



LESSONS LEARNED | 1904

## Dissemination and Adoption of Milkfish Aquaculture Technology in the Philippines

### KEY LESSONS LEARNED

1. Strengthen extension systems to better disseminate improved milkfish hatchery and nursery technologies.
2. Enhance the efficiency of milkfish grow-out culture by introducing restrictive feed management and polyculture with shrimp.
3. Train producer communities to add value by processing their milkfish harvest.
4. Improve milkfish farmers' access to credit.

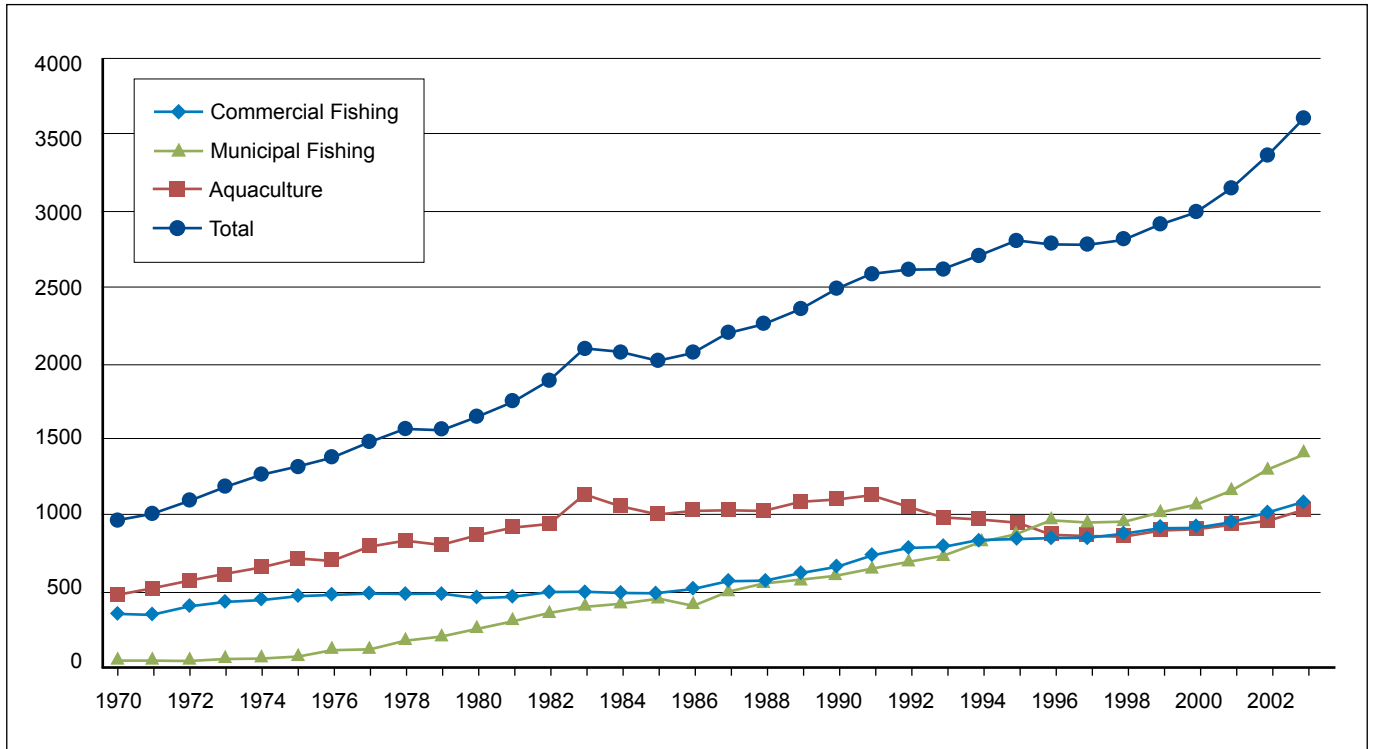
### Introduction

Milkfish aquaculture in the Philippines dates back to the 14th century. Today it accounts for 53% of national aquaculture production of fish and shellfish, with 99% of the harvest consumed domestically. Milkfish is a mainstay in the Philippine diet and traditionally considered the national fish. It is farmed under conditions ranging from freshwater ponds to marine pens, but mostly in brackish ponds.

