Summary Report of the PCARRD-ICLARM Workshop on Philippine Tilapia Economics

Edited by

Ian R. Smith
Enriqueta B. Torres
and
Elvira O. Tan

1983

PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH AND DEVELOPMENT

INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT

Summary Report of the PCARRD-ICLARM Workshop on Philippine Tilapia Economics

Los Baños, Laguna, Philippines
10-13 August 1983

EDITED BY

IAN R. SMITH
ENRIQUETA B. TORRES
AND
ELVIRA O. TAN

1983

Printed in Manila, Philippines

Published by the Philippine Council for Agriculture and Resources Research and Development, Los Baños, Laguna, Philippines and the International Center for Living Aquatic Resources Management, MCC P.O. Box 1501, Makati, Metro Manila, Philippines

Smith, I.R., E.B. Torres and E.O. Tan, editors. 1983. Summary report of the PCARRD-ICLARM workshop on Philippine tilapia economics. ICLARM Conference Proceedings 10, 45 p. Philippine Council for Agriculture and Resources Research and Development, Los Baños, Laguna, and International Center for Living Aquatic Resources Management, Manila, Philippines.

Cover: Tilapia fishfarmers stocking fingerlings in a pond in Sto. Domingo, Bay, Laguna, Philippines.
Photo by Noel A. Morales.

ISSN 0115-4435
ISBN 971-1022-02-8

Contents

Session 5: Tilapia Marketing

Preface

The Philippine Council for Agriculture and Resources Research and Development (PCARRD) and the International Center for Living Aquatic Resources Management (ICLARM) co-sponsored a workshop, 10-13 August 1983 on Philippine Tilapia Economics. The workshop brought together Philippine researchers who, with partial financial support from PCARRD and ICLARM, during 1982-1983 had conducted an economic analysis of tilapia operations.

The workshop was held at the Continuing Education Center on the campus of the University of the Philippines, Los Baños. Opening remarks for the workshop were given by Dr. Ramon V. Valmayor, Executive Director of PCARRD.

Full proceedings of the workshop, containing all presented papers and discussion, will be jointly published by PCARRD and ICLARM. In the interim, because of the keen interest that currently exists for tilapia culture, not only in the Philippines but elsewhere in the world, PCARRD and ICLARM have decided also to produce this Summary Report.

The Summary Report consists primarily of abstracts of papers presented and reports of four working groups. Interested readers could seek further details from the authors, pending publication of the Proceedings.

On behalf of PCARRD and ICLARM we would like to express our thanks to all of those individuals who contributed to the success of the workshop. These include not only the researchers and other participants, but also those who assisted behind the scene with workshop logistics, rapporteur notes and other administrative matters. As a group we are especially thankful to all of those private tilapia farmers, government officials and middlewomen who so kindly provided much of the information upon which most of the research papers were based.

It is our hope that this Summary Report and the workshop proceedings to follow will contribute to an understanding of the Philippine tilapia industry so that its current growth and economic vitality can be maintained and nurtured to the ultimate benefit of producers and consumers alike.

IAN R. SMITH
ENRIQUETA B. TORRES
ELVIRA O. TAN
November 1983, Manila

Introduction

Tilapia (*Oreochromis* and *Tilapia* species) are becoming increasingly important as food fish in the Philippines. The industry is growing rapidly as tilapia have become more accepted by consumers. As recently as the mid-1970s tilapia (primarily *O. mossambicus* at that time) were generally regarded as a nuisance fish by producers and as a low quality product by consumers. In fact, these attitudes still prevail in certain parts of the country. However, elsewhere consumer demand for tilapia has increased dramatically, due in part to the recent availability of more attractive species, especially *O. niloticus* (Table 1). In many areas of the country, particularly Luzon, the product currently commands prices in retail markets that are comparable to those of other prominent food fish such as milkfish. In response to this consumer demand, the industry is in a dynamic growth stage wherein rapid changes in production techniques and organizational structure of production and marketing are occurring.

Tilapia production systems appear to be well-suited for adoption by small-scale producers because the initial capital investment, especially for cage culture, is not high. Because of declining catch and catch per

Table 1. Tilapia introductions in the Philippines (1950-1982).

Species	Year	Origin	Agency responsible
Oreochromis mossambicus	1950	Thailand	Bureau of Fisheries and Aquatic Resources
O. hornorum x *O. mossambicus*	1971	Singapore	Private Sector
O. niloticus (Uganda)	1972	Israel	Laguna Lake Development Authority
O. niloticus (Egypt)	1972	Thailand	Bureau of Fisheries and Aquatic Resources
Tilapia zillii	1973 (?)	Taiwan (?)	?
O. aureus	1977	USA	Central Luzon State University
O. niloticus (Ghana)	1977	Israel	Central Luzon State University
O. niloticus (Ghana)	1977	Singapore	Bureau of Fisheries and Aquatic Resources
O. aureus (Israel)	1977	Singapore	Bureau of Fisheries and Aquatic Resources
O. aureus (Israel)	1978	Singapore	Southeast Asian Fisheries Development Center
O. niloticus (Ghana)	1978	Singapore	Southeast Asian Fisheries Development Center
Red tilapia (hybrid)	1979	Taiwan	Southeast Asian Fisheries Development Center
Red tilapia	1981	Taiwan	Private Sector
O. aureus (Israel)	1982	Israel	Private Sector
O. niloticus (Ghana)	1982	Israel	Private Sector
Red tilapia	1982	Taiwan	Private Sector

Source: Guerrero, R.D. III. Tilapia farming in the Philippines: practices, problems and prospects. Paper presented at Tilapia Economics Workshop co-sponsored by PCARRD and ICLARM. 10-13 August 1983. Los Baños, Laguna, Philippines.

effort of numerous inland lake fisheries, large numbers of small-scale fishermen have been attracted to cage culture systems and even to small land-based hatcheries where the investment required is comparable to that of a small motorized fishing boat *(banca)* and gear. Larger-scale producers are also increasingly drawn to the industry and several ponds over 100 ha in size are under development.

The increased production resulting from all this enthusiasm will have impacts on marketing systems and perhaps on prices. Depending upon economies of scale in production, small producers may face future difficulties in competing with larger-scale operators. Even in lakes where cages are suitable there is a tendency for numbers to proliferate to the eventual detriment of all producers as overcrowding occurs. Several small lakes in the country (e.g., San Pablo Lakes) have passed through several cycles of profits, overcrowding, withdrawal by marginal producers, profits and overcrowding again.

Because of the industry's potential for providing income to small-scale producers and protein to consumers, an economic analysis was needed to document the industry's current structure and the response of producers to potential profits and of markets to recent increases in production. Possible constraints to further expansion of the industry needed to be identified, whether they were in the form of input (feed and seed) supply limitations and costs, deteriorating quality of broodstock, overcrowding of available production areas, distribution bottlenecks or limited market absorptive capacity.

Both the Bureau of Fisheries and Aquatic Resources (BFAR) and the Philippine Fish Development Authority (PFDA) collect secondary data on production and prices that are useful as background to an economic analysis of the industry. However, for more complete documentation, an in-depth analysis of selected production and marketing systems based on data provided by private input suppliers, producers and marketing intermediaries was necessary. This information is especially important to guide government agencies such as the Ministry of Human Settlements which through its Kilusang Kabuhayan at Kaunlaran (KKK) Program is encouraging private investment by small-scale producers in tilapia production, particularly in cage culture systems.

To fulfill this need for an understanding of the industry, during 1982-1983 PCARRD and ICLARM invited individuals from a number of institutions around the country to participate in a nationwide economic analysis of tilapia production and marketing. Several separate, though complementary research projects were initiated during this period, and results were presented at a workshop in August 1983.

Abstracts of all papers presented are contained in this Summary Report. The various research studies undertaken fall into two broad categories:

1) national or regional industry status reports, and
2) economic analysis of selected input supply, production and marketing systems, including problems and successes with extension and technology transfer.

Since production of tilapia is widespread in the Philippines, it was not possible, given the very limited resources available, to undertake an in-depth economic analysis in every region of the country. Therefore, the research activities were concentrated upon selected regions (Central Luzon, Southern Tagalog, Bicol, Western Visayas and Southern Mindanao) and selected production systems within those regions.

The economic analyses presented at the workshop provided an extremely encouraging picture of this dynamic industry. Fueled by increased consumer acceptance of tilapia, most participants in the industry, including small-scale hatchery operators, grow-out farm and cage operators and marketing intermediaries earn high profits. Nevertheless, several serious problems face the industry. Paramount among these is deterioration of

broodstock and consequently poor quality fingerlings in several locations. Lack of appropriate feed for cage culture is a further constraint. Also overcrowding of some small lakes with tilapia cages has occurred and poaching remains a serious problem in some locations. High consumer demand prevails primarily on the northern island of Luzon in the Philippines and production is somewhat limited in the southern part of the country.

The workshop participants unanimously endorsed the establishment of a National Tilapia Broodstock Center which would seek to maintain and genetically improve tilapia broodstocks in the country. Also recommended was improvement in the national aquaculture statistics. More complete details on the various sectors of the industry can be found in the working group reports at the end of this Summary Report.

Abstracts

Session 1 : Introduction and Overview

TILAPIA FARMING IN THE PHILIPPINES: PRACTICES, PROBLEMS AND PROSPECTS

RAFAEL D. GUERRERO III
Aquaculture Consultant
Technology Resource Center
Buendia Ave. Extension, Makati, Metro Manila
Philippines

Abstract

Tilapia are important food fish cultured in developing countries. In the Philippines, in terms of annual production these fish are second only to milkfish in importance. Various farming techniques are applied by the industry for commercial tilapia production in fresh and brackish-water ponds, and cages and pens in lakes. Several factors contributed to the successful development of the tilapia industry including the energy crisis which favored aquaculture over capture fishing, improved technology made available by researchers and the ingenuity of Filipino fishfarmers. Total tilapia production is estimated to exceed 50,000 tonnes annually.

