



The WorldFish Center

THE MILLENNIUM DEVELOPMENT GOALS FISHING FOR A FUTURE



A study based on work in Malawi shows that average farm profits per unit area can be more than doubled by integrating aquaculture into traditional livestock and horticultural farming systems and these 'fish farming' families can earn 28% higher incomes. Fish consumption rises, strengthening the family's food security and child malnutrition decreases. During times of drought, these farms are 18% more productive. This has huge implications, particularly in southern Africa where even mild droughts can lead to food shortages, and demonstrates how fish ponds underpin the resilience of the entire farming enterprise.

WHY FOCUS ON FISHERIES AND AQUACULTURE?

The Millennium Development Goals (MDGs) set ambitious targets for improving human well-being by 2015. As the international community strengthens investment to meet these targets it is important that special attention is given to areas where there is greatest leverage for improving people's lives. The WorldFish Center believes that fisheries and aquaculture can make such a contribution in many of the poorest countries and the present document summarizes where the Center's research is helping to achieve this.

Many of the world's poorest people depend on fish to help meet their basic needs. Fish are a key dietary staple for over 1 billion people, providing up to 70% of animal protein in some countries. Similarly millions of families rely on catching, processing and trading fish to provide their main source of cash income. These benefits need to be protected if hunger and poverty are to be reduced and the MDG targets met.

As the world's population grows and purchasing power increases so does the demand for fish. Consumption has doubled since 1973, with rising demand in developing countries accounting for the bulk of that growth. Meeting that demand is both a challenge and an opportunity. It is a challenge because most wild-fish stocks are already reaching the limits of their productive capacity, while many

have leveled off or declined as a result of overfishing and other causes. In response we need not only to develop the capacities required to maintain wild fisheries in the face of these constraints and pressures, but also develop aquaculture which provides the only option for substantial increases in fish production.

It is an opportunity because the strong demand for fish creates national and international markets that provide an increasing number of farmers, fishers, processors, traders, and service providers, with attractive investment options. This has already driven the rapid expansion of aquaculture in Asia, and the recent increases in aquaculture production and associated livelihoods in Egypt and sub-Saharan Africa have been similarly fed by growth in local markets. As demand continues to increase, these national markets will grow together with international opportunities. With 40% of fish catch being sold internationally fish has already become the most heavily traded commodity in international markets, with a net value of \$18 billion a year, nearly 75% of which goes to developing countries in Asia. With adequate support, more small-scale fish producers in developing countries could benefit immensely from the globalization of trade in fish.

WORLD FISH AND THE MDG'S

There are many ways through which fisheries and aquaculture can contribute to reducing both poverty and



Photo by Mark Prein

Raising fish in rice fields is effective in increasing both the productivity and efficiency of farms. Fish wastes increase the amount of natural fertilizer reducing the need for chemicals. Fish also help the environment by preying on pests — reducing pesticide application by up to 90%, and feed on weeds and algae — reducing them by 30-50%. Rice production increases, sometimes by as much as 10%. Overall net farm profits rise by up to 65%.

hunger. Recognizing this pervasive importance, WorldFish has diversified the entry points for its research and initiated new development partnerships to increase its contribution to achieving the MDGs.

MDG 1: REDUCING EXTREME POVERTY AND HUNGER

Innovative fish-farming methods developed by WorldFish and its partners provide tens of thousands of farming families with a means to produce fish locally to both feed themselves and earn money. Notably, these techniques avert the kinds of environmental damage that have been linked with much commercial aquaculture in marine and coastal waters. Cheap and simple to implement, and applicable to a range of different agro-ecological conditions, these methods are steadily gaining ground in a number of Asian and African countries.