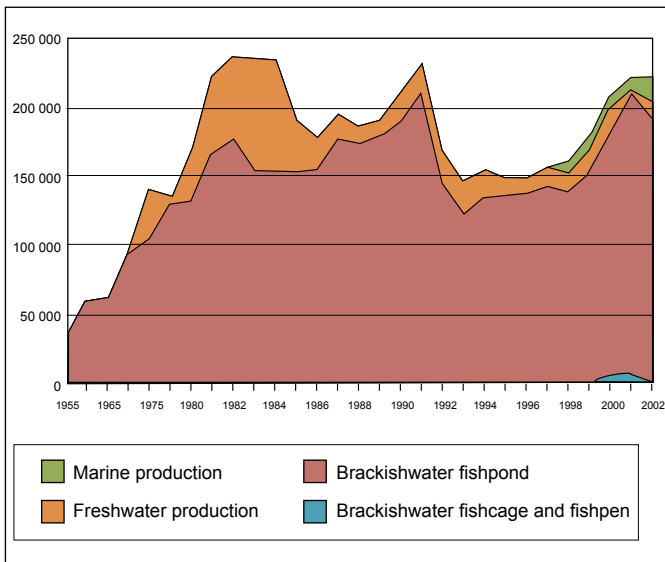
Milkfish production employs over 800,000 people and contributes to the tax base at all levels of government. It is vital to Philippine nutritional security, providing 8% of all animal protein consumed. Unrealized potential exists for earning foreign exchange through exports and for alleviating rural poverty through employment. Milkfish aquaculture is therefore a natural target for science-based improvement and sustainable expansion.

Fish production in the Philippines has been rising steadily since the 1970s but growth in aquaculture has not met its potential (Figure 1). Farmed production of milkfish peaked in the Philippines in 1982 at almost 240,000 tons (Figure 2). After falling by a quarter it spiked again in 1991 at 234,000 tons, only to drop by a third in the next 2 years. Production rose at an average annual rate of 8% from 1997 to 2005, but rollercoaster production figures confirm that milkfish farmers face stiff challenges, especially inadequate credit, erratic supplies of costly milkfish fry and other high production costs. A survey conducted in 2003 of brackish fishponds across the Philippines found that fingerlings and fry (many of them imported) absorb 30% of production costs, feed 21% and hired labor 19%. Meanwhile, from 1990 to 2005, inflation-adjusted wholesale and retail prices for milkfish fell,

**Figure 1. Volume of fish production by source, 1970-2004 ('000 tons)**



**Figure 2. Milkfish aquaculture production by environment, 1955-2002 (tons)**



supporting milkfish farmers' complaint of a price squeeze (Figure 3).

Further difficulties are presented by acid sulfate soils; deficient postharvest facilities, limited transport infrastructure and markets; poaching from ponds and pens; extreme