Culture methods for producing fingerlings and market size fish are discussed in detail. The critical issues that need to be addressed for further expansion of tilapia farming to proceed are the need for improvement of broodstock, commercial production of economical feeds and development of market strategies. On the whole, however, the future outlook for tilapia farming in the Philippines is very encouraging.

Session 2: Tilapia Hatcheries

ECONOMICS OF PRIVATE TILAPIA HATCHERIES IN LAGUNA AND RIZAL PROVINCES

LUZ R. YATER
and
IAN R. SMITH
International Center for Living Aquatic Resources Management (ICLARM)
MCC P.O. Box 1501, Makati, Metro Manila
Philippines

Abstract

This paper provides the results of a late 1982 survey of 80 privately operated tilapia hatcheries in Laguna and Rizal Provinces. Sample hatcheries represented approximately 20% of the total enumerated hatcheries in these two provinces. The "experimental" nature of fingerling production practices is documented, particularly variability in broodstock management, supplementary feeding and rates of fertilizer application. Average costs and returns are reported for various hatchery sizes, all of which reported positive net revenue. The average hatchery in 1982 was 3,900 m^2 in size, produced 488,200 fingerlings and earned a total revenue of ₱66,170.[1] After deducting all costs of ₱31,390 (including that of feeds which made up 39% of variable costs), the average hatchery earned a residual return to operator's own and family labor, capital, management and risk of ₱34,780 or approximately ₱890 per 100 m^2.

In the near term, these high returns can be expected to continue to attract both small-scale and large-scale investors into the business. Coupled with problems of inadequate broodstock quality control among the hatcheries surveyed, however, this increased competition is going to make it difficult for the Rizal and Laguna hatcheries to maintain their present competitive advantage and high rates of return. The paper concludes with a recommendation for intensified public sector efforts in the areas of research, extension and information dissemination to improve broodstock management practices and reduce average per fingerling production costs.

[1] At the time of this and other studies, ₱8.50 = US$1.00.

ECONOMIC ANALYSIS OF A LARGE-SCALE HATCHERY FOR THE PRODUCTION OF *OREOCHROMIS NILOTICUS* FINGERLINGS IN CENTRAL LUZON, PHILIPPINES

MERYL C. BROUSSARD, JR.
Department of Wildlife and Fisheries Sciences
Texas A&M University
College Station, Texas
U.S.A.

CECILIA G. REYES
Bureau of Fisheries and Aquatic Resources
Central Luzon State University
Muñoz, Nueva Ecija
Philippines

Abstract

Operations of the Bureau of Fisheries and Aquatic Resources (BFAR) hatchery at Muñoz, Nueva Ecija are analyzed from the economic point of view. Cost analysis of fingerling production using open pond spawning indicates that fingerlings can be produced at a relatively low cost at a large hatchery complex if production systems are properly managed. Cost estimates from this facility could be relevant for large private hatcheries. Additional costs to private producers would include interest on loans and operating capital, and higher cost for water. However, capital investment for facilities and pond construction should be substantially lower for a private hatchery.

Production during the first year of operation was approximately 33% of capacity because of the multiple uses of the facility and downtime during initial operations, but during the second year should approach capacity.

An important component of any large centralized hatchery is fingerling dispersal. Inability to disperse fingerlings is a primary limiting factor for marketing of fingerlings produced by small to medium (1-5 ha) scale private hatcheries in Central Luzon. Since small farmers are the target of the BFAR hatchery and individual orders are relatively small, dispersal is a large problem.

Hatchery budgets and pricing schemes for government operations should be reviewed. Cost of such operations can be supported by revenues from fingerling sales. If the government intends to encourage fingerling production from private hatcheries, government facilities should not undersell private producers. In areas where private hatcheries can meet fingerling requirements, government sales of fingerlings could be phased out.

THE ADOPTION OF TILAPIA FARMING AND ITS IMPACT ON THE COMMUNITY OF STO. DOMINGO, BAY, LAGUNA[1]

MA. CORAZON B. GAITE
JOSE NOEL A. MORALES
OLGA CRISELDA R. ORILLA
BERNARDINE B. PILI
Department of Communications
Ateneo de Manila University
Quezon City
Philippines

Abstract

Transforming traditional agriculture into a highly productive and profitable sector of the economy is a task that continues to challenge development efforts today. One rice farming community that has been transformed by adoption of tilapia culture is Bo. Sto. Domingo, Bay, Laguna. This paper ascribes the community's success to the right combination of available technology, community leadership, economic incentive and institutional support from the Bureau of Fisheries and Aquatic Resources (BFAR). By late 1982, over one-third of the community's 300 households were involved in backyard tilapia hatchery operations.

The paper illustrates the tangible change that has occurred in the community as the tilapia industry has grown. Change has occurred not only in terms of physical possessions and improvements to housing, but also in terms of reduced unemployment of household heads and more hopeful attitudes towards the future. Insecurity of land tenure, lack of quality control over broodstock and increased competition from fingerling producers elsewhere contribute to some uncertainty regarding the future of the community's tilapia farms but experience to date indicates that some of these problems can be overcome if the community receives continued support from government agencies. The study shows that small farmers can be active participants in the upliftment of their own socioeconomic conditions.

[1]This paper is also available as a 20-minute audio-visual (slides and cassette) from ICLARM, MCC P.O. Box 1501, Makati, Metro Manila, Philippines.

Session 3: Cage Culture Systems

THE ECONOMICS OF CAGE CULTURE IN BICOL FRESHWATER LAKES

EMMA M. ESCOVER*
Senior Researcher
Ateneo de Naga
Naga City

RODRIGO L. CLAVERIA
Economics Thesis Student
Ateneo de Naga
Naga City

Abstract

This paper analyzes the economics of cage culture of 70 tilapia cage operators in Lake Buhi and Lake Bato, both located in Camarines Sur Province.

Data showed that tilapia cage culture, although recently adopted, has made considerable contribution to the annual household income of operators in the two study areas. On the average, a tilapia cage operator in Bicol had five cages totalling 192 m^2. The cages were usually family-operated and utilized mostly the available fingerlings from the two lakes. Average investment for all farm sizes was ₱3,579.

In terms of production, Lake Bato cage operators had higher volume of production. The average production for all farms was 409 kg per cropping, 87% of which was sold, 6% was consumed at home, and 7% was given away.

Net cash incomes for all farms were positive. However, all farm sizes showed negative net income because of very high labor input in guarding tilapia cages.

Natural calamities, e.g., typhoons and sulfur upwelling, poaching and lack of capital were the major problems encountered in tilapia cage culture.

*Current address is c/o ICLARM, MCC P.O. Box 1501, Makati, Metro Manila, Philippines.

ECONOMICS OF CAGE CULTURE IN LAGUNA PROVINCE

CORAZON T. ARAGON
ENRIQUETA B. TORRES
MIGUELITO M. DE LIM
GERARDO L. TIOSECO
College of Development Economics and Management
University of the Philippines at Los Baños
College, Laguna
Philippines

Abstract

This study was conducted to determine the profitability of tilapia cage culture in San Pablo City and Los Baños, Laguna. Primary data were gathered from 29 and 63 producers engaged in tilapia cage culture in Los Baños and San Pablo City, respectively.

On the average, the total capital investment of tilapia farmers in Los Baños for their small-scale grow-out operation was ₱2,460 per farm. The small-, medium- and large-sized farms in San Pablo City had an average capital investment of ₱7,022, ₱14,363 and ₱66,462 for their grow-out operation, respectively. Large-sized farms in the area which were engaged in both grow-out and hatchery operations had a total capital investment amounting to ₱70,735. Fish nets represented the largest item of capital investment, comprising more than 30% of the total capital investment in both locations.

Findings of the study indicate that tilapia cage culture is a profitable business venture in San Pablo City but that there were significant differences in mean total labor use, production, total cost, gross return and net farm income among the three farm size groups.

Net farm income from tilapia cage culture in San Pablo City was also found to be directly related to farm size. Large farms engaged in both grow-out and hatchery operations in the area received the highest net farm income per season (₱231,000) followed by large farms engaged in grow-out operation only (₱151,000). On the other hand, the tilapia producers in Los Baños had a net average loss of ₱3,000. This was due to the high non-cash labor cost. Because of the poaching problem in the area, the tilapia producers spent much time in inspecting the cages thereby increasing the non-cash labor cost. However, the tilapia producers still continue to operate since the average net cash farm income from tilapia cage culture is ₱1,570.

ECONOMICS OF CAGE CULTURE IN MINDANAO

LYDIA P. OLIVA
Southern Mindanao Agricultural Research Center
University of Southern Mindanao
Kabacan, North Cotabato
Philippines

Abstract

The economics of cage culture in three lakes of Mindanao, namely: Lakes Buluan, Sebu and Lanao are compared.

Average production cost per farm was highest in Lake Buluan (₱2,487,125 for a farm of 1,100 floating cages operated by the Southern Philippines Development Authority), followed by Lake Lanao (₱7,898 for an average farm size of 4 cages). Lake Sebu incurred the least production cost (₱7,395 for an average farm size of 6 cages per farm). All produce of the tilapia cage operators in Lake Buluan was sold. In contrast, Lakes Sebu and Lanao cage operators sold 92.6% and 83.2% of their total produce, respectively, with the remainder either used at home or used for other purposes. The rates of profit of cage operators in Lakes Buluan, Sebu and Lanao varied with the operator in Buluan realizing the highest (₱2,739 per cage per cropping), followed by the operators in Lake Lanao (₱1,611 per cage per cropping). The operators in Lake Sebu realized the least profit (₱896 per cage per cropping).

