



The WorldFish Center

Reducing poverty and hunger by improving fisheries and aquaculture

MEDIUM TERM PLAN 2008-2010

Medium Term Plan 2008-2010

Table of Contents

A. Overview		
Introduction		1
Building for the future		4
Changes to the previous Medium Term Plan (MTP)		9
Highlights of the 2008 project portfolio		9
Center financial indicators		10
B. The WorldFish Center Project Portfolio		
Project 1: Increased integration of small-scale fisheries into national and regional development policy		11
Project 2: Integrated assessment and advisory systems for small-scale fisheries management		17
Project 3: Improved management and governance of small-scale fisheries		23
Project 4: Building institutional capacity for adaptive learning		28
Project 5: Improving the technological foundation for sustainable aquaculture		33
Project 6: Improving access to input and output markets		38
Project 7: Developing improved policy environments		41
Project 8: Improving institutional and human capacity		46
C. Finance Plan		51
D. Financial Tables		55
Annex I		
The WorldFish Center key performance goals for 2007		70
Annex II		
Progress report on implementation of EPMR panel recommendations		71

The WorldFish Center: Our Mission, Vision and Values

The WorldFish Center is part of the Future Harvest 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 for 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.

A. Overview

Introduction

This Medium Term Plan (MTP) sets out the plans for the WorldFish Center to pursue its mission within the context of current global events and in response to feedback from partners and other external sources. The Plan continues to consolidate the changes we made in 2005, when we introduced a new organizational structure, updated our research strategy, and started to focus our research on two major issues – small-scale fisheries and sustainable aquaculture.

These steps are important because the challenges for global fisheries and aquaculture are huge. Threats of over-exploitation and stock collapse continue to dominate the wild capture sector, while rapid growth of aquaculture production brings with it growing concerns about sustainability. To this, climate change adds an increasingly important challenge that we must address with well targeted research on both its impacts and the scope for adaptation.

According to statistics from the Food and Agriculture Organization of the United Nations (FAO), the total production of world capture fisheries was 95 million t in 2004, with an estimated first sale value of US\$84.9 billion. This figure has been relatively stable over the last decade, with the exception of variation in catch of Peruvian Anchoveta, a species for which population change is largely driven by oceanographic fluctuations. Unfortunately, although the overall global catch has been fairly stable, stock collapses and overfishing remain prevalent. Concerns about the livelihoods of fishers, the sustainability of fisheries and sustainability of the aquatic ecosystems on which they depend also continue to intensify.

These concerns are especially acute for small-scale fishers whose fisheries are often poorly documented in national and global statistics. There are no reliable global estimates of the number of people dependent on small-scale fisheries (SSFs) or reliable assessments of their role in national or regional economies.

Many of these people are desperately poor. FAO statistics for 2002 showed that out of the world's 29 million fishers, 20 per cent or 5.8 million were small-scale fishers earning less than US\$1 a day. Another 17.3 million of those falling under the income-poor category were at least partially dependent on upstream and downstream fisheries activities such as boat building, marketing and processing. Thus, as many as 23 million income-poor people plus their dependents rely on small-scale fisheries.

Sadly, fisheries management has largely failed to deliver resilient ecosystems and sustainable livelihoods for these poor people. These fisheries usually have a weak political constituency and are vulnerable ecologically, socially and economically. Inappropriate management practices, weak property rights, inability to control fishing capacity, poor governance, among other factors, have conspired to block these fisheries from achieving their potential. The priority for small-scale fisheries must be to secure and improve the benefits they provide by increasing their resilience to ecological, social and economic change.

In 2004, aquaculture output was 45.5 million t (32 per cent of total world fish production) with a value of US\$63.3 billion and 59.4 million t with a value of US\$70.2 billion, if aquatic plants are included. Over the last two decades, aquaculture has been one of the world's most innovative and rapidly growing food sectors, with notable investment, technical development and growth in many regions. This has had significant and positive effects on rural and urban food supply and on income and employment in many developing economies. Based on current per capita consumption targets and future population growth, and given the limits to growth in most capture fisheries, aquaculture has the potential to satisfy the world's growing demand for aquatic food products. However, the expansion and growing internationalization of aquaculture is accompanied by increasing concern over environmental impacts, inequity and social exclusion. While developing technologies that improve efficiency and productivity, aquaculture development must also focus on issues of social equity and environmental sustainability.

To better respond to the challenges facing fisheries and aquaculture in the coming decade we are refocusing our work. Central to this is an updated strategy and a new research structure to implement it. The Strategy Update¹ is rooted in the Center's Mission, Vision and Values and guided by the Millennium Development Goals (MDGs). These goals set a benchmark for achieving our Mission against which we can judge our

¹ <http://www.worldfishcenter.org/pdf/strategyupdatepdfin.pdf>

actions. To drive performance over the next 3-5 years we have identified three Thematic Goals, from which we derive our annual quantified Key Performance Goals (KPGs). Organized around five key stakeholder groups, our KPGs (Annex I) provide the detailed set of measurable targets we will try to achieve each year. A fundamental principle for WorldFish is that the KPGs set for the organization as a whole cascade down to operating units and individuals. This helps to align our actions and ensure that everyone is clear about what we are trying to achieve.

The most fundamental strategic choice we have made is the areas of research we will be active in. Answering this question has required us to be as specific as possible about the research we will do. It also demanded we be clear about the categories of outputs we will produce, our key technologies, and the geographic regions we will focus on (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.


Areas of WorldFish Activity Based on Research Disciplines			
	Natural Resource Management	Aquaculture and Genetic Improvement	Policy, Economics and Social Science
 We will increase	<ul style="list-style-type: none"> • Development of tools for small-scale fisheries management; • Fisheries analysis for management of inter-sectoral basins and coastal zones; • Ecological assessment; • Research support for management approaches involving interaction between water and fisheries. 	<ul style="list-style-type: none"> • Synthesis of lessons and approaches for management of production systems (including environmental and health); • Genetic improvement; • Development of dissemination methodologies; • Coordination and synthesis of research on low-cost feed and fishmeal replacement; • Development of livelihood options based on adding value to aquatic products; • Focus on coastal aquaculture. 	<ul style="list-style-type: none"> • Institutional and governance analysis; • Gender analysis and the role of fish in human development; • Development of tools for policy development and decision-making; • Analysis of trade and market access and private-sector development; • Studies of small-scale fisheries and their role in decentralized governance and economic development; • Research support for local (rural) commercial approaches to development; • Economic analyses of ecological/environment issues.
Overall increase in: Comparative analysis and synthesis; development of future scenarios (such as global change); development of cross-sectoral linkages and knowledge networks; institutional capacity-building; research on environmentally sustainable management practices			
 We will maintain or adapt	<ul style="list-style-type: none"> • Knowledge bases; • Stock enhancement. 	<ul style="list-style-type: none"> • Dissemination of new breeds; • Focus on inland aquaculture. 	<ul style="list-style-type: none"> • Impact assessment; • Resource valuation; • Co-management arrangements and their (real) implication for poverty reduction through small-scale fisheries.
 We will not do	<ul style="list-style-type: none"> • Lab-based genetic analysis research; • Development of tools for stock assessment of single species. 	<ul style="list-style-type: none"> • Development of post-harvest technologies; • Breeding and culture research; • Development of technologies for fish disease diagnosis and treatment; • Extension of aquaculture technologies. 	<ul style="list-style-type: none"> • Direct (operational) support to community-based management in Asia; • Traditional farm-management surveys at the micro level.

Figure 1: Extract from the WorldFish Strategy Update 2005

Building on this analysis and our review of the challenges facing world fisheries and aquaculture, we are now focusing our research on two globally significant issues: the development of resilient small-scale fisheries and sustainable aquaculture. We are pursuing our work in these areas through a concerted “campaign” approach, which is to identify the issues that need attention, the people and institutions who can address them, and the role played by research and international public goods. This approach will help us to more directly address the challenge set by the MDGs through our role in knowledge generation, knowledge synthesis and knowledge sharing. We will look to other organizations to play the leading role in knowledge application/extension and technology dissemination and will build strategic partnerships with such organizations. We will commit increased attention and resources to our research in Africa, while continuing our work in Asia and the South Pacific.

There is strong evidence that women in many economic sectors bear the brunt of poverty. The fisheries sector is no exception. Women and girls in poor fishing communities suffer most because of their subordinate position in the family, their lack of education or low academic qualifications, and their exclusion from decision making. Gender mainstreaming in the fisheries sector will help to increase equity by empowering and giving economic opportunity to women. We commit to a research agenda that places priority on gender issues, sex disaggregated data, gender analysis and gender mainstreaming.

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 the congruence between our research and the new CGIAR research priorities for the period 2005-2015, which we have described in a new publication². Many of our programs and achievements support the CGIAR system priorities (Table 1) 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. The section on Project Narratives for 2008-2010 describes how we plan to divide spending among the priorities.

Table 1: WorldFish activities in relation to CGIAR research 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  > > >

² http://www.worldfishcenter.org/cms/list_article.aspx?catID=3&ddlID=346

Building for the future

The analyses that resulted in our 2005 Strategy Update and the subsequent findings of the External Program and Management Review (EPMR) Panel in 2006 have given us a clear picture of how to consolidate and build. This section addresses some of the key issues for focus that emerged from these analyses.

Implementation of EPMR recommendations

The Worldfish Board of Trustees (BoT), with Management, considered the report of the 3rd EPMR when it met in Penang from 6-9 March 2006. Overall we found the report most positive. The Panel's explicit recognition of the impact of our work on poverty and its conclusion that we have been a good investment for our donors was especially gratifying.

Many recommendations converge with initiatives already underway to strengthen regional impact, increase science output, improve management efficiency, and streamline governance. In particular, we are continuing to increase our focus on key regions (especially Sub-Saharan Africa) and key topics (e.g. small-scale fisheries). We have also embarked on an ambitious program of investment in new scientific staff at both senior and junior levels. These new staff are focusing on specific priorities set out in our updated research strategy and will augment our output of peer-reviewed publications.

Details of the Center's efforts and plans to respond to the EPMR recommendations are set out in Annex III.

Defining the research agenda

In 2006 The WorldFish Center completed a strategic review of its science project portfolio and future directions. This process, augmented by the EPMR and Center commissioned reviews, has resulted in a major realignment of the Center's research around two campaigns: *Resilient Small-Scale Fisheries* (MTP Projects 1-4) and *Sustainable Aquaculture Development* (MTP Projects 5-8). These campaigns are designed to make a difference to the poor on a global scale. The campaigns will galvanize action, alignment and co-investment around major issues affecting these sectors. They will also directly address the need for the development partnerships identified in the MDGs. An important objective of both campaigns will be to better position the fisheries and aquaculture sectors to address opportunities and threats from outside traditional sector boundaries, including global issues such as trade and environmental change. There are many overlapping issues between the two campaigns - in trade, livelihood diversification and in the management of reservoir and enhanced fisheries. These Projects will also build on those identified in the Center's previous MTP, but with the additional benefit of the new strategic analysis and a more rigorous use of the Impact Pathway approach to identify priority outputs. Outputs from the 2007-2009 MTP have been reallocated to the new Projects. Institutional and human capacity building, which was previously spread across several projects, has become a separate Project to more transparently address System Priority 5A (SP 5A) shown in Table 1.

WorldFish research campaigns

Resilient Small-Scale Fisheries

One billion people rely on fish as their primary source of protein and several hundred million are dependent on fish as their main source of income. Fish are also an important trade commodity; with about 33 per cent of global fish production by value being traded across international borders in 2001. Unfortunately, despite their potential, many regions and countries fail to benefit fully from their small-scale fisheries.

SSFs offer a means to tackle the MDGs through the sustainable supply of fish and fish products. The majority of the world's fishers lives in developing countries and work in SSFs. These fisheries make important but poorly quantified contributions to national and regional economies, and to the food security of more than 200 million people. Failure to reverse the fortunes of the sector will almost certainly result in failure to meet the MDGs.

The diffused nature of SSFs and the remarkable diversity of these fisheries make it difficult for governments to harness their full economic benefit. As a result, they receive little investment from national development programs. In addition, the institutional and policy environments that are typical of many developing countries create uncertainty and potential threats for SSFs. The lack of transparency and dialogue about policy objectives, and weakness of civil society also conspire against coherent policy and management institutions.

These sources of vulnerability must be addressed for SSFs to deliver their full benefits. This requires change at multiple levels: at the level of the individual fishery system, with new management arrangements and approaches; at the national and regional levels, with, for example, changes in cross-sectoral relationships and policies; and globally, where we must better integrate the role of fisheries into the development agenda and include it in international development and trade policies. Effecting such change requires working from the inside out, by re-conceptualizing how we might better manage individual fishery systems, and from outside in, by mapping a path for change in international and regional perspectives and policies on fisheries. At the boundary between these two approaches lies the national level, where change can be made through action in both directions.

To develop our work plan for resilient small-scale fisheries we adopted an Impact Pathway approach³. The resulting Problem and Objective Trees helped us identify four high impact research interventions as MTP Projects. These are all consistent with the Center’s strategy and map clearly to CGIAR System Priorities. The Projects evolve from those identified in the Center’s previous MTP, but have a clearer strategic rationale and make more rigorous use of the Impact Pathway approach to identify priority outputs.

The four MTP small-scale fisheries Projects are:

1. Increased integration of SSFs into national and regional development policy.
2. Integrated assessment and advisory systems for fisheries management.
3. Improved management and governance of small-scale fisheries.
4. Building institutional capacity for adaptive learning.

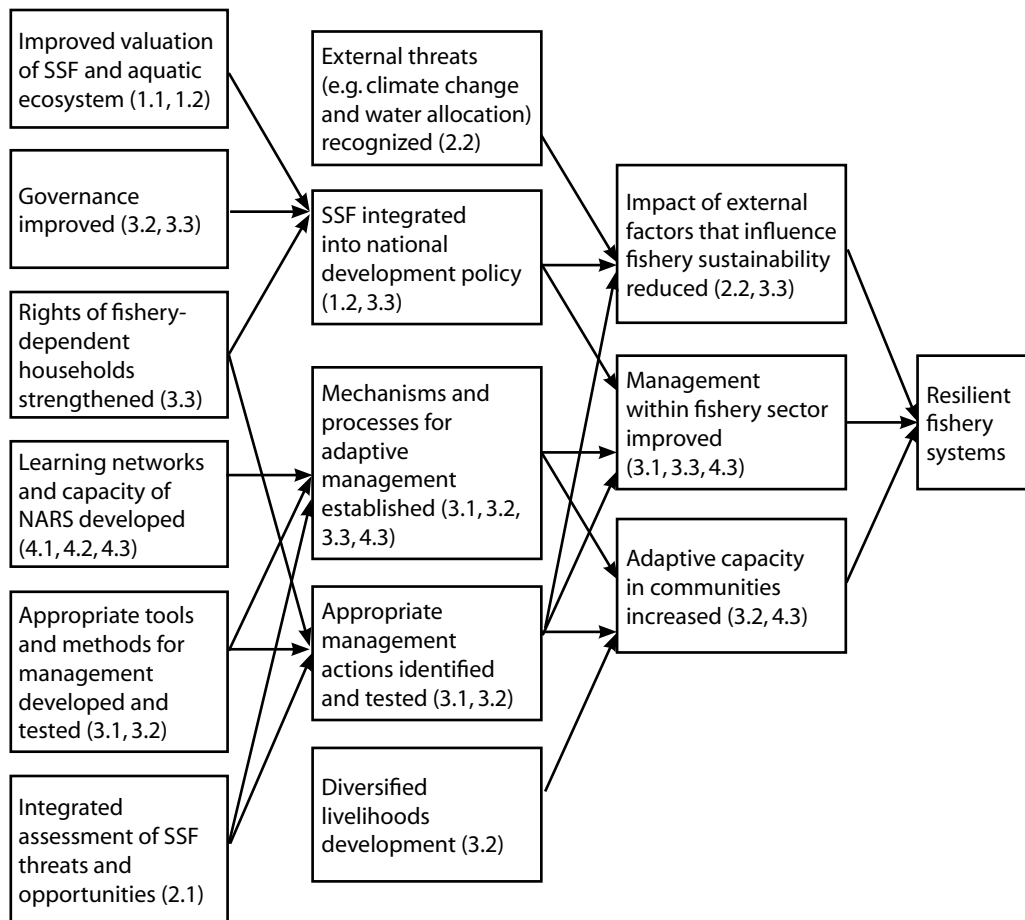


Figure 2: Summary of impact pathways for resilient small-scale fisheries

Note: Numbers in brackets refer to Output and Output targets, e.g. 1,1 stands for Output 1, Output target 1.

³ <http://boru.pbwiki.com/f/worldfish%2C%20aquaculture%20and%20impact%20pathways%20dec%202006.pdf>

Sustainable Aquaculture

Over the last two decades, aquaculture has been one of the world's most innovative and rapidly growing food sectors. It has had significant and positive effects on rural and urban food supplies and on incomes and employment in many developing economies, especially in Asia. Based on current per capita consumption targets and population growth trends, and with limits to growth in most capture fisheries, aquaculture is fêted by many as the means of satisfying the world's growing demand for aquatic food products. However, the expansion and growing internationalization of aquaculture is accompanied by increasing concern over environmental impacts, inequity and social exclusion.

The key internal factors that drive aquaculture expansion are technical development, market opportunity and investment. A pattern is emerging of expanding output, increasing competition, greater efficiency, lower production costs and stable or falling real prices. These trends must continue to enable aquaculture to meet food requirements, especially in poorer countries, but they must do so without aggravating social and environmental problems. WorldFish intends to address these issues by conducting research on how best to use aquaculture to help people escape from poverty, while avoiding unacceptable adverse impacts on biodiversity and ecological goods and services.

Achieving this goal will be no small task. FAO statistics for 2004⁴ show that aquaculture provided 43 per cent of global food fish production (106 million t). Trade in aquaculture products was worth \$US 71.5 billion, over 20 per cent higher than in 2000. There is a consensus that capture fisheries can produce little more, but the current growth rate of aquaculture production (~ 6.6 per cent/ annum) is likely to be sustainable for the next few years. Thus, by the latter half of the current decade, aquaculture will produce more than half of all fish consumed (~60 million t). In the second decade of this century, growth in global aquaculture production is likely to slow down. This will be largely because of growing competition for increasingly scarce environmental goods (resources) such as water, fishmeal and fish oil, and services (environmental capacity to disperse and assimilate wastes).

The impact of the expansion of aquaculture on poverty, biodiversity and the environmental goods and services it will consume will greatly depend on where and how aquaculture develops. Our vision is of an aquaculture sector that makes livelihoods more sustainable and resilient, creates employment, stimulates economic growth and improves the nutrition of millions of poor people.

To develop our work on sustainable aquaculture we adopted an Impact Pathway approach⁵. We used a 10-15 year time-frame to begin to address important emerging problems such as climate change, increased demand for water and changing markets. The resulting Problem Tree helped us to identify why aquaculture is not universally lifting large numbers of people out of poverty. An Objective Tree then helped us identify four high impact research interventions as MTP Projects. These are both consistent with the Center's strategy and map clearly to CGIAR System Priorities. The Projects evolve clearly from those identified in the Center's previous MTP, but have a clearer strategic rationale and make more rigorous use of the Impact Pathway approach to identify priority outputs.

The key changes we have made are to reallocate the previous MTP Pro-Poor Aquaculture Output Project 1 (2007-2009) among Projects 2 and 3, and merge Outputs 2 and 3 (2007-2009) into the present Project 1. We have also dealt more explicitly with institutional and human capacity building in Project 4 to more transparently address SP 5A. We had previously divided this between Outputs 2 and 3.

The four MTP Sustainable Aquaculture Projects are:

1. Developing an improved technological foundation for pro-poor aquaculture;
2. Improving access to input and output markets;
3. Developing an improved policy environment;
4. Building improved institutional and human capacity.

⁴ Source: FAO SOFIA (2006).

⁵ See <http://boru.pbwiki.com/f/worldfish%2C%20aquaculture%20and%20impact%20pathways%20dec%202006.pdf>

Staging our regional engagement

Our work will mainly focus on Africa, Asia and the South Pacific: Africa, because it is the continent in greatest need; Asia, because it is currently the main focus of our work and need continues to be high; and the South Pacific, because many countries in the region have high levels of poverty and few alternatives to aquatic resources for providing livelihoods. To better manage our research, we have organized ourselves into six regional portfolios, each with the responsibility for conceiving and delivering regionally and nationally focused science and for developing and maintaining relationships with regional and national investors and partners. In each region, the Center will address priority issues where concerted programs of research can inform policy and improve capacity to manage fisheries and aquaculture development. We will pursue this research in countries and sites where opportunities for impact and learning are greatest. To complement this regionally focused research we have identified focal countries where the Center will seek to engage in strategic support of national programs for fisheries and aquaculture research.

In selecting these countries, we have sought to strengthen the potential for learning that has region-wide and global value. There is a high potential for drawing lessons from research in each country where we work that are applicable to other countries. We used the following criteria to make the final selection on where we work:

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

Growth and consolidation in Africa

In sub-Saharan Africa, we have moved to consolidate our regional portfolios to match the CGIAR sub-regions of eastern and southern Africa and western and central Africa. We will manage the first of these from our regional office in Malawi and are currently exploring options for a regional office for western and central Africa. We have also opened offices in Zambia and the Democratic Republic of the Congo to pursue more intensive programs of research in these locations. Linked to these changes, the Center has also recruited more staff for its Africa program, including two more scientists in southern Africa, and two in western and central Africa. These changes reflect the directions set out in the Strategy Update and the importance we place on focusing our research on areas of greatest need and opportunity for impact.

An alliance with China

China is the world's dominant aquaculture producer, delivering 70 per cent of the world's cultured fish production. Because of this pre-eminence and the developing interest of China in the international development agenda, the 2005 WorldFish Strategy Update identified the exploring of a strategic alliance with China as a key action.

In December 2006, WorldFish and the Chinese Academy of Fishery Sciences (CAFS) signed a Memorandum of Understanding (MoU) at a formal ceremony in Beijing. Designed to strengthen collaboration between China and WorldFish, this MoU helps strengthen the partnership initiatives that are underway between the CGIAR system and China. The five-year agreement builds on long-term collaborative work between China and WorldFish, especially in developing improved strains of important farmed fish species. It seeks to promote joint research to improve the sustainability and social and economic impacts of aquaculture development and to support the Chinese government's commitment to poverty reduction through aquaculture production and sustainable livelihoods. These are priorities for both China's rural development strategy and for WorldFish. The specific outcomes of the collaboration will be:

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

Within the framework of the MoU, WorldFish has set up a project office based in FFRC in Wuxi and a coordinating office in CAFS in Beijing. Our strategic alliance promises a dynamic and productive future for aquaculture and fisheries in China and builds on the existing long and successful partnership between China and the WorldFish Center.

