152	0.174
		World Bank	0.007	0.000	0.034
	Non Member	African Wildlife Foundation	0.027	0.030	0.000
		Agence de Development Economic de la Nouvelle-Caledonia	0.008	0.000	0.000
		Agencia Espanola de Cooperacion Internacional	0.000	0.008	0.034
		ASARECA	0.000	0.003	0.009
		ASE (ASEAN)	0.000	0.000	0.006
		British Gas	0.000	0.025	0.008
		Brunei Department of Fisheries	0.000	0.000	0.000
		Collective Action and Property Rights (CAPRi) Secretariat	0.000	0.001	0.018
		Congo Basin Forest Fund	0.000	0.014	0.093
		Conservation International Foundation	0.013	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.011	0.029	0.005
		Force of Nature Aid Foundation	0.000	0.000	0.000
		Industrial Modernization Center	0.000	0.005	0.031
		IUCN	0.009	0.000	0.000
		Japan Wildlife Research Center	0.000	0.002	0.001
		Mekong River Commision	0.000	0.000	0.004
		Mitsui Bussan Environment Fund	0.000	0.005	0.007
		Natural Environmental Research Council (NER)	0.011	0.002	0.009
		Others	0.001	0.006	0.039
		Packard Foundation	0.000	0.000	0.001
		Science and Technology Development Fund	0.000	0.000	0.038
		Sri Lanka	0.000	0.000	0.001
		The Global Fund to Fight AIDS, Tuberculosis and Malaria	0.000	0.002	0.019
		Water & Food/CP	0.027	0.005	0.011
		World Resources Institute (WRI)	0.000	0.003	0.000
		World Vision	0.000	0.000	0.009
		World Wildlife Fund	0.048	0.024	0.000
	Unrestricted + Other sources		1.001	0.720	0.735
Project Total			**1.708**	**1.842**	**2.197**

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
MTP 3: Multi-Level and Multi-Scale Governance	**Member**	ADB	0.000	0.000	0.016
		AFDB	0.000	0.004	0.112
		Australia	0.013	0.015	0.110
		Bangladesh	0.000	0.000	0.000
		Belgium	0.000	0.000	0.087
		Canada	0.001	0.007	0.008
		CGIAR	0.004	0.001	0.000
		Denmark	0.006	0.077	0.004
		Egypt	0.000	0.002	0.028
		European Commission	0.151	0.087	0.115
		FAO	0.005	0.024	0.000
		Finland	0.000	0.005	0.020
		France	0.000	0.003	0.007
		Germany	0.123	0.115	0.101
		IDRC	0.000	0.002	0.013
		IFAD	0.000	0.000	0.012
		India	0.000	0.000	0.011
		Ireland	0.000	0.000	0.005
		Israel	0.000	0.000	0.003
		Japan	0.000	0.038	0.011
		Malaysia	0.001	0.014	0.006
		New Zealand	0.000	0.000	0.012
		Norway	0.005	0.130	0.045
		OPEC Fund	0.006	0.000	0.000
		Philippines	0.000	0.098	0.035
		South Africa	0.000	0.000	0.004
		Spain	0.000	0.000	0.019
		Sweden	0.573	0.399	0.090
		UNEP	0.000	0.000	0.006
		United Kingdom	0.000	0.009	0.045
		United States	0.018	0.074	0.177
		World Bank	0.007	0.000	0.034
	Non Member	African Wildlife Foundation	0.011	0.013	0.000
		Agence de Development Economic de la Nouvelle-Caledonia	0.008	0.000	0.000
		Agencia Espanola de Cooperacion Internacional	0.000	0.008	0.035
		ASARECA	0.000	0.004	0.010
		ASE (ASEAN)	0.000	0.000	0.006
		British Gas	0.003	0.036	0.008
		Brunei Department of Fisheries	0.000	0.052	0.000
		Collective Action and Property Rights (CAPRi) Secretariat	0.000	0.034	0.018
		Congo Basin Forest Fund	0.000	0.015	0.095
		Conservation International Foundation	0.013	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.011	0.012	0.005