The four major problems identified by cage operators in the three lakes were: 1) overcrowding, 2) lack of capital, 3) poaching and 4) lack of technical know-how in tilapia cage culture.

FINANCIAL AND ECONOMIC ANALYSES OF GROW-OUT TILAPIA CAGE FARMING IN LAGUNA DE BAY

JOVENAL F. LAZAGA
Research Associate
SEAFDEC Aquaculture Department
Ortigas Ave., Mandaluyong, Metro Manila
Philippines

LEONARDO L. ROA
Assistant Instructor, Economics
Ateneo de Manila University
Quezon City
Philippines

Abstract

A survey of grow-out tilapia cage farming in Laguna de Bay was conducted in two towns in Rizal Province. The resulting analyses indicate low financial performance and poor economic viability of grow-out tilapia cage farming in this part of the lake. Overcrowding of cages in limited areas, poaching and typhoon damage are the major reasons for poor performance.

Session 4: Land-Based Culture Systems

TILAPIA PRODUCTION IN FRESHWATER FISHPONDS OF CENTRAL LUZON

RUBEN C. SEVILLEJA
Instructor, College of Inland Fisheries and
Researcher, Freshwater Aquaculture Center
Central Luzon State University
Muñoz, Nueva Ecija
Philippines

Abstract

Tilapia production in freshwater ponds of Central Luzon is described and the economics of monoculture and polyculture systems are discussed. The culture of tilapia is shown to be economically feasible in the area with polyculture systems being slightly more profitable than monoculture systems. Land rent and feed purchases constitute the major cash expense items.

The major problems encountered by tilapia producers include the unavailability/difficulty of obtaining credit, lack of technical assistance, limited management expertise and high price of inputs. Availability of fry/fingerlings and market absorptive capacity for tilapia produced were reported only as minor problems.

ECONOMICS OF RICE-FISH CULTURE SYSTEMS

ROGELIO N. TAGARINO
Researcher, Center for Policy and Development Studies
University of the Philippines at Los Baños
College, Laguna
Philippines

Abstract

The study was an attempt to establish the technical input-output relationships in simultaneous rice-fish culture production systems. Individual output and composite output production functions in Cobb-Douglas functional form were estimated using cross-sectional data. On the basis of the estimated composite production functions, the economics of optimization in the use of production inputs are discussed. Costs and returns analyses were also undertaken and showed that simultaneous rice-fish culture could be a profitable venture. The study had the limitation of using farmers' recalled input-output data. It is recommended that further study on the input-output technical relationships in simultaneous rice-fish culture be undertaken with the use of more reliable farm production data.

THE INTRODUCTION OF INTEGRATED BACKYARD FISHPONDS IN LOWLAND CAVITE

FRANK FERMIN
International Institute of Rural Reconstruction
Silang, Cavite
Philippines

Abstract

This paper describes the process of re-introducing backyard fish ponds in lowland Cavite through an integrated approach to rural reconstruction known as the People's School System. This study involves three phases namely: (1) the training process of Barangay Scholars at the People's School; (2) the adaptation of the technology by the Barangay Scholars and other adaptors in the village; and (3) a study on the economic returns and the impact of the technology on six small-scale fish farmers. Patterns of adaptation by the Barangay Scholars and other farmers in the village are discussed, together with recommendations for future project expansion. Although typhoons and flooding affected some of the fishponds, the 14 Barangay Scholars were successful in involving an additional 45 farmers in family-operated integrated backyard fishponds. Water and manure supply are the major problems faced by the farmers. Although the program is still in its early stages, the economic prospects for the backyard fishponds appear quite favorable.

STATUS, POTENTIAL AND NEEDS OF TILAPIA CULTURE IN PANAY ISLAND, PHILIPPINES

VALERIANO L. CORRE, JR.
University of the Philippines in the Visayas
College of Fisheries
Brackishwater Aquaculture Center
Leganes, Iloilo
Philippines

Abstract

There are three tilapia species cultured in Panay Island: *Oreochromis mossambicus, O. niloticus* and red tilapia. The industry is in its infancy. The total area under tilapia culture on Panay Island is 102 ha (for freshwater ponds and rice-fish farms) but there is potential for the expansion of tilapia culture in the developed brackishwater fishponds of Panay Island which total 41,534 ha. The total tilapia production in 1982 was about 21 tonnes, while production of fingerlings exceeded one million in 1982. However, seed production is very crude and traditional and there are as yet no specialist hatchery operators.

Large tilapia (over 100 g) are sold in the major city markets on the island while the smaller fish produced from rice fields are seldom sold in the market. Limited consumer acceptance of tilapia and lack of regular supply of fingerlings are some of the main problems constraining the expansion of tilapia culture on Panay Island at the present time. Also, use of insecticides and multiple cropping of rice which shortens the growing period have limited the adoption of rice-fish culture.

TRANSFER OF FISH CULTURE TECHNOLOGY IN CENTRAL LUZON, PHILIPPINES

WESTLY R. ROSARIO
Freshwater Fish Hatchery and Extension Training Center
Bureau of Fisheries and Aquatic Resources
Muñoz, Nueva Ecija
Philippines

Abstract

The state of the extension activities of Bureau of Fisheries and Aquatic Resources (BFAR) in Central Luzon is presented. The two groups of extension people, the BFAR Regional/District office and the BFAR Freshwater Fish Hatchery and Extension Training Center (FFH-ETC), that extend assistance in this area are compared. There are 21 freshwater extension technicians who are inadequately equipped. The FFH-ETC has five full-time extension staff fully equipped and prepared with sufficient transport facilities to ensure mobility. The two groups have different criteria to measure accomplishment; the BFAR Regional extension staff consider farm area (size) while the FFH-ETC consider number of visits. The Pampanga district with seven BFAR extension workers rendered 31 extension visits while the FFH-ETC with five extension agents rendered 140 extension visits in April 1983. From January to June 1983, the FFH-ETC established 43 demonstration projects on rice-fish culture, fishpond, backyard fishpond, small-scale tilapia nursery and fish cage culture. At least five fish farmers are recorded to have benefited from each of the demonstration projects using backyard fishponds of cooperating owners at strategic locations.

Session 5: Tilapia Marketing

TILAPIA MARKETING IN CENTRAL LUZON AND METRO MANILA

ENRIQUETA B. TORRES
Associate Professor
College of Development Economics and Management
University of the Philippines at Los Baños
College, Laguna
Philippines

EMELINE R. NAVERA
Regional Manager, NACIDA Region V
Bureau of Agricultural Economics-National Cottage Industry
Development Authority
Legaspi City, Philippines

Abstract

Tilapia has a growing demand with the introduction of new and better species of fish. However, since it is still a minor product among fish producers, its trading is primarily handled by small retailers.

The marketing channels through which the commodity passes are relatively short. This may have been due to the fact that the geographical location of the production area and the trading activities are relatively close together in Metro Manila and Pampanga. Another reason is the relatively small supply.

The seasonality of supply affects to a large extent the price of tilapia. However, size and freshness are also factors that affect the price. The quality of the fish that reach the market also affects the demand as indicated by consumer preferences.

That there are no overwhelming problems in the marketing of tilapia implies that prospects for its culture as a source of income and a help to augmenting the protein food availability of the country are indeed bright.

TILAPIA MARKETING IN BICOL

EMMA M. ESCOVER*
Senior Researcher
Ateneo de Naga
Naga City
Philippines

ORESTES SALON* and CRISTINA LIM
Economics Thesis Students
Ateneo de Naga
Naga City
Philippines

Abstract

This study analyzes the marketing system for tilapia in Bicol. The 37 tilapia traders interviewed in eight selected areas in Camarines Sur and Albay were mostly full-time fish traders who received 71% of their income from tilapia trading. They had an average capital investment of ₱351.

Tilapias from Lake Buhi and Lake Bato passed through from one to four intermediaries before they finally reached the consumers. Tilapia buying and selling was a profitable activity. After deducting all costs, including imputed labor costs, the wholesalers/retailers averaged ₱554 monthly net profit; the producers/wholesalers/retailers, ₱452; and the retailers, ₱359. Marketing margins per kg were ₱1.06-1.80 for retailers and ₱0.37-0.63 for wholesalers/retailers.

Low price, low demand for tilapia, perishability due to long distance between source and market outlets, erratic supply and poor quality of tilapia were the common marketing problems encountered by tilapia traders.

*Current address: c/o ICLARM, MCC P.O. Box 1501, Makati, Metro Manila, Philippines.

TILAPIA MARKETING IN LAGUNA PROVINCE

CORAZON T. ARAGON
JUVILYN COSICO
NERISSA SALAYO
College of Development Economics and Management
University of the Philippines at Los Baños
College, Laguna
Philippines

Abstract

The important factors that affect the price of tilapia in Laguna are fish size, supply-demand conditions and degree of freshness.

Due to differences in tastes and preferences of consumers, the majority of the tilapia sellers sell both available species of tilapia *(Oreochromis niloticus* and *O. mossambicus).* Tilapia are acquired by the majority of the buyers on consignment basis (77%). There is no difference in the price of tilapia regardless of the method of payment. Most of the sample respondents (54%) report that they purchase tilapia in bulk because sorting is not practiced by the tilapia producers. These tilapia sellers purchase the fish directly from the tilapia producers.

The wholesalers have the highest marketing investment, averaging ₱6,242, followed by the retailers, wholesaler-retailers and the producer-retailers, with an average marketing investment of ₱5,270, ₱1,429 and ₱756, respectively. Vehicles are the major capital investment item of all the middlemen. Tools and equipment used in tilapia marketing are few and consist mainly of weighing scales, containers and ice boxes. None of the middlemen use cold storage facilities.

Marketing costs vary among municipalities and among types of tilapia sellers.