Improving science quality

We recognize that one of our key comparative advantages is our ability to provide high quality scientific advice and information to support development. However, as recognized in our recent EPMP, to keep that advantage we must improve our research base and increase the number of peer reviewed scientific publications we produce. A number of measures are helping us to do this.

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

Second, we have recently increased our scientific capacity by drawing on our financial reserves to invest in several new appointments at both the senior and junior levels. To manage the risk from increasing our costs, however, we have invested in new staff in a staged and focused manner to ensure that we attract commensurate increases in funding in the longer term to support our work. We will complete our investment program in 2008, but are already seeing the benefits with an increase in the number and quality of scientific publications and new research projects aligned with the Centre's campaigns. As one of our KPGs for both 2006 and 2007, we set an ambitious target of two peer reviewed publications per scientist annually. In 2006 we achieved 1.58 (up from 0.97 in 2005) and we expect to meet or exceed the target in 2007.

Finally, to complement our investments in staff, we are setting up several new mechanisms to increase research partnerships with Advanced Research Institutes (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 overall quality of the Center's research program is the responsibility of the Board. In 2006, the Board decided to abolish its Program subcommittee and to refer all key decisions and oversight responsibilities directly to the full Board. In addition, it set up a more comprehensive Scientific and Advisory Review Committee that advises the Board and management on various aspects of its research agenda. This Committee was established in late 2006. It includes external experts who will actively work with each Discipline to review existing and proposed research and then recommend changes to the Board. The Committee will hold its first meeting in August 2007.

Box 1: Research Dissemination: Key Publications

A total of 58 peer reviewed papers on aquatic fisheries and the environment were produced in 2006. Some papers were published in journals with a high impact factor (IF) rating (such as *Molecular Ecology*, IF 4.30; *Canadian Journal of Fisheries and Aquatic Sciences*, IF 1.95; *Journal of Experimental Marine Biology and Ecology*, IF 1.66; *Marine and Freshwater Research*, IF 1.48; *Aquaculture*, IF 1.37; and *Fisheries Research*, IF 1.16). A list of selected publications that highlight our work is given below:

Restocking and stock enhancement of coastal fisheries: potential, problems and progress. by Bell, J. D., et al. *Fisheries Research* 80:1-8.

Key issues in coastal fisheries in South and Southeast Asia: outcomes of a regional initiative. by Stobutzki, I., et al. *Fisheries Research* 78:109-118.

Microsatellite loci for studies on population differentiation and connectivity of the red-bellied yellow tail fusilier, *Caesio cuning* (Caesionidae). by Ablan, M. C. A. *Molecular Ecology. Primers* 6:170-172.

Nile tilapia (*Oreochromis niloticus*) seed production in irrigated rice-fields in northwest Bangladesh- an approach appropriate for poorer farmers? by Barman, B. K., and D. C. Little. *Aquaculture* 261:72-79.

Effect of varying density and water level on the spawning response of African catfish *Clarius gariepinus*: implications for seed production. by El-Naggar et al. *Aquaculture* 261:904-907.

Genetic parameters and genotype by environment interaction for body weight of *Oreochromis shiranus*. by Maluwa, A. O. B., et al. *Aquaculture* 259:47-55.

Coping with disaster: rehabilitating coastal livelihoods and communities. by Pomeroy, R., et al. *Marine Policy* 30:786-793.

Community management by decree? Lessons from Cambodia's fisheries reform. by Ratner, B. *Society and Natural Resources* 19:79-86.

Integrating agriculture, fisheries and ecosystem conservation: win-win solutions. by Sugunan, V., et al. *International Journal of Ecology and Environmental Sciences (Special Issue), Wetlands, Fisheries and Livelihoods* 32(1):3-14.

Changes to the previous Medium Term Plan (MTP)

Following the approval of the WorldFish campaigns by its BoT, this MTP sets out a more focused research agenda aligned to the campaigns for resilient small-scale fisheries and sustainable aquaculture. It emphasizes work in areas and on problems where there is a significant need, where the Center can clearly make an important contribution, and where the likelihood of impact is greatest. This sharpening of our research focus will continue to evolve in forthcoming MTPs and we anticipate that our research outputs will need further review and refinement in 2008 and 2009. However, we expect the major grouping into 4 projects within each of two campaigns to remain stable for the next 3-5 years.

Highlights of the 2008 project portfolio

The main highlight of the 2008 project portfolio is the aligning of all our outputs with the two campaigns on Resilient Small-scale Fisheries and Sustainable Aquaculture. Because we have been incrementally aligning our research to these campaign topics over the past two years, the current MTP does not represent a major change for our research. Instead, it more accurately groups our research under key issues that are relevant to the challenges for development and where the Center will focus on developing Intellectual Property Goods (IPGs).

The key outputs for 2008 include:

- a risk assessment tool box for dissemination of improved fish varieties;
- improved carp strains in China and conservation of existing wild carp genetic resources;
- methods for local production of aquaculture feed in Africa;
- identification of mechanisms for increasing access of women to the aquaculture value chains in Asia and Africa;
- a tool to identify constraints to aquaculture development at the watershed level;
- a training course on water management for inland fisheries and aquaculture;

- completion of a study on regional supply, demand and trade of fish in Southeast Asia;
- identification of opportunities and constraints for the collective management of fisheries in the lower Mekong basin;
- improved tools to support fisheries management by developing web portals on the Centre's two Global information systems (FishBase and ReefBase);
- identification of options for reducing risk and impact of HIV/AIDS through investments in small-scale fisheries in subSaharan Africa; and
- tests for the efficacy of stocking as a fishery enhancement tool in Egypt and India.

Center financial indicators

For 2008 we will meet or exceed all financial benchmarks (see Finance Plan and Financial Tables). Although we have exceeded the recommended range for minimum equity in recent years, the trend has been downward owing to a Board approved plan to reduce the reserve in 2005 and 2006. The Board has now approved plans to reduce further the Center's reserve during 2007 and 2008. It has, however, decided that it will keep the reserve at no less than 100 days of working capital.

B. The WorldFish Center Project Portfolio

Resilient small-scale fisheries campaign⁶

Project 1: Increased integration of small-scale fisheries into national and regional development policy

Background and rationale

Small scale fisheries in the developing world are diverse, numerous, 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 re-examination of the causes of poverty, recognition that SSFs are highly vulnerable and that we need new strategies to reduce poverty.

A key challenge facing SSFs is the indifference or neglect of governments. In a recent global review of 281 national policy papers, including 50 poverty reduction strategy papers, few countries included fishing communities among the target groups. Nor did they accord the fisheries sector an explicit role in poverty reduction and food security. A FAO review of national strategies in West African countries, for example, showed that small-scale fisheries were rarely or poorly considered, despite producing over one million t annually and providing livelihoods for over seven million fishers in the region.

The dynamic institutional and policy environments typical of many developing countries are in themselves a source of uncertainty and potential threat. Manipulation by elites, lack of transparency and dialogue about policy objectives, as well as limited capacity and weak influence of civil society diminish coherent policy and management of fisheries in many countries. Because SSFs mostly have a weak political constituency, the political and institutional costs of improved management will often be great. The momentum and political capital for change will most likely come from outside the fisheries sector, and examples of policy reforms opening new avenues for managing SSFs are growing.

The status of national and regional supply, demand and trade of fish and fish products are not adequately recognized in development policy and investment. Demand for fish for human consumption and fishmeal as feed for animals (including aquaculture) is growing fast. Understanding the interdependencies in opportunities and threats to national and local economies will be critical in developing policy. Changes in trade regimes, including globalization, technical barriers to trade and eco-labeling will add further layers of uncertainty.

The central challenge for SSFs is to use sound scientific evidence to provide a compelling argument for how investment in SSFs will generate tangible livelihood improvements, economic returns for national economies, and contribute to meeting national development objectives and MDGs.

Meeting these challenges will require responses at several levels. In Projects 2 and 3 we address issues from the perspective of management interventions from within the sector, and the science needed to inform and guide that process. In Project 1 we look at fisheries from the outside, from the perspective of national governments and the knowledge needed to invest in the sector more broadly. Fundamental to this perspective is an understanding of the value of SSFs to poverty alleviation, food security and national development.

⁶ Resilience is commonly defined as *the capacity of a complex system to absorb shocks while still maintaining function, and to reorganize following disturbance*. SSFs in the developing world are 'complex systems' that include both ecological and social elements. The interdependence of these elements and the need to place greater emphasis on the social aspects of fisheries and their impact on ecology is a central plank in our approach. 'Resilience' is NOT used in the older sense of 'ecosystem resilience', with people being viewed as outside the system. Using the more modern definition of resilience, the goals of management are to *prevent the fishery system (ecology + people) from moving into undesirable configurations and to nurture and preserve the elements that enable it to renew and reorganize itself following stresses and disturbance*.

The issue of valuation is particularly important in river and floodplain fisheries (e.g., Mekong, Niger, Zambezi, Logone-Chari and Ganges). These fisheries are critical to the livelihoods of poor households in remote rural areas, providing many with their only employment and income opportunity while also providing a nutritional safety net in these remote regions with limited access to markets. These fisheries are also highly vulnerable to competition for water from other sectors, especially irrigated agriculture and hydropower. As demand grows for water resources, those who depend on river fisheries need a voice in decisions on water allocation and river basin management. Many of the conclusions of the Comprehensive Assessment of Water Management in Agriculture (<http://www.iwmi.cgiar.org/Assessment/index.htm>) concentrated on the need to use water more productively and to account for the many potential uses of water, including to maintain ecosystem processes.

Goal

Increased integration of SSFs into national and regional development policy through better valuation and understanding of their role in national and regional economies.

Objectives

1. Improve knowledge of the current contribution of SSFs to the food and nutrition security and livelihoods of the poor.
2. Improve knowledge of drivers of change and likely future scenarios for contribution of SSFs.
3. Identify options for strengthening this contribution through investments in technologies, markets and institutional development.
4. Improve knowledge of regional demand, marketing and trade in fish and fish products.
5. Improve national risk assessments of fisheries and policy advice for high-risk countries, agro-ecosystems with aquaculture opportunities, and fish stocks.
6. Improve economic valuation of ecosystems, particularly wetlands and rivers, to put extractive uses of ecosystems into a better context, and provide a more complete picture of the costs and benefits of changing development policy.

Alignment with CG System Priorities

Allocation of resources to system priorities						
Project 1	Increased integration of small-scale fisheries into national and regional development policy	3C	4A	4B	4C	5D
Output 1	Policy briefs, information products and tools which promote increased understanding and valuation of SSFs in national and regional policy	20%	20%	30%	30%	
Output 2	Information products and tools for improved knowledge of contributions of water productivity and fish to food security and economic development		40%	30%	30%	

Note: See Table 1 for explanations on 3C, 4A, 4B, 4C and 5D.

Impact pathway

The starting point for Project 1 is to use a better understanding of policy processes to identify the evidence, arguments and research modalities that will influence policy. The Project is designed to have a broader impact beyond the level of individual fisheries. Improved valuation and better definitions of water productivity for inland fisheries will increase the likelihood of success at the narrower level. Output 1 approaches the issue of valuation from two perspectives: analyses of trade of fish and fish products; and development of new valuation tools. It is important to move the debate over the value of SSFs beyond a strict economic valuation to a more nuanced consideration of their contribution to diversified livelihoods (e.g., linkages between SSFs and seasonal urban migration) and to establish the dependence of SSFs on the ecosystem. Output 2 concentrates on SSFs within the broader debate of water allocation and usage. The concept of 'water productivity' must be redefined for fisheries and aquaculture. We will also address related issues of water usage in floodplains and the integration of fisheries with aquaculture and agriculture.

In Africa, we will work through the established research/policy partnerships under the New Partnership for Africa's Development (NEPAD) in order to achieve impact. The Forum for Agriculture Research (FARA) provides scientific and capacity strengthening support to national governments and their regional economic communities for agriculture development. Since 2007, this also includes fisheries, with a particular emphasis on small-scale fisheries and aquaculture. Like other CGIAR centers, the WorldFish Center will provide technical backstopping to FARA and its constituencies, particularly National Aquatic Research and Extension Systems (NARES) and their sub-regional organizations. With respect to policy impact, WorldFish is already playing a technical advisory role to NEPAD and regional economic communities (Common Market of Eastern and Southern Africa - COMESA, Southern African Development Community - SADC, and we will use this influence to promote recommendations from research on SSFs. At the same time, we are working with FARA's members to build their capacity to take on this technical advisory role in the near future.

Generation of international public goods

The outputs of Project 1 together provide an enhanced pathway to robust valuation of SSFs with particular focus on inland water systems. Direct IPGs will include working definitions critical for meaningful analysis of the value and contribution of SSFs as well as tools and broadly applicable methods for valuation studies. The Project will also deliver quantitative outputs from completed valuation studies at the watershed, national and global levels. Pathways to improved policy and decision making processes supported by comprehensive valuations will be modeled and disseminated through partner networks. This will be done in close collaboration with relevant policy and planning bodies who will take the lead in identifying areas and strategies for improvement.

Linkages and partnerships

Building the momentum and political capital for change will involve partnerships with institutions outside the fisheries sector and at various levels. An adequate, targeted investment in the sector requires the participation of development banks and the private sector. Partnerships with CGIAR centers (International Water Management Institute - IWMI, International Rice Research Institute - IRRI) that lead research on other productive uses of water are key to a better integration of inland fisheries in the wider context of the development of water resources. Partnerships with national governments and NARS will help identify interdependencies in opportunities and threats to national and local economies. The FAO and regional policy and advisory bodies are key partners in developing global and regional strategies to achieve the goal of increasing the impact of SSFs on rural development and poverty alleviation.

List of key partners and their roles		
Partner	Output	Role
ARIs: Helsinki University of Technology, Biota BD (Finland)	1,2	Research implementation and mobilization of new science; advanced training (Doctoral and Post-doctoral)
Asian Institute of Technology (AIT), WWF, Coastal Resources Institute (CORIN)	2	Training and local capacity building for wetlands management
National governments and NARS: Department of Fisheries (Cambodia); Department of Livestock and Fisheries (Lao PDR) and the Ministry of Fisheries (Vietnam); Inland Fisheries Research and Development Institute (IFRDI), Institute for Fisheries Economics and Planning (IFEP), Can Tho University, Nong Lam University	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
FAO	1	Strategy development; capacity building; research implementation; technical support for participatory planning and monitoring; fisheries management options
Foundations: Bangladesh Shrimp and Fish Foundation and Small Enterprise Development Foundation	2	MoUs developed for shared proposal development and implementation responsibility
CG centers: IWMI, IRRI and others	1	Valuation methods for integrating inland fisheries with other productive uses of water

List of key partners and their roles		
Partner	Output	Role
Regional policy and advisory bodies: NEPAD, SADC, COMESA, ECOWAS, Southeast Asian Fisheries Development Center (SEAFDEC), 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	1	Linkages with science and technical training providers; research and capacity building implementation

Project 1 MTP logframe: Increased integration of SSFs into national and regional development policy					
Outputs	Intended user	Outcome	Impact		
Output 1 <i>Policy briefs, information products and tools which promote increased understanding and valuation of SSFs in national and regional policy</i>					
Output targets 2008	A study of regional supply, demand and trade of fish in SE Asia to identify opportunities to improve poor people's market access and income completed and published	Policy officials, government agencies with responsibility for aquatic resources and rural development; NGOs that serve rural communities	Policy and management decisions respond more effectively to the interests of poor communities reliant on aquatic resources; government agencies and NGOs have the capacity to serve them effectively	Improved food security and increased incomes for aquatic resource-dependent communities in SE Asia; reduced livelihood vulnerability, particularly through measures that protect ecosystem sustainability	
	Methods for small-scale inland fisheries valuation empirically tested in at least 2 inland fisheries in sub-Saharan Africa *	NARS, Fisheries Department; local and national partners; CGIAR; ARIs	Techniques for small-scale fisheries valuation tested	Planners and policy makers better informed to promote pro-poor investments in SSFs through PRSP and other integrated planning processes	
	Fisheries policy processes at national and regional levels reviewed in lake Chad and Zambezi basin	Policy officials, government agencies with responsibility for aquatic resources and rural development	As above	Improved food security and increased incomes for aquatic resource-dependent communities in Nigeria, Cameroon, Niger, Zambia and Malawi; reduced livelihood vulnerability	
	Revised estimates of global catch and participation in SSFs published	World Bank; FAO; donors; national policyakers	Small-scale fisheries valued more appropriately	Small-scale fisheries have a higher profile in national and international policy	
2009	Analysis of contribution of river fisheries to rural and urban livelihoods in Democratic Republic of Congo, Lake Chad and Zambezi basin completed	NARS and governmental agencies; international research and development organizations; NGOs engaged in natural resource management	Opportunities for strengthening the water policy processes with high quality information on the value of fisheries	Improved food security and increased incomes for aquatic resource-dependent communities in Nigeria, Cameroon, Niger, Zambia, DRC and Malawi; reduced livelihood vulnerability, particularly through measures that protect ecosystem sustainability	
	Estimates of participation and role of women and children in SSFs in at least five countries	As above	Policy and management decisions respond more effectively to the interests of women and children; government agencies and NGOs have the capacity to serve them effectively	Improved food security; increased incomes and reduced livelihood vulnerability for women and children	

	Outputs	Intended user	Outcome	Impact
2010	Completion of a comprehensive overview of regional fish trade in sub-Saharan Africa with detailed case studies on key trading areas	Fish processors, communities; resource managers; government officials	Improved understanding of patterns and trends in the supply and demand of fish	Improved income and livelihoods
	Analysis of costs and opportunities for increased income and livelihood from improved marketing and post-harvest processing in SE Asia.	Fish processors; communities; resource managers; government officials	Improved markets and profitability from fisheries	Improved income and livelihoods
Output 2 <i>Information products and tools for improved knowledge of the contribution of water productivity and fish to food security and economic development</i>				
Output targets 2008	Improved definition of 'water productivity' for capture fisheries developed and published (global)*	ARIs; NARS; policy makers and donors	Improved understanding and valuation of inland capture fisheries	Greater integration of fisheries into water allocation and other development decisions
	Improved and refined community-based approaches to managing resources developed in Bangladesh for wider application, to a wider range of users, including other sectors	Water body users and national policy makers	Improved management of aquatic resources	Higher yields from ecologically sustainable inland fisheries benefiting many poor fishers and community members
	Opportunities and constraints for collective management of fisheries in seasonal floodplains in the lower Mekong basin identified and reported	Water body users; community fisheries management bodies; NGOs; national policy makers	Improved management and management outcomes at test sites	Higher yields from ecologically sustainable inland fisheries benefiting poor fishers and community members
	A study of water productivity in culture based floodplain fisheries in Bangladesh, Vietnam, Cambodia and China completed *	NARS; government agencies; investors	Improved valuation techniques and better valuation of contribution of these fisheries to local and national economies	Better integration of these fisheries into policy; improved sustainability
	Policy briefs on contribution of fisheries and aquaculture to water productivity in Zambezi basin developed and discussed with policy makers	SADC Water Division; Zambezi Commission; SADC Water Dialogue; Fisheries Departments	Improved understanding among policy makers of value of SSFs and of their policy requirements	Better integration of SSFs into basin-wide policies and investment planning processes
	2009	Social, economic, and ecological trade offs in uses of water and wetlands at local and basin scales in the lower Mekong basin analyzed; governance options identified and reported	National line agencies; regional advisory bodies; NGOs; researchers; provincial, district and commune planning units	Productivity, equity and sustainability considerations relating to fisheries, agriculture and water management explicitly considered in national planning.

	Outputs	Intended user	Outcome	Impact
2009	Community-based management models for Bangladesh inland fisheries scaled up and extended to the coastal communities	Government, donors; coastal communities	Adjustment of the CBFM model to suit coastal communities	Livelihood benefits for some early adopters; model under development
	Validated participatory decision making tool developed integrating water, agriculture and fisheries aspects and interactions for floodplain fisheries in the lower Mekong basin.	National line agencies; NGOs; researchers; provincial, district and commune planning units	Productivity, equity and sustainability considerations relating to fisheries, agriculture and water management explicitly considered in local and national planning processes	Improved combined land and water productivity (including fisheries) that better reflects local needs and priorities
2010	Tools developed to assess the value of ecosystem goods and services from fisheries in three river basins (global)	Governments; national agencies; basin organizations; NARS; 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 for aquatic ecosystems is based more closely on the values of ecosystem goods and services
	Briefings to government agencies on how the fishery sector can be integrated into national water management strategy for Bangladesh	Relevant Ministries; development planners	Integrated strategy developed for overall improved management of the land and water interface to sustainably increase productivity	Strategy incorporated into new policy development process for ultimately improving combined land and water productivity (including fisheries)
	Tools developed to determine the water requirements for maintaining fisheries in at least three river basins	Governments; national agencies; basin organizations; NARS; others in target basins	Decisions on water allocation informed on the basis of requirements of aquatic ecosystems and the services they provide	Water allocation for other uses is more in tune with the needs of aquatic ecosystems and fisheries
	Briefings to government agencies on how the Fishery sector can be integrated into national water management strategy for Bangladesh	Relevant Ministries and development planners	Integrated strategy developed for overall improved management of the land and water interface to sustainably increase productivity.	Strategy incorporated into new policy development process for ultimately improving combined land and water productivity (including fisheries).
	Tools developed to determine the water requirements for maintaining fisheries in at least three river basins	Governments, national agencies, basin organizations, NARS and others in target basins.	Decisions on water allocation informed on the basis of requirements of aquatic ecosystems and the services they provide.	Water allocation for other uses is more in tune with the needs of aquatic ecosystems and fisheries.

* This output target will be met largely through the Centre's involvement in the CPWF.

Project 2: Integrated assessment and advisory systems for small-scale fisheries management

Background and rationale

The rise of ecosystem concepts in evaluating the sustainability of fisheries has made an already data- and expertise-hungry process even more complex. Internalizing these concepts within the prevailing research and management paradigm has proved to be difficult: the capacity of science to develop ever more complex abstractions of ecosystems under exploitation and to predict their behaviour has reached a tipping point. It is implausible to promise model-based ecosystem sustainability advice for SSFs in the developing world. Management through interventions such as sanctuaries and marine reserves may also be problematic in the face of poor communities living in societies in which the rule of law is weak. More fundamentally, much scientific advice has concentrated on biophysical processes. When uncertainty in implementation and extra-sectoral influences in society (e.g., HIV/AIDS, climate change) and the economy are incorporated, it is clear that fundamental changes in the nature and content of fisheries management advice are required.

In-depth analyses of the vulnerability of fishery systems are needed to better target future investments in mitigation and adaptation. These analyses need to combine assessments of the risk that different ecosystems will be impacted by climate change, and the capacity of fisheries and their dependent communities to adapt to such impacts. Such analyses, including both descriptions and interpretation, will provide the foundation for innovation in management and governance.

