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TILAPIA FARMING IN THE PHILIPPINES

- A SUCCESS STORY

BY

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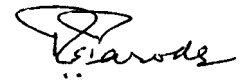
CONTENTS

FOREWORD

Asia-Pacific Association of Agricultural Research Institutions (APAARI) has recently decided to publish some success stories based on realized gains witnessed through the adoption of agricultural research technologies in the region.

In this context, it is felt that many countries could also get benefited provided proper information is disseminated, in order to catalyze all those concerned with agricultural research and development.

Present publication is the second in the Series. Objective of this report is to highlight the progress made on tilapia farming in the Philippines and various factors associated with this significant development in the region. Hope the readers would find this publication both interesting and rewarding



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TILAPIA FARMING IN THE PHILIPPINES

- A Success Story

I. Introduction

The need to identify alternative sources of nutrition and income exists in many developing countries. Inland aquaculture is one such field that has not been adequately utilized. In the Asia-Pacific region, the Philippines has had success with tilapia. Resource poor rural communities and large commercial producers alike have gained from the inland culture of tilapia.

The fuel crisis of the 1970s severely damaged the Philippine marine fisheries sector. The Philippine government selected tilapia for development because of its potential to benefit resource poor rural people as well as commercial growers. Researchers developed the technology to increase tilapia production and overcome marketing constraints. Tilapia technology was adapted and extended to small-scale farmers and large commercial producers. There has been steady growth in both foreign and domestic markets.

The Philippines has recently become one of the largest producers of tilapia in the world. Tilapia production has proven to be very beneficial to the communities as an inexpensive source of protein, as well as an economic boon to the government and the producers.

In the Asia-Pacific Region, other countries with appropriate water resources could also learn from the Philippine experience and

promote tilapia production. The details of the success of tilapia farming in the Philippines are discussed here.

II. Importance of Tilapia

The tilapia is cultured in the Philippines in both fresh and brackish water. In 1991, the country produced 76,570 metric tons of tilapia from aquaculture (Table 1). Two major species of tilapia (*Oreochromis niloticus* and *O. mossambicus*), and their hybrids predominate today in the Philippines. The Nile tilapia (*O. niloticus*) is the main species cultured in freshwater ponds and cages. The Mozambique tilapia (*O. mossambicus*) is extensively cultured as a secondary fish to milkfish and prawns in brackish water ponds.

The tilapia ranks second to milkfish as the most important cultured fish in the Philippines. Tilapia culture contributed 11% of total aquaculture production in 1991 (BFAR, 1992). The per capita consumption of fish and other fishery products by Filipinos is 40 kilograms per year, with tilapia consumption estimated at 1.2 kilograms per capita.

Table 1: 1991 Tilapia Production in the Philippines

PRODUCTION METHOD	PRODUCTION (MT)
Fresh-water Ponds	37,353
Fish Cages	21,048
Brackish water Ponds	14,072
Fish Pens	4,092
TOTAL	76,570

Source: Bureau of Fisheries and Aquatic Resources, Department of Agriculture, 1992

The Philippines has become the second largest producer of tilapia from aquaculture in the world (the top ten tilapia farming countries are shown in Table 2). The average annual growth rate was 10% for farmed tilapia production from 1981 through 1990. Production increased from 16,951 metric tons in 1981 to 76,142 metric tons in 1990 (Table 3). The national average yield from fresh-water ponds, where extensive to intensive culture of Nile tilapia is performed, was 2.6 metric tons per hectare.

Table 2: Top Ten Countries for Tilapia Production: 1990

COUNTRY	PRODUCTION (MT)
China	106,071
Philippines	76,142
Egypt	24,196
Thailand	21,500
Indonesia	13,870
Jamaica	2,400
Colombia	2,040
Saudi Arabia	1,417
Ivory Coast	1,221
Hong Kong	1,195

Source: FAO, 1992

Bimbao and Smith (1988) examined the economics of different aquaculture technologies and culture systems utilized in the various regions of the Philippines. The researchers concluded that commercial tilapia farming (at the time a newly emerging industry) was, on the whole, profitable. The majority of tilapia farms surveyed were profitable.

Table 3: Tilapia Production in the Philippines (1981-1990)

YEAR	TILAPIA PRODUCTION (MT)
1981	16,951
1982	16,777
1983	30,722
1984	32,002
1985	48,094
1986	55,819
1987	75,769
1988	75,046
1989	81,630
1990	76,142

Source: Bureau of Fisheries and Aquatic Resources, Department of Agriculture, 1992

The steady expansion of markets experienced by the tilapia industry has benefitted small-scale hatchery operators, grow-out farm and cage operators, and merchants (Smith *et al.*, 1985). Tilapias have become an important source of additional income and cheap protein for the rural communities in the Philippines (Fermin, 1985). Marginal rice farmers have boosted their incomes and improved living conditions by shifting to tilapia fingerling production. Landless peasants with access to inland waters depend on cage and pen culture of tilapia as a major source of income.