In Bangladesh, the rural poor have used these technologies to convert at least a million ponds, ditches, seasonally flooded fields, and other bodies of water into productive “fish factories.” Some small-scale fish producers have boosted their household income four-fold. When integrated into traditional farming systems, WorldFish’s aquaculture technologies can also help achieve impressive gains in agricultural productivity. Many rice farmers in Vietnam and other parts of Asia have boosted grain yields, lowered production costs, and earned bigger profits by growing fish in their rice paddies. The approach also has environmental

advantages because fish eat weeds and invertebrate pests, thereby reducing the need for pesticides and herbicides.

Integrated agriculture-aquaculture developed and tested in Malawi has increased farm productivity by 10% and efficiency by 50%, reduced nitrogen loss, and improved resilience during drought. These fish-farming families earned 28% higher income, and also enjoyed better nutrition, thanks to a regular supply of fresh fish. The boost in total farm productivity comes mainly from extensive recycling of organic farm wastes and nutrient-rich water from the fish ponds, which enables farmers to grow additional crops for local markets. The approach is steadily being adopted in Malawi and several other African countries, and analysis suggests that expanding implementation on a small fraction of suitable land in sub-Saharan Africa could produce nearly 4 million extra tons of fish a year and improve livelihoods for some 32 million families.

New strains of fish bred specifically for resource-poor conditions are further increasing the benefits of aquaculture for many small-scale fish producers. An acclaimed “super-tilapia” (or GIFT fish, for “genetically improved farmed tilapia”) produced by WorldFish and partners grows up to 60% faster than conventional strains and can reach market weight at up to 30% lower production costs. The breeding techniques that led to the GIFT fish are now being used in 15 countries to develop improved strains of other native fish



Driven mainly by women entrepreneurs, estimates suggest that over 1 million tonnes of fish from small scale inland and coastal fisheries trade within and between countries in southern Africa, at a value of at least 1 billion dollars per year.

for use in small-scale aquaculture, including three species of tilapias, carp, catfish, and silver barb.

In 2005 the GIFT fish and related breeding technology was named an outstanding achievement benefiting humanity by the Tech Museum of Innovation. Also in 2005, WorldFish's Senior Research Fellow Dr. Modadugu Gupta received the World Food Prize for his scientific leadership in developing WorldFish's aquaculture technologies targeted to poor rural fish producers.

MDG 2: SUPPORTING THE SPREAD OF UNIVERSAL PRIMARY EDUCATION

Educating children is one of the most fundamental requirements for human development. Yet the poor tend to lose out because they often lack the cash required for school fees, uniforms, and supplies. WorldFish work supports this MDG significantly but indirectly by giving families a way of acquiring money for basic household expenses and essential investments in the future of their children.

Studies in Africa and elsewhere have shown that school attendance is higher among children from families in which

women have independent income. These children also tend to eat better and be healthier, which has a positive effect on their performance at school. By developing approaches for aquaculture, as well as fish processing and marketing, that engage women, our work is specifically targeting this pathway to improved education. In the words of Jamia Mandisoni, a female fish farmer from Zomba, Malawi, "I am now using proceeds from fish farming to send my children, nieces and nephews to school".

In the Kafue Flats region of Zambia, WorldFish works with fishing communities to find sustainable ways of improving the social welfare of fisherfolk. Education for the large numbers of children in fishing camps is a chief priority for these remote communities where government services don't reach. Through local by-laws and civil society initiatives, communities are seeking new ways to reinvest revenue from fisheries into education facilities and attracting teachers. WorldFish is helping them explore innovations to increase revenue through changes in fisheries management and marketing chains.

In low-income food-deficient countries, fish provide 20% of animal protein in a typical diet, versus 13% in industrialized countries. In Asia, the proportion is 30% and in some regions it is much higher: 51% in Bangladesh, 58% in Indonesia, and 75% in Cambodia. Of Africa's 800 million people, more than 200 million regularly eat fish. It accounts, on average, for 22% of their animal protein intake—up to 70% in some countries.