Several recent studies of fishing communities have provided global assessments of vulnerability. To build on this foundation, we need to assess vulnerabilities and adaptability of fishing households to determine policy options at smaller spatial scales – those of national jurisdictions, river basins, upwelling systems and regional organizations. These analyses will guide strategic adaptations at each level.

The profound threat posed by climate change to ecosystems and livelihoods has changed the research-for-development agenda. Climate change must be viewed as a fundamental threat to human security in developing countries already vulnerable to social and economic dislocation and conflict. When viewed through this lens, the links between environment, national security, development and human rights become clearer. Framing global change as a human security issue opens the door to many different questions, including those about power, equity, and justice. It also greatly increases the chances of the political engagement necessary to transform societies. Fisheries are already being affected by altered water regimes, but the climate change discourse has had little impact on fisheries policy. There are many reasons for this, e.g., climate change may be seen as just another threat in the already crowded crisis narrative that pervades fisheries. In this Project we begin our engagement with climate change as a threat to SSFs. The issue will have greater prominence in future MTPs as the research agenda is developed.

Goal

Develop and test new methods for the integrated assessment of SSFs in the developing world.

Objectives

1. Develop and improve methods and knowledge for integrated assessment of SSFs that move beyond traditional forms of stock assessment to set SSFs in the broader ecological, social, and economic context, focusing on threats to effective management and benefit delivery.
2. Develop generic vulnerability indices and metrics for comparative analyses of fishery systems.
3. Improve decision-support tools for stakeholders and policy makers, particularly concerning environmental flows and water allocation in large river basins.
4. Improve knowledge of vulnerability at the regional, national and sub-national levels. Outputs will include interpreted maps of vulnerability.
5. Improve knowledge of how fishing communities perceive risk and vulnerability, and their response to that vulnerability in the face of external factors.
6. Increase understanding of the current and potential role of fish in addressing micro-nutrient deficiency and in supporting strategies to reduce the impact of HIV and AIDS.

Alignment with CG System Priorities

Allocation of resources to system priorities						
Project 2	Integrated assessment and advisory systems for SSFs management	3C	4A	4B	4C	5D
Output 1	Improved methods for integrated assessment of SSFs	40%	30%	20%	10%	
Output 2	Information and policy options to address the vulnerabilities of fishery-dependent people to external drivers and shocks	40%	10%	20%	10%	20%

Note: See Table 1 for explanations on 3C, 4A, 4B, 4C and 5D.

Impact pathway

In this project we concentrate on fisheries from the perspective of stakeholders and participants – from within the domain of the fishery. From this perspective, assessment and advice for management will concentrate on identifying and prioritizing threats and opportunities within the fishery, and also those from the external environment (broadly defined to include the natural environment as well as societal and economic processes). A distinction between the two is useful because the former are to a greater or lesser extent under the influence of participants in the fishery while the latter are not. Examples of drivers outside the fishery include climate change, globalization of markets, war, and disease. Assessing the relative importance of internal and external drivers is a critical part of the assessment process and there are not currently good tools to do so.

Research will focus on both methods for comparative analysis among fisheries and on tools for assessment for individual fisheries. These methods and analyses, when set within the broader landscape provided by Project 1, provide the necessary basis for managing fisheries, but are not sufficient in their own right. Output 1 focuses on methods for assessment – gathering existing methods into a toolbox and filling gaps with new methods where needed. The second output looks outward to the external environment and assessment of the vulnerabilities of people.

Generation of international public goods

The effort to mainstream adaptive management for resilience outcomes in SSF policy can only progress once these concepts are presented in the form of accessible, ground-truthed tools. The IPG from this project consists of a broad adaptive management framework and a set of tools that feed directly in to its application. These tools facilitate identification of the vulnerability context of fisheries, defining pathways to reduced vulnerability, and providing the feedback systems necessary for effective adaptive management. Case studies in the application of these systems will provide valuable lessons for the scaling-up and scaling-out of this approach, and will form the basis of future training materials.

This project is supported by two global information systems: FishBase – a database of almost 30,000 species of fish and their habitats; and ReefBase – 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 International Public Goods. Continued development of these databases is critical for the provision of information on species and ecosystem status. FishBase will develop new interfaces on resources management and biodiversity conservation. ReefBase will develop comprehensive information pages on critical management issues such as climate change, over-fishing and livelihood options targeted at policy makers and resource managers.

Linkages and partnerships

Key partners to this project are those that provide the technical and decision support competency needed for analysis of production and ecosystem variables that are of importance to SSFs. Partners who can facilitate dissemination of results as well as influence national and regional fisheries policies in favour of sustainable resource exploitation will also be targeted. Research implementation and mobilization of new science at global and regional scales are provided by FAO and ARIs. Regional Economic Communities and advisory bodies coordinate and advise policy development. NARS, NGOs and universities are key partners to implementing research for development and providing national and local capacity building.

List of key partners and their roles		
Partners	Output	Role
ARIs	1, 2	Research implementation and mobilization of new science; advanced training
FAO	1, 2	Collaborate in development of small-scale fisheries management tools; institutionalizing those tools; capacity development and agenda setting
National Governments and NARS: Bureau of Fisheries and Aquatic Resources (Philippines); Philippines Bureau of Agricultural Research; Department of Fisheries (Cambodia); Ministry of Marine Affairs and Fisheries (Indonesia); Solomon Islands Ministry of Fisheries & Marine Resources	1, 2	Strategy development; capacity building; research implementation; Technical support for participatory planning and monitoring; fisheries management options
NGOs	1, 2	Linkages with science and technical training providers; research and capacity building implementation
Regional Economic Communities and advisory bodies: NEPAD (SADC, ECA, ECOWAS); Secretariat of the Pacific Community (Aquaculture Section)	1, 2	Policy development; science support on regional issues; capacity building
Syah Kuala University (UNSYIAH), Indonesia	2	Collaborative implementation of project activities; identification of project sites; Liaison with coastal communities in Aceh
Tonle Sap Biosphere Reserve Secretariat	1	Intersectoral coordination
University of the Philippines Marine Science Institute	1	Liaison with coastal communities selected for sea ranching and restocking of sandfish. Hatchery production of sandfish and field experiments to improve survival of sandfish released in the wild

Project 2 MTP logframe: Integrated assessment and advisory systems for SSFs management				
Outputs		Intended user	Outcome	Impact
Output 1				
<i>Improved methods for integrated assessment of small-scale fisheries</i>				
Output targets 2008	Framework for integrated assessment of SSFs developed and disseminated (global)	FAO; fisheries managers in national agencies; NGOs	Improved fisheries management	Reduced vulnerability in fishery-dependent communities and progress toward the MDGs
	Conceptual basis for new indicators of socio-ecological sustainability of SSFs developed and published (global)	As above	As above	As above
	Methodology for rapid assessment of fish consumption and potential yield assessment developed in lower Mekong basin and disseminated	FAO, MRC, SEAFDEC -fisheries managers and researchers in national and regional agencies; Universities; NGOs	Improved assessments of consumption, contribution of fisheries to livelihoods and yields for SSFs.	Reduced vulnerability in fishery-dependent communities and progress toward the MDGs
	Enhanced FishBase and ReefBase tools to support fisheries management through web portal on SSFs; MPA planning; biodiversity mapping (global)	Fisheries researchers; managers and extension workers in government departments; research agencies, NGOs in developing countries	Fisheries managers and researchers use FishBase and ReefBase to obtain information which contributes to more effective decision making and fisheries and aquaculture policies	Fisheries and aquaculture are more productive and efficient, while also being ecologically sustainable

	Outputs	Intended user	Outcome	Impact
2008	Tool kit of geospatial analysis methods developed for aquatic resource assessment (global)	ARIs; NARS; national agencies	Improved integration of aquatic resources into land-based productive sectors	Greater water productivity and integration of fisheries into rural economies
	Decision support tools clarifying trade-offs between alternative development scenarios in the lower Mekong basin refined and tested	Mekong River Commission; National Mekong Committees; national line agencies; provincial and local authorities; NGOs	Agencies that influence resource management decisions better equipped to consider the ecosystem requirements for food production	Ecosystem services of rivers, floodplains, coastal and estuarine systems protected for the benefit of the rural poor
2009	National databases and coral reef decision support systems established in at least three countries in the Pacific region	Coral reef managers; researchers; NGOs in Asia and the western Pacific	Key stakeholders make better use of existing data and information from their region within status reports, management plans and policy briefs	Reefs in Pacific region are more effectively managed because of enhanced capacity of managers
	Enhanced FishBase and ReefBase tools to support fisheries management through improved coral reef mapping products, expanded coverage of freshwater species, including marine invertebrates (global)	Fisheries researchers; managers and extension workers in government departments; research agencies; NGOs in developing countries	Fisheries managers and researchers to obtain information that contributes to more effective decision making and fisheries and aquaculture policies	Fisheries and aquaculture are more productive and efficient while also being ecologically sustainable
	Develop a web interface within FishBase to assess the risk of establishment of introduced species, particularly those imported for the aquarium trade (global)	National agencies for biodiversity conservation; trade companies; local producers	Increased awareness of the risk associated with introduced species	Reduced risk of introduced species
2010	A typology of SSFs developed and used to guide management interventions in a range of institutional and ecological settings (global)	As above	As above	As above
	Enhanced FishBase and ReefBase tools to support fisheries management through expanded SSFs portal; development of INCOFISH, a database for marine invertebrate species (global)	Fisheries researchers; managers and extension workers in government departments; research agencies; NGOs in developing countries	Fisheries managers and researchers use FishBase and ReefBase to obtain information that contributes to more effective decision making and fisheries and aquaculture policies	Fisheries and aquaculture are more productive and efficient while also being ecologically sustainable

	Outputs	Intended user	Outcome	Impact
Output 2 <i>Information and policy options to address the vulnerability of fishery-dependent peoples to external forces and shocks</i>				
Output targets 2008	Policies and guidelines developed for community level rehabilitation of tsunami affected SSFs in Aceh and Solomon Islands	National agencies in Indonesia and Solomon Islands	Policies and guidelines for rehabilitation of tsunami affected SSFs taken up by into local and national governments	More effective rehabilitation of fisheries livelihoods
	Options for reducing risk and impact of HIV/AIDS through economic investments in SSFs in sub-Saharan Africa identified, documented and disseminated	NGOs; fishing communities; private sector; fisheries departments; donors	Investment options in key economic areas affecting HIV/AIDS vulnerability of fishing communities available	Improved capacity among fisheries stakeholders to manage impact of HIV/AIDS in the sector
	Assessment and applications tools developed for environment protection and effects of climate change on fisheries in Bangladesh	UNDP; MoEF; MOFL; BCAS; 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; process of evaluating changes integrated into the planning and investment framework
	Impacts of alternative scenarios of environmental and market changes on production, consumption and income in SE Asia analysed	Government agencies; regional bodies; researchers	Better understanding of likely impacts of markets and environmental shocks	Reduced vulnerability and improved likelihood of adaptation
2009	Impact of coral bleaching on reef fisheries analyzed; advice on adaptation disseminated (global)	Coral reef fisheries researchers and managers	Fisheries managers adapt policy and regulations to minimize impacts of coral bleaching	Reduced vulnerability and improved adaptive capacity of fishery-dependent communities
	Economic vulnerability indices and metrics for comparative analyses of fishery systems developed and applied in lake Chad and Zambezi basin	NARS and government agencies; international research and development organizations; NGOs engaged in natural resource management issues	Policy and management decisions respond more effectively to the interests of poor communities reliant on aquatic resources; government agencies and NGOs have the capacity to serve them effectively	Improved food security and increased incomes for aquatic resource-dependent communities in Nigeria, Cameroon, Niger, Zambia and Malawi; reduced livelihood vulnerability
	National risk assessments of vulnerability to HIV/AIDS and potential for investment in Malawi, Mozambique and Zambia	NARS; government agencies; NGOs engaged in management of natural resources	Improve knowledge of the risk factors National strategic responses to HIV/AIDS linked to wider sustainable support processes available at local levels	Improved capacity at national and local level to manage impact of HIV/AIDS in the sector
2010	Analysis of local-scale impacts of alternative climate change scenarios on fisheries and fishery-dependent communities, including measures taken to mitigate impacts such as water harvesting and infrastructure development completed in at least one river basin	National line agencies; provincial and local authorities; NGOs who support them	Agencies that influence resource management decisions better equipped to consider likely vulnerability	Policies developed and implemented to increase adaptive capacity of fishery dependent communities

	Outputs	Intended user	Outcome	Impact
2010	Analysis of local-scale impacts of alternative development scenarios with particular reference to dams and other built structure on fisheries and fishery-dependent people completed in at least one river basin	As above	As above	As above
	Comparative analysis of the environmental drivers of sustainability of inland fisheries in sub-Saharan Africa completed and disseminated	NARS; government agencies; international research and development organizations; NGOs engaged in natural resource management issues	Policy and management decisions respond more effectively to the interests of poor communities reliant on aquatic resources	Improved food security and increased incomes for aquatic resource-dependent communities
	Comparative analysis of the environmental drivers of sustainability of inland fisheries in sub-Saharan Africa completed and disseminated	NARS and government agencies; international research and development organizations and NGOs engaged in natural resource management issues	Policy and management decisions respond more effectively to the interests of poor communities reliant on aquatic resources	Improved food security and increased incomes for aquatic resource-dependent communities

Note: MoEF - Ministry of Environment and Forests, MoFL - Ministry of Fisheries and Livestock , BCAS - Bangladesh Centre of Advanced Studies.

Project 3: Improved management and governance of small-scale fisheries

Background and rationale

Fisheries management has largely failed to strengthen the resilience of fishery systems and provide sustainable livelihoods for the millions of people dependent on SSFs in the developing world. Inappropriate management, weak property rights, inability to control fishing capacity, poor governance and other causes have conspired to block these fisheries from achieving their potential. To improve management of these fisheries needs a radical rethink of established theory, approaches, definitions of sustainability, and indicators of management performance. Concepts, methods and sustainability indicators produced through this Project will catalyze a fundamental change in SSFs management in the developing world.

A major impediment to resilient SSFs in the developing world is the inability of fishers to secure and exercise rights and responsibilities over fisheries resources. This has many dimensions, including a mismatch between the scales at which power is exercised and the scales over which ecosystems function, lack of enabling legislation, poor implementation, and the politicization of management at all levels. Conflicts arising from contested or inappropriate rights regimes and larger institutional and governance issues profoundly affect the sustainability of fisheries and the livelihoods of millions. Methods to manage and resolve conflict will be an important part of any management tool kit.

In defining the social and ecological boundaries of a fishery, participants and analysts need to consider the capacity that stakeholders have or need to develop to engage effectively. Sometimes this may point to a need to develop new institutional connections, for example, linking changes in upstream land use and water management to efforts at maintaining downstream fisheries productivity. In other instances, an institutional ideal such as regulating access through genuine co-management in which government and community share powers and decision making may not be feasible or have social transaction costs that are too high. In such cases, simpler management interventions may be better.

Traditionally, management has concentrated on the fishery itself, even though this may present relatively weak levers for change. In conventional fisheries management practice, goals often focus on biological indicators, such as stock levels of target species or maintaining overall production, with little direct attention to the social mechanisms of distribution of benefits or the degrees of representation and accountability in the system. Lastly, being clear about the link between management interventions and desired outcomes calls for a detailed appreciation of the context in which a particular fishery operates. Given the high degree of uncertainty in SSFs in the developing world, adaptive management in its simplest form of 'learning by doing' offers the best route to sustainability.

Goal

Refine existing methods and develop and test new management concepts and approaches to the management of SSFs.

Objectives

1. Develop new management concepts and approaches that provide incentives to both mitigate risk and adapt under changing scenarios, particularly external shocks.
2. Operationalize concepts such as 'resilience' and 'adaptation' and build a foundation of experience based research to facilitate universal lessons.
3. Strengthen governance and social institutions outside the fishery sector to provide an enabling environment that provides incentives for building resilience.
4. Reduce dependence on SSFs by analyzing and testing livelihood diversification options. Of particular importance will be integrating aquaculture development with SSFs management. Assessment of livelihood options, such as aquaculture, will be essential to building adaptive capacity in fishing communities.

Alignment with CG System Priorities

Allocation of resources to system priorities						
Project 3	Improved management and governance of SSFs	3C	4A	4B	4C	5D
Output 1	Lessons learned from diverse management approaches for SSFs documented and translated into policy advice to reform and scale up successful approaches	20%	30%	20%	10%	20%
Output 2	Efficacy of alternative types of management intervention tested in a range of ecological and social settings	30%	30%	20%	10%	10%
Output 3	Improved analysis of the rights and livelihood interests of small-scale fishing households in development policy outside the sector	70%		20%	10%	

Note: See Table 1 for explanations on 3C, 4A, 4B, 4C and 5D.

Impact pathway

The context provided by Project 1 and the tools developed and tested in Project 2 provide the foundation for fisheries management. Such management may take many forms and prescriptions about the nature of the institutions needed for management (e.g., the form and strength of co-management institutions) are difficult. Output 1 focuses on tapping the diversity of SSFs and drawing lessons and Output 2 develops and tests alternative forms of adaptive management for SSFs in partnership with NARS and other institutions. Research under this MTP Output will be largely field-based and participatory. Output 3 places management of individual fisheries within a broader context of rights and livelihood options.

Generation of international public goods

WorldFish is uniquely positioned to provide a global level synthesis of lessons learned from the application of fisheries and environmental management systems in developing countries. The supporting data systems constitute IPG and will be developed, populated and promoted through existing and evolving research and stakeholder networks. The lessons learned from these analyses feed directly into the process of developing and refining new management systems and tools for broad applications globally. Lessons from case studies in the application of management interventions will be synthesized and distributed through scientific literature and existing partner networks.

Linkages and partnerships

The key partners to this project operate in an interdisciplinary context, focusing on the development of adaptive management of SSFs at scales defining the social and ecological boundaries of a fishery.

List of key partners and their roles		
Partners	Output	Role
ARIs	3	Research implementation and mobilization of new science; advanced training
Asian Institute of Technology (AIT); WWF; Coastal Resources Institute (CORIN)	2	Training and local capacity building for wetlands management
NARS: Department of Fisheries (Cambodia); Department of Livestock and Fisheries (Lao PDR); Ministry of Fisheries (Vietnam); Inland Fisheries Research and Development Institute, Cambodia (IFReDI); Institute for Fisheries Economics and Planning (IFEP), Can Tho University, Nong Lam University; Solomon Islands Ministry of Fisheries & Marine Resources	2	Policy design and implementation; strategy development; capacity building; research implementation; technical support for participatory planning and monitoring; fisheries management options
FAO	1, 2, 3	Collaborate in development of SSFs management tools; institutionalize those tools; capacity development; agenda setting

List of key partners and their roles		
Partners	Output	Role
IWMI	3	Help develop appropriate valuation methodologies for integrating inland fisheries with other productive uses of water
Mekong River Commission; National Mekong Committees	2	Transboundary resource management advice and decision making
NGOs: Oxfam America; Global Organization for People and the Environment (Canada); Fisheries Action Coalition Team	1,2,3	Research and civil society advocacy for policy reform; extension of research results
Regional economic communities and advisory bodies: NEPAD, SADC, ECA, ECOWAS; Secretariat of the Pacific Community (Aquaculture Section); Southeast Asian Fisheries Development Center (SEAFDEC),	1, 2	Policy development; science support on regional issues; capacity building
Ministry of Marine Affairs and Fisheries (Indonesia)	1	Liaison with various partner institutes in Indonesia; identification of research priorities in Indonesia ; collaborative implementation of project activities
Secretariat of the Pacific Community (Aquaculture Section)	2	Collaborative role in selecting mini-projects; support, review mini-project proposals; oversee mini-project execution and reporting
Solomon Islands Department of National Planning and Aid Co-ordination	1, 2	Increased capacity to attract investors for sustainable livelihoods in the fisheries sector

Project 3 MTP logframe: Improved management and governance of SSFs				
	Outputs	Intended user	Outcome	Impact
Output 1				
<i>Lessons learned from diverse management approaches for SSFs documented and translated into policy advice to reform and scale up successful approaches</i>				
Output targets 2008	Participatory methods for developing agreed sustainability indicators for SSFs tested in at least three fisheries in Solomon Islands, Indonesia, sub-Saharan Africa	Fishing communities; researchers; NGOs and other extension agencies; national agencies	More appropriate and durable indicators developed and implemented in SSFs	Greater prospect of sustainable fisheries
	Analysis of management options for improved governance of Bay of Bengal (Bangladesh) fisheries completed	Donors; MoFL	Improved strategy for fisheries management and approaches to implement existing and reformed policies	Options available to reduce negative impacts of over capacity and unregulated exploitation
	Lessons learned from supporting local stakeholders in conducting assessments of management plans for community fisheries in several sites in the lower Mekong basin documented and shared	Commune, provincial and national planners and policy makers	Improved policy, line agency, research and NGO support to local management planning, monitoring and evaluation	Local management plans for community fisheries in the lower Mekong basin assessed
	Global knowledge base on the ecological, social and economic attributes of SSFs developed and tested in 20 fisheries (global)	FAO; NARS; ARIs; World Bank	System for extracting lessons from the diversity of SSFs developed	Improved capacity to design appropriate management interventions

	Outputs	Intended user	Outcome	Impact
2009	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 within the context of integrated river basin management	Policies, plans and management processes for shared river fisheries enhanced; river fisheries production increased
	Measures required to restore indigenous carp stocks in Halda river, Bangladesh identified	MoFL, local implementing agencies	Approach developed for preservation of the last remaining natural stocks of 'genetically pure' Indian major carps	Program in place to improve livelihoods of existing poor fishers and quality stock available to aquaculture industry
	Global critical synthesis of Global Environment Facility (GEF) funded coral reef management studies completed and lessons published	GEF; donors, regional advisory bodies	Good and bad practice in coral reef management studies identified and lessons disseminated	More effective project implementation and greater outcomes from coral reef management research
2010	Global synthesis of lessons learned in SSFs management and governance based on analysis of at least 200 fisheries published	FAO; NARS; ARIs; World Bank	System for extracting lessons from the diversity of SSFs implemented	Improved capacity to design appropriate management interventions
	Meta-analysis of the effectiveness of marine protected areas as a fisheries management tool completed (global)	Regional bodies; national agencies; researchers	Better understanding of the social and ecological contexts in which MPAs are successful	Improved fisheries management and livelihoods for coastal communities
Output 2				
<i>Efficacy of alternative types of management intervention tested in a range of ecological and social settings</i>				
Output targets 2008	Efficacy of stocking as a fishery enhancement tool tested in Egypt and India	NARS; fishing communities; rural development NGOs; government agencies	Improved capacity amongst scientists and planners to assess potential and options for stocking	Improved income of fishing communities and production in freshwater fisheries through realistic investments in restocking
2009	Models for assessing the potential and options for restocking of collapsed fisheries in the Pacific region and sub-Saharan Africa developed and disseminated	NARS; ARIs; CGIAR	Improved capacity amongst scientists and planners to assess potential and options for restocking	Improved management of freshwater fisheries through realistic investments in restocking
	Co-management systems developed for managing culture-based fisheries in selected reservoirs in Ganges, Nile and Volta basins	Fishery co-operative societies; government agencies	Improved governance of culture based fisheries under a co-management regime demonstrated in the three basins	Enhanced participation of stakeholders in decision making process and equitable distribution of benefits from the fisheries
	Institutional mechanisms for integrating fish and crop production developed and disseminated in the Ganges and Mekong basins	Governments; national agencies; basin organizations; NARS; 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
	Efficacy of alternative local approaches to fisheries and wetlands management assessed and compared in lake Tana, Ethiopia and the Mekong region.	Community fishery organizations; local government; line agencies	Successful approaches recognized and supported by national agencies	Improved sustainability and productivity for the benefit of poor households