The problems in tilapia marketing are lack of market stalls, credit collection, fish deterioration, price variability and different taste of tilapia in some months of the year.

TILAPIA MARKETING IN MINDANAO

LYDIA P. OLIVA
Associate Professor
Southern Mindanao Agricultural Research Center
University of Southern Mindanao
Kabacan, North Cotabato
Philippines

Abstract

The marketing system for tilapia in selected areas of Mindanao was examined.

Marketing channels for tilapia were found to vary from no intermediary to at most three intermediaries before the produce reached the consumers. Over one-third of the total produce was sold through the longest route, i.e., through the wholesaler/retailer and finally the consumers.

Marketing margins for retailers were relatively high, ranging from ₱0.53/kg to ₱3.11/kg. In most cases, the wholesalers and wholesalers/retailers were receiving comparatively high margins. This is indicative of the relative profitability of tilapia marketing in the selected areas.

Marketing problems that beset a few producers included, among others, the high costs of transportation, low price and no storage facilities. The majority, however, had no marketing problems. Meanwhile, the most prominent problems identified by a few buyers/sellers were lack of capital, no storage facilities, high transport costs and sometimes lack of transportation facilities.

WORKING GROUP REPORTS

Four working groups met to consider economic, technical and institutional issues related to constraints to expansion of the tilapia industry, technology transfer, roles of private and public sectors including development and management policies, and recommendations for research.

- GROUP A : Inputs
- GROUP B : Lake-based production systems
- GROUP C : Land-based production systems
- GROUP D : Marketing

GROUP A : INPUTS

Members : C. Aragon (Chairperson)
A. Abordo
V. Corre
C. Dacanay
D. de Guzman
E. Escover
F. Fermin
L. Oliva
I. Smith

Discussion framework: The inputs working group confined its discussion to the hatchery sector and in particular to:

- technical, economic and institutional constraints to expansion or efficiency of the hatchery sector of the tilapia industry;
- the role of the private and public sectors in the development of the hatchery sector and related policy issues; and
- research strategies and priorities in the tilapia hatchery sector.

Constraints: Based on the experience of the private and government-operated hatcheries, several problems were identified particularly in the management and operation of hatcheries which may serve as constraints to the development and expansion of the tilapia industry (Table 1). The specific inputs required for hatchery operations, and which may to varying degrees constrain the development of the industry, are broodstock, feed, fertilizer, labor, water and land. While the level of production of tilapia fingerlings by the private sector and government hatcheries is indeed impressive, it is apparent that serious constraints are developing particularly in the area of broodstock management. Some location-specific problems, such as land and water quality or seasonal water shortages, may also constrain the production of individual hatchery producers. Table 1 itemizes those technical, economic and institutional factors that the working group believed to be most important. These problem areas reflect the relative newness of the industry.

Policy issues: With the foregoing identified problems, the following policies are hereby recommended for implementation:

1. Expansion of hatchery training programs.
2. Establishment of more demonstration farms in provinces.
3. Encouragement of hatchery operators to form groups to avail of economies of

Table 1. Constraints to expansion of hatchery operation.

Technical factors	Economic factors	Institutional factors
A. PRODUCTION OF FINGERLINGS		
1. Breeders • Poor quality and inappropriate broodstock – Inbreeding – Contamination/cross-breeding – Infrequent broodstock replacement – Inadequate broodstock selection criteria	1. Breeders • Lack of supply of good quality broodstock	General Problems: • Lack of technical know-how • Difficulty in securing loan assistance • Lack of information dissemination on loan assistance • Lack of coordination among credit institutions • Demand for technical services is expanding more rapidly than the capabilities of the extension institutions
2. Feeds/fertilizer • Feed formulation problem for broodstock • Poor quality of feed ingredients due to adulteration • Lack of standardization of types, frequency and rates of application of fertilizers for given physical conditions	2. Feeds/fertilizer • Irregular feed and fertilizer supply • Increase in price due to competition with other food-producing industries and hatcheries using these inputs	
3. Land/water • Seasonality of water supply and quality problem (location specific) • Lack of technical know-how on pond design and construction • Water retention problem due to soil characteristics (location specific)	3. Land/water • Competition for the use of water and land due to hatchery expansion and other users • High cost of water pumps/ reservoirs and wells in areas where irrigation water is inadequate (location specific) • Insecurity of land tenure and influence of the landlord	
4. Labor • Lack of manpower with technical know-how on hatchery operation	4. Labor • Inability of small operators to hire skilled manpower	
B. MARKETING OF FINGERLINGS		
	• Seasonality of demand for fingerlings • Deteriorating quality of fingerlings • Economies of scale in marketing to fill the bulk orders favoring large-scale hatcheries • Increase in competition due to the expanding number of hatcheries, thus reducing profit margin	

scale for purchase of inputs and marketing of fingerlings.
4. Establishment and creation of a National Tilapia Broodstock Board and Center.
5. Generation of income from selling broodstock by the Center and allocation of said income for research.
6. Effective information dissemination and translation to local dialects of the available technologies on tilapia hatchery management and loan assistance.

Research: The following technical, economic and institutional research topics in order of their priority are likewise recommended to provide solutions to the identified problems and constraints to the hatchery sector of the tilapia industry:

A. *Technical*
1. Broodstock development and improvement
   a) hybridization
   b) cross-breeding of different strains
   c) development of low-cost and practical methods for broodstock selection and monitoring
2. Nutrition of broodstock
3. Development of low-cost feeds out of locally available feed ingredients.
4. Standardization of fertilization techniques.
5. Engineering studies on hatchery design.

B. *Economics*
1. Survey of the status of government and private support services and programs.
2. Assessment of risk and uncertainty in hatchery operations.
3. Supply and demand studies for tilapia broodstock and fingerlings.
4. Assessment of demand for skilled labor in hatchery operations.
5. Comparative analysis on the profitability of the different hatchery systems.
6. Assessment of credit needs of the tilapia hatchery industry.
7. Price analysis of broodstock and fingerlings.
8. Assessment of marketing systems for broodstock and fingerlings.
9. Determination of optimal sizes and locations of hatcheries.
10. Impact study of the different hatchery programs.

C. *Institutional*
1. Assessment of the existing strategies for technology transfer to the tilapia hatcheries.

GROUP B : LAKE-BASED PRODUCTION SYSTEMS

Members : W. Cruz (Chairperson)
M. Beveridge
J. Bisuna
J. Dimapilis
E. Gonzales
A. Mines

Discussion framework: Instead of focusing separately on the three questions of constraints to expansion, private vs. public sector roles, and research strategies and priorities, the group decided to go directly into observed problems and, in the analysis of these problems, to evaluate the implications for (a) research and extension programs and (b) private sector vs. government role in developing the industry. The problem areas discussed may be classified under three topics: (a) technology dissemination and differing lake environments; (b) the lake system and carrying capacity; and (c) external (factor supply) constraints. These topics form the organizing framework for this report.

Technology, environment, and dissemination: While the basic technological research

into cage culture has been done, a general technology "package" cannot presently be disseminated because of many *site-specific* factors that arise in the lake environment. For example, there are eutrophic vs. oligotrophic lakes with different water retention rates, surface areas, and depths. Even within a specific natural-environment classification, the role of human populations differ with respect to uses of the lake. And yet the basic technology seems productive enough to encourage private operators to dc their own experimentation and modifications to suit special conditions.

These observations point to the following:

1. Learning-by-doing at this stage of technical development has high payoffs, and government research and extension activities should be closely coordinated. Emphasis should be on the identification of major lake-environment types and on-site pilot studies.
2. The extension process itself should be rationalized so that present dependence of operators on informal links to government technical sources will be reduced. Also there might be large gains if public extension programs (with their limited resources) can tie-up with private breeders for improving grow-out operations. For example, hatchery operators should be encouraged to operate grow-out cages, especially in low adoption areas. There is a need to identify and exploit the coincidence of private and public goals; in general, the government should not expect private grow-out operators to assist in technical dissemination to potential competitors.
3. Finally, private initiative and capability in research or experimentation should be viewed as equal in importance to government agency research. Existing practices of operators should be evaluated and, with refinements/modifications, should be included in the on-site research activities.

Carrying capacity and the need for lake management: Observed problems in the context of lake management include:

1. Lag in the development of formal institutions (e.g., licensing or zoning laws) and informal rules (e.g., community or cultural sanctions on poaching) in the context of technical and economic change.
2. Overcrowding within the tilapia cage culture fishery leading to decreased productivity.
3. Competition with other fisheries (both culture and capture) and with other lake users.

These problems underscore the need to view the cage culture fishery within the basin or lake system. In this system, there are different decisionmaking units and the objectives vary based on competing private uses and the social or public goals.

The "watershed" sector includes the many users (e.g., agriculture/watershed, industry, domestic sector) and their corresponding uses or outputs that affect lake quality and therefore lake-based activities (Fig. 1). These lake-based activities are classified as "Fishery" and "Other Activities", and they may be viewed as interacting subsystems within the lake which also interact with the watershed sector.

In Fig. 1, note the cage culture subsystem with the dotted outline. This is the object of the individual cage culture operator's decision-making, and his objective is straightforward: to make a living. But his activities affect the whole lake system just as some non-lake factors (e.g., feed sources) affect his decision-making. As long as there is some profit to be earned, he will want to expand his operation, and this will be true for others like him. It does not matter to him if the resulting overcrowding decreases the general productivity of the lake.