Photo by: Mark Prein

MDG 3: PROMOTING GENDER EQUALITY AND EMPOWERING WOMEN

Because so many poor families in developing countries are headed by women, WorldFish designs its programs with the particular needs of women in mind. The Center's approach to fish farming technologies that are adapted to local needs has proved to be a highly effective avenue to social and economic empowerment for many poor rural women because the techniques can be practiced close to home at relatively low cost. In Bangladesh, women now make up about 60 percent of all fish farmers, a number of them highly successful entrepreneurs.

African women are also increasingly engaged in fish farming, while across much of the continent women already dominate artisanal fish-processing activities and small-scale fish trading. Sustaining and strengthening these options, while expanding opportunities that make them available to other women, will have a direct impact on their continued access to fish for food and income, and the wider well-being of their families.

WorldFish work on community-based management of fisheries also empowers women by promoting their involvement. In Bangladesh, for example, women's

collectives have played a central role in implementing conservation measures that increased fish abundance and diversity in local waters, while in turn generating improved income that has been invested in health and education.

Our program on Fisheries and HIV/AIDS in Africa works specifically with women fish traders to reduce their risk to HIV exposure through changes in business relations and public policy towards informal trade. While they are often marginalized by service provision and legal and social status, these traders convey millions of tons of fish to poor people in Africa and are the guarantors of regional food security. Monitoring the gender impact of our work and the work of our partners is an essential component of how we measure our impact. We are thus more able to demonstrate what innovations in fisheries and aquaculture are of particular value for women and what new risks and threats are emerging. This knowledge is an important input into planning for investment in the sector by national governments, private sector, NGOs and international organizations.

MDGS 4 & 5: REDUCING CHILD MORTALITY AND IMPROVING MATERNAL HEALTH

Malnutrition is a major contributor to the death of infants and children under five, and to women during childbirth. By enabling poor families to acquire a regular supply of

"Rich food for poor people" —fish contain combinations of proteins, vitamins and micronutrients that provide a high level, nutritious diet. Fish also contain essential fatty acids that improve development of the fetal brain, and throughout childhood. Studies indicate that increased consumption of fish can reduce childhood malnutrition by as much as 15%.



Photo by: Mark Prein



Fishing communities suffer from rates of HIV infection that can be 5 to 10 times higher than those in the general population. According to the World Health Organization, good nourishment can prolong the life of people living with HIV by up to eight years.

affordable fish, investments in fisheries and aquaculture can help reduce malnutrition. Women who consume fish regularly as part of their diets enjoy better health themselves, and also produce healthier babies.

Fish is an excellent source of high-quality protein and other nutrients vital to good health, including iron, calcium, potassium, vitamin A, and iodine. Known as an important “brain food,” fish contains fatty acids that aid fetal brain development and cognitive abilities critical for effective learning. The nutritional benefits of fish also lower the risk of low birth weight in infants, a major factor in infant mortality.

In an impact study of households in Malawi that integrated aquaculture production into regular farm operations, WorldFish found that per capita consumption of fresh fish among the participating families rose by 160%. Related analysis suggested that increased consumption at that level could reduce childhood malnutrition by as much as 15%.

MDG 6: COMBATING HIV/AIDS AND OTHER DISEASES

HIV/AIDS related diseases are now the leading cause of death in sub-Saharan Africa. The often debilitating effects of HIV infection within families aggravate poverty by reducing household labor supply and limiting economic opportunities. Families that have lost one or more household members to an HIV-related illness are similarly disadvantaged.

Studies in several developing countries over the last decade indicate that HIV infection rates in fishing communities can be several times higher than those in the general population. The factors behind this include the typical age of fishermen who, at 15 to 35, are most sexually active, mobile lifestyles that increase exposure to risky behaviors, and inadequate health care and HIV/AIDS support services in marginalized fishing villages. Researchers in Malawi are adapting WorldFish’s fish-farming technologies to address the specific needs of HIV/AIDS-affected households, which often are headed by widows or orphans. Besides providing



Photo by: Mark Prein

In the seasonal and permanent lakes of Bangladesh, community based fisheries management and women-managed fisheries have led to significant increases in fish production and biodiversity due to the adoption of fish sanctuaries, closed seasons, and changes in fishing practices. Fish once 'lost' have reappeared in the catch.

an important source of income, the approach aims to optimize family nutrition through increased consumption of fresh fish. This is a boon particularly for family members living with HIV. Improved nutrition has been shown to enhance the effectiveness of anti-retroviral drugs and help fortify against secondary diseases. According to the World Health Organization, good nourishment can prolong the life of people living with HIV by up to eight years.