	Outputs	Intended user	Outcome	Impact
2009	Opportunities for livelihood diversification as a means of reducing pressure on wild fisheries assessed in the Solomon Islands and Cambodia	As above	As above	As above
2010	Guidelines for Adaptive Management in SSFs in the developing world incorporated in national and regional fisheries development in the Pacific, Mekong and sub-Saharan Africa regions	As above	As above	As above
	Assessments of role of closed areas (e.g., sanctuaries) and impediments to their functioning taken up by national line agencies and incorporated in policy change in Malawi and the Mekong river basin	As above	As above	As above
Output 3 <i>Improved analysis of the rights and livelihood interests of small-scale fishing households in development policy outside the sector</i>				
Output targets 2008	Analysis and advice given to national governments and regional bodies on how inland fisheries can be incorporated into national and regional policies and actions on food security in southern Africa	Regional Economic Communities (SADC, ECOWAS, COMESA, ECCAS); national governments	Improved national and regional level policies and actions that promote and support the contribution of inland fisheries to food security	Enhanced national and regional level policies and actions on food security through incorporation of inland fisheries.
	Review of human rights as a fundamental objective and entry point to fisheries management published (global)	FAO; ARIs; World Bank; donors; NARS	Knowledge shared among key collaborators and stakeholders on SSFs management and governance	Improved effectiveness and reach of programs to reform management of SSFs
2009	Global symposium on rights-based management in SSFs	As above	As above	As above
	Analysis of the distribution of benefits among participants in enhanced floodplain fisheries in Bangladesh, Mekong and China	Resource managers; researchers; policy makers	Greater understanding of inequities in distribution of benefits among participants	Greater equity in distribution of benefits from enhanced fisheries
2010	Demonstration that WorldFish collaboration has produced a measurable impact on policy or project decisions for upstream water resource development	As above	As above	As above
	An analysis of the distribution of benefits among participants in enhanced floodplain fisheries in Bangladesh, Mekong and China	Resource managers, researchers, and policy makers	Greater understanding of inequities in distribution of benefits among participants	Greater equity in distribution of benefits from enhanced fisheries
2010	Demonstration that WorldFish collaboration has produced a measurable impact on policy or project decisions for upstream water resource development	As above	As above	As above

Project 4: Building institutional capacity for adaptive learning

Background and rationale

Although there are biophysical technical fixes to some aspects of the SSFs management problem, reduced vulnerability and improved adaptive capacity will come from changed behavior. Institutions and individuals must “learn to learn” and evolve as threats and opportunities present themselves. The literature suggests that institutions are critical in both increasing and reducing vulnerability, adaptability and resilience. In the developing world, vulnerability is increased by rigid power structures that limit social learning. Often lessons are learnt at the local level with no transfer to the scale at which governments operate. Literacy, access to finance, security of entitlements, health, etc., all impinge on the ability and incentives for individuals to learn and adapt. Some fishery systems will learn and adapt while others will not. There will probably be common attributes in those that do survive and prosper.

Many lessons may be learned from the failure of fisheries management. The issue is how to capture those lessons. Few of the critical lessons are recorded, synthesized and presented in a timely way to the people who need them – fishery managers. Conventional methods of creating and exchanging knowledge of this type will not reach the right people in the right time frame. As part of a larger FAO led initiative, WorldFish will participate in a web-based knowledge network to support fisheries management (FIMNET). FIMNET is designed to improve the capacity and performance of fisheries management decision-support systems through: (i) improvement of accessibility, dissemination and exchange of existing (explicit) knowledge; (ii) mobilization of implicit (tacit) knowledge and generation of new knowledge, e.g., on emerging issues; (iii) improvement of fisheries management implementation (structures, processes); and (iv) improvement of advocacy and communication. WorldFish will concentrate on issues surrounding SSFs in the developing world.

Our strategy for achieving impact rests on the belief that better information and analysis alone do not change policies, reorient institutions or alter decision making in natural resource management. Research must be undertaken through appropriate partnerships to legitimize the advisory and decision making processes, and to build capacity for independent assessment and advice. Outputs have been designed in close cooperation with research partners and in direct response to needs articulated by the intended users.

Goal

Within broader networks, fulfill capacity development needs at the individual, institutional, sector and enabling environment levels.

Objectives

1. Improve national research and policy making capacity to better capitalize on indigenous skills for adaptation.
2. Improve investment and policy development by nurturing and developing regional networks.
3. Improve regional training and capacity building by identifying regional centers of excellence and building their capacity to serve these functions.
4. Improve knowledge of how innovations in fisheries management scale out by analyzing networks and pathways for technology transfer and social learning.
5. Improve impact pathway and network analysis methodologies that focus on identifying and prioritizing researchable constraints and maximizing development impact from research.

Alignment with CG System Priorities

Allocation of resources to system priorities						
Project 4	Building institutional capacity for adaptive learning	3C	4A	4B	4C	5D
Output 1	Coordination and training to promote national research and policy capacity to better capitalize on indigenous skills for adaptation	40%	20%	20%	10%	10%
Output 2	Regional and national policy and advisory bodies strengthened	40%	30%	30%		
Output 3	Learning networks and processes to quantify impacts formalized	40%	10%	10%	20%	20%

Note: See Table 1 for explanations on 3C, 4A, 4B, 4C and 5D.

Impact pathway

Our strategy for achieving impact rests on the belief that better information and analysis alone do not change policies, reorient institutions, or alter decision-making in natural resource management. Research must be undertaken through appropriate partnerships to legitimize the advisory and decision-making processes, and to build capacity for independent assessment and advice.

Outputs in this project are a mix of 'supply' and 'demand'. This mix satisfies the Center's place in the research-for-development chain – it creates new knowledge, it catalyzes and brokers knowledge, and it promotes learning and implementation among others. Demand-driven outputs have been designed in close cooperation with research partners and in direct response to need articulated by intended users. Outputs 1 and 2 respond to demand for training for both individuals and agencies (Output 1) and to strengthen and nurture national and regional networks to create, exchange and disseminate knowledge among different scales from people to governments (Output 2). The WorldFish Center is active in many regional policy and advisory networks (e.g. NEPAD, SEAFDEC, Wetlands Alliance, SPC) as well as research networks and alliances (e.g. CAPRI, IWMI-WorldFish and CPWF).

Output 3 is about the process of learning (how to make it faster and to reach further) and measuring impacts of research. In this Output we follow the lead taken by the CPWF and other institutions. An important attribute of this Output will be a focus on the uptake of critical syntheses of lessons learnt from field-based action research studies.

Generation of international public goods

Building institutional capacity with national and regional partners is central to the campaign to reform SSF management. Institutional capacity will be enhanced through active participation and support of regional, national and international research networks, initiating and participating in information exchange forums, and a strong emphasis on the inclusion of national partners in research initiatives. Training materials in assessment and management interventions with broad application globally will be developed and disseminated through formal and informal training opportunities.

Linkages and partnerships

This project aims to improve the institutional capacity of adaptive learning through regional networks linking a range of partners such as NEPAD, SEAFDEC, wetlands alliance, and others. Within the context of the Challenge Program on Water and Food (CPWF), WorldFish has adopted jointly with other CGIAR centers the impact pathway methodology as a scientific framework for evaluation and outreach (scaling out & up) of the interventions developed in its projects, to assess their potential impact across scales. The method aims to translate lessons learned into desirable development outcomes along impact pathways.

List of key partners and their roles		
Partner	Output	Role
Universities: Asian Institute of Technology (AIT); Chinese Academy of Fisheries Science; Coastal Resources Institute (CORIN)	1	Training and local capacity building
NARS: Departments and Ministries of Fisheries and Environment (Solomon Islands, Indonesia, Bangladesh, Philippines, Lao PDR, Vietnam, Cambodia)	1, 2	Identification of research priorities and coordination; collaborative implementation of project activities; identification of research priorities
IWMI	1, 3	CPWF secretariat
Mekong River Commission; national Mekong Committees	1, 2, 3	Trans-boundary resource management advice and decision making
Ministry of Marine Affairs and Fisheries (Indonesia)	2	Liaison with various partner institutes in Indonesia; identification of research priorities in Indonesia ; collaborative implementation of the project activities

List of key partners and their roles		
Partner	Output	Role
Regional advisory bodies: NEPAD; Secretariat of the Pacific Community; Southeast Asian Fisheries Development Center (SEAFDEC),	1	Development of regional initiatives; implementation of science and capacity building components
NGOs: Oxfam America; Global Organization for People and the Environment (Canada); Fisheries Action Coalition Team; WWF	1	Research and civil society advocacy for policy reform; extension of research results
FAO	2	Advisory role to national policy and management decision making; regional convening and norm-setting roles
Syiah Kuala University (UNSYIAH), Indonesia	2	Collaborative implementation of project activities; identification of project sites; liaison with coastal communities in Aceh

Project 4 MTP logframe: Building institutional capacity for adaptive learning				
Outputs		Intended user	Outcome	Impact
Output 1 <i>Coordination and training to promote national research and policy capacity to better capitalize on indigenous skills for adaptation</i>				
Output targets 2008	Fisheries agency staff trained in a range of skills in at least two of the following countries: the Solomon Islands, Cambodia, Malawi, Zambia, Egypt.	National research and management agencies	Greater individual and agency capacity for independent analysis and policy development	Improved fisheries management and greater sustainability
	Major international symposium on SSFs convened in collaboration with FAO (global)	Researchers; World Bank; FAO; donors; national policy makers	SSFs valued more appropriately	SSFs have a higher profile in national and international policy
2009	Training course in geospatial analysis for aquatic resource management developed and completed (global)	National researchers and policy makers	Better integration of scale and spatial issues into management	Improved water productivity and utilization of fisheries resources
	Water productivity curricula and training materials to serve CPWF capacity building needs developed and disseminated (global) *	Researchers; policy makers; trainers; universities	Increased water productivity	Increased food production and reductions in poverty
	FIMNET developed and in widespread usage among SSFs managers (global)	Fisheries managers and researchers in the developing world	Greater creation and exchange of formal and informal knowledge on fisheries management	More effective management and greater sustainability
2010	Training manuals and courses on integrated assessment and management of SSFs in the developing world developed and disseminated (global)	As above	As above	As above

	Outputs	Intended user	Outcome	Impact
Output 2 <i>Regional and national policy and advisory bodies strengthened</i>				
Output targets 2008	Regional networks and advisory bodies supported to synthesize and exchange lessons relating to management approaches and stakeholder roles (Mekong basin, SE Asia, southern Africa).	As above	As above	As above
	Technical support provided to research associations in eastern Africa (ASARECA) and southern Africa (SADC) to develop a regional research and capacity strengthening agenda for SSFs	FARA; NARES	Regional SSFs research agendas articulated and integrated in mainstream agriculture research for development planning	Enhanced coordination and funding of SSFs research in eastern and southern Africa
2009	Civil Society groups supported to make stronger contributions to resource management planning in the Solomon Islands	Local NGOs; coastal communities	Effective dispersion of natural resource management process and practices throughout the Solomon Islands	Greater participation and ownership of regional and national planning policies and decisions
	Regional networks and advisory bodies supported to synthesize and exchange lessons relating to management approaches and stakeholder roles (Mekong basin, SE Asia, southern Africa).	As above	As above	As above
	At least one collaborative initiative among scientists and managers developed which promotes the implementation of a country specific policy in SE Asia	Scientists and managers; policy makers; donors	Sustained partnership among members of East and South East Asia (ESEA) to foster improved developmental capacity building activities	Improved capacity of scientists and managers leading to improved aquatic resources management
2010	Regional networks and advisory bodies supported to synthesize and exchange lessons relating to management approaches and stakeholder roles (Mekong basin, SE Asia, southern Africa).	As above	As above	As above

	Outputs	Intended user	Outcome	Impact
Output 3 <i>Learning networks and processes to quantify impacts formalized</i>				
Output targets 2008	Completion of a workshop with CPWF Basin Focal Projects to analyze impact pathways for fisheries interventions in Theme 3 and in focal basins*	CPWF; NARS; national research agencies	More focused interventions from a better understanding of impact pathways	Better integration of fisheries into water allocation decisions and development policy
2009	Impacts of CBFM approaches in coastal area on reducing fishing pressure assessed and potential AIGA activities identified in Bangladesh.	MoFL; local implementing agencies	Institutionalization of pro-poor policies and institutions to support coastal resources management	Refined CBFM approaches to improve community resource management strategies for enhanced livelihoods
	Areas for scaling out of impacts determined <i>ex ante</i> in target basins within the CPWF*	Policy makers; government agencies with responsibility for aquatic resources and rural development	Sites most likely to offer the potential for successful adoption of T3 research products and services	Better contribution of aquatic ecosystems to food security and livelihoods
2010	CPWF Theme 3 project interventions / results scaled up and scaled out in target basins*	Scientists and managers; policy makers; donors	Up scaled and out scaled improvements to water allocation for aquatic ecosystems and their services	As above

* This output target will be met largely through the Centre's involvement in the CPWF.

Sustainable aquaculture campaign

Project 5: Improving the technological foundation for sustainable aquaculture

Background and rationale

The farming of aquatic organisms, particularly those that feed low in the food web, is among the most ecologically sound means of producing food. These foods occupy a uniquely important place in a nutritionally balanced human diet while at the same time relieving pressures on increasingly over exploited wild resources. Extractive forms of aquaculture, such as seaweed and mollusks, also provide environmental services by acting as net removers of nutrients from the environment. Other types of aquaculture, particularly the farming of top predators, place heavy demands on environmental goods and services and can never become the mainstay of global aquatic food production. Because of aquaculture's intimate connections with the wider aquatic environment, badly planned or managed aquaculture can also have unacceptable impacts on aquatic ecosystems.

Aquaculture must be implemented in an environmentally sound manner in order to have the greatest sustainable impact on poverty. Technologies that consume scarce resources (e.g., fishmeal) or discharge large volumes of waste per unit production may exacerbate poverty by consuming environmental goods and services upon which the poor are particularly dependent (clean water or low value fish, for example). Many technologies, however, promote better use of resources and reduce demands on environmental services through increasing water and land productivity and by improving recycling of on-farm wastes. The choice of technology also has implications for on-farm labor demand, impact on women and children, and consequences for education and health. The choice of technology determines the affordability and nutritional value of the farmed products, thereby enhancing incomes of those who adopt aquaculture and benefiting consumers. Provided they are developed in collaboration with stakeholders, aquaculture technologies can also help build resilient livelihoods.

Goal

Increase water productivity, increase farmer resilience and improve food security through the development of sustainable aquaculture technologies.

Objectives

1. Improve IAA technologies to increase water productivity, increase the use of on-farm wastes and foster livelihoods resilient to external shocks such as debt and climate change.
2. Develop and disseminate quality seed of key aquaculture species and to conserve genetic resources in anticipation of future needs.
3. Develop and disseminate improved feeds that minimize demands on environmental goods and services and also produce nutritionally sound fish.

Alignment with CG System Priorities

Allocation of resources to system priorities										
Project 5	Improving the technological foundation for Aquaculture for Development	1D	2D	3C	4A	4B	5A	5B	5C	5D
Output 1	Technologies developed to increase water productivity and use of on-farm wastes and foster livelihoods resilient to external shocks			70%	20%	10%				
Output 2	Technologies established to develop and disseminate quality seed for key aquaculture species, and to conserve genetic resources in anticipation of future needs	20%	50%	30%						
Output 3	Methodologies for the local production of aqua-feeds developed and used to produce locally sourced feeds in Asia and Africa			70%	20%	10%				

Note: See Table 1 for explanations on 1D, 2D, 3C, 4A, 4B, 5A, 5B, 5C and 5D.

Impact pathway

Aquaculture cannot help substantial numbers of poor people escape from poverty unless farmers adopt technologies appropriate to their agro-ecosystems to produce nutritious and affordable foods and earn profits. Technologies often exist but are unknown to producers, ARIs and others who support them. In other instances, technologies must be developed or refined, but there has been insufficient investment because of a general failure to understand their potential impact on poverty. For example, pond aquaculture technologies can help water conservation and wise use on farms by harvesting rainwater during the rainy season and producing a crop of fish and then using the nutrient enriched pond water to irrigate crops during the dry season. Similarly, it may be a better use of limited on-farm resources to use agricultural wastes to produce a crop of fish and to then use the organically rich pond mud as fertilizer. However, demands on on-farm labor and its consequences for the education and health of the household members – particularly female – must be considered. Securing investment to develop pond aquaculture technologies, therefore, requires better, more comprehensive valuation tools. It also requires that the market context (what species at what size in what form and when) be understood. WorldFish is conducting research to address these issues in contrasting agro-ecological zones in South and Southeast Asia and sub-Saharan Africa.

Research by WorldFish and others has shown that experiments on breeding selections for growth can result in faster growth and improved productivity over several generations of tilapias and other species. Conversely, our research has also shown that poor management of hatchery stocks can result in depression of economically important traits when compared to those in wild founding stocks. Because of this, we will continue to give high priority to developing and managing genetically improved strains of farmed aquatic animals. This means we will continue to work with partners to identify desirable traits specific to species in different agro-ecosystems (e.g., cold tolerance, delayed maturity, docility). We will also seek to help our partners develop their own genetic improvement programs.

Although our recent research has demonstrated attractive economic returns to investment in genetic improvement, adoption remains hampered by lack of investment, technical know how and appropriate seed distribution systems. Output 2 sets out to address this. The majority of the genetic diversity of important farmed aquatic species, such as tilapias and carps, remains in the wild. Therefore, in promoting the development of genetically improved strains, we will also carry out complementary research to identify and conserve genetic diversity of key farmed aquatic species where resources allow.

Increasing production per unit of water and land use requires intensified production methods and greater reliance on fertilizers and feeds. We still have much to learn about the design and use of feeds in pond aquaculture to maximize economic returns. In attempting to produce more environmentally friendly feeds (e.g., locally produced plant based feeds that minimize use of scarce resources such as fishmeal and fish oil) there may be impacts on water use as well as implications for animal welfare and the nutritional quality of the intensively produced farmed aquatic product. We must address these issues if aquaculture is to have a substantial impact on poverty and food security.

In summary, this Project aims to develop and promote aquaculture technologies that address the livelihood aspirations of farmers and are environmentally sound. This means that they will minimize consumption of water, encourage recycling of waste materials, minimize wastes and increase water and land productivity. The technologies must also be profitable by producing products that the market wants and can afford. Achieving these aims will help create sustainable livelihoods, generate employment and improve food security.

Generation of international public goods

The outputs of Project 5 complement one another by focusing on the three main elements of sustainable aquaculture technologies: aquaculture systems; genetically improved seed; and fertilizer and feed. Although we are developing specific technologies for each country (e.g., Malawi, Cameroon, Bangladesh), our outputs have a broader application. The conditions prevailing in the agro-ecosystems and socioeconomic circumstances of the countries we have chosen to work in are similar in many others. While the development of genetically improved seed is driven by specific stakeholder requirements, our research to date indicates that investment in IPGs such as GIFT provide a fast track means to establishing a founding stock upon which subsequent genetic improvements can be built locally. We are also increasingly focusing our efforts on investigating how best to support genetic improvement initiatives of others rather than developing the

genetically improved products itself. To conserve aquatic genetic diversity, most of which still resides in the wild, we will act as a catalyst or partner for research with the FAO and others to develop and promote risk assessment procedures. Although our research efforts to develop feeds is relatively small and focused on three countries (Malaysia, Egypt, Malawi), we will use the results for wider debate and policy development on how to sustainably intensify aquaculture production.

Linkages and partnerships

Developing and sustaining uptake of aquaculture technologies by farmers, hatchery and feed mill operators, and SMEs requires a wide range of skills. While some of the necessary skills exist within WorldFish, many others are better sourced in NARES, other CG Centers (especially IWMI, ILRI, IFPRI), ARIs and NGOs. To effectively scale up and out from Project results to maximize development impact requires effective dissemination of key results and a degree of advocacy. These are roles that the FAO and other UN organizations, national and international NGOs and producer organizations are often better placed to play.