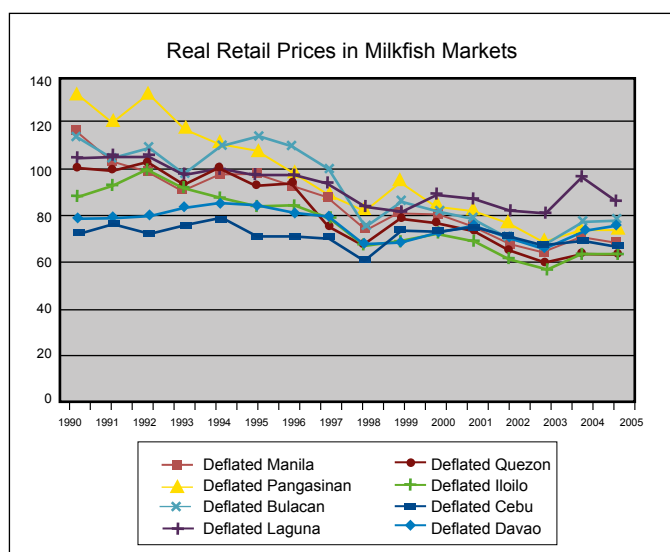
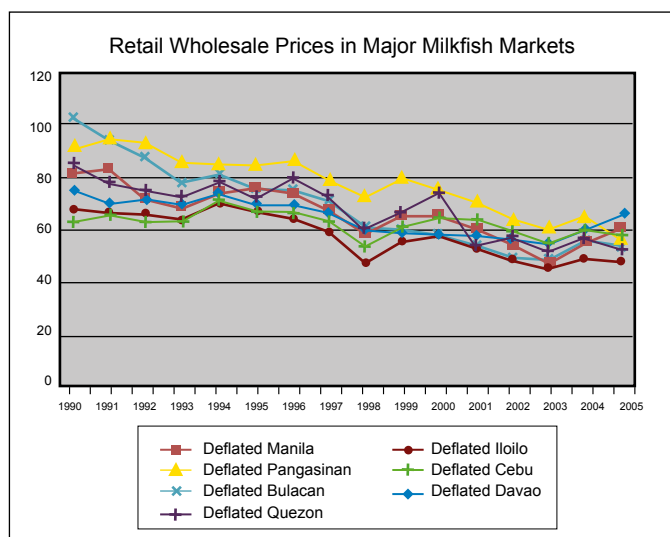
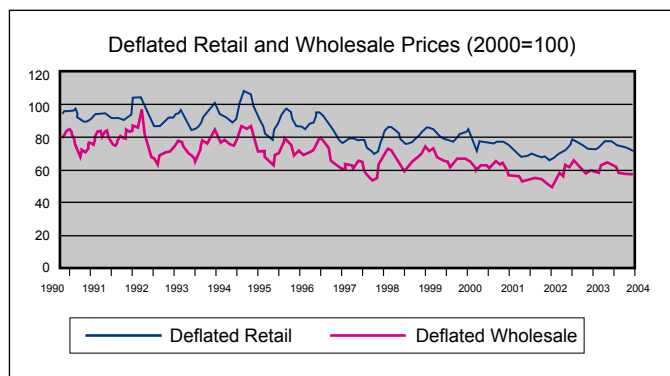
tidal fluctuations; and such natural calamities as typhoons and volcanic eruptions. But the key reason why milkfish aquaculture has failed to realize its potential is farmers' slow adoption of technologies to raise their yields. Research in recent decades has yielded new knowledge on feed efficiency, stocking density and methods of culture, as well as on cottage industry value-addition to the milkfish harvest. Yet many milkfish farmers still farm extensively and sell their product fresh. Stronger dissemination of new technologies for hatcheries and nurseries, grow-out culture, and postharvest processing is required if fish farmers are to benefit from them.

The WorldFish Center collaborated with Philippine national partners (2004-2007) to study supply and demand for milkfish fry in the Philippines, augmenting studies conducted in the 1980s on Philippine production technologies and performance, fry production, and marketing. The following are the key lessons learned.

## Lessons Learned

**Expand and revitalize extension services.** Extension services are important for transferring new technologies to the farmers. Operators who have attended training or seminars are more likely to know improved production