In Malawi, Mozambique, Zambia, Uganda and DR Congo, we are working with fishing communities, fish traders and fish processors to find sustainable solutions to the HIV crisis in the sector. This research is supporting these stakeholders to develop new business relations within the informal sector that can reduce exposure to risk. Building upon this we are also developing guidelines for attracting and delivering better NGO and government services to the sector, as well as investment strategies that can enhance the contributions of fisheries to the nutritional security of families touched by the HIV epidemic.

MDG 7: ENSURING ENVIRONMENTAL SUSTAINABILITY

Many of the world's fisheries have been pushed to the brink of their productive capacity by over-harvesting. Pollution, rapid development, and other forces compound the stress, with climate change posing a potentially enormous threat. The expected impacts of climate change, including greater swings between drought and flooding, higher ocean water temperatures, and heavier storms in coastal areas, will alter fisheries in ways that have major implications for ongoing production of fish and other aquatic resources. As a primary thrust of its research program, WorldFish works to help developing countries understand and address the impacts of climate change on fisheries and poor fish-dependent communities. Targeted outputs include better approaches to fisheries management, decision-support tools to facilitate that, and sustainable livelihood options that reduce over-reliance on traditional fishing activities.

The 2004 tsunami in Asia showed, tragically, how poor coastal communities are vulnerable to natural disasters. Working in Indonesia's Aceh province, WorldFish and a coalition of partners have developed a "Sustainable Coastal Livelihoods Framework" to guide rehabilitation of devastated communities. Rather than just replacing lost boats and fishing gear, it calls for integrated, multi-sectoral reconstruction that discourages over-fishing and builds a more diversified economic base for coastal communities. The learning from this work was successfully applied after the more recent 2007 tsunami in the Solomon Islands.

Initiatives to promote more sustainable fishing practices and improve fisheries management are strongly supported by the Center's work on community based management of fisheries. Building on field activities of the Center and partners we have developed guidance on the best approaches to forming effective partnerships between communities and governments in the management of fisheries. This work is now being expanded to other regions and adapted to consider the likely impacts of climate change.

The Center's environmental work is supported by a number of powerful tools produced through extensive partnerships with multiple collaborators. For example in the Greater Mekong region scientists and policy-makers are using the BayFish modeling tool to acquire a better understanding of the trade-offs involved in different water and land-use planning options. In Cambodia, WorldFish researchers and partners assessed how dams, irrigation systems and other infrastructure will affect fish production in the Tonle Sap area. The Tonle Sap Lake is the heart of Cambodia's inland fishery, the most intensive in the world and the source of 65-75% of animal protein in the rural population's diet.

At the global level the online FishBase, developed by WorldFish and some 900 partner institutions, offers a broad range of information on all 30,000 known species of fish. Its millions of records are enhanced by interactive and analytical features, and the information is accessible in several languages, making FishBase one of the most widely

used resources of its kind. Visits to the site number more than 30 million a month. Similarly ReefBase, is indispensable for monitoring and management of the world's coral reefs. This online resource features a comprehensive database of coral-related publications, full-resolution maps of all the world's coral reefs derived from Landsat satellite images, authoritative data on coral bleaching, and an award-winning interactive GIS-based mapping tool. Soon after the 2004 tsunami in Southeast Asia, scientists relied heavily on ReefBase in assessing environmental damage to coral reefs and coastal fishing communities in the region. The ReefBase team regularly provides scientific and technical assistance to Pacific and Southeast Asian countries that are working to build effective databases and management systems for coral reef information and analysis.