List of key partners and their roles		
Partner	Output	Role
UK universities: University of Stirling; University of East Anglia	1, 3	Development of policy brief on aquaculture development and sustainable livelihoods in West Africa; impact of aquaculture intensification on human nutrition (Stirling)
FAO	1, 2	Development and dissemination of policy brief on aquaculture development and sustainable livelihoods in West Africa; conservation and genetic improvement of farmed aquatic plants and animals
IWMI	1	Development and application of water productivity concepts for aquaculture and their incorporation into valuation tools
CPWF BFPs	1	Development and application of water productivity concepts for aquaculture and their incorporation into valuation tools
University of Wageningen, Netherlands	1,2	Dissemination of water productivity concepts for aquaculture; genetic improvement of Nile tilapia
FAO	2	Assistance in formulating and championing Codes of Conduct, Codes of Practice and Risk Assessment protocols in support of aquaculture development
Indian Council for Agricultural Research	2	Genetic improvement of giant freshwater prawn
Malaysian Agricultural Research and Development Institute	2	Co-design and implement breeding programs for genetic improvement of giant freshwater prawn, red tilapia and GIFT
Departments of Fisheries: Indonesia, Vietnam, Philippines (BFAR)	2	Development of improved fish strains by national breeding programs
Chinese Center for Agricultural Policy; Chinese Academy of Fisheries Science	2	Improved genetic strains of common carp
HAKI, Hungary	2	Conservation of common carp genetic resources, China
INGA	2	Dissemination of information on conservation and development of farmed aquatic animal resources
Farmers organizations; women's groups and others associated with and dependent upon small-scale aquaculture	2	Dissemination of information on conservation and development of farmed aquatic animal resources
University of Minnesota, USA	2	Risk assessment of GIFT and other genetically improved fish strains
University of Notre Dame, USA	2	Impacts of alien <i>O. niloticus</i> on indigenous stocks of <i>O. andersoni</i> in Zambezi basin
Department of Fisheries, Zambia	2	Impacts of alien <i>O. niloticus</i> on indigenous stocks of <i>O. andersoni</i> in Zambezi basin
Department of Fisheries, Malawi	2	Development of genetically improved strains of tilapia

Partner	Output	Role
University of Bergen, Norway	2	Technical inputs into design of genetic improvement programs for tilapia, Malawi
FARA	2	Promotion of risk assessment tool box through SCARDA or BASIC program
ILRI	2	Genetic analysis of wild tilapias
PRIMEX, Philippines	3	Co-development of production and feeding strategies for poor fish farmers
University of Guelph, Canada	3	Co-development of production and feeding strategies for poor fish farmers
American Soybean Association; Egyptian Fish Council	3	Provision of soybean diets and support to test fishmeal and fish oil free tilapia diets
Indiana Soy Bean Board; University of Malawi, Bunda College	3	Provision of soybean diets and development of cost-effective, plant based fish feed
Universiti Sains, Penang, Malaysia	3	Development of feeds based on local plant materials
IFPRI	3	Impact of intensification of aquaculture production methods on human nutrition
PCAMRD and NFRI, Philippines	3	Promote marine fish hatchery technology among small-scale producers
Hellenic Center for Marine Research, Greece	3	Develop marine fish hatchery technology, particularly in terms of diets that increase survival of larval-fingerling stages.
Center for Marine Sciences, Algarve, Portugal	3	Develop marine fish hatchery technology, particularly in terms of diets for flatfish that increase survival of larval-fingerling stages.
CIRAD, France	3	Develop marine fish hatchery technology, particularly in relation to feeding systems for larval fishes
Akvaplan-NIVA, Norway	3	Develop and promote marine fish hatchery technology and management practices among small-scale producers that increase fish survival and economic viability

Project 5 MTP logframe: Improving the technological foundation for Aquaculture for Development				
Outputs		Intended user	Outcome	Impact
Output 1				
<i>Technologies to increase water productivity and use of on-farm wastes and foster livelihoods resilient to external shocks</i>				
Output targets 2008	Aquaculture-specific water productivity methodology developed and disseminated*	Planners; donors (CPWF partners).	Aquaculture more widely adopted as a high value crop alternative	Livelihoods of farmers improved; food security enhanced
	Risk Assessment toolbox for dissemination of improved seed developed	FAO; NARES; ARIs; private sector; NGOs	Aquatic animal biodiversity conserved	As above
2009	Tool for assessing recycling of on-farm wastes tested at project level	As above	Aquaculture more widely considered as a high value crop alternative	As above
2010	Aquaculture incorporated into guidance on watershed management	Planners; donors	Aquaculture more widely adopted as part of sustainable livelihood	As above
	Aquaculture technologies that improve resilience to climate change developed	As above	As above	As above

	Outputs	Intended user	Outcome	Impact
Output 2 <i>Technologies established to develop and disseminate quality seed for key aquaculture species and to conserve genetic resources in anticipation of future needs</i>				
Output targets 2008	Development of breeding programs for genetically improved fish supported in Asia (China, India, Malaysia, Vietnam) and Africa (Egypt, Ghana, Malawi)	NARES; ARIs; private sector; NGOs	Farmers adopt new aquaculture technologies	As above
	Development of improved carp strains (China, India)	As above	As above	As above
2009	Development of breeding programs for genetically improved fish supported in Asia (Bangladesh, Sri Lanka, Thailand) and Africa (Egypt, Ghana, Malawi)	As above	As above	As above
	Conservation strategies for economically important carps in China developed; guidelines developed for application in other countries	FAO; NARES; ARIs; policy makers; private sector; NGOs	Carp biodiversity conserved	As above
2010	Development of breeding programs for genetically improved fish supported in Asia (Sri Lanka) and Africa (Nigeria)	NARES, ARIs, private sector; NGOs	Farmers adopt new aquaculture technologies	As above
	Methodology for genetic improvement of giant freshwater prawn developed (India; Asia)	As above	As above	As above
	Partnerships to develop, maintain and disseminate genetically improved African catfish developed	As above	As above	As above
	Marine finfish hatchery technology developed and promoted (Philippines, Indonesia)	As above	As above	As above
Output 3 <i>Established methodologies for the local production of aqua-feeds developed and used to produce locally sourced feeds in Asia and Africa</i>				
Output targets 2008	Methodologies for the local production of aqua-feeds developed in Egypt and Malawi	As above	As above	As above
2009	Methodologies for the local production of aqua-feeds developed in Malaysia	As above	Methodologies used to produce locally sourced feeds in Asia	As above
2010	A study on implications of use of plant based aqua-feeds on human nutrition completed and disseminated	Policy makers; feed manufacturers; scientists; farmers	As above	As above

* This output target will be met largely though the Centre's involvement in the CPWF.

Project 6: Improving access to input and output markets

Background and rationale

The lack of access to input markets – to credit, quality seed and feed - universally limits aquaculture development, especially among small-scale farmers and Small-Medium Enterprises (SMEs) in South Asia and sub-Saharan Africa. We need research to better understand these market dynamics so that we can foster environments that support and enable aquaculture investment and development. Specifically, we need research to determine how best to facilitate access to credit and to quality seed and feeds. Constraints to aquaculture fulfilling its potential to help people escape from poverty are as much the result of lack of investment and inefficient and ineffective private/public sector interactions as of technological impediments.

The lack of access to output markets at the local, national, regional and global levels can be a constraint on production and, therefore, limit investment in aquaculture by farmers and others. We also need research to identify how to make markets for aquaculture products work for the poor, including how traceability and certification could impact on poor producers and consumers.

Goal

Connect producers to inputs and markets through the identification and promotion of more effective and sustainable marketing mechanisms.

Objectives

1. Increase knowledge of market environments to help guide policy and investment.
2. Improve enabling market environments to support and foster aquaculture investment.
3. Better understand the role and identify the further potential for Public Private Partnerships (PPPs) to address key constraints to aquaculture development.

Alignment with CG System Priorities

Allocation of resources to system priorities										
Project 6	Improving access to markets	1D	2D	3C	4A	4B	5A	5B	5C	5D
Output 1	Market environments analyzed			80%				20%		
Output 2	Description of enabling market environments that support pro-poor aquaculture investment fostered			80%				20%		
Output 3	The role of PPPs in addressing key constraints to aquaculture development identified			80%				20%		

Note: See Table 1 for explanations on 1D, 2D, 3C, 4A, 4B, 5A, 5B, 5C and 5D.

Impact pathway

The uptake of aquaculture can help build resilient livelihoods by increasing supplies of nutritious food for home consumption and barter or sale within the community. However, research shows that sustained uptake of aquaculture and significant impact on poverty and food security are largely dependent upon strong access to inputs (water, credit, seed and feed) and to broader markets for the produce.

Poor valuation methods for water can restrict access by those wishing to adopt aquaculture. Traditional valuation methods, for example, often exclude the fact that water held in farm ponds to produce fish can be reused for other purposes, especially during times of water shortage. Indeed, water from fish ponds may have added value through the addition of nutrients. Poor farmers or those wishing to adopt cage aquaculture often lack water rights. Access to quality seed, fertilizers and feed essential to increase productivity and profitability may be limited because of poorly developed feed and hatchery sectors or because of lack of access to credit. The roles of the private and public sectors and of civil society in addressing these constraints are often not clearly defined. In particular, PPP mechanisms offer a potentially useful approach that exploits the strengths of both public and private sectors to the benefit of all.

The costs of supporting the sustained uptake of aquaculture are strongly influenced by access to markets in which farmers can readily trade aquaculture produce. Peri-urban aquaculture-related businesses, such as backyard hatcheries, small-scale seed producers and fish growers, are often more readily able to find markets for their goods than their rural counterparts, especially in low population density sub-Saharan Africa. Research is also needed to determine how best to facilitate the access of women to the aquaculture value chain. As farmed production of food fish grows to exceed that from capture fisheries (it already does so in many countries, especially in Southeast Asia) a number of challenges will emerge. How, for example, does one minimize the adverse effects on producers of seasonal gluts in regions with a limited growing season? Domestic and international consumers are increasing demands for certification and traceability to ensure that food is produced in the way they wish and that it is safe. We need research to understand how this will affect the ability of the poor to benefit from aquaculture development.

Generation of international public goods

Research into how to facilitate access of small farmers and SMEs to input and output markets must be conducted at a range of geographic levels. Lessons applicable to a broad range of stakeholders will then be synthesized and disseminated to donors, policy makers, NGOs and private sector institutions in order to both scale up and scale out the lessons learned. The comparative advantages of various PPP arrangements in addressing constraints will be highlighted in various WorldFish publications, including a Policy Brief, as well as through workshops.

Linkages and partnerships

To increase access to input and output markets, a combination of research, advocacy and implementation is required. We will continue to collaborate with a wide range of local and international partners (NARES, IFPRI, ARIs, NGOs, FAO, UNDP) to conduct primary research in most of the Project outputs. While some of the necessary skills exist within WorldFish, many others are better sourced in NARES, other CG Centers (especially IWMI, ILRI), ARIs and NGOs. To effectively scale up and out from project results to maximize development impact requires effective dissemination of key results and a degree of advocacy, roles that the FAO and other UN organizations, national and international NGOs and producer organizations are often better placed to play.

List of key partners and their roles		
Partner	Output	Role
GAFRD, Egypt	1	Collaborators on collection of farmed fish market data and their analysis
UK universities: University of Portsmouth; Imperial College	1	Market survey research on farmed tilapias, Egypt
Departments of Fisheries: Bangladesh, Cameroon, China and Malawi	1	Design tools, collect data and pilot recommendation domain tools
German universities: University of Hoenheim; University of Kassel	1	Design tools, collect data and pilot recommendation domain tools
Shrimp Foundation, Bangladesh	1, 3	Increasing access of women to shrimp value chain; Implementing quality assurance scheme among small-scale producers
BetterWorld Together Foundation, USA	1,3	Increasing access of small-scale farmers to market based credit and technical support services, Malawi
Department of Fisheries, Cameroon	1, 2	Support to small-scale peri-urban catfish producers
DFID	2	Synthesis and dissemination of lessons learned on small-scale aquaculture development, West Africa
Caritas, Bangladesh	2	Development of aquaculture among Adibashi tribal people, north and northwest Bangladesh
Ministry of Agriculture, Bangladesh	2, 3	Partner
Project Concern International, USA	3	Improvement and commercialization of pond-raised fish in Malawi via market based credit and technical support systems
Chemonics, USA	3	Bangladesh shrimp export promotion via certification and traceability

Project 6 MTP logframe: Improving access to input and output markets				
	Outputs	Intended user	Outcome	Impact
Output 1				
<i>Analysis of market environments</i>				
Output targets 2008	Value chain structure and competitiveness of small scale farmers and SMEs determined (Egypt)	Farmers; planners; policy people	Intensification of aquaculture production methods by small-scale producers	More profitable businesses producing more affordable high value food
	Input and output market information incorporated into the recommendation domains decision support tool	Planners; extension agents	More successful aquaculture development projects	Increased impacts on poverty and food security
	Mechanisms for increasing access of women to the aquaculture value chain (Bangladesh, shrimp; Cameroon, catfish) identified	Planners; NGOs; development professionals	Increased involvement of women in the value chain. Tools to address empowerment issues in aquaculture	Increased income and security for women through aquaculture participation
2009	Costs of supporting aquaculture development in different market environments (Cameroon) determined and general lessons disseminated	Donors; planners	Optimum use of resources to support aquaculture development	As above
2010	International markets for small-scale aquaculture producers made to work in one country (Bangladesh)	Small-scale producers	Access to international markets for small-scale producers	As above
Output 2				
<i>Description of enabling market environments that support pro-poor aquaculture investment</i>				
Output targets 2008	Economic returns on investment in genetically improved seed development determined	Public and private sectors	Increased investment in genetic improvement of farmed aquatic animals	As above
2009	Mechanisms to connect socially marginalized groups of aquaculture producers to input and output markets (Bangladesh) determined	Small-scale producers	Access to international markets for small-scale producers	As above
	Small-scale farmers connected to input and output markets and business development services providers	As above	Access to local urban markets for small-scale producers	As above
2010	Market preferences used to inform aquaculture production and processing systems in one country (Bangladesh)	Small-scale producers; NGOs; producer organizations	Increased, sustained uptake of aquaculture by small producers	As above
Output 3				
<i>The role of PPPs in addressing key constraints to aquaculture development identified</i>				
Output targets 2008	Policy Brief on use of PPPs in aquaculture development developed and disseminated	Research and development specialists; NGOs; governments; donors	Increased quality feed and seed production and availability	As above
2009	Participation of small-scale shrimp producers in quality assurance scheme assessed (Bangladesh)	Farmers; NGOs; exporters	Making international markets work for the poor	Sustainable production of export commodities by small-scale producers
2010	One PPP scheme to increase provision of seed or feed developed for implementation	Public and private sectors; farmers	Increased supply of quality seed or feed	Increased food security and decrease poverty

Project 7: Developing improved policy environments

Background and rationale

Poor people often have the resources and skills to use aquaculture to help lift them out of poverty. However, there can also be barriers to the poor becoming involved in the aquaculture value chain. These include poor education and health, access to resources and to input (e.g. credit) and output markets, lack of technological knowledge and management skills, poor technical support, a poor enabling environment and political and social constraints. A better understanding of potential, constraints and risks and of the policy and institutional contexts at national and regional levels is essential if aquaculture is to significantly impact on poverty.

Research is urgently needed into how to develop policies that secure sustainable and equitable benefits from aquaculture at watershed and coastal zone scales. Planning, monitoring and enforcement of regulations is essential to manage the rapidly increasing exploitation of public resources such as lakes and coastal areas for cage farming without unacceptably impacting on the provision of environmental goods and services. Aquaculture is relatively new in many parts of the world and the sector may be administered by either the Fisheries or Agriculture Department or some awkward combination of the two. Conflicting policies and lack of resources and expertise are common and often act as disincentives to potential investment. Country and region-specific research and stakeholder engagement is needed to determine how to streamline and harmonize policies and regulations and to determine the respective roles of the public and private sectors and civil society in creating enabling environments for aquaculture (especially the development and provision of quality seed and feeds).

Goal

With partners and stakeholders develop a sound understanding of the range of policies and the roles of the various implementing agencies and institutions required to create an enabling environment for aquaculture, provide access to information and facilitate dialogue among stakeholders.

Objectives

1. To improve understanding of the development potential, constraints and risks at national and regional levels;
2. To increase knowledge in key national, regional and international policy arenas of the policy and institutional contexts that facilitate sustainable aquaculture development;
3. To improve and increase adoption of integrated watershed and coastal zone management approaches to aquaculture development in key policy arenas.

Alignment with CG System Priorities

Allocation of resources to system priorities										
Project 7	Developing improved policy environments	1D	2D	3C	4A	4B	5A	5B	5C	5D
Output 1	Development potential, constraints and risks at national and regional levels identified	10%					20%	30%	20%	20%
Output 2	Policy and institutional contexts that facilitate sustainable aquaculture development determined and communicated in key national, regional and international policy arenas	10%					20%	20%	20%	30%
Output 3	Integrated watershed and coastal zone management approaches to aquaculture developed for uptake in key policy arenas				30%	20%	10%		20%	20%

Note: See Table 1 for explanations on 1D, 2D, 3C, 4A, 4B, 5A, 5B, 5C and 5D.

Impact pathway

For aquaculture to significantly reduce poverty requires not only adoption of the appropriate technology but also an enabling environment and efficient markets. While the latter to some extent depends upon transporting fish, which is a perishable commodity; it is also determined by demographics and good marketing institutions. We need research at local, national and regional level to determine where the constraints are and how they can be tackled.

Developing an enabling environment is contingent upon a good understanding of policy requirements to stimulate sustainable Aquaculture. An integrated, enabling policy environment will only develop if there is the political will to do so and if all stakeholders are involved in the policy development process. Efforts to harmonize policies are most likely to occur if policy makers are convinced that aquaculture can be an important engine for economic growth. This in turn requires, not only solid evidence generated through research, but also well planned and adequately resourced efforts to scale up and out research results. Policy development mechanisms that are responsive to private sector and civil society concerns should be encouraged as they will help ensure that there is a continuing consensus supporting the process.

Over-expansion of aquaculture, evident now in some parts of Southeast Asia, makes unsustainable demands on environmental goods and services, with the poor proving most vulnerable. To have a sustainable and substantial impact on poverty, aquaculture must be integrated with other economic activities and with conservation objectives at watershed and coastal zone levels. This requires a sound understanding of aquaculture – aquatic ecosystem interactions. To sustain aquatic ecosystems for food security and livelihoods it is important to develop policies that assess and manage the risks in the following areas: intensification of production (demands for feed, disease, self-pollution); translocation of species and genetically improved strains (loss of biodiversity); promoting cage aquaculture (over-consumption of environmental services); and developing aquaculture in environments vulnerable to climate change.

Generation of international public goods

This project will provide:

- an improved understanding of what constitutes an enabling environment for Aquaculture for Development;
- increased institutional capacity to support the development of national/regional sector planning;
- tools for adoption of ecosystem and watershed/ coastal zone management-based approaches to aquaculture development developed;
- tools to evaluate climate change impacts on and the promotion of policies that encourage uptake of aquaculture where it can increase the resilience of small-scale farmers developed;
- risk assessment and management toolkit for countries wishing to import or develop genetically improved aquatic animal strains.

All of these goods will be applicable to stakeholders in multiple countries and regions.

Linkages and partnerships

WorldFish has worked with NEPAD to develop an action plan for aquaculture which will be implemented as part of The Comprehensive Africa Agricultural Development (CAADP) and the associated national and regional mechanisms in order to help promote the development of policies that foster Sustainable Aquaculture. The WorldFish Center will work with both private and public sectors to develop these policies.

List of key partners and their roles		
Partner	Output	Role
NEPAD; CAADP	1	Development of regional aquaculture strategy and action plan for promotion of Aquaculture for Development
FAO	1	Develop guidance on sector planning for Aquaculture for Development
BFAR (Philippines); Ministry of Agriculture (Egypt)	1	Development of sector plans for Aquaculture for Development

Partner	Output	Role
University of Stirling, UK	1	Development of guidance on sector planning for Aquaculture for Development
Department of Fisheries, Malawi	1	Develop mechanisms for genetically improved seed distribution
Private sector hatchery producers, Malawi and Zambia	1	Implement brood stock management plans and seed distribution systems
PCAMRD and NFRI, Philippines	1	Promote marine fish hatchery technology among small-scale producers
Hellenic Center for Marine Research, Greece	1	Develop marine fish hatchery technology
Center for Marine Sciences, Algarve, Portugal	1	Develop marine fish hatchery technology
CIRAD, France	1	Develop marine fish hatchery technology
Akvaplan-NIVA, Norway	1	Develop and promote marine fish hatchery technology among small-scale producers
INGA	2	Promote lessons learned about institutional role in seed development and dissemination
Egyptian International Center for Agriculture; Egyptian Fish Council; Central Laboratory for Aquaculture Research, Ministry of Irrigation, Egypt	2, 3	Help determine role of private and public sectors in seed development and dissemination strategies; development of cage aquaculture development guidelines
Fayoum Fish Farming Association and Kafr El Sheikh Fish Farming Cooperative Society, Egypt	2, 3	Help determine roles of private and public sectors in seed development and dissemination strategies; development of cage aquaculture development guidelines
Arab Organization for Agriculture Development	2	Promote lessons learned about institutional role in seed development and dissemination
NARES in Bangladesh and Vietnam	2	Help establish institutional and community roles in establishing water allocation rights
Chinese Academy of Fisheries Science	2	Community based management of floodplain aquaculture
DoF, Bangladesh	2	Help establish institutional and community roles in establishing water allocation rights
Universities of Kassel and Hohenheim, Germany	3	Design tools, collect data and pilot recommendation domain tools
Network of Aquaculture Centers for Asia, Thailand	3	Construction and management of a European and Asian network for environmental management of aquaculture

Partner	Output	Role
Akvaplan-niva, Norway	3	Management of environmental management network
Scottish Association of Marine Sciences, UK	3	Development and collation of environmental management materials
Institute of Biology, University of Southern Denmark	3	Development and collation of environmental management materials
University of Crete, Greece	3	Development and collation of environmental management materials
University of Waterloo, Canada	3	Determination of environmental impacts and development of monitoring plans for cage aquaculture developments, lake Malawi
Press Corporation	3	Implementation of cage aquaculture management plan, lake Malawi

Project 7 MTP logframe: Developing improved policy environments

Outputs		Intended user	Outcome	Impact
Output 1				
<i>Development potential, constraints and risks at the national and regional levels identified</i>				
Output targets 2009	Dissemination of improved strains of fish seed in Malawi implemented	National government; hatchery producers	Increased production and productivity	As above
2010	Barriers to adoption of cage aquaculture by the poor identified	National governments; NGOs; development specialists	Development of equitable cage aquaculture development policies	As above
	Impacts on poverty of adoption of marine fish hatchery technology (Philippines) determined	Small-scale hatchery producers; farmers	Increased seed availability	As above
Output 2				
<i>Policy and institutional contexts that facilitate sustainable aquaculture development determined and communicated in key national, regional and international policy arenas</i>				
Output targets 2008	Institutional approaches to dissemination of improved strains and fish seed assessed in three countries (China, Malaysia, India); regional lessons distilled	Private and public sectors; development professionals	Increased distribution of genetically improved strains of aquatic animals	As above
2009	Community-based approaches to aquaculture in common property (irrigation systems, floodplains) developed in Bangladesh and Vietnam	NARES; farmers; NGOs	Sustainable increases in Aquaculture for Development production	As above
	Institutional mechanisms developed for community management of rice-fish culture in the seasonal floodplains of Bangladesh*	Governments; national agencies; basin organizations; NARES; others in target basins	Institutional mechanisms for community management of rice-fish culture in floodplains developed	Policy, institutions and governance enhanced; equitable distribution of benefits from ecosystems; informed decision making process with participation of all stakeholders

Outputs		Intended user	Outcome	Impact
2010	Institutional approaches to dissemination of improved strains and fish seed identified and disseminated in Egypt	Private and public sectors; development professionals	Increased distribution of genetically improved strains of aquatic animals	As above
	Improved governance systems for rice-fish culture practices* extended to selected case study sites in Mekong, Niger and Yellow river basins*	NARS; fishing households; rural development NGOs; local governments	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
Output 3 <i>Integrated watershed and coastal zone management approaches to aquaculture development developed for uptake in key policy arenas</i>				
Output targets 2008	Recommendation domains tool for watershed-scale identification of potential and constraints for aquaculture development developed and disseminated ;	Planners	Better selection of areas with aquaculture development potential	As above
2009	Development and assessment of RESTORE software as a tool for on-farm water use determined	Researchers; planners	Water use by aquaculture integrated at watershed level	As above
	Integrated watershed and coastal zone management approaches to aquaculture development promoted and adopted in SE Asia	Planners	Sustainable aquaculture development	As above
2010	Impacts of cage aquaculture on African water bodies (lake Malawi; irrigation canals, Egypt) understood and lessons disseminated	Planners; NGOs; FAO	Development of sustainable, pro-poor cage aquaculture	As above

* This output target will be met largely through the Center's involvement in the Challenge Program on Water and Food.