**Figure 3. Falling retail and wholesale prices for milkfish from 1990 to 2005.**



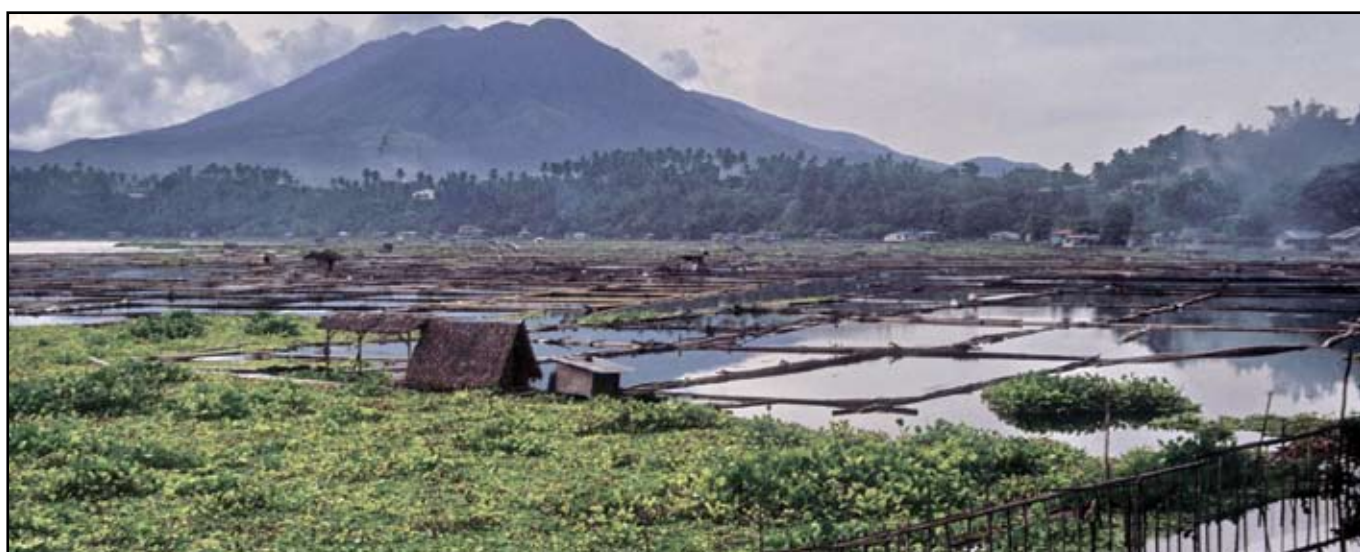
practices. Yet only 20% of fish farmers surveyed had attended a fishing or farming seminar. A third of these had attended a seminar on milkfish and tilapia aquaculture, half of which were conducted by feed companies and focused on feed. To be more effective, national extension programs need stronger structure and management.

**Tailor extension services to fish farmers' needs.** Most municipal agricultural officers today have bachelor of science degrees in agriculture but little or no expertise in aquaculture or fisheries. Properly trained extension personnel should use participatory processes to learn what fish farmers need and how they will respond to the technologies transferred. Colleges and universities should be mobilized to assist in the transfer of selected milkfish technologies. Collaboration with fishery schools should be formalized, and their faculties tapped as extension workers.

Extension services must develop and nurture research-extension links to ensure the smooth flow of information and knowledge — in both directions to ensure that research responds to needs. This would require strengthening the skills and capabilities of extension officers. The extension framework contained in the Agriculture and Fisheries Modernization Act of 1997 calls for a national extension system for agriculture and fisheries, with national, local and private subsystems, but extension continues to be a low priority in terms of budget allocations and human resource development.

**Disseminate improved milkfish hatchery and nursery technologies.** Fry production is essential to the healthy growth of the milkfish industry, which remains heavily dependent on wild sources despite recent improvements in hatchery fry production. The degradation of wild fry stocks by overexploitation, environmental pollution and illegal fishing, coupled with the failure to develop hatcheries, caused shortages estimated at 1.6 billion fry in 1995 and 2 billion in 2005. Shortages have been exacerbated by expanded fishpond acreage; intensified stocking; persistently high mortality rates in fry collection, sorting, counting and transport; and the seasonal nature of fry capture, as periods of high fry availability correspond poorly to stocking schedules.

One fry costs 25-30 Philippine centavos (about half a US cent), regardless of whether it is hatchery bred or wild caught (it is noteworthy that the number of fingerlings farmers stock depends less on the depth or area of their pens or ponds than on their capacity to purchase fingerlings). In Taiwan,



The WorldFish Center (Philippines)

*Milkfish grow-out ponds.*

the cost per fry is the equivalent of 16 centavos. Meanwhile, Indonesia has efficiently disseminated nursery and hatchery technologies to create countless backyard milkfish fry hatcheries. One fry costs the equivalent of 2 centavos in Indonesia, whose surplus supplies 97% of Philippine fry imports.