MDG 8: STRENGTHENING PARTNERSHIPS FOR DEVELOPMENT

Eradicating world hunger and poverty requires focused, concerted action on many fronts and at different levels – local, regional, national. Partnerships are critical to achieve significant impact. WorldFish collaborates with a wide range of organizational partners in carrying out its work. This approach augments resources, provides complementary skills, and expands reach. The Center's principal partners include other CGIAR centers and international scientific organizations, major policy-making bodies, universities and advanced research institutes, development agencies, conservation and philanthropic groups, NGOs, producer groups, and institutions in the private sector. In 2007 WorldFish worked with 250 partner institutions in 25 countries.

In recent years, WorldFish has played a prominent role in raising awareness of the need to address problems of shrinking fish supply and ensure sustainable fish production for the sake of present and future generations. "Fish to 2020," a major study by WorldFish and the International Food Policy Research Institute, provided important baseline information and scenario projections of global fish supply and demand in relation to factors such as trade trends and different policies. Building on this and other analyses the Center's "Fish for All" campaign and related initiatives have helped establish effective working partnerships with regional organizations and programmes in Asia and Africa through which we provide authoritative information and guidance on fish-related issues in these regions.

Collaboration underway in Africa provides an important illustration. With aquaculture and fisheries increasingly recognized across the continent as potentially strong drivers of social and economic development, WorldFish is working with the African Union, the New Partnership for Africa's Development, and the Forum for Agricultural



Research in Africa to plan and coordinate actions to support improved management of fisheries and foster aquaculture development. In the Asia-Pacific region, WorldFish is providing similar guidance on national strategies for aquaculture and fisheries development, and also plays a key advisory role to the ASEAN economic alliance on fisheries matters relevant to its member countries in Southeast Asia.