Project 8: Improving institutional and human capacity

Background and rationale

Both the public and private sectors have complementary roles to play in fostering the sustained adoption of aquaculture to reduce poverty. The specific roles of the two sectors vary greatly from country to country and research is needed to explore how to optimize their roles as the aquaculture sector expands. For example, fish farmers' organizations are increasingly common and, perhaps with support from NGOs and others, may be able to play a greater role in helping to disseminate best practices among farmers.

Once their respective roles in fostering sustainable and equitable aquaculture development are identified, it will be possible through multi-stakeholder interactions to identify skills needs, training requirements and professional development support. A range of models to strengthen capacity to deliver well targeted training and continuing professional development should be explored, including distance learning and identification of opportunities for scientific mentorship among institutions (e.g., networks).

We will also work with colleagues to help develop curricula and training materials where appropriate (e.g., CGIAR CPWF).

Goal

With partners and stakeholders, help identify capacity development needs at the individual, institution, sector and enabling environment levels, help develop and promote curricula, training materials and access to information, and facilitate their delivery.

Objectives

1. Improve and disseminate knowledge of the roles and potential of the public and private sectors in developing and disseminating best technologies.
2. Increase institutional and individual capacity for research by establishing research partnerships between WorldFish scientists and ARIs.
3. Improve research and training networks for developing countries and North-South and South-South links.
4. Improve training facilities and curricula and courses in aquaculture, water and environmental management.

Alignment with CG System Priorities

Allocation of resources to system priorities										
Project 8	Improving institutional and human capacity	1D	2D	3C	4A	4B	5A	5B	5C	5D
Output 1	Role of public and private sectors in developing and disseminating best technologies described and disseminated			20%			30%	10%	20%	20%
Output 2	Establish research partnerships between WorldFish scientists and ARIs to increase institutional and individual capacity for appropriate research						30%		30%	30%
Output 3	Research and training networks developed for developing countries; North-South and South-South links established									60%
Output 4	Training facilities and curricula and courses in aquaculture, water and environmental management established									

Note: See Table 1 for explanations on 1D, 2D, 3C, 4A, 4B, 5A, 5B, 5C and 5D.

Impact pathway

Technologies, in the broadest sense of the word, are a key element of a successful aquaculture sector. Knowledge of the appropriate technologies, or having the technical, social and business skills necessary to foster development of appropriate technologies, is essential. The public and private sectors and civil society all have roles in this process, which must be tailored to local circumstances and be able to adapt to evolving situations. For example, there are a number of models of how to successfully develop and disseminate genetically improved seed to farmers, with the public sector assuming a range of roles depending upon circumstances (centralized program versus decentralized program; state run versus private sector run, etc.). Only when the respective roles of the different sectors are established can capacity development be assessed. Current models recognize four levels of capacity development: individual, institutional, sector/network and enabling environment. The resources required to support development increase with each level. Skills needs assessments must be carried out at all levels to determine capacity building needs. WorldFish will raise awareness of the importance of clarifying roles and work with partners and stakeholders to promote skills assessments. This can only be done within a culture of institutional learning and requires that research and innovation are on the policy agenda.

Research priorities are best determined by a process of continuous *ex ante* and *ex post* structured analyses involving stakeholders. This will reveal what is working and what isn't, what can be improved and how. Fostering multi-disciplinary research communities of farmers (including producer organizations), SMEs, scientists (NARES, ARIs), policy makers, and civil society through networking activities is an effective means of developing and promoting sound technologies, strong connections to input and output markets and enabling environments.

For aquaculture to have a substantial and sustainable impact on livelihoods and food security, capacity building is needed not only in aquaculture sciences but in a range of other scientific disciplines as well as in the social and business sciences. It is important here to ensure consistency with wider development and capacity building goals and objectives (e.g., CAADP and NEPAD in Africa) and to coordinate with other initiatives, such as those of the CPWF. Capacity building requires access to good training materials. It is necessary to identify and evaluate organizations, partnerships and delivery mechanisms, including existing and novel web-based tools, which might be most cost effectively used to best meet present and future human capacity building needs and ongoing professional development.

Generation of international public goods

The WorldFish Center seeks to develop region wide increases in institutional capacity through the development of research networks and mentoring of individual research scientists in NARES and the development and distribution of capacity building materials. While capacity building materials are best developed by professional teachers and trainers, the WorldFish Center will provide important inputs into curriculum design and even into the teaching materials. The Centre is working with Egyptian and other scientists to organize and deliver a large international symposium on tilapia aquaculture.

Linkages and partnerships

The WorldFish Center is working with IWMI, NARES, ARIs, education specialists and the private sector (CABI) in the development and dissemination of capacity building materials. It is working with Egyptian and other scientists to organize International Symposium on Tilapia in Aquaculture (ISTA).

List of key partners and their roles		
Partner	Output	Role
Ministry of Agriculture (Egypt); Bureau of Fisheries (Philippines)	1	Development and implementation of aquaculture sector development plans
NARES and national and regional planning bodies, China	1	Development of community-based fish culture in irrigation systems and seasonal floodplains
FAO	1	Development of aquaculture sector plans; roles of producer organizations
Universities: Sussex and Stirling, UK	1	Roles of SME seed producers in stimulating entrepreneurship
INGA members	2	Development and management of the INGA website

Partner	Output	Role
ARIs	2	Development of joint research projects
NARES	2	Development of joint research projects
Buckland Foundation, UK and Ireland	2	Provision of platform to promote Aquaculture for Development research
IFS, Stockholm	2, 3, 4	Development of research networks, support to young scientists, provision of research training courses
CAADP and associated regional bodies	2, 3, 4	Development of institutional capacity to support Aquaculture for Development
Egyptian scientists and farmers	3	Organize and deliver an international symposium on tilapia aquaculture
Leading Africans working on pro-poor tilapia aquaculture development	3	Organize and deliver a special session on pro-poor tilapia farming development at ISTA
ARIs: European	3, 4	Development of North-South and South-South research networks in Africa and Asia
IWMI	4	Incorporation of aquaculture water productivity concepts into training materials
Imperial College, UK	4	Development of water management training materials that incorporate aquaculture water productivity concepts
Universities: Wageningen, (Netherlands); BOKU (Vienna, Austria); CAU (Kiel, Germany); INA-PG (Paris, France), SLU (Uppsala, Sweden); UMB (Aas, Norway)	4	Development of Erasmus Mundus MSc Course on Animal Breeding and Genetics
FAO	4	Development and implementation of training courses at Abbassa
CABI	4	Development of on-line aquaculture information and provision of increased access to African scientists

Project 8 MTP logframe: Building improved institutional and human capacity

Project 8 MTP logframe: Building improved institutional and human capacity				
Outputs		Intended user	Outcome	Impact
Output 1				
<i>Roles of public and private sectors in developing and disseminating best technologies described and disseminated</i>				
Output targets 2008	Completion and adoption of aquaculture sector development plan in one country	Governments	Clarification of public and private sector and civil society roles in aquaculture development	Sustainable increases in aquaculture production
	Roles of public and private sectors in seed development and distribution clarified in at least one country	Public and private sectors and civil society	More effective distribution of genetically improved seed	Reductions in poverty; increases in food security
2009	Roles of national and regional institutions in developing wetland-based aquaculture (China) described	Public and private sectors and civil society	More equitable access to water in irrigation systems and seasonal floodplains	Increased fish production and reductions in poverty
	Roles of SME seed producers in stimulating entrepreneurship established (Bangladesh, Vietnam)	Research and development specialists; policy makers	As above	As above
2010	Roles of producer organizations clarified and guidance distilled	Farmers; governments; NGOs	As above	As above

	Outputs	Intended user	Outcome	Impact
Output 2 <i>Establish research partnerships between WorldFish scientists and ARIs to increase institutional and individual capacity for appropriate research</i>				
Output targets 2008	Development of on-line website to support INGA members	Research scientists; hatchery managers; public and private sectors	Increased seed improvement programs	Increased use of genetically improved strains
2009	At least one new joint research project with NARES and ARIs developed in Asia or Africa	Research scientists; NARES; ARIs	Increased research capacity; development of a learning research environment	Increase in research activity; development and promotion of technologies
2010	At least one new joint research project with NARES and ARIs developed in Asia or Africa	As above	As above	As above
Output 3 <i>Research and training networks developed for developing countries and North-South and South-South links established</i>				
Output targets 2008	International Symposium on Tilapias in Aquaculture (Egypt) supported through organization of a Aquaculture for Development session and editing of proceedings	Researchers; farmers; SMEs	Increased contact among developing country aquaculture scientists and policy makers	Research in Aquaculture for Development increased
	Research networks with UK and Irish ARIs and fish farming sectors promoted through lecture tour	As above	As above	As above
2009	Network of North-South NARE – Asian ARI science institutions researching on environmental management of aquaculture established	NARES; ARIs; policy makers; private sector; NGOs	As above	As above
2010	Network of European ARI – African NARE science institutions developing Aquaculture for Development technologies established	NARES; ARIs; policy makers; private sector; NGOs	As above	As above
Output 4 <i>Training facilities and curricula and courses in aquaculture and water and environmental management established</i>				
Output targets 2008	Training for 30 Asian scientists in genetic improvement of aquatic animals designed and implemented	Developing country scientists; private sector hatcheries	Increased number and quality of genetically improved seed production programs	Increased farmed fish production
	Development of pilot GOFU training course on water management for inland fisheries and aquaculture	Researchers	Improve research skills related to water productivity	Sustainable aquaculture development
	10% increase in regional and international training courses run at Abbassa Field Station	Farmers; research scientists; investors; policy makers	Greater knowledge of aquaculture and its implementation	Sustainable aquaculture development

	Outputs	Intended user	Outcome	Impact
2009	Development of water productivity curriculum and training materials to serve CPWF capacity building needs*	Researchers; policy makers; trainers;	Increased water productivity	Increased food production and reductions in poverty
	Numbers of national, regional and international training courses run at Abbassa Field Station maintained or increased	Farmers; research scientists; investors; policy makers	Greater knowledge of aquaculture and its implementation	Sustainable aquaculture development
	Access of African scientists and farmers to CABI on-line compendium of Africa-specific aquaculture secured	Research scientists; NARES; NGOs	Better training material developed and disseminated	Better technologies developed and promoted
2010	Numbers of national, regional and international training courses run at Abbassa Field Station increased by 5% over 2009 levels or maintained	Farmers; research scientists; investors; policy makers	Greater knowledge of aquaculture and its implementation	Sustainable aquaculture development

C. Finance Plan

1. 2006 Results and 2007 Development

The 2006 net expenditure level was US\$ 15,540. About 90 per cent of 2006 resources were utilized for program related activities. We expect to maintain approximately this ratio in 2007. The WorldFish Center (ICLARM) ended the year with a deficit of US\$ 0.318 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 2006 grant income from donors amounted to US\$ 14.817 million in addition to US\$ 0.405 million of earned income. Grant income for 2007 is projected at US\$17.844 million. The increase in 2007 Center income is due to an increase in restricted grant funding. Recovery of indirect costs from funded projects amounted to US\$ 1.085 million.

The 2007 expenditure is estimated at US\$ 19.766 million compared to actual spending of US\$ 15.540 million for 2006. The increase in expenditure is in line with the increase with the restricted project funding.

Table 2: Comparison of 2006 performance and 2007 current estimate

	2006 Actual (US\$ million)	2007 Estimate (US\$ million)
Sources of Funds		
Donor funding	14.817	17.844
Earned income	0.405	0.798
Total	15.222	18.642
Application of Funds		
Program	13.927	17.639
Management and general expenses	2.356	2.656
Depreciation	0.342	0.761
Less: Overhead recoveries	(1.085)	(1.290)
Net expenditure	15.540	19.766
Unexpended Balance *	(0.318)	(1.124)

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

The 2006 spending and 2007 current planned resource allocation by CGIAR activity is summarized below:

Table 3: Allocation of resources by priorities

	2007	
	Estimate US\$ million	%
1D Conservation of aquatic animal genetic resources	0.357	2
2B Tolerance to selected abiotic stresses	0.131	1
2C Enhancing nutritional quality and safety	0.131	1
2D Genetic enhancement of selected species to increase income generation by the poor	1.269	6
3C Enhancing income through increased productivity of fisheries and aquaculture	5.496	28
4A Integrated land, water and forest management and landscape level	3.225	16
4B Sustaining and managing aquatic ecosystems for food and livelihoods	3.339	17
4C Improving water productivity	2.158	11
5A Science and technology policies and institutions	0.374	2
5B Making international and domestic markets work for the poor	0.637	3
5C Rural institutions and their governance	0.374	2
5D Improving research and development options to reduce rural poverty and vulnerability	2.275	11
Total	19.766	100

Table 4: Actual and planned resources allocation by CGIAR activity for 2006 and 2007

	US\$ (million)		
	2006 Actual	2007	
		Estimate	%
Increasing productivity	2.672	3.408	17
Protecting the environment	1.968	2.383	12
Saving biodiversity	1.676	2.021	10
Improving policies	2.792	3.699	19
Strengthening NARS	6.432	8.255	42
Total	15.540	19.766	100

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\$ 17.844 million in 2007 (expected), an increase during the period of over 85%.

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 2006 was US\$ 0.61 million, appropriated by the BoT for property and equipment renewal.

Working capital

The working capital as of 31 December 2006 can support operations for 190 days compared to CGIAR benchmark of 90 days of operations. As mentioned above, the Board has approved an investment plan that will draw down some of these reserves.

Liquidity

Although the Center's liquidity declined slightly last year, we have now taken action to restore an improving trend by focusing attention on actual cash flows and management of capital expenditure.

Table 5: Liquidity ratio analysis

	2005	2006
Current ratio (times)	2.13	2.54
Cash to current assets (%)	79.00	72.00
Cash to current liabilities (%)	168.00	183.00

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's equity for 2006 was 190 days. This equity will be reduced over the next 2 years as the Center uses its reserves for strategic investment purposes.

2008 - 2010 plans

Funding requirements and financing plans

The funding level for the first year of the MTP 2008 - 2010 was based on a carefully projected core and project funding. In 2007, the level of funding is higher due to the inclusion of carry over unexpended project funds from 2006 and the new projects to be started by the Center this year.

The level of donor funding for 2007 is projected at US\$ 17.844 million and indirect cost recoveries from funded projects at US\$ 1.290 million. The Center's projected operating levels (net of indirect cost recoveries) for 2007 - 2010 are shown in Table 6.

Table 6: The WorldFish Center operating levels

	US\$ (million)			
	2007	2008	2009	2010
Projected donor funding	17.84	18.38	19.30	20.26
Center income	0.80	0.10	0.11	0.12
Reserve draw down	1.12	0.01	0.00	0.00
Total	19.76	18.49	19.41	20.38

Funding in 2008 is expected to grow by approximately 3 per cent and the annual growth rate thereafter is expected to be 5 per cent year on year. This is a conservative estimate given the Center's historical annual funding increases since 1992. The reduction in other Center income in future years, which have been conservatively estimated, is due to large foreign exchange gains which are expected in 2007.

Earned income

Earned income is expected to be at the level of approximately US\$0.80 million for 2007 and US\$0.1 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 embarked on developing a full cost recovery system similar to the private sector, which will be tested in 2007. The Center's indirect cost recovery is expected to be around US\$ 1.290 million for 2007. Indirect cost recovery is still well below the full costs of targeted research projects.

Operating budget 2008-2010

The research activities and allocation of resources were determined by an in-depth review of the WorldFish Center Disciplines and research projects. A Center-wide review was conducted by Board and Management. The six portfolios and three science disciplines were allocated 73 per cent of total resources, which is consistent with 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 Financial Tables.

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 67 per cent of resources are allocated to Asia, 24 per cent to sub-Saharan Africa, 1 per cent to Latin America and the Caribbean and 8 per cent to west Asia and north Africa (Financial Table 6).

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 50 per cent of the resources are allocated to personnel costs for the years 2007-2010 (Financial Table 8).

Personnel input: Center-hired Internationally Recruited staff (IRS) number is estimated at around 51 positions, including post-doctoral fellows and visiting scientists. Additional positions are planned subject to funding availability in 2008 and beyond (Financial Table 11).

Regionally Recruited Staff (RRS) level is approximately 9 positions. The RRS represents Philippine senior national staff relocated to the new Penang headquarters in February 2000 and few positions at other regional research sites.

The number of Nationally Recruited Staff (NRS) is expected to be around 314 for all Center sites in 2008.

Capital budget

The Center will budget a modest amount for laboratory and research equipment, and computer hardware and software purchases as follows:

Table 7: The WorldFish Center capital requirements 2008 – 2010, US\$ (million)

	2008	2009	2010
Capital requirements	0.2	0.35	0.4

Inflation and exchange rates

The inflation rate in Malaysia is expected to be in the region of 4-5 per cent during the plan period. Currently the Malaysian Ringgit is allowed to float against a basket of currencies and is monitored by the Central Bank of Malaysia. It is expected to strengthen against the US\$. The Ringgit has appreciated against the US\$ and its exchange rate was 3.45 to 1US\$ on 31 May 2007.

The US\$ had slightly declined against major currencies, which has resulted in a positive impact on non-US dollar denominated contributions for 2007. However, this is more than offset by non-US locations. Overall, a declining dollar impacts our financial position.

Financing plan 2008

The confirmed and high probability funding for financing the Center operations in 2008 amounts to US\$ 18.38 million. This includes US\$ 1.44 million from the World Bank.

The projected core funding and project funding amounts to US\$ 5.88 million and US\$ 12.50 million, respectively.

Summary of financing plan

The resource requirements over the plan period are based on the 2007 budget and the best estimate of resources for 2008, which is the basis for this plan period. The spending plan is increased at an annual rate of 5 per cent for 2009 and 2010.

Table 8 provides details of the funding and donor support for 2008.

Table 8: The WorldFish Center Financing Plan for 2008, US\$ (million)

	US\$ (million)	%
Core support	5.88	31.8
Targeted/restricted Funding	12.50	67.6
Subtotal	18.38	99.4
Center earned income	0.10	0.6
Total revenue	18.48	100
Draw down on reserve	0.01	-
Expenditure in 2006	18.49	100

D. Financial Tables

Financial table 1: Allocation of Project Cost by Priority Area and Priorities, 2008	56
Financial table 2: Allocation of Project Cost to CGIAR Priorities, 2007 - 2010	57
Financial table 3: Summary of Project Cost, 2007 - 2010	58
Financial table 4: Summary of Priority Cost, 2007 - 2010	58
Financial table 5: Investments by Undertaking, Activity and Sector, 2006 - 2010	59
Financial table 6: Project Investments by Developing Region, 2006 - 2010	60
Financial table 7: Summary of Investments by Developing Region, 2006 - 2010	61
Financial table 8: Expenditure by Object, 2006 - 2010	61
Financial table 9: Member and Non-Member Unrestricted and Restricted Grants, 2008 - 2010	62
Financial table 10: Allocation of Member Grants and Center Income to Project, 2008 - 2010	63
Financial table 11: Internationally and Nationally Recruited Staff, 2006 - 2010	67
Financial table 12: Currently Structure of Expenditure, 2006 - 2008	67
Financial table 13: Statement of Financial Position (SFP), 2006 - 2008	68
Financial table 14: Statement of Activities (SOA), 2006 - 2008	69

Financial table 1: Allocation of Project Costs by Priority Area and Priorities, 2008
(in US\$ millions)

Project	Priority Area 1		Priority Area 2		Priority Area 3	Priority Area 4			Priority Area 5				Total	
	1D		2B	2C	2D	3C	4A	4B	4C	5A	5B	5C		5D
MTP Project 1: Increased integration of SSF into national and regional development policy						0.257	0.775	0.775	0.775					2.582
MTP Project 2: Integrated assessment and advisory systems for fisheries management						0.878	0.440	0.440	0.220				0.220	2.198
MTP Project 3: Improved management and governance of small-scale fisheries						1.658	0.830	0.830	0.415				0.415	4.148
MTP Project 4: Building institutional capacity for adaptive learning						0.963	0.481	0.481	0.241				0.241	2.407
MTP Project 5: Developing an improved technological foundation for pro-poor aquaculture	0.329				0.989	0.988	0.329	0.329	0.329				0.329	3.293
MTP Project 6: Improved access to input and output markets			0.095	0.095	0.142	0.236	0.095	0.095			0.190		0.095	0.948
MTP Project 7: Developing an improved policy environment							0.323			0.324	0.324	0.324	0.324	1.619
MTP Project 8: Building improved institutional and human capacity						0.259	0.258	0.258	0.129				0.387	1.291
Total	0.329		0.095	0.095	1.131	5.239	3.107	3.208	2.109	0.324	0.514	0.324	2.011	18.486

CGIAR Priorities

- 1 D - Conservation of aquatic animal genetic resources
- 2 D - Genetic enhancement of selected high-value species
- 3 C - Enhancing income through increased productivity of fisheries and aquaculture
- 4 A - Integrated land, water and forest management and landscape level
- 4 B - Sustaining and managing aquatic ecosystems for food and livelihoods
- 4 C - Improving water productivity
- 5 A - Science and technology policies and institutions
- 5 B - Making international and domestic markets work for the poor
- 5 C - Rural institutions and their governance
- 5 D - Improving research and development options to reduce rural poverty and vulnerability

Financial table 2: Allocation of Project Costs to CGIAR Priorities, 2007-2010
(in US\$millions)