III. Tilapia in the Philippines: History and Development

The Philippine government gave high priority to the development of the country's inland fisheries (fresh and brackish water

aquaculture) in the 1970s. This was with the expectation that inland production might alleviate expected fish shortages caused by the fuel oil crisis that severely damaged the country's marine fishing industry. Substantial research funding was provided for the generation of technologies at various aquaculture institutions.

The Mozambique tilapia was introduced to the Philippines in 1950. Easy to breed and economical to grow, it was touted as a "wonder fish" and promoted for backyard fresh water pond culture. The "wonder fish" was accompanied by some unforeseen problems. These were:

i) The species' prolific breeding in ponds led to overpopulation and stunted growth,

ii) The species' salt tolerance and tendency to escape led to it becoming a feral species in brackish water ponds,

iii) The species' dark color was not appealing to consumers.

The Mozambique tilapia was not well accepted by consumers in the 1950s and 1960s due to it's dark color, small size, and poor image as an undesirable fish. Commercial production of the species stalled because of the limited market. In brackish water ponds, where it competed for natural food with milkfish, it was eradicated as a pest.

IV. Tilapia Production:

A. Development of Technologies

The Philippine government, recognizing the potential of tilapia, launched a research programme to develop viable production technologies. The research was conducted at the Freshwater Aquaculture Center of the Central Luzon State University (FAC-CLSU) from 1974 through 1976. The programme was successful in

developing technologies to overcome the production constraints of the tilapia.

Early research by Guerrero and Guerrero (1975) indicated that male tilapias grow faster than females. As a result, the researchers targeted for study: i) Monosex male culture, and, ii) Sex-reversal (of females), to control population and produce large-sized fish.

The studies demonstrated that culture of all-male tilapia produced either by hand-sexing or sex-reversal (the process of converting genetic females into functional males by treating fry with hormones) can yield over two tons of harvestable size tilapia per hectare per year. In contrast, the culture of mixed sexes of tilapia at the same density produces less than one ton of market size fish.

The introduction of Nile tilapia, a species with light coloration, enhanced the image of tilapia and boosted commercial production. Researchers at FAC-CLSU were able to adapt sex-reversal techniques to the new species (Guerrero and Abella, 1976).

Sex Reversal of Tilapia Fry Using Nets

In the late 1970s and early 1980s, commercial tilapia production was advanced by the development of technologies for: 1. The breeding of Nile tilapia in floating net enclosures (Guerrero, 1977), and, 2. The production of Nile tilapia in floating cages with feeding (Guerrero, 1980). The new technologies were transferred to the private sector for evaluation.

Floating Tilapia Cages in a Philippine River

The San Miguel Corporation (the country's largest private conglomerate) pilot-tested the technologies for commercial production of Nile tilapia fry using net enclosures and grow-out in floating cages with feeding from 1980 to 1981. The project successfully demonstrated the commercial feasibility of the technologies developed by the FAC-CLSU.

From 1984 to 1986, the Meralco Foundation (a quasi-governmental corporation) evaluated and adopted the technologies for commercial production of sex-reversed Nile tilapia fingerlings and grow-out in cages in its tilapia hatchery and cage culture project. Today, the project is the largest tilapia hatchery using

concrete tanks for the production of sex-reversed Nile tilapia fingerlings in the country (Guerrero and Guerrero, 1988).

B. Transfer of Technology

The government employed various strategies to facilitate transfer of the tilapia production technology. Two groups were selected for tilapia technology transfer: 1. Resource poor rural communities were chosen as targets for outreach programmes in order that they could gain additional income and benefit from a cheap source of protein, and, 2. Potential large-scale commercial producers were chosen to meet increasing export and domestic market demands.

1. Resource Poor Rural Communities

Three major research and extension programmes to boost inland aquaculture production were supported by the government in the 1970s. The programmes targeted small-scale farmers and were instrumental in generating and extending the technologies for Nile tilapia fingerling production and grow-out in ponds, cages and paddy fields (Tayamen, 1987). The programmes were:

i) The Inland Fisheries Project (1971-1976). Implemented by the FAC-CLSU and the Brackish Water Aquaculture Center of the University of the Philippines (BAC-UP) supported by the National Science Development Board and United States Agency for International Development (USAID),

ii) The Freshwater Fisheries Development Project (1979-1983). Implemented by the Bureau of Fisheries and Aquatic Resources (BFAR) with the assistance of USAID, and

iii) The National Self-Reliance Movement (mid-1980s). Supported by the Ministry of Human Settlement.