The public sector decisionmaker, however, clearly has different goals. He may wish to increase total fish output (regardless of

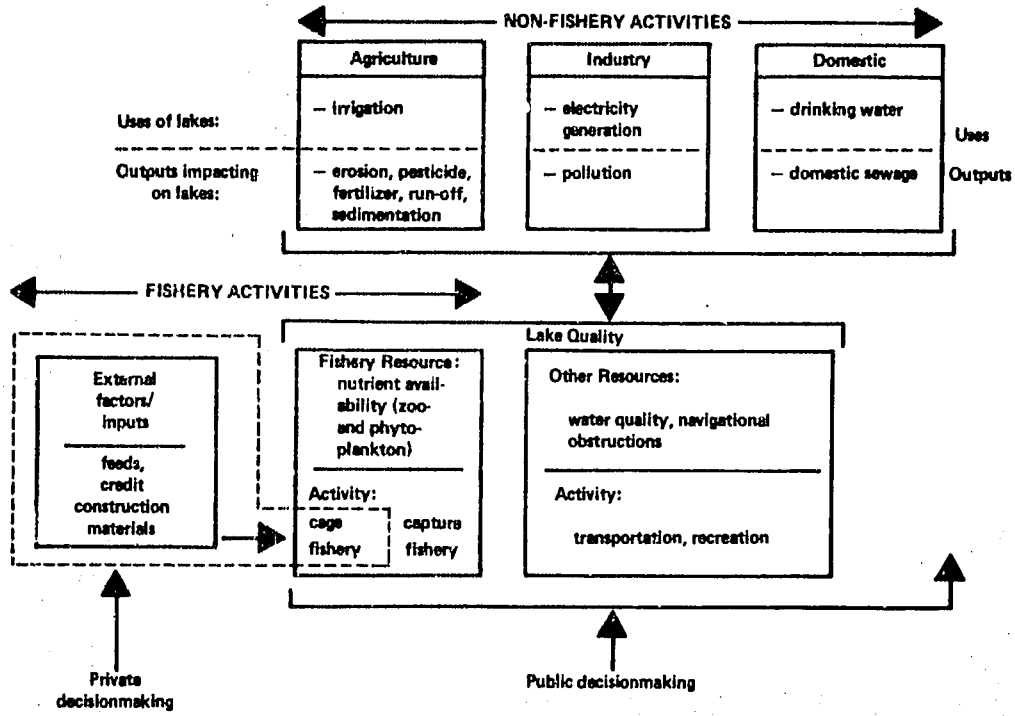

Fig. 1. The watershed sector includes agricultural, industrial and domestic users with uses and outputs which interact within lakes. Broken lines show the cage culture subsystem.

whether it is from the culture or capture fishery) while minimizing the use of scarce fertilizer or feed stocks. Or he may emphasize the other uses of the lake (e.g., irrigation) if this will be more effective at increasing total (national) income.

Following from this, the ideal procedure is to model the whole basin-lake system to optimize social gains. As a practical matter, however, such an effort will be time-consuming and costly (and may, in the end, have little to contribute to specific policy questions). An intermediate and policy-oriented procedure is to go ahead with the basic specification of current conditions (or requirements) and technical relationships (coefficients) among the activities in the system. This should then be used as the given environment in which a fishery (capture and culture) sub-model should be developed in detail. Carrying capacity for the culture fishery may then be determined simultaneously with the production of the capture fishery.

Fig. 2 illustrates how the two fishery sectors could be expected to interact over time and how total output *may be* determined in the vertical summation of the "culture" and "capture" curves.

Finally, institutional design and implementation strategies may follow from this procedure. The problem of institutional lag and the absence of effective rule changes and enforcement arise from this lack of appreciation of limited carrying capacity and competition. Aside from licensing and zoning regulations, effort should concentrate on local enforcement and administration. If equity is also an important goal, then regulating the size of

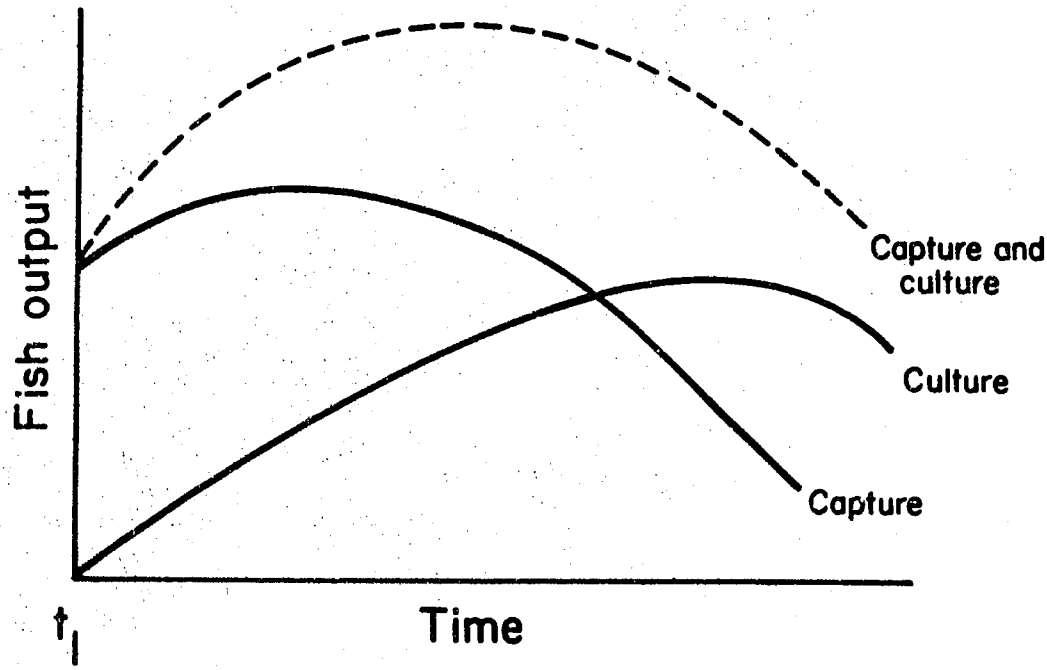

Fig. 2. The introduction of culture fisheries in a lake at time t_1 and the likely output of a lake over time in the absence of lake management. The decline in the capture fishery results from overfishing as too many fishermen enter the fishery; overcrowding in the culture sector similarly leads to decreased productivity.

culture operations, encouraging local initiative (through the licensing system), and integrating capture with culture operations should contribute to reducing the poaching problem.

External constraints: The group recognized the importance of input (or factor) supply as the basic external constraint.

For inputs, fry quality vs. quantity was emphasized as the major problem. It was observed that grow-out operators were willing to pay a premium for the assurance of quality in their fingerlings, and local hatcheries have an important role for both seed supply and grow-out technology dissemination.

The sources of raw materials for cage construction (e.g., bamboo) should also be studied as this is the major cash requirement and costs have been increasing. Researchers on cage design should check substitutes, and locally developed adaptations should be studied.

Credit may be a major bottleneck especially when the prospective operator cannot offer collateral. To safeguard the access of low income households of small-scale entrepreneurs to the industry, organized credit schemes will have to be promoted.

Finally, commercial or supplementary feeds should be studied. The first step is to outline the basic nutritional requirements and how potential feeds supply these and at what cost. Subsequently, current lake environments and their nutrient contents should be incorporated in the study. This again brings up the site-specific problems and complicates the use of standard linear programming techniques for determining the optimal feeding regime.

GROUP C : LAND-BASED PRODUCTION (GROW-OUT) SYSTEMS

Members : L. Gonzales (Chairperson)
M. Broussard
L. Darvin
L. Elizalde
R. Fabro
W. Rosario
R. Sevilleja
R. Tagarino
E. Tan

Introduction: The group attempted to describe and identify the different subsystems under the Land-Based Production (Grow-out) Systems category. Three general subsystems with various production schemes were identified by the group. These are: the agri-aqua integrated subsystem (crop-fish and animal-fish combinations); the pond subsystem (freshwater and brackishwater); and non-traditional systems (skypond, barricade fish culture and cages-in-ponds).

In trying to understand these subsystems, Group C developed the following matrix of concerns composed of: the description of the subsystems; constraints in the adoption of these subsystems; strategies to overcome these constraints; implications for policy insofar as private and public participation is concerned; and possible areas of research. A complete classification of each subsystem is given in Table 1.

Description of various land-based production (grow-out) systems:

A. AGRI-AQUA INTEGRATED SYSTEMS

- *Rice-fish:* Rice-fish technology consists of simultaneous production of rice and fish in the same paddy. The rice paddy is modified by construction of trenches that occupy approximately 10% of the total paddy area. Tilapia are stocked at a rate of 5,000/ha. Production period for fish is approximately 90-100 days. At the end of the production cycle both market size fish and fingerlings are harvested.
- *Integrated livestock-fish systems:* The major feature of these systems is the complementarity between the livestock and fish components. The manure output from the livestock operation is used in the fish culture operation. Thus, the livestock facilities (e.g., pig pens, chicken houses) are built on the fishpond dikes or just adjacent to the ponds to facilitate manure loading into the ponds. Minimal or no feeding and/or inorganic fertilization of the pond is done.

B. POND SYSTEMS

- *Freshwater ponds:*
  - Backyard

    The operation involves small-scale fishponds, the production of which is primarily intended for home consumption. Management is carried out at a limited scale with labor being provided by family members. Pond design and construction is simple and capital investment is low.
  - Semi-commercial

    This type of operation has higher capital and management requirements. A portion of the production is sold for cash. Fish stocks are either bought or produced on the farm, mainly through collection of fingerlings produced in the rearing ponds. Feeding and fertilization activities are carried out, but at irregular intervals.
  - Commercial

    This type of operation is characterized by high capital and management requirements and involves systematic and definite schemes. There is a definite cropping pattern and feeding and fertilization are done according to schedule. A separate breeding/nursery component may be incorporated in the farm set-up.

Table 1. Matrix of concerns for land-based production (grow-out) systems.