Projects	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
Priorities				
MTP Project 1: Increased integration of SSF into national and regional development policy				
3C	0.250	0.257	0.271	0.284
4A	0.749	0.775	0.813	0.854
4B	0.749	0.775	0.813	0.854
4C	0.749	0.775	0.813	0.854
Project Total	2.497	2.582	2.710	2.846
MTP Project 2: Integrated assessment and advisory systems for fisheries management				
3C	1.038	0.878	0.922	0.969
4A	0.518	0.440	0.462	0.485
4B	0.518	0.440	0.462	0.485
4C	0.260	0.220	0.231	0.242
5D	0.260	0.220	0.231	0.242
Project Total	2.594	2.198	2.308	2.423
MTP Project 3: Improved management and governance of small-scale fisheries				
3C	1.670	1.658	1.743	1.829
4A	0.834	0.830	0.871	0.915
4B	0.834	0.830	0.871	0.915
4C	0.417	0.415	0.435	0.457
5D	0.417	0.415	0.435	0.457
Project Total	4.172	4.148	4.355	4.573
MTP Project 4: Building institutional capacity for adaptive learning				
3C	0.779	0.963	1.011	1.062
4A	0.390	0.481	0.505	0.531
4B	0.390	0.481	0.505	0.531
4C	0.196	0.241	0.254	0.265
5D	0.196	0.241	0.253	0.265
Project Total	1.951	2.407	2.528	2.654
MTP Project 5: Developing an improved technological foundation for pro-poor aquaculture				
1D	0.357	0.329	0.346	0.363
2D	1.071	0.989	1.037	1.089
3C	1.071	0.988	1.036	1.090
4B	0.357	0.329	0.346	0.363
4C	0.357	0.329	0.346	0.363
5D	0.357	0.329	0.346	0.363
Project Total	3.570	3.293	3.457	3.631
MTP Project 6: Improved access to input and output markets				
2B	0.131	0.095	0.100	0.105
2C	0.131	0.095	0.100	0.105
2D	0.198	0.142	0.149	0.157
3C	0.328	0.236	0.248	0.259
4B	0.131	0.095	0.100	0.105
5B	0.263	0.190	0.199	0.209
5D	0.131	0.095	0.100	0.105
Project Total	1.313	0.948	0.996	1.045
MTP Project 7: Developing an improved policy environment				
4A	0.374	0.323	0.340	0.357
5A	0.374	0.324	0.340	0.357
5B	0.374	0.324	0.340	0.357
5C	0.374	0.324	0.340	0.357
5D	0.374	0.324	0.340	0.357
Project Total	1.870	1.619	1.700	1.785
MTP Project 8 : Building improved institutional and human capacity				
3C	0.360	0.259	0.272	
4A	0.360	0.258	0.271	0.285
4B	0.360	0.258	0.271	0.284
4C	0.179	0.129	0.135	0.142
5D	0.540	0.387	0.407	0.427
Project Total	1.799	1.291	1.356	1.423
Total	19.766	18.486	19.410	20.380

Financial table 3: Summary of Project Costs, 2007-2010
(in US \$millions)

Project	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
MTP Project 1: Increased integration of SSF into national and regional development policy	2.497	2.582	2.710	2.846
MTP Project 2: Integrated assessment and advisory systems for fisheries management	2.594	2.198	2.308	2.423
MTP Project 3: Improved management and governance of small-scale fisheries	4.172	4.148	4.355	4.573
MTP Project 4: Building institutional capacity for adaptive learning	1.951	2.407	2.528	2.654
MTP Project 5: Developing an improved technological foundation for pro-poor aquaculture	3.570	3.293	3.457	3.631
MTP Project 6: Improved access to input and output markets	1.313	0.948	0.996	1.045
MTP Project 7: Developing an improved policy environment	1.870	1.619	1.700	1.785
MTP Project 8: Building improved institutional and human capacity	1.799	1.291	1.356	1.423
Total	19.766	18.486	19.410	20.380

Financial table 4: Summary of Priority Costs, 2007-2010
(in US \$millions)

Priorities	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
1D	0.357	0.329	0.346	0.363
2B	0.131	0.095	0.100	0.105
2C	0.131	0.095	0.100	0.105
2D	1.269	1.131	1.186	1.246
3C	5.496	5.239	5.503	5.778
4A	3.225	3.107	3.262	3.427
4B	3.339	3.208	3.368	3.537
4C	2.158	2.109	2.214	2.323
5A	0.374	0.324	0.340	0.357
5B	0.637	0.514	0.539	0.566
5C	0.374	0.324	0.340	0.357
5D	2.275	2.011	2.112	2.216
Total	19.766	18.486	19.410	20.380

Financial table 5: Investments by Undertaking, Activity and Sector, 2006-2010
(in US \$millions)

Undertaking/ Activity	Actual 2006	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
Increasing Productivity	2.672	3.408	3.294	3.458	3.631
Germplasm Enhancement & Breeding	1.336	1.704	1.647	1.729	1.816
Production Systems Development & Management	1.336	1.704	1.647	1.729	1.815
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	1.336	1.704	1.647	1.729	1.815
Protecting the Environment	1.968	2.383	2.311	2.426	2.547
Saving Biodiversity	1.677	2.021	2.016	2.117	2.222
Improving Policies	2.792	3.699	3.353	3.521	3.697
Strengthening NARS	6.431	8.255	7.512	7.888	8.283
Training and Professional Development	1.980	2.558	2.282	2.396	2.516
Documentation, Publications, Info. Dissemination	2.875	3.649	3.320	3.486	3.660
Organization & Management Counselling	0.000	0.000	0.000	0.000	0.000
Networks	1.576	2.048	1.910	2.006	2.107
Total	15.540	19.766	18.486	19.410	20.380

Financial table 6: Project Investments by Developing Region, 2006-2010
(in US \$millions)

Project	Region	Actual 2006	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
MTP Project 1: Increased integration of SSF into national and regional development policy	Asia	1.265	1.407	1.414	1.485	1.559
	CWANA	0.051	0.092	0.089	0.093	0.098
	LAC	0.003	0.022	0.033	0.034	0.036
	SSA	0.449	0.976	1.046	1.098	1.153
	Total Project	1.768	2.497	2.582	2.710	2.846
MTP Project 2: Integrated assessment and advisory systems for fisheries management	Asia	1.715	1.483	1.499	1.574	1.653
	CWANA	0.106	0.164	0.142	0.150	0.157
	LAC	0.039	0.096	0.094	0.098	0.103
	SSA	0.462	0.851	0.463	0.486	0.510
	Total Project	2.322	2.594	2.198	2.308	2.423
MTP Project 3: Improved management and governance of small-scale fisheries	Asia	2.658	2.845	2.822	2.963	3.111
	CWANA	0.123	0.208	0.202	0.212	0.223
	LAC	0.039	0.100	0.118	0.124	0.130
	SSA	0.515	1.019	1.006	1.056	1.109
	Total Project	3.335	4.172	4.148	4.355	4.573
MTP Project 4: Building institutional capacity for adaptive learning	Asia	1.157	1.310	1.605	1.685	1.769
	CWANA	0.045	0.074	0.086	0.091	0.095
	LAC	0.001	0.017	0.031	0.033	0.034
	SSA	0.315	0.550	0.685	0.719	0.756
	Total Project	1.518	1.951	2.407	2.528	2.654
MTP Project 5: Developing an improved technological foundation for pro-poor aquaculture	Asia	1.784	2.714	2.533	2.659	2.792
	CWANA	0.452	0.407	0.398	0.418	0.439
	LAC	0.000	0.009	0.017	0.018	0.019
	SSA	0.436	0.440	0.345	0.362	0.381
	Total Project	2.672	3.570	3.293	3.457	3.631
MTP Project 6: Improved access to input and output markets	Asia	0.598	0.923	0.668	0.701	0.736
	CWANA	0.107	0.157	0.121	0.127	0.133
	LAC	0.000	0.003	0.006	0.006	0.006
	SSA	0.169	0.230	0.153	0.162	0.170
	Total Project	0.874	1.313	0.948	0.996	1.045
MTP Project 7: Developing an improved policy environment	Asia	1.176	1.339	1.162	1.221	1.282
	CWANA	0.229	0.223	0.206	0.217	0.227
	LAC	0.000	0.004	0.009	0.009	0.010
	SSA	0.223	0.304	0.242	0.253	0.266
	Total Project	1.628	1.870	1.619	1.700	1.785
MTP Project 8: Building improved institutional and human capacity	Asia	0.895	1.218	0.868	0.912	0.957
	CWANA	0.318	0.301	0.237	0.249	0.261
	LAC	0.000	0.004	0.008	0.008	0.009
	SSA	0.210	0.276	0.178	0.187	0.196
	Total Project	1.423	1.799	1.291	1.356	1.423
	Total	15.540	19.766	18.486	19.410	20.380

Financial table 7: Summary of Investments by Developing Region, 2006-2010
(in US \$millions)

Region	Actual 2006	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
SSA	2.779	4.646	4.118	4.323	4.541
Asia	11.248	13.239	12.571	13.200	13.859
LAC	0.082	0.255	0.316	0.330	0.347
CWANA	1.431	1.626	1.481	1.557	1.633
Total	15.540	19.766	18.486	19.410	20.380

Financial table 8: Expenditure by Object, 2006-2010
(in US \$millions)

Object of Expenditure	Actual 2006	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
Personnel	7.655	9.923	9.280	9.744	10.231
Supplies and services	3.330	4.577	4.281	4.495	4.719
Collaboration/ Partnerships	2.622	2.373	2.220	2.330	2.448
Operational Travel	1.591	2.132	1.994	2.094	2.198
Depreciation	0.342	0.761	0.711	0.747	0.784
Total	15.540	19.766	18.486	19.410	20.380

Financial table 9: Member and Non-Member Unrestricted and Restricted Grants, 2006-2008
(in US \$millions)

Member	Actual 2006	Estimated 2007	Proposal 2008
Unrestricted Grants Member			
Australia	0.383	0.383	0.415
Canada	0.539	0.408	0.414
Denmark	0.335	0.000	0.000
Egypt	0.250	0.250	0.250
FAO	0.000	0.105	0.231
Germany	0.217	0.000	0.000
India	0.138	0.138	0.138
Israel	0.030	0.030	0.030
Japan	0.206	0.206	0.205
Malaysia	0.000	0.000	0.000
Netherlands	0.572	0.000	0.000
New Zealand	0.281	0.278	0.349
Norway	0.917	0.889	0.925
Philippines	0.023	0.018	0.020
Sweden	0.296	0.158	0.359
United Kingdom	0.793	1.000	0.919
United States	0.800	0.800	0.680
World Bank	1.380	1.150	0.950
Subtotal	7.160	5.813	5.885
Total Unrestricted	7.160	5.813	5.885
Restricted Grants Member			
ADB	1.187	0.897	1.332
Australia	0.369	0.699	0.699
Belgium	0.000	0.000	0.053
Canada	0.044	0.118	0.051
Denmark	0.000	0.000	0.100
European Commission	0.000	1.503	1.880
FAO	0.008	0.048	0.200
Finland	0.205	0.347	0.104
Ford Foundation	0.031	0.000	0.000
France	0.000	0.000	0.300
Germany	0.802	1.033	0.627
IFAD	0.174	0.112	0.088
India	0.000	0.000	0.100
Ireland	0.000	0.000	0.026
Israel	0.000	0.000	0.030
Japan	0.037	0.023	0.000
Malaysia	0.029	0.062	0.061
Netherlands	0.000	0.000	0.400
New Zealand	0.160	0.222	0.070
Norway	0.000	0.000	0.026
OPEC Fund	0.046	0.000	0.000
Philippines	0.021	0.137	0.088
Sweden	0.280	0.493	1.195
UNDP	0.008	0.000	0.100
UNEP	0.209	0.799	0.740
United Kingdom	2.080	1.635	0.000
United States	0.628	0.661	0.519
World Bank	0.031	0.216	0.270
Subtotal	6.349	9.005	9.059
Restricted Grants Non-member			
MacArthur Foundation	0.079	0.000	0.000
Others	0.339	1.480	2.300
Water & Food/CP	0.890	1.546	1.141
Subtotal	1.308	3.026	3.441
Total Restricted	7.657	12.031	12.500
Total Grants	14.817	17.844	18.385

Summary and Statement of Activities	Actual 2006	Estimated 2007	Proposal 2008
Total Grants	14.817	17.844	18.385
Center Income	0.405	0.798	0.100
Total Reserve	15.222	18.642	18.485
Total Investment	15.540	19.766	18.486
Surplus (Deficit)	(0.318)	(1.124)	(0.001)

Financial table 10: Allocation of Member Grants and Center Income to Projects, 2006-2008
(in US \$millions)

Project	Member		Actual 2006	Estimated 2007	Proposal 2008
MTP Project 1: Increased integration of SSF into national and regional development policy	Member	ADB	0.005	0.012	0.162
		Australia	0.022	0.081	0.021
		Belgium	0.000	0.000	0.022
		Denmark	0.000	0.000	0.043
		European Commission	0.000	0.171	0.290
		FAO	0.005	0.023	0.002
		Finland	0.015	0.013	0.013
		France	0.000	0.000	0.042
		Germany	0.065	0.077	0.133
		IFAD	0.016	0.009	0.000
		Ireland	0.000	0.000	0.011
		Japan	0.022	0.014	0.000
		Netherlands	0.000	0.000	0.172
		New Zealand	0.016	0.022	0.007
		Norway	0.000	0.000	0.011
		OPEC Fund	0.011	0.000	0.000
		Philippines	0.000	0.013	0.009
		Sweden	0.000	0.026	0.368
		UNDP	0.002	0.000	0.001
		UNEP	0.014	0.042	0.035
	United Kingdom	0.611	0.433	0.000	
	United States	0.038	0.000	0.045	
	World Bank	0.005	0.010	0.002	
	Non-Member	MacArthur Foundation	0.010	0.000	0.000
		Others	0.043	0.168	0.206
		Water & Food/CP	0.135	0.252	0.149
	Unrestricted + Center Income		0.731	1.131	0.838
	Project Total		1.766	2.497	2.582
MTP Project 2: Integrated assessment and advisory systems for fisheries management	Member	ADB	0.339	0.251	0.166
		Australia	0.090	0.107	0.052
		Belgium	0.000	0.000	0.003
		Canada	0.000	0.004	0.000
		Denmark	0.000	0.000	0.006
		European Commission	0.000	0.141	0.083
		FAO	0.000	0.004	0.004
		Finland	0.081	0.087	0.013
		Ford Foundation	0.001	0.000	0.000
		France	0.000	0.000	0.090
		Germany	0.131	0.154	0.147
		IFAD	0.016	0.009	0.000
		Ireland	0.000	0.000	0.002
		Netherlands	0.000	0.000	0.024
		Norway	0.000	0.000	0.002
		OPEC Fund	0.005	0.000	0.000
		Philippines	0.000	0.013	0.009
		Sweden	0.004	0.030	0.092
		UNDP	0.001	0.000	0.002
		UNEP	0.108	0.451	0.432
	United Kingdom	0.410	0.305	0.000	
	United States	0.051	0.021	0.119	
	World Bank	0.002	0.011	0.032	
	Non-Member	MacArthur Foundation	0.027	0.000	0.000
		Others	0.074	0.207	0.230
		Water & Food/CP	0.022	0.041	0.032
	Unrestricted + Center Income		0.960	0.758	0.658
	Project Total		2.322	2.594	2.198

Financial table 10: Allocation of Member Grants and Center Income to Projects, 2006-2008
(in US \$millions) continued

Project	Member		Actual 2006	Estimated 2007	Proposal 2008
MTP Project 3: Improved management and governance of small-scale fisheries	Member	ADB	0.205	0.124	0.374
		Australia	0.127	0.203	0.400
		Belgium	0.000	0.000	0.007
		Denmark	0.000	0.000	0.013
		European Commission	0.000	0.418	0.271
		FAO	0.001	0.006	0.008
		Finland	0.082	0.095	0.013
		Ford Foundation	0.002	0.000	0.000
		France	0.000	0.000	0.132
		Germany	0.098	0.115	0.200
		IFAD	0.113	0.066	0.062
		Ireland	0.000	0.000	0.003
		Netherlands	0.000	0.000	0.052
		New Zealand	0.128	0.178	0.056
		Norway	0.000	0.000	0.003
		OPEC Fund	0.004	0.000	0.000
		Philippines	0.000	0.022	0.044
		Sweden	0.011	0.051	0.276
		UNDP	0.000	0.000	0.004
		UNEP	0.066	0.226	0.199
	United Kingdom	0.820	0.595	0.000	
	United States	0.114	0.043	0.064	
	World Bank	0.011	0.125	0.027	
	Non-Member	MacArthur Foundation	0.027	0.000	0.000
Others		0.077	0.359	0.771	
Water & Food/CP		0.132	0.254	0.151	
Unrestricted + Center Income			1.317	1.292	1.018
Project Total			3.335	4.172	4.148
MTP Project 4: Building institutional capacity for adaptive learning	Member	ADB	0.073	0.009	0.274
		Australia	0.022	0.065	0.097
		Belgium	0.000	0.000	0.003
		Denmark	0.000	0.000	0.005
		European Commission	0.000	0.011	0.043
		FAO	0.000	0.003	0.008
		Finland	0.015	0.010	0.013
		Ford Foundation	0.002	0.000	0.000
		France	0.000	0.000	0.030
		Germany	0.033	0.038	0.111
		IFAD	0.016	0.009	0.026
		Ireland	0.000	0.000	0.001
		Japan	0.015	0.009	0.000
		Netherlands	0.000	0.000	0.020
		New Zealand	0.016	0.022	0.007
		Norway	0.000	0.000	0.001
		OPEC Fund	0.003	0.000	0.000
		Philippines	0.000	0.010	0.026
		Sweden	0.215	0.297	0.459
		UNDP	0.000	0.000	0.004
	UNEP	0.021	0.080	0.074	
	United Kingdom	0.205	0.163	0.000	
	United States	0.026	0.021	0.016	
	World Bank	0.004	0.035	0.037	
Non-Member	MacArthur Foundation	0.011	0.000	0.000	
	Others	0.034	0.155	0.402	
	Water & Food/CP	0.132	0.243	0.151	
Unrestricted + Center Income			0.675	0.771	0.599
Project Total			1.518	1.951	2.407

Financial table 10: Allocation of Member Grants and Center Income to Projects, 2006-2008
(in US \$millions) continued

Project	Member		Actual 2006	Estimated 2007	Proposal 2008	
MTP Project 5: Developing an improved technological foundation for pro-poor aquaculture	Member	ADB	0.193	0.215	0.148	
		Australia	0.029	0.103	0.096	
		Belgium	0.000	0.000	0.004	
		Canada	0.017	0.037	0.000	
		Denmark	0.000	0.000	0.008	
		European Commission	0.000	0.549	0.773	
		FAO	0.001	0.005	0.074	
		Finland	0.004	0.118	0.013	
		Ford Foundation	0.010	0.000	0.000	
		France	0.000	0.000	0.003	
		Germany	0.102	0.150	0.012	
		IFAD	0.011	0.015	0.000	
		India	0.000	0.000	0.100	
		Ireland	0.000	0.000	0.002	
		Israel	0.000	0.000	0.030	
		Malaysia	0.018	0.034	0.035	
		Netherlands	0.000	0.000	0.032	
		Norway	0.000	0.000	0.002	
		OPEC Fund	0.009	0.000	0.000	
		Philippines	0.002	0.023	0.000	
		Sweden	0.025	0.038	0.000	
		UNDP	0.002	0.000	0.037	
		United Kingdom	0.016	0.059	0.000	
	United States	0.187	0.288	0.125		
	World Bank	0.004	0.015	0.085		
	Non-Member	MacArthur Foundation	0.001	0.000	0.000	
		Others	0.039	0.252	0.350	
	Water & Food/CP	0.189	0.332	0.287		
	Unrestricted + Center Income		1.813	1.337	1.077	
	Project Total		2.672	3.570	3.293	
MTP Project 6: Improved access to input and output markets	Member	ADB	0.107	0.121	0.028	
		Australia	0.034	0.037	0.000	
		Belgium	0.000	0.000	0.004	
		Canada	0.009	0.029	0.025	
		Denmark	0.000	0.000	0.008	
		European Commission	0.000	0.090	0.223	
		FAO	0.001	0.002	0.014	
		Finland	0.002	0.006	0.013	
		Ford Foundation	0.004	0.000	0.000	
		France	0.000	0.000	0.003	
		Germany	0.008	0.007	0.008	
		Ireland	0.000	0.000	0.002	
		Malaysia	0.002	0.007	0.006	
		Netherlands	0.000	0.000	0.032	
		Norway	0.000	0.000	0.002	
		OPEC Fund	0.003	0.000	0.000	
		Philippines	0.008	0.024	0.000	
		Sweden	0.013	0.013	0.000	
		UNDP	0.001	0.000	0.007	
		United Kingdom	0.008	0.021	0.000	
		United States	0.093	0.201	0.041	
		World Bank	0.001	0.005	0.000	
		Non-Member	MacArthur Foundation	0.001	0.000	0.000
		Others	0.018	0.084	0.011	
		Water & Food/CP	0.022	0.035	0.042	
		Unrestricted + Center Income		0.539	0.631	0.479
		Project Total		0.874	1.313	0.948

Financial table 10: Allocation of Member Grants and Center Income to Projects, 2006-2008
(in US \$millions) continued

Project	Member		Actual 2006	Estimated 2007	Proposal 2008
MTP Project 7: Developing an improved policy environment	Member	ADB	0.145	0.124	0.096
		Australia	0.030	0.054	0.033
		Belgium	0.000	0.000	0.006
		Canada	0.009	0.024	0.013
		Denmark	0.000	0.000	0.010
		European Commission	0.000	0.022	0.081
		FAO	0.000	0.003	0.048
		Finland	0.003	0.009	0.013
		Ford Foundation	0.007	0.000	0.000
		France	0.000	0.000	0.000
		Germany	0.246	0.330	0.008
		IFAD	0.001	0.002	0.000
		Ireland	0.000	0.000	0.003
		Malaysia	0.002	0.007	0.006
		Netherlands	0.000	0.000	0.040
		Norway	0.000	0.000	0.003
		OPEC Fund	0.006	0.000	0.000
		Philippines	0.011	0.032	0.000
		Sweden	0.006	0.020	0.000
		UNDP	0.001	0.000	0.024
	United Kingdom	0.005	0.031	0.000	
	United States	0.056	0.029	0.048	
	World Bank	0.002	0.008	0.051	
Non-Member	MacArthur Foundation	0.001	0.000	0.000	
	Others	0.029	0.132	0.310	
	Water & Food/CP	0.164	0.213	0.168	
Unrestricted + Center Income			0.906	0.830	0.658
Project Total			1.630	1.870	1.619
MTP Project 8 : Building improved institutional and human capacity	Member	ADB	0.120	0.041	0.084
		Australia	0.015	0.049	0.000
		Belgium	0.000	0.000	0.004
		Canada	0.009	0.024	0.013
		Denmark	0.000	0.000	0.007
		European Commission	0.000	0.101	0.116
		FAO	0.000	0.002	0.042
		Finland	0.003	0.009	0.013
		Ford Foundation	0.005	0.000	0.000
		Germany	0.119	0.162	0.008
		IFAD	0.001	0.002	0.000
		Ireland	0.000	0.000	0.002
		Malaysia	0.007	0.014	0.014
		Netherlands	0.000	0.000	0.028
		Norway	0.000	0.000	0.002
		OPEC Fund	0.005	0.000	0.000
		Sweden	0.006	0.018	0.000
		UNDP	0.001	0.000	0.021
		United Kingdom	0.005	0.028	0.000
		United States	0.063	0.058	0.061
	World Bank	0.002	0.007	0.036	
	Non-Member	MacArthur Foundation	0.001	0.000	0.000
		Others	0.025	0.123	0.020
Water & Food/CP		0.094	0.176	0.161	
Unrestricted + Center Income			0.942	0.985	0.659
Project Total			1.423	1.799	1.291
Center Totals			Actual 2006	Estimated 2007	Proposal 2008
Total Restricted			7.657	12.031	12.500
Total Unrestricted + Center Income			7.883	7.735	5.986
Total			15.540	19.766	18.486