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
		Force of Nature Aid Foundation	0.000	0.000	0.000
		Industrial Modernization Center	0.000	0.005	0.031
		IUCN	0.010	0.000	0.000
		Japan Wildlife Research Center	0.000	0.002	0.001
		Mekong River Commision	0.000	0.000	0.004
		Mitsui Bussan Environment Fund	0.000	0.006	0.007
		Natural Environmental Research Council (NER)	0.011	0.002	0.010
		Others	0.002	0.006	0.040
		Packard Foundation	0.000	0.000	0.001
		Science and Technology Development Fund	0.000	0.000	0.039
		Sri Lanka	0.000	0.000	0.001
		The Global Fund to Fight AIDS, Tuberculosis and Malaria	0.000	0.002	0.019
		Water & Food/CP	0.371	0.380	0.011
		World Resources Institute (WRI)	0.000	0.003	0.000
		World Vision	0.000	0.000	0.010
		World Wildlife Fund	0.020	0.010	0.000
	Unrestricted + Other sources		1.017	0.731	0.745
Project Total			**2.390**	**2.425**	**2.232**
MTP 4: Sustainable Aquaculture Technologies	**Member**	ADB	0.000	0.000	0.038
		AFDB	0.000	0.015	0.266
		Australia	0.033	0.041	0.262
		Bangladesh	0.000	0.000	0.000
		Belgium	0.000	0.000	0.208
		Canada	0.002	0.015	0.019
		CGIAR	0.010	0.003	0.000
		Denmark	0.014	0.000	0.011
		Egypt	0.000	0.006	0.066
		European Commission	0.400	0.740	0.275
		FAO	0.012	0.057	0.000
		Finland	0.010	0.028	0.048
		France	0.000	0.000	0.018
		Germany	0.101	0.126	0.239
		IDRC	0.000	0.005	0.030
		IFAD	0.000	0.000	0.028
		India	0.000	0.072	0.025
		Ireland	0.000	0.000	0.011
		Israel	0.000	0.022	0.008
		Japan	0.000	0.051	0.027
		Malaysia	0.002	0.068	0.015
		New Zealand	0.000	0.000	0.028
		Norway	0.032	0.106	0.106

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
		OPEC Fund	0.016	0.026	0.000
		Philippines	0.003	0.054	0.084
		South Africa	0.000	0.001	0.011
		Spain	0.000	0.000	0.046
		Sweden	0.237	0.167	0.213
		UNEP	0.000	0.000	0.015
		United Kingdom	0.014	0.103	0.106
		United States	1.529	1.601	0.421
		World Bank	0.016	0.000	0.081
	Non Member	African Wildlife Foundation	0.000	0.000	0.000
		Agence de Development Economic de la Nouvelle-Caledonia	0.019	0.000	0.000
		Agencia Espanola de Cooperacion Internacional	0.000	0.066	0.083
		ASARECA	0.000	0.009	0.023
		ASE (ASEAN)	0.000	0.005	0.013
		British Gas	0.000	0.062	0.019
		Brunei Department of Fisheries	0.000	0.000	0.000
		Collective Action and Property Rights (CAPRi) Secretariat	0.000	0.002	0.043
		Congo Basin Forest Fund	0.000	0.035	0.225
		Conservation International Foundation	0.032	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.026	0.015	0.012
		Force of Nature Aid Foundation	0.000	0.000	0.000
		Industrial Modernization Center	0.000	0.013	0.074
		IUCN	0.023	0.000	0.000
		Japan Wildlife Research Center	0.000	0.004	0.003
		Mekong River Commision	0.000	0.011	0.009
		Mitsui Bussan Environment Fund	0.000	0.013	0.016
		Natural Environmental Research Council (NER)	0.026	0.006	0.023
		Others	0.013	0.024	0.094
		Packard Foundation	0.000	0.000	0.003
		Science and Technology Development Fund	0.000	0.000	0.092
		Sri Lanka	0.014	0.009	0.003
		The Global Fund to Fight AIDS, Tuberculosis and Malaria	0.000	0.004	0.046
		Water & Food/CP	0.112	0.053	0.026
		World Resources Institute (WRI)	0.000	0.007	0.000
		World Vision	0.000	0.000	0.023
		World Wildlife Fund	0.004	0.000	0.000
	Unrestricted + Other sources		2.420	1.739	1.777
Project Total			**5.120**	**5.384**	**5.312**