Subsystem	Constraints	Strategies to overcome constraints	Policy implications	Possible research areas
A. AGRI-AQUA INTEGRATED SYSTEMS				
Rice-fish culture	1. management practices must be adapted to rice as primary crop, hence risk of pesticide contamination	analysis and modification of technology to suit farmer's managerial capability; evaluation of rotational cropping as alternative production scheme	support existing technology verification programs	establishing the economic viability of recommended technologies; technology verification for rotational cropping
	2. non-adherence to recommended practices	same as above	increased level of operation and closer monitoring of demonstration fish farms for integrated culture	evaluation of extent of technology adoption
	3. high managerial requirement			
	4. small size of fish at harvest	stock larger fish;[1] use rice-fish area for nursery purposes		
	5. limited availability of fish of desired size for stocking	integration of hatchery with production system		
	6. poaching	synchronized cropping within community		
	7. lack of coordination at the field level between extension groups among involved agencies	better or more specific delineation of agency goals and functions at the field level		
Integrated fish-livestock culture	1. high capital requirements for new venture	restrict adoption to established/existing livestock of fish entrepreneurs[2]; avail of subsidized credit for potential operators	inclusion of this project in the Kilusang Kabuhayan at Kaunlaran (KKK) livelihood program	

Continued

Table 1. Continued

Subsystem	Constraints	Strategies to overcome constraints	Policy implications	Possible research areas
A. AGRI-AQUA INTEGRATED SYSTEMS (Cont.)				
	2. consumer bias against fish produced in manure loaded ponds	information campaign on acceptability of fish; adoption of "freshening" techniques		consumer demand studies
	3. high managerial requirement	training of potential operators		
	4. risks to human health	follow deworming practices for animals		research on parasitic load of fish
	5. ecological implications			
	6. need for technology refinements			technology generation for other crop-livestock-fish combinations; delineation of optimum stocking combinations
B. POND SYSTEMS				
Freshwater ponds				
– Backyard fishponds	overcrowding of fish population (surplus fingerlings)	monosex culture; polyculture with predatory species; more selective harvesting; high stocking density to inhibit reproduction[3]	marketing assistance on sale of excess fingerlings	production of monosex fish under hatchery conditions (technology verification)
– Semi-commercial and commercial fishponds	1. limited availability of capital			
	2. overcrowding fish population	training of hatchery operators on production of monosex fingerlings		

Continued

Table 1. Continued

Subsystem	Constraints	Strategies to overcome constraints	Policy implications	Possible research areas
B. POND SYSTEMS (Cont.)				
	3. inadequate extension program	improvement of logistics and incentive systems; appropriate training; improvement of facilities of BFAR demonstration facilities	review and improve national fisheries extension programs	
	4. increasing demand for manure as input			alternative organic fertilizers (e.g., rice hull, compost)
	5. high input cost	group buying to avail of economies of scale for purchase of inputs		
	6. limited availability of low-cost commercial feeds	evaluation of commercially available fish feed		verification of formula of commercial feeds; use of indigenous materials in feed formulation
	7. poor quality fingerlings	maintenance of high quality of broodstock	broodstock improvement program	genetic research on broodstock selection
Brackishwater ponds	1. high fingerling mortality for *O. niloticus* due to salinity stress	dissemination and verification of acclimation technique	training of brackishwater extension agents on tilapia culture	hybridization for production of salinity tolerant strains[4]
	2. overcrowding of fish population *(O. mossambicus)*			

Continued

Table 1. Continued

Subsystem	Constraints	Strategies to overcome constraints	Policy implications	Possible research areas
B. POND SYSTEMS (Cont.)				
	3. modification in cultural practices			studies on pond management systems (appropriate food base), evaluation of economics of milkfish vs. tilapia production
	4. inability to install hatcheries in brackishwater for *O. niloticus*	support from freshwater hatcheries		
C. NON-TRADITIONAL SYSTEMS				
1. Upland or skyponds 2. Barricade system 3. Cage-in-pond	verification of biological and economic aspects required			studies on biological and economic aspects

[1] But prices of larger (>35 g) fish may be prohibitive.
[2] A minority opinion.
[3] >30,000/ha stocking rates may inhibit reproduction and actually increase average size at harvest.
[4] *O. niloticus* x *O. aureus* cross or *O. niloticus*. Suggest avoid *O. mossambicus*.

- *Brackishwater ponds:*
  These are ponds constructed largely on mangrove areas or adjacent to estuaries; salinity ranges from 15 to 30 ppt. In the Philippines, the ponds are traditionally used for milkfish and prawn production.

C. NON-TRADITIONAL SYSTEMS

- *Skypond:* This is a land-based production system for tilapia involving the use of highland ponds supplied with rain or stream water. The system can be integrated with other systems such as agro-forestry.
- *Barricade fish culture:* A system in Pampanga Province of growing tilapia in dead rivers and impounded waters partitioned by nets. Compartments are relatively smaller than in fish pens. The system is normally adopted in impounded waters along flood control dikes.
- *Cage-in-pond:* This involves the installation of small cages in undrainable ponds for easier management of fish stocks.

Conclusion: Reviews of land-based systems for grow-out of tilapia indicate a potential

for continued development in this sector. Although constraints were identified for all systems, strategies to overcome most of these constraints were identified. Major policy changes or implications were also identified. Continued research and adequate extension programs are needed to expedite development of this sector.

GROUP D : MARKETING

Members : E. Navera (Chairperson)
C. Reyes
O. Salon
E. Torres
N. Ty

Introduction: The present market for tilapia looks prosperous, with a few problems confronting the traders. Profit margins are highly positive with quantity supplied lagging behind what is being demanded. As more and more producers and traders are attracted to the industry and supply catches up with demand, different and bigger marketing problems are going to surface. The less significant problems enumerated and discussed in the following section could become important problems, which, if ignored, would inhibit the expansion of the tilapia industry.

About 90% of traders had some marketing

Table 2. Marketing problems reported by tilapia traders ranked according to importance in several locations in the Philippines, 1982. Source: workshop papers.

Constraints	Metro Manila	Laguna	Central Luzon	Bicol	Mindanao
Traders			**Rank**		
Lack of supply/seasonally erratic supply	1		1	4	
Poor quality	2		2	5	
Distant source of supply	3		4	5	
Low demand	3			3	
Perishability/lack of cold storage	5	4	3		2
Credit collection		1			
Weighing problems		2			
Seasonal unfavorable taste		3			
Low selling price		5		2	
Variation in price due to difference in quality by source of supply	6				
Poor market stalls (water)	7				
High buying price				1	
Lack of capital				5	1
High transport cost					3
Producers					
Low price received					1
High transportation cost					2

Table 3. Summary of constraints, research priorities and suggested role of the public sector in tilapia marketing.

Constraint	Research priorities	Role of public sector
1. Lack of marketable supply	Expansion of supply and reduction of seasonal fluctuation through improved production technology and management	Assist in the efficient distribution of supply
2. Unstable price due to seasonal fluctuation of supply	Research on demand creation and structure of supply important to planning	Institute measures to prevent or minimize unfair trade practices
3. Variability of fish quality at certain periods of the year	Development of appropriate technologies to improve post-harvest practices in handling, packaging, storage and processing	Provide market intelligence and price monitoring services
4. Perishability and rapid quality deterioration	Development of quality control measures consistent with consumer preferences	Provide research and extension services on improving post-harvest technologies
5. Lack of capital and poor credit collection by traders		Provide credit assistance to the private sector
6. Inadequate and poor market facilities	Study on optimal size, number and location of fish landing, storage and processing facilities	Provision of market infrastructures and facilities for trading
7. High transport cost		

problems, but only 30% of producers identified any such problems. The problems noted are shown in Table 2 for various geographical areas. Both the nature and ranking of problems varied in the five localities surveyed. Table 3 summarizes the marketing constraints, as well as research priorities and suggested roles of the public sector.

Constraints to expansion or efficiency in the distribution and marketing of tilapia:

a) Cited as the main constraint to the expansion in tilapia marketing in Metro Manila and Central Luzon is the lack of supply from producers and its wide seasonal fluctuation; this problem, however, is not reported in Mindanao where the greater bulk of tilapia production is by the Southern Philippines Development Authority (SPDA). Because of its volume of output, SPDA times its production such that harvesting is more or less distributed uniformly throughout the year. Small producers in Laguna, Rizal and Central Luzon could probably organize themselves into an association or associations and agree on a workable and acceptable production program for a common objective of obtaining fair and stable prices. Such a system should consider the seasonality of competing marine fish and other freshwater fish such as milkfish. A more

or less seasonally stable aggregate fish supply may be achieved. Expansion of production may be achieved through credit and technical assistance to producers and traders.

b) Fluctuations in prices due to variations in quality of tilapia from different sources as perceived by the consumers and reported by traders is a problem in Laguna. Variations in taste during certain periods of the year which caused variations in prices were also reported. Investigations on the causes or sources of the variations in quality including taste, size and color across geographical locations and across seasons should be conducted. The findings from such investigations should yield valuable information which can be used as a basis for adopting quality control measures.

c) The demand-related problems include poor quality (freshness, taste/smell, color and size) and perishability of tilapia. Unfavorable taste of the fish has been pointed out as a seasonal phenomenon in Laguna while black color and small size have been long-time deterring factors for wider consumer acceptability in many areas (especially of *O. mossambica*) *until* the introduction of Nile and red tilapias. Where consumer preference is for live, freshwater tilapia, perishability becomes another major problem especially in regions where the production sites are situated far from the main consumption points. Traders who have thin, small, and dead tilapia have no option except to sell these fish at a lower price (as in Bicol and Mindanao) or on credit (as in Laguna). However, for traders who are able to maintain the freshness of the fish and have the big-sized tilapias to sell, high demand and high selling price naturally result and there is no marketing problem at all. The development of appropriate technologies to improve the efficiency of post-harvest activities such as handling, packaging, storage and processing of tilapia can do much to minimize the perishability and quality deterioration problem. Improved technologies in the production of the preferred sizes, color, taste, and species of tilapia should also improve prices.

d) Lack of capital and difficulties in collecting payment from buyers were the major problems of Laguna and Bicol tilapia traders. Some financing scheme in the form of credit cooperatives may evolve among the traders themselves or perhaps a financing scheme for marketing purposes may be packaged by government financing institutions.

e) Poor marketing facilities such as lack of market stalls, and fresh water supply were also mentioned by a few traders in Laguna. Improvement of market facilities is important to reducing the deterioration rate of the fish.