Harvesting Tilapia in a Pond

The programmes were successful in transferring tilapia technology because they provided technical assistance, credit from government banks, and training for beneficiaries. The BFAR was able to maintain the momentum of the programmes after completion by establishing two-way linkages between farmers and researchers. This was accomplished by:

i) Demonstrating technologies using farmer-cooperators,

ii) Conducting provincial workshops and seminars for extension agents and farmers,

iii) Collaborating with researchers in technology verification, and,

iv) Dispensing fingerlings.

2. Commercial Producers

The government employed a different strategy for extending tilapia technology for commercial production. The government had

a mostly informal relationship with commercial producers and did not implement any formal programmes. Cooperation between the government and private sector facilitated the transfer of technologies for Nile tilapia hatchery and grow-out production from the research station to commercial farms in the Philippines. Private corporations (e.g. San Miguel Corporation and Meralco Foundation, Inc.) tapped scientists of the various research institutions to serve as consultants (short and long term) for the implementation of the tilapia technologies.

With the growing interest and demand for tilapia, the private sector actively sought out technical assistance and services. The following factors played an important role:

i) Financing and credit were provided by development banks to producers for viable tilapia commercial enterprises such as cage culture and pond culture of Nile tilapia;

ii) Fish farmer non-government organizations (NGOs) and cooperatives were quite active in assessing new technologies and implementing them, both at their own initiative and with government assistance (training, credit, etc.).

The steady growth of foreign and domestic markets, coupled with the dwindling capacity of the marine fisheries industry, fueled the expansion of the commercial tilapia industry. Sustaining this remarkable growth will depend on continued government/industry cooperation and favorable domestic and foreign market conditions.

V. Secrets of Success

The success of tilapia production in the Philippines has mainly depended upon the following factors:

i) Government support for research and extension,

Tilapia Ready for Market

ii) Government moratorium on tilapia price and market intervention,

iii) Cooperation between Philippine government and private sector,

iv) Cooperation and support of many international organizations, including ICLARM, USAID, FAO, UNDP, and the Asian Development Bank for providing material and financial support,

v) Introduction of new breeding stock (Nile tilapia), and

vi) Cooperation among researchers.

VI. Prospects for Regional Cooperation

The long term prospects for developing tilapia production in the Asia-Pacific region are very good. In fact, some efforts are already under way.

The International Center for Living Aquatic Resources Management (ICLARM), a non-government fisheries development organization based in the Philippines, has initiated the Genetic Improvement of Farmed Tilapias Project (funded by the Asian Development Bank and the United Nations Development Program). The goal of the project is to upgrade the cultured stocks of tilapias in Asia. Various national institutions (including BFAR and CLSU) cooperate with ICLARM on behalf of the Philippines. The ICLARM is already using tilapia farming technologies from the Philippines in their aquaculture information and outreach programmes in the region.

Further regional development of tilapia by interested countries in the region will largely depend on:

i) Joint meetings and visits by researchers and government officials,

ii) Development of human resources (workshops, seminars and publications),

iii) Information exchange,

iv) Breeding stock exchange,

v) Regional testing of species and hybrids,

vi) Collaborative research efforts, and

vii) Cooperation from policy makers in facilitating regional research, development and marketing.

VII. Future Strategies for Tilapia Research

Fresh water production of Nile tilapia in ponds and cages is well established in the Philippines. The next frontier for development of tilapia farming will be commercial culture of tilapias in brackish water ponds and sea cages. Initial research on saline water culture of tilapia hybrids (female *O. niloticus* x male *O. mossambicus*) in ponds and cages has shown promising results.

Pilot-testing of technologies for brackish water pond culture and sea cage farming of sex-reversed tilapia hybrids is in progress in two provinces. Evaluation and adoption by the commercial producers is crucial for an effective transfer of technology to occur.

The government expects a favourable economic impact for brackish water and sea farming of tilapias, due to the 200,000 hectares of brackish water ponds and extensive coastline. Although only milkfish and prawns are produced at this time, there are many areas where year round production is not possible due to inadequate fry supply, disease and other constraints not limiting for tilapias. Moreover, with the decline of the marine fisheries sector, sea farming of tilapias offers a viable alternative livelihood for thousands of small fish producers while stabilization of fish supply and prices.

Rapidly increasing population and dwindling marine fisheries production in the Philippines will certainly lead to a greater contribution from tilapia to total fish supply. The BFAR has given high priority to research and production of tilapia in 1993-1998 to alleviate any possible fish supply shortage.

VIII. Epilogue

Tilapia farming in the Philippines is a success story that other countries in this region can model. Tilapia farming not only provides income for both small-scale farmers and large producers, but it also is an inexpensive source of protein for communities. Besides, tilapia has helped to alleviate shortfalls in fish production brought on by the problems in the marine fisheries sector. The benefits were gained through research and development support in addition to appropriate government policies. Hence, considerable benefit could be gleaned from the Philippine experience of tilapia farming in the Asia-Pacific region.

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