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
MTP 5: Aquaculture and the Environment	**Member**	ADB	0.000	0.000	0.023
		AFDB	0.000	0.011	0.159
		Australia	0.020	0.021	0.157
		Bangladesh	0.000	0.000	0.000
		Belgium	0.000	0.000	0.125
		Canada	0.001	0.009	0.011
		CGIAR	0.006	0.002	0.000
		Denmark	0.008	0.000	0.006
		Egypt	0.000	0.003	0.040
		European Commission	0.247	0.282	0.165
		FAO	0.007	0.034	0.000
		Finland	0.016	0.033	0.029
		France	0.000	0.000	0.011
		Germany	0.034	0.052	0.144
		IDRC	0.000	0.003	0.018
		IFAD	0.000	0.000	0.017
		India	0.000	0.018	0.015
		Ireland	0.000	0.000	0.007
		Israel	0.000	0.005	0.005
		Japan	0.000	0.012	0.016
		Malaysia	0.001	0.000	0.009
		New Zealand	0.000	0.000	0.017
		Norway	0.005	0.006	0.064
		OPEC Fund	0.009	0.015	0.000
		Philippines	0.000	0.005	0.051
		South Africa	0.000	0.001	0.006
		Spain	0.000	0.000	0.027
		Sweden	0.000	0.000	0.128
		UNEP	0.000	0.000	0.009
		United Kingdom	0.000	0.023	0.064
		United States	0.523	0.618	0.253
		World Bank	0.009	0.000	0.049
	Non Member	African Wildlife Foundation	0.000	0.000	0.000
		Agence de Development Economic de la Nouvelle-Caledonia	0.012	0.000	0.000
		Agencia Espanola de Cooperacion Internacional	0.000	0.017	0.050
		ASARECA	0.000	0.005	0.014
		ASE (ASEAN)	0.000	0.000	0.008
		British Gas	0.000	0.036	0.012
		Brunei Department of Fisheries	0.000	0.000	0.000
		Collective Action and Property Rights (CAPRi) Secretariat	0.000	0.001	0.026
		Congo Basin Forest Fund	0.000	0.021	0.135
		Conservation International Foundation	0.019	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.016	0.003	0.007