Financial table 11: Internationally and Nationally Recruited Staff, 2006-2010
(in US \$millions)

	Actual 2006	Estimated 2007	Proposal 2008	Plan 1 2009	Plan 2 2010
NRS	287	309	314	319	324
IRS	42	56	60	65	70
Total	329	365	374	384	394

Financial table 12: Currency Structure of Expenditure, 2006-2008
(in millions of units and percent)

Currency	Actual 2006			Estimated 2007			Proposal 2008		
	Amount	\$ Value	% Share	Amount	\$ Value	% Share	Amount	\$ Value	% Share
MYR	17.180	4.685	30	26.755	7.432	38	27.950	7.764	42
Others	0.000	0.634	4	0.000	0.749	4	0.000	0.370	2
USD	10.221	10.221	66	11.585	11.585	59	10.352	10.352	56
Total		15.540	100 %		19.766	100 %		18.486	100 %

Financial table 13: Statement of Financial Position (SFP), 2006-2008
(in US \$millions)

Assets	2006	2007	2008
Current Assets			
Cash and Cash Equivalents	1.906	0.806	0.800
Investments	8.012	7.888	8.000
Accounts Receivable			
Donor	2.357	2.200	2.000
Employees	0.164	0.150	0.150
Other CGIAR Centers	0.004	0.002	0.002
Others	1.219	1.200	1.100
Inventories	0.000	0.000	0.000
Pre-paid Expenses	0.096	0.095	0.095
Total Current Assets	13.758	12.341	12.147
Non-Current Assets			
Net Property, Plan and Equipment	0.486	0.500	0.600
Investments	0.000	0.000	0.000
Other Assets	0.151	0.171	0.190
Total Non-Current Assets	0.637	0.671	0.790
Total Assets	14.395	13.012	12.937
Liabilities			
Current Liabilities			
Overdraft/Short Term Borrowings	0.000	0.000	0.000
Accounts Payable			
Donor	2.653	2.609	2.600
Employees	0.156	0.140	0.125
Other CGIAR Centers	0.007	0.005	0.005
Others	1.779	1.600	1.600
Accruals and Provisions	0.822	0.800	0.800
Total Current Liabilities	5.417	5.154	5.130
Non-Current Liabilities			
Accounts Payable			
Employees	0.396	0.400	0.354
Deferred Grant Revenue	0.000	0.000	0.000
Others	0.000	0.000	0.000
Total Non-Current Liabilities	0.396	0.400	0.354
Total Liabilities	5.813	5.554	5.484
Net Assets			
Unrestricted			
Fixed Assets	2.455	2.455	2.455
Unrestricted Net Assets Excluding Fixed Assets	6.127	5.003	4.998
Total Unrestricted Net Assets	8.582	7.458	7.453
Restricted	0.000	0.000	0.000
Total Net Assets	8.582	7.458	7.453
Total Liabilities and Net Assets	14.395	13.012	12.937

Financial table 14: Statement of Activities (SOA), 2006-2008
(in US \$millions)

	Unrestricted	Restricted	Total	Total	Total	
		Temporary	Challenge Programs	2006	2007	2008
Revenue and Gains						
Grant Revenue	7.160	6.767	0.890	14.817	17.844	18.385
Other revenue and gains	0.405	0.000	0.000	0.405	0.798	0.100
Total revenue and gains	7.565	6.767	0.890	15.222	18.642	18.485
Expenses and Losses						
Program related expenses	6.270	6.767	0.890	13.927	17.639	16.359
Management and general expenses	2.698	0.000	0.000	2.698	3.417	3.024
Other losses expenses	0.000	0.000	0.000	0.000	0.000	0.000
Sub Total expenses and losses	8.968	6.767	0.890	16.625	21.056	19.383
Indirect cost recovery	(1.085)	0.000	0.000	(1.085)	(1.290)	(0.897)
Total expenses and losses	7.883	6.767	0.890	15.540	19.766	18.486
Net Operating Surplus / (Deficit)	(0.318)	0.000	0.000	(0.318)	(1.124)	(0.001)
Extraordinary Items	0.000	0.000	0.000	0.000	0.000	0.000
Net Surplus / (Deficit)	(0.318)	0.000	0.000	(0.318)	(1.124)	(0.001)
Object of Expenditure						
Personnel	5.338	2.117	0.200	7.655	9.923	9.280
Supplies and services	1.286	1.871	0.173	3.330	4.577	4.281
Collaboration/ Partnerships	0.053	2.132	0.437	2.622	2.373	2.220
Operational Travel	0.915	0.599	0.077	1.591	2.132	1.994
Depreciation	0.291	0.048	0.003	0.342	0.761	0.711
Total	7.883	6.767	0.890	15.540	19.766	18.486

Annex I: The WorldFish Center key performance goals for 2007



Reducing poverty and hunger by improving fisheries and aquaculture

Growth	Partnership	Excellence
The bigger we are the greater the impact we can achieve.	We will achieve little impact on poverty and hunger working alone.	Excellence in our research and management is the foundation for high impact.

WorldFish Key Performance Goals 2007

Investors	Goal	Measure	Target
1)	Increase CORE funding	\$ value of CG core contribution	\$6.25m secured for 2007
2a)	Increase funding to WorldFish programs	\$ Value of project funding	\$11.5m secured for expenditure in 2007
2b)			\$7.6m secured for expenditure in 2008
3)	Increase the proportion of total project costs supported by restricted (project) funds.	% of total WorldFish project costs covered from restricted funds.	75%
4)	Improve overall scientific and organisational performance	# performance against WorldBank Indicators	Among the top 6 CG Centers
5a)	Increase outputs, outcomes and impacts of our research	% of submitted proposal containing an explicit impact pathway	100% of proposals > \$400K
5b)		% satisfaction with quality of investor reports & project outputs	80% of respondents feel that reports met or exceeded expectations
6)	Increase support to investors to build the case for increased support for R&D within their constituencies.	# special reports, briefs and publications provided	6
NARS/NGO's	Goal	Measure	Target
7)	Improve the feedback about us that partners give to others.	% satisfaction with WorldFish as a responsive partner	>80%
8a)	Increase human and institutional capacity in NGOs and NARS	# national or regional policy briefings/seminars organised jointly with NARS/NGOs	15 (>30 participants)
8b)		# scientists/students from developing countries co-supervised/supported.	30FTE
ARIs	Goal	Measure	Target
9)	Increase collaboration with ARIs to support the WorldFish mission.	# person weeks of ARI scientists working at WorldFish, but supported externally	120
10)	Improve opportunities for ARIs to develop research programs and attract resources in support of the WorldFish mission.	# proposals developed in collaboration with WorldFish	7 proposals with \$value > \$1m supporting WorldFish activities
Our People	Goal	Measure	Target
11a)	Improve project management	% progress milestones achieved on time for research projects	90%
11b)		% project underspend	< 10% on grant funded projects
12)	Improve the gender and diversity profile of the Center	% of female applicants for job vacancies	> 30% for positions recruited from the regional or global labour market.
13)	Increase the quality of performance management	% of Performance Management Agreements completed by the end of February.	95%
14a)	Increase the number of quality scientific publications	# papers/scientist accepted in peer-reviewed publications	2 papers per scientist
14b)		# mean impact factor for submitted papers	> 1.0
15)	Increase the quality and timeliness of corporate service delivery to regional offices.	% satisfaction based on customer survey	Target to be set based on 2006 result
16)	Increase capacity and effectiveness of staff in their jobs	# average number of training hours provided.	3 hours training for all staff on use of web-based service platforms.
17a)	Increase in the quality and timeliness of corporate service delivery	% satisfaction with financial information and budget management tools	Target to be set based on 2006 result
17b)		% satisfaction with Human Resources service delivery	Target to be set based on 2006 result
17c)		% satisfaction with Information and Knowledge Group service delivery	Target to be set based on 2006 result
18)	Increase staff attraction and retention rates	% satisfaction with performance management system	80% of respondents feel that their supervisors are managing performance more effectively.
	Behavioural Outcome Strategic Factor		

Annex II: Progress report on implementation of EPMR Panel recommendations

Dates of EPMR Report Presentation and Discussion:

Science Council: 10 April 2006
 Executive Council: 18 May 2006
 CGIAR Annual General Meeting: 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. Sept. 2006 2. 2009	Completed. Rolling CCERS approved by Board at September 6 BoT meeting
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 for leveraging additional resources	1. Nov. 2007 2. Nov. 2007	Strategic staffing approach is being continuously developed. A paper on strategic staffing and leveraging resources for this will be presented to the Board in November 2007
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 that are designed to provide such a focus for the Disciplines over 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. Sept. 2006 2. 2008	Completed. Strategies presented to the BoT in Sept. 2006 and now incorporated into the MTP PESS Director has been recruited and will be taking office in Sept. 2007. The PESS strategy will be finalized in 2008
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. Sept. 2006	Completed. The issue has been incorporated into the Aquaculture Campaign. A post-doc has been recruited and is working on nutrition trials with GIFT. A proposal to conduct work on fatty acid metabolism of GIFT has been jointly developed with the University of Science, Malaysia

<p>5. Move away from downstream development activities and explore opportunities for development-related activities to be executed by local or bilateral entities, where available; Analyze impacts and identify constraints and bottlenecks of development-related activities; Identify partners' strengths and weaknesses in order to better target capacity building, especially of NGOs;</p> <p>Synthesize and package existing information, including frameworks, manuals, protocols and guidelines, to ensure greater dissemination and use of its products</p>	<p>Agreed</p>	<p>1. Undertake assessment of partners' strengths and weaknesses globally and in regions</p> <p>2. Re-examine strategy and approach to knowledge sharing</p>	<p>1. 2008</p> <p>2. Dec. 2006</p>	<p>Assessments have been conducted in the greater Mekong area, sub-Saharan Africa and Bangladesh to analyze strengths and weaknesses of partners; Assessment of strengths and weaknesses of partners in the Pacific will be carried out formally in 2007/08 as part of the strategy implementation for the Pacific region</p> <p>Completed. A decision has been taken to consolidate KM* within WorldFish and to combine this with the business development functions of the Center. In 2007 WorldFish is commencing the implementation of a system for supporting sharing knowledge on projects. A comprehensive strategy for KM will be finalized end of 2008.</p>
<p>6. Define the Center's continuing involvement and role in FishBase, including specifying staff requirements</p>	<p>We believe we have already defined our continuing role. We have signed a MoU that commits us to the development of the FishBase project on a long term basis. We are committed, both in human resources and financial support, to continue to fully participate in the consortium</p>	<p>1. Develop a position paper for Board approval which clearly defines the Center's role in FishBase</p> <p>2. Communicate approved position to FishBase consortium members</p>	<p>1. Sept. 2006</p>	<p>Completed. Board has reviewed the measures already taken and agreed that the Center has clearly specified its role in the FishBase to the consortium</p>
<p>7. Expand modeling work on the supply and demand of fisheries and aquaculture and undertake additional <i>ex post</i> impact assessment in aquaculture, paying particular attention to technological and environmental impacts and non-negligible dynamic (inter-temporal) effects of fisheries and aquaculture activities</p>	<p>Agreed. Our research on fish demand and supply has been highly effective in guiding policy and future research on fisheries and aquaculture</p>	<p>1. Undertake <i>ex post</i> impact assessments of the Center's aquaculture research</p> <p>2. Present a major analysis of fish supply and demand in Asia and publish in a primary journal</p>	<p>1. Ongoing/ 2008</p> <p>2. Dec. 2007</p>	<p>Completed. WorldFish has been conducting <i>ex post</i> impact assessment of the Center's work on an on-going basis. In 2006, the Center conducted an <i>ex post</i> impact assessment of its Integrated Aquaculture-Agriculture work in Bangladesh</p> <p>An article is being finalized for submission to an international journal.</p>

<p>8. Define, on a pragmatic and objective basis, the acceptable dissemination area of an improved fish strain and the realistic monitoring that should be implemented in relation to this dissemination</p>	<p>Agreed. The Center is committed to expanding our work on the development of improved breeds of tilapia, carp and African catfish and, in doing so, developing improved tools for assessing both economic utility and environmental risk of introducing specific strains</p>	<p>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 2007-2009, Pro-poor Aquaculture Global Project no. 8)</p>	<p>1. 2007 2. 2007</p>	<p>Completed. A study was conducted evaluating the economic benefit of genetic improvement programs; the results are in press in the journal <i>Aquaculture</i> 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, passed by the Board in September 2006 subject to minor changes, are currently being revised in the light of recent decisions to extend the CGIAR SMITA* on crops to fish</p>
<p>9. For PESS: Secure a Discipline Director (DD) as soon as possible; Conduct a strategic process of research planning and prioritization that enables each 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</p>	<p>Agreed. When the position was advertised internationally in 2005, no suitably qualified candidate was secured. 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</p>	<p>1. Procure DD for PESS 2. Develop research strategy for PESS</p>	<p>1. 2006 2. 2008</p>	<p>Completed. A candidate has been appointed and will commence work in September 2007 To be undertaken by PESS director in late 2007 and early 2008</p>
<p>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</p>	<p>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 2007-2009, sub-Saharan Africa Project 5).</p>	<p>1. Increase partnership with CGIAR Centers wherever this adds value to the work of both Centers</p>	<p>Ongoing/2008</p>	<p>The Center has participated in the development of the Regional MTPs for Africa and is pursuing collaborative opportunities where these will add value to both Centers. Plans to co-locate staff with CIFOR in Zambia and with IITA in Congo are in train</p>

<p>11. Give high priority to:</p> <p>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</p>	<p>Agreed. The BoT and Management are committed to strengthening the scientific capacity of the Center. This is being pursued actively. 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</p>	<p>1. Complete recruitment of 10 new scientists as approved by the Board under the investment strategy</p> <p>2. Develop staff capacity in a staged manner in order to ensure financial sustainability</p>	<p>1. Dec. 2006</p> <p>2. 2008</p>	<p>Completed. 10 new scientists have been appointed at various levels, and some additional recruitment may be made in late 2007 and in 2008 if funding permits</p> <p>Completed. The new staff have been hired over a period of 3 years</p>
<p>12. Elaborate a Partnership Strategy focusing on, among others, the <i>modus operandi</i> for establishing strategic partnerships and alliances that would add significant value to the current research activities undertaken by the Center;</p> <p>Explicitly define the roles and responsibilities of the Center relative to its partners in all major projects;</p> <p>Determine its positioning on the research-to-development continuum, within the framework of an impact pathway analysis for all major projects;</p> <p>Elaborate a human capacity building policy for its staff and its partners taking into account, as appropriate, the suggestions that have been provided.</p>	<p>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. 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.</p>	<p>1. Prepare formal Partnership Strategy</p> <p>2. Build capacity of staff and partners through workshops and/or training events</p>	<p>1. 2007</p> <p>2. Ongoing/ 2008</p>	<p>Draft policy presented to BoT in March 2007. To be finalized in November 2007</p> <p>Ongoing capacity building is occurring through staff development plans and through the explicit capacity building work in a range of projects in all regions</p>

<p>13. Reduce size of BoT to not more than nine Trustees, including the ex-officio Director General, Host Country representatives and the FAO nominee;</p> <p>Modify Board committee structure to retain the Audit Committee, the Nominating Committee, and the Executive Committee, and eliminate the Program Committee;</p> <p>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;</p> <p>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;</p> <p>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;</p> <p>CCER Panel Chairs should be requested to make the presentations to the Board on their Reports and Recommendations.</p>	<p>The Center initiated a process of Board reform in September 2005 and we are pleased that the Panel's recommendations reflect the direction that has been taken</p>	<ol style="list-style-type: none"> 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 	<p>1. March 2006</p> <p>2. March 2006</p> <p>3. March 2006</p> <p>4. March 2006</p> <p>5. Sept. 2006</p> <p>6. June 2006</p> <p>7. Sept. 2006</p>	<p>Completed</p> <p>Completed</p> <p>Completed</p> <p>Completed</p> <p>Completed</p> <p>Completed. Will be reflected in the 2006 annual report</p> <p>Completed. Rolling CCERs approved at September 2006 Board meeting</p>
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<p>14. Continue to maintain reserves at prudent but 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</p>	<p>Agreed. The Center has developed a plan to draw on the Center's reserves to allow investment in science development</p>	<p>1. To utilize US\$1.2 million for additional scientists and support costs in 2006</p> <p>2. To make further strategic investments in research and support bringing reserves to no less than 100 days operating expenses</p>	<p>1. 2006</p> <p>2. 2008</p>	<p>Completed. Board has approved 1.2 million draw-down on reserves in 2006 and will consider further proposals for additional draw-down in 2007 and 2008</p> <p>In November 2007 the Board will further review the level of reserves it feels is prudent for the Center to maintain. If there are sufficient reserves then further investments will be planned in 2008</p>
<p>15. Revisit and comprehensively review the recovery methodology (rental charges as a component of overhead) in all its aspects;</p> <p>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</p>	<p>Agreed</p>	<p>1. Conduct comprehensive review of overhead recovery concept and methodology which addresses all the issues pointed out by the EPMR team</p> <p>2. Present review to the Center's Audit Committee and the Board</p>	<p>1. Aug. 2006</p> <p>2. Sep. 2006</p>	<p>Completed. The Board considered the overhead recovery method in September 2006 and clarified its policy</p> <p>Completed</p>

* CCERs - Center Commissioned Evaluation Reviews
NRM - Natural Resources Management
PESS - Policy, Economics and Social Sciences
EPMR - External Program and Management Review
KM - Knowledge Management.

WorldFish Offices

BANGLADESH

The WorldFish Center – Bangladesh Office
Mail: House 22B, Road 7, Block-F, Banani,
Dhaka 1213, BANGLADESH
Tel : (+880-2) 881 3250, (+880-2) 881 4624
Fax : (+880-2) 881 1151
Email : worldfish-bangladesh@cgjar.org

CAMBODIA

The WorldFish Center – Greater Mekong Office
Mail: PO Box 1135 (Wat Phnom), Phnom Penh, CAMBODIA
Office: #35, Street 71 (Cnr of Mao Tse Tong Blvd.),
Sangkat Beng Keng Kang 1, Phnom Penh, CAMBODIA
Tel : (+855) 23 223 208
Fax : (+855) 23 223 209
Email : worldfish-cambodia@cgjar.org

CAMEROON

The WorldFish Center – Cameroon Office
Humid Forest Center, BP 2008 (Messa),
Yaoundé, CAMEROON
Mail: IITA-Cameroon
c/o L.W. Lambourn & Co. Ltd.,
Carolyn House, 26 Dingwall Road,
Croydon CR9 3EE, ENGLAND
Tel : (+237) 223 7434, (+237) 223 7522
Fax : (+237) 223 7437
Email : worldfish-cameroon@cgjar.org

CHINA

The WorldFish Center – China Office
9 West Shanshui Road, Wuxi City,
Jiangsu Province,
PO Box 214081, P.R. CHINA
Tel : (+86-510) 8555 9919
Email : worldfish-china@cgjar.org

DEMOCRATIC REPUBLIC OF THE CONGO

The WorldFish Center – DRC Office
Boulevard du 30 Juin Nr 2515,
Immeuble Aforia ex. Shell, 6ème Etage,
Gombe, Kinshasa
RÉPUBLIQUE DÉMOCRATIQUE DU CONGO
Tel : (+243) 81 756 8724
Email : mhhoekstra@cgjar.org

EGYPT

The WorldFish Center – Egypt Office
Abbassa Research Center
Abbassa, Abou-Hammad, Sharkia, EGYPT
Tel : (+205) 5340 8165
Fax : (+205) 5340 5578

The WorldFish Center – Cairo Office
3, Abou El Feda Street,
Zamalek, Cairo 11211, EGYPT
Mail: PO Box 1261, Maadi, Cairo, EGYPT
Tel : (+202) 2736 4114
Fax : (+202) 2736 4112
Email : worldfish-egypt@cgjar.org

MALAYSIA (Headquarters)

The WorldFish Center – Malaysia Office
Jalan Batu Maung, Batu Maung,
11960 Bayan Lepas, Penang, MALAYSIA
Mail: PO Box 500, GPO 10670,
Penang, MALAYSIA
Tel : (+60-4) 626 1606
Fax : (+60-4) 626 5530
Email : worldfishcenter@cgjar.org

MALAWI

The WorldFish Center – Malawi Office
National Aquaculture Center, Domasi, MALAWI
PO Box 229, Zomba, MALAWI
Tel : (+265-1) 536 298, (+265-1) 536 274,
Fax : (+265-1) 536 274
Email : worldfish-malawi@cgjar.org

NEW CALEDONIA

The WorldFish Center – South Pacific Office
Mail: c/o The Secretariat of the Pacific Community
B.P. D5, 98848 Nouméa Cedex, NEW CALEDONIA
Tel : (+687) 262 000
Fax : (+687) 263 818
Email : worldfish-newcaledonia@cgjar.org

SOLOMON ISLANDS

The WorldFish Center – Solomon Islands Office
Gizo Office: PO Box 77, SOLOMON ISLANDS
Tel : (+677) 600 22
Fax : (+677) 605 34

Honiara Office: PO Box 438, SOLOMON ISLANDS
Tel : (+677) 250 90
Fax : (+677) 232 96
Email : worldfish-solomon@cgjar.org

THE PHILIPPINES

The WorldFish Center – Philippines Office
Khush Hall, IRRI College, Los Baños,
Laguna 4031, PHILIPPINES
Mail: MCPO Box 2631,
0718 Makati City, PHILIPPINES
Tel : (+63-2) 580 5659, (+63-49) 536 2701
Fax : (+63-2) 891 1292, (+63-49) 536 0202
Email : worldfish-philippines@cgjar.org

ZAMBIA

The WorldFish Center – Zambia Office
2 Dunduza Chisidza Crescent,
Longacres, Lusaka, ZAMBIA
Mail: PO Box 51289, Ridgeway, Lusaka, ZAMBIA
Tel : (+260) 211 257939/40
Fax : (+260) 211 257941
Email : worldfish-zambia@cgjar.org

For further information on publications please contact:

Business Development and Communications Division

The WorldFish Center

PO Box 500 GPO, 10670 Penang, Malaysia

Tel : (+60-4) 626 1606

Fax : (+60-4) 626 5530

Email : worldfishcenter@cgjar.org



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