Strong domestic fry hatcheries would reduce the risk of importing milkfish pests and diseases, lower input costs to grow-out operators and improve their profits, and expand the supply of affordable milkfish to poor Philippine consumers. Past efforts to develop domestic hatcheries have faltered as the quality of hatchery-produced fry was inconsistent and the market for fry was unstable, discouraging hatchery operators' further investment. Government agencies' uncoordinated efforts raised concerns, as did farmers' perception that hatchery-produced fry was inferior to wild-caught fry and that large hatcheries would come to monopolize production and manipulate prices.

Fish farmers need to learn better pond preparation for milkfish fry nurseries, including the use of manure or chemical fertilizer. Liming can lower the cost of production by promoting the growth of naturally occurring plankton, filamentous algae and lablab, reducing the need for commercially formulated feeds.

**Enhance the efficiency of milkfish grow-out culture by introducing restrictive feed management and polyculture with shrimp.** Grow-out operators can save a third of their feed costs with proper management and can increase their income by two thirds by raising shrimp in polyculture with milkfish. Efficient feed use cuts costs,

maintains water quality, and thereby mitigates fish disease and damage to the environment. Most milkfish farmers in the Philippines add as much feed to their ponds as the fish will eat, often resulting in overfeeding, waste and pollution. Trials found that limiting feed to a certain percentage of fingerlings' body weight — determined according to such environmental conditions as dissolved oxygen, water temperature and the availability of natural food — improved feed-use efficiency. Although harvests were a little smaller with restricted feeding, costs were much lower, resulting in 9% higher profits.

Improved feed-use efficiency is a factor in higher profits earned with polyculture of milkfish and shrimp, as is crop diversification. Mud crab and tilapia also grow well with milkfish.

Broadly, technical efficiency (or productivity under a given set of inputs and technology) was found to improve in marine or brackish pens with greater depth, denser stocking and larger fingerlings. Pens operated by owners are more technically efficient than those operated by caretakers, who generally receive 30% of net income. This may be because owners have more at stake and use inputs more efficiently because they are more conscious of how much they spend on them.

**Train producer communities to add value by processing their milkfish harvest.** Training on how to process surplus milkfish into valuable products can earn producers higher incomes. Target areas for promoting milkfish processing are those with surplus production and a high proportion of poor households to supply the needed manpower.

Milkfish that are deboned and either smoked or marinated in garlic and vinegar enjoy a good market domestically and in communities of overseas Filipinos. The bits of the flesh that come off with the bones can be processed into fish balls, *lumpiang Shanghai*, *quekiam* and *embutido*. The skin can be fried as cracklings. Processing technology is best disseminated to families and larger groups. Helping trainees draft business plans focuses business ventures and improves the prospects of obtaining credit from rural microfinance institutions. Rural women in particular enjoy enhanced livelihood opportunities from fish processing.

Training provides villagers with skills, and establishing a village processing center provides a venue to apply them. Although inexpensive, the equipment required for deboning and smoking is beyond the reach of most villagers. The equipment is best concentrated in a village processing center equipped with running water, a screened processing area, and appliances such as freezers and package sealers. A common processing facility optimizes equipment use and facilitates the maintenance of sanitary standards. Users pay fees to cover their center's operation and maintenance.

**Monitor and evaluate the benefits of extended technologies.** Measuring the economic impact of disseminated milkfish technologies is key to determining the

success of extension, and setting minimum targets facilitates this evaluation. For example, goals for nursery technology could be set at 10 operators in each target area adopting milkfish fingerling nursery technology and improving their income by 10%; for milkfish grow-out, 10% of operators adopting recommended feed management, 5% adopting milkfish polyculture with shrimp, and income improved by 10%; for value addition, 10-15 operators adopting milkfish-processing technologies and income improved by 5%.

**Provide market information and services to producers.**

The Agriculture and Fisheries Modernization Act of 1997 calls for creating the National Information Network to provide business information and the National Marketing Assistance Program to catalyze efficient trading services. The creation of a national system for the provision of timely, accurate and responsive business information to farmers and fisher folk, cooperatives, traders, and processors can improve efficiency and promote further uptake of milkfish aquaculture technology. Information supplied can include supply and demand data, price trends, market forecasts, product standards, directories of cooperatives and research information. At present the wide disparity in the marketing margins observed in regional markets suggests that the milkfish marketing system is not well integrated and in the