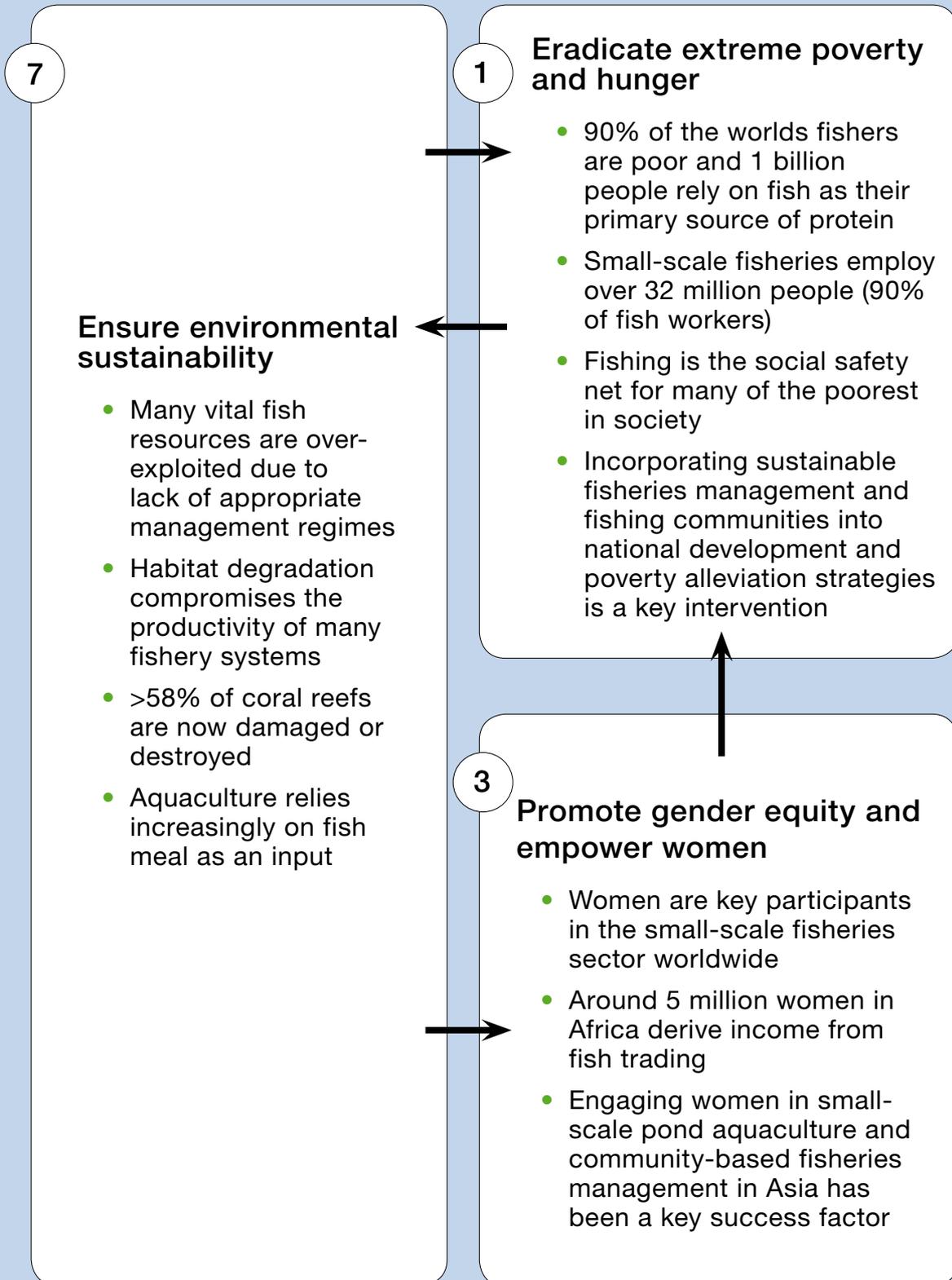
Photo by: Tim Nugent

Coral reefs provide revenues equivalent to \$375 billion each year but nearly 60% of them are at risk from disease, natural disasters, pollution, over-harvesting, and especially from global warming; 500 million people depend on them for food, livelihoods, and protection from natural disasters. Two-thirds of all coral reefs are in developing countries, an indication of their importance to the poor for nutrition and livelihoods.

Coral reef ecosystems are rich in biodiversity and highly productive; their associated fisheries are a major source of food and animal protein throughout the world, contributing to 10% of the fish consumed by humans and providing a supply of protein for tens of millions of people.

FISHERIES, AQUACULTURE AND

Direct Intervention points for fisheries and aquaculture



1

Millennium Goal Number



Demonstrated Linkage

AND THE MILLENNIUM GOALS

Known flow-on benefits

2

Achieve universal primary education

- Poverty and irregular income are leading causes of low educational attainment
- School attendance is higher where women have independence income
- Supporting women's income through engagement in fisheries and aquaculture has increased expenditure on child education

5

Improve maternal health

- Fish consumption during pregnancy and lactation improves nutritional and health status of mothers
- Even in UK a significant proportion of pregnant women are at risk from inadequate DHA intake from fish
- Improved nutrition reduces susceptibility to disease

4

Reduce child mortality

- About 60% of under 5 deaths in Africa are attributed to malnutrition
- Fish are a main source of vital nutrients, especially for the poor
- Insufficient omega-3 fatty acids from fish are associated with low birth weight and impaired brain function

6

Combat HIV/AIDS, malaria and other diseases

- Fishing communities have among the highest HIV/AIDS rates in Africa
- Fishing communities are a key strategic entry point for HIV/AIDS support
- Small scale aquaculture on African farms reduces the labour burden in AIDS affected households and improves nutrition

8

Develop a global partnership for development

- Trade partnerships have high potential as vehicles for achieving the Millennium Goals
- For 11 African countries fish products contribute more than 10% total export value
- North-South fish trade grew by 45% from 1990 - 2000 and at \$18billion exceeds many more traditional agricultural exports

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