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
		Force of Nature Aid Foundation	0.000	0.000	0.000
		Industrial Modernization Center	0.000	0.008	0.045
		IUCN	0.014	0.000	0.000
		Japan Wildlife Research Center	0.000	0.002	0.002
		Mekong River Commision	0.000	0.000	0.005
		Mitsui Bussan Environment Fund	0.000	0.008	0.010
		Natural Environmental Research Council (NER)	0.016	0.003	0.014
		Others	0.012	0.022	0.057
		Packard Foundation	0.000	0.000	0.002
		Science and Technology Development Fund	0.000	0.023	0.055
		Sri Lanka	0.004	0.002	0.002
		The Global Fund to Fight AIDS, Tuberculosis and Malaria	0.000	0.003	0.027
		Water & Food/CP	0.230	0.406	0.016
		World Resources Institute (WRI)	0.000	0.004	0.000
		World Vision	0.000	0.000	0.014
		World Wildlife Fund	0.003	0.000	0.000
	Unrestricted + Other sources		1.451	1.043	1.060
Project Total			**2.663**	**2.760**	**3.186**
MTP 6: Resilience in Practice for Small-Scale Fisheries	**Member**	ADB	0.000	0.000	0.033
		AFDB	0.000	0.000	0.228
		Australia	0.252	0.550	0.224
		Bangladesh	0.053	0.072	0.000
		Belgium	0.000	0.000	0.178
		Canada	0.002	0.013	0.016
		CGIAR	0.009	0.003	0.000
		Denmark	0.012	0.039	0.009
		Egypt	0.000	0.005	0.057
		European Commission	0.321	0.147	0.235
		FAO	0.010	0.061	0.000
		Finland	0.000	0.010	0.041
		France	0.000	0.106	0.015
		Germany	0.062	0.087	0.205
		IDRC	0.000	0.004	0.026
		IFAD	0.000	0.000	0.024
		India	0.000	0.000	0.021
		Ireland	0.000	0.000	0.010
		Israel	0.000	0.000	0.007
		Japan	0.000	0.046	0.023
		Malaysia	0.001	0.041	0.013
		New Zealand	0.391	0.180	0.024
		Norway	0.001	0.062	0.091
		OPEC Fund	0.013	0.000	0.000
		Philippines	0.003	0.087	0.072

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
		South Africa	0.000	0.000	0.009
		Spain	0.000	0.000	0.039
		Sweden	0.132	0.084	0.183
		UNEP	0.802	0.213	0.013
		United Kingdom	0.000	0.019	0.091
		United States	0.060	0.275	0.361
		World Bank	0.013	0.041	0.070
	Non Member	African Wildlife Foundation	0.011	0.013	0.000
		Agence de Development Economic de la Nouvelle-Caledonia	0.017	0.000	0.000
		Agencia Espanola de Cooperacion Internacional	0.000	0.017	0.071
		ASARECA	0.000	0.007	0.020
		ASE (ASEAN)	0.000	0.001	0.011
		British Gas	0.013	0.096	0.017
		Brunei Department of Fisheries	0.000	0.031	0.000
		Collective Action and Property Rights (CAPRi) Secretariat	0.000	0.001	0.037
		Congo Basin Forest Fund	0.000	0.031	0.193
		Conservation International Foundation	0.027	0.000	0.000
		Fishbase Information and Research Group (FIN)	0.133	0.217	0.010
		Force of Nature Aid Foundation	0.092	0.118	0.000
		Industrial Modernization Center	0.000	0.011	0.064
		IUCN	0.020	0.000	0.000
		Japan Wildlife Research Center	0.000	0.003	0.002
		Mekong River Commision	0.023	0.101	0.007
		Mitsui Bussan Environment Fund	0.000	0.011	0.014
		Natural Environmental Research Council (NER)	0.022	0.005	0.020
		Others	0.006	0.085	0.081
		Packard Foundation	0.037	0.043	0.003
		Science and Technology Development Fund	0.000	0.030	0.079
		Sri Lanka	0.000	0.000	0.002
		The Global Fund to Fight AIDS, Tuberculosis and Malaria	0.000	0.004	0.039
		Water & Food/CP	0.513	0.686	0.022
		World Resources Institute (WRI)	0.000	0.006	0.000
		World Vision	0.000	0.000	0.020
		World Wildlife Fund	0.022	0.010	0.000
	Unrestricted + Other sources		2.073	1.491	1.521
Project Total			**5.146**	**5.163**	**4.551**
Total Resticted			**11.280**	**14.123**	**13.988**
Total Unrestricted + Other sources			**9.567**	**6.877**	**7.012**
Total			**20.847**	**21.000**	**21.000**

Table 11: Internationally and Nationally Recruited Staff, 2008-2012 in $millions					
	Actual 2008	**Estimated 2009**	**Proposal 2010**	**Plan 1 2011**	**Plan 2 2012**
NRS	231	225	195	200	205
IRS	52	50	45	47	50
Total	**283**	**275**	**240**	**247**	**255**