**Main providers of microfinance services as of December 31, 2005.**

Microfinance Institution	Charter Type	Gross Loan Portfolio (PhP)	Number of active borrowers
TSPI Development Corporation	NGO	613,728,146	151,714
Taytay sa Kauswagan, Inc.	NGO	603,269,563	162,867
Center for Agricultural and Rural Development, Inc.	NGO	473,828,363	109,447
Negros Women for Tomorrow Foundation, Inc.	NGO	356,368,241	67,982
CARD Bank, Inc.	Rural Bank	281,213,999	31,479
CCT Credit Cooperative	Cooperative	247,342,519	63,084
Kabalikat para sa Maunlad na Buhay, Inc.	NGO	231,989,325	80,078
New Rural Bank of San Leonardo, Inc. (June 2005)*	Rural Bank	160,071,772	15,699
Opportunity Microfinance Bank, Inc.	Thrift Bank	137,984,972	23,044
ABS-CBN Bayan Foundation, Inc. (Dec. 2004)	NGO	137,382,059	38,422
Producers Rural Banking Corporation (Dec. 2004)*	Rural Bank	122,529,316	24,336
Alalay sa Kaunlaran Gitnang Luzon, Inc.	NGO	103,059,979	31,099

\* Data for Producers Rural Banking Corporation and New Rural Bank of San Leonardo cover their microfinance operations only  
Source: Asia Resource Centre for Microfinance, Philippine Country Profile

face of declining margins it will be the milkfish farmer who bears the squeeze.

**Improve milkfish farmers' access to credit.** Credit plays a significant role in aquaculture. Fish farmers consistently identify insufficient credit as the main constraint to successful operations. The lack of ready cash often hampers the purchase of such inputs as fertilizer, fingerlings, pesticides and feed. Accessible credit strengthens the ability of the poor to invest in and adopt labor-saving, productivity-enhancing technologies, as well as value-added processing.

Better access to credit would enable fish farmers to purchase feeds at the prevailing market price. The usual practice today is for fish farmers to pay feed suppliers after the harvest, including a surcharge of 30 pesos per bag, or about 6%.

However critical credit may be to the rural poor, the low volume per borrower has kept away commercial banks. In the past, the government supported directed credit programs, through which it aimed to finance backyard and small-scale business ventures. In the late 1990s, it recognized the inefficiency of these programs and started to phase them out in favor of microfinance institutions, many of them run by nongovernmental organizations. These often run capacity-building programs and are familiar with the local economy in which they operate.

## Future directions

Government credit programs that encourage financing through the private sector rather than directly from the government are the most effective. In 2005, the United Nations recognized the Philippines as having one of the best microfinance programs in the world. However, an executive order the following year set the stage for a return to direct government financing. The government's intention was to provide microfinance services in areas not currently served, but the measure drew condemnation from the business and banking communities, including the Asian Development Bank and the World Bank, which feared a return to undisciplined government lending to poorly selected beneficiaries.

Restoring a more favorable environment for microfinance institutions would allow them to continue to expand into areas they do not yet serve while maintaining their market-oriented credit policies that underpin their outreach and financial sustainability.

Credit alone does not work. Enhancing the availability and accessibility of credit should go hand-in-hand with improved extension of science-based technologies and infrastructure and market development. The government should catalyze capacity-building programs and help milkfish farmers and processors organize themselves into business clusters, the better to acquire loans. Aside from financial assistance, these business clusters need transfers of aquaculture technology and marketing, and professional management services.

Text adapted from: The WorldFish Center. 2007. Terminal report: Dissemination and adoption of milkfish aquaculture technology in the Philippines. Penang, Malaysia.

The project "Dissemination and Adoption of Milkfish Aquaculture Technology in the Philippines, 2007" was carried out in collaboration with the National Integrated Fisheries Technology Development Center of the Bureau of Fisheries and Aquatic Resources (BFAR-NIFTDC), the University of the Philippines Visayas (UPV), and the Southeast Asian Fisheries Development Center - Aquaculture Department (SEAFDEC-AQD) with funding from the Bureau of Agricultural Research of the Department of Agriculture (DA-BAR) and The WorldFish Center

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