Roles of the private and public sectors: Since the tilapia industry is relatively young, such that supply is still less than the apparent demand, it is time that policies be established so that the mistakes committed with other similar commodities can be avoided. The public sector can do a lot to encourage the growth of the industry through provision of incentives, institution building and creating a favorable climate to enhance efficient distribution of the product especially to those who need it the most.

The potential market for tilapia is generally large in areas far from the coastline. Thus, land-based producers must be provided with incentives to ensure that tilapia reaches the protein-deficient inland areas. Possible incentives would be provision of financing to traders servicing these areas or encouraging area marketing cooperatives to tie up with producers in the disposal of their produce.

Marketing and distribution of tilapia should be primarily left to the private sector. The government should be careful not to compete with the private sector especially when the private sector is already performing the function well. Nevertheless, there are several functions that can very usefully be performed by the public sector. These include:

- Provision of research and extension services for improving post-harvest technologies, such as increasing the shelf-life of tilapia to make possible the lengthening of the trade route geographically so that fish can be made available to more people.
- Provision of marketing infrastructures including transport and storage facilities.
- Provision of credit assistance in order to encourage the private sector to improve its marketing services.
- Assistance in efficient distribution of tilapia such as through the KADIWA operations of the National Food Authority (NFA) during periods of excess supply.
- Provision of market intelligence and price monitoring services. Timely information on production, price levels and market outlets provided by agencies like Bureau of Fisheries and Aquatic Resources (BFAR), Bureau of Agricultural Economics (BAEcon) and National Food Authority (NFA) is essential to planning and management of the industry.
- Institution of measures to prevent or minimize unfair trade practices such as short selling and exploitation of consumers and producers.

Research priorities: The following research strategies (in order of their importance) are proposed in anticipation of the problems that are bound to arise as competition among producers and traders of tilapia increases.

1. *Expansion of supply and reduction of seasonal fluctuations of supply levels through improved production technology and management.* As implied by the large profit margins of traders, supply of tilapia lags behind demand. Traders in general complain of not having enough fish to buy and sell. Improving production technology should lead to expansion in tilapia production. Wide seasonal fluctuation in supply of tilapia is also a problem which could be improved through programming and scheduling of production such that a more or less stable supply of the fish within a year may be achieved. A study to look into the seasonality of production from the biological as well as management points of view with regard to raising tilapia should be a first step towards minimizing supply fluctuations.
2. *Market research studies on the development of acceptable standards or quality control measures consistent with consumers' preferences, as to species, size, color and freshness.* The results of such a study should be useful as a guide to both producers and traders in the industry.
3. *Development of appropriate technologies to improve post-harvest practice such as handling and packaging, storage and processing.* Some innovations in these directions should prove profitable. For example, if indeed the consumers preference for live tilapia is great such that consumers would be willing to pay a premium price for it, selling the fish in aquarium-type containers may be profitable. Some experiments on tilapia processing into dried fish or fresh frozen fish fillets may also be useful.
4. *Economic research on the structure of the supply function for tilapia by size, species, sex and geographical location* as well as the nature of production whether land-based or lake-based is important to planning a development program for tilapia.

5. *Estimation of the demand parameters for tilapia* is even more important than that of supply. Consumer response to changes in the price of fish (price elasticities) and income changes (income elasticities), as well as to changes in the prices of other substitute or competing goods, including other fish species, meat, poultry, etc. (cross price elasticities) should be investigated. A knowledge of these parameters should make possible the systematic planning of production targets consistent with market conditions.
6. *Price analysis (seasonal and trend) of tilapia, considering inflationary and demographic conditions* should also provide valuable information for monitoring and assessing the performance of the industry so that planning and programming of development activities for the industry may be properly guided and directed.
7. *Market research studies on demand creation for tilapia* which should include analysis of the nutritional content of tilapia and food preparation technology.
8. *A study on the feasibility of raising tilapia in very small backyard ponds* for the nutritionally disadvantaged subsistence households may also be explored. Production in this case would be more for consumption within the household rather than for the market.
9. *A study on the optimal size, number and locations of fish landings, storage and processing facilities* should be conducted and used to guide future development projects for tilapia.

FINAL DISCUSSION AND RECOMMENDATIONS OF THE WORKSHOP

After presentation of the preceding four working group reports, a general discussion was held by participants on a variety of related topics.

Discussion of working group reports: There was some debate regarding the seasonality of demand for fingerlings. Demand for fingerlings is derived from the market demand for tilapia. While some participants observed that demand for fingerlings is adversely affected at certain times of the year due to bad taste of market-size tilapia and consequent difficulties in product disposal, others believed that in fact the conditions which produced bad taste were those which indicated good growing conditions in lakes and consequently increased demand for fingerlings. The latter may be true for Laguna de Bay, but it was pointed out that grow-out cage operators in smaller lakes (e.g., San Pablo Lakes) do indeed have seasonal demand for fingerlings because of upwelling in those lakes during colder months.

A question was raised regarding why Group A (Inputs) considered lack of quality control over feed ingredients to be an economic rather than a purely technical problem. In answer, the group explained that poor quality control leads buyers to favor only those sellers whom they can trust. This in turn contributes to a small-number-of-sellers condition in the feed market which may result in manipulation of feed prices to the advantage of these sellers. Better quality control would thus reduce the risk incurred by feed buyers and encourage competition among sellers.

Group B (Lake-based production systems) was asked why they thought tilapia growing was catching on and what role the private sector could play in disseminating cage culture technology. In reply, the group stated that the Philippines is a generally poor country with low, if not declining, real wages. Therefore, consumers are being made to adapt to a less-desired commodity such as tilapia, instead of consuming the traditional, now higher-priced, marine species and milkfish. Given the favorable market conditions that currently prevail for tilapia, it was believed to be unreasonable to expect the private sector to take the initiative in disseminating technology because it will only increase production and hence competition for the existing producers. Therefore, technology dissemination was clearly a role for the public sector.

A question was raised as to whether the conversion of riceland to fishponds was in conflict with the country's Land Reform program. In answer, a PCARRD official commented that the government seems to presently tolerate such conversion, but there is a need to examine this issue further to see if restrictions on riceland conversion may become a constraint to expansion of the tilapia industry.

Group D (Marketing) was questioned regarding which agencies, if any, could be the primary implementors of the various marketing strategies recommended by the group. The Bureau of Fisheries and Aquatic Resources (BFAR) and the Bureau of Agricultural

Economics (BAEcon) were both suggested as possibilities, though the question of overlapping and duplicative responsibilities would need to be resolved. The final comment made on the marketing issue was that one should be very cautious about saying there is a deficiency in supply of tilapia and that it is dangerous to base projected demand upon concepts of nutritional deficiency without taking effective purchasing power into account.

The participants were informed that an ad-hoc committee of researchers, private producers and government officials had already recommended the creation of a National Tilapia Broodstock Center and Board. A similar recommendation had been made by workshop Group A (Inputs) in hopes of stimulating research on broodstock management, quality control and hybridization. The aquaculture consultant to the BFAR-USAID Tilapia Hatchery project in Muñoz, Nueva Ecija stressed that certification of strains is a complicated and extremely touchy subject. Nevertheless, research on tilapia genetics and broodstock improvement is definitely needed.

The final issue of general discussion related to the need for economists and biologists to work together in interdisciplinary research. It was suggested that experimental data on tilapia production would be a good area in which to begin. Some participants had reservations about economists working with biological experimental data, and suggested instead that the most beneficial time for constructive interaction between economists and biologists could come during the pilot-scale testing of tilapia production technologies and would preferably involve testing and evaluation under actual farm conditions of private producers.

Recommendations: In addition to the specific recommendations of each of the working groups (see p. 22-37), the workshop made two general recommendations. These were:

- Endorsement of the proposed establishing of a *National Tilapia Broodstock Center* where research on genetics, broodstock management and fingerling production could be undertaken.
- Initiation of a *statistics collection system for tilapia.* At a minimum, these data should include area (by type of system and location), production and prices. The collection of secondary data suitable for economic analysis is recommended so that expensive primary surveys of producers need be undertaken at less frequent intervals. This recommendation applies not only to tilapia but to the entire Philippine aquaculture industry.