Table 12: Currency Structure of Expenditure, 2008-2010 in millions of units and percent									
	Actual 2008			**Estimated 2009**			**Proposal 2010**		
Currency	Amount	$ Value	% Share	Amount	$ Value	% Share	Amount	$ Value	% Share
AUD	0.447	0.388	2	0.028	0.019	0	0.024	0.019	0
EUR	0.426	0.636	3	0.012	0.016	0	0.012	0.016	0
MYR	11.844	3.547	17	13.083	3.640	17	12.231	3.640	17
Others	0.000	0.511	2	0.000	0.386	2	0.000	0.386	2
USD	15.765	15.765	76	16.939	16.939	81	16.939	16.939	81
Total		**20.847**	**100 %**		**21.000**	**100 %**		**21.000**	**100 %**

Table 13: Statement of Financial Position (SFP), 2008-2010 in $millions			
Assets, Liabilities and Net Assets	**2008**	**2009**	**2010**
Current Assets			
Cash and Cash Equivalents	7.793	7.493	7.193
Investments	0.000	0.000	0.000
Accounts Receivable			
- Donor	3.526	3.402	3.272
- Employees	0.161	0.169	0.178
- Other CGIAR Centers	0.000	0.000	0.000
- Others	1.867	1.960	2.059
Inventories	0.121	0.127	0.133
Pre-paid Expenses	0.000	0.000	0.000
Total Current Assets	**13.468**	**13.151**	**12.835**
Non-Current Assets			
Net Property, Plan and Equipment	0.384	0.403	0.423
Investments	0.000	0.000	0.000
Other Assets	0.000	0.000	0.000
Total Non-Current Assets	**0.384**	**0.403**	**0.423**
Total Assets	**13.852**	**13.554**	**13.258**
Current Liabilities			
Overdraft/Short Term Borrowings	0.000	0.000	0.000
Accounts Payable			
- Donor	2.785	2.242	1.688
- Employees	0.000	0.000	0.000
- Other CGIAR Centers	0.068	0.071	0.075
- Others	3.373	3.542	3.719
Accruals and Provisions	0.824	0.865	0.908
Total Current Liabilities	**7.050**	**6.720**	**6.390**
Non-Current Liabilities			
Accounts Payable			
- Employees	0.642	0.674	0.708
- Deferred Grant Revenue	0.000	0.000	0.000
- Others	0.000	0.000	0.000
Total Non-Current Liabilities	**0.642**	**0.674**	**0.708**
Total Liabilities	**7.692**	**7.394**	**7.098**
Net Assets			
Unrestricted			
- Fixed Assets	0.891	0.891	0.891
- Unrestricted Net Assets Excluding Fixed Assets	5.269	5.269	5.269
Total Unrestricted Net Assets	**6.160**	**6.160**	**6.160**
Restricted	0.000	0.000	0.000
Total Net Assets	**6.160**	**6.160**	**6.160**
Total Liabilities and Net Assets	**13.852**	**13.554**	**13.258**

Table 14: Statement of Activities (SOA), 2008-2010 in $millions							
		Unrestricted	Restricted		Total		
			Temporary	Challenge Programs	2008	2009	2010
Revenue and Gains	Grant Revenue	7.370	9.978	1.302	18.650	20.600	20.700
	Other revenue and gains	0.675	0.000	0.000	0.675	0.400	0.300
	Total revenue and gains	8.045	9.978	1.302	19.325	21.000	21.000
Expenses and Losses	Program related expenses	6.480	9.978	1.302	17.760	19.610	19.822
	Management and general expenses	3.259	0.000	0.000	3.259	3.598	3.637
	Other losses expenses	0.938	0.000	0.000	0.938	0.000	0.000
	Sub Total expenses and losses	10.677	9.978	1.302	21.957	23.208	23.459
	Indirect cost recovery	-1.110	0.000	0.000	-1.110	-2.208	-2.459
	Total expenses and losses	9.567	9.978	1.302	20.847	21.000	21.000
	Net Operating Surplus / (Deficit)	-1.522	0.000	0.000	-1.522	0.000	0.000
	Extraordinary Items	0.000	0.000	0.000	0.000	0.000	0.000
	NET SURPLUS / (DEFICIT)	**-1.522**	**0.000**	**0.000**	**-1.522**	**0.000**	**0.000**
Object of Expenditure	Personnel	6.317	2.602	0.425	9.344	9.670	9.670
	Supplies and services	1.133	2.799	0.191	4.123	6.613	6.613
	Collaboration/ Partnerships	0.983	3.810	0.563	5.356	2.196	2.196
	Operational Travel	0.946	0.709	0.119	1.774	2.185	2.185
	Depreciation	0.188	0.058	0.004	0.250	0.336	0.336
	Total	**9.567**	**9.978**	**1.302**	**20.847**	**21.000**	**21.000**

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 CCERs.	1. Rolling program of CCERs to be presented to BoT; 2. Center-wide review	1. Sep '06 2. 2009	**Completed:** Rolling CCERs approved by Board at September 06 BOT Meeting and revised at November 07 and September 08 meetings. The Center has conducted an exhaustive review of structure in the first half of 2009, and this will be discussed by the BOT in mid 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 Fellows, 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	**Completed:** Strategic staffing approach was presented to the Board in November 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 could be achieved within a reasonable period of time (4 to 6 years) and that could: stimulate WorldFish scientists of different disciplines and promote interdisciplinary research; be recognized by the scientific community as a cutting-edge research center and stimulate collaboration with scientists from both developed and developing countries; 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 NRM and Aquaculture are developing research strategies for these Disciplines that are designed to provide such a focus for the Disciplines for the next 5-10 years.	1. NRM and Aquaculture strategies to be presented to BoT 2. Strategy for PESS to be further developed following recruitment of PESS Discipline Director.	1.Sep. 2006 2. 2008	**Completed:** Strategies presented to the Board in Sept 2006 and now incorporated into the Center's evolving MTP. **Completed:** PESS Director recruited and outline strategy presented to BOT in November 2007. As for the other disciplines the evolving PESS strategy has been incorporated into the MTP where PESS is leading 3 out of 6 projects and 2 cross-cutting areas of work.

4. Conduct further research on GIFT focusing on genetics and nutrition using more controlled experimental conditions, and testing a large range of feeding levels.	Agreed in principle.	1. Research on genetics and nutrition incorporated into the Pro- poor Aquaculture Strategy Document.	1. Sep. 2006	**Completed.** The issue has been incorporated into the Center's focus on Sustainable Aquaculture. A post doc has been recruited and is working on nutrition trials with GIFT.
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 its products.	Agreed.	1. Undertake assessment of partners' strengths and weaknesses globally and in regions; 2. Re-examine strategy and approach to knowledge sharing.	2008 2. Dec 2006	**Completed:** Assessments have been conducted in the Greater Mekong, Sub-Saharan Africa, the Pacific, and Bangladesh to determine strengths and weaknesses of partners. **Completed.** The Center has consolidated KM and combine this with the Business Development functions of the Centre.
6. Define Center's continuing involvement and role in FishBase, including specifying how the various demands on staff will be met.	We believe we have already defined our continuing role. We have signed an MoU which commits us on a long-term basis to ensure development for the FishBase project. We are committed, both in human resources and financial support, to continue to fully participate in the consortium.	1. Develop a position paper for Board approval which clearly defines the Centers role in FishBase. 2. Communicate approved position to FishBase Consortium members	1. Sept 2006	**Completed.** The BoT has reviewed the measures already taken and agreed that the Center has clearly specified its role in the FishBase Consortium
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.	Agreed- our research on fish demand and supply has been highly effective in guiding policy and future research on fisheries and aquaculture.	1. Undertake ex-post impact assessments of the Center's aquaculture research; 2. Present a major analysis of fish supply and demand in Asia and publish in a primary journal	1. Ongoing/ 2008 2. Dec. 2007	**Completed.** WorldFish has been conducting **ex post** impact assessment of the Center's work on an on-going basis. In 2006, the Center conducted an ex-post impact assessment of its 'integrated Aquaculture-Agriculture' work in Bangladesh. Moving forward the Center is also strengthening capacity in impact assessment so that this can be done more systematically. **Completed:** Four articles were published in 2006-07.