PROGRAM OF ACTIVITIES

August 9 (Tuesday Evening) : Arrival and Registration of Participants

August 10 (Wednesday)

Session 1 (9:00 A.M.) : Introduction and Overview

Introductory Remarks – Dr. Ramon V. Valmayor (PCARRD), Dr. Ian R. Smith (ICLARM)

Tilapia Farming in the Philippines: Practices, Problems and Prospects – Dr. Rafael D. Guerrero III

Master of Ceremonies/Moderator – Dr. Elvira O. Tan

(10:15 A.M.) : Break

Session 2 (10:30 A.M.) : Tilapia Hatcheries

Economics of Private Tilapia Hatcheries in Laguna and Rizal Provinces – Ms. Luz R. Yater, Dr. Ian R. Smith

Economic Analysis of a Large-Scale Hatchery for the Production of *Oreochromis niloticus* Fingerlings in Central Luzon, Philippines – Dr. Meryl C. Broussard, Jr., Ms. Cecilia G. Reyes

The Adoption of Tilapia Farming and Its Impact on the Community of Sto. Domingo, Bay, Laguna – Ms. Ma. Corazon B. Gaite, Mr. Jose Noel A. Morales, Ms. Olga Criselda R. Orilla, Ms. Bernadine B. Pili

Panel Discussants – Dr. Roger S.V. Pullin, Ms. Nida R. Ty

Moderator – Dr. Enriqueta B. Torres

Lunch Break

Session 3 (1:45 P.M.) : Cage Culture Systems

The Economics of Cage Culture in Bicol Freshwater Lakes – Ms. Emma M. Escover, Mr. Rodrigo L. Claveria

Economics of Cage Culture in Laguna Province – Dr. Corazon T. Aragon, Dr. Enriqueta B. Torres, Mr. Miguelito M. de Lim, Mr. Gerardo L. Tioseco

Economics of Cage Culture in Mindanao – Dr. Lydia P. Oliva

Financial and Economic Analyses of Grow-Out Tilapia Cage Farming in Laguna de Bay – Mr. Jovenal F. Lazaga, Mr. Leonardo L. Roa

Panel Discussants – Dr. Rafael D. Guerrero III, Dr. Wilfrido D. Cruz

Moderator – Dr. Meryl C. Broussard, Jr.

August 11 (Thursday)

Session 4 (8:30 A.M.) : Land-Based Culture Systems

Tilapia Production in Freshwater Fishponds of Central Luzon – Mr. Ruben C. Sevilleja

Economics of Rice-Fish Culture Systems – Mr. Rogelio N. Tagarino

The Introduction of Integrated Backyard Fishponds in Lowland Cavite – Mr. Frank Fermin

Status, Potential and Needs of Tilapia Culture in Panay Islands, Philippines – Mr. Valeriano L. Corre, Jr.

(10:15-10:30 A.M.) : Break

Transfer of Fish Culture Technology in Central Luzon, Philippines – Mr. Westly R. Rosario

Panel Discussants – Dr. Aida R. Librero, Mr. Manuel Banzon

Moderator – Dr. Rodolfo G. Arce

Lunch Break

Session 5 (1:30 P.M.) : Tilapia Marketing

Tilapia Marketing in Central Luzon and Metro Manila – Dr. Enriqueta B. Torres, Dr. Emeline R. Navera

Tilapia Marketing in Bicol – Ms. Emma M. Escover, Mr. Orestes T. Salon, Ms. Cristina P. Lim

Tilapia Marketing in Laguna Province – Dr. Corazon T. Aragon, Ms. Juvilyn Cosica, Ms. Nerissa Salayo

Tilapia Marketing in Mindanao – Dr. Lydia P. Oliva

(3:15-3:30 P.M.) : Break

Panel Discussants – Dr. Leonardo A. Gonzales, Atty. Benito Bengzon

Moderator – Mr. Rogelio N. Tagarino

(8:00 P.M.) : Film Showing

August 12 (Friday)

Session 6 (8:30 A.M.) : Working Group Sessions
(12:00-2:00 P.M.) : Lunch Break

Session 7 (2:00 P.M.) : Continuation of Working Group Sessions

Working Group Chairmen:

1. Inputs – Dr. Corazon T. Aragon
2. Lake-Based Production Systems – Dr. Wilfrido D. Cruz
3. Land-Based Production Systems – Dr. Leonardo A. Gonzales
4. Marketing – Dr. Emeline R. Navera

August 13 (Saturday)

Session 8	*(8:30 A.M.)*	:	Working Group Presentations and Concluding Discussions
Session 9	*(P.M.)*	:	Field Trip
	(1:20 P.M.)	:	Departure from CEC
	(1:50 P.M.)	:	BFAR Station, Sto. Domingo, Bay, Laguna
	(2:30 P.M.)	:	Mang Pascual's Backyard Tilapia Hatchery, Sto. Domingo, Bay, Laguna
	(3:15 P.M.)	:	Mane's Hatchery Farm, Caluan, Laguna
	(4:15 P.M.)	:	Austria's Tilapia Farm, Sampaloc Lake, San Pablo City
	(6:00 P.M.)	:	Dinner, Sampaloc Lake

August 14 (Sunday) : Departure of Participants

List of Participants

Ms. Aurea G. Abordo
Researcher
Agribusiness and Natural Resources Research Department
Development Bank of the Philippines
Buendia, Makati, Metro Manila

Mr. Ruperto Angodung, Jr.
President
Philippine Federation of Aquaculturists
16 C.L. Montelibano
Bacolod City, Negros Occidental

Dr. Corazon T. Aragon
Assistant Professor
College of Development Economics and Management
University of the Philippines at Los Baños
College, Laguna

Dr. Rodolfo G. Arce
Director, Freshwater Aquaculture Center
Central Luzon State University
Muñoz, Nueva Ecija

Mr. Manuel Banzon
National Food and Agriculture Council
Elliptical Road
Diliman, Quezon City

Dr. Malcolm Beveridge
Research Fellow
Institute of Fisheries Development and Research
College of Fisheries
University of the Philippines in the Visayas
Diliman, Quezon City

Mr. Job Bisuña
Jobski Fish Farm
Baao, Camarines Sur

Dr. Meryl C. Broussard, Jr.
Aquaculture Consultant
BFAR-USAID Project
Central Luzon State University
Muñoz, Nueva Ecija

Mr. Valeriano L. Corre, Jr.
Assistant Professor
University of the Philippines in the Visayas
College of Fisheries
Brackishwater Aquaculture Center
Leganes, Iloilo

Dr. Wilfrido D. Cruz
Assistant Professor
College of Development Economics and Management
University of the Philippines at Los Baños
College, Laguna

Mr. Calvert C. Dacanay
Industry Specialist
National Lakes Development Programs
19th Floor, Strata Bldg.
Pasig, Metro Manila

Ms. Loureeda C. Darvin
Science Research Specialist
PCARRD
Los Baños, Laguna

Ms. Dalisay L. de Guzman
Science Research Specialist
PCARRD
Los Baños, Laguna

Ms. Julieta R. Dimapilis
ICLARM
MCC P.O. Box 1501
Makati, Metro Manila

Ms. Lucia P. Elizalde
Fishery Industry Project Officer
Fishery Industry Development Council
Ear' Avenue, Diliman, Quezon City

Ms. Emma M. Escover
Junior Research Fellow
ICLARM
MCC P.O. Box 1501
Makati, Metro Manila

Ms. Rita M. Fabio
Science Research Specialist
PCARRD
Los Baños, Laguna

Mr. Frank Fermin
International Institute of Rural Reconstruction
Silang, Cavite

Mr. Ernesto R. Gonzales
Research Associate
Binangonan Research Station-SEAFDEC
Binangonan, Rizal

Dr. Leonardo A. Gonzales
Associate Agricultural Economist
International Rice Research Institute
Los Baños, Laguna

Ms. Luzviminda A. Guerrero
General Manager
Aquatic Biosystems
Bay, Laguna

Dr. Rafael D. Guerrero, III
Aquaculture Consultant
Technology Resource Center
Buendia Ave. Ext., Makati
Metro Manila

Mr. Jovenal F. Lazaga
Research Associate
SEAFDEC Aquaculture Department
Ortigas Ave., Mandaluyong
Metro Manila

Dr. Aida R. Librero
Director for Social Science Research
PCARRD
Los Baños, Laguna

Mr. Christopher Maccormac
Program Officer-Economics
IDRC, P.O. Box 101 Tanglin
Singapore 9124

Mr. Andres M. Marie
Mayondon, Los Baños
Laguna

Prof. Antonio N. Mines
Director
Institute of Fisheries Development and Research
University of the Philippines
Diliman, Quezon City

Mr. Noel A. Morales
Ateneo de Manila University
Quezon City

Dr. Emeline R. Navera
Regional Manager, NACIDA Region V
BAEcon-NACIDA
Legaspi City

Dr. Lydia P. Oliva
Southern Mindanao Agricultural Research Center
University of Southern Mindanao
Kabacan, North Cotabato

Ms. Olga Criselda R. Orilla
Ateneo de Manila University
Quezon City

Ms. Bernadine B. Pili
Ateneo de Manila University
Quezon City

Dr. Roger S.V. Pullin
Senior Scientist
ICLARM
MCC P.O. Box 1501
Makati, Metro Manila

Ms. Cecilia G. Reyes
Supervising Fishery Technologist
Bureau of Fisheries and Aquatic Resources
860 Arcadia Bldg., Quezon Ave., Quezon City

Mr. Leonardo L. Roa
Assistant Instructor, Economics
Ateneo de Manila University
Quezon City

Mr. Westly R. Rosario
Freshwater Fish Hatchery and Extension
Training Center
Bureau of Fisheries and Aquatic Resources
Muñoz, Nueva Ecija

Mr. Orestes T. Salon
ICLARM
MCC P.O. Box 1501
Makati, Metro Manila

Mr. Ruben C. Sevilleja
Instructor
College of Inland Fisheries
Central Luzon State University
Muñoz, Nueva Ecija

Dr. Ian R. Smith
Senior Scientist
ICLARM
MCC P.O. Box 1501
Makati, Metro Manila

Mr. Rogelio N. Tagarino
Researcher I
Center for Policy and Development Studies
University of the Philippines at Los Baños
College, Laguna

Dr. Elvira O. Tan
Director for Fisheries Research
PCARRD
Los Baños, Laguna

Dr. Enriqueta B. Torres
Associate Professor
College of Development Economics and
Management
University of the Philippines at Los Baños
College, Laguna

Ms. Nida R. Ty
Asst. Prof. in Economics
College of Arts and Sciences
University of the Philippines in the Visayas
Iloilo City