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.	Agreed. The center is committed to expanding our work on the development of improved breeds of tilapias, carps and African catfish and in doing so, to developing improved tools for assessing both economic utility and environmental risk of introducing specific strains.	1. Develop improved tools for assessing both economic utility and environmental risk of introducing specific fish strains. 2. Develop policy and risk assessment methods for use of the GIFT tilapia strain (See MTP Pro-poor Aquaculture Global Project no. 8).	1. 2007 2. 2007	**Completed.** A study was conducted evaluating the economic benefit of genetic improvement programs; the results were published in the journal "Aquaculture". **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 the BOT in November 2007.
9. For PESS: Secure a Discipline Director (DD) as soon as possible; Conduct a strategic process of research planning and prioritization that enables the discipline to more precisely identify 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.	Agreed. When the position was advertised internationally in 2005 ,no suitably qualified candidate was secured, but we are confident that this will happen in 2006. When in post, the DD will have explicit responsibility for leading a strategic research planning process and for developing the staff capacity to pursue the discipline strategy.	1.Procure DD for PESS 2. Develop research strategy for PESS	1. 2006 2. 2008	**Completed.** New Director started work in September 2007. **Ongoing:** Being undertaken by PESS director and reflected in the MTP.
10. WorldFish explores opportunities in sub-Saharan Africa for collaboration with other CG Centers, in particular International Institute of tropical Agriculture (IITA), West Africa Rice Development Association (WARDA), International Rice Research Institute (IRRI), Center for International Forest Research (CIFOR), International Water Management Institute (IWMI), International Food Policy Research Institute (IFPRI) and International Center for Research and Forestry (ICRAF), 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.	Agreed. The Center is already collaborating with IWMI, ILRI and ICRAF in sub-Saharan Africa (and with IWMI and IRRI in Asia), and WorldFish and IWMI are collaborating on water management aspects of agriculture in southern Africa (See MTP sub-Saharan Africa project no.5).	1. Increase partnership with CGIAR Centers wherever this adds value to the work of both Centers.	Ongoing/2008	**Ongoing:**The Center participated in the development of the Regional MTPs for Africa and is pursuing collaborative opportunities where these will add value to both Centers. Collaboration is expanding with IITA, IWMI, ILRI, WARDA and ICRAF through new projects under development.

11. Give high priority to: Recruitment of senior scientists with a proven track record or the involvement of such scientists in Center projects through various forms of partnership and adjunct arrangements; Recruitment of a cadre of younger, recent PhD graduates, particularly in view of present and past difficulties in attracting more senior scientists.	Agreed. The Board of Trustees and Management are committed to strengthening the scientific capacity of the Center. This is being pursued actively but it is important to emphasize that these increases in staffing need to be financially sustainable and considerable effort is being invested in developing staff capacity in a staged manner in order to ensure sustainability.	1. Complete recruitment of 10 new scientists as approved by the Board under the investment strategy 2. Develop staff capacity in a staged manner in order to ensure financial sustainability	1. Dec 2006 2. 2008	**Completed.** 10 new scientists were appointed followed by additional recruitments in 2007 and 2008. **Completed.** The new staff have been hired over a period of 3 years. Long term funding for science positions remains a challenge and the Center's science staffing levels will be dependent on continued growth in grant funding.
12. Elaborate a Partnership Strategy focusing on, among others, 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 capacity building policy for its staff and its partners taking into account, as appropriate, the suggestions that have been provided.	Agreed. We are committed to strengthening and expanding our partnerships in order 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, and the elements recommended by the Panel will be addressed including clarifying the position of the Center and partners on the R&D continuum, and building capacity of staff and partners. WorldFish uses the Value Chain diagram as advice to guide discussion and thinking about these issues.	1. Prepare formal Partnership Strategy; 2. Build capacity of staff and partners through workshops and/or training events	1. 2007 2. Ongoing/ 2008	**Completed:** Policy presented to BOT in November 2007 and approved. **Ongoing:** Capacity building is occurring through staff development plans and through the explicit capacity building work in a range of projects in all regions.

13. Reduce Board size to not more than nine Trustees, including the ex-officio Director General, Host Country representatives and the FAO nominee; Modify Board Committee Structure to retain the Audit Committee, the Nominating Committee, and the Executive Committee, and 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, the Board, 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 and experience/expertise, with a member of the Board as the Committee Chair. The Committee will report to the Board, and the Committee Chair (or any other member other than the Director General) should brief the Board at every meeting on its deliberations and advice; Plan for CCERS on a three-year rolling time frame, to be updated each year, to obtain the best panelists with adequate advance notice, and spreading the workload evenly over the period; CCER Panel Chairs should be requested to make the presentations to the Board on their Reports and Recommendations.	The Center initiated a process of Board reform in September 2005, and we are pleased that the Panel Recommendations reflect the direction that has been taken.	1. Reduce Board size to eight Trustees, including the Director General and Host Country representatives; 2. Modify Board Committee structure to retain the Audit Committee, 3. Replace the Nominating Committee with a Governance Committee; 4. Eliminate the Program Committee; 5. Pursue establishment of a Science Advisory Committee, with the Terms of Reference and operating procedures for this Committee to be reviewed at the 30th meeting of the BoT; 6. Produce an Annual Report of the Trustees, approved and signed on behalf of the Board, as well as Audited accounts; 7. Plan CCERS on a 3-year rolling time frame (to be considered by BoT at 30th meeting.	1. March 2006 2. March 2006 3. March 2006 4. March 2006 5. Sept 2006 6. June 2006 7. Sept 2006	**Completed** **Completed** **Completed** **Completed** **Completed** **Completed** **Completed:** Rolling CCERs approved at September 2006 Board meeting, and revised in November 2007 and September 2008..

14. Continue to maintain reserves at prudent and yet not unduly excessive level, and to give this matter very high priority and importance so that necessary and appropriate allocations are expeditiously approved and utilized.	Agreed. The Center has developed a plan to draw on the Center's reserves to allow investment in science development.	1. To utilize USD1.2m for additional scientists and support costs in 2006 2. To make further strategic investments in research and support bringing reserves to no less than 100 days operating expenses	1. 2006 2. 2008	**Completed:** The BoT approved US$1.2 million draw-down on reserves in 2006 and further draw downs in 2007 and 2008. These have been used to expand science capacity. **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.
15. Revisit and comprehensively review the recovery methodology (rental charges as a component of overhead) in all its aspects; Seek directions from the Audit Committee and Board urgently, and adopt an appropriate policy that would be consistent with the Constitution mandating it as a not-for-profit organization, and in full compliance with the Host Country and Land Lease Agreements with the Malaysian Government, and transparent disclosure to, and concurrence of, the projects where such recoveries are proposed to be applied.	Agreed.	1. Conduct comprehensive review on overhead recovery concept and methodology which address all the issues pointed out by the EPMR team; 2. Present review to the Center's Audit Committee and the Board in Board Meeting.	1. August 2006 2. Sep. 2006	**Completed.** The Board considered the overhead recovery method in September 2006 and clarified its policy **Completed**

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